School of Geosciences
University of South Florida

Master of Science Degree & Graduate Certificate Programs

ENVIRONMENTAL
SCIENCE AND POLICY (ESP)

STUDENT HANDBOOK 2019-20

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Environmental Science and Policy Master of Science Program
http://hennarot.forest.usf.edu/main/depts/geosci/grad/students/
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I. Environmental Science and Policy Graduate Programs

The Environmental Science and Policy (ESP) Program at the University of South Florida (USF), is housed within the School of Geosciences, and it is intended to bring together faculty and students with a breadth of knowledge and curiosity about the environment. The program is broad in which it allows students to explore issues in both environmental science and policy, but it is specific in which students may specialize in an area that focuses on his/her unique interests.

Located in the Tampa Bay region, USF serves as a center of knowledge and research about our natural and built environments. With the largest economic growth in Florida, and on par with some of the faster growing regions in the United States, the Tampa Bay area is an ideal place to study issues related to environmental science and policy.

The programs of study in ESP are: the Master of Science (MS) Degree program (thesis and non-thesis options); the Graduate Certificate in Environmental Policy and Management EPM, and the doctoral program in Geography and Environmental Science and Policy. The doctoral program is discussed, in detail, in a separate handbook (School of Geosciences at http://hennarot.forest.usf.edu/main/depts/geosci/grad/students/). The programs are interdisciplinary in nature, intended to educate students in the cross-boundary problems facing researchers and decision-makers in today’s complex environmental problems.

II. Admission to the MS Degree Program

Students wishing to gain admittance into the graduate program in Environmental Science and Policy must have a baccalaureate degree or its equivalent from an approved/accredited college or university, typically in a discipline related to environmental science or environmental policy. All application items must be submitted via USF Online Application System, which include:

1. A completed application form. This can be found at the USF Graduate Admissions website.
2. Transcripts from the undergraduate degree as one of major application contents are required to submit with other application materials. Applicants will be considered if they have attained a grade point average of at least 3.0 (on a 4-point scale) for the last 60 credits taken as an undergraduate.
3. Scores from a Graduate Record Examination (GRE) taken within five years of the date of application are required with a minimum total scores of 297.
4. A letter of intent or a statement of interests is required. The letter should summarize the applicant’s relevant achievements and academic preparation; describe the applicant’s academic and career goals, and ways in which studies toward the MS will further those goals; and state the applicant’s intended area(s) of academic interest within the field of environmental science and policy, preferably identifying faculty members who share those areas of interest and who might serve as advisors for the applicant’s studies and research.
5. At least three (3) letters of recommendation from persons familiar with the applicant’s achievements, abilities, and performance, including two letters from persons familiar with the applicant’s academic performance, stating his/her judgment of the applicant’s likelihood
of success in the graduate program. Signatures and letterheads are required for letters of recommendation.

6. A Graduate Assistant (GA) application if the student is applying for a GA position. This form can be downloaded from the Department’s website (http://hennarot.forest.usf.edu/main/depts/geosci/grad/data/GA_Application_Form.pdf.)

7. Applicants for the Graduate Certificate Program in Environmental Policy and Management should see the admission and applications guidelines available at http://hennarot.forest.usf.edu/main/depts/geosci/grad/cert/.

Students admitted to the MS Program are expected to have adequate academic preparation to complete advanced coursework and research in a range of scientific disciplines, and in the application of scientific information to public policy and decision-making in the environmental field. Suitable undergraduate degrees may include: geography, biology; geology; chemistry; civil, chemical, or environmental engineering; urban planning; environmental studies, with quantitative coursework included; and other degrees where the student has mastered some quantitative methods, some analysis of environmental systems, and some assessment of public policy and decision-making for environmental protection. As a rule, applicants should expect to have completed the following pre-requisites before acceptance to the MS program:

1) Math: two courses, calculus and/or statistics preferred
2) Biology: one course
3) Chemistry: one course
4) Geosciences (geology, soils, agricultural science, other): one course
5) Physics, engineering mechanics, or equivalent: one course
6) Environmental policy: Demonstrated interest in and aptitude for public policy, preferably environmental policy and/or management. This may be demonstrated through coursework, professional or volunteer activities, written projects, or other evidence.

Applicants may be accepted into the program if they have not completed one or more of these prerequisites, though their preparation will be considered on a competitive basis during the admission process. A student who enters the MS program lacking any of these pre-requisites will be expected to complete them by taking additional coursework during his/her MS program, or demonstrate his/her proficiency in some other fashion, to the satisfaction of the student’s major professor and faculty advisory committee.

Students are encouraged to apply by February 15th for fall admission and October 15th for spring admission. For fall admission the decisions for financial support (graduate assistantships - GA) for the following year will be made from among completed applications received by February 15th. Generally, all financial support is provided to Fall applicants successful in obtaining a GA, and consequently, in most cases, GAs are not available for Spring applicants. Application materials will be accepted at any time, and students may be admitted for either spring or fall semester, but students applying for a GA position should adhere to the February deadline.
III. General Information and Overview of Procedures

General guidelines and procedures for the MS Degree Program and Graduate Certificate in Environmental Management are as follows.

1. It is the responsibility of the student to be acquainted with all requirements and regulations of the University and the School of Geosciences (SGS), and to complete all requirements of the ESP program.

2. New Graduate Assistants (Gas) attend a Department orientation session prior to the beginning of classes, as well as a two-day workshop offered by the Center for 21st Century Teaching Excellence for Teaching Assistants, which typically occurs during the week preceding the beginning of classes for the fall semester.

3. Graduate Assistants are required to take a minimum of nine hours per semester and a maximum of twelve hours.

4. Graduate students must maintain a cumulative GPA of 3.0 (“B”) averaged over all courses. In addition, students must attain a 3.0 in all required core courses. Students who fail to do so are placed on School and USF probation. A student may remain on probationary status for one semester only, after which he or she must raise his or her GPA to above 3.0. Students who remain below 3.0 for two semesters will be dismissed from the graduate program. No grade below “C” will be accepted toward a graduate degree, but all grades will be counted in computing the overall grade point average.

5. Graduate students (both thesis and non-thesis option) may include a maximum of six hours of Independent Study or Directed Research/Readings coursework in the program. Thesis option students must complete a minimum of six thesis hours (EVR 6971) and only six thesis hours will be counted toward the degree.

6. A grade of “incomplete” (an “I” grade) may be awarded at the discretion of the instructor only when the student is otherwise earning a passing grade and only if the incomplete is due to circumstances beyond the control of the student or the instructor. Students are advised to initiate a written contract for completing work to satisfy the course requirement and remove the incomplete grade. The contract should include a description of the work to be completed and the date by which the work is to be submitted; and must be approved and signed by the student and the course instructor. Until removed, the “I” is not computed in the grade point average. If not removed after two terms (including summer), “I” grades will be converted to “IF” or “IU” (Incomplete-Fail or Incomplete-Unsatisfactory). Students may not re-register for courses to change an “I” grade, but should complete the missing course requirements and receive a grade change from “I” to a letter grade. All grades of “I” must be removed before the student applies for graduation.

7. MS degree candidates must apply for graduation within 15 days after beginning of the term in which they expect to graduate, as specified in USF Office of Graduate Studies regulations. Other procedures and actions for graduation are described on the USF Graduate School website which can be found at https://www.usf.edu/registrar/resources/graduation.aspx.

8. Candidates for the Graduate Certificate in Environmental Policy and Management (EPM) must also apply for graduation. Students who have completed all necessary coursework are
not awarded the Certificate until they complete the application listing completed courses, which is approved by the Graduate Director.

IV. Advising

For each student accepted into the MS degree program, the Director of Geography Environmental Science and Policy (GEP) Programs will initially appoint a faculty member from the School as an advisor (major professor). The advisor will guide the student in selecting appropriate courses and overall program planning. A student is strongly encouraged to change his/her advisor if his/her academic interests become more closely aligned with the interests of another faculty member and that faculty member can accommodate another student. All changes in advisors must be approved by the Graduate Director.

For students pursuing the Graduate Certificate, the Director of GEP Programs remains the major advisor, and approves all coursework and completion requirements.

Guidelines for advising in the MS program are as follows:

1. Each student (both thesis and non-thesis options) will select, or be provided with, a major professor, who will also serve as the student’s Advisory Committee chair and academic advisor.

2. The major professor should be a faculty member with whom the student is willing to work and who is willing to give thoughtful direction with respect to the selection of courses, and for thesis option students, all aspects of the thesis. Students with particular areas of interest in mind, but are unsure of which faculty to approach, should consult the Graduate Director.

3. To qualify as a candidate for major professor:
   a) The professor must be a tenured or tenure-track faculty member in the School of Geosciences.
   b) For thesis option students, the professor’s research interest, area of expertise, and/or experience should relate to the interests of the student.
   c) The professor must be willing and reasonably available to assist and direct the student to completion of degree (or assist in the transition to another major professor should the need arise).

4. Each student, in consultation with his or her selected major professor, selects two additional members to complete the Advisory Committee (thesis option students), and in the case of non-thesis option students, an examination committee. At least one of the committee members must be a tenured or tenure-track faculty member in the School of Geosciences. Typically, it is in the student’s best interest to consider potential committee members early by seeking out faculty who work in areas relating to the student’s research and/or academic interests.

5. A completed Advisory Committee Appointment form must be signed by all members of the committee, and then submitted to the Graduate Director for approval. Non-thesis option student’s forms are internal, and thesis option student’s forms are submitted to the College of Arts and Sciences (CAS) Graduate Office. Students subsequently may change committee
members, including the major professor, by completing a change of committee form and submitting it for approval to the Graduate Director. Upon approval this form is forwarded to the CAS Graduate Studies Office.

6. Students are expected to present a thesis research proposal to their thesis advisory committee shortly before or after the completion of 18 credit hours (which is to include the core courses). The thesis committee will be given at least two weeks to review the written proposal, after which the committee will meet with the student to discuss the proposal and make recommendations. This meeting will take place at least one semester before the semester in which the student plans to graduate.

7. Non-thesis option students continue to work with their advisors and committees regarding course planning, and the comprehensive written examinations.

**Graduate Student Advisory Committee Expectations of Conduct**

The following expectations will be followed by all participants involved in a dissertation/thesis committee, including student, advisor (major professor) and committee members:

1) Regular communication about research progress between the student and the committee members.

2) If major changes occur to the proposed study, the student, in consultation with his/her advisor, is responsible for calling a committee meeting.

3) If concerns arise either with regards to what might be considered major changes within the thesis committee, or other matters pertaining to the pursuit of the proposed study, these concerns will be resolved by the Graduate Program Director working in conjunction with the GPY/ESP Graduate Committee and the Director/Chair of SGS. If the Graduate Program Director is the student’s major professor, then the Director/Chair of SGS will appoint another faculty to head that committee. If the concerns cannot be resolved at that level, then the matter will be dealt with solely by the SGS Chair/Director. If resolution cannot be reached at the school level, the student has the right to file a grievance with the College of Arts and Sciences. If a student is considering such a step, she/he is strongly encouraged to review the USF Graduate Catalog section of University’s Academic Grievance Procedures as time limits apply.

V. MS Degree Requirements: Coursework

To earn the MS degree, students must complete at least 36 hours of coursework according to guidelines specified below. Thesis option students must complete a thesis and pass a comprehensive oral exam to the satisfaction of the student’s Advisory Committee. Non-thesis option students must pass a six-hour written comprehensive exam.

**General guidelines** for the coursework requirements are as follows:

1. The coursework is expected to be at the graduate level (courses numbered in the 5000 or 6000 levels).

2. Students select coursework in consultation with their major professor and Advisory Committee. The Committees will direct students to complete coursework necessary to the
selected areas of concentration. Committees may direct students to complete additional courses beyond the minimum requirements for the Master’s Degree, for example to master subjects of pre-requisite courses not completed prior to entering the Program or to master techniques needed to complete the selected thesis research for thesis option students.

3. Students may count a maximum of nine (9) credits from previously completed courses (from non-degree courses and other MS programs) toward fulfilling the MS Degree requirements, provided the credits are appropriate to the program, and subject to approval by the Graduate Director and the USF Graduate School. Courses will be approved for credit toward the MS in ESP only if those courses have not been applied by the student to another earned degree, at USF or elsewhere. Students, completing the Environmental Policy and Management (EPM) Certificate Program, and other approved (by the Graduate Director) USF Certificate Programs, can apply 12 hours from that program toward the ESP MS Program.

4. All credits used to satisfy the requirements for the MS degree must be earned by the student within a period of five (5) academic years prior to the date of graduation.

5. Students are expected to remain continuously enrolled while seeking the MS degree. Upon successful completion of all degree requirements except for thesis, students must enroll in a minimum of 2 credit hours (except summers) and they must be enrolled in at least two semester hours in the semester they graduate (thesis option students should enroll in EVR 6971).

6. Prior to applying for graduation, the student will meet with his/her major professor to verify that all degree requirements have been met. During the student’s program, courses should be selected in consultation with the student’s advisor to ensure that the coursework satisfies all guidelines and requirements.

Coursework for the MS Degree is divided into 3 or 4 categories, with students selecting the thesis option completing items A–D below; non-thesis option students complete A, B and D, and item C is replaced with 8 or 9 additional hours of elective coursework.

A. Core courses: 15 credits
B. Elective courses: 12 credits
C. Supervised research (thesis preparation and research methods/design course): 8 or 9 credits
D. Research Colloquium 1 credit

Coursework in the three categories is selected according to the following guidelines:

A. Core Requirements (15 credits)

1. Advanced Environmental Topics (12 credit hours):

   Students complete both of the following courses:

   GEO 6116 Perspectives on Environmental Thought

   EVR 6922 ESP Capstone Seminar (taken after a minimum of 24 program hours have been completed).
Students must take two courses from the following list. At least one class must be an EVR course.

- EVR 6934 Seminar in Environmental Science (varying special topics)
- EVR 6937 Seminar in Environmental Science and Policy (varying special topics)
- EVR 6216 Advances in Water Quality Policy and Management
- EVR 6101 Geomorphology for Environmental Scientists
- EVR 6408 Wildlife Ecology
- GEO 6347 Natural Hazards
- GEO 6288 Hydrologic Systems
- GEO 6286 Advances in Water Resources
- GEO 6263 Soils Seminar
- GEO 6217 Karst Geomorphology
- GEO 6215 Geomorphology Seminar
- GEO 6209C Physical Geography Seminar
- GEO 6345 Technological Hazards and Environmental Justice
- PHC 6712 Air Pollution Research

Other courses may be accepted toward this core requirement subject to prior approval by the Graduate Director.

2. Applications/Tools (3 credit hours):

Quantitative methods suitable for advanced analysis of environmental problems. Students select one of the following:

- GIS 5049 Geographic Information Systems for Non-Majors
- GIS 6100 Advanced Geographic Information Systems
- STA 5166 Computational Statistics I
- PCB 6456 Biometry
- GEO 6166 Multivariate Statistical Analysis

Other courses with the primary objective of quantitative methodology for environmental science or policy decision-making will be considered, subject to the approval of the Graduate Director and the student’s Advisory Committee.

B. Elective Requirements (12 credits)

Students must complete 12 credit hours of elective courses within an area of concentration selected according to their interests and career goals. Students should select appropriate advanced coursework within their chosen area of concentration, in close consultation with their major professor and Advisory Committee, to develop programs of study that fit their scholarly and career interests, and for thesis option students, the needs of their research. Students completing an
approved (by the Graduate Director) graduate certificate as part of their programs can count 12 hours from the certificate program towards the MS degree elective requirements. Students completing the EPM Certificate can apply GEO 6116 and EVR 6922 (or approved course substitutions) toward the MS degree core requirements. Additional certificate courses that meet MS degree core requirements will be applied to the core and remaining courses will be counted as electives in the MS program. Each student’s elective program of study is subject to the approval of the Graduate Director.

General guidelines for elective coursework are as follows:

- Each student’s elective program of study should include at least one course in quantitative methods, guided by the description of core courses in the Applications/Tools category, in addition to the one course used to fulfill the Department’s Core Requirements as described above.

- Each student’s elective program of study should include at least one course designed to integrate science and policy considerations, guided by the description of core courses in the Advanced Topics in Environmental Science category, in addition to the one course used to fulfill the Department’s Core Requirements as described above.

- In other respects, the coursework selected by the student within the areas of concentration may be reasonably flexible, as long as it meets the guidelines in this manual and comprises an area of concentration consistent with the ESP Program’s educational objectives.

- Areas of concentration for the MS degree that also lead to a Graduate Certificate from another USF Department are further constrained by the requirements of each Certificate. MS students are encouraged to complete a certificate program as part of their program. The certificate program needs to be approved by the Graduate Director. A listing of all graduate certificate programs offered at USF can be found at https://www.usf.edu/innovative-education/graduate-certificates/.

Areas of concentration supported by ESP faculty research interests and Department educational objectives, where students may choose to focus their elective coursework, include the following:

1. **Ecology.** 12 credits primarily from courses offered within the ESP Program in the School of Geosciences (SGS), and courses in the Department of Biology, to be selected in consultation with the student’s major professor and Advisory Committee. This area features a particular concentration in landscape ecology, wildlife ecology and management, conservation biology, ecological modeling, and field methods, including the use of GIS, GPS, and remote sensing technologies.

2. **Environmental Policy and Management.** 15 credits (only 12 hours can be applied toward the MS program) guided by the guidelines for the Graduate Certificate in EPM. Credits will be applied to the core and elective requirements for the MS program as described above.

3. **Geology.** 12 credits primarily from courses offered within the ESP and Geology Programs in the SGS, to be selected in consultation with the student’s Advisory Committee. This area features a particular concentration in karst geology and public policy planning in karstic environments; and a concentration in paleo-geology.
4. **Hydrogeology.** 15 credits (only 12 hours can be applied toward the MS program) as required by the Graduate Certificate in Hydrogeology, as specified by the Geology Program in the SGS.

5. **Hazards Assessment and Mitigation.** 12 credits primarily from courses offered within the ESP and Geology Programs in the SGS and courses in the Department of Civil Engineering, to be selected in consultation with the student’s major professor and Advisory Committee.

6. **Environment Geography.** 12 credits primarily in the Geography Program in the SGS, to be selected in consultation with the student’s major professor and Advisory Committee.

7. **Water Quality and Policy.** 12 credits drawn from relevant courses offered within the ESP Program in the SGS, and courses in the Departments of Civil and Environmental Engineering, and Government and International Affairs, to be selected in consultation with the student’s major professor and Advisory Committee. This area features a particular concentration in urban runoff water quality, watershed-based water quality assessment, and watershed planning and management for water quality protection.

8. **Others.** 12 credits in other areas of concentration are also considered. The student may select an area of concentration that is strongly supported by graduate studies at USF and by one or more faculty members in the SGS. The student should be able to describe how the courses form a coherent area of concentration relevant to his or her scholarly interests, research objectives, and/or career goals, and prepare a brief statement to that effect for the approval of the Graduate Director. The student should then select courses in consultation with his/her major professor and Advisory Committee.

**C. Research (9 credits)**

a. **Thesis Research:** All students selecting the thesis option will complete at least 6 credits of Thesis (EVR 6971) hours under the supervision of their major professors. Thesis credits should be obtained only after the student has completed an approved research proposal as described below under the section entitled MS Degree Requirement: Research. Normally students register for 3 or more credits of thesis hours over their final two semesters, but students may register for additional thesis credits, but normally only six thesis credits are counted toward the degree requirements.

b. **Research Methods/Design:** All students selecting the thesis option will complete a research methods/design course (GEO 6970 – Research Methods in Geography, Old Title Geographic Research Design). Other courses (structured courses) may be substituted for this requirement with the permission of the student's advisor and the Graduate Director.

c. **Research Colloquium:** All MS degree candidates (both thesis and non-thesis option students) must complete the 1-credit Research Colloquium in Environmental Science and Policy (EVR 6930) at least once during their programs.

**CORE COURSE SUBSTITUTIONS**

Course substitutions for required core courses are discouraged in the SGS. However, under certain extenuating circumstances they are allowed. Students needing a substitution for one of the required
core classes should submit a written petition and complete the school’s substitution form. Only comparable graduate level courses at the same level covering similar material can serve as a replacement. The student will need to provide a syllabus of that course to his/her advisor, the graduate director and the graduate committee who will then approve or deny the request. Major professors do not have the authority to approve the substitution of any required core courses.

**POLICY FOR TAKING GRADUATE COURSES AT USF ST. PETERSBURG**

Graduate courses offered at the USF St. Petersburg campus can have a different focus than those offered on the USF Tampa campus. Therefore, a student must get approval from his/her advisor and the Graduate Director prior to taking any courses at the USF St. Petersburg campus to verify that these courses will count toward the degree. Additionally, only graduate faculty members in the SGS on the USF Tampa campus can serve as thesis advisors for graduate students enrolled on the Tampa campus.

**DEPARTMENT POLICY ON ACADEMIC INTEGRITY**

It is the student’s responsibility to review the graduate catalog’s section on academic integrity, which covers plagiarism. This section provides detailed examples of plagiarism, hence there should be no confusion on this matter. The university takes academic integrity extremely seriously and possible consequences of such actions include an F or FF grade for the class or even dismissal from the university. Please see the following website link: http://ugs.usf.edu/policy/academicintegrityofstudents.pdf.

**VI. MS Degree Requirements: Degree Options**

There are two options to complete the MS Degree:

A. **Thesis Option.** The thesis option is a 36-hour program designed for students who wish to complete original research as part of their graduate studies. The thesis option is a viable option for all students. Those intending to continue graduate work to the Ph.D. level are strongly encouraged to complete a thesis.

B. **Non-Thesis Option.** Students complete a minimum of 36 hours, with 24 hours of electives, keeping in mind that a minimum degree requirement is 16 hours at the 6000 level. Students must pass a comprehensive written examination that is administered during the semester they plan to graduate.

**VII. MS Degree Requirements: Thesis or Comprehensive Examination**

**Thesis Option**

1. The student is required to present his/her thesis research at a public thesis defense.
2. The thesis defense can be completed during any semesters (spring or summer or fall).
3. A copy of the thesis must be made available in the department office one week prior to the defense for public review.

**Non-Thesis Option**
1. The examining committee will be comprised of the Graduate Director and other two graduate faculty members and it will be formed at the beginning of the semester in which he/she intends to conduct the comprehensive exam.

2. Non-thesis students are required to complete a six-hour long written, open book, comprehensive exam, which typically consists of a series of questions that are prepared by the examination committee. Students have to answer the questions during the exam.

3. The exam can be completed only during the spring or fall semester.

4. Students are encouraged to complete the exam during the last semester of their coursework. The exam must be completed no later than one semester after the student completes the coursework for the degree. The student must be registered for two credits in the semester in which the exam is completed.

5. All non-thesis examinations will be scheduled for the same day each semester (i.e., all students will sit for the exam at the same time), the date being set by the Graduate Director. Students must coordinate with the Graduate Director when they will take the exam.

6. Questions are solicited and organized by the student’s examination committee.

7. The answers to the questions are evaluated by the student’s examination committee within two weeks of the exam.

8. If the answer to any question is determined to be incorrect or incomplete, the student may be required to retake that portion of the exam in the form of an oral exam that is only open to the committee. Students are encouraged to complete the oral exam in the same semester they completed the first written exam.

9. If the student fails all portions of the exam, she/he will have one opportunity to retake the entire exam. This second exam must be completed no later than the semester after the student receives notification that a second exam is necessary.

10. If it is determined that the student did not successfully complete his/her comprehensive exam after their second attempt, he/she will be dismissed from the program.

Preparation Guidelines for the Non-Thesis MS Written Comprehensive Exam

1. The student must meet with his/her examination committee once the committee is formed at the beginning of the semester in which he/she intends to conduct the comprehensive exam.

2. The date for the exam, set by the Graduate Director is typically at least two months past the beginning of the semester, and no later than two weeks prior to the beginning of final exam week. The exam must be completed no later than one semester after the student completes the coursework for the degree. Please remember that students must be enrolled for at least two graduate hours in the semester they plan to graduate.

3. Questions are developed by the student’s examination committee members.

4. At least six weeks prior to the exam, the student should consult with members of his/her examination committee regarding preparation materials for the exam.

5. These preparation materials can consist of the following:
a. Specific themes for the question(s) to be asked on the exam. The information provided should be specific to allow the student to prepare on his/her own for the question(s).

b. A reading list that consists of materials related to the question(s) to be asked on the exam. By reviewing and understanding this literature the student should be able to successfully answer the question(s) on the exam.

6. Any questions or concerns that the student has related to the comprehensive exam are directed to his/her examination committee.

Guidelines for Students Switching from the Thesis to Non-Thesis Option

1. Students planning to switch from the thesis option to the non-thesis option should consult his/her major professor and the Graduate Director prior to making the switch.

2. Students switching to the non-thesis program will be required to complete all requirements for the non-thesis option as set forth in the most current Graduate Catalog.

3. As per the guidelines set forth by the USF Graduate Handbook, if a student changes from thesis to non-thesis in a semester in which they are enrolled in thesis hours, these credits can be exchanged without academic penalty if a Graduate Studies Petition is filed with Graduate Studies prior to the last day of the drop/add period.

4. If a student enrolled in the thesis option has already taken thesis credits but elects to change to the non-thesis option, the accumulated thesis credits may not be exchanged or converted to another non-structured credit. The thesis hours will remain in the transcript and will retain the “Z” grade (in progress grade).

5. Students switching from the thesis to the non-thesis option will be required to complete the comprehensive written exam as indicated in the “Guidelines for Non-Thesis Comprehensive Exams.”

6. These students can also transfer up to 9 graduate credits from other institutions for inclusion in their non-thesis program of study. Transfer courses intended to meet non-thesis Program requirements must be approved by the Graduate Director.

7. Graduate assistants who switch from the thesis to the non-thesis option will forfeit their assistantship at the end of that contract period.

Note: The non-thesis option is not available for students on graduate assistantships.

VIII. Financial Supports

Graduate Assistants

Graduate assistantships (GAs) are awarded annually. Students are usually given a two-year contract as a graduate assistant subject to satisfactory academic progress and satisfactory work performance. If a student would like to be considered for a graduate assistantship, he or she should complete the Graduate Assistantship Application form (available at the USF SGS Website) and upload it, along with other application materials, via the USF online application system. Graduate assistantships are awarded based upon merits, e.g., grade point average, GRE scores, and original application materials.
GAs are under the direct supervision of the Chair of the SGS and the Graduate Director who assign the specific duties to the students. Typically students are required to supervise labs, grade exams, assist with audio-visual equipment, and teach specific lectures in their assigned courses. Students may be assigned to assist particular faculty. When this occurs, the faculty member is the direct supervisor of the GA.

Project (Research) Assistants

Research Assistants (RAs) are students who are hired to assist faculty with grant-funded projects. Students hired as RAs, for example, will complete computer analysis, cartography, fieldwork, and/or laboratory analysis related to a project. Students may be hired on salary or on an hourly basis. The rate of pay varies from project to project. Students are selected for these positions based upon the skills needed for individual projects.

Other Financial Support

The university’s Center for Urban Transportation Research (CUTR), the United States Geological Survey (USGS), and the Water Institute (in CAS/SGS) sometimes hire Geography and ESP graduate students. Students may submit applications for employment to these agencies directly. In addition, part-time and full-time jobs in the above programs are frequently posted on the bulletin board immediately outside of the SGS main office (NES 201).

Fellowships

Fellowships are funds received by students for which no GA or RA work is required. A listing of potential fellowships can be found at the website of the Office of Admissions website at: http://www.usf.edu/admissions/graduate/graduate-assistantships.aspx.

Scholarships, Grants, Work Study, and Loans

The USF Graduate School houses a Scholarship Library that allows students to access information on private funding sources of funding through a computerized database as well as through source books. The Office of Financial Aid administers the Federal Work Study Program as well as several loan programs. Students interested in loans or work study should apply as soon as possible, after January 1 of each year, for the coming academic year, which starts in August. Application packets are available outside the Office of Financial Aid (SVC 1102) or by calling (813) 974-4700.

IX. Graduate Certificate in Environmental Policy and Management (EPM)

The environment represents one of the most critical issues facing nearly all nations individually as well as the Earth's community as a whole. Increased population, greater consumption and diminishing resources combined with technological advances and new scientific revelations all play an important role in the study of the environment. By now, we realize that the environment is a multidisciplinary field where neither problems nor solutions honor traditional disciplinary boundaries. It is a field where information is fast flowing and technologies are rapidly evolving. Scholars of environmental management and policy, and decision-makers in agencies with environmental responsibilities or impacts, need to think in ways that cross those boundaries using the best available knowledge and tools of many fields.

The Graduate Certificate in Environmental Policy and Management (EPM) fills this need by providing a broad-based, multidisciplinary educational program to professionals, practitioners,
citizens and students who wish to acquire or strengthen their knowledge of the environment. The Certificate program is designed to meet the needs of either the traditional or the non-traditional student. The curriculum is rigorous yet flexible to cater to individual needs; and courses taken toward the Certificate will qualify for inclusion in the ESP MS Program and may qualify for graduate degree programs in other departments. An overview of the program as well as admission and application guidelines can be found at: https://www.usf.edu/innovative-education/.

Admissions

Admission requirements also are rigorous yet flexible. Along with the completed application, the applicant submits the following:

- Completed application
- Transcript of courses for an earned undergraduate degree
- Letter of recommendation describing the applicant’s academic and personal abilities (from a colleague, supervisor or professor)
- Statement (200 – 250 words) of interest describing the applicant’s achievements, abilities, interests in the environment, and ways in which career goals would benefit from the proposed studies

Who should apply?

The Certificate is designed for students with any relevant undergraduate degree and a committed interest in the environment. It fits the needs of the traditional or the non-traditional student, including:

- Environmental professionals with science and engineering degrees who wish to strengthen their understanding of policy decision-making and the political, economic, and social context in which science is applied to the real world.
- Professionals and public administrators who are not trained in the environmental field but are working in that field, or would like to improve their expertise.
- Graduate students enrolled in other disciplines with interests in the environment, or who wish to make the environmental field a focus in their careers.
- Students who have completed an undergraduate degree, have an interest in environmental issues, and are not ready to pursue a graduate degree but wish to strengthen their credentials.
- Concerned citizens who wish to pursue the satisfaction of intellectual exploration in the environmental field.

Curriculum

The EPM Certificate curriculum is designed to allow students to choose courses from across the spectrum of disciplines that explore the human and natural environments. All credits used to satisfy the requirements for the Certificate must be for courses completed within three (3) academic years prior to the date of graduation. The courses fall into three categories, as follows:

Required Courses
All students complete the following:
GEO 6116 Perspectives on Environmental Thought
EVR 6922 Environmental Science and Policy Capstone Seminar
(To be taken after completion of at least 3 courses)

**Core Courses**
Students select two from the following list, or another course in environmental management and policy approved in advance by the ESP Graduate Director:
EVR 6934 Environmental Management
EVR 6937 Graduate Seminar in Environmental Policy
EVR 6936 Seminar in Environmental Science
EVR 6216 Advances in Water Quality Policy and Management
GEO 6605 Contemporary Urban Issues
PAD 5605 Administrative Law
PHI 6934 History of Environmental Thought/Selected Topics
POS 6933 Seminar in Environmental Law/Selected Topics
*Courses from this list not used to fulfill core requirements can be taken as electives.

**Elective Courses**
Students select one or more graduate-level courses appropriate to his/her interests, subject to approval of the ESP Graduate Director. Examples of courses typically approved include:
GEO 6347 Advances in Natural Hazards
GEO 6286 Advances in Water Resources
PHC 6357 Environmental and Occupational Health
PHI 6405 Seminar in Philosophy of Natural Science
GEO 6345 Technological Hazards and Environmental Justice
**see https://www.usf.edu/innovative-education/ for a more complete list of possible electives.
Appendix I
List of Graduate Courses Offered by the School of Geosciences for GEP Program

EVR 6101 GEOMORPHOLOGY FOR ENVIRONMENTAL SCIENTISTS (3). Course will explore the evolution of landscapes, natural processes that alter Earth's surface, and rates of change in the surficial environment. The course will emphasize topics relevant to environmental scientists in Florida - esp. soils, karst, & coasts.

EVR 6216 ADVANCES IN WATER QUALITY POLICY AND MANAGEMENT (3). Conceptual structure and practical implementation of U.S. watershed-based water quality regulations and policies. Practical application of scientific information and quantitative methods in management/policy decisions for water quality protection.

EVR 6320 ENVIRONMENTAL MANAGEMENT (3). This course introduces the students to environmental management from technical and non-technical perspectives. The major topics covered will be water and air quality, environmental sustainability, collaboration and building consensus.

EVR 6408 WILDLIFE ECOLOGY (3). Population ecology, animal behavior, food resources, habitat resources, wildlife diseases, predation, competition, wildlife and water, wildlife and soils, hunting and trapping, exotic wildlife, urban wildlife, and conservation

EVR 6921 SCHOLARLY PRESENTATION OF ENVIRONMENTAL RESEARCH (1-3). Discussion and practice in methods of writing, presenting, and defending cross-disciplinary environmental research. Written and oral assignments on communicating research objectives, methods, results, theory, and analysis of policy relevance. Prerequisite: Second year in the M.S. program in ESP, or permission of instructor

EVR 6922 ESP CAPSTONE SEMINAR (3). A capstone graduate course that integrates issues related to science, policy and management in making decisions. Each semester, the program selects an environmental issue to serve as a case study. Some anticipated themes include global warming, water quantity and quality, air pollution and restoration. Prerequisite: Standing in the M.S. program or Graduate Certificate program in ESP, or permission of instructor

EVR 6930 RESEARCH COLLOQUIUM IN ENVIRONMENTAL SCIENCE AND POLICY (1).

EVR 6934 SPECIAL TOPICS IN ENVIRONMENTAL SCIENCE AND POLICY/SEMINAR IN NATURAL ENVIRONMENTS (3). A core course in the Geography and Environmental Science and Policy Doctoral Program that examines natural environments via sets of readings, discussion, and research. Students will be exposed to a wide variety of perspectives and scientific methodologies related to various aspects of the natural environment. (PR: GS and CI).

EVR 6936 SEMINAR IN ENVIRONMENTAL SCIENCE (3). A seminar course that reviews a major theme or themes in environmental science that integrates knowledge and research from various scientific disciplines.
EVR 6937  SEMINAR IN ENVIRONMENTAL POLICY (3). Critical assessment of environmental policy and regulatory formulation, implementation, evaluation, and revision in the context of scientific, technological, institutional, political, social, and economic factors; case studies of major U.S. policies.

EVR 7021  DOCTORAL DISSERTATION PREPARATION (3). This course will assist students in developing dissertation topics; to think creatively about their topics; to draft a dissertation proposal and a dissertation outline. Students should register for either evr or geo 7921 depending on his/her subject area.

EVR 7980  DOCTORAL DISSERTATION RESEARCH (2-15 var.).

GEA 6195  SEMINAR IN ADVANCED REGIONAL GEOGRAPHY (3). Analytic study of a selected region of the world. Repeat once for credit, but region may not be repeated. (PR: GS in Geography).

GEA 6215  SEMINAR IN NORTH AMERICAN GEOGRAPHY (3). Advanced survey of historical and contemporary issues in North American geography including: west and non-west exchange, revolutionary transformation, nation-building, regional disparities, and continental relations among states. (PR: GS in Geography or CI).

GEA 6252  SEMINAR IN THE GEOGRAPHY OF THE AMERICAN SOUTH (3). Intensive examination of regional geographic studies and their application to the American South, integrating concepts related to the physical and cultural landscapes, economic growth and change, urbanizations, and cultural diffusion processes. (PR: GS in Geography or CI).

GEA 6406  SEMINAR IN LATIN AMERICAN AND CARIBBEAN GEOGRAPHY (3). Readings and discussions organized around an examination of regional and systematic analysis of selected topics of Latin American and Caribbean geography. Emphasis is on combining physical and cultural analysis of this region. (PR: GS in Geography or CI).

GEA 6504  SEMINAR IN EUROPEAN GEOGRAPHY (3). Readings and discussions organized around an examination of regional and systematic analysis of selected topics of European Geography. Emphasis is on combining physical and cultural analysis of this region. (PR: GS in Geography or CI).

GEA 6745  ASIAN GEOGRAPHY SEMINAR (3). Analysis of regional divisions and spatial variations within Asia. Examines the significance of Asia in the global context. Focus on political, economic, cultural, and historical geographies, including development, environment, religion and gender. (PR: GS in Geography or CI).

GEO 6058  GEOGRAPHIC LITERATURE AND HISTORY (3). The origins and development of the discipline as revealed through an examination of the principal written sources. (PR: GS in Geography, or CI).
GEO 6116 PERSPECTIVES ON ENVIRONMENTAL THOUGHT (3). Analysis of the evolution of the major schools of environmental thought from antiquity to present-day green analysis, deep ecology, eco-feminism, and post-modern ecology. (PR: GEO 6058 or CI).

GEO 6115 ADVANCED FIELD TECHNIQUES (3). Field examination of one region. Students will complete field work in human and physical geography in a selected area. (PR: GS in Geography or CI).

GEO 6119 QUALITATIVE RESEARCH METHODS (3). A synoptic and detailed treatment of the subject, and an examination of the conceptual frameworks and practical issues behind data acquisition and analysis and how to interpret results.

GEO 6166 MULTIVARIATE STATISTICAL ANALYSIS (3.). Examination of advanced statistical approaches used by geographers. Descriptive, spatial and inferential statistics and multivariate analysis are highlighted. (PR: GS in Geography or CI, GEO 3164C).

GEO 6209C PHYSICAL GEOGRAPHY SEMINAR (3). Analytic study of one or more topics from physical geography. Selected problems may include hydrology, physiography, meteorology, climatology, soils, or vegetation, etc. May be repeated once. (PR: GS in Geography or CI).

GEO 6215 GEOMORPHOLOGY SEMINAR (3). Advanced examination of geomorphic processes and landforms with an emphasis placed on the formation and evolution of landscapes on a variety of scales. (PR: GEO 4372 or CI).

GEO 6217 KARST GEOMORPHOLOGY (3). An in-depth examination of the geomorphic aspects of karst landforms. The objectives, methods and results of karst geomorphic studies in which both field and laboratory analysis have been applied to geomorphic problems are reviewed. (PR: GS in Geography or CI).

GEO 6255 WEATHER, CLIMATE AND SOCIETY (3). This course explores the societal impact of weather, as well as the human impact on weather and climate. Students lead and participate in discussions on topics such as weather hazards, extreme temperature and human physiology, historical civilization and extreme climate, economic value of forecasts, weather modification, urbanization, and other land use change, anthropogenic aerosols, past and future climates. (PR: undergraduate general meteorology or CI).

GEO 6263 SOILS SEMINAR (3). Examination of how earth systems influence soil formation and variation. Detailed analysis of soils climosequences, biosequences, toposequences, lithosequences, chronosequences, and anthrosequences. (PR: GEO 4372 or CI).

GEO 6286 ADVANCES IN WATER RESOURCES (3). Water resources policies are viewed from theoretical and practical perspectives focusing on management strategies in different physical and human environments. (PR: GS in Geography or CI).

GEO 6288 HYDROLOGICAL SYSTEMS (3). A systematic approach to hydrology using the drainage basin as the fundamental unit of analysis is used to explore form and process, while modeling streamflows. (PR: GEO 4372 or CI).
GEO 6345 TECHNOLOGICAL HAZARDS AND ENVIRONMENTAL JUSTICE (3). Examination of theories, debates, methods, and models that improve our understanding of human vulnerability to technological hazards and risks, with emphasis on issues of fairness and equity in the distribution and impacts of hazards, (PR: GS in Geography or CI).

GEO 6347 NATURAL HAZARDS (3). Analysis of natural hazards integrating principles of physical, social, economic, political, and technical forces that affect extreme geophysical events. (PR: GEO 4372 or CI).

GEO 6428 SEMINAR IN ADVANCED HUMAN GEOGRAPHY (3). Analytic study of a problem selected from aspects of the human landscape (urban, political, economic, population, settlement). (PR: GS in Geography or CI).

GEO 6475 POLITICAL GEOGRAPHY SEMINAR (3). Advanced investigation of geopolitical issues including: the human construction of territoriality, ethnic relations, the making of nations and states, the geopolitics of localities, and environmental policy making. (PR: GEO 4470 or CI).

GEO 6545 ECONOMIC GEOGRAPHY SEMINAR (3). An intensive examination of selected issues in economic geography including: regional development and decline; spatial labor market trends; business locational analysis; and comparative economic policy. (PR: GEO 4502 or CI).

GEO 6605 CONTEMPORARY URBAN ISSUES (3). Advanced survey of urban issues such as: industrial restructuring and urban development, inner-city ethnic relations, the geopolitics or urban governance, and urban culture. (PR: GEO 3602; GEO 4604 or CI).

GEO 6627 SITE FEASIBILITY ANALYSIS (3). A project-oriented geographic examination of urban real estate development and site feasibility practices. Hands-on course including concepts of real estate development patterns, urban growth, and site-specific factors related to feasibility of specific developments. (PR: GS in Geography, or CI).

GEO 6704 TRANSPORTATION GEOGRAPHY (3). Review of transportation issues and analysis, focusing on modeling and planning for flows of goods and people. Provides a hands-on approach to the use of GIS for such analysis. (PR: GEO 4114C; GEO 4700 or CI).

GEO 6908 INDEPENDENT STUDY (1-19 Var.) Independent study in which students must have a contract with an instructor. S/U.


GEO 6944 INTERNSHIP IN GEOGRAPHY (3). The internship in Geography is designed to provide students the opportunity to work in an appropriate governmental agency to gain practical field experience. S/U. (PR: GS in Geography, CC).

GEO 6947 DIRECTED TEACHING (1-6 Var.) (PR: GS or CI)
GEO 6970  RESEARCH METHODS IN GEOGRAPHY (3). This course stresses conducting geographic research within the scientific method. Include aspects of both quantitative and qualitative research. Specific topics include sample design, data collection, defending and discussing results and conclusions, developing oral presentations, construction of written proposals and production of a thesis. (PR: GS and CI)

GEO 6971  THESIS: MASTER’S (1-19 Var.) Repeat. S/U. (PR: CC)

GEO 7021  DOCTORAL DISSERTATION PREPARATION (3). This course is designed to assist students in discovering, framing, and developing dissertation topics; to think creatively about the theoretical issues raised by their topics; to begin research on these issues; to draft a dissertation proposal; and to draft a dissertation outline. (PR: GS and CI).

GEO 7606  SEMINAR IN URBAN ENVIRONMENTS (3). This seminar will explore topics in the study of urban environments through readings, discussion, and research. Students will be exposed to a wide variety of perspectives and scientific methodologies related to various aspects of the urban environment. (PR: GS and CI).

GEO 7938C  DOCTORAL PROFESSIONAL DEVELOPMENT IN GEO SCIENCES (3).

GEO 7980  DOCTORAL DISSERTATION RESEARCH (2-15 var.). The dissertation will be a cohesive, original, and independent contribution to scholarship. The research is to be performed under the guidance of the major professor and the supervisory committee, which determine how many total dissertation hours each student completes (maximum 42 hours). (PR: Accepted into program, GEO 7920 and permission of the student’s advisor)

GIS 6355  WATER RESOURCES APPLICATION OF GIS (3). Examination of GIS applications in water resources, including watershed analysis, pollution modeling, and water resources modeling. Use of advanced GIS analysis techniques relevant to the specific applications. (PR: GIS 6100 or CI).

GIS 5034C  INTRODUCTION TO REMOTE SENSING (3). An introduction to basic concepts, principles of photogrammetry and remote sensing, and to applications of remote sensing in natural resource management, measurements of structural parameters, and environmental monitoring for non-GISc graduate students.

GIS 5049  GIS FOR NON MAJORS (3). An introduction to the concepts underlying digital information systems for non-geography majors and non-geography graduate students.

GIS 5075  GLOBAL POSITIONING SYSTEMS (3). Examination of the theory, operation and application of Global Positioning Systems (GPS). (PR: GIS for Non-Majors or permission of instructor).

GIS 6038C  ADVANCED REMOTE SENSING (3). Study of digital image processing techniques. Topics include filtering techniques, geometric and radiometric normalization, and classification algorithms with emphasis on developing. (PR: GS in Geography or CI, GEO 4124C).
GIS 6039  REMOTE SENSING SEMINAR/READINGS IN REMOTE SENSING (3). Analytic study of selected topics in remote sensing. Discussions around topics include data acquisition, sensor systems, multispectral and radar image analysis, change detection, and integration of remote sensing with GIS. (PR: GIS 6038C).

GIS 6100  GEOGRAPHIC INFORMATION SYSTEMS (3). Spatial problem solving utilizing GIS mapping and statistical methods. The course is designed to give students hands-on experience in using computerized techniques for geographic analysis. (PR: GS in Geography or CI)

GIS 6103  PROGRAMMING FOR GIS (3). Examination of the concepts and techniques for the customization of Geographic Information Systems (GIS) using object-oriented programming. (PR: GEO 6157 OR CI).

GIS 6112  SPATIAL DATABASE DEVELOPMENT (3). Development and management of spatial data for use in a Geographic Information System (GIS), including creating, editing, modifying and validating spatial data. (PR: GIS 6100 or CI).

GIS 6146  GIS SEMINAR (3). Analytic study of selected topics in GIS. The course will familiarize students with case studies involving GIS applications in environmental studies, coastal modeling, and urban planning. (PR: GIS 6100 or CI).

GIS 6306  ENVIRONMENTAL APPLICATION OF GIS (3). Examination of GIS applications in agriculture, forestry, wildlife management, biodiversity conservation, environmental assessment, water resources, and pollution modeling. Use of advanced GIS analysis techniques relevant to the specific applications. (PR: GIS 6100).

GIS 6307  SOCIOECONOMIC APPLICATIONS OF GIS (3). The course covers advanced GIS methods and their applications in socio-economic research fields, including transportation, health care, crime, and planning.

GIS 6355  WATER RESOURCES APPLICATIONS OF GIS (3). Examination of GIS applications in water resources, including watershed analysis, pollution modeling, and water resources modeling. Use of advanced GIS analysis techniques relevant to the specific applications.

GLY 6573  FLUVIAL HYDROLOGY AND GEOMORPHOLOGY (3). The course covers the mechanics of open channel flows, primarily to understand the potential energy available to do work, and the geomorphic responses to work, including channel initiation, sediment transport, and channel adjustment. (PR: MAC 2311 or the equivalent).

GLY 6824  ECOHYDROLOGY (3). This course covers hydrological processes along the atmosphere-plant-soil continuum and the ways in which hydrological processes control ecological structure and function. (PR: MAC 2311 or the equivalent).

GLY 6828  GROUND-WATER GEOCHEMISTRY (3). Chemical behavior of ground water. Includes interaction of water with aquifer materials, chemical effects of waste disposal, use of
chemical tracers, and transport of hazardous chemicals. Methods of sampling and data interpretation are emphasized. Lec. (PR: One year of college Chemistry, GLY 4822, GLY 6246).

**MET 6149** SAME AS GEO 6255.
Appendix II
Graduate Faculty Advisors in Geography and ESP Programs

All graduate faculty advisors in Geography and ESP programs specify those usually considered as GPY/ESP faculty. Per the eligibility to advise graduate students, regular professors at all ranks can be a major advisor and committee member; research professors at all ranks can be co-advisor and committee member; and Geology (GLY) faculty can be co-advisor and a committee member. The basic information for all faculty members in Geosciences, their ranks and their interest research areas can be found at http://hennarot.forest.usf.edu/main/depts/geosci/faculty/. All GPY/ESP faculty are listed as follows.

Fenda Akiwumi, Associate Professor, Ph.D. Texas State University (2006), Water Resources, Cultural Geography, Hydrology.

Kamal Alsharif, Associate Professor, Ph.D. University of Minnesota (2004), Water Resources, Conservation, Management.

Martin Bosman, Associate Professor, Ph.D. University of Kentucky (1999), History and Philosophy of Geographic Thought, Global City Formation, Economic Restructuring and Urban and Regional Revitalization.

Jennifer Collins, Professor, Ph.D. University College London (England) (2001), Tropical climatology, Hurricane Activity, Environmental Factors Influencing the Inter-Annual Variation of Hurricane Numbers.

Lori Collins, Research Associate Professor, Ph.D. University of South Florida (2007), LiDAR, Terrestrial Laser Scanning, 3D Printing, GPS, GIS, and Visualization Techniques.

Travis Doering, Research Associate Professor, Ph.D. University of South Florida (2007), Spatial technologies and imaging for cultural and natural heritage applications.

Joni Firat, Associate Professor, Ph.D. Florida State University (2008), Geographic Information Science, Landscape Ecology.

Shawn Landry, Research Associate Professor, Ph.D. University of South Florida (2013), Environmental Geography, Remote Sensing, Geospatial Analysis, GIS/GPS, Decision Support Systems.

Ambe Njoh, Professor, Ph.D. University of London (England) (1990), The Urban Planning/Public Health Nexus, Sustainable Development, Hygiene and Sanitation, Water Delivery Systems; Transportation and Land Use.


Steven Reader, Associate Professor, Ph.D. University of Bristol (England) (1989), Geographical Information Systems, Computer Cartography, Spatial Analysis, Medical Geography.

Ran Tao, Assistant Professor, Ph.D. University of North Carolina (2017), Geographic Information Science, spatial interactions (OD flows), spatial statistics, spatial data mining, geovisualization, transportation, migration, crime, civic conflicts.
Philip van Beynen, Associate Professor, Ph.D. McMaster University (1998), Karst Environments Pertaining to Paleoclimate Change, Human Disturbance, Environmental Indices and Sustainability.