Department of Environmental and Health Science
Columbus State University

Comprehensive Program Review

Master of Science in Environmental Science

Respectfully Submitted

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Graduate Program in Environmental Science
Department of Environmental and Health Sciences

Comprehensive Program Review

1. Mission

The Master of Science program provides advanced training, education and research opportunities to post-baccalaureate science students living primarily in the Georgia/Alabama region. Graduates of the program are trained to serve as environmental professionals in local, state, and federal environmental resource agencies; in the private sector, as environmental consultants; or are prepared to enter doctoral programs in environmental science and or related fields. Primary emphasis is placed upon acquiring a sound background in the underpinning concepts in environmental science, designing and conducting an original piece of research, and effectively communicating the results, in both written and oral forms. These professionals will be able to critically assess a wide range of environmental issues and create a plan for sound maintenance and/or environmental management.

Outcomes expected of the program include:

- An environmental scientist has an understanding of the integration of flows of water on and beneath the surface of the planet with the underpinning knowledge of basic fluid mechanics.
- An environmental scientist has an understanding of human interactions with the geologic environment, including geologic hazards, as well as resources and waste management.
- An environmental scientist has an understanding of basic aquatic and atmospheric chemistry, as well as environmental chemical analysis.
- An environmental scientist has an understanding of the basic principles of experimental design and the statistical analysis of environmental data.
- An environmental scientist has an understanding of environmental policy and statutes and how they are translated into regulations and on the factors that affect how they influence environmental decisions.
- An environmental scientist has the ability to conduct literature research and prepare both written and oral critiques of environmental science research.
- An environmental scientist has the ability to design and conduct and original program of research and monitoring in environmental science, which results in a publishable manuscript.

The Master of Science in environmental science program is designed to prepare graduates who can deal effectively with the increasing problems and questions

related to environmental impacts and in planning for the maintenance and management of environmental quality in the face of population and industrial growth. The program builds upon an undergraduate science background and provides a foundation in pertinent areas of biology, chemistry, and geology, as well as social and philosophical issues related to the development of sound environmental policy and regulation.

2. Teaching

Assessment of and Reward for Good Teaching and Advising

The graduate program in environmental science draws upon faculty members from a number of departments, most notably biology, chemistry, geology, and mathematics to teach two-thirds of the CORE graduate level courses and several elective courses in the program. Most of these courses are also cross-listed for credit to advanced undergraduates within the individual departments. Thus, contributing faculty are evaluated and rewarded according to individual department criteria.

The Department of Environmental and Health Sciences has only one full-time and one half-time faculty member contributing to the graduate program in environmental science. Along with those two faculty, a part-time faculty member teaches an undergraduate general education service course; ENVS 1105, entitled “Environmental Studies,” an area D option.

Teaching and advising are the dominant activities of the environmental science faculty and form one of the primary components in annual evaluations and merit-based raises. The annual evaluation process considers notable teaching successes and innovations, participation in interdisciplinary and team-taught courses, new course development, student evaluations of the instructors and the courses, as well as the Chair’s evaluation of teaching performance.

Since advising is an integral component of a thesis-based graduate program, the major professor, as well as members of the thesis advisory committee, throughout the graduate student’s career, share advising of students.

Opportunities for Student-Faculty Interaction

As previously indicated, student-faculty interactions are a critical component of the thesis-based graduate experience. The graduate student must work with the major professor and his/her advisory committee from inception of the research project to its completion and defense.

Student-faculty interactions include:

- Teaching Assistantships – faculty supervise the laboratory (and sometimes lecture) experience of graduate students in general biology, general chemistry, and physical and historical geology.

- Research Assistantships – faculty supervise graduate students during the field and laboratory acquisition of data required for completion of various externally funded research grants and contracts. Part of that data acquisition may be a component of the graduate student thesis but the contractual obligation of the research assistantship is to participate as a colleague on a larger research project.

- Laboratory/Field Assistants – faculty supervise graduate students, hired on a part-time basis, to complete data collection or analysis on short-term faculty projects not sufficient to comprise a thesis project but sufficiently noteworthy to provide a new and valuable research or intellectual experience for the developing environmental scientist. Such projects often include GIS analysis or production of maps, charts, and graphs for presentation, taxonomic identification of samples, collection of a portion of data on a long-term project (over more than four years), or statistical analysis of some types of data.

- Thesis projects – faculty supervise graduate students in the preparation of research proposals for external funding research, thesis proposals, field and laboratory collection of data, data analysis, and thesis preparation. Finally, faculty members interact with the graduate student in order to adequately defend their thesis research and their graduate experience.

Opportunities for Students

Graduate students in the environmental science graduate program or encouraged (and, by some faculty, expected) to participate in the presentation of their research results at regional or national scientific meetings in the discipline most appropriate to the research. Individual faculty and departmental funds are made available to students to attend and/or make presentations at these scientific meetings.

CSU has established an internship program with the Environmental Remediation Division of Georgia Power, Southern Companies. Graduate students accepted into the program work, full-time with stipend, for the Environmental Remediation Division for one semester. During that semester, with the advice of

Environmental Remediation Division personnel, the graduate student chooses a research project with a topic area of interest to Georgia Power, returns to CSU to pursue that thesis and continues to receive a stipend from Georgia Power for up to three more semesters. Three graduate students, Emelia Olivarez, Tracy Ferring, and Michael Trofinoff, have participated in this internship program.

All students at Columbus State University have the opportunity to study abroad through programs endorsed by the Center for International Education. In May 2001, Dr. Jim Gore conducted a field-experience class in the ecology of sub-Saharan Africa for three weeks in Zimbabwe and Botswana. Eight graduate students in the program participated in this class and made field-presentations on various aspects of the ecology of the region. In May 2003, Dr. Gore conducted a similar class in Namibia; four graduate students participated in this class. This class, taught as BIOL 5535u/g, is offered every two years and is available to all graduate students in the program.

3. Curriculum

The relationship between the program's curriculum and its outcomes

The program is designed to produce graduates with abilities to assess environmental problems on local, regional, national, and global scales and to apply the correct biological, geological, physical and chemical tools to respond to the problem in an appropriate manner. The program provides didactic courses and field/laboratory experiences to support a basic background in those areas, as well as a focus upon publishable thesis research. Primary emphasis is placed upon acquiring a sound background in the underpinning concepts in environmental science, designing and conducting an original piece of research, and effectively communicating the results, in both written and oral forms.

Statement of Expected Outcomes

At the time of completion of their MS degree, CSU environmental science graduate students will:

- Have knowledge of the integration of flows of water on and beneath the surface of the planet with the underpinning knowledge of basic fluid mechanics.
- Have knowledge of the human interactions with the geologic environment, including geologic hazards, as well as resources and waste management.
- Have knowledge of basic aquatic and atmospheric chemistry, as well as environmental chemical analysis.
- Have knowledge of the basic principles of experimental design and the statistical analysis of environmental data.

- Have knowledge of environmental policy and statutes and how they are translated into regulations and on the factors that affect how they influence environmental decisions.
- Have the ability to conduct literature research and prepare both written and oral critiques of environmental science research.
- Have the ability to design and conduct and original program of research and monitoring in environmental science, which results in a publishable manuscript.

The objectives for each environmental science graduate course are specific to the content of that course and are clearly defined by the instructor in his/her syllabus. Most of the courses emphasize the ability to integrate concepts into problem-solving situations and to undertake literature research in order to communicate new scientific concepts in written (term papers) and oral presentations (seminars).

Incorporation of technological skills into the program of study

As environmental science evolves, there is an increasing focus on holistic or ecosystem-level management, monitoring and research. These programs require the development and acquisition of new sets of skills, especially in the areas of multivariate and multimetric analyses, as well as various graphical and geographical methods. The program makes every attempt to incorporate thes abilities into every course.

Students in the program have access to a variety of presentation and analytical software, both as part of the university computer network system or available in graduate student and faculty laboratories. These include, but are not limited to, packages for spreadsheet analysis (Excel and SigmaPlot), complex graphics (SigmaPlot, Statistica, and others), as well as specialized GIS programs (ArcView and ArcInfo), analytical programs (SigmaStat, EDAS, SPSS, and others), and specialized ecological modeling programs (STELLA, PHABSIM, TSLIB).

Both faculty and graduate students for classroom and seminar presentations routinely use PowerPoint. All graduate students have accomplished their thesis defense with PowerPoint presentations as an integral part of their thesis work. Out-of-class assignments (lab and field reports, term papers, and take-home exams) are largely submitted in electronic format via E-mail.

Relevance of the program to student needs

The Graduate Program in Environmental Science offers the Master of Science (MS) in Environmental Science. The program is designed to produce graduates with a solid background in the application of biological, geological, physical and chemical principles to solving environmental problems. Graduates of the program have the ability to design experimental investigations and environmental monitoring programs and to understand the legal and social underpinnings of responding to various environmental disturbances and regulatory needs.

The Environmental Science Advisory Committee conducts oversight of the program contents. This committee consists of six faculty members from the primary disciplines in the core area of the program. Currently, those committee members are:

Dr. Jim Gore, Environmental Science
Dr. Harlan Hendricks, Environmental Science and Biology
Dr. Bill Birkhead, Biology
Dr. Tom Hanley, Geology
Dr. David Schwimmer, Geology
Dr. Charles Lovelette, Chemistry

Among the skills most sought after by doctoral programs, environmental consulting firms, conservation organizations, and regulatory agencies is the ability to effectively communicate scientific information in both verbal and written forms. Thus, the MS program emphasizes thesis-based research in applied environmental science. The production of publishable thesis work allows the graduate student to demonstrate the ability to organize a research project (preparation of a thesis proposal), data collection and analysis (thesis research, itself) and the written (thesis) and verbal communication (thesis defense) of the results. In addition, most faculty encourage their graduate students to present their data at regional or national meetings of appropriate scientific organizations. Attendance and presentation of data allows students to communicate with future colleagues in the discipline and also to make contacts with potential employers and/or new research partners.

Since environmental science encompasses so many different fields and applications, it is virtually impossible for any single faculty to provide training in all areas that might support graduate student goals and interests. The department, then, frequently invites regional, national, and, at times, international experts to conduct specialty classes for graduate credit. In the past five years, the environmental science graduate program has provided specialty courses in Environmental Archaeology, Protection of Cultural Resources, International Environmental Law and Policy, and Environmental Management; all provided by professionals in the field of environmental science or internationally known academicians in the field.

Recently, regulatory agencies, as well as environmental consulting firms, have been seeking graduate students with greater computer skills, especially in multivariate statistical analysis and the application of various Geographic Information System (GIS) tools. Although not part of the core course requirements, the graduate program regularly schedules a course in GIS/GPS skills and is working with Dr. Renjin Tu, Department of Mathematics, to create a course in applied multivariate statistical analysis for environmental science graduate students.

Challenging students to think across disciplines

More than most of the basic sciences, environmental science requires that student develop a knowledge base across a wide array of disciplines. The ability to apply basic principles of ecology to the problems of environmental protection, ecosystem restoration, and conservation is founded in a thorough knowledge of basic ecological principles and includes a meaningful background in physiology and taxonomy, as well as cellular and molecular biology. Similarly, environmental scientists must simultaneously be able to understand the physical, chemical, and geological underpinnings of environmental disturbance in order to ameliorate or rehabilitate a damaged system. Environmental law and policy at the local, state and federal levels largely drive environmental science, at least its application to current problems. Thus, environmental scientists must be familiar with environmental law and policy and the role of society, as well as regulatory agencies, in the formulation of legal protection of the physical, chemical and biological components of the biosphere.

Students in the graduate program are required to enroll in a series of six core courses that attempt to address the multidisciplinary requirements of sound environmental science. Environmental chemistry and environmental geology challenge students to understand the basic geological and chemical conditions that influence both pristine and disturbed ecological systems. Hydrology allows students to explore all of the aspects of the flow of water, the most critical resource on this planet, through the hydrological cycle on this planet. Ecological Methods teaches graduate students the basics of proper design of experiments and the meaningful statistical analysis of collected data. Environmental Law and Regulations surveys the plethora of environmental regulations and concentrates on the responsibilities of an environmental scientist in providing sound advice to regulatory agencies and legal structures regarding the disposition of environmental challenges. Finally, since good scientists must be able review and assess the value of other scientific work on contemporary issues as well as accept and understand criticisms of their own work, Environmental Issues allows graduate students to begin to form communication skills in relating current environmental research and to critically evaluate the work of other scientists and their fellow graduate students.

Although not designed to meet the needs of a large undergraduate or graduate audience outside the discipline of environmental science, many graduate students in the secondary education science program routinely enroll in environmental science graduate courses (or those elective courses cross-listed with biology, chemistry and geology) in order to satisfy their requirement of four graduate level science courses in disciplines appropriate to their teaching or certification goals. Less frequently, qualified undergraduates have enrolled in graduate-level environmental classes for independent study undergraduate credit.

Frequency of Course Offerings in the Program

The Department of Environmental and Health Sciences offers a single undergraduate course, ENVS 1105 Environmental Studies, as a general education course in Area D. This is a non-lab science course.

The graduate program requires that 20 hours of core courses must be completed. These are:

ENVS 5165 Hydrology
ENVS 5256 Environmental Geology
ENVS 6105 Environmental Issues
ENVS 6106 Environmental Law and Regulation
ENVS 6207 Ecological Methodology
ENVS 7115 Environmental Chemistry

In addition to a minimum of 6 hours of research/thesis credit (ENVS 7999), students must choose at least six more hours from the following elective course (with the advice and consent of the student's thesis committee):

BIOL 5515 Topics in Cell and Molecular Biology
BIOL 5525 Topics in Organismic Biology
BIOL 5535 Topics in Ecological and Evolutionary Biology
BIOL 5899 Independent Study

CHEM 7165 Environmental Organic Chemistry
CHEM 7175 Atmospheric Physics and Chemistry
CHEM 7185 Aquatic Chemistry
CHEM 7555 Special Topics in Environmental Chemistry

ENVS 5225 Natural Environments of Georgia
ENVS 6109 Environmental Air Quality
ENVS 6206 Water Resources Management

ENVS 6235 GIS/GPS Applications
ENVS 7145 Land Use and Waste Management
ENVS 7555 Special Topics in Environmental Science

GEOL 5115 Geochemistry
GEOL 5135 Introduction to Oceanography
GEOL 5215 Geomorphology
GEOL 5275 Vertebrate Paleontology
GEOL 7565 Special Topics in Environmental Geology

MATH 5175 Mathematical Statistics
MATH 5176 Statistical Design and Analysis of Experiments
MATH 5177 Applied Regression Analysis

A selection of elective courses is offered each semester. More frequently requested courses are offered on an annual basis while others may be offered for one semester every second or third year, depending upon demand.

Enrollment Trends in Environmental Science 1999-2003

(unless indicated in parentheses, only one section is offered)

ENVS Graduate Student Enrollment only
[5* level courses may have undergraduate and graduate enrollment from other colleges and disciplines]**

Since it is a general education offering, ENVS 1105 lists total undergraduate enrollment

	SP99	SU99	F99	SP00	SU00	F00	SP01	SU01	F01	SP02	SU02	F02	SP03
ENVS 1105	(1) 41	(1) 21	(3) 102	(3) 112	(1) 29	(3) 123	(3) 122	(1) 21	(4) 147	(3) 127	(1) 29	(4) 161	(4) 165
ENVS1105H												5	
CORE													
ENVS 5165 – Introduction to Hydrology	11			10			5			9			6
ENVS 5255 – Environmental Geology						8			4			7	
ENVS 6105 – Environmental Issues			9			13			7			15	
ENVS 6106 – Environmental Law and Regulations			10			17			7			11	
ENVS 6207 – Ecological Methods			11			4			8				9
ENVS 7115 – Environmental Chemistry	22			8			8			4			4
ENVS 7000 – Thesis Defense			3	2	2	1		1			3		
ENVS 7999 – Thesis Research	9	4	7	9	2	7	10	1	12	9	4	10	13
ELECTIVES													
ENVS 5225 – Natural Environments of Georgia											2		
ENVS 6109 – Environmental Air Quality													

	SP99	SU99	F99	SP00	SU00	F00	SP01	SU01	F01	SP02	SU02	F02	SP03
ENVS 6206 – Water Resources Management		13			10						8		
ENVS 6235 – Introduction to Geographical Information System and Geographical Positioning System			15					12					
ENVS 7145 – Land Use and Waste Management				3									2
ENVS 7555 – Special Topics	5	2	1	1	3	2	2			3	2		
Environmental Management							8						
Environmental Archaeology									4				
Instream Flow Analysis									5				
International Environmental Law													7
Historical Ecology													1
BIOL 5515G – Selected Topics in Cellular and Molecular Biology		3	4										
BIOL 5525G – Selected Topics in Organismic Biology	1					2							
Ichthyology				1									
Plant Taxonomy							3						
Aquatic Entomology					6					5			
BIOL 5535G – Selected Topics in Ecological and Evolutionary Biology	4												
Stream Ecology								10					
Ecology of SubSaharan Africa								5					
Environmental Toxicology	4											1	
Conservation Biology	12			3			8			7			3
BIOL 5899G	1	1	1							1			
CHEM 7165													
CHEM 7175													
CHEM 7185													
CHEM 7555													
GEOL 5115G									6			1	
GEOL 5135G				5							1		
GEOL 5215G													
GEOL 5275G													
GEOL 7565													

	SP99	SU99	F99	SP00	SU00	F00	SP01	SU01	F01	SP02	SU02	F02	SP03
MATH 5117G										3			
MATH 5118G													
MATH 5175G				1									
MATH 5176G													
MATH 5177G													

The role of the department/program in serving general education and other programs.

Generally, the graduate program in environmental science does not provide service to the general education requirements of undergraduate majors and was not originally designed to do that. However, faculty in the Department of Environmental and Health Sciences have designed a non-laboratory science course, titled "Environmental Studies" (ENVS 1105), as an option within Area D (Science, Mathematics, and Technology) of the general education requirement of all undergraduates. This has become a popular course among students and all sections offered during the regular academic year are almost always filled within a few hours of the opening of registration. The number of sections available to be filled is constrained by the availability and other obligations of the faculty.

Enrollment Trends in Environmental Science General Education Courses 1999-2003

	SP99	SU99	F99	SP00	SU00	F00	SP01	SU01	F01	SP02	SU02	F02	SP03
ENVS 1105 Environmental Studies	41	21	102	112	29	123	122	21	147	127	29	161	165
ENVS1105H Environmental Studies (Honors)												5	

In addition to the core courses specifically required in the graduate program in environmental science, several elective courses from across a range of disciplines are available for graduate students. Many of these courses have been newly designed to be at the 5000-level and available for either graduate or undergraduate credit. Thus, a many undergraduates in the disciplines of biology, chemistry and geology take these to fulfill elective requirements in their undergraduate majors.

The following courses were designed to be available for both graduates and undergraduates but targeted for graduate students in the environmental sciences:

BIOL 5525 Topics in Organismic Biology – Aquatic Entomology
BIOL 5535 Topics in Ecological and Evolutionary Biology – Conservation Biology
BIOL 5535 Topics in Ecological and Evolutionary Biology – Stream Ecology
BIOL 5535 Topics in Ecological and Evolutionary Biology – Ecology of Sub-Saharan Africa

BIOL 5535 Topics in Ecological and Evolutionary Biology – Environmental Toxicology
BIOL 5535 Topics in Ecological and Evolutionary Biology – Aquatic Toxicology

The Graduate Program in Environmental Sciences also provides service to many graduate students in the Education Department. Especially during the summer terms, over 50% of enrollment in ENVS and BIOL 5000G-level courses are graduate students in secondary education with a specialty in the sciences.

The following table summarizes the number of undergraduate science majors and education graduate students serviced by courses specifically designed for the graduate program in environmental science.

Enrollment Trends in Environmental Science 1999-2003

Graduate Education and (Undergraduate) Enrollment only

	SP99	SU99	F99	SP00	SU00	F00	SP01	SU01	F01	SP02	SU02	F02	SP03
CORE													
ENVS 5165 – Principles of Hydrology	I (5)						1 (1)			3 (2)			1
ENVS 5255- Environmental Geology			3 (1)			(1)			2 (1)			2 (1)	
ENVS 6105 – Environmental Issues			2			6			5			6	
ENVS 6106 – Environmental Law and Regulations			2			5			4			2	
ENVS 6207 – Ecological Methods			1			1			1				
ENVS 7115 – Environmental Chemistry	3						1						
ELECTIVES													
ENVS 5225 – Natural Environments of Georgia											1		
ENVS 6109 – Environmental Air Quality													
ENVS 6206 – Water Resources Management		2			1						3		
ENVS 6235 – Introduction to Geographic Information and Global Positioning Systems			5					2					
ENVS 7145 – Land Use and Waste Management													

	SP99	SU99	F99	SP00	SU00	F00	SP01	SU01	F01	SP02	SU02	F02	SP03
ENVS 7555 – Special Topics													
Environmental Management							1						
Environmental Archaeology									1				
Instream Flow Analysis													
International Environmental Law													3
Historical Ecology													

Inclusion of diversity, multiculturalism and international perspective in the program

All scientific disciplines are, by their very nature, global in dimension. That is science classes discuss theory and application of theory regardless of the ethnic or cultural origin of those theories. Indeed, most modern theory has its origin in countries outside of North America. When discussing the application or utilization of these theories, it is often necessary to place an historical, social, and/or cultural perspective to decisions made about application or future research. Thus, based upon their undergraduate science backgrounds, graduate students are quite accustomed to and expect an international perspective in the development and application of the science that is presented to them.

Because the United States is generally regarded as the leading nation in environmental sciences and its various sub disciplines, the graduate program at CSU has a significant portion of its student body as international students. Currently, for example, the graduate program in environmental science has students from Nepal, India, The People's Republic of China, Serbia, Nigeria, Cameroon, and Sweden; all conducting research within the department. These students actively participate in interdisciplinary research teams or independently on individual projects. As a result, graduate students regularly exchange not only scientific perspectives but also cultural and social perspectives on issues in environmental science.

Since conservation of biodiversity is a global environmental issue, students in the graduate program in environmental science (along with qualified undergraduates) are encouraged to visit at least one of the global biodiversity "hot-spots" during their tenure at CSU. Faculty of biology, geology, and environmental science have created a series of courses that offer the students the opportunity to earn course credit while experiencing the diversity of ecosystems on this planet and conducting short research projects in such places as Panama, Ecuador, Belize, Andros Island (Bahamas), Zimbabwe, Botswana, South Africa, and Namibia. Credit for these classes is awarded in the BIOL 5535 U/G offering.

4. Students

Student Diversity

The majority of students in the graduate program fit the profile of those for which the program was initially designed; those people with full time jobs seeking a primarily part-time graduate program. Thus, the majority of our students, with an average age of over 30 years, have had some amount of work experience before entering the graduate program.

AGE	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
21-25	9	15	10	11	4	2	6
26-30	9	10	17	15	17	14	11
31-40	4	7	8	5	6	5	7
41-50	3	3	5	4	2	5	4
>50	2	2	1	2			2
Total	27	37	41	37	29	26	30
Ave. Age	31.38889	30.27027	31.03659	30.87838	30.06897	32.42308	32.88333

The proportion of males and females enrolled in the graduate program has remained fairly constant over the past five or more years. This seems to be in contradiction to national trends in which females are coming to dominate graduate programs in most science areas.

	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003
Females	10	17	17	17	13	10	16
Males	17	20	24	20	16	16	14
Total	27	37	41	37	29	26	30

On average, 76% of graduate students in environmental science have been white, 11% have been black, and with the remainder being other racial categories. Over the past few years there has been an increase in graduate students entering the program from universities outside of the United States, especially students from Asia (China and India) and the Middle East (Saudi Arabia).

	1996-1997	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	Ave.
White	26	30	30	28	19	17	22	76%
Black	1	3	5	4	5	4	3	11%
Hispanic			1	1	1			3%
Asian		1	1	2	3	3	3	7%
Middle Eastern		2	2	2		1	1	5%
Multi-Racial			1		1	1	1	3%
Total	27	36	40	37	29	26	30	

The slight decline in enrollment over the past few years most likely reflects a change in employment status, age, and career goals of entering graduate

students. Originally intended to be a primarily part-time graduate program for those students who were employed full-time during the day, the graduate program in environmental science has slowly evolved into a program where equal or greater numbers of graduate students are full-time, daytime graduate students. Thus, they expect to receive some sort of stipend, in the form of teaching or research assistantships. The number of teaching assistantships has been fixed within the department, at three per semester, for the past eight years. The number of graduate research assistantships is variable and depends upon the successful grantsmanship of the faculty involved in the graduate program. Over the past few years, only two faculty members, Dr. Gore and Dr. Cleveland, have obtained research funding that provides for graduate research assistantships.

Student Learning, Satisfaction, and Success

Upon completion of the six core courses, all students in the MS program in environmental science are required to take and pass a Comprehensive Examination covering the six core areas, environmental issues, environmental law and regulation, environmental geology, environmental chemistry, hydrology, and ecological methods. Each section of this 6-hour examination, completed in a single day, is graded by the instructor of record for that course and is graded as superior (1), acceptable (2), or unacceptable (3). At the discretion of the examiner, these grades may be modified on a +/- basis. Depending upon the performance, graduate students who receive an unacceptable evaluation must complete additional work ranging from additional problem sets, an independent research paper on a topic assigned by the professor, re-taking the comprehensive exam, to re-taking the class for a grade better than originally earned.

The following table summarizes the performance of all graduate students having completed the Comprehensive Examination in the MS program in environmental science.

Year	Student	Environmental Issues	Environmental Law	Environmental Geology	Environmental Chemistry	Hydrology	Ecological Methods
1996		2-	2-	2-	2-	2-	2-
1996		2-	2-	2-	2-	2-	2-
1997		3	2	1-	2	2-	2-
1997		2	2	1-	2-	2	2
1997		2	2	1-	2	2	2
1998		2	1	1	2-	2+	1
1999		2+	2-	2+	1	2	1
1999		2-	2	2	2	2	2
1999		2	2	2	2	2	2
1999		2-	2-	2-	3	2-	1
2000		3	2+	2	3	1	2-
2000		2+	2	2+	2	2+	3
2000		2-	2-	2	3	2	2-
2000		1-	1-	1	1	1	1

Year	Student	Environmental Issues	Environmental Law	Environmental Geology	Environmental Chemistry	Hydrology	Ecological Methods
2000		2	2	2-	3	2-	3
2000		2+	1	2+	2-	1	2+
2000		2+	2+	2	1	2	1
2001		2	3	3	3	3	3
2001		3	2	2+	2+	2	2-
2002		2-	2	2	3	2-	2
2002		3	2-	2	2	2	2
2002		2-	2-	2-	3	2	2-
2003		1	2	2-	2	2-	1
2003		2	2+	1-	2+	1	1
2003		1	2+	2+	2	2	1
2003		3	2-	2-	2-	2	3
2003		3	2-	2-	2	2	3
2003		1	1-	2+	1	2	2
2003		1	1-	2+	2	2	2

Year	Student	Environmental Issues	Environmental Law	Environmental Geology	Environmental Chemistry	Hydrology	Ecological Methods
2003		3	1-	2+	3	2+	1
2003		2	2	2-	2	2	2-
	AVERAGE	**2.16**	**2.01**	**2.00**	**2.23**	**1.99**	**1.99**

Although the most difficult portion of the exam is in the areas of environmental chemistry and environmental issues, the typical graduate student in the environmental science graduate program passes the comprehensive exam on the first attempt.

Ultimately, the success of a graduate student is measured by his/her professional experience and successes in environmental science and related disciplines upon completion of the graduate program in environmental science.

The following table summarizes the current occupation and/or professional position of the graduates of the CSU graduate program in environmental science (anticipated 2003 graduates included).

Student	Year Graduated	Current Position
R. Carson Strinfellow	1997	Part-time Instructor,Columbus State University – Consultant Biologist, U.S. Fish and Wildlife Service
Dorinda Morpeth	1997	Research Biologist – Natural Resources Division, Fort Benning, GA
H. Lee Griffith	1998	Senior Scientist and Principal – Wetlands Delineation – Environmental Consultant, Atlanta, GA
Patty Kosky	2000	Unknown
Hans Eikaas	2001	Doctoral Candidate – Zoology – University of Canterbury – Christchurch, New Zealand
Nathan Boddie	2001	Medical Student – University of Grenada, New York University
Page Jones	2001	Doctoral Candidate – Environmental Health – University of Alabama, Birmingham
John Olson	2002	Doctoral Candidate in Conservation Science – Utah State University
Ted Roever	2002	Part-time Instructor – Columbus State University
Michelle Smith	2002	Environmental Specialist – ecological consulting firm – Baltimore, MD
Michael Trofinoff	2002	U.S. Army Engineers – Fort Hood
Marcie Parrish	2003	Research Biologist – Jones Ecological Laboratories
Mohammad Melibari	2003	Environmental Scientist – Saudi ARAMCO
Jonathan Neufeldt	2003	Research Biologist – U.S. Fish and Wildlife Service, Fort Benning, GA
Jennifer Lang	2003	Instructor – Columbus Technical Institute

The number of graduates from the program over the past years may seem to be quite low. However, it must be remembered that the program was initiated in 1994 primarily targeted to students who were working full-time during the day and taking graduate classes in the evening. As a result, all of the core courses and the majority of elective classes are offered in the evenings. With this structure, a great many of graduate students find it difficult to balance the demands of a full-time job, the demands of a family, and the rigorous demands of thesis research. As a result, many of our graduate students attend and pass the required didactic courses, some even progress to completing the comprehensive examination, but find it difficult to budget the time demands for thesis research (especially if no external funding is available), choosing to drop from the program instead. Of the graduates from the program, five have completed their thesis without external support. This represents only 10% of those students who entered the program without external support. The remaining graduates all had some form of external support in the form of internships, scholarships, or graduate assistantships. Of the externally funded graduate students, only one has failed to graduate to this point, meaning that 95% of funded students are able to complete the program and proceed in their professional careers. Although we do not know how this compares to graduate programs at research universities, we expect that this is a competitive rate of completion and graduation.

Some amount of concern has been expressed about the low graduation rate relative to the number of students who enter the program. Some of this may come about since students fail to understand the extent of their obligations as graduate students (i.e., they confuse graduate study with and "extension" of undergraduate study). All graduate students receive a document outlining their responsibilities and obligations upon entering the program [this document is attached as appendix 4]. Additionally, a component of the Environmental Issues class is a discussion of the graduate experience in environmental science. Considering that a great number of entering graduate students are working full-time and have family obligations, as well, it is not too surprising that a low number finish the program. Regardless, it has been suggested that one option to increase graduation numbers is a "non-thesis" option. The Environmental Science Advisory Committee has generally felt uncomfortable with this option since it "dilutes" the value of the thesis option. That is, in order to get an advanced degree in any of the sciences, it is generally accepted that the graduate student must demonstrate the ability to "do" science and communicate the results (conduct a piece of original research). The non-thesis option would abdicate that responsibility. A recently proposed alternative would be to create a separate track within the graduate program, entitled Master of Arts in Environmental Studies. This would not require thesis research but would not be considered as true graduate training in a science, *per se*. The proposed course of study is contained in appendix 5. The Environmental Science Advisory Committee has recommended that a formal proposal for this option be submitted to the Board of Regents.

5. Faculty

Faculty Training and Specialization

The department utilizes a combination of full-time tenure track faculty as well as part-time faculty in delivering its courses. There are only three faculty assigned to the Department of Environmental and Health Sciences (two, full-time, one, half-time). Faculty from other departments teach many of the courses under the ENVS designation or graduate-level credit is given for courses housed within individual departments. A normal teaching load (graduate plus undergraduate courses) for full-time faculty consists of 12 semester credit hours (effectively, four courses). The instructors utilized, as of Spring 2003, along with their highest degree obtained and areas of specialty are detailed below. This lists includes all faculty regularly contributing graduate course-work and thesis supervision in the graduate program in environmental science.

Tenure track faculty:

1. James A. Gore, Ph.D. University of Montana – ENVS - river and stream ecology, water resources management, hydrology, conservation biology
2. Harlan J. Hendricks, Ph.D. Virginia Polytechnic and State University – ENVS - Insect Ecology and Evolution, Invertebrate Biology, Plant Mimicry by Insects, environmental issues
3. Warren B. Church, Ph.D., Yale University – ENVS – cultural anthropology, Andean cultures, historical ecology

4. Julie A. Ballenger, Ph.D. Miami University – BIOL – plant taxonomy, ecology of tropical and subtropical ecosystems
5. John A. Barone, Ph.D. University of Utah – BIOL – plant ecology, landscape ecology, experimental design and statistics
6. William S. Birkhead, Ph.D. University of Texas – BIOL – vertebrate ecology, conservation biology
7. Arthur G. Cleveland, Ph.D. University of North Texas – BIOL – environmental remediation, ecology of bats
8. John K. Davis, Ph.D. Indiana University-Bloomington – BIOL – microbial ecology
9. George E. Stanton, Ph.D. University of Maine – BIOL – freshwater ecology
10. Glenn D. Stokes, Ph.D. Pennsylvania State University – BIOL – physiological ecology, Geographical Information Systems (GIS)
11. Jeffrey A. Zuiderveen, Ph.D. University of Kentucky – BIOL – environmental toxicology

12. Zewdu Gebeyehu, Ph.D. Philipps University – CHEM – environmental chemistry
13. Charles A. Lovelette, Ph.D. Rensselaer Polytechnic University – CHEM – biochemical process in metals accumulation

14. William J. Frazier, Ph.D. University of North Carolina – GEOL – sedimentology, hydrology
15. David R. Schwimmer, Ph.D. State University of New York at Stony Brook – GEOL – vertebrate paleontology, environmental geology

Part time faculty:

1. R. Carson Stringfellow, M.S. Columbus State University – freshwater mussel ecology and taxonomy, environmental studies

Faculty Available to Support Course Offerings

Faculty from an array of disciplines and departments regularly teach within the graduate program in environmental science. Although other faculty should be capable of teaching many of these courses, teaching obligations within individual departments preclude their regular availability. The chart below provides an overview of the faculty most readily available to teach each of the regular course offerings.

Course	**Faculty Available to Teach Course**
ENVS 1105 Environmental Studies	Gore, Hendricks, Stringfellow
ENVS 5165 Hydrology	**Frazier, Gore**
ENVS 5225 Natural Environments of Georgia	Birkhead, Ballenger, Hanley
ENVS 5256 Environmental Geology	**Schwimmer**
ENVS 6105 Environmental Issues	**Gore, Hendricks, Birkhead**
ENVS 6106 Environmental Law and Regulations	**Gore**
ENVS 6109 Environmental Air Quality	
ENVS 6206 Water Resources Management	Gore
ENVS 6207 Ecological Methods	**Birkhead, Ballenger, Barone, Stanton**
ENVS 6235 GIS/GPS Applications	Stokes
ENVS 7115 Environmental Chemistry	**Gebeyehu**
ENVS 7145 Land Use and Waste Management	Schwimmer
BIOL 5515 Selected Topics in Cellular and Molecular Biology	Ballenger, Davis
BIOL 5525 Selected Topics in Organismic Biology	Gore, Stanton, Barone, Birkhead, Zuiderveen

Course	Faculty Available to Teach Course
BIOL 5535 Selected Topics in Ecological and Evolutionary Biology	Gore, Barone, Birkhead, Stanton, Cleveland, Church
CHEM 7165 Environmental Organic Chemistry	NONE IDENTIFIED
CHEM 7175 Atmospheric Physics and Chemistry	NONE IDENTIFIED
CHEM 7185 Aquatic Chemistry	NONE IDENTIFIED
GEOL 5115 Geochemistry	Frazier
GEOL 5135 Introduction to Oceanography	Frazier
GEOL 5215 Geomorphology	Hanley
GEOL 5275 Vertebrate Paleontology	Schwimmer

Faculty Development

As in previous years, the FY2004 department budget allocates $2000 for faculty and student travel. This money also supports two full-time faculty in Health Science. Additional institutional support might be obtained through the College of Science funds and faculty development grants awarded by the Vice President for Academic Affairs. These funds are available for faculty to participate in conferences, workshops, seminars, and other approved activities.

Since research and scholarship are fundamental underpinning of a research-based graduate program, participating faculty also obtain external funding on a regular basis to support their own research as well as research projects of graduate students in the program. These research grants and contracts are described in the **Research and Scholarship** section of this report.

6. Facilities

Rooms in Lenoir Hall are specifically assigned to Environmental Science faculty and include the following:

ROOM	FUNCTION
LENR 106B	Laboratory – water chemistry and atomic absorption spec
LENR 153	Departmental Office
LENR 156	Laboratory – microscope/taxonomy and computer use
LENR 157	Faculty Office
LENR 158	Faculty Office
LENR 163	Laboratory – wet lab – kitchen – computer use
LENR 301E	Faculty Office

Although not assigned specifically to the Environmental and Health Science department, the following rooms in Lenoir Hall are assigned to the College of Science, Biology and/or Geology/Chemistry and are or have been utilized by graduate students and their thesis advisors for research in environmental science.

ROOM	FUNCTION
LENR 103	Chromatography Laboratory
LENR 203	Paleontology Laboratory
LENR 206	Chemistry Laboratory
LENR 108	X-Ray Diffraction Laboratory
LENR 251	Biology Stock Room – De-ionized Water
LENR 260	Cellular/Molecular Laboratory
LENR 263	Cellular/Molecular Laboratory
LENR 264A	Biology Cold Room
LENR 266	Microbiology Clean Room
LENR 305	Chemistry Instrumentation/Cold Room
LENR 308	Chemistry Stock Room
LENR 352	Toxicology Lab
LENR 353	Zoology Museum – Invertebrate/Vertebrate Collections
LENR 354	Aquatic Biology Research Lab
LENR 355	Vivarium
LENR 357	Ecology Research – HPLC
LENR 359	Herbarium – Botany Research
LENR 365	Field Equipment Preparation and Storage

Computers

Each faculty member in the department is provided with an IBM compatible workstation/PC with speeds from 166 MHz to 1GHz. Graduate offices and labs are equipped with IBM compatible workstation/PC's for research use. Most offices are equipped with laser and color printers.

Software

In addition to the computer programs provided by the university computer network, the department has purchased or leased software specifically designed for research applications in environmental science.

SOFTWARE	PURPOSE
PHABSIM	DOS/Windows versions for instream flow analysis
TSLIB	Time-series analysis for streamflow analysis

SOFTWARE	PURPOSE
SigmaPlot	2-D, 3-D graphical and statistical analysis
SigmaStat	Basic statistical analysis
ARCInfo	Geographical Information Systems
ARCView	Geographical Information Systems
STATISTICA	Single and multivariate statistical analysis
EDAS	Spread sheet (ACCESS) and analytical tool for ecological data – multimetric analysis

Library Facilities

The university library has modest texts and journals related to environmental science. There is no collection of *current* environmental science research journals in the library. Faculty and students do have access to a wide variety of on-line services related to current scientific literature. Many professional organizations and professional journals have web pages that list titles and abstracts as a point of access to the literature in that sub-discipline. In addition, students can search the scientific literature through connections to GALILEO, particularly the on-line search facilities of *Current Contents*, which summarizes the titles and abstracts of most of the SCI approved scientific journals over the past 20 or so years. Also, faculty and students can avail themselves of a relatively rapid and efficient interlibrary loan service and have temporary access to all text and journal holdings in the libraries of the Georgia University System.

Additional Infrastructure Support

The Computer Information and Networking Service (CINS) has provided faculty with current tools (Front Page, etc.) to develop and construct web pages for web-based instruction. Although the graduate program, since it requires hands-on instruction and research, does not contain on-line courses, many faculty have developed personal web-pages that contain course syllabi, reference material, and assignments as supplements to current coursework.

7. Research and Scholarship

Student Involvement in Research

Thesis research is the essence of the MS degree in environmental science. All graduate students in the program are required to conduct and report on the results of an original research project. This activity includes creation of a committee-approved research proposal, field and laboratory analysis of data, thesis production, and public and private defense of that thesis.

A list of graduate students, their proposed thesis topic, is included below. This does include those students who have not progressed in the program to the point of creating the proposal or conducting the research project.

Student	Grad. Year	Thesis Topic	Supervisor
Nathan Boddie	2001	Impact of a historical translocation on populations of white-tailed deer *Odocoileus virginianus.*	Ballenger
Michele Brossett	IP	The effects of nutrient variability on macroinvertebrates in pristine streams in different ecoregions across the state of Georgia	Gore
Hans Eikaas	2000	Heavy metal inhibition of the prophenoloxidase cascade in crayfish. An *in vitro* investigation.	Lovelette
Kristine Farley	IP	Radiotelemetric analysis of movements of translocated gopher tortoises.	Birkhead
Tracy Ferring	IP	An analysis of the value of quality assurance/quality control sampling in rapid bioassessment.	Gore
Lee Griffith	1998	Analysis of hydric pine flatwood ephemeral pool macroinvertebrate and crustacean assemblages along a temporal and spatial gradient from a hypothesized colonial source.	Gore
Duncan Hughes	IP	Physical, chemical, and biological characterization of reference conditions for streams in the major ecoregions of Georgia	Gore
Page Jones	2001	The distribution of macroinvertebrates along the impounded middle Chattahoochee River.	Gore
Torrey Knight	IP	The application of PHABSIM to the analysis of minimum low flows in subtropical rivers in southwest Florida.	Gore
Patty Kosky	2000	Analysis of small mammal populations in disturbed and restored long-leaf pine habitats.	Cleveland

Student	Grad. Year	Thesis Topic	Supervisor
Jof Mehaffey	IP	Development of a numerical classification system of stream health in Georgia.	Gore
Mohammad Melibari	2003	Characterization of environmentally friendly polymers: Amylopectin and it's blends.	Al-Saigh
Amanda Middleton	IP	Application of EPA's aquatic life-use criteria to stream classification systems in Georgia.	Gore
Dorinda Morpeth	1997	A comparison of movements and burrow usage between indigenous and relocated gopher tortoises (*Gopherus polyphemus)* in a Fall Line sandhills community.	Birkhead
Jonathan Neufeldt	2003	Radiotelemetric analysis of the movements of gopher frogs from various levels of disturbance in longleaf pine forests.	Birkhead
John Olson	2002	Using GIS and land use data to select candidate reference sites for stream bioassessment.	Gore
Marcie Parrish	IP	The impact of land use, especially riparian grazing, on aquatic macroinvertebrates in west central Georgia.	Gore
Neil Pearce	2002	Land usage impacts on spring head salamander populations at Callaway Extended Properties, Harris County, Georgia.	Birkhead
Salini Pillai	IP	Stratification of Georgia streams for rapid bioassessment, focusing upon differing structures of blackwater versus clearwater streams.	Gore
Uttam Rai	IP	Differences in rapid bioassessment scores and stream classification based upon macroinvertebrate sample size.	Gore
Theodor Roever	2002	Using the index of biotic integrity of fish communities to evaluate habitat quality in middle Chattahoochee river tributaries.	Birkhead

Student	Grad. Year	Thesis Topic	Supervisor
Ashley Scott	IP	Creation of policy and regulatory structure for the incorporation of rapid bioassessment into stream monitoring in Georgia.	Gore
Michelle Smith	2002	Differences in pesticide accumulations in bat populations in urban and rural environments.	Cleveland
Carson Stringfellow	1997	A survey of freshwater unionid bivalves in five creeks located in west central Georgia.	Stanton
Michael Trofinoff	2002	Determining the mobility of metals through coal combustion byproducts in surface impoundments by analyzing leachate from modified saturated hydraulic conductivity tests.	Frazier
Elena Vratonjic	IP	Metals processing and bioaccumulation in bacteria	Davis
George Williams	IP	The impacts of changes in catchment slope and riparian widths on rapid bioassessment scores in ecoregions of Georgia.	Gore
Jodi Williams	IP	Changes in rapid bioassessment scores based upon taxonomic accuracy and level of identification.	Gore

Faculty Research and Its Relation to the Program Mission

Faculty involvement with original research enables them to stay current in their particular areas of specialization and expertise and to explore new opportunities in areas related environmental science. Research in environmental science can be both labor-intensive and equipment-expensive. The university has provided considerable support for basic equipment purchases so that faculty can conduct basic environmental research projects. Beyond those needs, faculty have written and obtained research grants and contracts to support additional equipment needs.

Faculty research enhances the reputation of the college and the university and allows individual faculty as well as the program, itself, to attract more research funding and highly qualified graduate students. This improves the quality of the graduate experience as well as improving the chances of graduates in the

marketplace as well as obtaining entrance to doctoral programs at other universities.

Mentoring and Professional Development Opportunities for Faculty

As in previous years, the FY2004 department budget allocates $2000 for faculty and student travel. This money also supports two full-time faculty in Health Science. Additional institutional support might be obtained through the College of Science funds and faculty development grants awarded by the Vice President for Academic Affairs. These funds are available for faculty to participate in conferences, workshops, seminars, and other approved activities.

Since research and scholarship are fundamental underpinning of a research-based graduate program, participating faculty also obtain external funding on a regular basis to support their own research as well as research projects of graduate students in the program. These research grants and contracts are described below:

James A. Gore, Professor and Chair, Environmental Science

Since 1996, Dr. Gore has obtained $1,938,768, which has supported (or is currently supporting) 31 graduate research assistantships.

1. "Minimum Low Flow evaluations and management alternatives for the Hillsborough, Crystal, Braden, and Rainbow Rivers and associated spring runs" 2003-2006. Southwest Florida Water Management District. **($300,000)** ($60,000 awarded for 2003-2004; subsequent contracts pending) [**Supports 6 graduate students]**
2. "Minimum Low Flow evaluations and allocation alternatives for the Myakka, Alafia, and Middle Peace Rivers." 2002-2004. Southwest Florida Water Management District. **($50,000) [Supports 2 graduate students]**
3. "Roanoke River Instream Flow Study. Clover Power Station. 2002-2004. Old Dominion/Virginia Power **($50,000)**
4. "Recovery of fish and benthic macroinvertebrate communities after dredging PAH contaminated sediments on the Oconee and Ocmulgee Rivers in Georgia." 2001 – 2003. Georgia Power/Electric Power Research Institute (EPRI). **($80,000) [Supported 2 graduate students]**
5. **Ecoregion Reference Site Project** U.S. Environmental Protection Agency (Section 319(h))/Georgia Department of Natural Resources. **($1,334,667) [Supports 12 graduate students]**

    - **Phase II -** "Distribution and characterization of reference stream sites for bioassessment in Georgia" 2000-2002. ($417,667)

- **Phase III -** “Development of a numerical index (biocriteria for water quality) for the major ecoregions and subecoregions of the state of Georgia” 2001– 2003. ($417,000)

- **Phase IV** - “Validation of numerical index and recommendations for application of macroinvertebrate biocriteria for the state of Georgia” 2003– 2005. ($500,000)

6. "Fish and mussel surveys - Middle Chattahoochee Hydroelectric Project" 1999. "CH2M Hill. **($8000)**
7. "Recreation support services - Middle Chattahoochee Hydroelectric Project" 1999-2000. CH2M Hill **($8,000)**
8. "The distribution of fish and macroinvertebrates in the Chattahoochee watershed near Columbus, Georgia, as they are affected by CSO treatment technology and changes in land use". 1997-1999. Columbus Water Works, Water Environment Research Foundation, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, Georgia Environmental Protection Division, Alabama Department of Environmental Management, Georgia Power. **($75,000) [Supported 5 graduate students]**
9. "An analysis of temporal changes in wetland macroinvertebrate communities in hydric pine flatwoods of south Florida”. 1997-1998. South Florida Water Management District. **($13,101) [Supported 1 graduate student]**
10. "Water quality study of West Point Lake, Georgia" 1996-1997. West Point Lake Development Authority **($20,000) [Supported 1 graduate student]**

[*Prior to 1996*]

11. "Forage area, home-range, and population density of Solpugidae in Organ Pipe Cactus National Monument, Arizona." 1978. Sigma Xi. (Requested: $750; Funded: $350)
12. "Recolonization of a reclaimed stream channel after coal strip mining." 1978-79. Peter Kiewit Sons, Mining District Office and Big Horn Mine Corp., Sheridan, WY ($24,000)
13. "Determination of instream flow requirements of brown trout using radio-isotopes." Year II. Salmonid winter flow studies. 1979-1980. Office of Water Resources and Technology (OWRT), Wyoming Game and Fish Commission, and Wyoming State Engineer Office. (Requested: $36,000; Funded: $31,000)
14. "Determination of effective methods of restoration of hydrologic and biotic balance of a reclaimed coal strip-mined river." 1979. Rocky Mountain Inst. of Energy and Environment, Industrial Fund. ($12,500)
15. "Baseline impact study (macroinvertebrates and suspended sediment). Powder River and Willow Creek. *In situ* uranium mining." 1979-1980. Wyoming Mineral Corporation. ($8,700)

16. "Cumulative effects of a series of storage and run-of-river impoundments on aquatic communities." 1980-1981. OWRT. (Requested: $45,022; Approved but canceled after federal dissolution of OWRT).
17. "Determination of instream flow requirements of benthic macroinvertebrates in the Tongue River upstream of the reservoir." 1980. AMAX foundation ($1,500)
18. "Survey and habitat description of aquatic biota in the Cheyenne river and tributaries near uranium mine site, Edgemont, SD." 1980-81. Tennessee Valley Authority ($6,500)
19. "Evaluation of limnological parameters of Fremont, Willow, and Half-Moon Lakes as related to *Mysis* production." 1980-81. U. S. Dept. of Interior, Office of Water Resources and Technology. ($19,365)
20. "Benthic invertebrate baseline studies from previously coal mined areas in Tennessee." 1980-81. U.S. Geological Survey. ($18,000)
21. "Benthic invertebrate distributions in low order streams potentially impacted by coal surface mining on the Cumberland Plateau." 1980-1981. U.S. Dept. of the Interior, Office of Surface Mining, Knoxville. ($36,000)
22. "Distribution and microhabitat requirements of *Mudalia potosiensis* (Mesogastropoda: Pleuroceridae), a stream dwelling snail." 1981. Univ. of Tulsa, Faculty Res. Suppl. ($350)
23. "Cumulative effects of a series of storage impoundments on benthic communities of the Arkansas River." 1982. Univ. of Tulsa, Summer Faculty Fellowship. ($3,000)
24. "A test of instream flow theory for macroinvertebrates by the use of colonization of artificial substrates in natural and experimental streams." 1982-83. Council for the International Exchange of Scholars. **(FULBRIGHT SENIOR RESEARCH AWARD)** (Full maintenance and travel for one year to the Hebrew University of Jerusalem, Israel)
25. "Maintenance of macroinvertebrate habitat for fish food production: implications to regulated flow management." 1985. Univ. of Tulsa, Summer Fac. Fellowship ($2,400)
26. "Comparison of techniques for predicting densities of aquatic invertebrates." 1985-1986. Federal Republic of Germany, Academy of Science; Univ. of Karlsruhe; Univ. of Tulsa ($35,000) (with V.H. Resh and B. Statzner)
27. "Changes in darter assemblage structure with changes in hydraulic parameters as a test of the river continuum concept." 1986. Univ. of Tulsa, Faculty Development Summer Fellowship ($2,500)
28. "Development of a method for predicting the effects of peaking hydropower releases on fish and benthos." 1986-1988. U.S. Army Engineers ($360,000; including 1 year IPA assignment to Waterways Experiment Station [1986-1987]) [Project extended, 1988-1989; $160,000; co-PI with James B. Layzer, Tennessee Tech University; renewed, 1989-1990; $75,000]

29. "Assessment of hydropower uprates on the Obey River downstream of Dale Hollow Dam, Tennessee." 1987. U.S. Army Engineers, Nashville, District. ($40,000)
30. "Assessment of hydropower uprates on the Cumberland River downstream of Wolf Creek Dam, Kentucky." 1987. U.S. Army Engineers, Nashville, District ($80,000)
31. "Testing instream flow methodologies to resolve water resource issues in South Africa." 1988-1989. Council for International Exchange of Scholars. **(FULBRIGHT SENIOR RESEARCH FELLOWSHIP)** ($29,035 + travel and expenses)
32. "Hydraulic influences on colonization rate in disturbed streams: can they be used to predict recovery?" 1990. Univ. of Tulsa, Faculty Summer Fellowship ($4,500)
33. "Analysis of benthic invertebrate and fish communities associated with potential groundwater and surface water contamination by creosote plant effluent." 1990. U.S. Geological Survey, Nashville Office. ($5,000)
34. "PHABSIM analysis of stream restoration structures on the Little Missouri River, Arkansas, before and after construction of reregulation weirs." 1991-1992. U.S. Army Engineers, Waterways Experiment Station. ($124,000)
35. "Distribution and assessment of restoration potential of endangered mussel fauna in Shoal Creek, Tennessee and Alabama." 1991-1992. U.S. Fish and Wildlife Service, Tennessee Wildlife Resources Agency ($15,000) (renewed 1992-1993 [$30,000]; renewed 1993-1994 [$30,000])
36. "Minimum flow requirements to maintain faunal diversity on the Sabie and Letaba Rivers in Kruger National Park." 1991. CSIR/FRD and Univ. of the Witwatersrand, Pretoria, South Africa. ($10,000)
37. "Nonpoint source water pollution reduction planning process: West Sandy watershed." 1991-1996. Tennessee Dept. of Environment and Conservation. ($200,000) (co'PI with Mack T. Finley and S.W. Hamilton) [under consideration for amended funding as National Demonstration Project; $500,000]
38. "Evaluation of the success of Best Management Practices to control nonpoint source pollution in the Double Bridges Creek watershed." 1993 - 1994. Wiregrass RC&D (U.S. Soil Conservation Service) ($15,000)
39. "GIS analysis of environmentally sensitive areas, seagrass beds, and manatee protection zones in waterways in Collier County, Florida" 1994-1995. Marine Trades Assoc. ($5,000)
40. "GIS support and training" 1995-1996. CTSP Program - Hewlett Packard/Environmental Systems Research Institute/Smithsonian Institution. (awarded complete GIS system [hardware and software] plus training) (approximate value: $75,000) (submitted with Christine Ramsey)
41. "Nutrient analysis of waters in Moorings Bay, Seagate, and Clam Bay ecosystems." 1995-1996. Save The Bays Assoc., Inc. ($5,000)

42. *"The hydrology and ecology of the Clam Bay basin and mangrove ecosystem"* funded through:

    - "Analysis of the Clam Bay ecosystem. Phase I - historical records and data analysis." 1995. Bay Colony Assoc. ($10,000)

    - "Water quality analysis of canals and estuarine areas on Marco Island" 1995-1996. Marco Island Civic Association. ($6,000)

    - "Water quality analysis of Vanderbilt Lagoon and the southern end of Water Turkey Bay" 1996-1997. Vanderbilt Beach Property Owners Association and Wiggins Pass Conservancy ($5,000)

43. "Analysis of the composition and distribution of midge (Diptera: Chironomidae) assemblages in isolated wetlands in South Florida." 1996-1997. South Florida Water Management District. ($10,000)

Harlan J. Hendricks, Associate Professor of Biology and Environmental Science

Dr. Hendricks has obtained grants and contracts in excess of $40,000 since 1996.

1. Awarded a $39,368 grant from National Science Foundation (NSF) Course, Curriculum, and Laboratory Improvement Program with Dr. Brian Schwartz. (2001)
2. Awarded a Catalyst II Mini-Grant to develop web-based course enhancements for SPED 3225 Teaching Mathematics in Special Education. Teamed with Dr. Mary Beth Hendricks, Department of Curriculum & Instruction. (2000)

Warren B. Church, Assistant Professor of Anthropology

1. Faculty Development Grant. 2003. To attend the "First International Conference on the Art, Ethnohistory and Archaeology of the Chachapoya, " August 9 and 10 in Leymebamba, Perú.
2. "Emergency Archaeology at Gran Pajatén, Peru." 2003. Dumbarton Oaks Project Grant.
3. **"**Emergency Archaeology at the Tombs of Los Pinchudos, Chachapoyas, Peru." 2000. National Geographic Society Committee for Research and Exploration Grant No. 6819-00
4. "Origins of Tropical Andean Cloud Forest Culture: Vertical Colonization or Interregional Interaction?" 1999. Foundation for Exploration and Research on Cultural Origins (FERCO).

5. “Pre-Columbian Fellowship, Research Project: Culture Areas and Interaction Spheres in the Eastern Andes of South America.” 1998-1999. Dumbarton Oaks. Research, development of publications and grant proposals.

[*Prior to 1996*]

6. Yale University Mellon Dissertation Writing Fellowship. 1992.
7. “Prehistoric Cultural Development and Highland-Lowland Rainforest Interaction in the Northeastern Andes of Peru." 1992. National Science Foundation Dissertation Research Grant No. DBC-9200799.
8. "Cultural Chronology and Prehistoric Highland-Lowland Interaction in the Northeastern Andes of Peru." 1992. Wenner-Gren Foundation for Anthropological Research Grant No. 5425.
9. Yale University Joseph Albers and matching Augusta Hazzard Fellowships for analysis of archaeological materials from Manachaqui Cave, Peru. 1991.
10. Yale University Joseph Albers Fellowship award for travel and archaeological survey, northeastern highlands of Peru. 1989.
11. Yale University Fellowship for graduate studies in Anthropology. 1988.
12. University of Colorado Graduate School Foundation Fund Grant for research in Peru. 1987.
13. Doctoral Student Fellowship Grant from the Office of the Dean of the Graduate School. University of Colorado-Boulder. 1987.
14. **Fulbright Scholarship** for one-year study in Peru (extended to eighteen months). 1985.

John A. Barone, Assistant Professor, Biology

Dr. Barone has just joined the faculty of biology at CSU. His grants and contracts prior to arriving at CSU are:

1. Postdoctoral Fellowship, Smithsonian Institution . 1997
2. Dissertation Improvement Grant, National Science Foundation. 1994.
3. Pre-Doctoral Fellowship, Smithsonian Institution. 1994.
4. Sigma Xi Grants-in-Aid. 1993.

A. Herbert and Marion Gold Scholarship (for plant field biology). 1993.

5. Short-term Fellowship, Smithsonian Tropical Research Institute. 1992.

William S. Birkhead, Professor and Acting Chair, Biology

Dr. Birkhead has obtained grants and contracts in excess of $100,000 since 1996. These grants have supported 8 graduate assistantships.

1. "Recovery of fish and benthic macroinvertebrate communities after dredging PAH contaminated sediments on the Oconee and Ocmulgee Rivers in Georgia." 2001 – 2003. Georgia Power/Electric Power Research Institute (EPRI). **(with Jim Gore) ($80,000) [Supported 2 graduate students]**
2. "Ecology of Sub-Saharan Africa." 2001. CSU Faculty Development Grant.
3. "The distribution of fish and macroinvertebrates in the Chattahoochee watershed near Columbus, Georgia, as they are affected by CSO treatment technology and changes in land use". 1997-1999. Columbus Water Works, Water Environment Research Foundation, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, Georgia Environmental Protection Division, Alabama Department of Environmental Management, Georgia Power. **(with Jim Gore) ($75,000) [Supported 5 graduate students]**
4. "Symposium on the Natural History of the Bahamas." 1997. CSU Faculty Development Grant.
5. "Distribution and management needs of woodrats (*Neotoma*) in north Georgia and determination of incidence of the parasite *Baylisascaris* in north Georgia woodrats." 1997-1998. Georgia Department of Natural Resources Non-game Wildlife Program.
6. "Turtle Trapping at Oxbow Meadows Environmental Learning Center." 1997. CSU Faculty Development Grant.
7. "Prevalence of *Mycoplasma agassizii* in gopher tortoises in central and southwest Georgia." 1996. CSU Faculty Development Grant.

[*Prior to 1996*]

8. "Status of the gopher tortoise in Georgia." 1990-1991. Georgia Department of Natural Resources Non-game Wildlife Program.
9. "Study of the environmental pH as an isolating mechanism of two cyprinid fishes." 1984, 1986, 1987. CSU Faculty Development Grant.
10. "Design of analysis for beaver pond ichthyofauna." 1984. CSU Faculty Development Grant.
11. "Stream monitoring on the Fort Benning Military Reservation." 1982. CSU Faculty Development Grant.

Arthur G. Cleveland, Professor of Biology and Environmental Science

Dr. Cleveland has obtained grants and contracts in excess of $50,000 since 1996. These grants have supported 2 graduate assistantships.

1. Georgia Department of Transportation. 2003. ($46,000) Grant to study distribution and management of bats under bridges in the state (with J.Jackson).
2. Georgia Department of Natural Resources. ($7,000). 1996. Grant to study the distribution and potential parasitism in woodrats in extreme northern Georgia and the needs for management of the species.

[*Prior to 1996*]

3. Welder Wildlife Foundation. Funded as research fellow in connection with population studies in southern Texas, Oklahoma, Kansas and Mexico as a doctoral student. 1969-1971
4. National Science Foundation. Recipient of NSF award for participation in studies in primate behavior and ecological adaptation. (University of Texas). 1972-1973.
5. National Science Foundation. Recipient of NSF award for participation in studies of atmospheric science. (Univ. of Texas). 1974-1976.
6. T.C.U. Research Foundation. Funded research on *Dasypus novemcinctus* reproductive cycles. 1974-1976.
7. National Audubon Society. Financial support of Rattus rattus studies in the Sabal Palm Forest (Mexican-Texas border). 1975.
8. National Science Foundation. Funded by NSF to participate in a conference examining the impact of plate tectonics upon geological theory (with Walter C. Pitman of the Lamont-Doherty Geological observatory) held in Santa Ana, California. 1975-1976.
9. Crouch Industries Research Grant. ($1500) Funded research on effectiveness of certain iodine-based preparations as anti-bacterial agents of agricultural impact. 1982.
10. Dexide Industries Research Grant (with B. Goven) ($6,000) Determination (*In vivo* and *In vitro*) of efficacy of UltradexTM surgical scrub and its effects upon *Serratia marcescens*.1111. 1982-1983
11. Richardson Foundation. ($4,000) Funded initial studies on post-cranial skeleton of North American Geomyidae. 1983.
12. Richardson Foundation and The Conservation Agency. ($4,000) Funded expedition to the Dinghushan area of southern China. 1984.
13. Carter Foundation ($10,000) Financed purchase of research microscope and photographic equipment for examination of karyotypes and chromosome banding on mammals. 1984.
14. Richardson Foundation (5,000) Funded second expedition to southern tropical China. 1985.

15. Richardson Foundation. ($20,000) Sabbatical for December 1985 to June 1986 for writing, research and third China expedition. 1985-1986.
16. Richardson Foundation ($5,000) Funded fourth expedition to southern China. 1987.
17. Richardson Foundation ($6,000) Funded fifth expedition to China and Presentation to the International Meeting on Asian Mammalogy in Beijing. 1988.
18. SWS, Incorporated ($5,000) Microbial testing of a biogenerator for pollution abatement. 1989.
19. NIH Minority Biomedical Research Support (MBRS) Grant ($500,000) Prepared Grant proposal for Incarnate Word College, Funded for three years. 1990.
20. Jonsson Foundation ($5,000) Remodeling of offices/conference rooms of Science Center - Incarnate Word College. 1990.
21. U.S. Air force ($19,500) Habitat (flora/fauna) study of the Lackland AFB Annex Wildlife Area (with D. McLain). 199l.
22. U.S. Department of Interior (OSM) ($1200) Review of status of constructed wetlands in the treatment of acid-mine drainage (with D. McLain and L. Sandberg). 199l.
23. Nature Conservancy of Texas ($1000) Mammalian survey of the Duval County, Texas Brushland Reserve. 1992.
24. Munitech, Inc. ($3,400) Bioremediation of several environmental pollutants using continuous stream cultures. 1993.
25. South Texas Doctoral Bridge Program. ($140,000) U.S. Department of Health and Human Services (1 R25 GM50080-01) Program to support and encourage minority graduate student participation in research. (with M. Medina and E. Baca). 1993.

John Davis, Assistant Professor of Biology

1. Characterization and Applications of Reductive Dehalogenase Genes in Enhancement and Monitoring of Biodegradation of Chlorinated Pollutants. Awarded by Environmental Protection Agency to James M. Tiedje, John K. Davis, Baolin Sun and Sayyed Hasham, $400,000 to run through fiscal years 2002-2004

2. Fecal Coliform Testing of Drag Nasty Creek, Quitman County, Georgia. Submitted to Lower Chattahoochie Regional Development Center, September 2003.

[*Prior to arrival at CSU*]

3. Indiana University Internal Research Grant to study swarming motility of *Proteus* and *Serratia*, 1989

4. Howard Hughes Medical Institute Outstanding Associate Instructor Award, Indiana University, 1990

5. Dow Chemical Environmental Grant award to study reductive dehalogenation of chlorophenols, Awarded to John K. Davis. $12,000. Awarded 1998, indefinite duration.

Zewdu Gebeyehu, Associate Professor of Chemistry

1. Synthesis, characterization, luminescence and waveguide property studies of Lanthanide (III) complexes (Submitted to NRC- SUPPORTED FOR THE SUMMER OF 2001-2003)

2. Investigating the nonlinear optical properties of some Thiol complexes of selected transition metals (Submitted to RDL- SUPPORTED FOR THE SUMMERS OF 1997-1999)

George E. Stanton, Professor of Biology and Acting Dean, College of Science

Dr. Stanton has obtained grants and contracts in excess of $60,000 since 1996. These grants have supported 2 graduate assistantships.

1. “Freshwater mussel surveys within the Flint River Basin.” 2002. U.S. Fish and Wildlife Service. R. Carson Stringfellow and George E. Stanton (PI’s). ($55,000 with possibility to extend to $100,000)
2. "Survey of macroinvertebrates on Georgia granite outcrops.” 1997-1998. Georgia Non-game and Endangered Wildlife Program, Department of Natural Resources. ($7,000)

[*Prior to 1996*]

3. "Analysis of population dynamics of *Psychoda alternata* on sewage sludge application fields, Columbus, BA." 1994-1995. Columbus Water Works ($19,000)
4. "Ecological distributions and life histories of *Procambarus acutissimus* and *Procambarus verrucosus* in west Georgia." 1993-1994. Georgia Non-game and Endangered Wildlife Program, Department of Natural Resources. ($1,000)
5. "Ecological distributions of *Procambarus versutus* and *Procambarus acutissimus* in west Georgia." 1991-1992. Georgia Non-game and Endangered Wildlife Program, Department of Natural Resources. ($1,000)
6. "Testing *habitat indices* suitability for environmental impact on streams and beaver ponds, Fort Benning, GA." 1983. Waterways Experiment Station, US Army Corps of Engineers. ($25,000)

Faculty Publications, Papers Given, and Public Lectures

James A. Gore, Professor and Chair, Environmental Science

Publications:

1. **Gore, J.A.**, and P.M. Jones. Distribution of Chironomidae in the mainstem Chattahoochee River and cumulative impacts of a combination of low and high-head impoundments. Submitted: *Southeastern Naturalist.*
2. Olson, J.R., **J.A. Gore**, and M. Barbour. A GIS-based method for choosing candidate reference streams in the ecoregions of Georgia: Comparisons with *best professional judgement.* Submitted: *Freshwater Biology.*
3. **Gore, J.A.**, W.S. Birkhead, D.L. Hughes, S.L. Nichols, and T.W. Roever. 2004. Recovery and colonization dynamics of macroinvertebrates and fish in newly created habitat after sediment remediation from manufactured gas-processing waste in the Oconee River. (IN PRESS) *River Research and Applications.*
4. **Gore, J. A.** 2004. Discharge Measurements and Streamflow Analysis. [Revised] *in*: F.R. Hauer and G.A. Lamberti (eds.) *Methods in Stream Ecology*. (2nd Edition) Academic Press, San Diego, CA. (IN PRESS)
5. **Gore, J.A.**, and J. Mead. 2003. The Benefits and Dangers of Ecohydrological Models to Water Resource Management Decisions. *In: Ecohydrology: A new Paradigm* United Nations/UNESCO, Geneva and Cambridge University Press. (IN PRESS)

6. **Gore, J.A.** 2003 experiência de reuperaçã e restauro de cursos de água nos Estados Unidos. *in*: I. Moreira, G. Saraiva, and F. Nunes Correia (eds.) *Conservação, Valorização e Gestãa Ambiental de Sistemas Fluviais*. National Board of Science and Technology, Lisbon, Portugal. (IN PRESS)
7. Addison, D.S., **J.A. Gore**, J. Ryder, and K. Worley. 2002. Tracking post-nesting movements of loggerhead turtles (*Caretta caretta*) with sonic and radio telemetry on the southwest coast of Florida, USA. *Marine Biology* 141: 201-205.
8. **Gore, J.A.** 2002. Preliminary Analysis of Habitat Loss for Target Biota in Rivers Impacted by Long-Term Flow Increases from CBM Production. *In:* Proc. of 9th Int. Petroleum Environmental Conference, *http://ipec.utulsa.edu/ipec/Conf2002/gore_121.pdf*
9. **Gore, J.A.**, C. Dahm, C. Klimas. 2002. A Review of "Upper Peace River:An Analysis of Minimum Flows and Levels", Southwest Florida Management District, Brooksville, FL.
10. **Gore, J.A.**, J.B. Layzer, and J. Mead. 2001. Macroinvertebrate instream flow studies after 20 years: a role in stream and river restoration. *Regulated Rivers* 17: 527-542.
11. **Gore, J.A.** 2001. Models of Habitat Use and Availability to Evaluate Anthropogenic Changes in Channel Geometry. Pp 27-36 *in:* J. Dorava (ed.) American Geolophysical Union Monograph *Geomorphic Processes and Riverine Habitat*. Water Science and Application, Volume 4.
12. Timchenko, V., O. Oksiyuk, and **J.A. Gore.** 2000. A model for ecosystem state and water quality management in the Dnieper River delta. *Ecological Engineering* 16: 119-125.
13. **Gore, J.A.** 1999. *Book Review.* ELEMENTS OF PHYSICAL HYDROLOGY by Hornberger, et al. *Journal of the North American Benthological Society* 18: 143-145.
14. Statzner, B., **J.A. Gore**, and V.H. Resh. 1998. Monte Carlo simulation of benthic macroinvertebrate populations: Estimates using random, stratified, and gradient sampling. *J.N. Am. Benthol. Soc.* 17: 324-337.
15. **Gore, J.A.**, D.J. Crawford, and D.S. Addison. 1998. An analysis of artificial riffles and enhancement of benthic community diversity by Physical Habitat Simulation (PHABSIM) and direct observation. *Regulated Rivers* 14: 69-77.
16. **Gore, J.A.** 1998. Instream flow studies and habitat suitability - criteria for macroinvertebrates. Pp. 14-16. *In*: S. Blažková, C. Stalnaker, and O. Novický (eds.) *Hydroecological Modelling : Research, Practice, Legislation and Decision-Making*. Occ. Non-Per. Publ., USGS MESC, Fort Collins, Co./T.G. Masaryk Water Research Inst., Prague, Czech Republic.

17. **Gore, J.A.** 1997. "Water Quality" in the United States: Evolving perspectives and public perception. pp. 69-85 *in:* P.J. Boon and D.L. Howell (eds.) *Freshwater Quality: Defining the Indefinable?* HMSO, The Stationery Office, Edinburgh.
18. **Gore, J.A.** 1997. Introduction: Application of ecological theory to aquatic habitat restoration. Pp. 17-22 *in*: K. Koski and W.J. Hauser (eds.) *Aquatic Habitat Restoration in Northern Ecosystems*. U.S. Environmental Protection Agency/American Fisheries Society, Special Publication, Washington, DC/Bethesda, MD.
19. **Gore, J.A.** 1997. Application of a hydraulic habitat approach to restoration. Pp. 27-34 *in*: K. Koski and W.J. Hauser (eds.) *Aquatic Habitat Restoration in Northern Ecosystems*. U.S. Environmental Protection Agency/American Fisheries Society, Special Publication, Washington, DC/Bethesda, MD.
20. **Gore, J.A.**, and S.W. Hamilton. 1996. A comparison of flow-related habitat evaluations downstream of low-head weirs on small and large fluvial ecosystems. *Regulated Rivers* 12: 459-469.
21. **Gore, J.A.** 1996. Responses of Aquatic Biota to Hydrological Change. pp. 209-230 *in*: P. Calow and G.E. Petts (eds.) *River Biota. Diversity and Dynamics*. Blackwell Sci., Publ., Oxford.
22. **Gore, J. A.** 1996. Discharge Measurements and Streamflow Analysis. pp. 53-74 *in*: F.R. Hauer and G.A. Lamberti (eds.) *Methods in Stream Ecology*. Academic Press, San Diego, CA.
23. **Gore, J.A.** 1996. Forward. *in*: A.Brookes and F.D. Shields, Jr. (eds.) *River Channel Restoration*. Wiley, Chichester.
24. **Gore, J.A.** 1996. Blending biological and physical considerations in riverine restorations. pp. 509-518 *in*: P.E. Black and J.J. McDonnell (eds.) Proc. AWRA Symposium, *Watershed Restoration Management*, American Water Resources Association, Huntsville, AL.
25. **Gore, J.A.**, D.J. Crawford, and D.S. Addison. 1996. An analysis of artificial riffles and enhancement of benthic community diversity by Physical Habitat Simulation (PHABSIM) and direct observation. pp. B643-B653 *in*: M. Leclerc, H. Capra, S. Valentine, A. Boudreault, and Y. Côté (eds.) *Proc. 2nd International Symposium on Habitat Hydraulics*, INRS-Eau, Québec.
26. **Gore, J.A.**, and F.D. Shields, Jr. 1995. Can large rivers be restored? *BioScience* 45: 142-152.
27. **Gore, J.A.**, F.L. Bryant, and D.J. Crawford. 1995. River and Stream Restoration. pp. 245 - 275 *in*: J. Cairns, Jr. (ed.) *Rehabilitating Damaged Ecosystems. Second Edition.* Lewis Publ., Chelsea, MI.
28. **Gore, J.A.**, Niemela, S., Statzner, B., and V.H. Resh. 1994. Near substrate hydraulic conditions under artificial floods from peaking hydropower operation: disturbance intensity and duration. *Regulated Rivers* 9: 15-34.

29. **Gore, J.A.** 1994. Perturbations and Biological Impacts: Hydrological Change. pp. 33 - 54 *in*: P. Calow and G.E. Petts (eds.) *The Rivers Handbook*. Vol 2. Blackwell Sci., Publ., Oxford.
30. Davies, B.R., M. Thoms, K.F. Walker, J.H. O'Keeffe, and **J.A. Gore.** 1994. Arid and semi-arid-land river ecosystems: perspectives on ecological functioning, and problems of their management and conservation. pp. 484 - 511 *in*: P. Calow and G.E. Petts (eds.) *The Rivers Handbook*. Vol. 2. Blackwell Sci., Oxford.
31. Niemela S., J.B. Layzer, and **J.A. Gore.** 1993. An improved radiotelemetry method for determining use of microhabitats by fishes. *Rivers* 4: 30-35.
32. **Gore, J.A.**, J.B. Layzer, and I.A. Russell. 1992. Non-traditional applications of instream flow techniques for conserving habitat of biota in the Sabie River of southern Africa. pp. 161-177 *in*: P.J. Boon, G.E. Petts, and P. Calow. (Eds.) *River Conservation and Management*, Wiley, NY.
33. Finley, M.R., **J.A. Gore**, and S.W. Hamilton. 1992. Proposed best management practices for improving water quality in the West Sandy watershed. Tennessee Dept. of Environ. and Conserv., Contr. C-92-0081.
34. **Gore, J.A.**, and M. Piehler. 1992. The development of guidelines for use of statistical tools in terrestrial monitoring. pp. 217-220 *in*: R. Graves and R. Bisson (eds.) *Fourth Annual Ecological Quality Assurance Workshop*, U.S. Environmental Protection Agency, EPA-600/R-92/097.
35. **Gore, J.A.** 1992. Predicting enhancement value and recovery times after placement of habitat structures for fish and benthos in erosional zones. Proc. 1992 Int. Environmental Dredging Symposium.
36. **Gore, J.A.** 1992. *Book Review:* RIVER PROJECTS AND CONSERVATION by Gardiner*. J.N. Amer. Benthol. Soc.* 11: 336-338.
37. **Gore, J.A.** 1992. *Book Review*: BATTLE AGAINST EXTINCTION: NATIVE FISH MANAGEMENT IN THE AMERICAN SOUTHWEST by Minckley and Deacon. *Quarterly Review of Biology* 67: 542-543.
38. **Gore, J.A.**, J.M. King, and K.C.D. Hamman. 1991. Application of the Instream flow incremental methodology (IFIM) to southern African rivers. I. Protecting endemic fish of the Olifants River. *Water SA* 17: 225-234.
39. **Gore, J.A.** 1991. Application of tools for ecological restoration: predictive modeling. pp. 42-44 *in*: Tetra Tech Inc. (ed.) *Workshop on the Water Quality-based Approach for Point Source and Nonpoint Source Controls*. U.S. Environmental Protection Agency, Office of Water. EPA 503/9-92-001.

40. Gelwick, F.P., and **J.A. Gore.** 1990. Fishes of Battle Branch, Delaware County, in northeastern Oklahoma. *Proceedings of the Oklahoma Academy of Science* 70: 13-18.
41. **Gore, J.A.**, J.R. Kelly, and J.D. Yount. 1990. Application of ecological theory to determining the recovery potential of disturbed lotic ecosystems: Research needs and priorities. *Environmental Management* 14: 755-762.
42. **Gore, J.A.**, and A.M. Milner. 1990. Island biogeographic theory: can it be used to predict lotic recovery rates? *Environmental Management* 14: 737-753.
43. **Gore, J.A.**, and R.M. Bryant, Jr. 1990. Temporal shifts in physical habitat of the crayfish, *Orconectes neglectus* (Faxon). *Hydrobiologia* 199: 131-142.
44. **Gore, J.A.**, J.M. Nestler, and J.B. Layzer. 1990. Habitat factors in tailwaters with emphasis on peaking hydropower. U.S. Army Engineers, Waterways Experiment Station, Tech. Rpt. EL-90-2.
45. **Gore, J.A.** 1990. Predicting recovery of stream ecosystems from disturbance: the potential for application of colonization theory and hydraulic stream ecology. Proc. 3rd Ann. Symp. Natural History of Lower Tennessee and Cumberland River Valleys, pp. 21-31.
46. **Gore, J.A.** 1989. Case histories of instream flow analyses for permitting and environmental impact assessments in the United States. *South African Journal of Aquatic Sciences* 15: 194-208. (INVITED PAPER)
47. **Gore, J.A.** 1989. Setting priorities for minimum flow assessments in Southern Africa. *South African Journal of Science* 85: 614-615.
48. **Gore, J.A.**, and G.E. Petts. (Eds.) 1989. **ALTERNATIVES IN REGULATED RIVER MANAGEMENT**. CRC Press, Inc., Boca Raton, FL. 345 pp.
49. **Gore, J.A.** 1989. Models for predicting benthic macroinvertebrate habitat suitability under regulated flows. pp. 253-265 *in*: J.A. Gore and G.E. Petts (eds.) *Alternatives in Regulated River Management*, CRC Press, Inc., Boca Raton, FL.
50. Layzer, J.B., T.J. Nehus, W. Pennington, **J.A. Gore**, and J.M. Nestler. 1989. Seasonal variation in the composition of the drift below a peaking hydro-electric project. *Regulated Rivers* 3: 29-34.
51. **Gore, J.A.**, J.M. Nestler, and J.B. Layzer. 1989. Instream flow predictions and management options for biota affected by peaking hydropower releases. *Regulated Rivers* 3: 35-48.
52. **Gore, J.A.** (Ed.) 1989. ВОССТАНОВЛЕНИЕ ИОХРАНА МАЛЫХ РЕК. ТЕОРИЯ ИЛРАКТИКА. Moscow, USSR.
53. **Gore, J.A.** and J.M King. 1989. Application of the revised physical habitat simulation (PHABSIM II) to minimum flow evaluations of South African rivers. pp. 289-296. in: S. Kenzle and H. Maaran (eds.) *Proc. Fourth South African Nat. Hydrological Symp.* Univ. of Witwatersrand, Pretoria.

54. Statzner, B., **J.A. Gore**, and V.H. Resh. 1988. Hydraulic stream ecology: observed patterns and potential applications. *Journal of the North American Benthological Society* 7: 307-360.
55. **Gore, J.A.**, and J.M. Nestler. 1988. Instream flow studies in perspective. *Regulated Rivers* 2: 93-101.
56. **Gore, J.A.**, and F.L. Bryant. 1988. River and stream restoration. Pp. 23-38 *in*: John Cairns, Jr. (ed.) *Rehabilitating Damaged Ecosystems, Vol. I*, CRC Press, Inc., Boca Raton, FL.
57. Nestler, J.M., **J.A. Gore**, L.T. Curtis, and J.L. Martin. 1988. Prediction of effects on brown and rainbow trout of turbine uprating in the Cumberland River downstream of Wolf Creek Dam, Kentucky. U.S. Army Engineers, Waterways Experiment Station, Misc. Paper EL-88-10.
58. **Gore, J.A.** 1987. Development and application of macroinvertebrate instream flow models for regulated flow management. p. 99-115. *in*: J.F. Craig and J.B. Kemper (eds.) *Regulated Streams: Advances in Ecology*, Plenum Press, NY.
59. **Gore, J.A.** 1987. Regulated river management models and a review of regulated research in the United States. *Int. Newsletter on Regulated Stream Limnology* 8: 27-34.
60. **Gore, J.A.**, and R.M. Bryant, Jr. 1986. Changes in fish and macroinvertebrate assemblages along the impounded Arkansas River. *Journal of Freshwater Ecology* 3: 333-345.
61. **Gore, J.A.** (Ed.) 1985. **THE RESTORATION OF RIVERS AND STREAMS**. *Theory and Experience*. Butterworth Publ., Inc., Boston, MA. 280 pp. [2nd printing - 1987] [3rd Printing – 2004]
62. **Gore, J.A.** 1985. Mechanisms of colonization and habitat enhancement for benthic macroinvertebrates in restored river channels. pp. 81-101 *in*: J.A. Gore (ed.) *The Restoration of Rivers and Streams*, Butterworth, Publ., Inc., Boston, MA.
63. **Gore, J.A.**, and W.A. Swartley. 1985. Distribution of mayfly nymphs in relation to water quality of streams draining coal surface-mined areas on the Cumberland Plateau. *American Fisheries Society, Special Publication, Water Quality Section*, pp. 59-73.
64. **Gore, J.A.** 1985. *Book Review:* REGULATED RIVERS by Lillehammer and Saltveit. Bull. N. Amer. Benthol. Soc. 2: 148-150.
65. **Gore, J.A.** 1984. Comment: Potential errors in P/R measurements by the methods of Pavletic, Matonickin, Stilinovic, and Habdija. *Hydrobiologia* 118: 213-214.
66. **Gore, J.A.** 1983. The distribution of desmognathine larvae (Amphibia: Plethodontidae) in coal surface mine impacted streams of the Cumberland Plateau, USA. *Journal of Freshwater Ecology* 2: 12-23.

67. **Gore, J.A.** 1983. Considerations of size-related flow preferences among benthic macroinvertebrates for use in instream flow studies and regulated flow management. pp. 389-397 *in*: H.I. Shuval. (ed.) Developments in Ecology and Environmental Quality, Vol. II, Balaban Int. Publ., Jerusalem.
68. **Gore, J.A.** 1983. Summary report: Toxicity tests of coal gasification process waters to the cladoceran *Daphnia magna* and the mayfly *Ephemerella doddsi*. U.S. Dept. of Energy/Univ. of Wyoming Res. Corp., 40 pp.
69. **Gore, J.A** 1982. Benthic invertebrate colonization: source distance effects on community composition. *Hydrobiologia* 94: 183-194.
70. Wichers, D.L., L.S. Johnson, T.A. Wesche, and **J.A. Gore.** 1982. Two techniques for locating and sampling brown trout microhabitat under complete ice cover. Water Resources Series No. 83, Wyoming WRRI, Univ of Wyoming, 48 pp.
71. Johnson, L.S., D.L. Wichers, T.A. Wesche, and **J.A. Gore.** 1982. Instream salmonid habitat exclusion by ice-cover. Water Resources Series No. 84, Wyoming WRRI, Univ. of Wyoming, 92 pp.
72. **Gore, J.A.**, and R.D. Judy, Jr. 1981. Predictive models of benthic macroinvertebrate density for use in instream flow studies and regulated flow management. *Canadian Journal of Fisheries and Aquatic Science* 38: 1363-1370.
73. **Gore, J.A.**, and L.S. Johnson. 1981. Restoration of surface mined rivers in the Northern Great Plains. *Water Spectrum* 13: 31-38.
74. Summers, P.B., Jr., and **J.A. Gore**. 1981. Chironomid communities as indicators of water quality affected by acid mine drainage. Proc. Southeast. Assoc. Fish. Wildl. Agencies 35: 474-486.
75. **Gore, J.A.** 1980. Ordinational analysis of benthic communities upstream and downstream of a prairie storage reservoir. *Hydrobiologia* 69: 33-44.
76. **Gore, J.A.**, and B.S. Cushing. 1980. Observations on temporary foraging areas and burrows of the sun spider, *Ammotrechula penninsulana* (Banks) (Arachnida: Solpugida). *Southwestern Naturalist* 25: 95-102.
77. **Gore, J.A.**, and L.S. Johnson. 1980. Establishment of biotic and hydrologic stability in a reclaimed coal strip-mined river channel. Rocky Mtn. Inst. Energy and Environ. 135pp.
78. **Gore, J.A.** 1979. Patterns of initial benthic recolonization of a reclaimed coal strip-mined river channel. *Canadian Journal of Zoology* 57: 2429-2439.
79. **Gore, J.A.** and L.S. Johnson. 1979. Biotic recovery of reclaimed channels after coal strip mining. Proc. The Mitigation Symposium, rocky Mtn. For. Range Exp. Stn., Gen. Tech. Rpt. TM-65: 239-244.

80. **Gore, J.A.** 1978. A technique for predicting the in-stream flow requirements of benthic macroinvertebrates. *Freshwater Biology* 8: 141-151.
81. Bovee, K.D., **J.A. Gore**, and A.J. Silverman. 1978. Field testing and evaluation of a methodology to measure "in-stream" values in the Tongue River, Northern Great Plains (NGP) region. U.S. Environmental Protection Agency, EPA-908/4-78-004a. 465 pp.
82. **Gore, J.A.** 1977. Reservoir manipulations and benthic macroinvertebrates in a prairie river. *Hydrobiologia* 55: 113-123.
83. **Gore, J.A.** 1975. Fall-winter distribution of benthic macroinvertebrates in the Tongue River, Montana. Proc. Ft. Union Coal Field Symp. 2: 212-225.

Presentations:

1. 10th International Petroleum Environmental Conference. 2003. Houston, TX. **Invited Paper**: Potential habitat loss and population bottlenecks created by increased flows from CBM operation."
2. Ninth International Conference on River Research and Applications. 2003. Albury, NSW, Australia. Presented Paper: Recovery and colonization dynamics of macroinvertebrates and fish in newly created habitat after sediment remediation from manufactured gas processing waste in the Oconee River, Georgia, USA.
3. Southeast Chapter, Society for Environmental Toxicology and Chemistry. 2003. Columbus, GA. **Keynote Talk.** The Georgia Ecoregions Project - Assessing Stream Ecosystem Integrity from NPS Pollution: Is there a linkage to TMDL's?
4. Instream Flow Science and Management in Western Washington: Developing a Comprehensive, Ecosystem-Based Approach. 2003. Seattle, WA. **Invited Paper**: Effects of streamflows on aquatic and riparian biota (excluding salmonids).
5. Georgia Water & Pollution Control Association. 2002. Dalton, GA. **Invited Paper**: The Georgia Ecoregions Project: Assessing nonpoint source impacts in reference and impaired streams.
6. 9th International Petroleum Environmental Conference. 2002. Albuquerque, NM. **Invited Paper**: Analysis of habitat loss for target biota in rivers impacted by long-term flow increases resulting from CBM production in the Powder River basin.
7. North American Benthological Society. 2002. Pittsburgh, PA. Presented Paper: Recovery and structure of benthic communities after MGP sediment remediation and habitat rehabilitation.
8. International Association for Sediment Water Science (**IASWS**) Ninth International Symposium, Banff, CANADA. 2002. Recovery and structure of aquatic communities after MGP sediment remediation and habitat rehabilitation.

9. Gas Technology Institute. GTI's 14th International Conference on Site Remediation Technologies & Environmental Management in the Utility Industry. 2001. Orlando, FL. Presented Paper: Recovery and structure of benthic and fish communities after habitat rehabilitation: Athens, Georgia, MGP excavations.
10. Water Environment Federation. WEFTEC. 2001. Atlanta, GA. WERF: Technology and Watershed Assessment: Application to Reasonable Assurance Determinations in Columbus, Georgia. Presented Paper: Macroinvertebrates survey and biotic indices.
11. Murray-Darling Freshwater Research Center. 2001. Albury, NSW, Australia. **Invited Lecture**: Instream flows, politics, and engineers?
12. Atlanta Constorium for Research in the Earth Sciences. 2001. Atlanta, Ga. **Invited Lecture**: Ecohydrological models for use in regulated river management and stream restoration.
13. North American Benthological Society. 2001. LaCrosse, WI. Macroinvertebrate bioassessment detects the impacts of three years of drought in the catchment of the middle Chattahoochee River.
14. North American Benthological Society. 2001. LaCrosse, WI. Using GIS and landuse data to select candidate reference sites for stream bioassessment.
15. Eighth International Symposium on Regulated Streams. 2000. Toulouse, France. **Invited Paper**: Macroinvertebrate instream flow studies after 20 years: a role in stream and river restoration.
16. WERF Workshop to Develop Research Framework to Assess Ecosystem Effects Relative to the Scale and Dynamics of Large River System. 1999. Chicago, IL. **Invited Paper**: Summary report: US EPA Large Rivers Science Advisors workshop in Baltimore.
17. International Conference on Modeling for the Twenty-First Century, Predicting Plant and Animal Occurrences: Issues of Scale and Accuracy. 1999. Snowbird, UT. **Invited paper**: Macroinvertebrates in instream flow management: issues of density, diversity, and taxonomic scale.
18. 19th Annual Symposium on Sea Turtle Biology and Conservation. 1999. South Padre Island, TX. Poster Presentation: Early post-nesting movements of loggerhead turtles (*Caretta caretta*) on the southwest coast of Florida.
19. Georgia Chapter, American Fisheries Society. 1999. Tifton, GA. **Invited Presentation**: Is there value in using benthic macroinvertebrates in in-stream flow decisions?
20. North American Benthological Society. 1998. Prince Edward Island, Canada. **Invited Presentation**: Large River Restoration: Lessons yet to be learned.

21. Department of Biology, Monash University, Caulfield East, VIC Australia. 1998. **Invited Workshop** (full day): The future of stream and river rehabilitation and restoration.
22. Cooperative Research Center for Freshwater Ecology, Albury, NSW Australia. 1998. **Invited Workshop** (full day): The future of stream and river rehabilitation and restoration.
23. Seventh International Symposium on Regulated Streams (SISORS III). 1997. Chattanooga, TN. Presented Paper: Macroinvertebrates in instream flow studies: What are the appropriate targets for management?
24. Workshop on Instream Flow Assessments. 1997: T.G. Masaryk Institute of Hydrology; Prague, Czech Republic. **Invited Presentation**: Field analysis and PHABSIM application of macroinvertebrate habitat suitability criteria.
25. American Water Resources Association. 1996. Syracuse, New York. **Invited Keynote Paper**: Blending biological and physical considerations in riverine restorations.
26. Ecohydraulics 2000. 1996. Quebec City, Quebec. Presented Paper: An analysis of artificial riffles and enhancement of benthic community diversity by Physical Habitat Simulation (PHABSIM) and direct observation.
27. North American Benthological Society. 1996. Kalispell, MT. Presented Paper: Longitudinal shifts in high quality macroinvertebrate habitat as flows fluctuate across an artificial riffle.
28. Symposium on Remedial Strategies in Regulated Rivers. 1995. Lycksele, Sweden. **Invited Plenary Paper**: Flow-related habitat requirements as a component of remediation in regulated rivers.
29. Symposium on Water Quality: Freshwater Quality: Defining the Indefinable? 1995. Sterling, UK. **Invited Plenary Paper** Current interpretations of the term 'freshwater quality': a non-European perspective.
30. North American Benthological Society. 1995. Keystone, CO. **Invited Paper**: The use of benthic macroinvertebrate community diversity as a "target species" in instream flow assessments. (invited as organizer/chair of Technical Information Workshop on applications of benthos in instream flow studies)
31. Symposium on Aquatic Habitat Restoration in Northern Ecosystems. 1994. Girdwood, AK. **Invited Paper**: Applying island biogeographic theory to river and stream restoration.
32. Symposium on Aquatic Habitat Restoration in Northern Ecosystems. 1994. Girdwood, AK. **Invited Paper**: The science of restoration: facts and fiction.

33. First IAHR Symposium on Habitat Hydraulics. 1994. Trondheim, Norway. Presented Paper: Combining colonization rates and hydraulic criteria for prediction of restoration success in streams and rivers.
34. Sixth International Symposium on Regulated Streams (SISORS II). 1994. Ceske Budejovice, Czech Republic. Presented Paper: Disturbance risk as a measure of habitat suitability for benthos below a peaking hydropower project.
35. Sixth International Symposium on Regulated Streams (SISORS II). 1994. Ceske Budejovice, Czech Republic. Presented Paper: Habitat partitioning among co-existing darter species (Percidae) in parallel catchments. Implications for instream flow analysis using target fish species.
36. International Conference on Sustaining the Ecological Integrity of Large Floodplain Rivers. 1994. La Crosse, WI. **Invited Paper**: Managed floods on floodplain rivers: is hydraulic disturbance offset by ecological benefit?
37. American Power Conference. 1994. Chicago, IL. **Invited Paper**: New methods for instream flow assessments related to hydropower development.
38. North American Benthological Society. 1994. Orlando, FL. **Invited Paper**: Using physical habitat models to aid in the design, placement and timing of instream habitat structures.
39. Association for Integrative Studies. 1993. Detroit, MI. Presented Paper: An approach to the development of interdisciplinary graduate programs in environmental analysis and management.
40. Ecological Society of America. 1993. Madison, WI. **Invited Paper**: Ecological considerations in the design of restoration projects on large rivers.
41. Riparian Habitat Protection and Reconstruction Workshop. 1993. Clarksville, TN. **Invited Paper**: Habitat enhancement using instream sediment control structures.
42. National Institute of Water and Atmospheric Research. 1993. Hamilton, New Zealand. **Invited Paper**: Problems associated with the management of endangered species and river ecosystems in developing nations.
43. New Zealand Limnological Society. 1993. Wellington, New Zealand. **Invited Special Workshop**: Stream and River Restoration. [Conducted two days of 8-hour sessions].
44. Fifth Symposium on The Natural History of Lower Tennessee and Cumberland River Valleys. 1993. Land Between The Lakes, Tennessee. Presented Paper: Best management practices for improving water quality in the West Sandy Creek watershed, Henry County, Tennessee.

45. Phi Beta Kappa Symposium on Development and the Environment. 1992. Tulsa, OK. **Invited Paper**: Water resource management in southern Africa: ecosystem stability and human consumption.
46. International Environmental Dredging Symposium. 1992. Buffalo, NY. **Invited Plenary Paper**: Predicting enhancement and recovery times after placement of habitat structures for fish and benthos in erosional zones.
47. Auburn University. Dept. of Biology/Coop. Fish. Res. Unit. 1992. Auburn, AL. **Invited Seminar**: Southeastern streams and the hydrodynamics associated with macroinvertebrate populations; plus IFIM.
48. North American Benthological Society. 1992. Louisville, KY. Presented Paper: Use of physical habitat models to predict relative abundances of benthos downstream of multiple impoundments in the Buffalo River (eastern Cape Province), South Africa.
49. Seventh Annual Scientific Symposium of the Ohio River Basin Consortium. 1991. Murray State University, Murray, KY. Presented Paper: Special considerations in the development of predictions of ecological effects from modification of peaking hydropower operations.
50. Tennessee Tech University, Dept. of Biology. 1991. Cookeville, TN. **Invited Seminar**: Application of habitat models for protecting endangered aquatic fauna in southern African rivers.
51. East Tennessee State University, Dept. of Biology. 1991. Johnson City, TN. **Invited Seminar**: Application of habitat models in the management of endangered aquatic fauna of southern Africa.
52. Fifth International Symposium on Regulated Streams. 1991. Flathead Biological Station, MT. Presented Paper: Use of physical habitat models to predict relative abundances of biota downstream of multiple impoundments in the Buffalo River (eastern Cape Province), South Africa.
53. United States Environmental Protection Agency. National Workshop: Water Quality-Based Approach for Point Source and NPS Controls. 1991. Chicago, IL. **Invited Paper**: Application of tools for ecological restoration - predictive modeling.
54. Hancock Biological Station. 1991. Murray, KY. Summer seminar series. INVITED SEMINAR: Conserving endangered aquatic biota in southern Africa through application of physical habitat models.
55. North American Benthological Society. 1991. Santa Fe, NM. Presented Paper: Near-substrate hydraulic conditions under artificial flood conditions.
56. Louisiana Nature and Science Center. 1991. New Orleans, LA. **The Annual FREEPORT-MCMORAN Lecture**: A biologist's view of South Africa.

57. University of New Orleans. Dept. of Biology. 1991. **Invited Seminar**: Application of physical habitat models for conserving endangered aquatic fauna in southern Africa.
58. International Conference on the Conservation and Management of Rivers. 1990. Univ. of York, Peterborough, UK. Presented Paper: The use of instream flow techniques for evaluating freshwater mussel habitats and predicting flow-related loss of mussel beds.
59. International Conference on the Conservation and Management of Rivers. 1990. Univ. of York, Peterborough, UK. Presented Paper: A non-traditional application of instream flow techniques for conserving habitat of biota in the Sabie River of southern Africa.
60. Wetlands Delineation Workshop (Tennessee Div. of Water Poll. Contr./US EPA) 1990. Tech Aqua Biol. Stn., TN. **Invited Paper**: An overview of stream restoration practices.
61. North American Benthological Society. 1990. Blacksburg, VA. Presented Paper: *Hippopotamus amphibius*, a "benthic" indicator for flow-related habitat in southern Africa.
62. Symposium on River and Stream Management. 1990. Indiana Dept. Env. Mgmt./Indiana Wildlife Society. Muncie, IN. **Invited Paper**: The role of instream flow studies in regulated river management.
63. Center for Field Biology. 1990. Third Annual Symposium, The Natural History of Lower Tennessee and Cumberland River Valleys. Land-Between-The-Lakes, TN. **Invited Paper**: The affect of varying flow rates on colonization rates and the ability to predict recovery from disturbance in lotic ecosystems.
64. Fourth South African National Hydrological Symposium. 1989. Pretoria. Presented Paper: Application of the revised physical habitat simulation (PHABSIM II) to minimum flow evaluations of South African rivers.
65. American Fisheries Society. 1989. Ann. Mtg. Anchorage, AK. Presented Paper: Altering physical habitat simulations to account for responses of rainbow trout and banded sculpin to peaking hydroelectric discharges.
66. Department of Zoology/Department of Botany/Institute of Natural Resources, University of Natal, Pietermaritzburg, South Africa. 1989. **Invited Seminar**: Development and application of minimum flows to riverine ecosystems.
67. Zoology Department/University of Cape Town. 1989. Cape Town, South Africa. **Invited Colloquium**: Are lotic organisms adapted to flow and what are the implications to ecological theory?
68. Symposium on Water: Laws and Management. 1989. Cape Town, South Africa. **Invited Paper**: Case histories of instream flow assessments to meet U.S. regulatory requirements.

69. North American Benthological Society. 1989. Guelph, Ontario. Presented Paper: Application of ecological theory to determining the recovery potential of disturbed lotic ecosystems: research needs and priorities.
70. Institute for Freshwater Research/J.L.B. Smith Institute of Ichthyology/Department of Zoology, Rhodes University, Grahamstown, South Africa. 1989. **Invited Seminars**: (1) Theory and field techniques in instream flow analysis. (2) Are lotic organisms adapted to flow?
71. Department of Water Affairs, Pretoria, South Africa. 1989. **Invited Seminar**: A survey of instream flow techniques, the computer simulation PHABSIM, and possible applications to southern Africa rivers.
72. Freshwater Research Unit, University of Cape Town, South Africa. 1989. **Invited Seminar**: Techniques for predicting minimum flow requirements in lotic ecosystems: application of the physical habitat simulation (PHABSIM).
73. U.S. Environmental Protection Agency. National Symposium: Recovery of lotic ecosystems after disturbance: theory and application. 1988. Duluth, MN. **Invited Paper**: Summary and synthesis of research needs and application to EPA regulatory functions.
74. U.S. Environmental Protection Agency. National Symposium: Recovery of lotic ecosystems following disturbance: theory and application. 1988. Duluth, MN. **Invited Paper**: Island biogeographic and predicting lotic community recovery rates and pathways.
75. Texas Instream Flow Workshop. 1988. San Marcos, TX. **Invited Paper**: Techniques and limitations of instream flow models for peaking hydropower impacts. [Invited as participant on National Expert Panel]
76. Fourth International Symposium on Regulated Streams. 1988. Loughborough, England. Presented Paper: Seasonal variation in the composition of the drift below a peaking hydroelectric project.
77. Fourth International Symposium on Regulated Streams. 1988. Loughborough, England. Presented Paper: Benthic macroinvertebrate communities below a hydropower dam, Caney Fork River, Tennessee, USA.
78. Fourth International Symposium on Regulated Streams. 1988. Loughborough, England. **Invited Keynote Paper**: Instream flow predictions and management options for biota affected by peaking-power hydroelectric operations.
79. North American Benthological Society. 1988. Tuscaloosa, AL. Presented Paper: Changes in larval chironomid habitat with distance from peaking hydropower operations.

80. U.S. Fish and Wildlife Service, National Conf. on Instream Flow and Restoration Techniques. 1988. Atlanta, GA. **Invited Paper**: Case history study of the application of IFIM techniques to river restoration.
81. American Fisheries Society, Warmwater Fish. Div. Workshop on application of instream flow methodologies to warmwater fisheries. 1987. Tech Aqua Biol. Stn., TN. Presented Paper: Problems in applying IFIM to warmwater river ecosystems.
82. American Fisheries Society, Warmwater Fish. Div. Workshop on application of instream flow methodologies to warmwater fisheries. 1987. Tech Aqua Biol. Stn., TN. **Invited Paper**: Macroinvertebrate instream flow studies: needs and levels of precision.
83. North American Benthological Society. 1987. Orono., ME. **Invited Plenary Session Paper**: Physical habitat simulations for benthos applied to stream management.
84. National Science Foundation. Workshop on Prairie Stream Ecology. 1987. Univ. of Oklahoma, Biol. Stn., Lake Texoma, OK. **Invited Paper**: Applied hydraulics in stream research.
85. Sixth Annual Fisheries and Limnology Colloquium. 1987. Land-Between-The-Lakes, Kentucky. **Invited Paper**: Research needs for instream flow assessments.
86. Workshop on Environmental Aspects of Local Flood-Protection Projects. 1986. Waterways Experiment Station, Vicksburg, MS. Presented Paper: The physical habitat simulation (PHABSIM) system: overview and potential application to local flood-protection projects.
87. European Entomological Congress. 1986. Amsterdam, The Netherlands. Presented Paper: Microdistribution of *Aphelocheirus* in relationship to physical characteristics of the stream reaches.
88. Fifth International Symposium on Trichoptera. 1986. Lyon, France. Presented Paper: Physical habitat characteristics and microdistribution of final instars of *Hydropsyche angustipennis* (Curtis).
89. North American Benthological Society. 1986. Lawrence, KS. Presented Paper: Stream hydraulics as a determinant of microhabitat shifts in the crayfish, *Orconectes neglectus* (Faxon).
90. Waterways Experiment Station. 1986. Vicksburg, MS. **Invited Seminar**: Modifications and alternatives for instream flow models predicating the effects of flow alterations on benthic invertebrates.
91. Third International Symposium on Regulated Streams. 1985. Edmonton, Alberta. **Invited Plenary Session Paper**: Development and application of macroinvertebrate instream flow models for regulated flow management.

92. North American Benthological Society. 1985. Corvallis, OR. Presented Paper: Diet and habitat preference of four co-existing darter species in an Ozark stream.
93. Univ. of Texas-Dallas, Environ. Sci. Colloquium. 1984. Dallas, TX. **Invited Paper**: Composition and toxicity of synfuel effluents to *Daphnia* and selected mayfly species.
94. North American Benthological Society. 1984. Raleigh, NC. Presented Paper: Comparison of toxicity of treated condensate from underground coal gasification to *Daphnia* and selected mayfly species
95. American Fisheries Society. 1983. Ann. Mtg. Milwaukee, WI. **Invited Paper**: Distribution of mayfly nymphs in relation to water quality of streams draining coal surface-mined areas on the Cumberland Plateau.
96. North American Benthological Society. 1983. LaCrosse, WI. Presented Paper: Distribution of benthic macroinvertebrates along the impounded Arkansas River.
97. North American Benthological Society. 1982. Ann Arbor, MI. Presented Paper: Effects of metals and other strip mine pollutants on benthic communities in the New River drainage, Tennessee.
98. Ann. Mtg., South. Div., Amer. Fish. Soc. and Southeastern Assoc. Fish. Wildl. Agencies. 1981. Tulsa, OK. Presented Paper: Chironomid communities as indicators of water quality affected by acid mine drainage.
99. North American Benthological Society. 1981. Provo, UT. **Invited paper**: Macroinvertebrate instream flow habitat preferenda: a component of regulated flow management in the Rocky Mountains.
100. North American Benthological Society. 1980. Savannah, GA. **Invited Paper**: Models of biotic recovery in strip mined river channels.
101. American Society of Limnology and Oceanography. 1980. Los Angeles, CA. **Invited Paper**: Colonization theory applied to benthic stream ecosystems.
102. National Symposium on Strategies for Fish and Wildlife Mitigation (The Mitigation Symposium). 1979. Fort Collins, CO. Presented Paper: Biotic recovery of reclaimed channels after coal strip mining.
103. North American Benthological Society. 1979. Erie, PA. Presented Paper: Trends in recolonization and diversity of benthos in a reclaimed coal strip-mined river.
104. First International Symposium on Regulated Streams. 1979. Erie, PA. **Invited Paper**: An ordinational analysis of benthic communities influenced by a prairie irrigation reservoir.
105. American Fisheries Society, CO-WY Chapter. 1979. Laramie, WY. Presented Paper: Fisheries recolonization of a channel of the Tongue River reclaimed after coal strip mining.

106. North American Benthological Society. 1978. Winnipeg, Manitoba. Presented Paper: A dendrogram analysis of long-term effects of channelization on stream benthos.
107. American Society of Limnology and Oceanography. 1977. San Francisco, CA. Presented Paper: In-stream flow requirements of benthic macroinvertebrates as a means of minimum flow recommendations.
108. North American Benthological Society. 1976. LaCrosse, WI. Presented Paper: Effects of temporary massive flow reductions on benthic invertebrates of a prairie river.
109. Fort Union Coal Field Symposium. 1975. Billings, MT. Presented Paper: Fall-winter distribution of benthic macroinvertebrates in the Tongue River, Montana.

Harlan J. Hendricks, Associate Professor of Environmental Science and Biology

Publications:

1. **Hendricks, H.J.** A new species of *Peridiococcus* from South Africa. (in progress, to be submitted to African Entomology, the journal of the Entomological Society of South Africa)
2. **Hendricks, H.J.** Mirid predators of *Melanaspis obscura* (Homoptera: Diaspididae) in Alabama. (in progress, to be submitted to the *Annals of the Entomological Society*)
3. **Hendricks, H.J.** and M. Kosztarab. 1999. Revision of the tribe Serolecaniini Shinji (Pseudococcidae), with discussion on other "legless" mealybugs. *Das Tierreich.* Walter de Gruyter & Co, Berlin. 213 pp.
4. **Hendricks, H.J.** and M.L. Williams. 1992. Life history of *Melanaspis obscura* (Homoptera: Diaspididae) infesting pin oak in Alabama. *Ann. Entomol. Soc. Am.* 85(4): 452-457.
5. **Hendricks, H.J.** and M. Kosztarab. 1991. Invited book review, Fauna of New Zealand (No. 11): Pseudococcidae (Insecta: Hemiptera), 1987, J. M. Cox. *Ann. Entomol. Soc. Am.* 84(6): 637-638.
6. **Hendricks, H.J.** and Eric Day. 1991. Obscure scale. *Va. Coop. Ext. Publ*. 444-226.
7. Williams, M.L and **H.J. Hendricks.** 1991. Jumping tree bugs are important natural enemies of obscure scale infesting landscape plantings of pin oak. *Ala. Agric. Exp. Stn. Res. Report Series*, Sept 1991 (7): 33.
8. Stephenson, J.C., G.L. Miller, **H.J. Hendricks**, and M.L. Williams. 1989. Southern red mite control, 1988. *Insecticide & Acaricide Tests* 14: 310.

9. Miller, G.L., M.L. Williams, and **H.J. Hendricks.** 1988. Insect problems on gardenias. *Southern Nurserymen's Assoc. Res. Conf. Proc.* 33: 146-149.
10. Stephenson, J.C., G.L. Miller, **H.J. Hendricks**, and M.L. Williams. 1988. Control of southern red mite on azalea. *Ala. Agric. Exp. Stn. Ornamental Horticulture Substation Res. Rep*.: 12-14.
11. Stephenson, J.C., G.L. Miller, **H.J. Hendricks**, and M.L. Williams. 1988. Control of southern red mite on azalea. *Southern Nurserymen's Assoc. Res. Conf. Proc.* 33: 132-134.
12. Stephenson, J.C., M.L. Williams, **H.J. Hendricks**, and G.L. Miller. 1988. Mite control, 1987. *Insecticide & Acaricide Tests* 13: 358-359.
13. Williams, M.L., G.L. Miller, and **H.J. Hendricks**. 1988. Control of eastern tent caterpillar on black cherry, 1987. *Insecticide & Acaricide Tests* 13: 56.
14. Williams, M.L., G.L. Miller, and **H.J. Hendricks**. 1988. Efficacy of selected insecticides against euonymus scale. *Southern Nurserymen's Assoc. Res. Conf. Proc.* 33: 160-161.
15. **Hendricks, H.J.**, G.L. Miller, M.L. Williams, and J.C. Stephenson. 1987. Control of citrus whitefly on common gardenia. *Ala. Agric. Exp. Stn. Ornamentals Res. Rep. Ser.* 5: 23.
16. **Hendricks, H.J.** and M.L. Williams. 1987. Obscure scale poses serious problem to landscape plantings of pin oak in Alabama. *Ala. Agric. Exp. Stn. Highlights Agric. Res.* 34(4): 8.
17. **Hendricks, H.J.**, M.L. Williams, G.L. Miller, and J.C. Stephenson. 1987. Citrus whitefly control on common gardenia. *Southern Nurserymen's Assoc. Res. Conf. Proc.* 32: 186-187.
18. Miller, G.L., M.L. Williams, **H.J. Hendricks**, and B.J. Sheffer. 1987. Controlling fall webworm in the landscape. *Southern Nurserymen's Assoc. Res. Conf. Proc.* 32: 188-189.
19. Williams, M.L., G.L. Miller, and **H.J. Hendricks.** 1987. Persimmon, fall webworm control trial, 1986. *Insecticide & Acaricide Tests* 12: 355.
20. Williams, M.L., G.L. Miller, and **H.J. Hendricks**. 1987. The holly looper: A new pest of holly in the southern landscape. *Ala. Agric. Exp. Stn. Ornamentals Res. Rep. Ser.* 5: 30.
21. Williams, M.L., B.J. Sheffer, G.L. Miller, and **H.J. Hendricks.** 1987. Control of fall webworm. *Ala. Agric. Exp. Stn. Ornamentals Res. Rep. Ser.* 5: 24.
22. Williams, M.L., J.C. Stephenson, G.L. Miller, and **H.J. Hendricks.** 1987. Control of two-spotted spider mites on golden euonymus. *Southern Nurserymen's Assoc. Res. Conf. Proc.* 32: 189-190.
23. Williams, M.L., G.L. Miller, and **H.J. Hendricks.** 1986. Control of holly looper: a new pest of landscape plantings of Japanese holly. *Southern Nurserymen's Assoc. Res. Conf. Proc.* 31: 129-130.

24. **Hendricks, H.J.**, G.L. Miller, M.L. Williams, and J.C. Stephenson. 1986. Citrus whitefly control, Alabama, 1985. *Insecticide & Acaricide Tests* 11: 388-389.
25. Miller, G.L., **H.J. Hendricks**, and M.L. Williams. 1986. Hemispherical scale control on nun's orchid, 1985. *Insecticide & Acaricide Tests* 11: 415-416.
26. Miller, G.L., **H.J. Hendricks**, and M.L. Williams. 1985. Control of hemispherical scale on Nun's orchid. *Southern Nurserymen's Assoc. Res. Conf. Proc.* 30: 146-147.

Presentations:

1. Hendricks, H.J. 1993. Revision of the tribe Serolecaniini Shinji (Pseudococcidae), with discussion on other "legless" mealybugs. Virginia Tech. (Defense Seminar)
2. Hendricks, H.J. 1992. A preliminary analysis of the subfamily Sphaerococcinae (Pseudococcidae). Department of Entomology, Virginia Tech. (Invited)
3. Hendricks, H.J. and M. Kosztarab. 1991. The genus *Serrolecanium* Shinji: Redescription and phylogeny (Homoptera: Pseudococcidae). Entomological Society of America, Annual Meeting, Reno, NV. (Display)
4. Hendricks, H.J. and M. Kosztarab. 1990. An evaluation of the type species of Sphaerococcinae (Pseudococcidae). Entomological Society of America, Annual Meeting, New Orleans, LA. (Invited)
5. Hendricks, H.J. and M.L. Williams. 1988. Hymenopterous parasitoids associated with obscure scale, *Melanaspis obscura* (Comstock), attacking pin oak in Alabama. Alabama Academy of Science, Annual Meeting, Auburn, AL.
6. Hendricks, H.J. and M.L. Williams. 1987. Phenology and associated hemipteran predators of obscure scale, *Melanaspis obscura* (Comstock), attacking pin oak in Alabama. Entomological Society of America, Annual Meeting, Boston, MA. (Invited)
7. Hendricks, H.J. and M.L. Williams. 1987. Mirid predators of obscure scale, *Melanaspis obscura* (Comstock), attacking pin oak, *Quercus palustris* Muenchhausen. Entomological Society of America, Southeastern Branch Meetings, Jackson, MS.
8. Hendricks, H.J. and M.L. Williams. 1986. Management of citrus whitefly (Homoptera: Aleyrodidae) on ornamental plants in Alabama. Alabama Academy of Science, Annual Meeting, Montgomery, AL.
9. Hendricks, H.J. and M.L. Williams. 1985. The control of citrus whitefly on ornamental plants. Entomological Society of America, Annual Meeting, Hollywood, FL.

Warren Church, Assistant Professor of Environmental Science and Archaeology

Publications:

1. **Church, W.B.** 2002. Los Pinchudos: Mausoleo Polícromo de los Andes Nor Orientales del Perú. *Revista Arqueológica Sian*. Año 8, Edición No. 12. Special edition. Trujillo, Perú
2. **Church, W.**B. 2002. *Diagnóstico Situacional para un Plan de Uso Público del Sector Occidental del Parque Nacional Río Abiseo y Zonas de Influencia* (with Mariella Leo and Jorge Aliaga). INRENA and PROFONAMPE. Lima.
3. **Church, W.B.** 2001. The Chávin Archaeological Tradition. Pp. 36-55 *in:* P. Peregrine and M. Ember (eds.) *Encyclopedia of Prehistory, Vol. 7.,* Kluwer Academic, NY.
4. **Church, W.B.** 2001. *Parque Nacional del Rio Abiseo, Sector Occidental. Diagnóstico Situacional para un Plan de Uso Público* (with APECO: Asociación Peruana para la Consevación de la Naturaleza). 1st Edition. Didi de Arteta, S.A. Lima, Peru.
5. **Church, W.B.** 1999. Loving it to Death: The Pajatén Predicament. *George Wright Forum* special edition "Archaeology and the National Park Idea." Edited by J.H. Jameson, 16 (4):16-27. *Journal of the George Wright Society*. Hancock, MI.
6. **Church, W.B.** 1999. Mas Allá del Gran Pajatén: Conservando el Paisaje Prehispánico Pataz-Abiseo. *Revista del Museo de Arqueología, Antropología e Historia* No. 7 (1997):203-246. Facultad de Ciéncias Sociales de la Universidad Nacional de Trujillo. Trujillo, Peru.
7. **Church, W.B.** 1999. Recovery and Discovery in Peru: Opening Hidden Gateways. *Americas* Vol. 51, No. 1 (February), pp. 35-39. Simultaneously published in Spanish edition.
8. **Church, W.B.** 1996. Gran Pajatén. In *Dictionary of Art*, Vol. 13, pp. 312. Edited by J. Turner. Macmillan Publishers Limited. London.
9. **Church, W.B.** 1994. Threats to Rio Abiseo National Park, Northern Peru (with Kenneth R. Young, Mariella Leo and Patricia F. Moore). *Ambio* 23(4-5):312-314. Royal Swedish Academy of Sciences. Stockholm.
10. **Church, W.B.** 1994. Early Occupations at Gran Pajatén, Peru. *Andean Past* 4:281-318. Latin American Studies Program, Cornell University. Ithaca.
11. **Church, W.B.** 1991. La Ocupación Temprana del Gran Pajatén. *Revista del Museo de Arqueología de la Universidad Nacional de Trujillo* 2:3-37. Trujillo, Peru.
12. **Church, W.B.** 1989. Investigaciones Arqueológicas en el Parque Nacional Rio Abiseo, San Martín (with Thomas J. Lennon and Miguel Cornejo G.) *Boletín de Lima*, No. 62, Año 11, pp. 43-56. Lima.
13. **Church, W.B.** 1982. Rance Hood: An Interview with a Comanche Painter and Peyotist, Part II. *Earth News*, 1:2:19-21. Boulder.
14. **Church, W.B.** 1982. Rance Hood: An Interview with a Comanche Painter and Peyotist, Part I. *Earth News*, 1:1:7-9. Boulder.

Presentations:

1. Primera Conferencia Internacional sobre los Chachapoya. 2003. Museo Leymebamba, Leymebamba, Perú. **Invited Paper**: "Arqueología del Paisaje Prehispánico Pataz-Abiseo."
2. 100th Annual meetings of the American Anthropological Association, . 2001. Washington, DC. **Invited Paper**: "Building Bridges with Style: Style and Interaction at the Andean-Amazonian Interface." Presented at symposium on "The Appropriation of Style in the Americas."
3. 66th Annual Meetings of the Society for American Archaeology. 2001. New Orleans, LA. **Invited Paper**: "Interregional Interaction and Early Social Complexity in the North Highlands of Peru: A View from the Andean Slopes." Presented at symposium on "Social Dynamics in Early Central Andean Civilization."
4. Dumbarton Oaks Research Library and Collections, Washington, D.C. 2000. **Invited Participant** at Roundtable on *Chavín Art and its Transformations*.
5. 65th Annual Meetings of the Society for American Archaeology,. 2000. Philadelphia, PA. Paper: "Preceramic Occupations in the Tropical Montane Forests of Peru."
6. 64th Annual Meetings of the Society for American Archaeology. 1999. Chicago. Discussant at symposium "From the Sea to the Selva: A Focus on Interregional Cultural and Economic Dynamics in Prehispanic Ecuador."
7. Roundtable on Long Distance Contacts in a Pre-Columbian World. 1999. Dumbarton Oaks Research Library and Collections. Washington, D.C. **Invited Speaker**: "The Eastern Andean Slopes: Axis of Interaction and Cultural Integration."
8. 17th Annual Northeastern Conference on Andean Ethnohistory and Archaeology. 1998. SUNY-Binghamton, NY. Paper: "Preceramic Period Occupations in the *Ceja de Selva* of Northern Peru."
9. Spring Tertulia Series. 1998. Dumbarton Oaks Research Library andCollections. Washington, D.C. Paper: Tertulia: "Style and Pre-Hispanic Boundary Interaction on the Eastern Slopes of the Central Andes."
10. 15th Annual Northeastern Conference on Andean Ethnohistory and Archaeology. 1996. University of Pennsylvania Museum. Philadelphia. Paper: "The Manachaqui Phase and Initial Period Montane Forest Interaction Spheres."
11. 93rd Annual Meeting of the American Anthropological Association. 1994. Atlanta. Paper: "Migrations, Colonization and Cultural Development in Peru's Tropical Montane Forest."
12. 12th Annual Northeast Conference on Andean Archaeology and Ethnohistory. 1993. University of Pittsburgh. Paper: "Late Prehistoric Architecture of the Northeastern Montane Rainforest of Peru: Gran Pajatén and La Playa."

13. “Roundtable on Early Complex Societies in the Central Andes.” 1993. Dumbarton Oaks Research Library and Collections. Washington, D.C. **Invited speaker**: "Initial Period and Early Horizon Occupations at Manachaqui Cave: Evidence for Interregional Interaction from the Highland-Tropical Forest Ecotone."
14. 58th Annual Meetings of the Society for American Archaeology. 1993. St. Louis. **Invited Paper**: "Evidence for Prehistoric Highland-Tropical Forest Interaction from Manachaqui Cave in the Northeastern Highlands of Peru: Preliminary Report."
15. “Symposium on Biodiversity, Culture History and the Future of the Rio Abiseo National Park.” 1992. Organizing Committee; Paper: "Investigaciones Arqueológicas en el Gran Pajatén: 1985-1986." Sponsored by the Asociación Peruana para la Conservación de la Naturaleza and the World Wildlife Fund. Hosted by the Banco Continental. Lima, Peru.
16. “Fronteras de Investigación en el Parque Nacional Rio Abiseo.” 1991. **Invited Paper**: “La Importancia Arqueológica del Parque Nacional Rio Abiseo.” Sponsored by the Asociación Peruana para la Conservación de la Naturaleza. Hosted by the Banco Continental. Lima, Peru.
17. 28th Annual Meeting of the Institute of Andean Studies. 1988. University of California at Berkeley. Paper: "Stratigraphy and Ceramic Artifacts from Building No. 1 at Gran Pajatén."
18. Sixth Annual Northeast Conference on Andean Archaeology and Ethnohistory. 1987. Trent University, Peterborough, Ontario, Canada. Paper: "Stratigraphy and Ceramic Artifacts from Building No. 1 at Gran Pajatén."
19. University of Colorado Rio Abiseo Research Project Symposium. 1987. Boulder. Paper: "Excavations and Ceramic Artifacts from Gran Pajatén."
20. Annual Meeting of the Colorado Council of Professional Archaeologists. 1985. Glenwood Springs, Colorado. Co-chair of symposium with Dr. Frederick W. Lange; Paper: "The Amateur and the Professional Archaeologist in Northeastern Colorado."
21. Annual Meeting of the Colorado Council of Professional Archaeologists. 1984. Boulder, Colorado. Paper: "The University of Colorado Museum Archaeological Repository as a Research Tool."
22. University of Colorado at Denver Anthropology Club Annual Spring Conference. 1984. Denver, Colorado. Paper: "Insights into the Role of Lithic Thermal Alteration in Northeastern Colorado."

Julie A. Ballenger, Associate Professor of Biology

Publications:

1. Timmerman-Erskin, M., **J.A. Ballenger**, R. Dute, R. Boyd. 2003. Allozyme investigation of the Trillium pusillum Michaux complex (Trilliaceae): Taxonomic and conservation implications. *Journal of the Torrey Botanical Society* (IN PRESS)
2. Doyle, J.J., J.L. Doyle, **J.A. Ballenger**, E.E. Dickson, T. Kajita, and H. Ohashi. 1997. A phylogeny of the chloroplast gene *rbc*L in the Leguminosae: Taxonomic correlations and insights into the evolution of nodulation. *American Journal of Botany.*
3. Doyle, J.J., J.L. Doyle, **J.A. Ballenger**, and J.A. Palmer. 1996. The distribution and phylogenetic significance of a 50 kilobase chloroplast DNA inversion in the flowering plant family, Leguminosae. *Molecular Phylogenetics and Evolution* 5: 429-438.
4. **Ballenger, J.**, B. Riphagen, and P. Zwank. 1983. Status of the Louisiana Prairie Vole (*Microtus ochrogaster ludovicianus*). Coop. Agreement No. 14-16-1526, No. 2., *U.S. Fish and Wildlife Service.*

Presentations:

1. Ballenger, J.A. and T.O. Knight. 1998. Population genetics of the gopher tortoise, Goperus polyphemus, in the state of Georgia. Gopher Tortoise Council Annual Meeting, Hattisburg, Mississippi.
2. Crawford, K.A., J.A. Ballenger, and W.S. Birkhead. 1996. Association of Southeastern Biologists. Presented Paper: A small mammal survey at Oxbow Meadow, Muscogee County, GA.
3. Stringfellow, R.C., J.A. Ballenger, D.R. Schwimmer, and G.E. Stanton. 1996. Association of Southeastern Biologists. Presented Paper: A preliminary survey of the freshwater mussel community at Harding Reservoir, Harris County, Georgia.
4. Lai, M., J. Sceppa, J.A. Ballenger, J.L. Doyle, J.J. Dolye, and R. Wunderlin. 1994. Presented Paper: Loss of the *rpl*2 intron from the chloroplast genomes of Bauhinia species. [*American Journal of Botany*]
5. Ballenger, J.A., E.E. Dickson, M.W. Meyer, and J.J. Doyle. 1993. DNA sequence data and phylogeny of the Leguminosae. [*American Journal of Botany*]
6. Ballenger, J.A. 1992. Third Int. Legume Conf. Presented Paper: A reevalutation of the North American species of *Cercis* (Leguminosae).
7. Ballenger, J.A., W.H. Eshbaugh, R.J. Hickey, and S.I. Guttman. 1991. Electrophoretic variation in populations of *Cercis* (Leguminosae). *[American Journal of Botany*]

John A. Barone, Assistant Professor of Biology

Publications:

1. **Barone, J. A.** and A. L. Friend. 2003. Effects of leaf litter on establishment of seedlings in warm temperate forests. *American Midland Naturalist.* (IN PRESS)
2. **Barone, J. A.** and P. D. Coley. 2002. Herbivorismo y las defensas de las plantas. In M. R. Guariguata and Gustavo Kattan, eds. *Ecologia y conservacion de bosques neotropicales*.
3. **Barone, J. A.** and P. D. Coley. 2001. Ecology of plant defenses. In S. Levin, editor. *Encyclopedia of Biodiversity.* Academic Press.
4. **Barone, J. A.** 2000. Comparison of herbivores and herbivory in the canopy and understory for two tropical tree species. *Biotropica* 32:307-317.
5. **Barone, J. A.** 1998. Effects of light availability and rainfall on leaf production in a moist tropical forest in central Panama. *Journal of Tropical Ecology* 14:309-321.
6. **Barone, J. A.** 1998. Host-specificity of folivorous insects in a moist tropical forest. *Journal of Animal Ecology* 67:400-409.
7. Coley, P. D. and **J. A. Barone.** 1996. Herbivory and plant defenses in tropical forests. *Annual Review of Ecology and Systematics* 27:305-335.

Presentations:

1. Ecological Society of America. 2000. Salt Lake City, Utah. Presented Paper: "Herbivore community dynamics in wet and dry tropical forests."
2. Association for Tropical Biology. 2002. Panama City, Panama. **Invited Talk:** "Herbivore communities along a tropical rainfall gradient."
3. Meeting of the El Verde Long-Term Ecological Research Site. Rio Piedras, Puerto Rico. 2002. **Invited Talk: "**Effects of biotic interactions on plant communities."
4. Meeting of the El Verde Long-Term Ecological Research Site, Rio Piedras, Puerto Rico. 2002. **Invited Talk**: "The elevation gradient of vegetation in the Luquillo Experimental Forest."
5. Department of Biological Sciences, Auburn University. 2000. **Invited Talk:** "Effects of herbivores and pathogens on tropical tree diversity."
6. Workshop on Tri-trophic Level Interactions. 1999. Sponsored by the Organization for Tropical Studies and the Mellon Foundation. La Selva, Costa Rica
7. Department of Forestry, Mississippi State University. 1999. **Invited Talk:** "Patterns of tropical tree diversity."

8. Department of Biology, Mississippi State University. 1999. **Invited Talk:** "Herbivores, pathogens and tropical forest tree diversity."
9. Ecological Society of America. 1998. Baltimore, MD. Presented Paper: "Diversity and leaf damage in a wet and a dry tropical forest in Panama."
10. Estacion Biologica Cocha Cashu, Parque Nacional Manu, Peru. 1998. **Invited Talk:** "Patrones de herbivoria dentro bosques tropicales."
11. Symposium on tri-trophic level interactions, Annual Meetings of the Association for Tropical Biology, San Jose, Costa Rica. 1997. **Invited Talk:** "Tri-trophic-level interactions in a moist tropical forest: the importance of young leaves."
12. Ecological Society of America. 1996. Providence, RI. Presented Paper: "Host-specialization of insect herbivores in a moist tropical forest."
13. Smithsonian Tropical Research Institute, Panama City, Panama. 1995. **Invited Talk:** "Maintenance of local tree diversity in a moist tropical forest."
14. Smithsonian Tropical Research Institute, Panama City, Panama. 1994. **Invited Talk:** "Distance-dependence and tropical tree diversity."
15. Conference on Canopy Biology. 1994. Marie Selby Botanical Gardens, Sarasota Florida. Presented Paper: "Herbivores and herbivory in the canopy and understory on Barro Colorado Island, Panama."
16. Ecological Society of America. 1993. Madison, WI. Presented Paper: "Distance-dependence and tropical tree diversity."

William S. Birkhead, Professor of Biology, Chair, Biology Department

Publications:

1. Gore, J.A., **W.S. Birkhead**, D.L. Hughes, S.L. Nichols, and T.W. Roever. 2004. Recovery and colonization dynamics of macroinvertebrates and fish in newly created habitat after sediment remediation from manufactured gas-processing waste in the Oconee River. (IN PRESS) *River Research and Applications.*
2. Jensen, J.B., and **W.S. Birkhead.** 2002. Distribution and status of the alligator snapping turtle, (*Macrochelys temminickii*) in Georgia, USA. *Southeastern Naturalist* 2: 25-34.
3. Johnston, C.E., and **W.S. Birkhead.** 1988. Spawning in the bandfin shiner, *Notropis zonistius* (Pisces: Cyprinidae). *Journal of the Alabama Academy of Science* 59: 30-33.
4. **Birkhead, W.S.,** and C.R. Bennett. 1981. Observations of a small population of estuarine-inhabiting alligators near Southport, NC. *Brimleyana* 6: 111-117.

5. **Birkhead, W.A.** 1980. *Cichlasoma cyanoguttatum* (Baird and Girard), Rio Grande Perch. Pp.765 *in:* D.S. Lee *et al.* (eds.) *Atlas of North American Freshwater Fishes,* NC State Museum of Natural History, Raleigh.
6. **Birkhead, W.A.** 1980. *Astayanix mexicanus* (Fillipi), Mexican tetra.. Pp.139*:* D.S. Lee *et al.* (eds.) *Atlas of North American Freshwater Fishes,* NC State Museum of Natural History, Raleigh.
7. Copeland, B.J., J.M. Miller, W. Watson, R. Hodson, **W.S. Birkhead**, and J. Schneider. 1976. Pp. 119-137 *in:* L.D. Jensen (ed.) Third *National Workshop on Entrainment and Impingement,* Ecological Analysts Inc., Melville, NY.
8. **Birkhead, W.S.** 1972. The toxicity of stings of Ariid and Ictalurid catfishes. *Copeia* 1972: 790-807.
9. **Birkhead, W.S.** 1967. The comparative toxicity of stings of the Ictalurid catfish genera, *Ictalurus* and *Schilbeodes. Comp. Biochem. Physiol.* 22: 101-111.

Presentations:

1. SEMP Research Coordination Meeting. 2001. Presented Paper: Fish surveys and biotic integrity.
2. Water Environment Research Foundation. 2001. Atlanta, GA. Technology and Watershed Assessment: Application to reasonable assurance determinations in Columbus, GA. Presented Paper: Fish surveys and biotic integrity.
3. Georgia Water Pollution Control Association. Columbus, GA. 1996. Presented paper: Wetlands.
4. Georgia Science Teachers Association. 34th Annual Science and Leadership Conference. 1994. Savannah, GA. Presented Paper: The Gopher Tortoise: Profile of a threatened species.
5. 73rd Annual Meeting of the American Society of Ichthyologists and Herpetologists. 1993. Austin, TX. Presented Paper: Fishes of the Fort Benning Reservation, west central Georgia.
6. Mid-Winter Seminar for Land Surveyors and Engineers. 1993. Presented Paper: Wetlands: What we should know.
7. State of the Art in Biology Meeting. 1992. Athens, GA. Participant in a panel discussion of introduced, threatened, and endangered species.
8. Annual Meeting of the Gopher Tortoise Council. 1992. Fargo, GA. Presented Paper: Status of the Gopher Tortoise in Georgia.
9. 48th Annual Meeting of the Association of Southeastern Biologists. 1987. Athens, GA. Presented Paper: pH discrimination of two Cyprinid fish.
10. 48th Annual Meeting of the Association of Southeastern Biologists. 1987. Athens, GA. Presented Paper: Population structure of the bandfin shiner, *Notropis zonistius*, in two small piedmont streams in west central Georgia.

11. 47th Annual Meeting of the Association of Southeastern Biologists. 1986. Columbia, SC. Presented Paper: Fishes of the Upatoi Creek drainage, west central Georgia.
12. 47th Annual Meeting of the Association of Southeastern Biologists. 1986. Columbia, SC. Presented Paper: pH as an isolating mechanism for two Cyprinid fish.
13. Freshwater Wetlands and Wildlife Symposium. 1986. Charleston, SC. Presented Paper: Characteristics of natural aquatic systems of Fort Benning, Georgia.
14. Georgia Academy of Science. 1982. Columbus, GA. Presented Paper: Limnological studies of two small streams that drain the north slope of Pine Mountain, Harris County, GA.
15. 11th Semiannual Meeting of the Southeastern Estuarine Research Society. 1979. Jacksonville, FL. Presented Paper: Incipient species replacement within the genus *Menidia* following the alteration of a tidal creek near Southport, NC.
16. 55th Annual Meeting of the American Society of Ichthyologists and Herpetologists. 1975. Williamsburg, PA. Presented Paper: Ecological equivalency among stream-inhabiting fishes in central Argentina and north central Mexico.
17. Second Thermal Ecology Symposium. 1975. Savannah, GA. Presented Paper: Variability of the entrainment of organisms in an estuarine power plant.
18. 17th Annual Meeting of the Southwestern Association of Naturalists. 1970. College Station, TX. Presented Paper: Notes on the fishes which inhabit the Sierras de Cordoba.
19. 25th Annual Meeting of the Society of Evolution. 1970. Austin, TX. Presented Paper: Niche similarities between fish species which inhabit semi-arid regions in North and South America.
20. 47th Annual Meeting of the American Society of Ichthyologists and Herpetologists. 1967. San Francisco, CA. Presented Paper: The adaptive significance of the Ictalurid catfish sting.
21. 17th Annual Meeting of the American Institute of Biological Science. 1966. College Park, MD. Presented Paper: A possible adaptive function of the Ictalurid catfish sting.
22. 12th Annual Meeting of the Southwestern Association of Naturalists. 1965. New Orleans, LA. Presented Paper: Relative toxicity of catfish venoms to fishes.

Arthur G. Cleveland, Professor of Biology and Environmental Science

Publications:

1. Waste treatment using nature's processes. 2000. *Soil Sediment & Groundwater.* Oct./Nov. (with B. York, J. Mayer and J. Andrews).

2. Tardigrada from southern Yunnan Province, People's Republic of China. (with C. Beasley). 1996. *Zoological Jour. of the Linnean Soc.* 116:239-243.
3. *Niviventertrema yunnanensis* gen.n., sp. n. (Lecithodendriidae: Pleurogenetinae) from Niviventer cremoriventor (Muridae) From Yunnan Province of the Peoples Republic of China. (with N. Dronen and Z. Homesley) 1995. *J. Helminth. Soc. Wash.* 62(1): 18-21.
4. *Conodiplostomum asymmetricum* sp. n. (Neodiplostomidae: Crassiphialinae), from *Niviventer cremoriventer* (Muridae) from Yunnan Province of the Peoples Republic of China. 1995. *J. Helminthol. Soc. Wash*. 62(2), pp. 131-134.
5. A preliminary study of small rodent communities in a brushland of south Texas, U.S.A. (with Wu Delin) 1992. *Zool. Research (China)* 13 (2):132-135.
6. Ectoparasites of some mammals from southern China. 1990. *Bull. Soc. Vector Ecol.* 15(l)53-58. (with J. Baccus and J. Whitaker).
7. Diel activity patterns of two female small Indian Mongooses (Herpestes javanicus) in relation to weather. (with S. Buskirk and Wu Delin). 1990. Zool. Research (China) ll (4): 355-358.
8. The barn owl (*yto alba*) as a major predator of bats in southern Yunnan, China. 1990. *Bat Research News* 31 (4):87 (with Wm Lopez-Foremnt and Wu Delin).
9. Comparative anatomy of the vertebrates: A laboratory manual. 4th Ed. (with G. Kent and D. Martin). 1988. William C. Brown Publisher. 100pp.
10. A new species of *Trombigastia* (Acari: Trombiculidae) from a horseshoe bat collected in China. 1987. *Internat. J. Acarol.* 13 (2): 149-151. (with M.L. Goff and J.T. Baccus).
11. First record of *Baiomys taylori* north of the Red River. 1986. *Southwestern Nat.* 3l (4).
12. Ecology of several rodent species in southern tropical China. (abst.) Fourth International Theriological Congress, 1985. Edmonton, Alberta, Canada.
13. Testicular cycles of the common long-nosed armadillo *Dasypus novemcinctus*, in north central Texas. (article by graduate student J.S. McCusker). 1985. Smithsonian Instit. Press.
14. Distributional records and notes for nine species of mammals in eastern Texas. (with J.T. Baccus and E.G. Zimmerman). 1984. *Tex. J. Sci*. 35 (4): 323-326.
15. Natural history of the hispid cotton rat, *Sigmodon hispidus*. *In* Proceedings of the First Welder Wildlife Foundation Symposium. 276 pp. 1979.
16. A Manual for Vertebrate Natural History. 2nd Edition. 1978. Texas Wesleyan Publ. Mus. Nat. Hist. No. l. 116 pp.

17. Evaluation of the resources of the proposed Cooper Lake. 1977. S.M.U. Res. Rpt. 110. S.M.U. Press, Dallas. (with K. Koehner, et al.)
18. First south Texas records of *Pappogeomys castanops*. 1977. Tex. J. Sci. 29 (3-4): 299.
19. Brazos River basin biological inventory. U.S. Army Corps of Eng. DACW 63-76-M-123l. (with R.H. Parker, et al.) 1976.
20. Manual for vertebrate natural history. 1975. Texas Wesleyan Publication. 105pp.
21. Variation in litter size in the cotton rat, *Sigmodon hispidus* (Abst.) 1974. *Texas J. Sci.* 25:130. (with G.G. Raun).
22. Geographic variation in the cotton rat, *Sigmodon, hispidus* (Abst.) 1972. *Texas J. Sci*. 23:582. (with G.G. Raun).
23. Current geographic distribution of the armadillo, *Dasypus novemcinctus* in the United States. 1970. *Texas J. Sci.* 22:90-92.
24. Ecology of *Geomys bursarius*. 1962. *Arl. Rev*. l:l0-12.

Presentations.

1. Texas System of Natural Laboratories Board Meeting. 1993. **Invited Paper:** "Opportunities for Business, Science & Technology on the Pacific Rim".
2. Texas Society of Mammalogists. 1988. Junction, Texas. Presented Paper: "Photographic coverage of the capture of a spotted bat, *Euderma maculatum*" (with J. Pressley and P. Hiltibidal).
3. Asian Symposium of Mammalogy (American and Chinese Mammal Societies). 1988. Beijing, People's Republic of China. **Invited Paper:** "Significance of bamboo rats in the conservation of the Chinese Panda."
4. Texas Society of Mammalogists. 1987. Junction, Texas. Presented Paper: "Preliminary examination of the comparative histology of adult and juvenile tracts of bamboo rats (*Rhizomys*) from southern China" (with D. Martin, B. Chapman and Laio Weiping).
5. Several **invited seminars** in southern provinces of China. 1987. "Conservation efforts needed to perpetuate the species of *Rhizomys*".
6. Texas Society of Mammalogists. 1985. Junction, Texas. Presented Paper: "Mammals of Dinghushan, Guangdong Province, Peoples Republic of China."
7. 4th International Theriological Congress. 1985. Edmonton, Alberta, Canada. **Invited Paper:** "Ecology of several rodent species in southern tropical China."

8. Zoology Faculty; Guangdong Institute of entomology and Zoology, Guangzhou, People's Republic of China. 1984. **Invited Seminar: "**Current status of taxonomic problems with rodents and bats in southern China."
9. Southwestern Association of Naturalists. 1980. Las Cruces, New Mexico. Presented Paper: "Geographic variation in the nine-banded armadillo, *Dasypus novemcinctus*" (with P. Wynne) and "Lead concentrations in the liver of the cotton rat, *Sigmodon hispidus*" (with B. Nickerson)
10. North Texas Biological Society. 1979. Fort Worth, Texas. Presented Paper: "Distribution of the Mountain Lion (*Felis concolor*) in Texas."
11. Texas Academy of Science. 1979. Arlington, Texas. Presented Paper: "Environmental factors influencing tunnel depth in *Thomomys* (Rodentia: Geomyidae)" (with M. Schlangenstein).
12. North Texas Biological Society. 1978. Fort Worth, Texas. Presented Paper: "Mammals of North Texas," (paper in a symposium series on Vertebrates of North Texas.)
13. First Welder Wildlife Foundation Symposium. 1978. Sinton, Texas. **Invited Paper:** "Natural History of the Hispid Cotton Rat."
14. Texas Association for Environmental Education. 1977. State Conference. **Invited Paper:** "Value of Summer Programs in Environmental Education."
15. Texas Academy of Science. 1977. Waco, Texas. Presented Paper: "*Rattus* population in the National Audubon Society Sabal Palm Grove Sanctuary, Southmost, Texas."
16. Texas Academy of Science. 1976. College Station, Texas. Presented Paper: "Analysis of seasonal variation in the reproductive biology of male nine-banded armadillos, *Dasypus novemcinctus*." (with A.E. Mathisen)
17. North Texas Biological Society. 1976. Waco, Texas. Presented Paper: "Mammals of the National Audubon Society Sabal Palm Forest Sanctuary, Southmost, Texas."
18. Texas Academy of Science. 1975. Huntsville, Texas. Presented Paper: "Geographic distribution of the nutria, *Myocaster coypu*, in the United States".
19. North Texas Biological Society. 1975. Fort Worth, Texas. Preseented Paper: "Food habits of the barn owl, Tyto alba in South Texas. (with D.L. Shockley.)
20. Welder Wildlife Foundation Summer Seminar Series. 1974. Sinton, Texas. **Invited Paper:** "Geographic variation in mammals."
21. Texas Academy of Science. 1973. Houston, Texas. Presented paper: "Geographic variation in the litter size of Sigmodon hispidus."

22. Southwestern Association of Naturalists. 1973. Emporia, Kansas. Presented Paper: “Variation in the parasites of the hispid cotton rat from south Texas to Kansas."
23. Texas Academy of Science. 1971. Nacogdoches, Texas. Presented Paper: "Geographic variation in the cotton rat, Sigmodon hispidus."
24. Southwestern Association of Naturalists . 1969. Tempe, Arizona. Presented Paper: "Current geographic distribution of the nine-banded armadillo in the United States."
25. American Society of Mammalogists, 1969. New York City, New York. Presented Paper: "Rectal temperatures of the cotton rat, *Sigmodon hispidus*."

John K. Davis, Assistant Professor of Biology

Publications:

1. **Davis, J. K.** and J. M. Tiedje. 2001. Sequence and transcriptional analysis of reductive dehalogenase gene and homologs of *Desulfitobacterium*. Submitted to Applied and Environmental Microbiology.
2. **Davis, J. K**., B. M. Griffin, and J. M. Tiedje. 2001. The use of polymerase chain reaction to investigate the prevalence and diversity of reductive dehalogenase genes in communities and pure cultures, p. 3-14 *In* A. Kornmüller (ed.), Treatment of Industrial and Commercial Wastewater. Technical University of Berlin, Berlin, Germany.
3. **Davis, J. K.,** G. C. Paoli, Z. He, L. J. Nadeau, C. C. Somerville, and J. C. Spain. 2000. Sequence analysis and initial characterization of two isozymes of hydroxylaminobenzene mutase from *Pseudomonas pseudoalcaligenes* JS45. *Appl. Environ. Microbiol.* 66:2965-2971.
4. **Davis, J. K.,** Z. He, C. C. Somerville, and J. C. Spain. 1999. Genetic and boichemical comparison of 2-aminophenol 1,6-dioxygenase from *Pseudomonas pseudoalcaligenes* JS45 to *meta*-cleavage dioxygenases: divergent evolution of 2-aminophenol *meta*-cleavage pathway. *Arch. Microbiol.* 172:330-339.
5. He, Z., **J. K. Davis,** and J. C. Spain. 1998. Purification, characterization, and sequence analysis of 2-aminomuconic 6-semialdehyde dehydrogenase from *Pseudomonas pseudoalcaligenes* JS45. *J. Bacteriol.* 180:4591-4595.
6. **Davis, J. K.** 1993. Cloning of a Gene Involved in Benzoate Catabolism Under Denitrifying Conditions from *Alcaligenes xylosoxidans* subspecies *denitrificans* strain PN-1. Doctoral Thesis, Indiana University.

7. **Davis, J. K**. 1987. Transformation Studies on pCBI, a Plasmid Encoding Anaerobic Benzoate Catabolism. Masters Thesis, Indiana University.

Presentations:

1. **Davis, J. K.,** S. Buckner, and J. M. Tiedje. Nitrogen fixation by reductively dechlorinating bacteria. To be presented at the102nd annual general meeting of the American Society for Microbiology, Salt Lake City, UT, May 19-23, 2002.
2. **Davis, J. K.** and J. M. Tiedje. Examination of the genome of *Desulfitobacterium hafniense* suggests that nitrogen fixation is a common characteristic among reductively dehalogenating bacteria. 9th International Conference on Microbial Genomes, Gatlinburg, TN, Oct. 28-Nov.1, 2001.
3. **Griffin, B. M.,** J. K. Davis, J. M. Tiedje, and F. E. Löffler. Molecular characterization of microbial populations that produce trans-dichloroethane (DCE) during tetrachloroethane (PCE) reductive dechlorination. 21st annual meeting of the Society of Environmental Toxicology and Chemistry, Nashville ,TN, Nov. 12-16, 2000.
4. **Davis, J. K.,** and J. M. Tiedje. Sequencing and analysis of *o*-chlorophenol reductive dehalogenase genes from *Desulfitobacterium* spp. Abstract Q-173. 100th General meeting of the American Society for Microbiology, Los Angeles, CA, May 21-25, 2000.
5. He, Z., **J. K. Davis,** and J. C. Spain. Purification, characterization, and sequence analysis of 2-aminomuconic 6-semialdehyde dehydrogenase from *Pseudomonas pseudoalcaligenes* JS45. 98th General Meeting of the American Society for Microbiology, Atlanta, GA, May 17-21, 1998.
6. **Davis, J. K.,** C. C. Somerville, and J. C. Spain. *Pseudomonas pseudoalcaligenes* JS45 possesses two genes encoding hydroxylaminobenzene mutase. Abstract Q-342. 97th General Meeting of the American Society for Microbiology, Miami Beach, FL. May 4-8, 1997.
7. **Davis, J. K.,** C. C. Somerville, and J. C. Spain. Cloning of hydroxylaminobenzene mutase from *Pseudomonas pseudoalcaligenes* JS45. Abstract H67. 96th General Meeting of the American Society for Microbiology, New Orleans, LA. May 19-23, 1996.

George E. Stanton, Professor of Biology and Acting Dean, College of Science

Publications:

1. **Stanton, G.E.** manuscript on *Procambarus verrucosusI* accepted for publication by *Southeastern Naturalist*.
2. Stringfellow, R.C. and **G.E. Stanton**. 1998. A survey of freshwater bivalves in five creeks located west-central Georgia. Accepted by *Georgia Journal of Science*.
3. Hodge, M.T. and **G.E. Stanton.** 1998. Evaluation of dispersal and infestation of thistle weevils (*Rhinocyllus conicus*) for biological control of musk thistle (*Cardus nutans*))in west-central Georgia. Submitted to *Journal of Entomological Science*.
4. **Stanton, G.E.** and H.L. Griffith, III. 1996. Observations on dispersal and life history of *Psychoda alternata* in surface application field, Columbus, Georgia. Report to Columbus Water Works. 15 pages.
5. **Stanton, G.E.** 1995. Distributions and life history ecology of *Procambarus (Ortmannicus) acutissimus* (Girard) and *Procambarus (Ortmannicus) verrucosus* Hobbs in Georgia. 1993-1995. *Report to Georgia Nongame and Endangered Wildlife Program, Georgia Department of Natural Resources.* 41 pages.
6. **Stanton, G.E.** 1992. Georgia distribution ecology of *Procambarus (Pennides) versutus* (Hagen) and *Procambarus (Ortmannicus) acutissimus* (Girard), (DECAPODA: Cambaridae). *Report to Georgia Nongame and Endangered Wildlife Program, Georgia Department of Natural Resources.* 10 pages.
7. Harrison, A.M. and **G.E. Stanton.** 1992. Effects of predation by *Chrysoperela rufilaabris* on population densities of *Monelliopsis pecanus* under laboratory contidiont [ABSTRACT). *Georgia Journal of Science* 50(1): 18-19.

Presentations**:**

1. **Stanton, G.E.** and P.T. Lopez. 2001. Georgia distributions and habitat characteristics of *Procambarus (Ortmannicus) acutissimus* and *P. (O) verrucosus.* Presented at 62nd meeting of the Association of Southeastern Biologists, New Orleans (April, 2001)
2. Birkhead, W.S., G.D. Stokes, **G.E. Stanton**, A.C. Miller, and F.E. Birkhead. 1993. Fishes of the Fort Benning Reservation, west central Georgia. 73rd Ann. Mtg. Amer. Soc. Ichthyol. Herpetol., Austin, TX.
3. Birkhead, W.S., **G.E. Stanton**, and G.D. Stokes. 1986a. Characteristics of natural aquatic systems of Fort Benning, Georgia. Freshwater Wetlands and Wildlife Symposium, Charleston, SC.

4. Birkhead, W.S. , **G.E. Stanton**, and G.D. Stokes. 1986b. Fishes of the Upatoi Creeek drainage, west central Georgia. 47th Ann. Mtg. Assoc. Southeastern Biol., Columbia, SC.

Glenn D. Stokes, Professor of Biology and Associate Dean, College of Science

Publications:

1. Maud, P. J., **G. D. Stokes**, D. Shannon, and W. Curl. Use of the Powercam© torque modifier for bicycle front chain wheels: implications for triathlete competition. *Submitted.*
2. Birkhead, W.S., **G.D. Stokes**, and J. Herrington. 1998. Status of the Gopher Tortoise, *Gopherus polyphemus*, on the Kimbrel Tract, Miller County, Georgia, 1996-1997. Report to U.S. Fish and Wildlife Service.
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Jeffrey A. Zuiderveen, Associate Professor of Biology

Publications:

1. **Zuiderveen, J.A.**, and W.J. Birge. 1997. The relationship between chronic values in toxicity tests with *Ceriodaphnia dubia. In:* F.J. Dwyer, T.R. Doane, and M.L. Hinman (eds.) *Environmental Toxicology and Risk Assessment: Modeling and Risk Assessment (6th Volume)*. ASTM 1317.
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3. **Zuiderveen, J.A.** 1996. "Ode to a Daphnid" The *Voice Within.* National Library of Poetry. P. 69.
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William J. Frazier, Professor of Geology

Publications:

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2. **Frazier, W.J.**, and D.R. Schwimmer. 1987. *Regional Stratigraphy of North America.* Plenum Press, NY. 719pp.
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Zewdu Gebeyehu, Associate Professor of Chemistry

Publications:

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3. "Transition Metal-Nitrogen Multiple bonds", Air Force Research Laboratory, Materials Directorate, Wright Patterson AFB, OH, April 1997.
4. "Synthesis and Characterization of Nitrido Complexes of Mo, W, and Os", Department of Chemistry, Columbus State University, Columbus, GA, May, 1995.

Charles A. Lovelette, Associate Professor of Chemistry

Publications:

1. **Lovelette, C.A.**, W.S. Barnes, J.H. Weisburger, and G.W. Williams. 1987. Improved synthesis of the food mutagen, 2-Amino-3,7,8-trimethylimidazo[4,5-f]quinoxaline and activity in a mammalian DNA repair system. *J. Agric. Food Chem.* 35: 912.
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2. American Chemical Society. 1996. New Orleans, LA. Presented Paper: Effects of lead (II) ion on the prophenoloxidase enzyme system and the genotoxicity of lead (II), cadmium (II) and chromium (VI) in *P. acutissimus* (crayfish). (Elizabeth Wright, co-author)
3. Southeastern Regional ACS Meeting. 1994. Birmingham, AL. Presented Paper: The halogenation of 3-Amino-1,2,4-triazine and 3-Amino-1,2,4-triazine-5-one: A rate study and possible mechanism. (Elizabeth Wright, co-author)
4. Southeastern Regional ACS Meeting. 1994. Birmingham, AL. Presented Paper: Regioselective ring-closure of 5-Amino-6-hydrazino-(2H)1,2,4-triazin-5-one. (Elizabeth Wright, co-author)
5. Joint Meeting ASPET/SOT. 1978. Houston, TX. Presented Paper: Oxidation of pyrimadine derivatives by flavoproterins. (J.J. McCormack and B. Allen, co-authors)

David R. Schwimmer, Professor of Geology

Publications:

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2. **Schwimmer, D.R.**, G.E. Hooks, and B. Johnson. 2002. Revision of taxonomy, age, and geographic range of the large lamnid *Cretodus semiplicatus. J. Vertebrate Paeleontology.*
3. **Schwimmer, D.R.** 2001. Giant fossil coelacanths from the Late Cretaceous of the eastern USA. *Fernbank Magazine.*
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2. Society of Vertebrate Paleontology. 2000. Mexico City, Mexico. Presented Paper: Where are the large, Late Cretaceous sharks on the Atlantic Coastal Plain of the USA?
3. Geological Society of America. 2000. Charleston, SC. Presented Paper: A new Middle Cambrian lagerstätten in the Conasauga Formation of northwestern Georgia.
4. Society of Vertebrate Paleontology. 1999. Denver, CO. Presented Paper: On the size of the giant Crocodylian *Deinosuchus.*
5. Geological Society of America, Southeastern Meeting. 1999. Athens, GA. Presented Paper: The care and feeding of transitional organisms in the fossil record: a response to Creation Science rhetoric.
6. Columbus State University. 1998. Debate on “Creation Science” *contra* Mr. Kent Hovind.
7. Dinofest III International Symposium. 1998. Philadelphia, PA. Presented Paper: Paleoecology of *Deinosuchus rugosus,* a late Cretaceous crocodile.
8. Geological Society of America, Southeastern Meeting. 1998. Charleston, WV. Vertebrate-on-vertebrate scavenging and predatory bite traces in Late Cretaceous coastal marine fossils.
9. Society of Vertebrate Paleontology. 1997. Chicago, IL. Presented Paper: Disparity of North American Late Cretaceous marine vertebrate faunas: perhaps more artifactual than real.
10. Geological Society of America, Southeastern Meeting. 1997. Auburn, AL. Presented Paper: Predatory dominance of giant crocodiles on the Late Cretaceous Southeastern Coastal Plain.

11. Society of Vertebrate Paleontology. 1996. New York, NY. Presented Paper: New speciments of *Deinosuchus rugosus*, and further insights into chelonivory by Late Cretaceous eusuchian crocodiles.
12. Dinofest II International Symposium. 1996. Tempe, AZ. Presented Paper: Late Cretaceous dinosaurs in eastern USA: One big faunal province with western connections.
13. Geological Society of America. 1995. New Orleans, LA. Presented Paper: East-west Late Cretaceous marine vertebrate provincialism: An artifact of parasynchrony?
14. Geological Society of America. 1995. New Orleans, LA. Presented Paper: Evidences of scavenging by the selachian genus *Squalicorax* in the Late Cretaceous of North America.
15. Geological Society of America, Southeastern Meeting. 1995. Knoxville, TN. Presented Paper: Vertebrate teeth as biostratigraphic range-zone fossils in the Upper Cretaceous of the Gulf and Atlantic Coastal Plains.
16. Society of Vertebrate Paleontology. 1994. Seattle, WA. Presented Paper: Vertebrate-based Upper Cretaceous biostratigraphy for the Gulf and Atlantic Coastal Plains.
17. Auburn University, Dept. of Geology. 1994. **Invited Lecture**: Marine scavengers and predators of the Southeastern Late Cretaceous.
18. Georgia Science Teachers Assoc. 1994. **Invited Lecture**: Dinosaur research in Georgia.
19. Georgia State University, Dept. of Geology. 1994. **Invited Lecture**: Dinosaur Research.
20. Society of Vertebrate Paleontology. 1993. Albuquerque, NM. Presented Paper: A giant crocodile from Alabama and observations on the paleobiology of southeastern crocodilians.
21. Geological Society of America, Southeastern Division. 1993. Tallahassee, FL. Presented Paper: Fossil vertebrates in Upper Cretaceous marine strata in the southeast: Dinosaurs, and their kin, sleep with the fishes.
22. Society of Vertebrate Paleontology. 1992. Toronto, Ontario. Presented Paper: Late Cretaceous *Xiphactinus* fossils in eastern United States are not necessarily *X.nudax.*
23. Georgia Science Teachers Conference. 1992. Atlanta, GA. **Invited Lecture**: Dinosaur research.
24. Society of Vertebrate Paleontology. 1991. San Diego, CA. Presented paper: Evidence of scavenging by the selachian *Squalicorax kaupi* in Upper Cretaceous marine sediments of the eastern Gulf Coastal Plain.
25. Geological Society of America. 1991. San Diego, CA. Paper Presented: Upper Cretaceous coelacanths in eastern Alabama: suggestion of a Gondwanaland-eastern Gulf lineage.

26. Clayton State College. Distinguished Lecture Series. 1991. Morrow, GA. Dinosaur research.
27. Zoo Atlanta. 1991. Atlanta, GA. **Invited Lecture**: Dinosaur research.
28. Society of Vertebrate Paleontology. 1990. Lawrence, KS. Presented paper: A giant Upper Cretaceous coelacanth from eastern Alabama.
29. Geological Society of America. 1990. Dallas, TX. Upper Cretaceous vertebrate fossils in the easternmost Gulf Coastal Plain: mixed Atlantic and western Gulf marine taxa with cosmopolitan terrestrial components.
30. University of Tennessee, Dept. of Geology. 1990. **Invited Lecture**: Dinosaur research.
31. Geological Society of America, Southeastern Division. 1990. Tuscaloosa, AL. Presented Paper: New Middle Cambrian asaphiscid trilobites from the Conasauga Fm. In Georgia – with observations on form and function of some unique genal spines.
32. Society of Vertebrate Paleontology. 1989. Austin, TX. Presented paper: Dinosaurs from the Blufftown Formation (Campanian) in western Georgia and eastern Alabama.
33. Geological Society of America. 1989. St. Louis, MO. Presented Paper: First dinosaur record from Tennessee – a Campanian hadrosaur.
34. Geological Society of America, Southeastern Division. 1989. Atlanta, GA. Presented Paper: Late Middle Cambrian trilobites and biostratigraphy in part of the southernmost Appalachians.
35. University of Georgia, Dept. of Geology. 1989. **Invited Lecture**: Dinosaur research.
36. Society of Vertebrate Paleontology. 1988. Drumheller, Alberta. Presented Paper: Dinosaurs from the Blufftown Formation (Campanian) in western Georgia and eastern Alabama.
37. Geological Society of America, Southeastern Division. 1988. Columbia, SC. Presented paper: Late Cretaceous dinosaurs from the Georgia-Alabama border region and the biogeographic relationship with western lowland assemblages.
38. Emory University, Dept. of Geology. 1988. **Invited Lecture**: Dinosaur research.
39. Auburn University, Dept. of Geology. 1988. **Invited Lecture**: Dinosaur research.
40. Fernbank Science Center, Atlanta, GA. 1988. **Invited Lecture**: Dinosaur research.
41. Geological Society of America, Southeastern Division. 1986. Memphis, TN. Presented paper: Revised trilobite taxonomy and Middle Cambrian biostratigraphy of the Conasauga Formation in western Georgia.

42. Debate on “Scientific Creationism” *contra* Duane T. Gish. University of Georgia, Athens, GA.
43. Geological Society of America, Southeastern Division. 1985. Knoxville, TN. Presented paper: Quantitative revision of *Exogyra* systematics and biostratigraphy of the Gulf Coastal Plain.
44. Geological Society of America, Southeastern Division. 1984. Lexington, KY. Presented paper: New vertebrate faunas in the Upper Cretaceous of Georgia: small, rare scraps in many big animals.
45. Georgia Academy of Sciences. 1984. Statesboro, GA. Presented paper: Cretaceous vertebrates from marine strata of the Georgia - Coastal Plain.
46. Geological Society of America, Southeastern Division. 1983. Tallahassee, FL. Presented paper: Is there scientific method in Creationism madness?
47. Georgia State University, Dept. of Geology. 1982. **Invited Lecture**: Cretaceous paleoecology.
48. Georgia Academy of Sciences. 1982. Columbus, GA. Presentation on “Scientific Creationism”
49. Geological Society of America, Southeastern Division. 1981. Tallahassee, FL. Presented paper: Paleontology of a larger-oyster bioherm and related strata, Blufftown Formation, Stewart County, Georgia.
50. Debate on “Scientific Creationism” (with W.J. Frazier) *contra* Henry Morris and Harold Slusher. Columbus College, GA. 1981
51. Geological Society of America. 1980. Atlanta, GA. Presented paper: Coastal Plain and Piedmont geology of Muscogee County (Columbus), Georgia, and vicinity.
52. Geological Society of America, Northeastern Meeting. 1972. Buffalo, NY. Presented paper: The Middle Cambrian biostratigraphy of Montana and Wyoming.
53. First International Conference on Numerical Taxonomy. 1970. Toronto, Ontario. Presented Paper.
54. New York State Geological Association, 41st Annual Meeting. 1969. Presented Paper: The growth and allometry of the trilobite *Phacops rana.*

Thomas B. Hanley, Professor of Geology and Chair of Chemistry/Geology Department

Publications:

1. **Hanley, T.B.**, and M. Steltenphol. 1998. *Mylonites and Other Fault-related Rocks of the Pine Mountain and Uchee Belts of Western Georgia and Alabama.* Field guide for the Atlanta Geological Society.
2. **Hanley, T.B.**, C.I. Chalokwu, and M. Steltenpohl. 1997. Constraints on the location of the Carolina/Avalon terrane boundary on the southernmost exposed Appalachians, western Georgia and eastern Alabama. Pp. 15-24 *in:* L. Golver III and A.E. Gates (eds.) *Central and Southern Appalachians Sutures: Results of the EDGE Project and Related Studies,* Geological Society of America, Spec. Paper 14.
3. **Hanley, T.B.**, and M. Steltenphol. 1997. *Mylonites and Other Fault-related Rocks of the Pine Mountain and Uchee Belts of Western Georgia and Alabama.* Field guide, Southeastern Section, Geological Society of America.
4. Steltenpohl, M.G., S.A. Goldberg, **T.B. Hanley**, and M.J. Kunk. 1992. Alleghanian development of the Goat Rock fault zone, southernmost Appalachians. Compatibility with the master decollement. *Geology* 20: 845-848.
5. Chalokwu, C.J., and **T.B. Hanley**. 1990. Geochemistry, petrogenesis, and tectonic setting of amphibolites from the southernmost exposure of the Appalachian Piedmont. *J. of Geology* 98: 725-738.
6. Frazier, W.J., and **T.B. Hanley**. 1987. *Geology of the Fall Line: A Field Guide to Structure and Petrology of the Uchee Belt and Facies Stratigraphy of the Eutaw Formation in Southwestern Georgia and adjacent Alabama.* Georgia Geological Society Guidebook.
7. **Hanley, T.B.** 1986. Petrology and structural geology of the Uchee Belt rocks in Columbus, Georgia. Pp. 297-300. *Geological Society of America Centennial Field Guide – Southeastern Section.*
8. **Hanley, T.B.**, and J. Redwine. 1986. The Bartletts Ferry and Goat Rock fault zones north of Columbus, Georgia. *Pp. 291-296. Geological Society of America Centennial Field Guide – Southeastern Section.*
9. Kish, S.A., **T.B. Hanley**, and S. Schamel. 1985. *Geology of the Southwestern Piedmont of Georgia.* Geological Society of America Guidebook.
10. **Hanley, T.B.**, and C.J. Vitaliano. 1983. Petrography of the highly metamorphosed Archean mafic dikes, Tobacco Root Mountains, Madison County, Montana. *Northwest Geology* 12: 43-55.

11. **Hanley, T.B.** 1983. *Western Uchee Belt Near Columbus, Georgia, and Vicinity.* Dept. of Geology and Chemistry, Columbus College.
12. Schamel, S., **T.B. Hanley**, and J.W. Sears. 1980. *Geology of the Pine Mountain Window and Adjacent Terranes in the Piedmont Province of Alabama and Georgia. .* Geological Society of America Guidebook.
13. *With others.* 1979. Explanatory text to accompany geologic map of the southern Tobacco Root Mountains, Madison County, Montana. Map and Chart Series MC 31. *Geological Society of America.*
14. **Hanley, T.B.** 1976. A field guide to the stratigraphy and structure of the Precambrian rocks in the central fault block, northwestern Tobacco Root Mountains. Pp. 7-14 *in:* M. Lankston (ed.) Montana *Bureau of Mines Special Publ. 73.*
15. Graff, M.M., and **T.B. Hanley**. 1976. *Rock Trails in Central Park*, Greensward Foundation, NY.

Presentations:

1. Fourth Annual Conference on the Americas. 2001. Savannah, GA. Presented Paper: Chemical study of rocks from the Mamoni River valley of eastern Panama.
2. Geological Society of America. 2001. Presented paper: Geochemical, petrological and field study of the Motts gneiss and other lineated gneisses in the Uchee belt of western Georgia and eastern Alabama.
3. Geological Society of America. 2001. Presented paper: SE maps: a hands-on integrated curriculum package introducing remote sensing technology to the secondary school classroom.
4. Geological Society of America. 2000. Presented paper: Hydrogarnet mineral recalculation program and ternary classification diagram exemplified by Uchee belt coronites in western Georgia.
5. Geological Society of America. 2000. Presented paper: Petrographic and geochemical study of rocks from eastern Panama: an Atlanta Consortium of Research in Earth Sciences (ACRES) progress report.
6. Geological Society of America. 2000. Presented paper: Geological and geochemical study of gneisses, amphibolites, and additional rocks in the Uchee belt of western Georgia and eastern Alabama: an Atlanta Consortium of Research in Earth Sciences (ACRES) progress report.
7. Geological Society of America. 2000. Presented Paper: Allaghanian K-Ar ages from texturally distinctive biotite-rich lithologies in the central Uchee belt of western Georgia.
8. Geological Society of America. 2000. Presented paper: SE Maps in Georgia: strategies and currently developed geologic sites in Coastal Georgia, the Atlanta Metropolitan area and Pine Mountain.

9. Geological Society of America. 2000. Presented paper: Geochemistry of gneisses and amphibolites in the Uchee belt of western Georgia and eastern Alabama: an ACRES progress report.
10. Geological Society of America. 1999. Presented paper: SE MAPS in Georgia: Coastal Georgia, Atlanta urban sprawl, Stone Mountain, Soapstone Ridge, and Pine Mountain.
11. Geological Society of America. 1999. Presented Paper: a small ultramafic body west of the Talbotton Fault in eastern Harris County, Georgia.
12. Geological Society of America. 1999. Presented Paper: Petrology and mineral chemistry of calc-silicates from the Uchee Belt, Columbus, Georgia.
13. Geological Society of America. 1993. Presented paper: Down to the southeast kinematic indicators associated with the Goat Rock fault and gneisses to the south.
14. Geological Society of America. 1993. Presented paper: Geology of the southernmost Piedmont from Columbus to Junction City, GA.
15. Geological Society of America. 1991. Presented paper: Are Carolina/Avalon Terrane rocks exposed in Alabama.
16. Geological Society of America. 1990. Presented paper: Structural investigations of the Lake Oliver synform, Uchee Belt, Alabama and Georgia.
17. Geological Society of America. 1989. Presented paper: Integrating social studies, language arts and mathematics into a sixth grade geological field trip across the Fall Line.
18. Geological Society of America. 1989. Presented paper: Present status of geological quadrangle maps of the southern Alabama Piedmont.
19. Geological Society of America. 1989. Presented paper: Observations on late-Paleozoic southeast-directed structures associated with the Goat Rock fault zone, Alabama and Georgia.
20. EOS. 1988. Amphibolite facies metamorphism in the Uchee belt of the southern Piedmont: P-T constraints at the garnet isograde.
21. Geological Society of America. 1986. Presented paper: Petrochemistry of Amphibolites from the Uchee Belt, Southern Appalachian Piedmont.
22. Geological Society of America. 1982. Presented paper: Deformed masses in the Uchee Belt: evidence of its early nature.
23. Geological Society of America. 1981. Presented paper: Zones of cataclasis and high ductility in the Uchee Belt rocks, north Muscogee County (Columbus), Georgia.
24. Geological Society of America. 1980. Presented paper: Coastal Plain and Piedmont geology of Muscogee County (Columbus), Georgia, and vicinity.

25. Geological Society of America. 1979. Presented paper: The crystalline rocks of Muscogee County (Columbus), westcentral Georgia: a preliminary report of their structure and petrography.
26. International Geological Correlation Project. 1979. Red Lodge, MT. Presented Paper: Geochemistry of high grade metamorphosed basaltic dikes of the Tobacco Root Precambrian rocks of the Beartooth Mountains.
27. Geological Society of America. 1976. Presented paper: Almandine-amphibolite faceis metamorphosed basalts of the Tobacco Root Mountains, Madison County, Montana.
28. Geological Society of America. 1975. Presented paper: Precambrian rocks of the Tobacco Root Mountains, Madison County, Montana.

5. Service

Along with two representatives each from Biology and Chemistry/Geology, all full-time faculty in the Department of Environmental and Health Science serve on the Environmental Science Advisory Committee. This committee evaluates the graduate program on a regular basis, suggests changes in program content, reviews applications for the graduate program, and assigns graduate teaching assistantships. In addition, individual faculty participating in the graduate program in the environmental science serve on various university and college committees as well as serving the community and specific disciplines' professional organizations and scientific journals.

Individual Service Contributions

Since the fall semester, 1996, current full-time faculty in the department and other faculty having a major role in the graduate program have served in the following service activities:

James A. Gore

College/University Service

1. Department Chair, Department of Environmental and Health Sciences, 1999-2003
2. Program Director, Graduate Program in Environmental Science, 1996-2003
3. Academic Technology Utilization Committee, 1996-1998
4. Graduate Council, 1996-2003; Secretary 1999-2001
5. College of Science Curriculum Committee 1998-2003
6. College of Science Post-Tenure Review Committee, 1998-2003
7. College of Science Personnel Committee, 1998-2003
8. College of Science Search Committee, 1998-2002

9. University Comprehensive Program Review Committee, 2000-2002
10. University Graduation and Special Events Committee; 2002-2004; Faculty Marshal, 2002-2003

Community Service

1. Chamber of Commerce Environmental Committee 1996-2003; Program Committee Chair, 1996-1997
2. Judge, Greater Columbus Regional Science Fair 1996-2003
3. Presentations to Columbus Rotary Club, 1999, 2000

Professional Service

1. Journal Manuscript Referee
   Ecology (1996)
   Hydrobiologia (1997, 1999, 2001-02)
   Ecological Monographs (1996)
   Canadian Journal of Fisheries and Aquatic Science (1998, 2000)
   Journal of the North American Benthological Society (1995, 1998-2000, 2003)
   River Research and Applications (formerly *Regulated Rivers* (1995 - 2003)
   Rivers (1995 - 2001)
   Transactions of the American Fisheries Society (1998, 2000)
   Aquatic Conservation (1997, 1999)
   Wetlands (1995, 1997)
   Limnology & Oceanography (1996)
   Journal of Restoration Ecology (1997)
   Freshwater Biology (1998)
   New Zealand Journal of Marine and Freshwater Research (1998)
   Marine and Freshwater Research (Australia) (1999)
   Ecological Engineering (1999)
   Basic and Applied Ecology (2001)
   Archiv für Hydrobiologie (2001)
   Journal of Applied Ecology (2003)
2. Text Chapter Referee:
   DYNAMICS OF SHALLOW LAKE COMMUNITIES by Marten Scheffer (1995) [Chapman & Hall, London]
   ECOLOGY AND MANAGEMENT OF STREAMS IN RIVERS IN THE PACIFIC NORTHWEST COAST ECOREGION by R.J. Naiman and R.E. Bilby (1997) [Univ. of Washington Press]
3. Member, Working Group for Technical Guidance on Large Rivers, U.S. Environmental Protection Agency
4. Proposal Referee:
   National Science Foundation (1996, 1998, 2000, 2002, 2003)
   - Ecology Section (1996, 1998, 2000, 2002)
   - Hydrology Section (1998, 2000, 2003)
   - Geology and Paleontology Section (2003)

Natural Environment Research Council (Great Britain) (1998-2001)
U.S. Dept. of Interior, Bureau of Reclamation (1996)
U.S. Environmental Protection Agency (1997, 2000, 2001)
Water Environment Research Federation (2002)
U.S. Army Corps of Engineers (2003)

5. Board of Editors:
   (1) *Regulated Rivers: Research & Management* (Wiley) (1995-2003)
   (2) *Rivers: Studies in the Science, Environmental Policy, and Law of Instream Flow* (Allen Press). (1995-2001)
6. Associate Editor: *River Research and Applications* (Wiley) [formerly: *Regulated Rivers: Research & Management*] – (2002-Present)
7. The Nature Conservancy of Georgia, Technical Advisory Committee for Fort Benning Reservation's Integrated Natural Resource Management Plan. (1998-1999)
8. Organizing Committee: Seventh International Symposium on Regulated Streams - Chattanooga, TN. (1996-1997)
9. Scientific Committee: National Conference on Management of Landscapes Disturbed by Channel Incision (Sponsored by USDA National Sedimentation Lab and US Army Corps of Engineers), Oxford, MS. (1996-1997)
10. Scientific Advisory Panel: Water Environment Research Foundation. Project 98-HHE-6, "Assessment of Ecosystem Effects Relative to the Scale and Dynamics of Large River Systems" (1999-2000)
11. Advisory Panel on watershed restoration - State of North Carolina, Department of Forestry. (1999-2000)
12. Invited Panelist: U.S. EPA and Water Environment Federation Workshop: Assessment of Ecosystem Effects Relative to the Scale and Dynamics of Large Rivers (2001)
13. Scientific Advisory Board – United Nations/UNESCO – International Hydrology Program (IHP) – section on ecohydrology (1999-Present)
14. Consultant Biologist/Hydrologist. 2003.
    1) Southwest Florida Water Management District. IFIM and PHABSIM workshop for SWFMD and Florida Wildlife and Fisheries Conservation Commission personnel
15. Consultant Biologist/Hydrologist. 2002.
    1) U.S. Environmental Protection Agency. National Center for Environmental Research. Peer Review Panel. Proposal reviews for: *Futures: Ecosystem Assessment and Effects* – Washington, DC.
    2) Wyoming Outdoor Council. Review: Draft Environmental Impact Statement for the Powder River Coalbed Methane.
    3) Expert Panel Member. Pacific Rivers Council. Regional Conservation Plan for Rivers of the Southeast. Chattanooga, TN.
    4) CALFED Bay-Delta Program's Ecosystem Restoration Program. Proposal reviews.

5) Southwest Florida Water Management District. Peer review committee on minimum flow analysis of the Upper Peace River. (Committee Chair)

16. Consultant Biologist/Hydrologist. 2001.
    1) Virginia Power & Light - instream flow reservations for relicensing of hydropower facilities on the Roanoke River in North Carolina and Virginia.
    2) Nantahala Power & Light – time series analysis of habitat availability and bottlenecks on Queens Creek and South Yadkin River
    3) Upper Chattahoochee River Keeper – instream flow analysis of water withdrawal by Georgia Power at Plant Wansley
17. Consultant Biologist/Hydrologist. 2000.
    1) Virginia Power & Light - instream flow reservations for relicensing of hydropower facilities on the Roanoke River in North Carolina and Virginia.
    2) Nantahala Power & Light – time series analysis of habitat availability and bottlenecks on Queens Creek and South Yadkin River
18. Consultant Biologist/Hydrologist. 1999.
    1) Virginia Power & Light - instream flow reservations for relicensing of hydropower facilities on the Roanoke River in North Carolina and Virginia.
19. Consultant Biologist/Hydrologist. 1998.
    1) Virginia Power & Light - instream flow reservations for relicensing of hydropower facilities on the Roanoke River in North Carolina and Virginia.
20. Consultant Biologist/Hydrologist. 1997.
    1) City of Gatlinberg and City of Sevierville, TN - minimum flow evaluations for the Pigeon River
    2) South Florida Water Management District - macroinvertebrate surveys in isolated wetlands project - specifically taxonomic identification and analysis of distribution of chironomid larvae
    2) Virginia Power & Light - instream flow reservations for relicensing of hydropower facilities on the Roanoke River in North Carolina and Virginia.
21. Constultant Biologist/Hydrologist. 1996.
    1) City of Gatlinberg and City of Sevierville, TN - minimum flow evaluations for the Pigeon River
    2) Bureau of Reclamation - review of proposals for research on controlled flood releases downstream of Glen Canyon Dam, Arizona
    3) Virginia Water Resources Research Center - review of proposals for research sponsored by the U.S. Geological Survey
    4) Nantahala Power and Light (North Carolina) - evaluation of instream flow studies of hydropower relicensing

5) U.S. Environmental Protection Agency - National peer review panel - Risk Management Plan for Ecosystem Restoration in Watersheds
6) South Florida Water Management District - macroinvertebrate surveys in isolated wetlands project - specifically taxonomic identification and analysis of distribution of chironomid larvae

22. Consultant Biologist/Hydrologist - 1995
    1) Texas Parks and Wildlife Department, Texas Water Development Board, Texas Natural Resource Conservation Commission - Instream Flow Task Force of the Ecological Water Needs Technical Advisory Committee
    2) USDA - Agricultural Research Service - Atlanta, GA - Regional Vision Development Conference
    3) City of Hendersonville, NC - instream flow reservations on the Mills River and tributaries
    4) Virginia Power & Light - instream flow reservations for relicensing of hydropower facilities on the Roanoke River in North Carolina and Virginia.

Harlan J. Hendricks

College/university Service:

1. Faculty Senate (2002-present)
2. Webmaster, Department of Biology (http://bio.colstate.edu/) (2001-present)
3. Admission Appeals Committee (2001-present)
4. Chair, Environmental Health and Safety Committee, College of Science (2001-present)
5. Facilities and Safety Committee (Chair 2003, Member 2000-present,)
6. Botany Faculty Search Committee, Department of Biology (2003)
7. Anatomy and Physiology Faculty Search Committee, Department of Biology (2002)
8. Administrative Coordinator of Operations and Services Search Committee, Oxbow Meadows Environmental Learning Center (2002)
9. College of Science Curriculum Committee (2000-present)
10. Faculty Representative, University Visitation Day (2001)
11. Science Education Faculty Search Committee, College of Education (2001)
12. Principles of Biology Textbook Committee (Chair 2003, Member 2000)
13. Acting Science Education Coordinator, College of Education (Fall 2000)
    a. Advised graduate students, reviewed and updated approved curriculum requirements, updated such requirements on the College of Education's website.
14. Faculty Representative, Student Information Desk (Spring 2000)
15. Assistant, Midnight Madness (2000)

Community Service:

1. Guest speaker at Career Fair for Reese Road Elementary (2003), Clubview Elementary (2003), Chattahoochee County Elementary (2002)
2. Organizing Committee member, Help the Hooch River Cleanup (2001)
3. Volunteer, Help the Hooch River Cleanup (2002)
4. Judge, Richards Middle School Science Fair (2001)
5. Judge, Columbus Regional Science and Engineering Fair (1998-2001)
6. Presenter, Oxbow Meadows Environmental Learning Center's Insectival (2001-2002)
7. Presented program on spiders and other arthropods for students at Reese Road Elementary (2000, 2001), Calvary Christian School (1999) McKenzie Special School District, Tennessee (1993-1997), Montgomery County School District, Virginia (1989-1992)
8. Developed and monitored the Bugs and Stuff display at the Coca Cola Space Science Center's Super Saturday (1999-2000)
9. Member, Reese Road Elementary School's Environment Committee (1998-2000)
10. Served as Assistant Coach, McKenzie Soccer League, 5-6 age division, Tennessee (1996-1997)

Professional Service:

1. Peer reviewed the manuscript entitled, "On the distribution of *Phenacoccus yerushalmi* Ben-Dov (Hemiptera: Coccoidea: Pseudococcidae) in the Mediterranean Basin," by Y. Ben-Dov and D. Matile-Ferrero; submitted to the journal Phytoparasitica (2000)
2. Consulted with Dow AgroSciences in the study of fungal inhibitors in termite baits (2000)
3. Identified the macroinvertebrates in armadillo gut contents for Tony Griffin's senior research project (2000-2002)
4. Attended the annual meeting for the State of the Art in Biology (1998-2000, 2002)
5. Attended the "Infusing Technology into the Teaching Learning Process: A Multimedia, Internet-Based Model" workshop at Clayton College and State University (1998).
6. Peer reviewed the article entitled, "*Melzeria horni* Green (Hemiptera: Coccoidea: Eriococcidae): Redescription of a poorly known felt scale," by D.R. Miller and D.J. Williams; submitted to the Proceedings of the Entomological Society of Washington (1997)
7. Work Supervisor, Internship of Ms. Lessly Williams, Biology Laboratory Manager of Bethel College (1996)

Warren B. Church

College/University Service:

1. Curriculum Committee, Columbus State University
2. University Library Committee, Columbus State University

3. Latin American Studies Committee, Center for International Education Program, Columbus State University
4. Student Scholarship Committee, Center for International Education Program, Columbus State University
5. Institutional Animal Care and Use Committee
6. Chair, Search Committee for faculty position in Pubic Health, year 2000-2001.
7. Search Committee for faculty position in Anthropology/Sociology, year 2000-2001.
8. Search Committee for faculty position in Sociology year, 2001-2002.

Community Service:

1. Presentations on archaeology to Boulder, Colorado and Columbus, Georgia Area Preschool, Elementary, Middle and High school students. 1983-Present.
2. Public lecture at the Instituto Nacional de Cultura, Trujillo, Peru. "Investigaciones Arqueológicas en el Parque Nacional Río Abiseo: 1985-1990." 1990.
3. Lecture to Pre-Columbian Society, Washington, DC. "Gran Pajatén: Cloud Forest Colony or Cloud Forest Crossroads?" 1997.
4. Public lecture at the Instituto Nacional de Cultura, Trujillo, Peru. "Abiseo: Una Prehistoria para la Ceja de Selva del Perú." 1998.0
5. Public lecture at the Town Hall, Pataz, Peru. "La Importacia Arqueológica de Pataz." 2000.

Professional Service:

1. Society for American Archaeology: Committee on the Americas Advisory Network
2. Manuscript reviews for journals *Latin American Antiquity, Science* and *Andean Past*.
3. Textbook reviews for Prentice Hall, Inc.
4. Grant proposal reviews for Wenner-Gren Foundation for Anthropological Research and National Geographic Society.

Julie A. Ballenger

College/University Service:

Community Service:

1. **Medicinal Plants** – Lynnhaven Botanical Club - 2003
2. **Department of Biology senior research opportunities** – Harris County High School Biology Club- 2002
3. **CSU International Ecology Courses** (Africa, Ecuador and Andros Island) – Harris County High School - 2002
4. **Sub Saharan Africa** – Beta Beta Beta, Columbus State University - 2002
5. **Sights and Sounds of Africa** – Pella Community Schools, Pella, Iowa - 2001

6. **Tropical Ecology of Andros Island, Bahamas** – Beta Beta Beta, Columbus State University - 2001
7. **Andros Island** - formal tea, future honors students and parents - 1999
8. **Ecology of the Bahamas; an Andros perspective** – Beta Beta Beta presentation, Columbus State University, Columbus, Georgia. - 1998
9. **"Saving the Rainforest - examples from Panama"** - presented to Webster Elementary School, Pella, Iowa (May), Harris County Garden Club, Hamilton, Georgia (June), Beta Beta Beta, Columbus State University, Columbus Georgia (October). - 1998
10. **American Association of University Women** - "Girls Can" - hands - on DNA presentation; Columbus State University, Columbus, Georgia - 1996
11. **"Redbuds"** - presented to the Alabama Wildflower Association - Auburn, Alabama - 1995
12. **"From Flower to Fruit to Seed"**, presented to Girls' Inc. of Columbus - Columbus, Georgia. - 1995

William S. Birkhead

College/University Service

1. Chair, Committee on Institutional Purpose, SACS Self-Study, 1993 – Present.
2. Interim Chair, Department of Biology, 2003 – Present.
3. Faculty Senate: Chair, Committee on Committees, 1987; Executive Committee, 1989; Chair, Committee on Elections, 2002.
4. Assistant Chair, Department of Biology, 1997-2003.
5. Chair, Athletic committee, 1996-2003.
6. Local Advisor, *Beta Beta Beta*, 1993-2003.
7. Acting Director, Master of Science in Environmental Science, 1994-1995.
8. Chair, Strategic Planning Commission, 1990-1995.
9. Chair, Baccalaureate Nursing Faculty Search Committee, 1985-1988.
10. Chair, Director of the Library Search and Screening Committee, 1982-1983.
11. Treasurer, Columbus College Chapter, American Association of University Professors, 1980.

Community Service

1. Hamilton Planning Commission, 1987-1997; 1998-Present
2. Columbus Chapter of the National Audubon Society: President, 1982-1984; Chapter representative, national meeting, 1985; chapter representative, regional meeting, 1986.
3. Harris County Recreation Board, 1982-1984.

Professional Service

1. Region Coordinator and Steering Committee member for the *Georgia Breeding Bird Atlas*. 1994 – Present.

2. Technical Committee Member, Georgia Important Bird Areas, 2001 – Present.
3. Co-chair of the Gopher Tortoise Council, 1994-1996; State representative, 1997–Present; Student research award committee, 1997-Present.
4. Georgia Department of Natural Resources, Wildlife Resources Division Non-game Advisory Committee Member, 1998 – Present.
5. Georgia Ornithological Society, Editorial Board Member for *The Oriole*, 1999.
6. The Nature Conservancy of Georgia, Technical Advisory Committee for Fort Benning Reservation's Integrated Natural Resource Management Plan, 1998-1999.
7. Columbus Chamber of Commerce Environmental Committee, 1995-1996.
8. Georgia Herpetological Steering Committee, 1983-1986.

Arthur G. Cleveland

College/University Service

1. State Chair, Arts and Science Deans Advisor Council for the University System of Georgia Board of Regents (2000 – 2002)
2. Co-chair, State Education Preparation Advisory Council (2001-02)
3. International Board of Examiners, Genetic Computer Educational Group (Singapore)
4. Visitor (Reaffirmation), Southern Association of Colleges and Schools (2000- present).
5. Annual Fund Solicitor for Columbus State Foundation (Business and Industry)
6. Planning for Technology and Commerce Building ($16 million) (Completed 2003)
7. Planning/program design for two classroom/technology buildings at Columbus State (1997)
8. Leadership for Columbus State University Space Science Center and Observatory (1997 – 01)
9. Member of the Library Construction Committee for the West Library at Texas Wesleyan University (Faculty Representative) ($8,000,000) Completed May 1988.
10. Chair, College Appeals Board, Texas Wesleyan University (1974-75)
11. Member, Graduate Council, Incarnate Word College (1990-1994)
12. Member of multiple committees over the years including: Trustee - Faculty, Presidential Inauguration, Science Center Construction, Physical and Capital Facilities Planning, Student Life, Tenure and Privilege (5 years, Chair 1986-7), Recruitment, Library Dedication, Nomination, Graduate Affairs, Program Evaluation, Computer Infrastructure, Computer Resources, Accreditation Committees, and Teacher Education Councils.
13. Attended American Council on Education Program on "Academic Departments" for Deans, Division and Department Chairs (1991)

14. Participated in the Georgia Conference on Planned Giving (1995)
15. Graduated, Leadership Columbus Class of 1997-8 (Columbus, Georgia)

Community Service

1. Board Member, Twin Cedars Youth Services of Georgia, currently Chair of the Development Committee and member of the Long-range Planning Committee (2000-present)
2. Board Member, Beacon Theological Seminary, Columbus, Georgia (1998 - 2000)
3. Co-Organizer of the 1997 International Sports Medicine Symposium, Columbus, Georgia
4. Board Member, Chattahoochee Riverkeeper (1996-98)

Professional Service

1. Board Member, State Consortium of Gerontology (Georgia) (1998 - present)
2. Board Member, Zungarococha Research Center Foundation, Iquitos, Peru (1998 - 2002)
3. Columbus representative to the Central Georgia Air Quality Advisory Board (2000 –present)
4. Member, Columbus Environmental Task Force and Executive Committee (1999- present)
5. Vice-Director of the Board, Texas System of Natural Laboratories (1992 - 93)
6. Board Member, Southwestern Association of Naturalists (1979 - 86)
7. Chair, Development Committee, Southwestern Association of Naturalists (1989 - 95)
8. President, North Texas Biological Society (1977-78)
9. President, Texas Society of Mammalogists (1992-93)
10. Secretary -Treasurer, Texas Society of Mammalogists (1981-91)
11. President -Elect, Texas Society of Mammalogists (1991)
12. Reviewer of scientific journals including *National Geographic, Journal of Mammalogy, Southwestern Naturalist, Journal of Tropical Ecology and Texas Journal of Science.*

George E. Stanton

College/University Service

1. Twice led departmental reforms of biology curricula
2. Servant Leadership Faculty Advisory Committee, Columbus State University (2001-2003)
3. Have contributed to the University System Academic Advisory Committee in biology and have contributed to leadership of SOTAB (20 year-old faculty development program for biologists)
4. Member of Educator Preparation Program Council (EPPC) (2000-2002)

5. Chair, P-16 Reform Committee on Science (1997-1999)
6. Chair, College of Education Council (1997-1999)
7. Co-author of successful proposal for MS in environmental science at Columbus State Univ. (1990-1991)
8. Developed concept and helped establish the Center for Excellence in Mathematics and Science Education (CEMSE) at CSU (1989-1990)
9. Developed a science enrichment program (**Science Challenge**) in stream ecology for high ability high school students; director of this program for four years, two of which were funded by the NSF Young Scholars Program (1988-1991)
10. Wrote Columbus College proposal acquiring 182 surplus acres from Ft. Benning for outdoor education (1974-1975) and negotiated bequest of 82 acres in Harris County and 4 acres in Marion County for environmental education

Community Service

1. Worked with Billy Turner, President, Columbus Water Works, to develop vision for Oxbow Meadows Environmental Learning Center and Park; Developed educational mission plan for learning center; Served as volunteer (no pay nor released time) director of learning center from 1995-1997)
2. Liaison to Muscogee County School District **Adopt-A-School Program** (1991-1992); Chaired task force to develop proposal to reduce drop-out rate [*Yes Program*] in public schools (1988)
3. **Muscogee County Board of Education** member (1976-1980 and 1982-1987) of Board responsible for management of over 30 schools, a regional library system and the Columbus Museum, **President** (1986-1987); **First Vice President** (1985); **Curriculum Committee Chair** (5 years), **Planning Committee Chair** (2 years), Teacher's Committee, Museum Committee; Regional Library Board in the 70's, while chair of the Curriculum Committee, we unified the secondary school curriculum for seven high schools, implemented system-wide, written courses of study for all district courses, added a required high school course in environmental science, built Patterson Planetarium, increased curricular and credit-hour requirements for graduation, and piloted an award-winning health education program (HIP) in the science curriculum; during my terms as President we passed a public referendum for an $18,000,000 bond issue to air-condition all schools;
4. Columbus Ledger-Enquirer **Page One Awards** Science Judge in 1987, 1989 and 1991; wrote an environmental column in newspaper for a year

5. Served **Georgia Science and Engineering Fair** eight times as a judge; Head Judge for Life Science Division (1987 and 1988), Tier Leader Judge for Senior Zoology (1985 and 1986); conducted workshops for students and teachers on preparation of science fair projects; instrumental in moving Columbus Science Fair onto campus and expanding it to become a regional science fair, served as judge and official to the **Greater Columbus Regional Science and Engineering Fair**

Professional Service

1. Chair of the **Tree Board**, Columbus, GA (2003-Present)
2. Board of Directors and Executive Committee of **Trees Columbus, Inc.** (2001-2003)
3. Appointed to City of Columbus Tree Board (2003)
4. Chaired Columbus College Scholastic Honors Committee (1981-1993; 2001-2003)
5. Columbus State University Liaison to **Council on Undergraduate Research** (1995-2003)
6. Participated in establishment of **Chattahoochee River Keeper**; Board of Directors (1992-1996)
7. Local arrangements committee for meeting of the **American Society of Zoologists** (1991)
8. Chaired Student Award Committee of the **Association of Southeastern Biologists** (1990); on committee (1988-1990); Conservation correspondent (1976)
9. Served for ten years on **Muscogee County Board of Education**, including 5 years as chair of curriculum committee and a term as President (1976-1980; 1982-1987)
10. Smithsonian Visiting Associate (1986), spending a week working with Smithsonian staff toward the development of approaches to attract minority participation in Smithsonian programs
11. Worked with Horton H. Hobbs at the Smithsonian National Museum of Natural History, Department of Invertebrate Zoology, Crustacean Section, on crayfish (1982)
12. Buell Award Judge, **Ecological Society of America** (1982)
13. Member of Editorial Board of the ***Journal of Freshwater Ecology*** (1988-1992), reviewed manuscripts (1985-1988), reviewed manuscripts for the ***Journal of Entomological Science*** (1976-1988), reviewed films for ***A.A.A.S. Science Books and Films***
14. Secretary of **Georgia Academy of Science** and Representative to the **American Association for the Advancement of Science** (1991-1996), chaired biology section (1987 and 1988), section secretary (1986), local arrangements chair for annual meeting (1982), organized and moderated annual symposium on *Evolution and Creation*
15. Georgia State Environmental Advisory Commission (1972-1974)
16. Led efforts to establish chapters of Georgia Conservancy and Audubon Society in Columbus (1970-1974)

17. **Columbus Audubon Society**, President (1972-1974 and 1980-1982); **Georgia Conservancy**, Chapter President (1970-1972) Trustee (1972-1975); Nature Conservancy, Georgia Live Oak Member; **Georgia State Environmental Advisory Commission** (1972-1974); **Sierra Club**, Group Conservation Chair (1991-1992); Advised Harris County, Georgia, Georgia 2000, Environmental Concepts Committee (1988); Citizens' Advisory Board, Columbus-Phenix City Transportation Study (1972-1976).

Glenn D. Stokes

College/University Service:

1. College:
   Retention Task Force (1985-1986)
   Statistical analysis of student survey.
   Faculty Senate (1986-1990)
   Student Rights and Responsibilities (1985-1987, 1992-1993,1998-1999)
   Readmissions Appeals (1984-1995, chair 1988-1992)
   Turner Mini-grant (1983-1986)
   Turner Grant Committee (1986-1987, 1994-1997)
   Human Subjects Committee (1987-1988)
   Assistant Director of Development Search Committee (1990)
   President's Home Committee (1989, chair)
   Childcare Center Committee (1989-1990)
   School of Education Dean's Advisory Committee (1992-1993)
   College Assessment Committee (1992-1993)
   SACS Administrative Process Committee (1993-1994)
   Banner Conversion Steering Committee (1995-2000)
   Columbus Technical Institute Articulation Committee (1995-1996)
   Faculty Athletic Representative to the NCAA (1993-present)
   Athletic Committee (1993-present)
   Academic Standards Committee (1994-1995)
   General Assessment Committee (1993-1995)
   Tower Director Search Committee (1995)
   Semester Catalog Conversion Committee (1997-2000)
   Semester Schedule Committee (1997-1998)
   Honors Program Committee (1997-2000)
   Physical Education Complex Planning Committee (1996-1998)
   Baseball Coach Search Committee (1997)
   Developed proposals for cooperative Occupational Therapy and Family Nurse Practitioner program with the Medical College of Georgia, 1996-1998.
   Technology Plan Task Force, 1999-2000
   Technology Utilization Committee, 1999-2001
   Honors Scholarship Committee, 1999-2003
   Web Utilization Committee, 1998-2003

Athletic Enhancement Task Force, 1999-2000
Peachbelt Athletic Conference Strategic Action Committee, 1998-2003
State Charitable Contributions Committee, Science Rep., 1999
Orientation Committee, 1998-present (Chair of Academic Session)
Visitation Day Committee, 1999-2001
University Marketing Committee, 2000-2001.
Chair of Financial Aid Subcommittee
University Capital Campaign Advisory Committee, 2000-2001
Chair of the Science, Math and Technology Education Committee
Language and Literature Chair, Search Committee, 2000-2001.
Faculty Representative for the 2002-2003 Annual Fund.
Honorary Degree Committee, 1998-2003

2. School/College of Science:
   Curriculum Committee (1985-present, presiding chair 1993-present)
   School Personnel Committee (1989-90)
   Chemistry Chair Search Committee (1990)
   Nursing Chair Search Committee (1990)
   Computer Utilization Committee, Chair (1990-1993)
   Dean Search Committee (1994)
   Environmental Science Director Search, Chair (1995-1996)
   Developed proposal for Cooperative Nurse Practitioner program (1995)
   Developed proposal for Cooperative Occupational Therapy program (1996)
   Served on three graduate thesis committees
   College of Science Web Master (1998-2003)
3. Departmental:
   Curriculum Committee (Chairman 1985-1986)
   Student Relations (Chairman 1984-1985)
   Equipment Committee (1983-1985, 1987-1988, 1990-1992, current Chairman)
   Personnel Committee (1989-1990)
   Faculty Search Committees (1993-1996)
   New faculty mentor, 1999.
   Pre-professional Advisory Committee (2002-2003)
4. Regional:
   Columbus College Chapter of Phi Kappa Phi Honor Society
   Board Vice President 1985-1986
   Board President 1986-1987
   Treasurer 2001-2003
   College representative to the State Arts and Sciences Dean's Council. 1992-2000.
5. State:
   CCSO-Mellon Project Committee for Public School Teacher Recruitment, Georgia
   Dept. of Education 1986-1987

Community Service:

1. Judged Local Science Fair competitions at High School level every year
2. Regional Science Fair judge. Also collected $200 in contributions for the Science
3. Fair winners, 1985-1986.
4. Tier II Judge at the State Science Fair, 1987-1988.
5. United Way Fund Drive Representative, 1983.
6. Baldwin Co. Big Brother/Big Sister Board of Directors, 1981-1983.
7. Judge for the Life Science Bowl, 1984.
8. Lectures to area elementary school science classes, yearly.
9. High School and College sports physicals for Spring and Fall. In conjunction with
10. the Hughston Sports Medicine Foundation, 1983-1986.
11. Nominated to run for Muscogee County School Board by former students.
12. Program chair for first annual TEAMS competition, committee member 1988-1992.
13. Science Olympiad judge, 1988-1991. Event coordinator, 1997-present.
14. Science Program Coordinator for Jr. Leadership Columbus, 1991.
15. Science Magnet School Development Committee, Muscogee Co. School District, 1991-1992.
16. Callaway Chemical Science Day presenter 1994-1997.
17. Program presentation to Muscogee Co. Summer program camps, 1997.
18. Running for the Board of Directors of the Columbus Youth Soccer Association, 1998. President, 1998. Current member.

Jeffrey A. Zuiderveen

College/University Service

1. Faculty Senate, elected for 2000-2003 (3 year term)
   2001: Member of their Committee on Committees
   Member of their Special Committee to develop an Honor Code
   2002 & 2003: Executive Officer
2. Worked to develop and provide a Kaplan course for students preparing to take the MCAT to enter medical school. There was some monetary remuneration, but I taught the course mainly because students from this area (even ones not attending CSU but living in Columbus) were having to travel over an hour to get preparation I felt could and should be offered at CSU.
3. Animal Care and Use Committee, 1995-present.
   Chair: 1995-2001
4. Benefits Committee, 1999-present.
5. Honor Scholarship Committee, 1995-1998.
6. Personnel Committees (Department and College of Science), 2000.
7. Preprofessional Advisory Committee, 1994-present.

8. Publications Committee, 1995-1997, 2001-2002.
   Chair: 1996-97
9. Recruitment and Retention Committee, 1995.
10. Strategic Planning Commission, 1997-2002.
11. Faculty Affairs Assessment Committee.
    1995: Gathered and summarized faculty opinion on performance evaluations, annual salary adjustments, as well as promotion and tenure procedure and policies.
    1996: Developed drafts of policies for pre- and post-tenure review policies.

Community Service

1. Judge for the Regional Science Olympiad ('97-'99, '02, '03)
2. Co-coordinator for the Regional Science Olympiad (2/00)
3. State Science Olympiad (2001)
4. Judge in the Greater Columbus Area Regional Science Fair (annually 1995-03)
5. Judge in local Science Fair at Harris County Middle School (2002)
6. Judge in local Science Fair at Calvary Christian High School (1999-2001)
7. Member of the Columbus Community Greenspace Committee (2000)
8. Chair - Subcommittee for the Development of Regulations and Legal Issues (as related to the Greenspace grant application)
9. Member of the Greater Columbus Georgia's Chamber of Commerce Environmental Committee (1999-present)
10. Attended the Flint River Riverkeeper's meeting and agreed to act as their toxicological advisor concerning the impacts of proposed industrial discharges into the Flint River (8/99)
11. Speaker at the Oxbow Meadow's Second Sunday series (2/99 - on the comparative anatomy of vertebrate hearts)
12. Member of the Phoenix City Exchange Club Selection Committee ('95, '96) which chose the outstanding High School Student from the Phoenix City area
13. Adopt-A-Stream faculty advisor ('95, '96)

Professional Service

1. Initially coordinator, then (11/02) elected President of the Ad Hoc Committee to recreate the Southeastern Regional Chapter of the Society of Toxicology and Chemistry. (It had been defunct for approximately 3 years) Our first annual meeting is scheduled for June 2003 at CSU
2. Reviewer for *River Research and Applications* (2002-03)
3. Participant in the Georgia Initiative in Mathematics and Science (GIMS) Roundtable Discussion (2/97)

4. Speaker at the 1996 Georgia Water and Pollution Control Association Youth Conference (8/96)

Appendix 1

Quantitative Measures

Columbus State University Comprehensive Program Review
Department of Environmental and Health Sciences
Program: MS in Environmental Science
Quantitative Measures

Measure	1999/2000	2000/2001	2001/2002	2002/2003
Number of Declared Majors – Fall Semester				
MS Environmental Science				
Full-Time	12	10	8	11
Part-Time	15	14	10	4
Total	27	24	18	15
Number of Degrees Conferred – Fiscal Year				
MS Environmental Science	1	3	4	4
Credit Hour Production – Fall Semester				
Below 1000 Level Courses	0	0	0	0
1000 Level Courses	306	369	441	483
2000 Level Courses	0	0	0	0
3000 Level Courses	0	0	0	0
4000 Level Courses	0	0	0	0
5000U Courses	0	0	0	0
5000G Courses	69	38	34	34
6000 Level Courses and Above	210	167	207	154
Average Course Enrollment – Fall Semester				
Below 1000 Level Courses	0	0	0	0
1000 Level Courses	34	41	36.8	40.3
2000 Level Courses	0	0	0	0
3000 Level Courses	0	0	0	0
4000 Level Courses	0	0	0	0

Measure	1999/2000	2000/2001	2001/2002	2002/2003
5000U Courses	0	0	0	0
5000G Courses	3.67	5	4.75	3
6000 Level Courses and Above	7.25	7.5	7	7.6
Number of Faculty/Staff by EFT – Fall Semester – Prorated				
Full-Time Faculty	0.75	0.75	0.75	0.75
Part-Time Faculty	0.28	0.23	0.25	0.25
Full-Time Staff	1	1	1	1
Part-Time Staff	.32	0	0	0
Student Assistants	.28	0	0	0
Graduate Assistants	2.88	2.20	8.04	1.84
Prorated Departmental Budget – Fiscal Year				
State Funds	$131,757	$130,042	$81,086	$92,307
Private/Grant Funds	$27,742	$17,565	$88,114	$44,101
Total	$159,499	$147,607	$169,200	$136,408
Prorated Personal Services Budget – Fiscal Year	$155,178	$140,246	$129,179	$125,228
Operating Expense Budget – Fiscal Year	$3,447	$2,632	$33,172	$8,652
Prorated Travel – Fiscal Year	$0	$4,730	$6’849	$2,528
Equipment Expenditures – Fiscal Year	$874	$0	$0	$0
Cost per Major – Fiscal Year	$5,907	$6,150	$9,400	$9,094
(Total Expenditures/Number of Declared Majors)				
Credit Hours Taught Fall and Spring Semesters	1032	1176	2501	1486
(ENVS courses and cross-listed BIOL, CHEM, and GEOL courses)				

Measure	1999/2000	2000/2001	2001/2002	2002/2003
Cost per Credit Hour Fall and Spring Semesters	$738	$499	$671	$394
Program-Specific Scholarship Funds Awarded				
Fall Semester	0	0	0	0
Spring Semester	0	0	0	0
Percent of Non-Productive Grades (i.e., W, WF, F)				
Lower Division Courses	16.46%	12.03%	14.19%	12.99%
Upper Division Courses	0	0	0	0
Graduate Courses	8.93%	7.03%	3.92%	6.99%
Averages for Declared Majors – Fall Semester				
Average GRE Score				
(Verbal and Quantitative)	1069	1037	1033	987
Average Graduate GPA	3.62	3.41	3.60	3.48
Gender				
MS in Environmental Science				
Female	17	13	10	16
Male	20	16	16	14
Total	37	29	26	30
Race/Ethnic				
MS in Environmental Science				
Asian	2	3	3	3
Black	4	5	4	3
Hispanic	1			
Native American				
White	28	19	17	22
Multi-Racial		1	1	1

Measure	1999/2000	2000/2001	2001/2002	2002/2003
Middle Eastern	2		1	1
Total	37	29	26	30
Age				
MS in Environmental Science				
Under 21				
21 – 25	11	4	2	6
26 – 30	15	17	14	11
31 – 40	5	6	5	7
41 – 50	4	2	5	4
51 – 60	2			1
Over 60				1
Total	37	29	26	30
Average	30.88	30.07	32.4	32.8

Appendix 2

Major Programs Assessment

M.S. Environmental Science – 1998/1999

COLUMBUS STATE UNIVERSITY	Anticipated Outcomes	Assessment Method	Assessment Results:	Use of Results:
Statement of Purpose: The Master of Science degree program in environmental Science provides advanced training, education and research opportunities to post-baccalaureate science students living primarily in the Georgia/Alabama region. Graduates of the program are trained to serve as environmental professionals in local, state, and federal environmental resource agencies; in the private sector, as environmental consultants; or are prepared to enter a doctoral program in environmental science or related fields. Primary emphasis is placed upon acquiring a sound background in the underpinning concepts in environmental science, designing and conducting an original piece of research, and effectively communicating these results, in both written and oral forms. These professionals will be able to	**1. An environmental scientist has an understanding of the integration of flows of water on and beneath the surface of the planet with the underpinning knowledge of basic fluid mechanics.** .	• CORE evaluation exam: a comprehensive exam (hydrology, environmental chemistry, environmental geology, environmental issues, environmental law and regulation, and ecological methods) administered at completion of CORE courses • Alumni Survey: a retrospective assessment of the program by graduates currently employed as environmental professionals • Employer Survey: designed to assess the needs of the environmental science	• 90% of students taking the CORE exam have been graded at the acceptable or superior level in all six areas. 10% scored at the unacceptable level in at least one area. Those students were referred to the instructor and the Environmental Science Advisory committee for additional studies and research to supplement background education. • None currently conducted. • Employers have given graduates superior performance appraisals. One employer has	• Revision of individual course content and design of CORE sequence.

critically assess a wide range of environmental issues and create a plan for sound maintenance and/or environmental management.		profession and the ability of this graduate program to provide those skills.	declared that he is willing employ "as many CSU graduates as can be provided."	
	2. An environmental scientist has an understanding of human interactions with the geologic environment, including geologic hazards, as well as resources and waste management.	• CORE Evaluation Exam • Alumni Survey • Employer Survey		• Revision of individual course content and design of CORE sequence.
	3. An environmental scientist has an understanding of basic aquatic and atmospheric chemistry, as well as environmental chemical analysis.	• CORE Evaluation Exam • Alumni Survey • Employer Survey		• Revision of individual course content and design of CORE sequence.
	4. An environmental scientist has an understanding of the basic principles of experimental design and the statistical analysis of environmental data.	• CORE Evaluation Exam • Alumni Survey • Employer Survey • Thesis Preparation and Defense		• Revision of individual course content and design of CORE sequence.

	7. An environmental scientist has an understanding of environmental policy and statutes and how they are translated into regulations and on the factors that affect how they influence environmental decisions.	• CORE Evaluation Exam • Employer Survey • Alumni Survey		• Revision of individual course content and design of CORE sequence.
	8. An environmental scientist has the ability to conduct literature research and prepare both written and oral critiques of environmental science research.	• CORE Evaluation Exam • Employer Survey • Alumni Survey		• Revision of individual course content and design of CORE sequence.
	7. An environmental scientist has the ability to design and conduct and original program of research and monitoring in environmental science, which results in a publishable manuscript.	• Thesis Preparation and Defense: provides direct evidence of the students' ability to design and conduct scientific research, as well as the ability to communicate this information in written and oral forms	• 100% of CSU graduates in environmental science have made at least one presentation at regional or national meetings of professional societies in environmental science 100% of CSU graduates have at least one manuscript published or accepted for publication	• Revision of individual course content and design of CORE sequence.

		• Advisory Committee: consisting of the research director, at least one other member of the environmental science graduate faculty, and one environmental professional from outside the department or university. The committee advises on the student's plan of didactic learning, as well as providing guidance on the design, conduct, and analysis of the thesis research. • Alumni Survey	in refereed scientific and technical journals in environmental science	

M.S. Environmental Science – 1999/2000

COLUMBUS STATE UNIVERSITY	Anticipated Outcomes	Assessment Method	Assessment Results:	Use of Results:
Statement of Purpose: The Master of Science degree program in environmental Science provides advanced training, education and research opportunities to post-baccalaureate science students living primarily in the Georgia/Alabama region. Graduates of the program are trained to serve as environmental professionals in local, state, and federal environmental resource agencies; in the private sector, as environmental consultants; or are prepared to enter a doctoral program in environmental science or related fields. Primary emphasis is placed upon acquiring a sound background in the underpinning concepts in environmental science, designing and conducting an original piece of research, and effectively communicating these results, in both written and oral forms. These professionals will be able to	**1. An environmental scientist has an understanding of the integration of flows of water on and beneath the surface of the planet with the underpinning knowledge of basic fluid mechanics.**	• CORE evaluation exam: a comprehensive exam (hydrology, environmental chemistry, environmental geology, environmental issues, environmental law and regulation, and ecological methods) administered at completion of CORE courses • Alumni Survey: a retrospective assessment of the program by graduates currently employed as	• Five graduate students completed the CORE exam. Three of the students taking the CORE exam have been graded at the superior level in all six areas. One student received acceptable scores in all six areas. One scored at the unacceptable level in at least one area. That student was referred to the instructor and the Environmental Science Advisory committee for additional studies and research to supplement background education. This additional work was completed within one month of assignment. • None currently conducted.	• Revision of individual course content and design of CORE sequence.

critically assess a wide range of environmental issues and create a plan for sound maintenance and/or environmental management.		environmental professionals • Employer Survey: designed to assess the needs of the environmental science profession and the ability of this graduate program to provide those skills.	• Employers have given graduates superior performance appraisals. One employer has declared that he is willing employ "as many CSU graduates as can be provided."	
	2. An environmental scientist has an understanding of human interactions with the geologic environment, including geologic hazards, as well as resources and waste management.	• CORE Evaluation Exam • Alumni Survey • Employer Survey		• Revision of individual course content and design of CORE sequence.
	1. An environmental scientist has an understanding of basic aquatic and atmospheric chemistry, as well as environmental chemical analysis.	• CORE Evaluation Exam • Alumni Survey • Employer Survey		• Revision of individual course content and design of CORE sequence.

	2. An environmental scientist has an understanding of the basic principles of experimental design and the statistical analysis of environmental data.	• CORE Evaluation Exam • Alumni Survey • Employer Survey • Thesis Preparation and Defense		• Revision of individual course content and design of CORE sequence.
	9. An environmental scientist has an understanding of environmental policy and statutes and how they are translated into regulations and on the factors that affect how they influence environmental decisions.	• CORE Evaluation Exam • Employer Survey • Alumni Survey		• Revision of individual course content and design of CORE sequence.
	10. An environmental scientist has the ability to conduct literature research and prepare both written and oral critiques of environmental science research.	• CORE Evaluation Exam • Employer Survey • Alumni Survey		• Revision of individual course content and design of CORE sequence.

	7. An environmental scientist has the ability to design and conduct and original program of research and monitoring in environmental science, which results in a publishable manuscript.	• Thesis Preparation and Defense: provides direct evidence of the students' ability to design and conduct scientific research, as well as the ability to communicate this information in written and oral forms • Advisory Committee: consisting of the research director, at least one other member of the environmental science graduate faculty, and one environmental professional from outside the department or university. The committee advises on the student's plan of didactic learning, as well as providing guidance on the design, conduct, and analysis of the thesis research. • Alumni Survey	• 100% of CSU graduates in environmental science have made at least one presentation at regional or national meetings of professional societies in environmental science 100% of CSU graduates have at least one manuscript published or accepted for publication in refereed scientific and technical journals in environmental science	• Revision of individual course content and design of CORE sequence.

M.S. Environmental Science – 2000/2001

COLUMBUS STATE UNIVERSITY	Anticipated Outcomes	Assessment Method	Assessment Results:	Use of Results:
Statement of Purpose: The Master of Science degree program in environmental Science provides advanced training, education and research opportunities to post-baccalaureate science students living primarily in the Georgia/Alabama region. Graduates of the program are trained to serve as environmental professionals in local, state, and federal environmental resource agencies; in the private sector, as environmental consultants; or are prepared to enter a doctoral program in environmental science or	**1. An environmental scientist has an understanding of the integration of flows of water on and beneath the surface of the planet with the underpinning knowledge of basic fluid mechanics.**	• CORE evaluation exam: a comprehensive exam (hydrology, environmental chemistry, environmental geology, environmental issues, environmental law and regulation, and ecological methods) administered at completion of CORE courses	• Four graduate students completed the CORE exam. One of the students taking the CORE exam has been graded at the superior level in all six areas. One student received acceptable scores in all six areas. Two scored at the unacceptable level in at one area; Environmental Chemistry. Those students were required by the instructor and the Environmental Science Advisory	• Revision of individual course content and design of CORE sequence.

related fields. Primary emphasis is placed upon acquiring a sound background in the underpinning concepts in environmental science, designing and conducting an original piece of research, and effectively communicating these results, in both written and oral forms. These professionals will be able to critically assess a wide range of environmental issues and create a plan for sound maintenance and/or environmental management.		• Alumni Survey: a retrospective assessment of the program by graduates currently employed as environmental professionals • Employer Survey: designed to assess the needs of the environmental science profession and the ability of this	committee to retake that section again. On the additional test, one student passed with an acceptable score. The other student failed a second time and must retake the course and score a grade of "B" or better to satisfy the requirement. • None currently conducted. • None currently conducted	

		graduate program to provide those skills.		
	2. An environmental scientist has an understanding of human interactions with the geologic environment, including geologic hazards, as well as resources and waste management.	• CORE Evaluation Exam • Alumni Survey • Employer Survey		• Revision of individual course content and design of CORE sequence.

	3. An environmental scientist has an understanding of basic aquatic and atmospheric chemistry, as well as environmental chemical analysis.	• CORE Evaluation Exam • Alumni Survey • Employer Survey		• Revision of individual course content and design of CORE sequence.
	4. An environmental scientist has an understanding of the basic principles of experimental design and the statistical analysis of environmental data.	• CORE Evaluation Exam • Alumni Survey • Employer Survey • Thesis Preparation and Defense		• Revision of individual course content and design of CORE sequence.
	5. An environmental scientist has an understanding of environmental policy and statutes and how they are translated into regulations and on the factors that	• CORE Evaluation Exam • Employer Survey • Alumni Survey		• Revision of individual course content and design of CORE sequence.

	affect how they influence environmental decisions.			
	6. An environmental scientist has the ability to conduct literature research and prepare both written and oral critiques of environmental science research.	• CORE Evaluation Exam • Employer Survey • Alumni Survey	• 100% of CSU graduates in environmental science have made at least one presentation at regional or national meetings of professional societies in environmental science	• Revision of individual course content and design of CORE sequence.
	7. An environmental scientist has the ability to design and conduct and original program of research and monitoring in environmental science, which results in a	• Thesis Preparation and Defense: provides direct evidence of the students' ability to design and conduct scientific research, as well as the ability to	• 75% of CSU graduates have at least one manuscript published or accepted for publication in refereed scientific	• Revision of individual course content and design of CORE sequence.

	publishable manuscript.	communicate this information in written and oral forms • Advisory Committee: consisting of the research director, at least one other member of the environmental science graduate faculty, and one environmental professional from outside the department or university. The committee advises on the student's plan of didactic learning, as well as providing guidance on the design, conduct, and analysis of the thesis research. • Alumni Survey	and technical journals in environmental science	

M.S. Environmental Science – 2001/2002

COLUMBUS STATE UNIVERSITY	Anticipated Outcomes	Assessment Method	Assessment Results:	Use of Results:
Statement of Purpose: The Master of Science degree program in environmental Science provides advanced training, education and research opportunities to post-baccalaureate science students living primarily in the Georgia/Alabama region. Graduates of the program are trained to serve as environmental professionals in local, state, and federal environmental resource agencies; in the private sector, as environmental consultants; or are	**2. An environmental scientist has an understanding of the integration of flows of water on and beneath the surface of the planet with the underpinning knowledge of basic fluid mechanics.**	• CORE evaluation exam: a comprehensive exam (hydrology, environmental chemistry, environmental geology, environmental issues, environmental law and regulation, and ecological methods) administered at completion of CORE courses	• Five graduate students completed the CORE exam. One of the students taking the CORE exam has been graded at unacceptable in five of the six areas. That student has left the program. The remaining students received acceptable scores in all but one are, either Environmental Issues or Environmental Chemistry. Those	• Revision of individual course content and design of CORE sequence.

prepared to enter a doctoral program in environmental science or related fields. Primary emphasis is placed upon acquiring a sound background in the underpinning concepts in environmental science, designing and conducting an original piece of research, and effectively communicating these results, in both written and oral forms. These professionals will be able to critically assess a wide range of environmental issues and create a plan for sound maintenance and/or environmental management.		• Alumni Survey: a retrospective assessment of the program by graduates currently employed as environmental professionals • Employer Survey: designed to assess the needs of the environmental science profession and the ability of this graduate program to provide those skills.	students were required by the instructor and the Environmental Science Advisory committee to retake that section again. On the additional test, one student passed with an acceptable score. • None currently conducted. • None currently conducted	

	2. An environmental scientist has an understanding of human interactions with the geologic environment, including geologic hazards, as well as resources and waste management.	• CORE Evaluation Exam • Alumni Survey • Employer Survey		• Revision of individual course content and design of CORE sequence.
	3. An environmental scientist has an understanding of basic aquatic and atmospheric chemistry, as well as environmental	• CORE Evaluation Exam • Alumni Survey • Employer Survey		• Revision of individual course content and design of CORE sequence.

	chemical analysis.			
	4. An environmental scientist has an understanding of the basic principles of experimental design and the statistical analysis of environmental data.	• CORE Evaluation Exam • Alumni Survey • Employer Survey • Thesis Preparation and Defense		• Revision of individual course content and design of CORE sequence.
	11. An environmental scientist has an understanding of environmental policy and statutes and how they are translated into regulations and on the factors that affect how they influence environmental decisions.	• CORE Evaluation Exam • Employer Survey • Alumni Survey		• Revision of individual course content and design of CORE sequence.

	12. An environmental scientist has the ability to conduct literature research and prepare both written and oral critiques of environmental science research.	• CORE Evaluation Exam • Employer Survey • Alumni Survey	• 100% of CSU graduates in environmental science have made at least one presentation at regional or national meetings of professional societies in environmental science	• Revision of individual course content and design of CORE sequence.
	7. An environmental scientist has the ability to design and conduct and original program of research and monitoring in environmental science, which results in a publishable manuscript.	• Thesis Preparation and Defense: provides direct evidence of the students' ability to design and conduct scientific research, as well as the ability to communicate this information in written and oral forms	• 70% of CSU graduates have at least one manuscript published or accepted for publication in refereed scientific and technical journals in environmental science	• Revision of individual course content and design of CORE sequence.

		• Advisory Committee: consisting of the research director, at least one other member of the environmental science graduate faculty, and one environmental professional from outside the department or university. The committee advises on the student's plan of didactic learning, as well as providing guidance on the design, conduct, and analysis of the thesis research. • Alumni Survey		

M.S. Environmental Science – 2002/2003

COLUMBUS STATE UNIVERSITY	Anticipated Outcomes	Assessment Method	Assessment Results:	Use of Results:
Statement of Purpose: The Master of Science degree program in environmental Science provides advanced training, education and research opportunities to post-baccalaureate science students living primarily in the Georgia/Alabama region. Graduates of the program are trained to serve as environmental professionals in local, state, and federal environmental resource agencies; in the private sector, as environmental consultants; or are prepared to enter a doctoral program in environmental science or	**3. An environmental scientist has an understanding of the integration of flows of water on and beneath the surface of the planet with the underpinning knowledge of basic fluid mechanics.**	• CORE evaluation exam: a comprehensive exam (hydrology, environmental chemistry, environmental geology, environmental issues, environmental law and regulation, and ecological methods) administered at completion of CORE courses	• Nine graduate students completed the CORE exam. Six of the students were graded at the superior level in at least three of the six areas. One student received acceptable scores in five areas and an unacceptable score in Environmental Chemistry. Two others received unacceptable marks in Environmental Issues and Ecological Methods. At the advise of the instructor and the Environmental	• Revision of individual course content and design of CORE sequence.

related fields. Primary emphasis is placed upon acquiring a sound background in the underpinning concepts in environmental science, designing and conducting an original piece of research, and effectively communicating these results, in both written and oral forms. These professionals will be able to critically assess a wide range of environmental issues and create a plan for sound maintenance and/or environmental management.			Science Advisory committee, the students retook the exam in Environmental Chemistry, Ecological Methods, and Environmental Issues and passed with acceptable grades. One student has been advised to retake the Ecological Methods course and obtain a grade of "B" or better. • None currently conducted. • None currently conducted	

		science profession and the ability of this graduate program to provide those skills.		
	2. An environmental scientist has an understanding of human interactions with the geologic environment, including geologic hazards, as well as resources and waste management.	• CORE Evaluation Exam • Alumni Survey • Employer Survey		• Revision of individual course content and design of CORE sequence.
	5. An environmental scientist has an understanding of basic aquatic and	• CORE Evaluation Exam • Alumni Survey		• Revision of individual course content and design of CORE sequence.

	atmospheric chemistry, as well as environmental chemical analysis.	• Employer Survey		
	6. An environmental scientist has an understanding of the basic principles of experimental design and the statistical analysis of environmental data.	• CORE Evaluation Exam • Alumni Survey • Employer Survey • Thesis Preparation and Defense		• Revision of individual course content and design of CORE sequence.
	7. An environmental scientist has an understanding of environmental policy and statutes and how they are translated into regulations and on the factors that affect how they influence	• CORE Evaluation Exam • Employer Survey • Alumni Survey		• Revision of individual course content and design of CORE sequence.

	environmental decisions.			
	8. An environmental scientist has the ability to conduct literature research and prepare both written and oral critiques of environmental science research.	• CORE Evaluation Exam • Employer Survey • Alumni Survey	• 100% of CSU graduates in environmental science have made at least one presentation at regional or national meetings of professional societies in environmental science	• Revision of individual course content and design of CORE sequence.
	9. An environmental scientist has the ability to design and conduct and original program of research and monitoring in environmental science, which results in a publishable manuscript.	• Thesis Preparation and Defense: provides direct evidence of the students' ability to design and conduct scientific research, as well as the ability to communicate this information in written and oral forms	• 60% of CSU graduates have at least one manuscript published or accepted for publication in refereed scientific and technical journals in environmental science	• Revision of individual course content and design of CORE sequence.

		• Advisory Committee: consisting of the research director, at least one other member of the environmental science graduate faculty, and one environmental professional from outside the department or university. The committee advises on the student's plan of didactic learning, as well as providing guidance on the design, conduct, and analysis of the thesis research. • Alumni Survey		

Appendix 3

Graduate Student Guidelines

Provided to All Graduate Students Upon Admission

Columbus State University

Environmental Science Graduate Program

GUIDELINES and MANDATES

Welcome to the most unique graduate program in the sciences. **The Environmental Science Graduate Program Advisory Committee uses a guideline of an undergraduate GPA of 3.0 and GRE scores (verbal and quantitative sections) of 1000 to determine admission status.** This is a program which requires you to undertake advanced education in many disciplines, including biology, chemistry, geology, and environmental law and policy. **You are expected to have already demonstrated your background in physical geology, introductory biology, introductory chemistry, organic chemistry, statistics, calculus, and introductory physics.** If you are weak in one of these areas, you have already been advised, by the Environmental Science Advisory Committee, that there will be extra courses or activities that you must complete in order to be granted full admission to the program. Regardless, you are about to embark on a course of study **very** unlike your undergraduate career. The purpose of these guidelines is to give you an idea of what you will be expected to do, as a graduate student, at Columbus State University.

First, you must understand that being in a **science** graduate program is not like other graduate programs that you may have heard about. Most often, potential graduate students think that a graduate program in the sciences is just another year of classes. This may be true in some other disciplines, but in the sciences, the requirements are different. If your career goals are to become a professional in the environmental sciences, the most important skill you can develop (and sell to a potential employer) is the ability to organize and conduct a research project or some sort of applied investigation; for example a wetlands delineation. This includes the formulation of an hypothesis, collection of essential data, and the critical analysis of those data. More importantly, you must be able to communicate the results of your research to other scientists in both written and oral forms. Employers in the sciences consider these to be the **essential** skills demonstrated by your graduate degree. Thus, the focus in CSU's environmental science graduate program is upon **research**. Yes, you will take additional specialized classes, but until you complete your research, present it in the form of a thesis and successfully defend that work, your graduate career will be incomplete. It is important to remember that the Masters' thesis is **not** an extended term paper, nor is it a minor requirement in the program. If at this point, you have gone through your academic career by doing everything at the last minute, you will be surprised by the work that must be put into thesis research. As a grad student in the environmental science program, you should expect to spend the majority of your time on your research. This will include time in the field or lab collecting and analyzing data, conducting the literature research necessary to prepare your research program, and comparing the results of your data with those of other scientists who have conducted similar types of work. On average, a good Masters' thesis will take between 1000 and 1500 hours to complete. Of course, during all of this, you will be taking courses to assure the faculty and your future employers that you have developed some basic skills in the various disciplines within environmental science.

Finally, you must remember that this is a program in **Environmental Science.** So … even if you have undergraduate expertise in biology, you may be conducting your thesis research in some other area, like

environmental geology or chemistry. At the very least, you should expect that the focus of your research will involve several of the disciplines within environmental science, not just the one you had as your major, as an undergraduate.

So... Now that I'm at CSU, what do I do, next?

Below is a checklist of all of the things you must complete in order to obtain the Master of Science Degree in Environmental Science.

χ **Having** been admitted to the graduate program, your first task should be to discuss your program plans with your advisor. In all probability, you will not have formed your graduate advisory committee, so you should contact the director of the Environmental Science Graduate Program, Dr. Jim Gore (LeNoir Hall 158). Until you have decided upon your research program, Dr. Gore will advise you on your plan for completing the **Core Courses** and in choosing an appropriate research direction.

χ **At,** the next available time, make sure to enroll in ENVS 6105, **Environmental Issues**, which is your introduction to the graduate program in environmental science. This course is more than just a seminar course. You will get your first opportunity to do some literature research and make a class presentation. This course will address the basics of literature research, scientific citation formats, thesis preparation, and thesis/advisory committees. In addition, primary faculty in the Environmental Science Graduate program will present seminars where they will lecture on their current research and present personal views on research and employment opportunities in their subdisciplines of environmental science.

Program Requirements include completion of 32 hours of formal didactic classes, 6 hours of thesis research, completion of the comprehensive examination, and your thesis defense.

The **CORE** courses, elective courses, and basic requirements for graduation are all contained within the description of the graduate program in the university catalog.

However, to reiterate, the 20 hours of core courses that you must complete are:

ENVS 5165	Hydrology
ENVS 5256	Environmental Geology
ENVS 6105	Environmental Issues
ENVS 6106	Environmental Law and Regulation
ENVS 6207	Ecological Methodology
ENVS 7115	Environmental Chemistry

χ **Soon** after completion of Environmental Issues, if you have not already done so, you should be in the position to choose your **committee**. This includes your thesis advisor ("major professor") and at least two other members of the graduate faculty. At least one of the members should be from a different department than your primary advisor. From that point on, your advisor and your committee will oversee the rest of your graduate career. They will approve your thesis proposal, read and review your thesis and conduct your defense. In addition, your advisor will register you for classes or will approve your choices prior to registration

through Dr. Gore. Indeed, you should plan to meet with your committee soon after it is formulated so that you and your committee can "map out" your remaining graduate career and preliminarily approve your research topic and potential elective specialty courses you will take outside of the Core requirements. **You are required to form your Thesis Committee after completing 9 semester hours of graduate work.** You will not be able to register without approval of your thesis advisor and/or committee.

The thesis advisor (major professor) chosen by the student must be a member of the graduate faculty at Columbus State University at the time of the thesis defense. External members of the thesis committee can be qualified professionals in the discipline and may be affiliated with other universities or professional organizations or government agencies. However, at least two of the three committee members (or a majority if there are more than three committee members) (and including the thesis advisor) must be members of the graduate faculty at Columbus State University.

In the event that the thesis advisor leaves the faculty at Columbus State University, within one semester of that faculty member's departure, the graduate student must choose a new thesis advisor from among the graduate faculty in the program. The former thesis advisor may continue to supervise the graduate student's thesis research and will, then, continue to remain as an external member of the student's thesis committee.

Currently, the following program electives are available:

BIOL 5515	Topics in Cell and Molecular Biology
BIOL 5525	Topics in Organismic Biology
BIOL 5535	Topics in Ecological and Evolutionary Biology
BIOL 5895	Independent Study
CHEM 7185	Aquatic Chemistry
CHEM 7175	Atmospheric Physics and Chemistry
CHEM 7165	Environmental Organic Chemistry
CHEM 7555	Special Topics in Environmental Chemistry
ENVS 5225	Natural Environments of Georgia
ENVS 6109	Environmental Air Quality
ENVS 6206	Water Resources Management
ENVS 6235	GIS/GPS Applications
ENVS 7145	Land Use and Waste Management
ENVS 7555	Special Topics in Environmental Science
GEOL 5115	Geochemistry
GEOL 5275	Vertebrate Paleontology
GEOL 7565	Special Topics in Environmental Geology
MATH 5175	Mathematical Statistics
MATH 5176	Statistical Design and Analysis of Experiments
MATH 5177	Applied Regression Analyses

χ Thesis Proposal Format

[**Note:** A copy of your committee-approved thesis proposal must be on record with the Director of the graduate program. The Director will provide you with the appropriate cover sheet for signatures.]

Your thesis proposal should follow this format:

Introduction

In this section you identify the problem you will be examining. This will include a preliminary review of the pertinent literature so that you have demonstrated a knowledge of the state-of-the-art, what conclusions have been made, what questions have yet to be asked, and how your research might fit into this body of literature.

Objective

In this section, you create your working hypothesis and state what your goals will be in order to reach a successful conclusion. It is here, that you indicate specifically, how your research will fit into the body of existing knowledge.

Methods

This is a detailed description of potential sample sites and locations, as well as a description of the protocol you have designed to conduct your sample collections, experiments, laboratory analysis, and data analysis. If necessary you should reference specific literature in experimental design and indicate which statistical tests or other analytical methods will be used to test your results for significance.

Expected/Anticipated Results

In this section, you will tell your committee (and anyone else who reads your proposal) what results (or suite of results) are most likely to be obtained and reiterate, again, how these results (depending upon which one you get) will answer (or not answer) the question you posed in the introduction and objective sections.

Project Funding

Indicate what funding might be required for this research in the form of a short budget and what the sources of this funding is. That is, if you are supported on a specific research grant or contract to your major advisor, a teaching or research assistantship, or out-of-pocket, report that information in this section.

Information Transfer

Other than your thesis, indicate how you plan to disseminate the results of your research to the rest of the environmental science community. That is, tell us of your plans to present your results at a regional or national scientific meeting (a specific meeting or society would be nice) or a journal (or potential journals) which might publish your work. [You may need to consult your thesis advisor or other members of your committee for advice in this area. Do not hesitate to contact them!]

References

This section is derived, mostly from your Introduction and methods sections. These are the citations to other scholarly works that support the proposal.

The Graduate Faculty and their areas of interest are:

- **Julie A. Ballenger**
  Associate Professor. *BA, Central Univ. of Iowa; MS, Fort Hays State Univ.; PhD, Miami Univ.* **Plant systematics.** *Email:* Ballenger_Julie@colstate.edu.

- **John A. Barone**
  Assistant Professor, *BS (Biology), BA (Psychology), Indiana University – Bloomington, PhD., University of Utah.* **Plant ecology, tropical ecology, herbivory, ecological methods.** *Email:* Barone_John@colstate.edu.

- **William S. Birkhead**
  Professor and Chair, Department of Biology. *BS, Cornell Univ., MS, PhD Univ. of Texas.* **Vertebrate ecology.** *Email*: Birkhead_Bill@colstate.edu.

- **Rebecca A. Champion**
  Associate Professor. Director, Oxbow Meadows Environmental Learning Center. *BS, Brenau College; MS, Georgia State Univ; PhD, Georgia Institute of Technology.* **Microbiology and water quality.** *Email:* Champion_Becky@colstate.edu.

- **Warren B. Church**
  Assistant Professor. *BA, MA, University of Colorado; MPhil, PhD, Yale University.* **Environmental Archaeology.** *Email:* Church_Warren@colstate.edu

- **Arthur G. Cleveland**
  Professor. *BS, Arlington State College; MA, PhD, North Texas State Univ.* **Bioremediation, zoogeography, ecology of bats.** *Email:* Cleveland_Art@colstate.edu.

- **John K. Davis**
  Assistant Professor. *BA, Hanover College, MA, PhD, Indiana University-Bloomington.* **Microbial ecology.** *Email*: Davis_John@colstate.edu

- **William J. Frazier**
  Professor. *BS, Furman Univ; PhD, Univ. of North Carolina.* **Sedimentology.** *Email:* Frazier_Bill@colstate.edu.

- **Zewdu Gebeyehu**
  Associate Professor. *BS, MS Addis Ababa University, PhD Philipps University.* **Environmental chemistry.** *Email:* Gebeyehu_Zewdu@colstate.edu.

- **James A. Gore**
  Professor. Director of Graduate Program in Environmental Science. Chair, Department of Environmental and Health Sciences. *BA, Univ. of Colorado; MA, PhD, Univ. of Montana.* **Aquatic ecology and water resources management.** *Email:* Gore_James@colstate.edu.

- **Thomas B. Hanley**
  Professor, Chair of the Department of Chemistry and Geology. *BS, Univ of Notre Dame; MA, PhD, Indiana Univ.* **Structural geology and Geographical Information Systems.** *Email:* Hanley_Tom@colstate.edu.

- **Harlan Hendricks**
  Associate Professor. *PhD, Virginia Polytechnic and State University.* **Ecology of Terrestrial Insects.** *Email:* Hendricks_Harlan@colstate.edu.

- **Floyd Jackson**
  Assistant Professor. *B.S., Benedict College; PhD, Howard University.* **Inorganic chemistry.** *Email:* Jackson_Floyd@colstate.edu.

- **Charles A. Lovelette**
  Associate Professor. *BS, Norwich Univ.; PhD, Rennselaer Polytechnic Institute.* **Bioorganic chemistry.** *Email:* Lovelette_Charles@colstate.edu.

- **Brian W. Schwartz**
  Associate Professor. *BS, Memphis State Univ; PhD, Univ of Wisconsin.* **Genetics.** *Email:* Schwaratz_Brian@colstate.edu.

- **David R. Schwimmer**
  Professor. *BS, Univ. of Wisconsin; MA, State Univ of New York at Buffalo; PhD, State Univ of New York at Stony Brook.* **Paleontology and environmental geology.** *Email:* Schwimmer_David@colstate.edu.

- **George E. Stanton**
  Professor. Acting Dean, College of Science. *BS, Bucknell Univ.; PhD, Univ of Maine.* **Ecological theory, aquatic ecology and entomology.** *Email:* Stanton_George@colstate.edu.

- **Glenn D. Stokes**
  Professor. Associate Dean, School of Science. *BS, Univ of Rhode Island; PhD, Pennsylvania State Univ.* **Cell biology and physiological ecology. GIS/GPS technology.** *Email:* Stokes_Glenn@colstate.edu.

- **Jeffrey A. Zuiderveen**
  Associate Professor. *BS, Western Michigan Univ; PhD, Univ of Kentucky.* **Environmental toxicology.** *Email:* Zuiderveen_Jeffrey@colstate.edu.

χ **After** completing the core requirements, you must request and complete a **Core Evaluation Exam**, covering material contained within the Core area of courses and administered by those faculty who taught the courses. You must arrange for and complete the exam within one semester of completion of your last course in the Core. [**NOTE:** You can not request that the exam be administered in two separate sections; for example, a three-hour exam after you complete the first set of three Core courses]. You do have the option of requesting that the exam be administered as an oral exam before a board of examiners. However, in most cases, the exam will be written and usually takes approximately six hours to complete. That is, the exam is given in two three-hour sessions on designated day during a weekend. The exam is graded and the results returned to you within four weeks of the time that you take the exam. If you perform poorly on a section of the exam, you may be required, by the Environmental Science Advisory Committee or specific instructors of the Core courses, to take additional course work or conduct detailed independent studies in order to make up any deficits in your training. The objective of the Core Evaluation Exam is not to "weed you out" but to assure you and CSU that you have acquired the many basic skills necessary to become an accomplished environmental scientist. Graduate students must have completed their Core Evaluation Exam (comprehensive exam), including all remedial requirements as a result of poor performance on that exam, ***prior*** to conducting their thesis defense.

χ **At** some point, you will begin to write your thesis. Your thesis advisor will be able to provide you with the details of the thesis format and contents, but, in general, the environmental science thesis will contain:

- an **abstract**, which is a summary of the major details, from beginning to end, of your thesis;

- an **introduction**, which is a survey of the literature pertaining to your research topic, a discussion of major conclusions or theories, and a justification of your own research;

- a **"materials and methods"** section which contains such things as a description of sample sites, a detailed description of specific protocols (field and laboratory) which you used), and any descriptions (or discussions of appropriateness) of any analytical methods/tests which you used;

- a **results** section which reports the results of your experiments or data collection trips or analyses [this is probably the most difficult section to write since so many people confuse "results" with "discussion;

- a **discussion** or **conclusion** section which is a comparison of your results with those of other scientists (usually presented in the introduction), a discussion of the contribution of your results to answering the questions you

posed in the introduction, and recommendations for future research in the same areas;

- a **references cited** section, indicating the materials you referenced throughout your thesis;

- **appendices**, which may include extensive tables of data or listings of specific taxonomic or analytical texts used in your study;

These are only general details of the content of the thesis. Again, the thesis is the major focus of your graduate work in environmental science. The best way that you can prepare yourself to begin writing your thesis is to read completed theses of other graduate students in environmental science at CSU and other universities, research papers by noted scientists in your particular area of research, and one or two brief books on how to write scientific papers. In biology and ecology, for example, one of the most commonly consulted books is ***Writing Papers in the Biological Sciences*** by Victoria E. McMillan and the *CBE Style Manual* by the Council of Biological Editors. Your thesis advisor can recommend other similar books.

χ **Final** preparation of the thesis must follow a specific format that is described in a thesis guide provided by the Associate Dean of the School of Science, Dr. Stokes. This information is also available from the Director of the Graduate Program, Dr. Gore. This information will provide material on margins, type-styles, etc., and other requirements of Columbus State University.

χ **Thesis Defense** will be conducted at some point after your committee approves of a "near-final" version of your thesis. You will make an oral presentation of your research work and be expected to answer questions from a general audience consisting of your committee, other faculty, and fellow students. After that presentation, there will be a private examination administered by your committee alone. **It is your obligation** to arrange for the time and meeting place of our thesis defense. You announce your defense at least ten (10) days prior to the examination date, in order to provide faculty and students with sufficient time to plan to attend.

Just Some Extra Reminders!

- You will be given an email account from the University computer center. Be sure to activate it with your password. Most notices to faculty, staff, and graduate students are posted on email.

- Unfortunately, there is little room to provide you with your own office. However, once you have chosen a research project and thesis committee, your major professor will provide you with a work area and study space in his/her laboratory.

- Students must earn a 3.0 grade point average calculated on all graduate work attempted for which letter grades are awarded and cannot include more than ten hours with grades of C. At least **24** of the hours required for the degree, including the program core, must be earned in residence. A maximum of **10 semester hours** with no grade lower than B may be accepted for transfer. Transfer credit will not be used in computing the student's grade point average.

- A limited number of graduate assistantships are available through Columbus State University. If you are interested in obtaining one of these assistantships, you should contact the Director of the Environmental Science Program, Dr. Gore. Teaching assistantships pay a stipend (currently, about $500 per month), as well as a waiver of tuition and fees (except for a small administrative fee), for the academic year. You will be obligated to teach between 15 and 19 hours per week in the undergraduate areas of your expertise.

  Research assistantships are available, from time to time, through grants and contracts awarded to individual faculty. Your thesis advisor can tell you about any opportunities in your field of study. The amount of support is variable, depending upon the research grant, but generally range from $600 to $1000 per month stipend with a reduction in tuition.

  CSU also has an agreement with Georgia Power to provide **Graduate Internships** in environmental remediation. These positions are awarded every semester and require you to work for Georgia Power, full-time, for one semester while choosing an appropriate research topic. In exchange for pursuing this research to its conclusion with the presentation of your thesis, Georgia Power continues to pay your stipend and support for a maximum of three semesters beyond the completion of the semester that provides the work experience. This is a very competitive program, since the stipend is $800 per month. Application materials are available from Dr. Gore.

- If you are a graduate of Columbus College or Columbus State University, the CSU Alumni Association has scholarships available for each academic. The amount varies but is approximately $600 per year for up to three years. Application deadline is early in the Fall Quarter. See the director of the graduate program, Dr. Gore, for more information. It is a relatively painless application (one page) and, currently, there is more money available than scholarships granted.

- You must complete your Core Evaluation Examination at least one term prior to your thesis defense.

- All degree requirements must be completed within seven **(7)** years of first enrollment.

- The maximum recommended course load for a graduate student in the School of Science in a given semester is **13** semester hours, except that the maximum course load for a student holding a graduate assistantship is **9** semester hours.

- **For more information (and for program updates), contact the website at:** www.colstate.edu

Appendix 5

Proposed Non-Thesis Track

Master of Arts in Environmental Studies

The MA in Environmental Studies is designed primarily to accommodate the needs of those graduate students seeking to improve their academic backgrounds in the environmental sciences while continuing to hold a full-time job in areas related to the environmental sciences. Thus, this degree track intends to support those part-time students who seek an advanced degree to improve their employment prospects within their current jobs by enhancing their backgrounds in current applied environmental science. As such, it is considered to be a terminal degree program. Although this option is not research/thesis based, it will be sufficiently rigorous to assure the faculty and university system that graduates with an MA in Environmental Studies have the intellectual skills expected of all graduates intending to work in the areas of environmental management and regulation. This track does not support or assure that graduates will be sufficiently trained nor will they necessarily be able to demonstrate the ability to organize original research and monitoring projects nor should it be considered adequate training for doctoral-seeking graduate students.

Those students seeking admission to the MA in Environmental Studies program will be expected to meet the same criteria as those to the MS in Environmental Sciences program. That is, students must be able to demonstrate an undergraduate background in physical geology, introductory biology and ecology, introductory chemistry, organic chemistry, statistics, calculus, and introductory physics. In addition, students must submit scores from the Graduate Record Examination (GRE) with a combined score of at least 1000 from the verbal and quantitative sections and a comparable score from the analytical section; that is, a total score of 1500.

Graduate students in the MA in Environmental Studies will be expected to satisfactorily complete the same core courses (20 hours) as the MS in Environmental Science:

ENVS 5165 Hydrology
ENVS 5256 Environmental Geology
ENVS 6105 Environmental Issues
ENVS 6106 Environmental Law and Regulation
ENVS 6207 Ecological Methodology
ENVS 7115 Environmental Chemistry

Instead of a minimum of 6 hours of research/thesis credits, students must choose at least **9** more hours from the following elective course (with the advice and consent of the student's thesis committee):

BIOL 5515 Topics in Cell and Molecular Biology
BIOL 5525 Topics in Organismic Biology
BIOL 5535 Topics in Ecological and Evolutionary Biology

BIOL 5899 Independent Study

CHEM 7165 Environmental Organic Chemistry
CHEM 7175 Atmospheric Physics and Chemistry
CHEM 7185 Aquatic Chemistry
CHEM 7555 Special Topics in Environmental Chemistry

ENVS 5225 Natural Environments of Georgia
ENVS 6109 Environmental Air Quality
ENVS 6206 Water Resources Management
ENVS 6235 GIS/GPS Applications
ENVS 7145 Land Use and Waste Management
ENVS 7555 Special Topics in Environmental Science

GEOL 5115 Geochemistry
GEOL 5135 Introduction to Oceanography
GEOL 5215 Geomorphology
GEOL 5275 Vertebrate Paleontology
GEOL 7565 Special Topics in Environmental Geology

MATH 5175 Mathematical Statistics
MATH 5176 Statistical Design and Analysis of Experiments
MATH 5177 Applied Regression Analyses

The remaining three hours (**3**) hours of credit will consist of enrollment in a new course, ENVS 7***, Research in Environmental Studies, in which the graduate student, upon the advice and approval of his/her committee, will undertake an extensive literature research and will produce a small monograph detailing the current status of a timely environmental issue. This monograph, usually forty to sixty pages in length, will be reviewed and approved by the graduate student's advisory committee.

Graduate students in the MA in Environmental Studies option must also pass a Comprehensive Examination that will consist of a written and oral examination conducted by those faculty (or a subset) who taught the core and elective courses chosen by the student. Students will enroll in ENVS 7000 in order to complete the examination process.

There are certain restrictions on admission to the MA in Environmental Studies program:

Since research grants and research internships are designed specifically to support graduate thesis research and teaching assistantships are designed to allow support graduate students during their thesis research, **any graduate**

student who is supported by a graduate or teaching assistantship or who has accepted an internship with a company that provides research support as part of the internship will not be allowed to enroll in the MA in Environmental Studies option.