

The School for Field Studies



1993-94 Course Catalogue

Environmental semester programs:

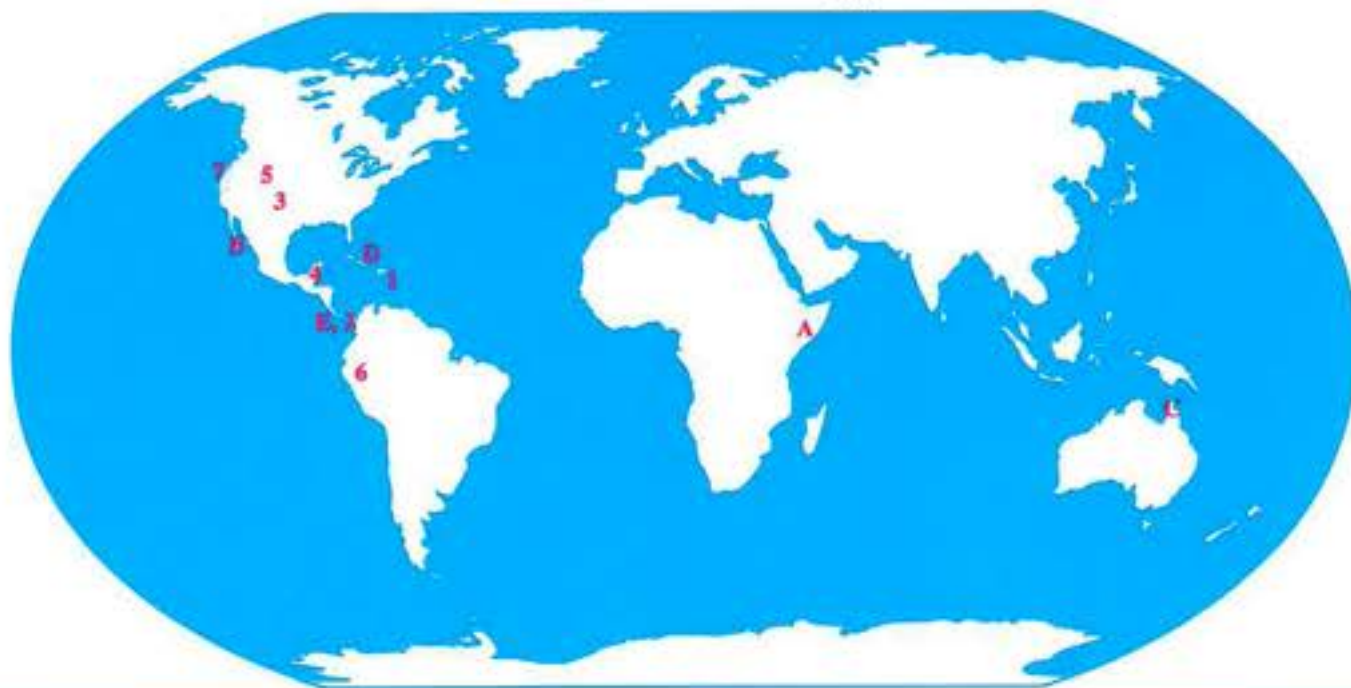
Sustainable Development Studies
Wildlife Management Studies
Marine Resource Studies
Marine Mammal Studies
Rainforest Studies

Costa Rica
Kenya
Caribbean
Mexico
Australia



and summer courses around the world

1993-94 Curriculum



About The School for Field Studies p. 2-6

About SFS	p. 2-3
Curriculum	p. 4
Academic Credit	p. 5
Faculty, Research Papers	p. 6
Processes, Requirements, Tuitions & Costs	p. 27-28
Reference Form	p. 29-30
Application	p. 31-32
SFS Organization	p. 33

A. Center for Wildlife Management Studies p. 7-10

Site: KENYA
 Fall and Spring Semester Programs:
Wildlife Ecology and Management
 Summer Course: (June 15-July 14; July 21-August 19)
Wildlife Management

B. Center for Marine Mammal Studies p. 11-14

Site: BAJA, MEXICO
 Fall and Spring Semester Programs:
Marine Mammal Conservation
 Summer Course: (June 15-July 14; July 21-August 19)
Sea Lion and Dolphin Conservation

C. Center for Rainforest Studies p. 15-18

Site: AUSTRALIA
 Fall and Spring Semester Programs:
Tropical Rainforest Management
 Summer Course: (June 25-August 7)
Tropical Reforestation

D. Center for Marine Resource Studies p. 19-22

Site: TURKS AND CAICOS ISLANDS, CARIBBEAN
 Fall and Spring Semester Programs:
Marine Resource Management
 Summer Course: (June 15-July 14; July 21-August 19)
Marine Parks Management

E. Center for Sustainable Development Studies p. 23-26

Site: COSTA RICA
 Fall and Spring Semester Programs:
Studies in Sustainable Development
 Summer Courses: (June 15-July 14; July 21-August 19)
Tropical Forest Ecology
Sustainable Land Use

SFS also offers 30 day summer courses at satellite sites. Please see the center insert section in this catalogue for more information on these summer satellite courses:

1. Primate Ecology and Conservation/Barbados
2. Ecology of Endangered Sea Turtles/Costa Rica
3. Landscape Ecology/Colorado Rockies
4. Tropical River Ecology/Belize
5. Raptor Ecology and Conservation/Montana
6. Ethnobotany/Ecuador
7. Ecology of Killer Whales/Puget Sound, Washington

A Letter from the President

Dear Reader,

Thank you for your interest in The School for Field Studies. Right away, let me tell you that our courses are not for everyone. Nor are they only for students majoring in environmental sciences or those who seek a career in that area.

But if you want to learn about (and see) more of the world... understand how your own decisions affect the environment... challenge yourself, physically and mentally... make a real difference in how the world manages its natural resources... SFS may be ideal for you.

In fact there may be no better way to achieve your goals than to spend a semester or summer with SFS.

You see, I began SFS twelve years ago with several of our Trustees to do one thing: give bright, talented students—no matter what their academic focus or career aspirations—a unique opportunity to study environmental problems firsthand, contribute immediately to their solutions and carry a heightened awareness of environmental issues to the world.

Today, there seems to be no lack of environmental interest. People recycle. Governments are moving to limit some pollutants. "Green consumer" is the latest marketing buzzword.

But fundamental environmental crises won't be solved just because people recycle cans. Preserving ecosystems, balancing development and conservation, finding ways to manage and maintain wildlife and marine resources—these problems have been growing for years. Finding the answers will require time, commitment, and a thorough understanding of these very complex issues.

SFS offers you a way to take the time, make the commitment, and gain an understanding of the issues. In return, you will be richly rewarded. You'll work with others who share your desire to contribute. You will have the opportunity to obtain a practical education in the best possible laboratory—the real world. In the end, when your course of study is successfully completed, you will have a sense of achievement and a deeper understanding of the complex aspects of the environmental issues facing us today.

If our curriculum intrigues you, I urge you to apply soon because enrollment is limited. And don't let financial concerns stop you. Scholarships and loans are available.

The challenge awaits you. We invite you to accept.

Sincerely,

Jim Elder
James L. Elder, Jr.
President





About SFS

What The School for Field Studies Does.

SFS provides motivated young people—from secondary schools, colleges and universities nationwide, and from a variety of academic backgrounds—with an action-oriented, experience-based education in environmental issues. At the same time, students are able to make immediate contributions toward sustainable management of natural resources.

In doing so, we seek to make tomorrow's leaders more environmentally literate, aware and able to recognize the environmental effects of how they choose to live.

Since our founding in 1980, we have given more than 5,000 students a unique opportunity to conduct hands-on field studies and research addressing some of the most critical environmental issues facing the world. SFS is the largest private educational institution exclusively offering courses and fieldwork for undergraduates in the increasingly important field of conservation biology.

In an SFS program you'll be face-to-face with the issues.

Rainforests don't fit under a microscope. Giraffes don't graze in a test tube. That's why SFS courses don't take place in a classroom. We'll take you to the best possible laboratories for environmental studies, the actual ecosystems where problems are occurring. This provides dramatic, real-life illustrations of the issues that can only be imagined through lectures and textbooks. We provide an educational experience which fully integrates theory and practice.

SFS operates five Centers where you can participate in 13-14 week **semester programs** (part of ongoing, year-round studies). Each Center also offers **month-long summer courses**. These campuses include:

- The Center for Rainforest Studies in Australia
- The Center for Marine Resource Studies in the Caribbean
- The Center for Wildlife Management Studies in Kenya
- The Center for Marine Mammal Studies in Baja, Mexico
- The Center for Sustainable Development Studies in Costa Rica

For SFS students, the rewards can far exceed academic credit.

You will have an opportunity to learn.

We will teach you how to approach a problem, how to formulate and test a hypothesis. You will work within a team, building on individual strengths to reach a common goal. You'll gain skills in research methodology, teamwork, outdoor living and a scientific discipline—a breadth of training unmatched by any other program.

In short, you'll tackle and solve serious problems under real-life conditions. Many former students tell us the skills learned here stay with them, helping them to succeed in school, in their careers, in their lives.

You will have the opportunity to contribute.

The research that results from your work will become part of databases and management reports for use by wildlife officials, government organizations and other environmental agencies. You can make a unique, personal contribution to science and humanity.

You'll have opportunities rarely available to undergraduates.

For science majors, SFS is a chance to obtain field training before graduation. For students with little or no scientific back-

ground, but interested in a career as a field scientist, SFS is a unique way to see what it's really like. For those simply intrigued by environmental issues, SFS is a practical way to study them.

You will have the opportunity to live where few others are allowed to go.

Our courses address timely and sensitive issues. Much of our work is carried out in spectacular places—game ranches, pristine coral reefs, rainforests—that provide dramatic illustrations of the issues under study. Access to these areas often requires special permits not available to the public.

You can establish lasting friendships.

A strong comradery builds among team members as you share daily challenges—setting up camp, cooking, tackling a tough aspect of the research—and as you share thoughts at the end of each day. The experiences you share as you work toward a common goal form the basis of friendships that endure over the years.

Of course, you'll receive college credit.

Upon successful completion of an SFS program, students receive credit through Northeastern University. For information on academic credit and a partial list of over 250 colleges and universities who have accepted/awarded credit for SFS programs, please see page 5.



"I expected some of the awkwardness of getting to know new people, and envisioned the silence that is present in a group that doesn't know what to say to each other. There was not a trace of that, only an air of eagerness and excitement."

David John Cornet, Olmstead Falls, OH—Cleveland State University
(Photo: Jim Elder)

**The School
for Field Studies**



Academics and personal growth go hand in hand in a SFS course.

Academic study, research and the development of practical skills are the three components of any SFS course. Though separated here for the sake of clarity, these components are integrated within the course structure.

Academics

Though we utilize many traditional methods of instruction (lectures, seminars, assigned readings, critical reviews of current research papers, presentations, papers and exams), we constantly seek creative ways to enhance learning through hands-on experience and direct application. For instance, a marine species identification exam is given underwater, with living examples; in one Resource Management course, the "midterm paper" is an Environmental Impact Statement.

Research

It is here that the opportunity arises for you to make a personal contribution to science and—because of the kinds of issues addressed—to humanity.

You will engage directly in real-world problem solving across a wide range of questions: how to control loss of species diversity... feed an expanding world population... strike a balance between development and preservation. While taking part in team research efforts, you will also have the opportunity to test out the career of a field scientist by designing and carrying out a directed research project, either independently or in a small group.

A few of our current research projects include the effects of human activity on whales and seals and the variability in giraffe feeding behavior on a Kenyan wildlife ranch.

Practical skills

Students routinely receive training in field methodology. Field techniques, which may include tracking, censusing, capturing, mapping, wilderness living and a dozen other skills, are also presented. You will gain experience in teamwork and cooperative problem solving.



SFS students have the opportunity to conduct hands-on research on real world issues. Here team members weigh a marsupial found in a recently disturbed area of the Australian rainforest. (Photo: David Bathgate)

Team building is the essence of the SFS experience.

SFS teams range from 24-32 students and three faculty on a month-long course to 30-32 students and three to four faculty for semester programs.

SFS students come from public and private high schools, colleges and universities. They major in everything from science to liberal arts. They come from across North America and from many other countries. They're as young as 16 and as old as 25-26. **About 25% receive SFS financial aid** (see page 28 for financial aid information). The one thing that everyone shares is a desire to learn more about the natural world.

As an SFS team member, you are actively involved in all aspects of our research and day-to-day living. In fact, with so much to accomplish in the limited time available, there is little time for individual ventures. This team approach to learning and problem solving is at the heart of the SFS educational philosophy; it is one of our greatest strengths.

Working with people from different backgrounds, under demanding conditions, you will learn a lot about yourself, how you relate as a member of a team, how you adapt to new people and surroundings. Students often say they learn as much about themselves as they do about the environment. To us, that means the program works.

You provide the enthusiasm, we provide the experience.

Since one of our goals is to introduce students to field training methodology not found in most traditional classroom settings, SFS program participants do not need previous camping experience, field training or, in most cases, a science background.

Summer courses are offered at the college introductory level. Our low student to faculty ratio and interactive teaching approach allows us to adjust course pace and content to suit the needs of the team. While most summer participants have completed at least one college biology or ecology course, talented and motivated students with no ecology background have had comparable academic success. Summer participants must be at least 16 years of age and have completed the junior year of high school.

SFS semester programs require successful completion of one college level ecology or biology course. Applicants to semester programs must be at least 18 years of age and should have completed at least one semester at a college or university.

In all cases, the Admissions Committee carefully screens students to insure that they have the potential to contribute to and be successful in an SFS program.



SFS students collecting data in a Costa Rican forest. With SFS you'll gain skills in research methodology, teamwork, outdoor living and a scientific discipline. (Photo: Bill McComas)



The SFS Educational Philosophy

SFS is developing a unique synthesis of the **case study** method linked with **field studies** and **research**. We seek to find an ideal balance between teaching theory and engaging students experientially in practice, on the premise that neither first hand experience nor theoretical study is sufficient by itself for real understanding of environmental problems.

All our programs begin with an investigation of one or more environmental problems in the field and an exploration of the complexity of these issues from numerous human points of view. We then study the theories that are relevant to understanding these problems, usually including some combination of the disciplines of biology, ecology, resource management, resource economics, applied anthropology, and political science. These disciplines are **integrated** by a common focus on the particular case study at hand and are taught with the common objective of understanding **sustainable development** (the use of natural resources for economic development in a manner which can be sustained indefinitely).

All SFS programs include a field **research** component. This research component provides students with an opportunity to make an immediate contribution to the improvement of a local environmental issue and, at the same time, to put the theories learned in the SFS classroom into practice.

We consider this combined educational approach to be the essence of a **practical** education. It is designed to be action-oriented, capable of being put to good use, manifested in practice, experience-based, and concerned with voluntary actions and ethical considerations.

Preparation

SFS faculty prepare a detailed syllabus for each program. The syllabus contains academic and research objectives, reading lists, and a course schedule, as well as information on the site, necessary personal equipment and medical information. Students may be assigned pre-course readings and will be expected to complete these assignments before the start of the course. When possible, a faculty member will contact students prior to the course to discuss his/her participation in the program. SFS Admissions Counselors are available to answer or refer pre-course questions.

Semester Programs

Each semester program enrolls 30-32 students, and is comprised of four carefully integrated courses. Three of these courses (usually an ecology course, a resource management course, and a socioeconomic or applied anthropology course) focus on theory through the use of local examples. All involve the traditional elements of undergraduate study including more than 40 hours of lecture per course, readings, written assignments, field trips, oral and written evaluations. The fourth course, Directed Research, involves over 150 hours of coursework including instruction in research design and completion of a directed research project addressing a component of the research objective of that particular semester. Together, these four courses carry 21 quarter credits, which usually convert to 16 semester credits. Since we compress a 15 week semester into 13 weeks (by working on weekends among other methods), be prepared for an intensive learning process.

Faculty

Semester programs are usually taught by three fulltime resident faculty (one of whom may be the Field Director) who all live on-site for the duration of the program. Additional staff include a Program Coordinator and occasional part-time faculty and guest lecturers. This level of staffing provides SFS students with a remarkably low student to faculty ratio (no higher than 10:1). Resident faculty hold an advanced degree (usually a Ph.D.) and usually have at least several years experience in the semester topic at the location of the Center.

Schedule

Semester programs run for at least 90 days not including a four day midterm break (the only time students are free to travel on their own). On average, 3-4 weeks of each semester are spent away from the Center on field trips. (Students at the South Caicos Center spend significantly less time off-campus). Courses are taught six days per week.

Prerequisites

Applicants must be at least 18 years old by the time the program begins, must have successfully completed at least one college level ecology or biology course, and should have completed at least one semester at a college or university. Other prerequisites may apply to individual semesters; please check individual semester descriptions.



"My Directed Research course was the first time that I had been able to do experimental work from start to finish—from researching and designing the project to the final presentation of my work—even though I have been involved in the sciences since I was in the ninth grade!"

Timothy Curry, Youngtown, NY—Middlebury College (Photo: Bill McComas)

Summer Courses

Thirty-day summer courses at SFS Centers depart in June and July and carry 8 quarter credits (which usually convert to 6 semester credits). SFS also offers a 42 day summer program that runs from late June through early August. This six week program is comprised of two courses: a theory course (5 quarter credits) and a Directed Research course (6 quarter credits).

Summer courses enroll 24-32 students, and are taught by three faculty members. Activities are held seven days a week, with only one or two days off during the course or program.

Applicants to summer courses must be at least 16 years of age and have successfully completed the junior year of high school by the time the course begins. Please check individual course descriptions for additional prerequisites.

Evaluations

Faculty will conduct oral and written evaluations of students based on classwork, field work, examinations, papers, presentations and other aspects of the course. Students will be requested to evaluate both their course and their faculty. Upon successful completion of the course, students will receive a transcript from Northeastern University or from SFS if the student attends an SFS Affiliate School (see pages 5 and 27 for additional information).



Academic Credit

All SFS participants are registered at and receive credit from Northeastern University in Boston, which accredits SFS programs. The only exceptions are students from SFS Affiliate and Consortium schools who receive credit directly from their home institutions. (Students from these schools should see sections on this page regarding Affiliate and Consortium schools.)

SFS semester programs incorporate four courses and carry a total of 21 quarter credits in biology, anthropology or independent study from Northeastern University. Summer courses carry 8 or 11 quarter credits in biology or independent study. At the conclusion of the program, students will receive an official transcript from Northeastern University. Many students have arranged either to transfer credit from Northeastern or to receive credit directly from their home school.

The following is a partial list of the home schools of previous SFS participants. The majority of these schools have accepted or awarded credit for SFS participation. As the final decision regarding credit transfer rests with the home institution, **students should check with their advisor/registrar before going into the field.** Many schools award credit on a case by case basis and credit granted to previous students does not imply credit approval.

Albion College
Allegheny College+
Alma College
American University
Amherst College
Augsburg College
Barnard College
Barry University
Bates College
Bennington College*
Berea College
Boston College
Boston University
Bowdoin College
Brandeis University*
Brown University
Bryn Mawr College
Bucknell University
California Lutheran University
Calvin College
Carnegie Mellon University
Case Western Reserve University*
Clarion University
Clark University*
Colby College+
College of the Atlantic
College of St. Thomas
Colorado College
Connecticut College
Cornell University
Dartmouth College
Davidson College*
Denison University*
Dickinson College*+
Drake University
Drew University
Duke University
Emory University
Evergreen State College
Fort Lewis College
Franklin and Marshall College
Franklin Pierce College
Gettysburg College
Guilford College
Hamilton College
Hampshire College
Harvard College
Hiram College*

Humboldt State University
Huron College
Indiana State University
Indiana University
Ithaca College
Kansas State University
Kent State University
Kenyon College*
Knox College
Lang College, New School for Social Research*
Lehigh University
Lewis and Clark College
Macalester College
Marlboro College
McGill University
Merrimack College
Miami University*
Middlebury College+
Mitchell College
Mount Holyoke College
Mount Union College
Muhlenberg College
New York University
North Carolina State University
Northeastern University
Northwestern University
Oberlin College
Ohio State University
Ohio Wesleyan University
Oregon State University
Pacific Lutheran University
Pennsylvania State University
Pomona College
Prescott College
Providence College
Purdue University
Randolph Macon College
Reed College
Saint Lawrence University
Saint Michael's College
Saint Olaf College
Salem College
Scripps College*
Simon's Rock College
Skidmore College
Smith College
Southern Connecticut State University
Stanford University

S.U.N.Y. College of Environmental Sciences and Forestry*
Swarthmore College
Trinity College
Trinity University
Tufts University
Tulane University
Union College
University of Alberta
University of California/Berkeley
University of California/Los Angeles
University of California/Santa Cruz
University of California/San Diego
University of Cincinnati
University of Colorado
University of Connecticut
University of Iowa
University of Kansas
University of Maryland
University of Massachusetts
University of Miami*
University of Michigan+
University of Minnesota
University of New Hampshire
University of North Carolina
University of Pennsylvania
University of Pittsburgh
University of Puerto Rico
University of Rhode Island
University of Southern Maine
University of Utah
University of Vermont
University of Victoria
University of Wisconsin
Vassar College
Villanova University
Washington University
Wellesley College
Wells College*
Wesleyan University
Whitman College
William Smith College
Williams College
Wittenberg University
Yale College

* SFS Affiliate School
+ Member of Sustainable Development Studies Consortium

SFS Affiliate Schools

The SFS Affiliate Program was initiated with the goal of helping students to maximize their SFS experience by building better linkages to the academic community from which SFS students are drawn. Students from Affiliate institutions receive preferential admission and financial aid from SFS. The home schools provide direct academic credit for SFS participation and have curricular input into the SFS program. In addition, an SFS liaison has been identified at each affiliate school who is available to provide on-campus advising on SFS programs. Applicants from Affiliate schools must obtain permission to participate from their campus Affiliate Representative. Students at Affiliate Schools should contact the SFS Admissions Office for the name of their representative. The current SFS Affiliate Members are:

Bennington College
Brandeis University
Case Western Reserve University
Clark University
Colby College
Davidson College
Denison University
Dickinson College
Hiram College

Kenyon College
Lang College/New School for Social Research
Miami University
Scripps College
S.U.N.Y. College of Environmental Studies and Forestry
University of Miami
Wells College



One of the many variables one can't control in field work is the weather. SFS team members after hiking to a new research site during the rainy season in Costa Rica. (Photo: Chip Giller)

The Sustainable Development Studies Consortium

The Studies in Sustainable Development Program in Costa Rica was created through the joint efforts of SFS and the Environmental Studies Programs at Allegheny, Colby, Dickinson and Middlebury Colleges and the University of Michigan to provide an intermediate level field study opportunity. A portion of the spaces in the semester program are reserved for students from Consortium schools. **Students from these schools should contact their Environmental Studies Departments for more information on the program, credit and application procedures and deadlines.** Students from all other schools should contact the SFS Admissions Office for further information.



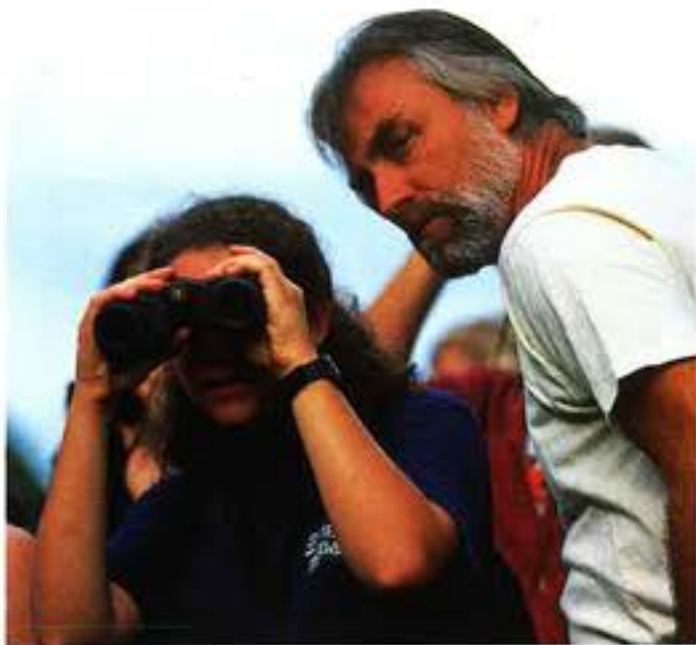
SFS Faculty

SFS faculty are selected for their teaching and field experience, knowledge of research and inter-personal skills. Complementing their strong backgrounds in the sciences are a broad range of skills and experiences that qualify them to lead SFS courses.

Research conducted by members of our faculty has resulted in hundreds of published scientific articles documenting research funded by National Geographic, NATO, the National Science Foundation, U.N.E.S.C.O., and the EPA. The success of SFS programs

in effectively challenging you intellectually, physically and socially, and in building your self-confidence and self-reliance, can in large measure be attributed to the commitment of our faculty. (Please see individual Center sections for additional faculty information.)

Faculty Profile—Paul Robertson



Students benefit from Paul Robertson's (right) dynamic teaching style (he was voted "Teacher of the Year" by his former students in Texas) and extensive experience in field research.

Director: SFS Center for Rainforest Studies/Australia

Education: B.S. (Zoology) Louisiana State University; M.A., and Ph.D. (with honors), Kansas State University.

Teaching Experience: Associate Professor, Trinity University; Visiting Professor, Texas A&M University; Faculty Member, Organization for Tropical Studies, Rocky Mountain Biological Laboratory.

Field Research: Oaxaca, Mexico: Community structure of small rodents. Australia: Ecology of flying foxes. Additional field research in Costa Rica, Belize, French Guiana, Brazil and the U.S..

Other Professional Experience: Executive Director, Bat Conservation International; Program Director for Environmental Studies, Trinity University; Field Coordinator, Rocky Mountain Field Laboratory.

Society Affiliations: American Society of Mammalogists, American Institute of Biological Sciences, Association for Tropical Biology, Society for Conservation Biology.

Published: Dr. Robertson's work has appeared in publications including *Encyclopedia Britannica*, *Journal of Mexican Society of Mammalogists*, *U.S. Fish & Wildlife Service Biological Report*, *Mammalia*, and *Condor*. He has lead and participated in dozens of formal presentations, lectures and seminars.

Personal: Paul grew up in Louisiana at the edge of Atchafalaya Swamp where he developed an intense love for natural history. He has a strong interest in environmental and conservation issues and has been an active member of The Nature Conservancy and The Audubon Society for many years. Paul's wife, Diana Swan, is also a biologist and teacher. While ecology is their primary interest, they both enjoy travel, cooking, camping, hiking, scuba diving and dancing.

Selected Research Papers Resulting from SFS Field Courses

Center for Wildlife Management Studies

STELFOX*, J.B. 1987. Thompson's and Grant's gazelle in relation to seasonal environments and resource use. *African Journal of Ecology*, 24:111-120.

MADDEN**, D. and T.P. YOUNG*1992. Symbiotic ants as an alternative defense against giraffe herbivory in spinescent *Acacia drepanolobium*. *Oecologia* 91:235-238.

YOUNG*, T.P. and L.A. ISBELL. 1991. Sex differences in giraffe feeding ecology: energetic and social constraints. *Ethology* 87:79-89.

Center for Marine Resource Studies

ALMENARA-ROLDAN**, S. 1991. A comparison between two coral reef fish communities at South Caicos Island, Turks & Caicos, BWI, 1990. Presented at 2nd National Conference of Ichthyology of Mexican Ichthyological Society, March 4-9.***

EDMUNDS*, P.J., D.A. ROBERTS*, and R. SINGER*. 1990. Reefs of the Northeastern Caribbean I. Scleractinian Populations. *Bulletin of Marine Science* 46 (3):780-789.

Center for Rainforest Studies

LAURANCE*, W.F., and E. YENSEN*. 1991. Predicting the impacts of edge effects in fragmented habitats. *Biological Conservation*. 55:77-92.

LAURANCE*, W.F. 1990. Comparative responses of five arboreal marsupials to tropical forest fragmentation. *Journal of Mammalogy*. 71:641-653.

PUTZ*, F.E. 1990. Growth habitats of climbing palms (*Calamus* spp.) in North Queensland rainforest. *Australian Journal of Botany*. 38:603-8.***

Center for Marine Mammal Studies

BARNES*, J., J. BOOHER**, H. GRANTHAM**, and B. WEYLMAN**. 1992. Fish species off the shores of Espiritu Santo, La Partida and Los Islotes Islands, and their relative importance to the California sea lion (*Zalophus californianus*) and the fishermen of La Paz, 1991. Presented at the 17th International Meeting of Marine Mammal Studies, Mexico.***

GREENBERG**, D., D.M. MORGAN, and G.D. MILLER*. 1991. Airborne vocalizations in the California sea lion (*Zalophus californianus*). Presented at the Annual Meeting of Animal Behavior Society.***

* SFS Faculty

** SFS Student

*** Recipient of the SFS Andreas Communication award



Background

It is a time of high drama on the plains of Kenya. This country of enormous physical beauty—from the rugged scar of the Great Rift Valley and its soda lakes teeming with pink flamingos, to the vast savannas and escarpments approaching Mount Kenya—is becoming a vulnerable and worried land. With one of the highest population growth rates in the world and a rapidly developing economy, Kenya provides a dramatic illustration of conflicting priorities of preserving land, protecting wildlife, and feeding people.

Population and economic growth have placed severe pressures on the rapidly diminishing natural habitats needed to sustain Kenya's irreplaceable wildlife herds. The increasing need for protein, in particular, has led to extensive ranching of beef cattle. Many of these cattle varieties, however, were originally developed in countries with abundant water, a commodity in short supply in Kenya. Several biologists have proposed what, at first glance, seemed a radical solution: the practice of ranching game. In game ranching, populations of native ungulate species (hoofed mammals) are strictly managed in a protected environment and periodically cropped to be served as food.

Substituting native wildlife species for domestic cattle offers an ecological alternative that lowers water and energy demand. If properly applied, this may allow more protein production per acre than crop farming in East Africa, and may potentially

lead to increased food production. Yet game ranching itself may pose ecological threats. How do harvested populations differ from natural herds? Only carefully coordinated research including population and habitat studies will provide the answers.

We must find a way to satisfy the needs of both wildlife and humans on shared land, rather than assuming that the presence of one excludes the other. SFS students will have the unique opportunity to become directly involved in this dilemma.

Our research is part of a continuing analysis of the ecological viability of game ranching. The results of our research will be integrated with ranch management programs to serve as a model for other initiatives in Kenya and elsewhere in East Africa.



Center for Wildlife Management Studies

Site: Athi-Kapiti Plains, KENYA

Curriculum:

Semester Program

Wildlife Ecology and Management

Summer Course

Wildlife Management

Staff:

Field Director: Richard Garstang, M.Sc., University of Pretoria (Zoology).

Resident Faculty: Samuel P. Thomas, Ph.D., University of Florida (Anthropology).

Janet Rasmussen, Ph.D., Purdue University (Ecology).

Toloumbaye Tadingar, Ph.D., University of Nebraska (Range Science).

Facilities: "International Wildlife Ranching and Research, Ltd.", the site of our Center, consists of 81 square kilometers of fenced rangeland on the Athi-Kapiti Plains. The Center is approximately 40 kilometers southeast of Nairobi. Accommodations are in thatched "bandas" and/or walled tents beneath thatched roofs. Additional facilities include a kitchen area, outhouses, solar water heater, gravity showers, and a dining/lecture/library building. We will sleep on foam mattresses at the Center and on foam pads while on safari. We will have access to the Ranch's laboratory and slaughterhouse. There is no electricity at the Center.

Native wildlife, such as these eland, surround us at the ranch... "Whether your SFS experience leads to more field biology, an honors thesis, or simply a broader world view, is impossible to predict. What is certain, however, is that it will lead to something and it will always be with you."

Peter Coppolillo, Englewood, CO—University of Colorado (Photo: Weaver Whitehead)



Center for Wildlife Management Studies-KENYA

Site

The enormous variety of wildlife in Kenya occupies an equally remarkable variety of terrain. Herds of antelope, buffalo, giraffe, and zebra graze in the expansive savannas as lions, cheetahs, leopards and other large carnivores prowl in the bush. The lush mountain forests to the west are home to duikers, bushbucks, forest hogs and colobus monkeys as well as a large number of impressive birds. In the Grand Rift Valley, believed to be the ancestral home of modern man, hippopotami bathe in lakes shared with white pelicans and pink flamingos.

Significant areas of the country have been set aside as national parks and game reserves where native flora and fauna thrive with little human interference. These settings provide the rare opportunity to witness the complex interrelationships of climate, physiography, vegetation, and animal life.

Our base of operation will be "International Wildlife Ranching and Research, Ltd.," established by Dr. David Hopcraft as an experimental game ranch. Here, a variety of large mammal populations are protected, carefully monitored and ranched. Situated approximately 40 kilometers southeast of Nairobi on the Athi-Kapiti Plains, the ranch consists of laboratory facilities, a slaughterhouse, a small library, and 81 square kilometers of protected and fenced savanna where wildebeest, zebra, fringe-eared oryx, impala and giraffe roam free.

Research Focus

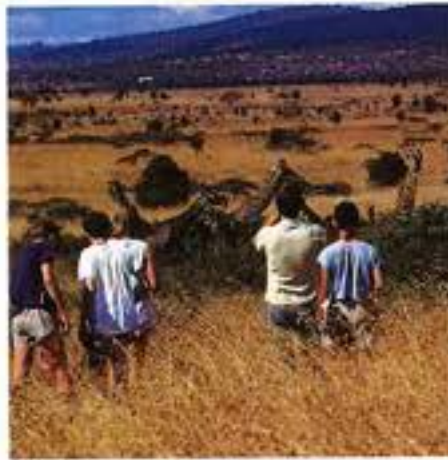
The success of wildlife ranching depends on whether wild ungulates can be maintained on limited areas under a regular cropping regime. In our eleventh consecutive year of research in Kenya, we will assist in conducting applied research which is crucial to game ranch management.

For example, how much woodland habitat does a large population of giraffes need to sustain optimal growth and reproduction? What is the best way to control weeds and improve rangeland quality? How can cattle herders benefit from the presence of wildlife on their ranches? We are seeking answers to these questions at our Center for Wildlife Management Studies.

Living and Working Conditions

Although located near the equator, Nairobi enjoys a year round climate similar to that of a New England September. Nights are cool and chilly, days are warm to hot.

Located in its own isolated setting on the ranch, with the Ngong hills to the north and Mount Lukenya dominating the eastern horizon, our SFS basecamp includes a permanent dining/lecture hall, library, outhouses and open air showers. When in camp, our accommodations will be thatched huts called "bandas" and walled tents suspended in the shade beneath thatched roofs. On off-ranch field expeditions, we will pitch safari tents.



"If I were to summarize the most powerful thing about my SFS experience it would be this immersion. No other learning experience could compare."
M.K. Crabb, Richmond, KY—University of Massachusetts
(Photo: Louise Matthews)



Reconstructing a skeleton helps us to understand structure and function. "A biologist who only learns from a book can never be called a true biologist. Had I not gone, I'd still be that narrow-minded person thinking she could go on and study mammals and nothing else."
Blanca Simmons, Fullerton, CA—California Polytechnic Institute (Photo: Sue Natali)



Our off-ranch expeditions will include visits to several game parks where we will have the opportunity to meet with park officials. (Photo: Rich Ruggiero)

**The School
for Field Studies**



A series of case studies, focusing on local environmental problems and resource-use conflict, will be used to illustrate the concepts presented in the four semester courses. The first case study, *African Ecosystems*, will investigate the inter-relationships between humans, wildlife and their environment. In *Biodiversity of Africa*, we will investigate the cultural and biological diversity of the continent with special emphasis on East Africa. The *Sustainability* case study will review philosophical, political, social and economic justifications for wildlife conservation strategies.

Our first course, **Techniques of Wildlife Management** will provide us with the means to study and understand wildlife populations and habitats in East Africa. We will emphasize techniques and strategies to assess wildlife habitat status and study the requirements of native large game species with the aim of providing suggestions for their management. We will examine the effects of human disturbance and domestic livestock as well as the ability to formulate sound conservation and management policy with the aim of optimizing productivity while maintaining biodiversity. The lecture component of this course will be complemented by laboratory and field exercises on the Ranch and directed observation in several national parks and reserves in Kenya. Field work will include bird and mammal observation, identification techniques and methods for analyzing and classifying vegetation. The digestive anatomy and physiology will be demonstrated at the Ranch slaughterhouse and laboratory, and practical aspects of the harvesting of game species will be discussed. We will explore current controversies in wildlife conservation, and discussions of the global implications of conservation issues will help us focus our understanding of wildlife biology and management.

Wildlife Ecology is designed to provide us with the information and conceptual background to understand the underlying ecological principles of the East African ecosystem. We will focus on fundamental processes and the inter-relationship of the biotic and abiotic components of the system. Lectures, field observations, required readings and seminars will help us examine the theoretical underpinnings of the other courses in our curriculum.

In **Environmental Policy and Socioeconomic Values** we will consider contemporary environmental problems and deterioration from the standpoint of social theory, history, and political economy. We will explore how social organization and value systems, economic forces and political structure all influence policy formulation. Specific related topics include: the relationship between economic growth and policy, analysis of social choice mechanisms, dispute resolution (mediation and arbitration), environmental ethics, and transboundary issues from a social and cultural perspective.

Directed Research builds on the other three courses. A thorough research training begins with examining how key questions are formulated as experimentally testable hypotheses. Lectures are limited to basic field techniques and scientific design, sampling procedure, basis statistics, and the interpretation and communication (graphic, written and oral) of research findings.

Actual field research, consisting of group projects, begins during the second week of the semester. Teams of two to four students will either continue studies begun during previous semesters or conduct new research. Topics of key interest have been identified by SFS faculty in conjunction with other experts in the field of wildlife conservation and management in Africa. Directed research projects are designed to provide hands-on experience in the applied research

Semester Program: *Wildlife Ecology and Management*

Site: Center for Wildlife
Management Studies, KENYA

Course Titles and Numbers:
Techniques of Wildlife Management
(BIO 1821)
Wildlife Ecology (BIO 1823)
Environmental Policy and Socioeconomic Values (SOA 1909)
Directed Research (INT 1191)

Departure Point: Nairobi, Kenya

Program Dates:
September 10 - December 13, 1993
January 28 - May 3, 1994

which forms the basis for modern wildlife management both on the ranch and elsewhere in game-rich East Africa.

We will conduct field work on the ranch which supports both domestic livestock and native wildlife. The ranch and its slaughterhouse enable us to carry out a wide variety of research projects, which may range from behavioral ecology to prescribed fire experiments. Most studies apply to practical management concerns of rangeland and wildlife biologists.



SFS students studying in the classroom banda on the ranch. "I wanted to test my ability to survive in a more simple and a totally unfamiliar environment. Life in Hamden, Connecticut seemed so very different from life in Kenya. What would it be like to live with outhouses and without electricity?"
Rachael Feldman, Hamden, CT—University of Connecticut
(Photo: Jenee Colton)



Summer Course: *Wildlife Management*

Site: Center for Wildlife Management Studies, KENYA

Purpose: to compare the population dynamics, carrying capacity and economic potential of large mammals (antelope, giraffe and zebra) in hunted populations and in national parks; to assess the long term implications of game ranching as a wildlife management technique.

Course Number: BIO 1806

Departure Point: Nairobi, Kenya

Course Dates:

Session I: June 15 - July 14

Session II: July 21 - August 19

Rising early each morning, we will begin a busy day with field observations. We will return to camp for breakfast and some camp chores, followed by either lectures or field exercises. On days that include research time, we will travel by foot or by landrover to our research sites. Our studies call for extensive monitoring of vegetation and field conditions as well as long, sometimes arduous, observations of wildlife species including zebra, antelope and giraffe. Our research activities will address questions including: Does cropping adversely affect the social organization and breeding success of antelope? What is the economic potential of various species? What is the diversity of incidental species affected by game ranching (e.g. scavengers)? What is the recovery rate of areas overgrazed by cattle and how are these areas utilized by game?

In order to answer these questions, we will need to develop our research skills, including behavioral sampling techniques and large mammal census techniques, and learn how to conduct vegetation surveys. Faculty and guest lecturers will provide us with the necessary background to begin our research. Lectures will introduce us to the general principles of ecology, animal identification and social organization, game ranching and management techniques, plant and herbivore interactions and techniques for estimating rangeland productivity.

The Ranch's weekly cropping operations provide us with unique opportunities to study the physical condition, parasite loads and commercial productivity of wildlife from both free-ranging and confined populations.

We will initiate small group field research projects early in the course. Potential topics for directed research include giraffe feeding ecology and carrying capacity, behavior and social organization of the fringe-eared oryx, fleeing distance and cropping protocol for various species on the Ranch and surrounding ranches and wildlife areas, and management of cattle bomas.

Field excursions outside the Ranch will take us to some of the more spectacular areas of Kenya. These trips may include visits to Lake Nakuru to examine the effects of the surrounding human population on one of Africa's greatest national parks, the Maasai-Mara Reserve to witness the massive concentrations of game and to examine the Maasai and wildlife interactions here. We may also visit Nairobi National Park to compare the ecology of a semi-fenced national park with that of International Wildlife Ranching and

Research, Ltd. We may also hike up nearby Mt. Lukenya to take a first-hand look at some of the factors affecting raptor conservation or visit the bustling Monday market at Machakos to interact with the local people in a thriving agricultural area. Other possible day trips include the National Museum of Kenya and the Olorgesailie National Monument, a prehistoric archaeological site.

"The measure of the success of SFS should not be the degree to which they increase interest in science per se, but the degree to which they help each of us define our appropriate roles as global citizens and protectors of a fragile planet. By this latter measure, I think they are enormously successful."

Claudia Polsky, NY, NY—

Harvard/Radcliffe College/ Fulbright Scholar



When thinking of Kenya, one often has visions of giraffe, zebra, lions and elephants. Kenya is also home to many spectacular bird species including raptors. (Photo: Rich Ruggiero)



Background

It has been said of Baja that "few places exist today where nature proceeds so unhindered with its own agenda." Increasing resource requirements, spurred by Mexico's exponentially increasing population, may soon pre-empt this agenda. The waters surrounding Baja—the Pacific Ocean and the Sea of Cortez (also known as the Gulf of California)—are among the most productive marine ecosystems on earth. Benign climate, historically undisturbed habitats and the presence of marine upwellings—unusually rich sources of plankton—provide ideal conditions for the area's remarkably diverse marine mammals and their prey. However, with increasing demand and technological capability, humans and marine mammals are becoming competitors for the same food and habitat resources, threatening fundamental portions of the marine food web.

The rich waters adjacent to Baja support large populations of whales, dolphins, sea lions, and porpoises. These waters provide a habitat for an unusually large resident populations, while numerous other animals migrate—often thousands of miles—for the seasonally abundant food supply and protected warm waters necessary for reproduction.

Schools of anchovies, shrimps, sardines and numerous species of gamefish drawn to these waters are the targets not only of commercial fishermen, but also sportsfishermen from all over the world. Overfishing is driving fish resources to new lows, presenting the threat of a diminished food source and the loss of dependent species from their habitats.

For centuries the Baja peninsula was nearly inaccessible. 1973 marked the opening of a highway from its U.S. border to the tip of the cape. A steadily increasing influx of tourists portends mixed results. Monies derived from tourism can be directed to conservation efforts to protect this irreplaceable ecosystem, which will no doubt be additionally stressed by their presence.

The Government of Mexico has a long history of wildlife conservation and a strong interest in protecting marine mammals. Unfortunately, funds for marine mammal research are severely limited. Through a cooperative agreement with the University of Southern Baja California, and by working with the Mexican Society for the Study of Marine Mammals, SFS students will have an opportunity to make a significant contribution to future management policies as we consider the status of marine mammal populations here. Through our on-going presence, SFS can document the changing demographics of marine mammals at constant sites over several years. These baseline data can provide much needed information on changes in the utilization of coastal waters by



"Suddenly I was living as part of a working team of research scientists studying marine mammals. I was no longer just reading books and papers about natural resource management, I was participating in the research, discussion and creation of those papers!" Elizabeth Mowris, Atlanta, GA—Davidson College (Photo: Steve L. Swartz)



Center for Marine Mammal Studies*

Site: La Paz, Baja California Sur, MEXICO

Curriculum:

Semester Program
Marine Mammal Conservation
Summer Course
Sea Lion and Dolphin Conservation

Staff:

Field Director: Don Croll, Ph.D.,
Scripps Institute of Oceanography
(Marine Biology).

Resident Faculty: Stephanie Paladino,
M.A., American University
(Applied Anthropology).
Ann Weaver, M.S., San Diego State
University (Animal Behavior).

Visiting Faculty/Research Director:
Jorge Urban Ramirez, M.Sc.,
Universidad Autonoma de Mexico
(Marine Mammal Biology).

Site Manager: Henk Nienhuis,
M.Sc., State University of Leiden,
The Netherlands (Marine Biology).

Facilities: The Center is currently based out of a small hotel just outside the city of La Paz, at the southern end of the Baja California peninsula. Our site affords excellent access to the nearby Bay of La Paz where over 20 species of whales and dolphins have been sighted. Our facilities consist of three, large, dormitory style rooms, and access to small lecture rooms, a kitchen and dining/commons area. In addition to the small field library and computer room at the site, our affiliation with the Universidad de Baja California Sur allows us access to the university's small library. We will make trips into nearby La Paz to enjoy the cultural opportunities of the city. We will camp in tents during trips to wilderness areas.

*The Center is sponsored in Mexico by the Universidad de Baja California Sur, which offers local assistance and cooperation in the operation of Center programs.



Center for Marine Mammal Studies-MEXICO

marine mammals as these animals are caught in the growing struggle over use and management of the region's natural resources.

Site

Jutting south 800 miles from its border with California, Mexico's Baja peninsula separates the Pacific Ocean and the Gulf of California. Its mountainous landscape is speckled with a desert garden of thorny cacti. The Pacific coastline is marked by occasional saltmarshes and lagoons, widely separated by miles of sandy dunes. The rockier coastline of the Gulf and the plethora of adjacent islands provide an ideal nesting site for numerous bird species including brown pelicans, brown boobies, terns, blue footed boobies and Heerman's gulls.

Human presence is noticeably absent here. The few large cities and resort areas are separated by miles of rural coastline dotted with small fishing villages. Nearby waters teem with fish including anchovies, sardines, brightly colored king angelfish, Moorish idols, black marlin, sailfish and sharks.

Resident populations of marine mammals include California sea lions, bottlenose dolphins and Bryde's whales. These waters also comprise key migration routes of gray whales, blue whales, fin and humpback whales.

Research Focus

In order to manage human activities for the benefit of both humans and marine mammals, it is essential that we understand the natural history and habitat requirements of each species (including humans) within the Bay of La Paz. Our field work will directly contribute to and support ongoing work of Mexican scientists concerned with conserving the marine mammals around the southern peninsula. We will document the seasonal abundance and distribution of marine mammals in and around La Paz Bay, focusing on both resident and migratory species. Key questions addressed by our research include: How do species differ in their patterns of prey and habitat use? To what extent does increased boat traffic impact whale and sea lion activity patterns? What are the energy requirements and feeding success rates of brown pelicans? We will use photo-identification to study individual variations in movement and behavior.



The Baja Peninsula boasts several dynamic and beautiful desert environments. Our studies will include some desert ecology, focusing on the unique interface between desert and marine ecosystems. (Photo: Lorayne Meltzer)



"In what other classroom can you listen to a lecture about sea lions and observe a sea lion pop up in the water behind the lecturer?" Mark Clements, Plymouth, IN—Butler University (Photo: Steve L. Swartz)

Travel and leisure are key elements of the economy of Baja California. Assisting Mexican scientists in assessing marine mammal occurrence and the impact of increased human disturbances will help guide future programs to increase tourism and devise policies and strategies that will preserve the natural resources of the region.

Living and Working Conditions

La Paz, the capital of Southern Baja, California, is the largest city on the peninsula with a population of over 100,000 people. Our base camp will be situated in an old hotel on La Paz Bay. Our simple living accommodations will be supplemented with a field computing facility, a darkroom, lecture and study space, and a small field library. We will have kitchen facilities and will cook for ourselves.

The site provides easy access to an extraordinary array of marine mammals in nearby crystal clear waters surrounded by rocky cliffs and sandy beaches. The city of La Paz, and all it has to offer, is accessible by a short boat ride.

**The School
for Field Studies**



Background

Tropical rainforests are complex ecological arenas within which intricate evolutionary scenarios have been unfolding for over 100 million years. The tropical forests that span northern Queensland are the most diverse in all Australia and are inhabited by the greatest diversity of wildlife found anywhere on the continent. The greatest concentration in the world of primitive flowering plants—thirteen of the known original nineteen families—are found here in an area botanists claim to be a "priceless world heritage."

When Australia was cut off from the rest of the world by its separation from South America and Antarctica over 60 million years ago, it became isolated from the mainstream of mammalian evolution. A unique evolutionary pattern arose. Instead of the dominance of placental mammals found elsewhere in the world, marsupial (pouch-bearing) mammals—kangaroos, possums and bandicoots—evolved. Australia's isolation, coupled with the lack of a major human presence and the absence of other predatory animals, allowed the survival of bizarre evolutionary phenomena—the egg-laying, milk-producing, furred, duck-billed platypus, the strange spiny anteater, and the air-breathing lungfish which crawls about mud flats on its fins.



"The rainforest was magical. No one had any trouble getting up in the morning with the dawn chorus of birds and the scurrying sounds of small mammals right outside our windows."
Jason Carter, Rome, NY—SUNY Buffalo
(Photo: Chip Isenhardt)

As a consequence of the high incidence of endemism—the evolution of species found nowhere else on Earth—the botanical and faunal riches of this area are exceptionally unique. North Queensland rainforests have been subjected to an array of intensive land uses in the past century—deforestation for agriculture, logging, and mining. Most of Australia's remaining rainforests are protected as a World Heritage site. We will conduct our studies and research in protected areas and in a number of modified habitats, as we attempt to assess the impacts of human activities on the unique rainforest biota. SFS students have a rare opportunity to participate in research on this "frontier of ecology." Semester participants will explore the extent to which endemic species—including birds, possums and other marsupials—can serve as indicators of ecological disturbance. Summer participants will focus upon a specific conservation problem such as assessing the impacts of rainforest fragmentation on native plants and animals.

Research focus

Given the realization that rainforests worldwide are being felled, logged, burned and altered at astonishing rates, our research focuses on understanding the ecological processes and communities that characterize intact rainforests and which may be lost as the forests are destroyed or modified. A second goal is to develop strategies for regenerating and rehabilitating formerly degraded tropical communities. These topics have direct relevance for rainforest conservation in a world which will probably lose much of its rainforest during the next few decades.



Center for Rainforest Studies

Site: North Queensland, AUSTRALIA

Curriculum:

Semester Program

Tropical Rainforest Management

Summer Course

Tropical Reforestation

Staff:

Field Director: Paul Robertson, Ph.D., University of Kansas (Zoology).

Resident Faculty: David Bathgate, Ph.D., University of Colorado (Ecological Anthropology).

Tony Cummings, M.E.S., Yale University (Environmental Studies).

Site Manager: David Wilson.

Facilities: The Center is located in North Queensland, on 153 acres of secondary growth forest and rainforest on the Atherton Tableland. A farmhouse serves as our Administrative Center, complete with lecture hall, modern kitchen facilities, refrigeration, washing machines, a small library and periodicals collection, and computer center. Students live in one of four dormitory cabins on the property. Faculty housing is now under construction. The nearest town is Yungaburra, approximately 12 miles from the Center.

SFS gratefully acknowledges the Archer Daniels Midland Company, processors of agricultural products for their support of this program.



Financial Aid is available.

Please see page 28.



Center for Rainforest Studies-AUSTRALIA

The Center's 153-acre property is comprised of a mosaic of logged rainforest, rainforest regrowth, and cleared pastures. Our research attempts to illuminate the composition of plant and animal communities in these modified habitats. We will also study assemblages of species in "corridors" of regrowth vegetation along streams; similar corridors may be used to provide avenues for animal migration between isolated forest fragments and nature reserves. Finally, we are investigating the use of "key indicator species" such as lemuroid ringtail possums and Lumholtz's tree kangaroos, birds such as the logrunner, and other species to indicate the "health" of the rainforest ecosystem.

Site

Northern Queensland has the greatest biological, climatic, and social diversity in all of Australia. Jutting some 400 miles toward New Guinea from the rest of the continent, it separates the Coral Sea from the Gulf of Carpentaria. A narrow strip of Australia's largest remaining tropical rainforest runs down to the water along the shoreline fringed by the magnificent 1,200 mile long Great Barrier Reef.



Now that the area around our Center has been protected from further deforestation, we need to better understand the relatively new concept of reforestation. SFS students discuss tree planting with a local forester. (Photo: David Bathgate)

Living and Working Conditions

Be prepared for wet weather, especially during the rainy season from January to May, when rainfall may average 400 mm/month. Rainfall and thunderstorms occur sporadically during other times of the year. The dry season months of September through December are often quite warm, with temperatures in the 80's and low 90's. We conduct field work at all times of the year, regardless of the weather.

The SFS Center for Rainforest Studies is located on 153 acres on the Atherton Tableland, a mid-elevation plateau, and provides ready access to rainforest and modified habitats on and adjacent to our property. On our frequent forays into the rainforest, we

encounter hundreds of species of trees and highly diverse animal communities including wallabies, lorikeets and cockatoos, tree kangaroos, pythons, and monitor lizards. Large groups of flying foxes (huge bats) often fill the evening skies near the station. Streams wind their way through dense, lush vegetation and occasional waterfalls fill the air with the persistent hum of crashing water.

Students live dormitory-style in modern cabins surrounded by forest, and can expect to be awakened by a "dawn chorus" of myriad birds and the hopping and scurrying sounds of small animals. Fresh fruits, vegetables, fish and meat are readily available in nearby Yungaburra to embellish our culinary endeavors.



Many of the species we will encounter in the rainforest are found nowhere else on Earth. Here students and faculty examine a lace monitor lizard. (Photo: Jennifer Taylor)



The Center for Rainforest Studies, called "Warrawee"—'you are welcome here' in the local Aboriginal tongue, is located on 153 acres of rainforest and secondary growth forest. (Photo: Mark Noble)

**Please recycle this catalogue
by sharing with a friend or library.**

Ecology of Endangered Sea Turtles/Costa Rica

Sea turtles are among the largest living reptiles, ranging in size up to 900 kg. Surprisingly little is known about sea turtles, since they spend the majority of their lives at sea. What little is known is fascinating. It is thought that sea turtles live an extremely long time, but no one is sure how long. The sex of hatchling sea turtles is not determined by genetics, but by the temperature at which the eggs are incubated. In sea turtles, low incubation temperatures produce males and higher temperatures produce females.

Today sea turtles face a growing number of environmental threats, many of them of human origin. Worldwide, their nesting areas are being altered or destroyed by development, they face inadvertent capture by fishermen, and both adults and eggs on or near beaches are exposed to the threat of poaching. Additional problems include survival of hatchlings through the vulnerable first years at sea, incidental capture by shrimpers, dangers posed by marine debris, and nest failure due to predators and physical processes such as seawater washout.

SFS students will return to the beaches at Ostional for a third year to study the biology, ecology and conservation of the olive or Pacific Ridley turtle (*Lepidochelys olivacea*). The beach at Ostional is one of the two most important nesting areas in the world for this endangered species. An agrarian community of approximately 50 families live at Ostional and legally harvest turtle

eggs for subsistence and commercial uses.

Ridley turtles often use a unique nesting strategy known as the "arribada", which involves monthly mass nestings that last from three to ten days each. Arribadas usually occur at night and can involve up to 100,000 animals. On nights between arribadas, individual turtles nest in a more typical manner. One question that we will address is whether these solitary nesting turtles also participate in arribadas.

After meeting in San Jose, we will travel by bus to our base at the Ostional Field Station. Because much of our data collection must be done at night, when females come ashore to lay their eggs, our days will be devoted to lectures, studying and documenting evidence left on beaches from any turtle activity from the previous evening. Faculty and guest lectures will address the taxonomy, natural and life histories of turtles, concepts of population and physiological ecology as they apply to sea turtles, nesting and pollution biology, temperature dependent sex determination, and sea turtle conservation.

In order to diminish the impact of large numbers of humans on the nesting beaches at any given time, we will divide into smaller research teams with two teams patrolling the beach each night. Students will be introduced to field research skills including tagging, censusing, conducting thermal measurements, recording nesting activities and physical characteristics. Questions we

will seek to answer include: What is the relationship between nesting activity, tides and climatic conditions? What percentage of nests are damaged by the nest-digging of other turtles? What percentage of nests are lost to humans? We will also consider the attitude of local citizens and Park officials regarding the potential increase of tourism at Ostional. In addition, students will have

Purpose: to investigate the ecology and behavior of the endangered Pacific Ridley turtle (*Lepidochelys olivacea*); to investigate the nesting beach at Ostional in order to recommend management policies that will protect the nesting habitats of these endangered species.

Course Number: BIO 1842

Departure Point: San Jose, Costa Rica

Course Dates:

Session I: June 15 - July 14

Session II: July 21 - August 19

Faculty: Molly Lutcavage, Ph.D.
Ana Chaves Quiros,
License in Biology

Cost: \$2,580 + \$100 Registration Fee.

the opportunity to conduct individual directed research projects. Potential projects include consideration of environmental factors affecting hatchling emergence, spatial variations in nest success considering mortality from humans and natural factors, and the aging biology of sea turtles.

During the final days of the program, we will compile and analyze our data for use in oral presentations of our research. Our results will be shared with the University of Costa Rica and with the Ostional Association for use in developing management plans for the beach.

Our base at the field station consists of a bunkhouse/laboratory. We will all pitch in to complete daily chores and some cooking, although many of our meals will be prepared by a local cook. Plan on hot weather at Ostional. Although we will be on the "dry" side of Costa Rica, this is the wet season and mosquitoes will be plentiful. The opportunity to get to know the local people of Ostional and to understand their perspectives regarding the turtles, tourism and conservation, are a bonus of this location.



If they survive the perils facing them as hatchlings, female turtles are thought to always return to the beaches where they were born to lay their eggs. Thus, habitat protection is essential to this endangered species. (Photo: Susan Barvanek)

Landscape Ecology/Colorado Rockies

Purpose: to determine the quality and size of ecological land units needed to preserve ecological diversity in the San Juan Mountains; to evaluate the suitability of prairie dog communities as sites for the reintroduction of the endangered black-footed ferret.

Course Number: BIO 1800

Departure Point: Denver, Colorado

Course Dates:

Session I: June 15 - July 14

Session II: July 21 - August 19

Faculty: Donna Stockrahm, Ph.D.
Ursula Shepherd, M.A.

Cost: \$2,380 + Registration Fee.

What's the difference between a national park, a national forest, and a biosphere reserve? What is the best way to preserve biodiversity for future generations? We will address these questions while gathering valuable baseline data in the remote San Juan Mountains which represent one of America's most outstanding natural areas. Here, where snow-capped mountain peaks jut skyward from green-forested valleys, elk, mule deer and the solitary black bear roam at will. The sweeping landscape encompasses alpine meadows giving way to subalpine and montane forests, which in turn grade into upland grasslands/shrublands, each with their unique community of plants and animals. This area forms one of the last intact fortresses of vast wildlife diversity in the continental U.S. Planned land-use changes throughout the southern Rockies are leading to concern that competing interests will lead to a rapid loss of wildlife habitat. In order to protect the diversity of species that naturally occur in threatened primary wildlife areas, biologists and resource managers must know where, how large, and "natural" key areas should be to sustain wildlife diversity.

The San Juan Mountains lie to the north and east of Mesa Verde National Park and the Southern Ute Indian Reservation,

along the Colorado-New Mexico border.

Over the past three summers, SFS research teams have studied the ecology of the Gunnison's prairie dog in the high grasslands of the Western Slope near Pagosa Springs, Colorado. Prairie dog communities were evaluated for their suitability to serve as sites for the reintroduction of the endangered black-footed ferret. Our research methodology included live-trapping of prairie dogs in order to conduct population studies, and the use of radio-telemetry to track underground movements of tagged dogs. We plan to continue this research in 1993.

Study areas will be selected on the basis of factors such as current use, proposed development or conservation efforts, or indications of potential as wildlife habitat. Our findings will be of use in answering critical questions such as how much development can be interspersed with natural systems of a region? How will the current system be impacted by proposed land-use changes?

We will carry out directed research projects based on our interests and observations. There are many important questions to be addressed such as how suitable are landscape units for endangered species such as grizzly bear, wolverine, lynx and black-footed ferret? Do public land-use values threaten the pristine qualities of this region? Would ranchers support the protection of Gunnison's prairie dog colonies as future reintroduction sites for black-footed ferret? Our results will be presented to the U. S. Forest and U. S. Fish and Wildlife Services in order to build support for preservation of this vital area.

Faculty lectures will address the vegetation and habitat types of the southern Rockies, the natural history and ecology of native species, conservation biology and theories

of biogeography. Students will participate by discussing papers and making short presentations on animals of the region. Around the evening campfire, we will consider topics that may range from cultural differences in land ethics to personal views about conservation and wildlife protection.

Our study area extends from grassland/sagebrush habitat below 8,000 ft. to spectacular high peaks reaching over 14,000 ft. We will set up mobile tent camps in a variety of habitats at varying altitudes. You can expect primitive camping conditions throughout most of the course. We will live in tents, bathe in streams, and often must purify our drinking water. We cook our own food over campstoves and share camp chores. Participants will need to be in good physical condition as approximately half of our time is spent in remote backcountry, where we carry all of our gear and supplies on our backs. Weather conditions can range dramatically from mid-day heat to night-time cold. While it will be generally warm and dry at lower elevations, we can expect occasional afternoon thundershowers, especially along the higher mountain slopes.



Vegetation sampling in the Colorado Rockies. As I talked to the other students, I found people with a variety of interests. They weren't all bio majors, there were economics and liberal arts majors, and the ever present undecided majors."
Timothy Jon Van Norman, El Paso, TX—Washington State University (Photo: Donna Stockrahm)

Summer Satellite Courses

In addition to conducting research at the five SFS Centers, SFS is keenly interested in having the flexibility to mount shorter-term research efforts addressing timely environmental issues worldwide. To this end, we offer students the opportunity to participate in 30 day summer courses at seven satellite sites around the globe. The academic rigor of satellite courses is equal to that of summer courses at our Centers.

SFS satellite sites are chosen in large measure for their dramatic illustrations of the issues under study. SFS research at these sites may take place over one to as many as five or six years. As is true for our Center-based programs, all research results are shared with local agencies and resource managers for use in developing management policies.

Each satellite course enrolls 16 students and is taught by two faculty. Activities are held seven days a week with only one or two days off during the program. Each course is accredited for eight quarter credits. In most cases, our accommodations are in tents or rustic cabins. When necessary, we use mobile camps in order to access the best research sites.

Applicants must be 16 years of age and have successfully completed the junior year of high school by the time the course begins. The SFS policies and procedures described on pages 27-28 of the 1993-94 Course Catalogue are applicable to all satellite programs. SFS Admissions Counselors are happy to answer any additional questions and can be reached at (508) 927-7777.

SUMMER 1993 SATELLITE COURSES

Primate Ecology and Conservation/Barbados	p. ii
Ecology of Endangered Sea Turtles/Costa Rica	p. iii
Landscape Ecology/Colorado Rockies	p. iv
Tropical River Ecology/Belize	p. v
Raptor Ecology and Conservation/Montana	p. vi
Ethnobotany/Ecuador	p. vii
Ecology of Killer Whales/Puget Sound	p. viii

The School For Field Studies

16 Broadway
Beverly, MA 01915-4499
(508) 927-7777
FAX (508) 927-5127



Primate Ecology and Conservation/Barbados

Purpose: to study the demography, resource utilization, ranging, and behavioral ecology of African green monkeys (*Cercopithecus aethiops*); to assess the potential effectiveness of the African green monkey as a tourist attraction and economic resource for the island; to contribute to efforts to identify a site and management plan for a proposed green monkey preserve.

Course Number: BIO 1808

Departure Point: Christ Church, Barbados

Course Dates:

Session I: June 15 - July 14

Session II: July 21 - August 19

Faculty: Diane Chepko-Sade, Ph.D.
Lynne Miller, Ph.D.

Cost: \$2,580 + \$100 Registration Fee.

This summer SFS will begin a new study focusing on the ecology and management of the African green monkey (*Cercopithecus aethiops*) on the island of Barbados. First introduced to the West Indies from Africa in the 17th century, the African green monkey, also known as the vervet or guenon, has repeated its African success story by adapting to a variety of environmental conditions and living in close proximity to intensive development. Over the past three centuries, as more and more of the arable land in Barbados was put into agricultural use, the available habitat for monkey troops was increasingly restricted to remnant patches of forest in gullies and on hillsides. The vervet has successfully adapted to these restrictions, modifying its behavior, troop size, sex ratios, and foraging strategies; and now it relies heavily on cultivated plants and cash crops as food sources. The monkeys increasingly incur the wrath of local farmers who view and hunt them as pests.

Recently some islanders have seen these monkeys in a different light, suggesting that populations of these animals may have economic potential as a tourist attraction. Our studies this summer will represent the first stage of a long-term research project assessing the demography, resource utilization, ranging, and behavioral ecology of African green monkeys in the habitat most

likely to be set aside by the government for the development of "green" tourism.

Specific questions we will seek to answer include: What percentage of foraging time do troops spend in cultivated areas compared to more sheltered areas of "natural" vegetation? What is the average size and age-sex composition of troops in various locations, and how are these variables affected by the degree of reliance on human agricultural activity? How do monkey populations respond to human attempts to control, prevent, or limit their access to agricultural resources?

We will meet at the airport in Barbados and travel together to our basecamp. We will begin with a brief orientation to the island followed by an introduction to primate behavioral ecology with emphasis on the African green monkey in the Caribbean. Faculty will introduce methods for identifying and recording monkey behaviors. After spending a few days at the Bellairs Research Institute, we will move to the nearby Barbados Wildlife Preserve at Farley Hill where we will practice our newly acquired identification skills on small groups of captive monkeys and on the wild monkeys that enter the reserve each day.

We will begin our observations before dawn and will follow the monkeys until their mid-morning rest period. The middle of the day will be devoted to lectures on topics including principles of demography and population ecology, human-monkey resource competition, foraging and resource utilization strategies in nonhuman primates, and introduction to wildlife management techniques. Our

field work will resume in the early afternoon and continue until dark.

Once we become proficient at identifying monkey behaviors and characteristics, we will transfer our skills to free-ranging monkey groups at two sites—the mahogany forest adjacent to the reserve and an agricultural site. In addition to working on the group research projects, students will conduct directed research projects with faculty assistance. Potential projects include consideration of intergroup relations in free-ranging troops, age-sex bias in susceptibility to baiting and trapping, and interviews with tourists and locals to assess the appeal of "green" tourism involving monkeys.

During the final days of the program, we will compile and analyze our data for use in oral presentations of our research. Our results will be shared with managers of the Wildlife Preserve and government ministries interested in the economic impact of green monkey distribution and resource utilization. In addition, this project will help assess the potential effectiveness of the African green monkey as a tourist attraction

and economic resource for the island and the identification of a site and management plan for the proposed preserve.

Barbados, the most easterly of the Caribbean Islands, is home to 250,000 English-speaking residents. We will live and work in the northern parish of St. Peter. Our accommodations will most likely be in small, simple cabins, where we will prepare many of our own meals including "flying" fish, a local delicacy. Steady trade winds help keep temperatures in the 75-85 range with only moderate humidity. Showers are more frequent later in the summer with the onset of the "rainy" season. We will take special precautions to protect ourselves from the effects of the tropical sun and biting insects.



"It is very different collecting data on monkeys that are running from you or throwing twigs at you than it is collecting data on rats that are in a Skinner box!"
Christy Freeland, Charlotte, NC—University of North Carolina (Photo: Bill McComas)

Ethnobotany/Ecuador

The greatest storehouse of information about human use of tropical plants resides not in university libraries but in the oral traditions of indigenous peoples who have lived among and used these plants for centuries. The Runa or Quichuas of Ecuador have lived along the Arajuna, a tributary of the Rio Napo, for hundreds of years. Like other Amazonian people, they adapted to the forest and now depend on it for their survival. From the rich, tropical vegetation they find food, shelter, clothing, medicine and almost everything else they need to survive.

At present, both the people and the forest are undergoing rapid change. The forest area in which we will be working is under escalating pressure from the growing timber and oil industries and the increasing migrant squatter populations who have moved into this region. Our goal will be to gather data and information that can be used by both the indigenous peoples and management agencies to develop conservation and sustainable land use strategies.

By studying the rareness/abundance, ecology, ethnobotanical importance and conservation prospects of specific plant species, we hope to determine their role in the rainforest and in the lives of local peoples. Armed with an understanding their uses of plants, we hope to be able to assess ways in which we may contribute to the preservation of the ethnobotanical heritage of these indigenous peoples. For centuries, local people have verbally passed on much of their ethnobotanical understanding to the younger generations. As modernization and emigration weaken these traditions, it becomes important to document this knowledge.

With the assistance of Quichua informants, we will identify and collect samples of rainforest plants and record their traditional names and uses. Questions we will ask include: What plant species are used medicinally? Which plants provide edible materials? If the plant is cultivated, do traditional agricultural practices mimic secondary succession? To answer these questions we will employ both anthropological and botanical field techniques. Working with indigenous people requires sensitivity and patience. While our contacts with local peoples will be limited, we will be introduced to the interviewing and observational skills necessary for successful fieldwork with traditional cultures.

We will meet at the airport in Quito and travel to our basecamp together. Lectures by faculty will introduce the cultural history of the indigenous people of Ecuador

and some of the plant species we are likely to encounter in our fieldwork. Each student will then select one species of plant to investigate in depth. Working in groups, we will collect herbarium species from the primary forest. Our samples may include species from the canopy, understory shrubs, trees and herbaceous plants growing in soil and on the limbs and trunks of trees. As we collect plants utilized by the Runa, we will have the opportunity to observe and appreciate the extensive biodiversity of this ecosystem. Returning to camp at the end of the day, we will prepare our species for identification and analysis using standard botanical field techniques which faculty will introduce. These species will be donated to the permanent collection at the National Herbarium.

Additional faculty lectures will address taxonomy and physical adaptations of major plant groups within tropical ecosystems, field identification techniques, the isolation and concentration of active plant products, ethnobotanical and anthropological methods, and the problems and potential ethical considerations of rainforest development. Periodically we will travel, usually by large motorized canoes, to visit small villages and towns along the river. Here we will meet with residents to better understand their uses for and concerns about rainforest

Purpose: to identify plants used by indigenous peoples in Ecuador's Amazon Basin for medicine, food, construction, hunting and rituals; to determine how plants can be collected and harvested on a sustainable basis; to assist the indigenous peoples and other agencies to develop conservation and sustainable land use strategies.

Course Number: BIO 1801

Departure Point: Quito, Ecuador

Course Dates:

Session I: June 15 - July 14

Session II: July 21 - August 19

Faculty: Shawn Sigstedt, M.A.
Rocio Alarcon, M.A.

Cost: \$2,680 + \$100 Registration Fee.

products. In addition to collecting data on the plant species of their choice, students will undertake directed research projects with faculty assistance. Previous projects have examined medicinal uses of traditional crops, the economic potential of novel species, and the uses of plants in home construction.

During the final days of the program, we will write up our findings for oral presentations to the group. Our results will contribute to ongoing conservation research programs sponsored by Esosciencia Foundation and the National Herbarium for Economic Botany.

Our basecamp will be located near Tena, a small village along the Rio Napo River only one degree north of the equator. Here drenching rains of up to 6 meters annually foster a verdant green rainforest which is home to countless endemic plant and animal species. Days are warm and clear while nights can be quite cool. Downpours are possible at any time. We will live in a large, rustic lodge with dormitory style accommodations. On a clear day, if we are lucky, we may catch a glimpse of the spectacular snow-capped Andes rising in the distance.

Local Quichuas demonstrating the use of rainforest plants in home construction. "To be listening to a lecture on botany and then to reach over the 'classroom wall' and grab a handful of the subject matter was incredible!" (Photo: Brad Bennett)



Ecology of Killer Whales/Puget Sound

Purpose: to study the impact of human activity (fishing, boating, whale watching, habitat destruction) on the current and long-term patterns of habitat use by resident killer whales (*Orcinus orca*) in the Puget Sound area; to identify strategies for improved policy regulations to control and manage interaction between human activities and the most "urban" killer whale population in the world.

Course Number: BIO 1853.

Departure Point:

Friday Harbor, San Juan Island, Washington

Course Dates:

Session I: June 15-July 14

Session II: July 21-August 19

Faculty: Richard Osborne, M.A.

Lourdes Flores Ochoa, B.S.

Cost: \$2,680 + \$100 Registration Fee.

Few conservation issues have engendered as much worldwide interest and support as the plight of marine mammal species. As population counts stabilize, and in some cases increase, efforts to protect dwindling populations of marine mammals from hunting and incidental capture may be viewed in retrospect to be among the biggest conservation success stories of the last twenty years. Although spared from many (though not all) of the direct threats once posed by commercial fishing, marine mammal species still face loss of habitat to an increasing human impact, and competition for food sources still imperils their long-term survival.

The San Juan Islands are at the international crossroads of an important summer feeding and mating area for a large, stable population of killer whales (*Orcinus orca*). This once remote area has experienced a continuous increase in shoreline development and industrialization over the last century, and over-fishing, boating and whale watching during the last decade. Killer whales, also known as "orca", are the largest members of the oceanic dolphin family. Averaging 25 feet in length and seven tons for males, four tons for females, orcas are the only known cetacean to feed regularly on other marine mammals.

Last year the resident killer whale population at the north end of Vancouver were the subject of study. This summer SFS teams will focus on the killer whale populations south of Vancouver Island. Our research will address the following questions: Have long-term patterns of behavior and habitat use by these killer whales shown changes that can be attributed to 1) salmon resources, 2) vessel traffic patterns, or 3) whale watching? Can we measure short-term effects on the behavior and vocalizations of killer whales in relation to current vessel-based whale watching activities? What would be an effective strategy for regulating the behavior of whale watchers in this location that would a) protect the whales, and b) maintain vessel-based whale watching as a viable activity? How robust is the adaptive capacity of killer whales?

After meeting in Friday Harbor, we will travel together to our island basecamp. Faculty lectures will introduce concepts of marine mammal biology, ecology and behavior, marine mammal conservation and management, and regional geography. Research techniques including the use of theodolites and video, censusing, and focal animal observations using spotting scopes will also be presented.

We expect to be conducting several projects simultaneously and each day we will break into smaller teams and rotate between research activities. Shore-based groups will use theodolites and spotting scopes to collect data on movement patterns of killer whales when boats are with them and when they are alone, while other team members record behaviors such as breaches, spyhops and tailslaps. The lighthouse observers will use video docu-

mentation and will collect underwater acoustic recordings of whales and vessels. At each site we will also record observations on any other marine mammal species we encounter including river otters, harbor seals, grey whales, minke whales, and northern seals.

In addition to contributing to the group research efforts, each student will have the opportunity to undertake a directed research project within the framework of the overall research objective. Potential projects include an assessment of the impact of boat traffic on whale movements, a study of the attitudes of whale watchers, changes in the movement of whales in relation to fisheries, and the effect of boat sounds on whale vocalizations.

During the final days of the course we will analyze, write-up, and present our findings. Our results will be shared with researchers at The Whale Museum. Our recommendations for proposed whale-watching regulations will be submitted to the Protected Species Division of the U.S. National Marine Fisheries and the Canadian Federal Committee on Whales and Whaling.

The San Juans are a group of 172 islands situated between Vancouver Island, Canada and the U.S. mainland. The area's spectacular beauty has made it a favorite vacation spot. Field conditions at our base camp will be quite primitive. We will live in tents and cook over Coleman stoves. When possible, lectures will be held at The Whale Museum in Friday Harbor and we will have access to computers at the nearby lighthouse field station. The weather will be variable; bouts of cold rain, grey skies and fog will be punctuated by days of spectacular warm sunshine.



While the San Juan Islands have retained much of their natural splendor, development threatens the long-term survival of many marine mammals found here. Our cliff top and shore-based observation posts will afford us unobstructed views of passing killer whales. (Photo: Gary Miller)

Raptor Ecology and Conservation/ Montana

Purpose: to study the nesting and foraging behavior and ecology of raptors in southwestern Montana; to understand the impact of the proposed expansion of a ski area on raptors and their prey; to document the ecological conditions of this area before, during and after major forest development.

Course Number: As this catalogue goes to press, this new course is pending approval by Northeastern University.

Departure Point: Butte, Montana

Course Dates:

Session I: June 8 - July 7
Session II: July 14 - August 12

Faculty: Jack Kirkley, Ph.D.
Louis Berner, M.S.

Cost: \$2,380 + \$100 Registration Fee.

Some of the most dynamic and controversial conservation challenges of this century have centered around the impacts of human disturbance and habitat contamination on birds of prey. Populations of bald eagles, ospreys and peregrine falcons have declined precipitously since the 1940's and have only recently begun to show signs of recovery. Less dramatic, but equally troubling, are the gradual population declines of other raptor species such as northern spotted owls, northern goshawks, Swainson's hawks and ferruginous hawks.

Habitat fragmentation and loss due to human activity appear to play a significant role in the decline of these species and are subjects of escalating controversy and concern. The attention of the conservation community is likely to continue to focus on raptors in light of their potential to serve as indicators of environmental change and ecosystem health. Largely unknown are the effects of human disturbance, such as timber harvest, on the broad spectrum of forest animals, including small mammals and birds, which provide the prey base for raptors.

Previous SFS research teams have conducted studies of bald eagles in Alaska and of eagles and ospreys in northwestern Montana. This summer, we will broaden our focus to include other raptor species inhabiting the mountain forests of southwestern

Montana. Our focus will be on nesting raptors such as goshawks (*Accipiter gentilis*), Cooper's hawks (*Accipiter cooperii*) and sharp-shinned hawks (*Accipiter striatus*) and their bird and mammal prey on a forested mountainside slated for development to expand a nearby ski resort. Participants in this summer's program will conduct the initial stages of a long-term research project documenting conditions before, during and after development. Our initial findings may influence the layout of proposed ski slopes to minimize their impacts on nesting hawks, owls and other wildlife.

Questions we will attempt to answer include: Where are the raptor nests located? What areas do adults and fledglings use for hunting? How do the kind and abundance of prey species vary with elevation, and in open habitats (i.e. ski slopes) as compared to heavily timbered areas? How will animal distributions, nesting density and location, and foraging areas change in response to newly created ski slopes?

We will meet at the airport in Butte and travel to our study site by bus. Faculty will introduce field research techniques including survey methods, mapping, field identification of birds and mammals, capture and marking techniques and behavioral observation methods. In addition to monitoring adult raptors and their young with binoculars and spotting scopes, we will band nestling raptors on nearby Forest Service and Bureau of Land Management lands.

Field work will be interspersed with lectures covering raptor diversity, reproductive strategies and mating systems, social and population biology, hunting and foraging ecology, migrating patterns and conservation. We may encounter up to 20 different raptor species during field work and trips to other habitats important to raptors including nearby prairies and high elevation wetlands. Guest lecturers will provide us with a historical perspective of this

area and visiting resource managers will discuss current conflicts in managing public lands.

In addition to working on the group research projects, students will conduct directed research under faculty direction. Potential topics include songbird surveys utilizing song transect counts and mist netting, monitoring parental behavior at raptor nests, and determining raptor diets. During the final days of the course, we will analyze, compile and present our research results. Our data will be shared with resource personnel of the U. S. Forest Service and the Bureau of Land Management, and with the ski resort developers to support efforts to manage wildlife populations in the face of increasing human activity in this area.

Our study area is located 25 miles northwest of Dillon, Montana, at 7,000 ft. in the West Pioneer Mountains of the Beaverhead National Forest. We will establish our tent camp adjacent to the small ski lodge which will serve as our kitchen, classroom and restroom facility. We will make occasional visits to a privately operated hot springs with shower facilities a few miles away. Participants will need to be in good physical condition as we will be hiking from our camp to higher elevation mountain slopes to collect our data. Most days will be warm and dry but occasional, sudden mountain thunderstorms can pose a threat to those who lack raingear.



Banding raptors, such as the ferruginous hawk shown here, will be part of our summer research plan. (Photo: Paul Feldhaus)

Tropical River Ecology/Belize

For many Americans, a description of a tropical river might include adjectives such as mysterious, exotic, and even romantic, as one conjures up scenes of Bogart and Hepburn on the African Queen. In reality, tropical rivers do present us with mystery. Relatively little is known about their diversity, structure and function. The lack of research and management focus devoted to tropical rivers is surprising given the significant role many of these rivers play in the history, commerce, and wellbeing of the countries through which they flow.

Belize, with the lowest population density and deforestation rate of all Central American countries, offers an excellent site to study tropical river ecology. Since the environment has suffered less human impact than most other neotropical countries, the Belizian ecosystems retain much of their ecological value. However, Belize is now undergoing an agricultural transformation as small scale farms give way to large, multinational citrus plantations. Effective management and conservation of Belize's river systems are critical to Belize's future prosperity. The stakes are high; development along rivers must be well managed. Pollution and flooding threaten the world's second largest coral reef and residents living along the river banks face losing their land, livestock and even their lives.

SFS students will continue to help unravel some of the mystery surrounding tropical river systems as we return to the Sittee River for a third year to study and inventory the river at critical points along a 10-mile stretch of its route to the sea. Questions we will seek to answer include: How does the ecosystem structure and function differ as the river changes from a freshwater stream to a mainly saline/sea water system? To what extent have land-use patterns changed the river, and how can the river be managed to prevent degradation?

We will meet at the airport in Belize City and fly as a group to Dangriga. From here our basecamp is only a short bus ride away. Lectures by faculty on concepts of aquatic ecology will prepare us for field work. We will break into groups to facilitate sampling, which will take place at several locations along the river. The fact that no taxonomic keys exist for identifying certain species in inland tropical rivers is one indication of how little attention has been focused on this ecosystem. Working from small boats, we will collect our first samples near our base at the midpoint of the river. Toward the middle of the course, we will spend a week

upstream camping at the Coxcomb Jaguar Preserve in order to sample the waters near the river's source.

To better understand community structure, students will utilize snorkeling and seine netting to sample fish and macro-invertebrates and to assess in-stream habitats at all of our collection sites. We can expect to encounter a range of species on our collecting forays, from anemones, crabs and shrimp at the mouth of the river to insect larvae, snails and crayfish in the freshwater upstream. The presence of specific indicator taxa as well as the diversity of species will be used to assess water quality, which we can then relate to the condition of the watershed as a whole.

Additional lecture topics including the natural history of Belize, taxonomy, biodiversity, the role of floodplain swamps, and the role of the Maya in land-use changes, will prepare students to undertake directed research projects. Potential projects include the characterization of macroinvertebrate indicator communities, the role of the river in the local economy, and measurements of sediment loads and estimation of impacts on the offshore coral reef.

The importance of watershed management will be dramatically illustrated during the last days of the course when we travel to the Wee Wee Caye Marine Station, situated amid Belize's world famous coral reefs. These magnificent reefs and their myriad resident species are nurtured by rivers including the Sittee. We will spend the final days of the course at the field station compiling our data into written and oral reports with recommen-



Purpose: to assess water quality throughout the river to identify present impacts and to serve as baseline data in the face of impending development in order to support efforts of resource managers to creative effective policies for watershed management.

Course Number: BIO 1848

Departure Point: Dangriga, Belize
(We will meet in Belize City and fly to our site as a group.)

Course Dates:

Session I: June 15 - July 14
Session II: July 21 - August 19

Faculty: William Shepard, Ph.D.
Edward Boles, M.S.

Cost: \$2,580 + \$100 Registration Fee.

dations for viable river conservation strategies. These data will be submitted to government resource managers and to the Belize Audubon Society and the Programme for Belize.

Our basecamp at the Possum Point Biological Field Station, along the banks of the Sittee River, will be rustic but comfortable. We will sleep in platform tents and use a large screened building that will protect us from insects and serve as our lecture room and dining hall. Expect warm, humid weather with frequent showers. We will travel between collection sites in small boats and look to the river for food and recreation. A local cook will help us with meal preparation in camp, we will cook for ourselves during field trips. Brightly hued flowers, birds and butterflies provide splashes of color along river banks shrouded in lush vegetation. We will use snorkeling equipment to collect samples. Due to the large portion of time we will be spending in and near the river, participants must be strong swimmers.

SFS students try to unravel some of the mysteries surrounding the structure and function of the Sittee River. So little research has been conducted to date that we may be unable to identify some of the invertebrate species we collect from the river. (Photo: Mi Kim)



This 95 day semester program consists of four courses designed to allow students to explore the scientific, economic, social and historical issues involved in the conservation and protection of marine mammals.

Marine Mammal Biology will provide the foundation of our semester's work. This course will provide an overview of the biology of the five marine mammal groups—cetaceans, pinnipeds, sirenians, polar bears and otters—concentrating on cetaceans and pinnipeds. Lectures will cover the evolution, systematics, social and behavioral ecology, anatomy, physiology and adaptations to marine environments of marine mammals. We will also discuss the history of marine mammal/human interactions, touching on the animals' ecological role in the past and present. Our research will focus on cetaceans and the California Sea Lion, and how they interact with the human population in the area. Guest lecturers will include leading marine mammal biologists from the area who will share their recent research experiences and ideas.

Resource Ecology and Management will complement Marine Mammal Biology in that we will continue to use pinniped and cetacean examples in our discussions of resource use and management. In Resource Management, we will expand our view to consider conservation and resource management issues more generally as we integrate concepts of marine ecology with the needs of managing marine resources. We will consider problems created by the often conflicting demands of resource use and conservation as well as how conservation policies are made on both local and global scales. The course will review the management of complex ecological communities and ecosystems. Techniques of data collection and analysis will be introduced during laboratory sessions.

In **Environmental Policy and Socioeconomic Values** we will consider contemporary marine environmental problems and deterioration from the standpoint of social theory, history, and political economy. We will explore how social organization and value systems, economic forces and political structure all influence marine policy formulation. Specific related topics include: the relationship between economic growth and marine policy; analysis of social choice mechanisms; dispute resolution (mediation and arbitration); environmental ethics; and transboundary issues from a social and cultural perspective.

**All courses
carry college credit.**

In **Directed Research** students will have the opportunity to integrate perspectives developed in the previous courses as we design independent research projects focusing on the behavior and ecology of marine mammals in the wild. These projects will support ongoing research by Mexican scientists through the University of Southern Baja California. Students will be exposed to how to identify key questions and to transform them into testable hypotheses. We will then develop the technical skills of research including statistics, behavioral observation, data collection and analysis, and marine mammal identification at sea, in order to test these hypotheses. Finally, we will work on the communication of research results. Potential projects include creating a photo-identification catalog of whales and dolphins, determining distribution patterns of whales in the Bay of La Paz, examining special relationships of bottlenose dolphin, and assessing whether vigilance behavior of sea lions is affected by group size and approach.

Note: Students are strongly encouraged to complete a course in Spanish prior to participating in this program.

Semester Program: *Marine Mammal Conservation*

Site: Center for Marine Mammal Studies, MEXICO

Course Titles and Numbers:

Marine Mammal Biology
(BIO 1816)

*Resource Ecology and
Management* (BIO 1822)

*Environmental Policy and
Socioeconomic Values*
(SOA 1909)

Directed Research (INT 1191)

Departure Point: La Paz, Baja,
Mexico

Program Dates:

September 10 - December 13, 1993

January 28 - May 3, 1994



We will utilize boats such as the one above to gain access to the over 20 species of resident and migrating marine mammal species that have been recorded in the nutrient rich waters surrounding the Baja peninsula.
(Photo: C. Shannon Goob)



Summer Course-Center for Marine Mammal Studies-MEXICO

Summer Course: *Sea Lion and Dolphin Conservation*

Site: Center for Marine Mammal Studies, MEXICO

Purpose: to study and recommend management practices for sustainable utilization of marine resources in the Bay of La Paz through case studies focusing on 1) the resident dolphin population, 2) the California Sea Lions (*Zalophus californianus*) on the island of Los Islotes, and 3) the impact of fishing and coastal development on marine mammal populations.

Course Number: As this catalogue goes to press, this new course is pending approval by Northeastern University.

Departure Point: La Paz, Mexico

Course Dates:

Session I: June 15 - July 14

Session II: July 21 - August 19

For centuries the Baja peninsula was relatively inaccessible. Its few inhabitants were found in small fishing villages bordering the Sea of Cortez. The construction of a highway from the U.S. border to the tip of the cape in the early 1970's opened the area to visitors. The climate and fabulous marine resources, including over 20 species of whales and dolphins in the Sea of Cortez, are largely responsible for the recent flourishing tourism industry. Along with economic development, rapid growth of international fishing and tourist industries has brought concern for the continued health of the area's invaluable marine resources.

Collaboration between the Autonomous University of Baja California Sur (UABCS), SFS, and other local agencies over the past three years has resulted in a thorough description of the resident marine mammal populations in the Bay of La Paz. We have contributed to photo-identification

efforts for the dolphin population which enables individual identification and delineations of family genealogies. Over time, this population can become one of only a few worldwide where the fate of individuals and their offspring can be observed. Our studies of Sea Lions have focused on diet, population growth, and their responses to the burgeoning ecotourism industry.

This summer, SFS students will choose to participate in one of three research projects related to the management of marine mammal populations in the Bay of La Paz. Our three focal areas will be 1) the resident dolphin populations in the harbor, 2) the California Sea Lions on the island of Los Islotes, and 3) the impact of fishing and coastal development on these and other transient populations of marine animals.

During the first week of the program, faculty will offer introductory lectures on marine mammals, marine ecology, fisheries and marine park management, and coastal development. Field trips to remote islands in the Bay of La Paz will illustrate concepts covered in the lectures. At week's end, students will commit to one of the three major research areas.

Our time during the next two weeks will be split between lectures/labs and field work, either individually or in small groups, on our Directed Research projects. Lectures will address statistical techniques as well as the taxonomy, anatomy, physiology, and behavioral ecology of marine mammals. Re-

search techniques will be presented to enable us to use transects to determine abundance and species richness, measure population changes, and compare distributions of invertebrates, fish and seagrasses. Local scientists will offer special lectures to each team on topics relevant to their research focus.

Students focusing on dolphins will do field work from small boats in La Paz harbor. In our efforts to determine responses of common dolphins (*Delphinus delphinus*) and Bottlenose dolphins (*Tursiops truncatus*) to coastal development, we will address questions such as: What behaviors are typical and how do these behaviors vary with water quality parameters? What factors influence the distribution and survival of dolphins?

The Sea Lion team will make several trips to rookeries on the small islands in the bay in order to determine the age distribution and maternity rates of the population. Other questions we will address include: how does the activity of tourist boats influence sea lion behavior, what do sea lions eat, and do they compete with local fishermen?

Students focusing on resource management issues will make forays into the La Paz area to assess environmental impacts of activities (electric power generation, phosphorus mining, boating) on marine resources. We will also try to predict the impacts of a proposed campground and tourist facility in the park adjacent to Sea Lion pupping grounds on Los Islotes.

We will spend the remainder of the course completing field research and analyzing our results. We will compile our findings into reports for presentation to the group and area scientists. Our reports will be submitted to UABCS and local agencies for consideration in the formation of regulations for use and enforcement of natural resource conservation.

We will sleep in large dormitory rooms at the Center. During field trips, we will camp on the beach or, if insects are too numerous, on the deck of the boat. These will be hot, sometimes uncomfortable trips to spectacular habitats. Fresh water is in short supply and we will need to conserve this resource. This is a water-based course and good skills in the water area are important. Previous snorkeling ability is highly recommended to appreciate the full range of marine resources. SFS will not provide training in swimming or snorkeling.



Worldwide, impacts on marine mammals from pollution, habitat and food loss, and boat traffic are thought to be significant but are poorly understood. Our work offers an opportunity to contribute information about the condition of marine mammal species to Mexican authorities who have responsibility for managing these fascinating animals.
(Photo: Lissa Flemming)

**Please recycle this catalogue
by sharing with a friend or library.**



We will investigate the biological, political, economic and historic issues underlying rainforest conservation through a series of case studies on 1) *wet tropics management*, 2) *rainforest reforestation on the Atherton Tableland*, and 3) *development, planning, and sustainable use of resources in far north Queensland*.

Our first course, **Rainforest Ecology** provides the ecological background to understand the tremendous diversity of Australian tropical ecosystems. We will focus on the rainforest, but field trips to a variety of other ecosystems will enrich our studies.

Lecture topics include the ecology, evolution, taxonomy, and natural history of rainforest animals, as well as rainforest ecology, biogeography and conservation. Field activities will include spotlighting for animals at night, live-trapping small mammals, mist-netting birds, dawn choruses (identifying bird calls), trapping terrestrial and aquatic insects, and measuring forest vegetation.

Concepts developed in the preceding course will be applied to real-life problems in **Principles of Forest Management**. Case studies emphasize the ecological impacts and yield optimization of tropical forestry, and include field trips to forest plantations and reforestation projects. Focusing on problem solving skills—environmental impact assessment, forest surveys, the design and management of nature reserves—this course will be applicable throughout the world. Resource management policies in developing nations will be presented, with emphasis on multiple land use, sustainable development and intercropping strategies.

In **Ecological Anthropology** we will use the ecosystem model and current anthropological theory to explore the interaction of humans and tropical rainforest environments of Australia, Melanesia and Southeast Asia. The archaeological record and ethnographic data will be presented to detail evolutionary processes leading to this adaptation. Aboriginal and Euro-Australian views of the rainforest, its use, management, and preservation will be presented in light of current social involvement and natural resource

policy formation. Field trips and guest lectures will constitute important aspects of this applied learning experience.

In **Directed Research**, we will develop skills needed to address crucial ecological questions while emphasizing modern scientific methods. The formulation of testable hypotheses, sampling strategies, data analysis, as well as written and oral presentation of results will be practiced. With faculty consultation, students will devise and implement an original research project designed to address a significant problem in rainforest ecology. Emphasis will be placed on assessing the impacts of deforestation, habitat fragmentation and logging on Australian wildlife. Likely topics include censusing of bird and mammal populations in secondary vegetation and forest fragments, assessing the habitat requirements of critical "indicator species" such as logrunners and marsupials, and assessing the utility of "corridors" for wildlife dispersal. We will present our findings in a public meeting before interested local residents. Government scientists are also often in attendance.



Semester Program: **Tropical Rainforest Management**

Site: Center for Rainforest Studies—
AUSTRALIA

Course Titles and Numbers:

Rainforest Ecology
(BIO 1825)

Principles of Forest Management
(BIO 1845)

Ecological Anthropology (SOA 1910)
Directed Research (INT 1191)

Departure Point: Cairns, Australia

Program Dates:

September 10 - December 13, 1993
January 28 - May 3, 1994

"I've gone from a raving environmentalist to a raving environmentalist who can present an issue clearly, factually, calmly, and with a sense of direction for correcting or solving a problem. I'm more able to integrate the us and them syndrome and move people toward co-operation and problem solving."

Annie Farris, Woody Creek, CO
—University of Colorado

Financial Aid is available.
Please see page 28.

"Not only do I now know what it is like to get down on my hands and knees in the dirt to search for data, I also know what it is like to analyze data, write a clear research report and to stand up in front of a group to present my findings."
Heather Cureton, Elgin, TX—Trinity University
(Photo: Chip Isenhardt)



Summer Course:

Tropical Reforestation

Site: Center for Rainforest Studies—AUSTRALIA

Purpose: to determine which methods of reforestation are most effective from the perspective of growth rates, human subsidy requirements, sustainable use, and conservation of forest biotas.

Course Titles and Numbers:

Tropical Reforestation (BIO 1852)

Directed Research (INT 1191)

Departure Point: Cairns, Australia

Course Dates: June 25 - August 7

Tropical rainforests are among the Earth's most ancient, diverse, and ecologically complex communities. Covering only 7% of the planet's land surface, tropical rainforests may sustain half the world's plant and animal species. Many of these ancient forests are being burned, logged, fragmented and overhunted on a scale that lacks historic precedents. At current rates of deforestation, two-thirds of the Earth's rainforests will disappear by early next century, leading to the extinction of up to 600,000 species.

SFS students will set out from the Center for Rainforest Studies to investigate whether tropical rainforests are renewable, an issue that has great significance in Queensland. A 1988 Australian government decree preserved much of Australia's rainforest through the establishment of World Heritage sites. This policy has been hotly contested by the state government of Queensland, and by foresters, miners, dairy farmers and others whose livelihoods depend on forest development. The degree and speed at which forests can be regenerated could influence how much neighboring land must be preserved. Little data on this subject exist at present.

The questions we will address are designed to help us understand the resilience of rainforest species to disturbance and optimal strategies for reforestation. How are marsupials impacted by fragmentation?

Which birds, mammals and reptiles are most prone to extinction? How does logging alter the rainforest's structure and microclimate? What combination of tree species should be planted first and in what spatial pattern? In light of the unique research opportunities presented here, we have elected to extend our studies over a six-week period. Students will participate in two integrated courses, carrying a total of eleven quarter credits. Although presented in an integrated format in the field, we have separated our studies into discrete courses below to facilitate the awarding of credit.

Tropical Reforestation (5 credits) will provide an introduction to fundamental ecological concepts. Emphasis will be placed on demographics and community ecology, and on the relevance of these concepts to the structure and function of rainforests and other Australian biomes. Lectures by faculty and guests will address rainforest ecology and tropical resource management. We will compare and contrast different forest types with special emphasis on identifying centers of tropical endemism.

Directed Research (6 credits) will offer a thorough grounding in how to design, conduct and communicate scientific research. Our group research will focus on the design

of reforestation strategies and the assessment of their effectiveness. Faculty will introduce field techniques for conducting biological surveys including vegetation transects, quadrat measurements, canopy and forest floor cover estimates, the mist-netting of birds and live-trapping of small animals, and spotlighting for rainforest animals at night. We will apply these skills while conducting individual directed research projects on topics of critical interest in conservation biology. Topics may include questions such as which bird and mammal species can survive in disturbed vegetation and which are most easily lost? How does the microclimate of degraded forests differ from intact rainforest? Which vertebrate species can use "corridors" of regrowth forest along streams for dispersal?

Our days will pass quickly as we orient ourselves to the intricacies of the 100-million-year old rainforest where the canopy of tree crowns tower 60 meters above and vines and epiphytes (rootless, attached "air plants") stream about us. During the final days of the course, we will compile the results of both our team and directed research projects. Our findings will be summarized in a "rainforest symposium" before park managers, government scientists and interested local residents.



SFS students caring for an orphaned bandicoot, a small rainforest marsupial.
(Photo: Bill Laurance)



Background

The Turks and Caicos Islands and their surrounding Caribbean waters offer us an unparalleled classroom/laboratory in which to study marine resource issues. Here one finds one of the last remaining pristine refuges for inshore marine life. Throughout the Caribbean, tourism and development are exerting extreme pressures on the linked and delicate coastal ecosystems. If the Turks and Caicos area is to escape the detrimental environmental effects brought on by the increased tourism, population growth and urbanization now being evidenced in other parts of the Caribbean, studies that will lead to management plans for conserving precious marine resources must be initiated without delay.

The Turks and Caicos Islands were once the world's largest exporter of conch and an important exporter of lobster; both shellfish are important as local food sources. South Caicos has been the Island's most important port for the local fishing industry. This industry, once the economic mainstay of the area, has reported that catches of both conch and lobster have dropped drastically in recent years. The depletion of the fishery is of major concern, with impacts on employment, nutrition and social structure.

Growth and development present three primary threats to the local coastal ecosystem. These are: 1) the direct impacts

of overfishing and destructive fishing practices, 2) the direct impacts of tourism, and 3) the general impacts of the increased pollution and waste disposal that accompany increases in human populations. Confounding the relatively simple relationship between human population size and environmental stress, is the issue of a culture attempting to move from a simple artisanal lifestyle toward a more wasteful and inefficient lifestyle characteristic of urbanized, industrialized western societies. The possible negative ecological effects of these processes are magnified in island communities because of limited locally produced resources and options for waste disposal. The relatively high cost of obtaining resources and/or disposing of wastes off island make it much more expensive to support a western lifestyle on a remote island than in a continental setting. Yet today, inhabitants of these islands seek to make these changes in order to be able to compete for the highly valued tourist dollars on which their fragile economies heavily depend.

Faculty and students at the SFS Center for Marine Resource Studies at South Caicos are in a unique position to influence the policies and decisions that will ultimately influence the course of growth and development here. The local government has actively solicited our input in such areas as basic resource assessment, resource manage-

Center for Marine Resource Studies

Site: South Caicos Island, BRITISH WEST INDIES

Curriculum:

Semester Program

Marine Resource

Management

Summer Course

Marine Parks Management

Staff:

Field Director: Murray Dailey, Ph.D., Colorado State University (Biology).

Resident Faculty: Shelly Raven, Ph.D., University of California, Davis (Anthropology).

Edmund Greene, Ph.D., London University (Marine Ecology).

Site Managers: Kea and Terry Foreman.

Facilities: The Center is based in a former hotel on the southern edge of South Caicos Island. From its perch atop a small bluff, the Center overlooks clear Caribbean waters, offshore cays, and the town of Cockburn Harbor. The main facility has a large, brightly muralled classroom/dining area, a kitchen, and computer room/library. There are 14 residence rooms, each with a bath and an often necessary ceiling fan. We are fully equipped for marine operations with a private dock to support our boats and a dive shop with a commercial SCUBA compressor. A rainwater cistern supplies water, which is a most precious commodity here. One of our goals is to introduce as many renewable and sustainable resource options as possible at the Center.



"Our directed research projects are run in conjunction with the Fisheries Department for use in their management decisions. This work will not die in a folder on a professor's desk, but will be passed on to government agencies for their use."

Jesse Williams, Richmond, VA—Middlebury College (Photo: Bob Singer)

The World

Is Your Classroom





Center for Marine Resource Studies-CARIBBEAN

ment strategies, and training in fisheries enhancement methods. In providing these research data and recommendations, we may have the opportunity to help guide the processes in such a way that the Turks and Caicos might become a model for other developing Caribbean island nations.

Research Focus

Our research efforts will focus on three aspects of the island economy and their effects upon the ecosystem: the conch and lobster fisheries; the fin fishery; and the tourist industry, which includes the future development of Admiral Cockburn Land and Sea Park. To a great extent, these three activities are linked, and the future configuration of the island economy will depend upon their interrelationship. The decline in lobster and conch stocks may force a shift in emphasis to either or both of the other activities. We will examine the implementation, costs and benefits of proposed changes from the perspectives of marine ecology, resource management and anthropology.

Students will participate in ongoing joint research now being conducted under the auspices of SFS, the local Fisheries Department and the Marine Parks Trust. Our efforts can assist in the development of long-term environmental protection strategies which are sensitive to and incorporate the needs of the local community.



SFS students and faculty have identified over 60 species of corals and 150 species of fish on the nearby reefs.

(Photo: Tim Stout)

From its perch atop a small bluff, the Center looks out over clear blue waters with nothing but open ocean all the way to the African coast.

(Photo: Jim Elder)

Site

The Turks and Caicos Islands lie at the southern most edge of the Bahamas chain, approximately 100 miles north of the Dominican Republic. The islands represent the surface exposure of two vast platforms, the Turks Bank and the Caicos Bank. The two banks plunge some 7000 feet into the deep ocean abyss, making the area a world class diving site. In addition, a vast shallow bank area, averaging 10 to 12 feet deep, stretches for nearly 60 miles. With expansive seagrass beds and scattered coral heads, this area is highly productive and is the source of the area's premiere shellfish products, Queen Conch and Spiny Lobster. A five minute boat ride from our base provides access to shallow expanses of turquoise waters or to the deep blue of the open sea.

The residents of South Caicos live in Cockburn Harbor, a small fishing port and the only town on the island. In the face of the declining fish catch, almost half the island's residents have moved in recent years. The town, which has very limited shopping facilities, is the site of the island's only industry, three small fish processing plants.

In order to develop viable resource management strategies, we must understand local perceptions regarding resource use and potential impacts of development and conservation. SFS students make presentations at South Caicos schools and often host local students at the Center.

(Photo: Beth Bader)

Living and Working Conditions

A true tropical climate prevails here with hot (90's) days and warm (80's) nights. Temperatures range from the 70's to 80's in the winter months. The strong, steady trade winds off the ocean help keep the site comfortable throughout most of the year. Ocean temperatures range from the 70's to 80's. Much of our data will be collected via SCUBA and snorkeling. Most dives will be in waters under 50 feet deep although we will try to visit the drop off for deeper dives during each program.

We will utilize local seafood as much as possible; basic staples (rice, beans, fruits and vegetables) will be provided via regular shipments from the U.S.



**Please recycle this catalogue
by sharing it with a friend or library.**



We will use case studies to illustrate the concepts addressed in the four courses which comprise this 13 week semester program. Our study of the *conch and lobster fisheries* will focus on the past, present and future of the primary economic force on the island. The second case study will examine the less developed *fin fish industry and the local economy*. The third case study will focus on the island's hope for the future, the rapidly expanding *tourism industry*.

Tropical Marine Ecology will orient us to the marine environment and provide an overview of the biology of the major groups of organisms. Distribution and diversity of marine organisms in response to their environment will be explored. Fundamentals of reproductive strategies and population growth will be presented. Classic principles of ecology are discussed and applied to the tropical environment using field work to illustrate local examples. Mutualism, competition, predation and succession will be studied with respect to how these interactions structure marine communities. Nutrient cycling, energy flow and organization of major coastal communities including pelagic, seagrass, mangrove and reef systems will be discussed. Field and laboratory work will be integrated with the Directed Research course; students will have the opportunity to learn the essentials of underwater data collecting, computer-aided data analyses and report writing. Field work will include supervised snorkeling and SCUBA exercises designed to investigate the distribution and interactions of near-shore marine organisms.

In **Ecological Anthropology** we will consider the role of humans in the marine ecosystem and in the global economy. General models drawn from human ecology will serve as a basis for examining human/environment interactions in the Caribbean in general and South Caicos in particular. We will seek to maximize anthropology's relevance to studies of marine conservation by developing an understanding of the ways in which people use the environment to make a living. An overview of local history and culture will be presented and students will be encouraged to meet with local people in order to develop a better understanding of local perceptions as well as an appreciation of ways of life different from their own. This course will provide insight into the complex social, cultural and economic considerations that must be addressed in developing policies regarding the conservation of marine resources.

In **Principles of Resource Management** we will develop an in-depth understanding of marine resource utilization and conservation by reviewing resource use in the coastal zone and conservation strategies to reduce or avoid impacts from resource utilization. Our goal will be to understand sustainable development in the context of marine resources utilizing case studies from around the world with a close examination of issues in the Turks and Caicos Islands. We will explore conservation strategies including coastal land-use planning, fisheries management, aquaculture, environmental impact assessment and marine park design. Our focus will be on the optimum design for the

Semester Program: ***Marine Resource Management***

Site: Center for Marine Resource Studies, CARIBBEAN

Course Titles and Numbers:

Tropical Marine Ecology
(BIO 1824)

*Principles of Resource
Management* (BIO 1846)

Ecological Anthropology
(SOA 1910)

Directed Research (INT 1191)

Departure Point: South Caicos Is.

Program Dates:

September 10 - December 3, 1993

January 28 - May 3, 1994

proposed national park and adjacent coastal development so that local needs are met while ecological processes and environments are maintained in their near pristine condition.

The **Directed Research** component of our program will complement our over-all objective of quantifying the impact of fisheries and tourism on the Island ecosystems. The opportunity to integrate perspectives developed in the preceding courses becomes evident here as students work with faculty to design independent projects from coordinated parts of the overall research effort. The initial part of the course will introduce field identification of organisms, experimental design and field methods. Workshops will be presented on computer-aided data analyses and statistical methods. Students may choose from research topics in marine ecology, resource management or cultural ecology. Sample projects include the role of human-induced stress on the diversity and structure of coral reef and seagrass communities, changes in conch distribution and abundance, and coastal zone management. Results will be presented orally to the group and to guests at a seminar and also will be submitted to local government officials.

Note: Students must be certified in SCUBA prior to the program. Please contact the SFS Admissions Office for assistance in arranging certification. Students must provide their own SCUBA equipment except weights and tanks, which may be rented on-site.



"By being able to observe in the natural environment what I just heard in the classroom, I was able to not only learn more but also remember more. I still know the scientific names of at least twenty species of coral; I can't say the same for any class I've taken in 3 years of college."

Matthew Molnar, Guilford, CT—Wesleyan University (Photo: Shaun Bennett)



Summer Course: **Marine Parks Management**

Site: Center for Marine Resource Studies, CARIBBEAN

Purpose: to support efforts to implement plans for the sustainable utilization of marine resources in the Parks, Reserves and Historical sites around South Caicos Island through 1) ecological studies of "baseline" conditions, 2) predicting and monitoring impacts of development projects, and 3) fisheries research on important species including the Queen Conch (*Strombus gigas*) and Spiny Lobster (*Panulirus argus*).

Course Number: BIO 1826

Departure Point: South Caicos Is.

Course Dates:

Session I: June 15 - July 14

Session II: July 21 - August 19

From the windows of the plane approaching South Caicos, the waters below appear as a patchwork of blue and green. This mosaic effect is caused by the variety of marine habitats-seagrass beds, mangrove swamps, sandy shoals, patch, barrier, fringing and deep reefs-that surround the island.

The Caicos bank supports one of the world's largest commercial conch and lobster fisheries. But there have been large fluctuations in both conch and lobster catches recently and it is not known whether these fluctuations are due to changing levels of fishing effort or to local or regional depletion of stocks. This has led to local impacts on people including increased migration, declining income and increasing unemployment.

Prior to the mid-1980's, the Turks and Caicos Islands were isolated and underpopulated. Recent large-scale tourist development has caused surrounding islands to undergo rapid social, economic and ecological change. As planners try to diversify the economy to reduce impacts from the declining fishery, tourism and development are poised to become major issues for South Caicos Island. Planning is underway to complete construction of a large hotel, to build a 250 unit condominium complex, and to dredge the harbor to accommodate larger ships. Potential impacts of this development include water pollution, sedimentation, boat anchor and diver damage to pristine coral reefs, and the influx of larger numbers of tourists.

Funding for a National Park system on South Caicos was approved in 1992. The new National Parks Trust has been given a mandate to conserve valuable marine resources while simultaneously encouraging economic development. SFS is working with the National Parks Trust and the Department of Fisheries to provide information to support upcoming decisions that will influence the fate of one of the Caribbean's most unspoiled and beautiful coastal ecosystems.

This summer we will focus our efforts in three critical areas: 1) Fisheries Management and Aquaculture 2) Monitoring and Assessing Park Resources, and 3) Environmental Impact Assessment of Proposed Development. During the first week, faculty will offer introductory lectures on marine ecology, coral reefs, coastal zone management, and the role of marine parks in coral reef conservation. Field trips around the island and diving and snorkeling excursions will illustrate concepts covered in the lectures. At week's end, students will divide into three teams, each focusing on one of the major research areas.

Our time during the next two weeks will be split between lecture/labs and field work, either individually or in small groups, on Directed Research topics. Lectures will address statistical techniques, oceanography, fisheries management, vertebrate and invertebrate zoology, and the distribution and function of coral reefs. Research techniques will be presented to enable us to use transects to determine abundance and richness of coral species, measure population changes, and compare distributions of invertebrates, fish and seagrasses. Special lectures will be offered, often by local managers, to each team on topics relevant to their research.

Students focusing on fisheries and aquaculture will address questions such as:

What are the preferred habitats of Queen Conch and Spiny Lobster? What is the availability of these habitats? Can the size of conch and lobster be increased by supplementing the diet of impounded animals prior to marketing them? What factors influence survival of hatchery reared juvenile conch when they are released into natural environments?

Students assessing park resources will try to determine if satellite and aerial imaging can be used to assess distribution of sensitive coral, seagrass and mangrove habitats. Additional questions will focus on the health of the reef systems, whether the distribution of corals varies between reefs, and if some reefs are refuges for rare endangered species.

The third team will assess the environmental impacts of each of the proposed deep water port scenarios and will also consider impacts of a proposed cement plant associated with the condominium project. We may also assess newly proposed projects if such opportunities occur.

We will spend the remainder of the course completing field research and analyzing our results. We will compile our findings into reports for presentation to the group and area scientists. Our reports will be submitted to planners at the Department of Fisheries and the National Parks Trusts to support plans to manage and preserve the pristine and increasingly rare marine systems of South Caicos.

Visibility in the island's clear, turquoise waters averages 100 feet. Students will have the option to utilize SCUBA or snorkeling when conducting research. Those planning to use SCUBA must be certified prior to arrival. SFS will provide snorkeling instruction. All participants should be strong swimmers.

Note: All students must provide their own SCUBA/snorkeling equipment with the exception of weights and tanks which may be rented on-site.



Upcoming decisions regarding resource development on South Caicos will influence the fate of one of the most beautiful and unspoiled coastal ecosystems in the Caribbean.
(Photo: Chris Neefus)



Background

Sustainable development, defined as the management of resources so that they may yield the greatest benefit to present generations while maintaining their potential to meet the needs of future generations, is thought by many to be one of the few viable, long-term conservation strategies for implementation on a global scale. Historically, the conservation movement has sometimes floundered, in part because of the "total preservation" attitude of its advocates, and the implication that conservation and economic development are incompatible. Theories underlying sustainable development propose that development and conservation are, in fact, mutually dependent, rather than mutually exclusive.

Site

Costa Rica presents some very special opportunities for case studies of the challenges of sustainable development including examples where progress has already been achieved. These include protection of forested watersheds while developing hydroelectric power; the establishment of conservation regions for the protection of biological diversity, indigenous peoples, and the culture of regional communities; control of disease; development of sustainable agricultural practices; and restoration of native ecosystems.

Costa Rica, translated "rich coast", was discovered and named by Christopher Columbus in 1502. Similar in size to West Virginia, Costa Rica is bordered by Panama and Nicaragua as well as the Pacific Ocean and the Caribbean Sea. Costa Rica has not had an army since 1948, and has a strong democratic history. While approximately 23% of Costa Rica's land is protected as national preserves, outside of these parks deforestation continues at an alarming rate. In the face of the highest per-capita debt in the world, "Ticos", as Costa Ricans call themselves, are addressing their country's environmental problems with a commitment and creativity rare among developing countries.

Costa Rica's cloud forests, rainforests, mountain plains and lowland jungles are home to over 6,000 species of plants, including 1,200 varieties of

orchids. The iridescent Blue morpho is just one of over 500 species of butterflies found here; total insect species number in the thousands. Costa Rica is home to over 850 bird species including quetzels, scarlet macaws, toucans and hummingbirds. Drenching rains—up to 300 inches per year—foster large expanses of rainforest that provide refuge for howler monkeys, capuchins, and three-toed sloths. Much of the plant and animal life exists in the uppermost reaches of the rainforest where the canopy towers 150 feet above the forest floor.

Dry, tropical forests can be found in the northwest. Condensation, rather than precipitation, provides moisture to sustain the unique flora and fauna found at the Monteverde cloud forest on the continental divide in the central mountains. To the southeast, near the border with Panama, La Amistad Park hosts a population of jaguars and pumas. The country seemingly "tilts" toward the Pacific, and the sloped terrain is etched by swift rivers, several of which have been harnessed to power electric plants. Magnificent beaches fringe both coasts, and some of the largest known nesting beaches for sea turtles are found here. Costa Rica's rich botanical and faunal diversity is fostering the development of a significant tourist industry. Many Ticos support themselves through agriculture, especially the growing and harvesting of sugar, bananas and coffee. Cattle graze on inland slopes while the coasts are the sites of productive fisheries. There is some manufacturing, usually utilizing products from the rainforest. San Jose, the capital, is a bustling, modern city.



SFS students planting trees with local residents to help prevent erosion. The fact that Costa Ricans are addressing their environmental problems with creativity and commitment may ensure the availability of critical resources for the next generation. (Photo: Chris Vaughan)

Center for Sustainable Development Studies*

Site: COSTA RICA

Curriculum:

Semester Program
Studies in Sustainable Development
Summer Course
Tropical Forest Ecology

Staff:

Field Director: Moises Leon Azofeida, Ph.D., Tulane University (Cultural Anthropology).

Resident Faculty: Bernardo Aguilar, M.S., University of Georgia (Agricultural and Applied Economics).

Additional faculty to be announced.

Facilities/Living and Working

Conditions: The Center is based at El Rodeo, a large ranch approximately an hour southeast of San Jose. We will live in a 100 year old house on the grounds of what was one of the largest haciendas in the Central Valley and is now the campus of the University for Peace. This 177 hectare parcel includes cattle and coffee fields and primary forest that is home to white-faced monkeys, deer and peccary. Our accommodations will be in a large wooden building with space for eating, classrooms, and dorm rooms housing 6-10 students. Bathrooms have flush toilets and showers. A cook will assist with our meals when we are on-site. When we are on our frequent field trips, we will live in tents and prepare our own meals. Temperatures range from 60-85 degrees, humidity is often high especially during the rainy season from May to November.

* The Center is affiliated with the Universidad Nacional, which offers local assistance and cooperation in the operation of the Center.

Semester Program: *Studies in Sustainable Development*

Site: Center for Sustainable Development Studies, COSTA RICA

Course Titles and Numbers:
Tropical Ecology and Sustainable Development (BIO 1849)
Socio-Political Systems and Sustainable Development (SOA 1907)
Economic and Ethical Issues in Sustainable Development (SOA 1908)

Directed Research (INT 1191)

Departure Point: San Jose, Costa Rica

Program Dates:

September 10 - December 13, 1993

January 28 - May 3, 1994

The SFS Center Sustainable Development Studies is the result of cooperative effort between The SFS and a consortium of schools including the University of Michigan, and Allegheny, Colby, Dickinson, and Middlebury Colleges. A portion of the spaces in each semester are reserved for students from Consortium Schools. Please see page 5 for further information.

Prerequisites: This program will be offered at the intermediate level. Applicants must complete at least one college level ecology course and one spanish course prior to participating. Background in one of the following areas would enable students to maximize this opportunity: environmental studies, international development or Latin American studies.

Program of Study

The study of Costa Rica's effort to protect their environment and deal with the challenges of sustainable development will be presented as a series of case studies on specific issues. Students will spend a period of time learning first-hand about scientific and social aspects of the issue, and the efforts of the Costa Rican people to address their need for development and protection of their environment. These cases will then be used to address broader issues of sustainable development in developing countries.

The overall themes of the curriculum will be to understand: what scientific information is necessary to achieve programs that support sustainable human systems; how different development issues are unavoidably interrelated; and how solutions are shaped by existing political and cultural conditions. Emphasis will be placed on having students directly involved with the communities affected by the issues and engaged in projects that involve monitoring conditions over extended periods of time. Potential case studies include:

- *What is the impact of agricultural production and social development on the Central Plateau?*
- *How do multinational corporations affect sustainable development?*
- *Can we protect conservation areas by making them productive?*
- *How does ethnicity interact with attitudes and practices toward natural resources in a multi-ethnic society?*

Our case study approach necessitates that material be presented in an integrated fashion by faculty teaching as a team rather than breaking the curriculum into discrete courses. We will therefore integrate our



At one time, Costa Rica was virtually covered by forest. Today, less than 35% of the country is forested and, outside of national preserves, deforestation continues at an alarming rate. (Photo: Oscar Luke)

studies of conservation biology, agroecology, hydrology, soil science, mineralogy, economics, political science, social planning and organization, and Latin American culture. For the purpose of awarding academic credit, these subject matter comprise the necessary components for the following courses:

Tropical Ecology and Sustainable Development will explore the natural mechanisms by which biodiversity is maintained. We will study patterns of interactions among biological components of a tropical ecosystem to understand the factors controlling diversity, scarcity and ecosystem health, and how biodiversity can be protected from human disturbance.

Socio-Political Systems and Sustainable Development examines the human history of Costa Rica. Costa Rican democracy will be compared with that of the United States, particularly with respect to the formation and enforcement of resource policies. The high literacy rate, relatively good economic situation, and other special features such as lack of an army, will be examined and contrasted to other Central American countries. We will explore the historical and contemporary cultural composition of Costa Rica, giving attention to ways in which Costa Ricans perceive the conservation/exploitation of their natural resources.



SFS students cleared a field and planted coffee and banana crops as part of a case study on sustainable agriculture. (Photo: Chris Vaughan)



Economic and Ethical Issues in Sustainable Development will examine the essential elements for designing and implementing sustainable rural development efforts. We will consider projects in agriculture, forestry, and energy production as well as fisheries, "eco-tourism", and small scale manufacturing. The role of local people and of government and private national and bilateral aid agencies will be covered.

Directed Research will enable students to undertake an original project reflecting one or more of case studies, examples of which are described above. The group will choose a research topic addressing a conservation, social, or welfare issue and will develop research objectives and design data collection with faculty supervision. Each project will be presented in a paper and a public meeting to which local residents and/or development professionals will be invited.

One of our potential case studies considers whether Costa Rica can protect conservation areas by making them productive as ecotourist destinations or by other means. (Photo: Chip Isenhardt)



"Your SFS experience is not just about what and who you see. It is about living in an entirely different world...Having been challenged in your new world and having gone beyond the initial marvel and wonder to put things in ecological, environmental and conservation contexts, you will realize that you are capable of dealing with many issues that once seemed beyond your reach."

Peter Coppolillo, Englewood, CO-The University of Colorado

Helping a local resident build a cabin gives SFS students insight into differing perspectives on local resource management. "I had studied Latin America and sustainable development for 3 years but the difference between studying a subject and living it is a totally different type of education. SFS has helped me shed my 'developed nation' perspective and realize a developing perspective."
Paul Kurtz-Drew University
(Photo: Chris Vaughan)



Potential Summer Course: *Sustainable Land Use*

Site: Center for Sustainable Development Studies, COSTA RICA

The Center for Sustainable Development Studies is currently located on a large ranch an hour outside of San Jose. Included in the property is a tract of forest which is the **only** remaining primary forest this close to San Jose. The owner of the property wishes to develop the ranch in an environmentally sensitive manner, and has asked the Center staff and students to put together a plan for his review which will accomplish this. The SFS spring semester team will be researching the ecological importance of this piece of forest as well as viable uses for the remainder of the property.

As this catalogue goes to press, we are considering a summer program which will build on the spring semester research by developing a feasibility plan for use of the forest in particular and other critical resources on the property. One likely component of the plan is to develop the forest as an environmental education center for the surrounding localities. Our work this summer will likely involve identifying individuals with a vested interest in the use and protection of the forest, building consensus among these people for a plan, and implementing the first phase of the plan. Students involved with this project will receive training in land use planning and the use of field centers in environmental education.

Please contact the SFS Admissions Office at (508) 927-7777 for further information on this proposed new course.

Summer Course: *Tropical Forest Ecology*

Site: Center for Sustainable Development Studies, COSTA RICA

Purpose: to determine the physical, chemical and biological factors that determine the rates of forest growth and regeneration; to explore the interactions between plants and animals that generate biodiversity; and to examine rural cultural and economic factors that lead to deforestation or forest conservation.

Course Number: BIO 1807

Departure Point: San Jose, Costa Rica

Course Dates:

Session I: June 15 - July 14

Session II: July 21 - August 19

The World Conservation Strategy calls rainforests the "most exuberant celebration of genetic diversity on Earth." Of the estimated 4 to 5 million species of plants and 10 to 30 million species of insects on earth, the majority exist only in rainforests. Only a small fraction of these have been described. The tropics and subtropics contain only 7% of the earth's land surface but possess 50-80% of all living species. Just as scientists are beginning to unveil their secrets, rainforests are being destroyed at a rate of 25-50 acres a minute.

There are approximately 750 known tree species found in the United States. Costa Rica, which covers a territory about half of the size of the state of Ohio, is home to over 1,200 tree species. Before it was settled, virtually all of Costa Rica was covered by forest. Today that area has been reduced to less than 35%. This summer SFS research teams will examine the ecology of a Costa Rican forest to try to determine if sustainable forest management in the tropics is possible and if so, how? We will also examine the social impacts, economic demands and political influence affecting the forests of Costa Rica.

We will meet at the airport in San Jose and travel together by bus to our base site. Along the way, we may stop for a brief visit at the local herpetarium where we will be instructed on how to identify and avoid the snakes which are present in many of Costa Rica's forests. As we continue on to our site, we will begin to experience and appreciate

some of the spectacular biodiversity that has made this country the destination and research site of many of the world's tropical ecologists.

Costa Rica is home to over 6,000 species of plants, 500 species of butterfly, 850 species of birds and 250 species of mammals. We are more likely to encounter birds and insects because much of the plant and animal life found in the forest lives in the upper reaches of the canopy. Last summer's research team identified two new species of beetle here that were previously unknown to mankind.

Our research will focus in the productivity of a tropical forest. What effects the size and growth rate of tree species? What happens to the biological integrity of a tropical forest when its area is significantly reduced? How is regeneration of plant diversity affected by the size of a disturbance and distance from mature forest? What is the relationship between plant and animal diversity? We will assess species composition, species richness and relative dominance of trees in regenerating and mature forests. In addition, we will evaluate the influence of soils, slopes, nutrients and water on forest growth.

Lectures will focus on the nature and conservation of tropical biological diversity. Faculty will discuss species interactions, community and ecosystem dynamics, nutrient cycles, succession, and plant and animal identification. Also emphasized will

be causes of habitat destruction, economics of reforestation, and principles of natural resource management. Integral to the program is a series of classes that examine land use by Central American inhabitants, including historical, political and social roles. During these classes we will visit local fincas and interview Ticos (as Costa Ricans call themselves). Our interactions with local people will help us gain a greater understanding of the difficult decisions involved in conserving tropical resources while attempting to promote improvements in the quality of life for people in tropical regions.

With faculty assistance, students will have the opportunity to undertake directed research projects. Potential topics include the effect of weather or forest fragmentation on insect diversity and populations; bird diversity in fragments of disturbed understory; and pollinator and flower densities in disturbed areas of forest.

We will live in a rustic environment and visit a remarkable range of ecosystems: one of the most luxuriant cloud forests in the New World tropics; remote premontane moist forests; and low-land deciduous forests. Tall trees dripping with epiphytes and a large array of animal life—including howler monkeys, sloths, toucans, and spectacular butterflies—create an unforgettable tropical world. Temperatures at these locations vary from very cool and wet at higher elevations to hot and muggy at lower elevations. Rain showers are short but frequent.



Documenting the growth and occurrence of key plant species ... "I yearned for the opportunity to apply what I was learning in the real world, not just in the laboratory where results are often known before the experiment has even begun."

Larry Boles, King, NC—University of North Carolina
(Photo: Tom Kleinert)

Financial Aid is available.

Please see page 28.



Requirements for Admission

We are seeking a body of curious students with a thirst for learning and the maturity and personal initiative to make use of our unique educational opportunities. Individuals should exhibit enthusiasm, character, compassion, flexibility and social concern. Also evident should be a demonstrated promise to benefit academically and socially from this experience as well as a willingness to, at times, put the needs of the group ahead of those of an individual. The essay in which the student defines his or her motivation for participation is a strong determining factor in the admission process.

Admission to SFS courses is open to eager, motivated students. A strong background in science is *not* required. Participants are screened by the Admissions Committee to insure that they are choosing the right course for the right reasons. We encourage students who are willing to commit their emotional, intellectual, and physical energies to working toward a better understanding of crucial environmental issues to join us.

All applicants for admission are required to submit an SFS application form and essay, a \$35 application fee and an SFS reference form before the application will be reviewed.

Applicants for semester programs should be 18 years of age and have completed at least one college-level ecology or biology course and one semester of college. Semester applicants must submit an official, current transcript to complete their application.

Applicants for summer courses should be at least 16 years of age and have completed at least the junior year in high school. Applicants who have not entered college must submit a transcript.

For further information regarding admission, please call the SFS Admissions Office at (508) 927-7777.

Acceptance

Applications for all programs are reviewed on a rolling admission basis, as soon as all required information is received. The Admissions Committee meets on the 1st and the 15th of every month.

Teams fill quickly. We strongly urge students to apply early to join the course of their choice. Waiting lists are maintained for courses that fill early.

All acceptances are contingent upon medical approval. Course syllabi will be sent to all accepted applicants. Whenever possible course faculty will call accepted students to discuss their participation in the program.

Academic Credit

All students, except those from SFS Affiliate Schools, receive academic credit for their SFS course from Northeastern University in Boston, Massachusetts. A non-refundable registration fee of \$150 for semester programs and \$100 for summer courses is due 10 days after acceptance into the program. All summer courses carry Biology Department credit at Northeastern. Semester students will receive biology, sociology/anthropology and Interdisciplinary course credit from Northeastern. Upon completion of the course, students will receive an official transcript from Northeastern University. Over 200 colleges and universities have accepted or awarded credit for SFS courses. Applicants should consult their Registrar or the SFS Admissions Office for details. Students from SFS Affiliate Schools (see page 5) will receive a transcript from SFS and credit directly through their home school.

All SFS courses are approved and assigned course numbers by Northeastern University. As this publication goes to press, several new courses are undergoing the approval process at Northeastern. Course numbers are usually assigned at the end of this process.

Changes and Cancellations

SFS programs are obviously different from travel or adventure programs. We have tried to give accurate portrayals of every program in this catalogue. All course descriptions have been written in consult with a current or past faculty member. However, each project is unique and often cannot be implemented exactly as planned for a variety of reasons. There are factors which, although monitored closely, are beyond our control. For example:

- Over half of our projects take place in highly regulated and sensitive environments, usually requiring special permits, such as in Kenya and Mexico.
- Some projects depend on the goodwill and generosity of individuals and institutions which lend support.
- Tenuous weather situations, natural disasters or changes in political conditions in another country may require last-minute changes in sites or research plans.

Applicants are advised that these or other variables (including staffing) may result in changes before or during a course. Indeed, part of the challenge is in adapting to changing conditions and overcoming the obstacles they may present. In other words, the whales are not always where we want them to be, so please be flexible.

Student Conduct

Participants are expected to conduct themselves in a mature and responsible manner. SFS reserves the right to require any participant to withdraw from any program at any time if the faculty deem the student's conduct to be detrimental to or incompatible with the interest, harmony, comfort, or welfare of the course—including use of alcohol or drugs not authorized by a medical doctor, or uncooperative or disruptive behavior. Should such a decision be made, SFS will notify parents and return the student to the point of course departure, at which time any and all responsibility on the part of The School for Field Studies will cease.



"Arriving as an unknown, closed-minded, unsuspecting Long Island armchair traveller, I experienced SFS with wide eyes as an intense new world offering rich opportunities for self-challenge in the outstretched arms of instructors and students; I left with a greater self-esteem, world awareness, and very special friends."

Michelle Weideman, Melville, NY—Union College
(Photo: Stephanie Clapes)

Responsibility

In organizing and managing these courses, The School for Field Studies (SFS), its agents, employees, and staff give notice that they act solely on behalf of and for the benefit of the participants, on the express agreement that SFS shall not be liable, financially or otherwise, for non-performance or unsatisfactory service; for injury to persons including death; for loss of, or damage to property; for accident or delay; and/or for expenses arising from strikes, weather, quarantine, sickness, government regulation, or from any act or omission of its agents or employees, and/or airline, railroad, bus company, automobile rental agency, hotel, or other supplier of service.

SFS reserves the right to refuse any applicant admission to any program if he/she is deemed unsuited for the project for any reason. All courses, fees, and dates are tentative until verified and confirmed in writing by The School for Field Studies.

The School for Field Studies admits students of any sex, religion, race, color, national or ethnic origin to all the rights, privileges, programs, and activities generally accorded or made available to students of the School and does not discriminate on the basis of sex, religion, race, color, national and ethnic origin in the administration of its educational policies, admissions policies, scholarship loan programs, and other School-administered programs. SFS is an equal opportunity institution.



Processes, Requirements, Tuitions and Costs

Deposits, Tuitions and Fees

Like other non-profit, tax exempt educational institutions, SFS meets its expenses with a combination of tuition charges and income from grants and donations. Tuition pays for instruction, room and board, and ground transportation during the course. It also includes group equipment, medical supplies, scientific instruments and material. *It does not include transportation to and from departure point.*

A non-refundable deposit of \$350 for

summer courses or \$500 for semester programs is due no later than 10 days following acceptance in order to reserve a place in the program. All students will be registered for academic credit with Northeastern University. The non-refundable registration fee of \$100 for summer courses or \$150 for semester programs is due with the deposit. (Deposits and registration fees for financial aid candidates are non-refundable 10 days following financial aid offer. Students must complete and return their financial aid application within 10

days of acceptance to qualify for refund status.)

Full tuition is due sixty days prior to course departure. No student with an outstanding tuition balance will be allowed to participate.

Note: The tuition fees listed in this catalog are based on estimates made a year in advance of departure and involve many variables—currency rate, outside project support, enrollment projections, etc.—all of which may change. The tuition for each program is tentative until confirmed in writing by SFS.

Tuitions

SFS Fall 1993 and Spring 1994 Semester Programs\$9,850

(all programs have additional \$150 registration fee)

Summer 1993 Courses (30 days)

(all programs have additional \$100 registration fee)

Wildlife Management/Kenya	\$2,950
Sea Lion and Dolphin Conservation/Baja, Mexico	\$2,680
Tropical Deforestation/Australia (6 weeks)	\$3,680
Marine Parks Management/Caribbean	\$2,680
Tropical Forest Ecology/Costa Rica	\$2,580

In addition to tuition charges, please also consider the following to determine the total cost of participation:

Transportation and Travel Arrangements: To insure orderly arrival at the site as well as low fares, we work with one travel agency to handle SFS travel. This agent will arrange travel to the course, with any special arrangements students require. Any student not using the SFS agent must have their travel plans approved by the SFS Admissions Office. Specific details will be forwarded upon acceptance. Students are responsible for passport/visa fees as well as all transportation costs and arrangements to and from the site.

Clothing and Equipment: SFS will provide food, cooking equipment, tents and all scientific and research equipment. Students are responsible for personal gear including sleeping bags, backpacks, clothing, and SCUBA gear (if applicable). Stu-

dents may find they already have much of what they need, and we encourage students to borrow as much gear as possible from friends.

Physical Examination and Medical Insurance: Students must present a completed SFS Medical Form, signed by a doctor, no later than 30 days prior to course departure. All medical forms must be approved by the SFS Medical Committee. Students must be able to meet the physical challenges presented by SFS courses without undue risk. Academically qualified individuals may be disqualified from participating on medical grounds. Students will not be allowed to join an SFS program without proof of up-to-date medical coverage and a signed medical release.

Financial Aid

Financial aid, in the form of scholarships and/or interest-free loans, is available to qualified students based on need. The School is committed to making the SFS experience accessible to as many qualified students as possible and has been the recipient of generous contributions from foundations, corporations and individuals to help attain this goal.

In 1993, we expect to be able to award partial program funding, totaling over \$400,000, to over 200 participants. Financial aid packages are comprised of an

interest-free loan or a combination of a grant and a loan.

We encourage students who will need financial assistance to request, complete and return a SFS Financial Aid Application as soon as possible. Aid is available by need until funds are exhausted. *Semester participants may arrange to apply federal financial aid toward their tuition in addition to applying for SFS funding.*

For more information on how to qualify for assistance, please call the Admissions Office at (508) 927-7777.

Refund Policies

Summer Courses:

Registration fees are non-refundable and non-transferable. If a student withdraws prior to 21 days before the start of the course, it may be possible to transfer his/her non-refundable deposit to another SFS program within a 12 month period. If a student withdraws 21 days or less before the start of the course, SFS will retain 50% of the course tuition. No refunds are made once the course has begun.

Semester Programs:

Registration fees are non-refundable and non-transferable. Deposits are non-refundable. If a student withdraws more than 30 days prior to the start of the program, SFS will retain 50% of the program tuition; it may be possible to transfer his/her non-refundable deposit to another SFS program within a 12 month period. If a student withdraws from a course 30 days prior to the program commencement to 14 days after program departure, SFS will retain 75% of the tuition. No refunds are made after the second week of the program or to students asked to leave the program.



"The most important thing that this program taught me was how to work with people, not against them, to achieve the equilibrium that exists in nature...Now my dreams have changed and I only hope that I can pass on the things I have learned to others and contribute to the conservation of this planet."
Charles Montgomery, Baltimore, MD—Simon's Rock College

**The School
for Field Studies**

Administrative Staff

President's Office/Development

James L. Elder, Jr.
President

Bethany L. Ericson
*Development Coordinator/ Assistant
to the President*

Marketing and Admissions

Andrea C. Walgren
Vice President for Student Affairs

Margaret C. Jones
Manager for Institutional Relations

Donna C. Dowal
Senior Admissions Counselor

Alexandra C. Arnold
Admissions Counselor

Meghan M. Kelley
Marketing Assistant

Andrea Jones
Admissions Assistant

Administration/Finance

Elizabeth J. Story
Vice President for Administration

Paul Coombs
Administrative Services Coordinator

Mary Wentzel
Operations Manager

William P. Whelan
Operations Coordinator

Susan P. Sanchez
Receptionist

Michael T. Daley
Finance Manager

Jane Flinn
Bookkeeper

Program Department

Katherine F. Abbott
Vice President for Program

Robert Singer, Ph.D.
*Director of Academic Affairs & Marine
Programs*

Anne Dodge
*Director of Satellite Programs and
Staff Training*

Gail Kessler-Walsh
Faculty Recruiter

Cathy Babb
Program Assistant

Jody L.P. Mello
Program Assistant

The SFS Organization



Board of Trustees

Terry L. Andreas, Chairperson
New York, New York

James L. Elder, Jr., President
*The School for Field Studies
Beverly, Massachusetts*

Evan Davis, Esq., Treasurer
*Cleary, Gottlieb, Steen & Hamilton
New York, New York*

G. Dudley Welch, Esq., Clerk
*Davis & Welch
Wakefield, Massachusetts*

David Aycr
*Essex Street Associates
Beverly Farms, Massachusetts*

F. Whitney Hatch, III
*GTE Service Corporation
Washington, D.C.*

Michael Hirschberg, Esq.
*Brown Raysman & Millstein
New York, New York*

Peter Jacobs, Esq.
*Pierce, Atwood, Scribner, Allen Smith
& Lancaster
Portland, Maine*

Cordelia Gould Kelly
New Canaan, Connecticut

Kenneth R. Locklin
*Appropriate Technology International
Reston, Virginia*

W. Kent Olson
*The Conservation Fund
Arlington, Virginia*

Sumner Pingree, III
*Global Environment Fund
Washington, D.C.*

Jane E. S. Sokolow
Riverdale, New York

Members of the Corporation

Martina Lee Albright
Brookline, Massachusetts

Inez Andreas, Ph.D.
Bal Harbor, Florida

G. Randolph Bevis
Boston, Massachusetts

Susanna Colloredo-Mansfeld
South Hamilton, Massachusetts

The Honorable Sumner Gerard
Fort Lauderdale, Florida

Enid Gort, Ph.D.
New York, New York

Terry Hunt, Ph.D.
Cambridge, Massachusetts

Charles McKee
*Tucker, Anthony & R.L. Day
Portland, Maine*

Emil Mosbacher, III
Greenwich, Connecticut

Rolando Perez
New York, New York

Susanne LaC. Phippen
Wenham, Massachusetts

Carlos Riva
Newburyport, Massachusetts

Jo-Ann Watson
Marion, Massachusetts

Richard B. Wilson
Boston, Massachusetts

Board of Advisors

Astra Davis
Bal Harbor, Florida

David Hales
*Lincoln Park Zoo
Chicago, Illinois*

Thomas Kunz, Ph.D.
*Boston University
Boston, Massachusetts*

Georg Lamb
*Jackson Hole Preserve, Inc.
New York, New York*

John Lawrence
South Hamilton, Massachusetts

James Millinger, Ph.D.
*Sea Education Association
Woods Hole, Massachusetts*

Arthur Page
*Palmer and Dodge
Boston, Massachusetts*

Aja Reid
*Grants Management Associates
Boston, Massachusetts*

F. James Rutherford, Ph.D.
*AAAS
Washington, D.C.*

Crocker Snow, JR.
*World Paper
Boston, Massachusetts*

Timothy R. Donovan, Ph.D.
*Northeastern University
Boston, Massachusetts*

David Bright
New South Wales, Australia

Walter Smith
*Pine Cay
Turks and Caicos Islands*

The following are considered
Founding Donors in view of their
substantial contributions toward
The School's development:

Andreas Foundation

**Archer Daniels Midland
Foundation**

The Boston Globe Foundation

Cabot Family Charitable Trust

Digital Equipment Corporation

The Charles Engelhard Foundation

The Arnold D. Frese Foundation

The George Gund Foundation

Homeland Foundation

The Hunt Foundation

Island Foundation

Richard King Mellon Foundation

Merck Family Fund

Curtis and Edith Munson

Foundation

National Science Foundation

The Laurance S. Rockefeller

Charitable Trust

RJR Nabisco

SFS is a private, 501 (C) (3) non-profit
educational institution.

SFS gratefully acknowledges the
assistance of Omni Travel, Cambridge
and Newton, Massachusetts.

© 1992 The School for Field Studies

Cover Photos: William McComas,
Bob Singer, Chris Vaughan, Phillipa
Richards, David Bathgate and
Donna Stockrahm.
Photo on Page 1: Chip Isenhardt.

Printing: Bradford & Bigelow
Design: Stokes & Company

THE SCHOOL FOR FIELD STUDIES
16 BROADWAY
BEVERLY, MA 01915-4499
(508) 927-7777
FAX: (508) 927-5127

NON-PROFIT ORGANIZATION
U.S. POSTAGE PAID
BOSTON, MA
PERMIT NO. 55476



The world is your classroom

PRINTED ON
RECYCLED PAPER