

Environmental Field Studies Abroad

1996/1997 COURSE CATALOGUE

THE SCHOOL FOR FIELD STUDIES



Semester & Summer Environmental Field Studies Programs

Wildlife Management Studies - KENYA
Marine Resource Studies - BRITISH WEST INDIES
Coastal Studies - PACIFIC NORTHWEST CANADA
Island Management Studies - REPUBLIC OF PALAU
Wetlands Studies - BAJA, MEXICO
Sustainable Development Studies - COSTA RICA
Rainforest Studies - AUSTRALIA

The world is your classroom



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The World Is Your Classroom Environmental Field Studies Abroad



The Mission
*of The School for Field Studies
is to provide motivated young people
from the U.S. and abroad
with an excellent practical education
in environmental studies,
in order that tomorrow's leaders
may become more environmentally literate
and aware and make immediate and future
contributions toward the sustainable
management of the world's
natural resources.*

Holding class in one of the world's last temperate rainforests on Vancouver Island.

Photo: David Silverberg

Snorkeling in the clear turquoise waters off South Caicos Island.

Photo: Matt Weedon.



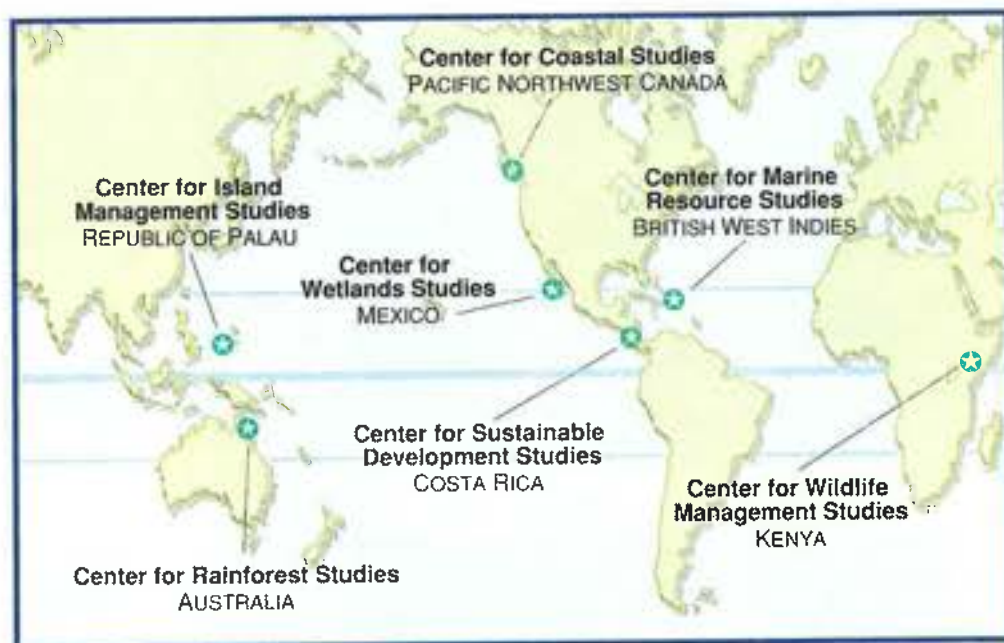
THE SCHOOL FOR FIELD STUDIES

SFS

is the country's oldest and largest educational institution exclusively dedicated to offering undergraduate environmental field courses throughout the world. Since our founding in 1980, more than 7,000 college and high school students, with a variety of academic interests, have had the unique opportunity to conduct hands-on field work addressing some of the earth's most critical environmental issues.

Fall and spring semester programs and intense 30 day summer courses enable students to earn college credit for participating in real-life field studies of such challenging problems as preserving entire ecosystems or individual species, balancing economic development and conservation, and finding ways to manage and maintain wildlife, agricultural and marine resources.

SFS operates seven diverse field study Centers, each offering fall and spring semester programs and summer courses. Centers offer us the opportunity to conduct field work on a year-round basis from permanent facilities, enabling us to undertake long term projects and to develop strong relationships with the local community and partnerships with regional management agencies.



SFS CENTERS AND PROGRAMS

The Center for Wildlife Management Studies – KENYA

Semester Program: Wildlife Ecology & Management

Summer Course: Community Wildlife Management

The Center for Marine Resource Studies – BRITISH WEST INDIES

Semester Program: Marine Resource Management

Summer Course: Marine Parks Management

The Center for Coastal Studies – PACIFIC NORTHWEST CANADA

Semester Program: Coastal Rainforests & Marine Resources

Summer Course: Conserving Marine Resources & Coastal Rainforests

The Center for Wetlands Studies – BAJA, MEXICO

Semester Program: Wetlands Management: Preserving an Ecosystem, an Economy, and a Community

Summer Course: *To be offered in 1997; call admissions office for details*

The Center for Island Management Studies – REPUBLIC OF PALAU

Semester Program: Island Management Studies

Summer Course: Management of Tropical Island Resources

The Center for Sustainable Development Studies – COSTA RICA

Semester Program: Studies in Sustainable Development

Summer Course: Alternative Strategies for Preserving Tropical Ecosystems

The Center for Rainforest Studies – AUSTRALIA

Semester Program: Tropical Rainforest Management

Summer Course: Tropical Reforestation

***How to get the most from your encounter with
an African elephant
or Why I think you should apply to SFS***

An interest in the environment increases, so do your options to study environmental issues in the field. SFS is the best of these options, and here's why:

If you're on a field study in Kenya, you'll probably see African elephants. You can either see them and think, "definitely better than in a book or on TV!" or, you can see them as a living embodiment of a complex, international ecological and economic controversy.

When SFS students in Kenya come upon a herd of elephants, they have the benefit of Center Director Toni Jackman's 15+ years of experience living with Maasai and Turkana pastoralists and working with Jane Goodall and Louis Leakey. And they have Richard Flatfield's insights on the economic and ecological impacts caused by elephant herds; Wayne Vos' expertise on pachyderm ecology and Derek Berliner's wildlife management examples to spark a lively debate on the hot issue of managing elephants.

Let's face it - not counting the other students, a program's faculty are the biggest factor in what you'll get from it. The four member faculty teams at every SFS Center:

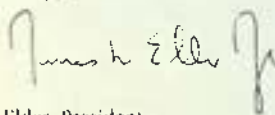
- have a minimum of 20 years of combined professional experience in the subjects and ecosystems we're studying - they know their stuff;
- are fully committed to teaching you full-time - no other commitments, no grant monies to chase;
- live at the Center and eat, travel and relax with you. They're always there to answer questions and help you see the bigger, global picture.

The leadership required of tomorrow's leaders won't come from working independently but from being able function as part of a team. Employers say that having international experience on your resume is helpful *if* that experience helped you become a flexible team player with the ability to look at issues from multiple perspectives. You need to demonstrate that you can successfully inform, motivate and bring diverse constituencies to a common understanding. The SFS faculty are great role models in this regard and our program is designed to help you learn and practice these skills.

When you do your directed research project, you'll work independently but we don't just throw you out there and expect you to figure it out on your own. Faculty guide you in developing skills with lifelong value - in data analysis, problem-solving and teamwork. They know the community and have developed relationships with local clients. When you choose your project from a list at the Center, you know someone has requested, is interested in, and will use your work. You'll make a difference.

If learning and preparing for the future are your goals, seek out the best teachers and program you can find. You'll find them at SFS.

Sincerely,



Jim Elder, President



Photo: Blair McCaw

P.S. Be sure to check out our new Center in Baja, Mexico - I've been working hard on this exciting opportunity and am very proud of what this and all our Centers offer you.

**WHY PARTICIPATE
IN THE
SCHOOL FOR FIELD
STUDIES?**

1

**LEARN ABOUT ENVIRONMENTAL
ISSUES FIRST-HAND.**

2

**HELP SOLVE IMPORTANT
ENVIRONMENTAL PROBLEMS.**

3

**GAIN PRACTICAL FIELD
EXPERIENCE.**

4

**EXPERIENCE THE REWARDS
OF LIVING IN A NATURAL
ENVIRONMENT.**

5

**LEARN FROM EXPERIENCED
FACULTY.**

6

**ACQUIRE VALUABLE
CRITICAL THINKING SKILLS.**

7

**GAIN EXPERIENCE IN
TEAMWORK AND COOPERATIVE
PROBLEM-SOLVING.**

8

**WORK CLOSELY WITH PEOPLE
WHO SHARE SIMILAR GOALS
AND INTERESTS.**

9

**EXPLORE A POTENTIAL MAJOR OR
CAREER AND GAIN JOB SKILLS.**

10

EARN COLLEGE CREDIT.

1 Learn about environmental issues first-hand. Rainforests

don't fit under a microscope. Giraffes don't graze in a test tube. That's why The School for Field Studies' programs/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. You will experience for yourself dramatic, real-life illustrations of issues that can only be imagined through lectures and textbooks. An SFS educational experience fully integrates theory and practice.

2 Help solve important environmental problems. All SFS

programs use a case study approach to analyze an actual environmental situation or dilemma that requires making a decision about a critical issue. Students engage directly in real-world problem-solving across a wide range of questions: how to strike a balance between development and preservation... control loss of species diversity... feed an expanding world population.

Every SFS program has a local client or partner who has requested or will utilize our work. The data that result from our efforts will become part of databases and management reports for use in decision-making by wildlife officials, government agencies and other environmental organizations. SFS allows you to make a unique, personal contribution to science and our environment.

Photo: David Barfgate



"The world does not need more rootless symbolic analysts. It needs instead hundreds of thousands of young people equipped with the vision, moral stamina, and intellectual depth necessary to rebuild neighborhoods, towns and communities around the planet."

David Orr, *Earth in Mind*

"This program made a huge impact on the way I see the world and the environmental problems facing us today. Basically, it made me look at environmental problems from a different angle - how to best go about solving them. Before I went to Costa Rica I was extremely concerned about the environment, but I never knew what I could do to help; I always felt the problems were too big to be solved in the near future. This course made me see that every little bit helps and that the small contributions made by groups such as SFS quickly add up to be important contributions to the environmental movement."

Kelly Boyden,
Tacoma, WA -
University of Puget Sound

3 Gain practical field experience.

One of our goals is to introduce students to field methodology not available in traditional classrooms. At SFS you will have the opportunity to conduct a directed project from start to finish - formulating a hypothesis, collecting and analyzing data, and presenting your results. You will use many practical field techniques such as tracking, censusing, mapping, sampling, and interviewing. Your results may take the form of a publishable paper, a management plan or a draft policy. You also will gain practical wilderness/outdoor experience and skills.

4 Experience the pleasures and rewards of living in a natural environment.

Much of our field work is carried out in spectacular places - pristine coral reefs, rainforests teeming with biodiversity, fragile mountain habitats - that provide dramatic illustrations of the issues under investigation and renew our motivation to protect our natural resources. Spending an extended period of time immersed in the ecosystem you are studying and meeting the physical challenges of a simple lifestyle - living in tents or rustic field stations, practicing minimum impact camping, recycling and greening - can lead to increased self-confidence and awareness.

"Our son had a fantastic academic adventure in South Caicos. We were fortunate to visit the Caicos in March and were at once impressed and enchanted by the island and school. Your school offers young adults a chance to make a difference in the world through friendships and care for the earth. Thank you for making the world and little closer and caring."

Elizabeth & Richard Coakley,
Blue Hill, ME

"Studying the Australian Nature Conservation Act of 1992 gives me an upperhand when trying to understand current American politics - especially recent talk about repealing the Endangered Species Act. Because I will graduate with a degree emphasizing political science, it is very important to me to follow and understand political trends. I now have a great deal to say to politicians about this issue."

Marti Harris,
Rice, MN -
Hamline University

Photo: Bill McCormas



Photo: David Bahlgate



“The faculty was superb. I viewed them not only as professors but as friends. They encouraged us to find answers to our questions and sometimes demanded that we put our heart and souls into the problem or issue. They encouraged us to immerse ourselves entirely into the program. I view them and their accomplishments as an inspiration to my own life.”

Jacqueline Fung,
Boulder, CO -
University of Colorado

“Perhaps the most stimulating part of the program was the directed research. The feeling of doing something that had never been done before was intellectually intoxicating. I did my research on the economics of reforestation, and I am so proud of that paper. I will read it in years to come and still feel I accomplished something worthwhile that contributed to not just my education but to the community. I believe this feeling, by itself, was worth the cost of the program.”

Ben Bedard,
New Vineyard, ME -
University of Maine

5 Learn from experienced faculty. SFS faculty are selected for their interdisciplinary teaching and field experience, knowledge of research or applied environmental problem-solving and interpersonal skills. Given our low student to faculty ratio (no higher than 10 to 1), you will work closely with and learn from these accomplished professionals as they conduct cutting edge field work. Our faculty live on-site so they are accessible, and they are committed to helping you learn. They are successful practitioners of careers to which you may aspire and are valuable resources long after you leave the field.

“The SFS experiences have been a marvelous addition to our Biology curriculum at Davidson. Students return to campus with the self-assuredness that comes from having their sense of the world, and their place in it, challenged. Their experiences totally integrate learning and living so that the boundaries of the “academic” world and the “real” world dissolve. They have developed skills in problem-solving, critical thinking and research. In summary, the SFS experience develops leaders, both in and out of the classroom.”

Verna Miller Case
Professor of Biology
Davidson College

6 Acquire valuable critical thinking skills. Faculty from students' home schools consistently comment that students return from their SFS experience with highly developed critical thinking skills.

SFS will teach you how to approach a real-world problem, to evaluate potential impacts and solutions, and to make difficult decisions without all of the data. In this way, your SFS experience will help you improve your ability to analyze and solve practical problems – skills that will serve you well in your continued education, your career, and throughout your life.

“I was intrigued by the SFS poster I saw on a bulletin board at school and proceeded to question faculty members about the program – all gave the program two thumbs up!”

Marianne Fry,
Saunderstown, RI -
University of Rhode Island

Photo: Liana Babbar



Photo: David Bahlgate



7 Gain experience in teamwork and cooperative problem-solving. The team approach to learning and problem-solving is the heart of the SFS educational philosophy and one of our greatest strengths. You will live as a community with responsibility for each others' well-being and will often work in teams, building on diverse individual strengths to achieve a common goal.

The SFS experience is a journey during which we ask that you be crew not just a passenger. By giving you more control of the educational process - from academics to site management, group dynamics, risk management and community relationships - you not only learn more and participate more but also benefit more from the results.

8 Work closely with people who share similar goals and interests. SFS students come from public and private high schools, colleges, and universities. They major in everything from science to economics to liberal arts. They come from across North America and from many other countries. They are as

young as 16 and as old as 25-26. Approximately 26% receive SFS financial aid from SFS to enable their participation. (See page 42 for financial aid information.)

Although SFS students come from diverse backgrounds, they all share a commitment to learning, a concern for the environment, and a desire to make a real contribution to the future of our planet. A strong camaraderie builds among team members as you share daily challenges—setting up camp, cooking, tackling a tough aspect of 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.

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, and how you adapt to new people and surroundings. SFS students often say they learn as much about themselves as they do about the environment.



Photo: Lynne Metcalf



Photo: Lynne Metcalf

“This program has really helped me focus the next few years of my life. From the contacts I made in the islands, I leave for a job teaching marine ecology in the Florida Keys at the end of the month. I’m sure the reference from my SFS faculty member was a major influence on their decision to hire me.”

John Richardson -
University of Washington

“I decided I needed to learn more about the environment because this would be a major issue in international relations in the coming decades. That is how I found myself, a creative writing/international relations major, bound for Australia to study tropical rainforest ecology. Looking back, I realize what a varied group we were. Some were art students, some biology students, others unsure. In this diversity, we learned from each other.”

Ben Bedard,
New Vineyard, ME
University of Maine

9 Explore a potential major or career and gain job skills.

Students with different academic and career interests participate in SFS for different reasons. For science majors, SFS is a chance to obtain field training before graduation. For students who have little or no scientific background, but are considering a career in an environmental field, economics or public policy, SFS is a unique way to see what it’s really like. For those who simply want to learn more about environmental issues and help our planet, SFS provides an exciting opportunity to do so.

No matter what their specific interests are, former students tell us that the skills they learned from their SFS experience stay with them, helping them to succeed in school, in their careers, and in their lives.

10 Earn college credit.

Upon successful completion of an SFS program, students receive credit in biology or environmental studies through Boston University, the nation’s fourth largest private university, or from their home school if the student attends an SFS Affiliate School. 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 41.

“The SFS programs are an integral part of the environmental curriculum at Boston University. We have a hard time keeping students on campus! To me, the greatest feature of the SFS programs is their ability to integrate information from many traditional disciplines into a coherent, reasoned analysis of environmental problems. We have undergraduate environmental majors in the natural and social sciences. Students from both programs reap great benefits from the SFS experience that ties important concepts together and gives them a real-world laboratory in which they apply those ideas.”

Cutler Cleveland
Director Center for
Energy and Environmental
Studies
Boston University



Photo: David Barthgate

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Our goal is to enable you to come away from your SFS experience with a new understanding of environmental issues, as well as an increased commitment and new skills to help improve the environment and the lives of people dependent on the environment. We particularly want to help you understand the complexity and interrelatedness of all aspects of environmental problems.

We believe that the most effective way to achieve this goal is to offer you, as an integral part of your environmental studies at SFS, a chance to participate in making a meaningful contribution



Photo: Bill McConas

Students in Costa Rica assessing potential ecotourism and conservation impacts of setting aside private land as a preserve that would also attract ecotourism.

towards solving environmental problems. To deliver this opportunity, we have created an integrated curriculum incorporating:

- 1 an interdisciplinary, *(ecology, resource management, economics, applied anthropology, and political science)*, "case studies" approach to teaching;
- 2 problem-solving through field work which aims to provide solutions to local environmental problems;
- 3 involvement in the local community through field and service projects undertaken at the request of a local partner/client; and
- 4 participation in an educational journey during which you are asked to be a member of the crew, not a passenger; where we expect and encourage you to take a proactive role in all aspects of your education.

1. The interdisciplinary, "Case Studies" approach to teaching.

All SFS programs begin with an investigation of local environmental problems in the form of a case study. A case study is an analysis of an actual (*not simulated*) environmental problem which requires that a decision be made. Drawing from a number of disciplinary perspectives (*usually ecology, resource management, economics, applied anthropology, and political science*), we study those theories and tools that are relevant to understanding a particular complex problem. In each case study, we seek to identify ways in which natural resources can be developed economically in a manner which can be sustained indefinitely, a concept known as *sustainable development*.

Faculty lectures and readings provide theoretical information necessary to understand the problems raised by the cases. Guest lectures by individuals who are often intimately involved in the issue under study provide a rich (*and, at times, conflicting and confusing*) context which is typical of major social problems. Practical, interdisciplinary activities enable us to gain hands-on experience as we address these issues.

In the course of the case study, you will be faced with making a decision, usually with less than complete data and less than perfect solutions. For example, in Kenya, the elephant problem has become a defining international image of wildlife management. The politics of international conservation have run headlong into issues over national sovereignty. Our case study on the effectiveness of the ivory ban as a way to manage the elephant population challenges you to reconcile local economic needs with national and international conservation interests.

Faculty routinely lecture together and cooperate in field exercises. Courses are integrated with fieldwork assignments and other activities. Debates, policy statements, or management plans are often used in the concluding and evaluative stages of the case study. The goal of the case study approach is to integrate the lectures, discussions, debates, and field trips into a nearly seamless academic experience.

2. Learning problem-solving through field work which aims to provide solutions to local environmental problems.

All SFS programs include a field research component. This component provides you 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 you are learning in the classroom into practice. The School's mission does not seek to promote research for its own sake. Rather, we seek to produce first-rate applied research in the form of practical reports to local resource managers.

You will have the opportunity to design and carry out a field project related to the current goals of the Center or program. These projects usually last for more than half the program, culminating in presentations to both the local community and the larger outside community of scientists, researchers and representatives from SFS partners and clients.

3. Involvement in the local community through field and service projects undertaken at the request of a local partner/client.

Case studies and field work can only be successful if we develop solid partnerships and client relationships with local individuals, organizations, and agencies interested in conservation: our program partners. Our clients are stakeholders who are personally impacted by the environmental issue under study. Our partners are working on those critical local environmental issues related to the Center which will provide suitable material for an applied education.

In addition, you may engage in environmentally related community service projects outside the formal academic curriculum. In South Caicos for example, SFS students, led by a faculty member, started a science club at the High School. Club members in turn helped our students stage a "SEA DAY" at the Center, when all the island children come to the Center to learn more about their surrounding ocean environment.

4. Participation in an educational journey during which you are asked to be a member of the crew, not a passenger; where we expect and encourage you to take a proactive role in all aspects of your education.

We seek to put some control of – and responsibility for – your educational process in your hands. We trust that, if given this opportunity, you will not only participate more fully in your education, but also benefit more fully from the results. Your responsibility to learn in an SFS program is not limited solely to academic study; it extends to many aspects of group dynamics, community relationships, daily living, and institutional relations.

Field work can be fraught with daily challenges – tools and equipment break down, field projects fail for reasons outside of your control, and a "foreign" environment, in almost all senses of the word, creates obstacles as well as opportunities. SFS teams often live in isolated settings; participants spend up to three months living in close proximity with up to forty other team members and may, at times, be asked to give up personal freedoms for the good and safety of the group. Identifying

effective solutions to environmental problem-solving requires a sensitivity to, and an understanding of, the local context. Mastering these challenges requires developing problem solving, team and relationship building and risk management skills that are useful long after you leave the field.



Photo: Bill McComas

Occasional moments for private reflections are treasured as living and working with a group of individuals day in and day out presents both challenges and rewards.

As a result of SFS experience, we are hopeful that an SFS graduate will have developed:

- an integrated understanding of the relevance and application of select principles of: ecology and conservation biology, resource economics, resource management, cultural history, political science, social ecology, and ethics related to environmental problems;
- the problem-solving, critical thinking, and communication skills necessary to enact change;
- the personal confidence and self-sufficiency to accept responsibility for his/her own personal decisions, learning and growth;
- the conviction that one person can make a difference, especially by getting others involved and working together;
- the confidence to work toward solutions for complex environmental problems;
- and the realization that each individual has a responsibility to a larger community, requiring each of us to be informed and active citizens.

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Photo: Beth Bader

Local children visiting the Center for Marine Resource Studies on SEA DAY. When I decided to go to SFS, I was more idealistic, thinking I could change the world just by my interest. But throughout the three months I spent on South Caicos with the other students, I realized that I have to be active. I have to make things happen. Before, I used to sit around and complain a lot about all the environmental problems of the world and say, "I wish somebody would..." never thinking that somebody could and should be ME.

— Maryono Davis, Dorestown, PA • St. Francis College

"When environmental education is done well, students have an understanding and appreciation of natural systems and cycles and of how humans impact them through economic, political, and cultural systems... They understand how values influence decision making and have a clear sense of their own values on how people should relate to the environment and to each other regarding sharing natural resources."

Mary Paden, Environmental Education Director,
World Resources Institute

The goal of our conservation focus is to create projects at each Center that provide solutions to real environmental problems at the local and regional level and that offer models for creating policies, methodologies, and planning tools to deal with global environmental problems. Conservation projects undertaken by SFS teams in 1995 have resulted in:

- the adoption by the Palau Legislature of new dates for the opening of the harvesting season for giant clams, based on assessments of growth rates conducted by SFS students at the Center for Island Management Studies;
- the inclusion of a reforestation plan, proposed by students and faculty at The Center for Rainforest Studies, into an overall management strategy for the Lake Tinaroo watershed that is currently being developed by the Department of Primary Industries in Atherton, North Queensland. The plan calls for planting native rainforest trees and should lead to improved water quality and better soil conditions for agriculture and farming on the southern edge of Lake Tinaroo;
- the creation and implementation of a marine environmental education program that has been formally incorporated into the curriculum of the South Caicos Island high school;
- the implementation of seasonal hiking restrictions on a trail on Mount Lukenya, enforced and publicized in a brochure by the Mountain Clubs of Kenya, after research conducted by SFS students indicated raptor nesting habitat in close proximity to a heavily travelled hiking path;

In addition, numerous papers based on directed research projects conducted by SFS students and faculty have been published or presented at international conferences in 1995. For example, students and staff at The Center for Sustainable Development Studies presented or authored eleven papers during the year including:

- "Interactions Between Socio-Economic Indicators and Ecosystem Health in Privately Owned Protected Zones in Costa Rica: Can Sustainable Conservation of Natural Resources be Achieved Without Equity?" by co-authors Joshua Tull (*University of Pennsylvania*), Yvonne Troya (*Bowdoin College*) and Judith Hochauer (*Binghamton University*), and SFS faculty Bernardo Aguilar and Jose L. Diaz Naranjo, at the Second International Workshop of the International Society for Ecological Economics, held in Pereslavi-Zalessky, Russia.
- "Community Development Organizations as a Potential Tool for Increasing Women's Participation in Crop Production", co-authored by staff Dr. Lisa Bradshaw, Mr. J.L. Diaz Naranjo, and Ms. Lucy Lawrence, was presented at the The XIIIth International Plant Protection Congress, held at The Hague, The Netherlands.

SFS SEMESTER PROGRAMS

Curriculum

Fall and spring semester programs at each Center run for 14 weeks and enroll up to 32 students. To facilitate credit transfer, we have separated the lectures and field work in the integrated semester curriculum into four separate university courses, each carrying 4 semester credits. Three of these courses (*usually incorporating an ecological, resource management, and socio-economic or applied anthropology perspective*) focus on theory using local examples. Each involves the traditional elements of an undergraduate course including more than 50 hours of lecture, readings, written assignments, exams, 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 an individual field project addressing a component of the semester's research objective. (*Please see page 38-39 for individual course descriptions*).

Schedule

Semester programs run for at least 90 days not including a five day midterm break (*the only time you are free to travel on your own*). We compress a 16 week semester into 14 weeks (*by working on weekends among other methods*), so be prepared for an intensive learning process.

The program begins with a ten day-long introductory module orienting you to the site and the local environmental issues. An average of three weeks is allotted to each of the case studies. Several days at the end of these periods are set aside for synthesis and evaluation. The program ends with a 'Re-Entry' Module which offers us an opportunity to reflect on the experiences of the semester, clarify values and consider career possibilities.

Our schedule varies throughout the semester. The first half of the semester will include approximately 15, one to one and one half hour long, lectures a week plus 3-5 other meetings (*organizational, research/paper presentations, guest lectures*). Afternoons are generally filled with field trips or laboratories. Academic activities are usually held six days a week. On average, we will spend 3-4 weeks of each semester off-campus on field trips. (*Students at the South Caicos and Palau Centers spend significantly less time off-campus*).

Later in the semester, there will be fewer lectures and organized classes and more time is allocated for Directed Research projects. Additional meetings offer training sessions in the skills (*statistics, paper writing formats, computer spreadsheets, and laboratory analysis*) needed to complete your research.

In addition to daily chores like kitchen duty, several hours are scheduled each week for a thorough site clean-up.

Prerequisites

Semester participants must be at least 18 years old, 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; please be sure to check individual program descriptions.

SFS SUMMER PROGRAMS

Curriculum

SFS offers summer programs at all Centers. Students in summer programs focus on a single case study. (Please see page 6 for a detailed case study description).

Each program involves elements of an undergraduate course including more than 40 hours of lecture, readings, written assignments, exams, field trips, oral and written evaluations. In addition, you will have the opportunity to design and carry out a field project related to the current goals of the Center. These projects usually last for more than half the program, culminating in presentations to the local community and interested scientists and representatives from SFS partners and clients.

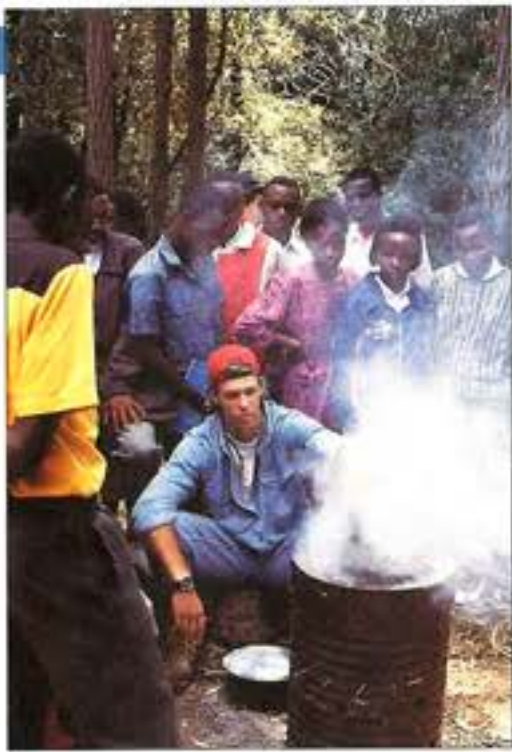
Schedule

SFS summer programs run for 30 days, enroll 32 students with four faculty, and are accredited for 4 semester credits in environmental studies. You will be involved in activities seven days a week with only one or two days off during the program. These courses run from mid-June to mid-July and from mid-July to mid-August. Be prepared for an intensive learning process. Our daily schedule will vary from course to course, depending on research agendas, weather, field trips and logistics. Typically, we awaken early and either attend a morning lecture or head out to the field. We will devote much of the day to field work, returning to the Center in the late afternoon to process our data, or if we haven't already done so, to participate in our daily lecture. After dinner we may have a guest lecture, group discussion or study time.

Later in the course, we spend less time in lectures and more time working on directed field projects. Additional meetings may be scheduled to offer training in skills (*statistics, paper writing formats, computer spreadsheets, and laboratory analysis*) needed to complete your research. Everyone should expect to be involved in kitchen/cooking duty and site clean-up.

Prerequisites

Summer courses are taught at the college introductory level. Our low student to faculty ratio and interactive teaching approach allow us to adjust the content and pace of the course 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. To apply to a summer program, you must be at least 16 years old by the time the program begins, and must have successfully completed at least the junior year of high school. Other prerequisites may apply; please check specific program descriptions.



SFS students demonstrating a model dump stove developed as part of a directed research project examining options to reduce reliance on wood for cooking at the Center for Wildlife Management Studies in Kenya.



Photo: Liara Babbar

Sharing environmental insights with local students in Barrio Usulután, Costa Rica. "I feel the program's biggest impact was the opportunity for each individual to contribute and make a real difference at the local level and on being grounded by the global nature of most environmental issues. I also feel that many of the ideas brought up in the program are very transferable to other parts of the world."

Richard Blum, Dry Creek, CA - Virginia Polytechnic Institute

KENYA

CENTER FOR
WILDLIFE MANAGEMENT STUDIES

C E N T E R P R O G R A M S

Wildlife Ecology and Management

Semester Program — Page 12

Community Wildlife Management

Summer Course — Page 13

Center Objective

To develop scientifically sound and culturally and economically appropriate guidelines for managing Kenya's wildlife and habitat that respect both the country's need for agricultural production and its history and identity as a famous haven for wildlife.

Critical Environmental Issues

Kenya's reputation and reality are on a collision course. Increasing human population has so stressed the country's patterns of land-use that huge tracts of wildlife habitat have been reallocated to food production. Reduction and degradation of natural habitats and the increasing incursion of agriculture into traditional migration corridors threaten the survival of wildlife populations — and the tourist industry they support. Moreover, current methods of food production such as cattle ranching are unsustainable and will require sacrificing yet more land. Wildlife, Kenya's chief natural resource, may provide an ecologically appropriate solution to the dilemma — but first these questions must be answered:

- ◆ What is the status of existing wildlife populations?
- ◆ Which current land-use patterns are sustainable?
- ◆ What benefits can landowners obtain from encouraging wildlife?
- ◆ What are the cultural and economic barriers to changing land-use patterns in Kenya?

Center Clients/Partners

Recent clients and partners include a Maasai group ranch, the Mountain Clubs of Kenya, the Kenya Wildlife Service, and the Wildlife Clubs of Kenya. Private raisers of game (including *Game Ranching Ltd.*, the home of our Center) welcome our research involving the ecological impacts of game ranching. Our findings may also be of use to tribal cooperatives seeking alternative methods of food production and revenue.

Field Director: Toni Jackman, M.S., Wichita State University (*Geology*).

Resident Faculty: Richard Hatfield, M.S., Cornell University (*Agricultural Economics*) and M.I.M., American Graduate School of International Management.

Derek Berliner, M.S., University of Witwatersrand (*Ecological Modeling*).

Wayne T. Vos, Ph.D., University of Natal (*Botany*).



Site Description

Kenya's stark and beautiful countryside deserves its stunning reputation. Authors and adventurers from Hemingway to Dinesen have mesmerized us with its harsh desert, arid plains, gentle savannas and dense rainforests. These provide the stage for an variety of plant and animal life: acacia thorn trees and croton thickets which shelter antelope, zebra, rhino, and elephant, as well as the lions, cheetahs and leopards which prey on them. Kenya sits astride the equator. This not only makes for days and nights of equal length — unfamiliar enough to most North Americans — it also prompts



Photo: Dick Garstang

"It was a different kind of learning. I was absorbing things all around me and it was fascinating and fun. I received a 100% on the mammal practical exam because I was living with and seeing the animals every day. This kind of learning stays with you a long time."

Kim Susco, Carlsbad, PA • University of Pittsburgh

abrupt, vivid sunrises and sunsets of breathtaking color. Darkness arrives by 7 p.m. every night of the year and then the African sky offers up a panorama of unfamiliar stars. Our familiar constellations may be visible, but they skirt the northern edge of the sky.

The shock of the unfamiliar can be a daily companion at Jua Kali, our field station based in a remote corner of an experimental game ranch on the high plains. Oryx and velvet monkeys wander freely through our cluster of thatched roofed

Center For Wildlife Management Studies

Photo: Liz Kaplan



The classroom at Juu Kahi, where skeletons reconstructed by former students are part of the reference materials.

huts. The umbrella shaped thorn trees, rich plains, wildebeest, impala and zebra and the diverse array of tropical birds that characterize the ranch environment are constant reminders that we are in Africa. To complete the picture, densely vegetated Mount Lukenya dominates the northern horizon; Dinesen's beloved Ngong Hills lie due west.

Center Facilities

Our Center for Wildlife Management Studies is based at Game Ranching Ltd., a forty minute drive from Nairobi. The main headquarters of this 81-square kilometer ranch lies several kilometers from our rustic isolated field station. Students sleep in grass thatched bandas and rely on kerosene for light. An open dining/lecture hall, library, separate student center, outhouses and open-air shower complete our base camp.

Living and Working Conditions

Days follow a structured pattern early in the program: Mornings are reserved for lectures, afternoons for field work, and after-dinner hours for presentations and guest lectures. Each term includes extended field trips (*three during a semester and one during summer courses*) of at least a week each to sites in other parts of the country. During these expeditions, activities, field lectures and research are scheduled to take advantage of the particular opportunities available at each site. When we are at the Center, time is set aside each week for maintenance work and community service projects. Toward the end of the term, our schedule becomes more flexible as directed research and data gathering take precedence.

Even at rest, we will seem on safari; a generator powers only the main building where lap top computers are available, and vehicle access is usually by four-wheel drive. Student teams prepare most meals,



Photo: Ed Staehle

Derek Berliner takes advantage of a stop during a field trip to give a lecture on elephant management models.

with the aid of a local cook. Foodstuffs are Western with an African influence (*the Kenyan traditional diet lays heavy emphasis on animal protein, but we try to procure fruit and vegetables*). Game meat from animals raised and slaughtered on the ranch provides our usual non-vegetarian meal options.

Despite our equatorial location, the climate is temperate. Days can be hot, with temperatures rising into the high 80s; nights are cool enough for sweaters. From January to March, there can be 10 hours of cloudless sunshine in a 12-hour day; as April approaches, the rainy season begins.

Members of the Center staff come from various regions of Kenya and belong to several Kenyan tribal groups, including Kamba, Turkana and Luo. Our field trips and discussions with local farmers and pastoralists, as well as park wardens and management officials, will bring us into contact with other tribal groups and indigenous communities, providing exposure to the multifaceted basis of Kenyan society.

Continued Next Page

Photo: Dick Garstang



Practical problem-solving is put to a test as students design and construct a bird observation tower for use in their directed research project. Student bandas (living quarters) can be seen in the background.

KENYA

WILDLIFE ECOLOGY AND MANAGEMENT

Program Dates:

September 10 – December 13, 1996

January 31 – May 6, 1997

Departure Point:

Nairobi, Kenya

Students will be registered in four academic courses:

BI/EE (NS) 371	Techniques of Wildlife Management
BI/EE (NS) 372	Wildlife Ecology
EE (SS) 302	Environmental Policy and Socioeconomic Values
EE 491 or 492	Directed Research

*Please see pages 38-39 for course descriptions.***Introduction**

The habitat required by Kenya's wildlife, its most famous and most economically valuable resource, is increasingly threatened by the country's soaring rate of population growth – the highest in Africa. So many people, in such an arid country, must struggle to raise enough food just to survive. Farmers are being forced onto land that is marginal or unsuitable for agriculture and traditional pastoralist lifestyles are also threatened. Previously nomadic peoples, such as the Maasai, and the cattle herds that provide their primary sustenance, have been confined to diminished areas at the same time their populations are increasing. Overgrazing and rangeland devastation is inevitable. The wild animals which have co-existed for centuries with these non-hunting people are increasingly seen as being competitors for scarce water and grazing resources.

The parks and reserves which offer protection to wildlife are being isolated as the traditional dispersal areas surrounding the protected areas are converted to food production using methods hostile to wild animals. Reduced habitat undermines the long-term viability of Kenya's irreplaceable wild animal populations. These animals are a magnet to tourists; more than a half-million visit each year and supply the country's primary source of foreign income. Clearly, ecologically appropriate solutions to the conflict between food production and wildlife habitat must be found.



Photo: Weaver Whitehead

On off-ranch safaris we confront environmental problems facing Kenya first-hand. "Through my classes and these safaris, I was afforded a very whole vision of the issues facing conservationists and was able to develop my ability to think critically and beyond readily available media perspectives."

Rachel Bridgewater, Warner, NH - Simon's Rock of Bard College

We will begin the semester with a brief overview introducing the problem-oriented case studies approach and the environment and ecological concerns of Kenya before examining three case studies and pursuing directed research projects which integrate material from the three courses.

Case Study #1:**How do we manage rangeland resources for optimal and sustainable wildlife production?**

The tremendous strain placed on land in Kenya by its burgeoning population has resulted in the conversion of highly productive rangeland to barely viable agricultural use and has disrupted the seasonal migration patterns of both wildlife and pastoralist cattle herds. Government efforts to settle livestock-herding tribes has resulted in the redesignation of communal tribal land into clearly delineated group ranches or subdivided private holdings. Large concentrations of herbivores have degraded the land and diminished the economic viability of large tracts of grassland and savanna. We will examine the methods and techniques needed by managers to rehabilitate, maintain or improve rangeland. Understanding vegetation analysis, herbivore

effects, niche partitioning and plant succession will help us with the ecological assessment and monitoring that are key elements of any management plan. We will investigate the pastoralist way of life through lectures, manyatta visits and interviews with traditional Maasai, Samburu and Somali people. Our base on a game ranch affords us opportunities to test and monitor the outcomes of management techniques including the effects of fire, adding water points, and varying stocking rates and cropping quotas of wild animal populations.

Case Study #2:**What are the most viable strategies for managing pachyderms?**

Sparsely populated areas surrounding parks and reserves have historically served as dispersion areas for migratory herds and large animals such as elephants. As these areas are developed or used for agriculture, wildlife managers face serious dilemmas of elephant/human interaction. We will visit conservation areas where vegetation is now lush, biodiversity high and large herds of grazers are abundant as well as areas where large populations of feeding elephants have left a stark and lunar-like landscape and



Photo: Pete Coppello



As part of our case studies investigating how to optimally manage rangeland, we'll visit and interview traditional Maasai, Samburu and Somali people.

dramatically decreased biodiversity. We will also talk with Kenyans living adjacent to these areas who must deal with marauding wildlife which threaten crops and lives. The Kenyan government's policy toward elephant management is strictly hands-off. By contrast, neighboring Zimbabwe culls elephants to balance park wildlife. These contrasts spur an immense controversy over methods for managing elephant populations and ecosystems in a sustainable manner. We will examine various management options including the ivory trade ban, sport hunting and elephant birth control. Rhinoceros management and conservation present an entirely different set of concerns which we will also explore during visits to rhino sanctuaries.

Case Study #3:

What are the impacts of commercializing wildlife?

Game ranching, originally seen as the obvious solution to the problem of inappropriate agricultural techniques in Kenya's traditional rangelands, has not fulfilled its early promise. It remains largely the province of white Kenyan landowners and has not penetrated tribal culture. This is despite the fact that traditional inheritance practices in many communities have diced land into non-viable agricultural units and residents must now consider alternative protein and income sources. During field trips to ranching establishments and in discussions with local experts on wildlife, we will explore the conditions under which wildlife is an appropriate and sustainable land-use option. Utilizing economic analyses and anthropological interviewing techniques, we will investigate cultural, economic and practical barriers to wildlife ranching. The wide range of possible commercial uses of wildlife will be considered from game cropping to regulated sports hunting to commercialized eco-tourism. We will evaluate the regional Wildlife Forums formed by owners seeking cooperative management options to maximize return on wildlife utilization and explore future possibilities for optimizing wildlife potential.

KENYA COMMUNITY WILDLIFE MANAGEMENT

Program Dates:

Session I: June 13 - July 12

Session II: July 19 - August 17

Departure Point:

Nairobi, Kenya

Course Number: EE (NS) 350

Case Study Question:

Will developing Kenya's chief indigenous resource, its wildlife, as a food source provide a sustainable solution to this conflict between Kenya's need to feed its rapidly growing human population and the desire to conserve wildlife populations?

Field Work Focus

- ◆ Determining whether land-use strategies now in place are ecologically sustainable.
- ◆ Investigating the tribal and cultural factors affecting land use in Kenya.
- ◆ Exploring stresses on natural resources caused by game ranching.
- ◆ Exploring cultural and practical barriers to raising, purchasing and consuming game meat.

Course Objectives

We will research potential solutions to the conflict between current wildlife management practices and traditional land-use practices. Reconsidering wildlife as sources of food as well as objects of tourist enthusiasm, may provide a sustainable land-use option.

Faculty lectures introduce African

climatology, plant and animal identification, socio-economic parameters, animal social organization and behavior, plant/herbivore interactions, and theories of island biogeography and biodiversity. Guest speakers may include experts in ecology and Maasai culture as well as local game ranchers discussing range management issues and techniques.

Field work on the ranch exposes us to ecological assessment techniques, mapping, vegetation analysis, animal population censusing, biometry, behavioral observation and sampling. During field trips to parks and critical wildlife areas, we will meet with park managers and have an opportunity to compare behavior and productivity of free-ranging wildlife in protected areas with that of animals confined on game ranches or in protected areas. Interviews with community members provide insight into cultural perceptions that may influence our recommendations.

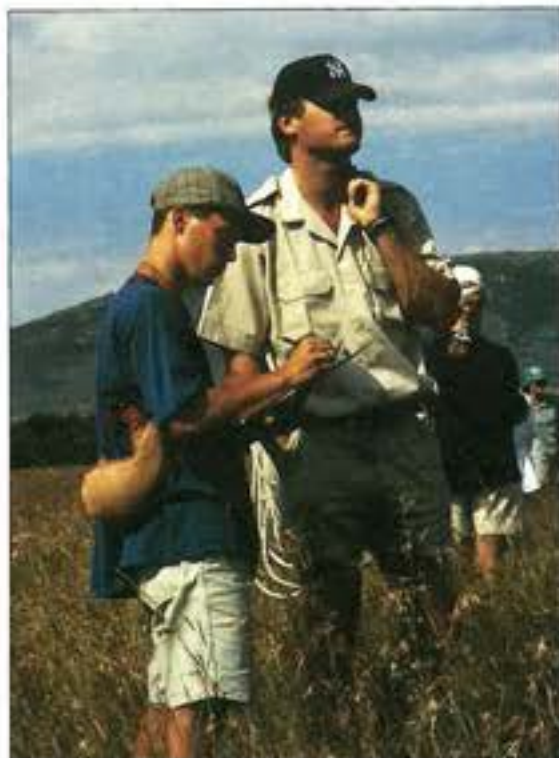


Photo: Gregg Twinn

"Managing animals requires managing the land they live on. Here students conduct vegetation analysis with Gerard Chech E.D. in Tesero, who requests LSPS assistance in developing rangeland management strategies on the Ol Choro Orodia group ranch.

THE SCHOOL FOR FIELD STUDIES
BRITISH WEST INDIES

CENTER FOR MARINE RESOURCE STUDIES

CENTER PROGRAMS

Marine Resource Management

Semester Program — Page 16

Marine Parks Management

Summer Course — Page 17



Site Description

The Turks and Caicos Islands (TCI) lie south of the Bahama Islands, approximately 100 miles north of the Dominican Republic. The islands represent the surface exposure of the Turks Bank and the Caicos Bank. Just east of South Caicos, the Caicos bank plunges 7000 feet into the deep ocean abyss. To the west a shallow bank, averaging 10 feet deep, stretches for nearly 60 miles. This productive area supports one of the largest remaining fisheries for both Caribbean spiny lobster and Queen conch.

From the air, the local waters appear as a patchwork of blues and greens. This mosaic effect is caused by the variety of marine habitats - seagrass beds, mangrove-studded woodlands, sandy shoals, patch, fringing and deep reefs - that surround the islands. Diving into turquoise waters, where

Center Objective

To assist local residents and managers in developing scientifically sound, culturally acceptable, and politically and economically feasible policies and practices that will lead to sustainable development of the marine resources of the Turks and Caicos Islands.

Critical Environmental Issues

Developing sustainable fisheries is an immediate concern for this fishing community that is economically dependent on fluctuating lobster and conch harvests. In addition, a new national parks system was approved in 1992 to preserve critical natural areas, manage the harvests of renewable resources, and promote income-generating ecotourism. The Department of Environment and Coastal Resources must determine how to develop and manage the parks and reserves for the use and benefit of residents and visitors without degrading valuable marine resources. At the same time, the relatively unspoiled environment here is drawing developers of second homes and resorts who may degrade the very attributes which drew them here initially. There are many questions that must be answered in the process of developing an ecosystem management plan and addressing the use of specific resources:

- ◆ What are appropriate levels of coastal development?
- ◆ Could a system of parks and reserves supplement the nations' economy? If so;
- ◆ How can marine and coastal reserves be used to encourage tourism?
- ◆ What are sustainable levels of harvest for lobster and conch?
- ◆ What is the potential for sustainable exploitation of deep water fish?

Center Clients/Partners

The Department of Environment and Coastal Resources, the Tourism Department, the National Trust, the Nature Conservancy, the British Overseas Development Administration, the TCI Community College and the Caicos Conch Farm are our principal clients and partners in undertaking ecological studies and resource assessments, marine environmental education and the monitoring of critical environmental impacts. Faculty and students at the Center are in a unique position to contribute to policies and plans that will influence future growth and environmental integrity here.

Field Director: Bill Brownell, M.S., Cornell University (*Fisheries*).

Resident Faculty: Sascha Steiner, Ph.D., University of Vienna (*Zoology*).

Derek Carrington, M.A., University of Waterloo
(*Regional Planning and Resource Development*).

Andrew Gude, M.S., Portland State University
(*Natural Resource Management*).

*SFS gratefully acknowledges The Curtis and Edith Munson Foundation
for their generous support of this Center.*



Photo: © Matt Weedon

*Classes are taught on land and underwater.
"The biggest impact the program had on me was
creating a need to know more about the world around me.
For two years I worked on a harbor and never knew any
of the species in it. The marine knowledge and
scientific experience I gained with SFS helped me be
hired as a curator at an aquarium."*

Kierston Foley, Cape Elizabeth, ME • Tufts University

Center For Marine Resource Studies



Photo: © Matt Weedon

A vibrant and varied landscape of the fish, in species of invertebrates, coral, 15 species of corals, 200 species of fish, and the water, snappers, groupers, and many other species of fish and invertebrates.

Photo: © Matt Weedon

visibility is often over 100 feet, one is amazed by the variety of fish and invertebrate species. Over 40 species of corals and 200 species of fish have been identified here including spotted eagle rays, shark and grouper species, snappers and mahimahi. The islands are inhabited by lizards, crabs, birds, and the largest remaining Caribbean iguana population. Hawksbill, loggerhead and green turtles are often seen, as are several species of dolphin.



Photo: © Matt Weedon

Photo: © Matt Weedon



Photo: © Jim Elder

Center Facilities

The SFS Center is based in a rustic former hotel on the southern edge of South Caicos Island. A rainwater catchment system supplies water, a precious commodity here. A Center goal is to operate as sustainably and self-sufficiently as possible in its use of natural resources.

The main Center facility has a large, screened-in dining area, kitchen, classroom, library/computer area with six computers and a covered verandah. Students live 3 or 4 to a room in two residence wings

extending out from this hub of campus activity. We are fully equipped for marine operations with a private dock, four boats, a commercial SCUBA compressor and plenty of tanks. The site affords easy access to unspoiled reefs and other marine habitats.

SFS is a small, rustic, but comfortable, building with a large, screened-in dining area, kitchen, classroom, library/computer area with six computers and a covered verandah. Students live 3 or 4 to a room in two residence wings extending out from this hub of campus activity. We are fully equipped for marine operations with a private dock, four boats, a commercial SCUBA compressor and plenty of tanks. The site affords easy access to unspoiled reefs and other marine habitats.

Living and Working Conditions

A typical day during the first half of the semester includes two morning lectures and a reading hour. Afternoons are devoted to field work, often comprised of data collection using SCUBA or snorkeling, or, since we won't be diving every day, explorations of other islands or the coastal zone. Evenings may include a guest lecture or workshop. Time is set aside each week for Center maintenance and for local community service projects. During the second part of the term, we will have fewer lectures and classes and more time is allocated for directed research projects. Free time is limited but there will be opportunities through coursework, community projects and recreation to get to know the friendly Turks Islanders.

This is a true tropical climate with hot (80-95's) days and warm (70-80's) nights. Tradewinds keep our rustic site comfortable and free of biting insects for much of the year. Many of our field work sites can be accessed by snorkeling in the warm (77'-83') ocean waters. When we dive, it will usually be in waters under 60 feet deep, as that is where most of the life of the sea occurs. Although the Center employs a cook, students participate regularly in kitchen duty. Meals consist of simple food - rice, beans, pasta, chicken, and occasionally fresh vegetables, fish and conch.

Continued Next Page

SOUTH CAICOS ISLAND MARINE RESOURCE MANAGEMENT

Program Dates:

September 10 – December 13, 1996
January 31 – May 6, 1997

Departure Point:

South Caicos Island, BVI

**Students will be registered
in four academic courses:**

BI/EE (NS) 373	Tropical Marine Ecology
EE (NS) 374	Principles of Resource Management
EE (SS) 302	Environmental Policy and Socioeconomic Values
EE 491 or 492	Directed Research

Please see pages 38-39 for course descriptions.

Note: If you intend to use SCUBA you must be certified before arrival; divers and snorkelers must bring their own equipment; weights and tanks may be rented on site.

Background

The Turks and Caicos Islands (TCI) is a major exporter of conch and spiny lobster; both are important as sources of local income. South Caicos has been the country's most important port for the fishing industry, the economic mainstay of the area. Potential depletion of the fisheries has become a major concern with impacts on employment and social structure.

Throughout the Caribbean, communities have encouraged the growth of tourism as a means to diversify and strengthen their economies. This has often led to rapid social, economic and ecological change. Tourism and development could become major issues for South Caicos, as they already are on neighboring islands. Rapid development may offer residents short term financial gain while threatening the island's resource base. If the TCI is to escape the detrimental environmental effects of development, similar to those occurring elsewhere in the Caribbean, management plans for conserving marine resources must be initiated without delay.



Photo: Jim Elder

We begin the semester with a study model introducing the problem-oriented case studies approach within the context of local and regional geography, natural and social sciences, and environmental issues. We then spend the remainder of the semester examining three specific case studies and on directed research projects integrating material from our three courses.

Case Study #1:

What are the natural attributes of the TCI, and is there justification for making the Caicos Bank a World Heritage site?

The reefs surrounding the TCI provide excellent habitat for fish and lobster; the shallow banks within them contain an abundance of marine life including conchs and juvenile lobsters. The reefs, beaches and small islands also attract tourists, the greatest source of potential new revenue. The reefs are under assault from many sources - land and sea based pollution, global warming, diver and boat damage, dredging, dumping and construction. Lectures by faculty and visiting speakers and readings on the ecology and life cycles of marine communities will prepare us to conduct resource inventories of the reefs, bank and coastal fringe. During our dives we will survey corals for any signs of damage or disease or changes in abundance or diversity of species. As we develop an understanding of the physical and biological processes in action here, we will focus on developing



Photo: Bob Singer

"The Center was a focal point of the community. Perched atop a cliff, the site was always visible to the town and, more importantly, the town was always visible to us. The view was a constant reminder of our purpose in the program - to give something back to the community of South Caicos."

Diana Van Vorhes, Clinton, CT - University of Connecticut

recommendations for culturally acceptable and scientifically sound measures that can be taken to attract international attention to this ecosystem, and thus help to preserve it.

Case Study #2:

How can a sustainable level of conch, spiny lobster and finfish harvests be maintained in the TCI fishing industry? Can this approach be applied to other Caribbean Islands?

We will examine the past, present and future of the island's primary economic force - the lobster and conch fisheries. Because these fisheries are showing signs of decline, our focus will be on resource sustainability. After conducting stock assessments in the field, we will discuss concepts of sustained yields through natural recruitment and strategies for stock enhancement. Visits to lobster and conch processing plants and meetings with local fisherman and fisheries officials may engender discussions of catch restrictions and fishing controls. We will also consider the fin fishery, currently a less developed subsistence industry, which may increase in influence if tourists demand it and shellfish stocks continue to decline. In order to plan for its possible role in the future of the TCI, we must understand the potential and long and short-term benefits of intensified use of the finfish resources

During lobster season, individual local divers have caught more than 1,000 pounds of lobster in a single day, diving without the use of SCUBA. Developing sustainable fisheries is an immediate concern for this fishing community.

SOUTH CAICOS ISLAND MARINE PARKS MANAGEMENT

Program Dates:

Session I: June 13 - July 12

Session II: July 19 - August 17

Departure Point:

South Caicos Island, BWI

Course Number: EE (NS) 351

Case Study Question: How can the marine and island ecosystem of the Caicos Bank be managed to provide the necessary access for users without compromising its natural attributes?

Field Work Focus

- ◆ Investigating habitat preferences and stock levels of major commercial shellfish species.
- ◆ Determining the health of coral reef systems.
- ◆ Assessing biodiversity in the Caicos Bank ecosystem and comparing it with similar island systems, use patterns and management practices.
- ◆ Evaluating the potential environmental and social impact of planned construction and development.

Course Objectives

The reefs surrounding the TCI provide excellent habitat for fish and lobster; the shallow banks are sources of conch. The reefs also attract tourists, the greatest source of potential new revenue. The reefs are under assault from many sources - land and sea based pollution, global warming, diver and boat damage, dredging, dumping and construction. Once we understand the

threats to the reefs, we will focus on developing recommendations for culturally and economically viable actions that can be taken to minimize impacts of development on them. Faculty lectures on conservation biology, marine ecology, vertebrate and invertebrate zoology, coastal zone management and coral reef function will provide a framework for our field work. Guest lecturers will discuss specific management approaches and economic alternatives, while interviews with local residents and fishermen will provide a further social and economic information for our investigations.

We will catalog resources in the vicinity of South Caicos, and further afield when possible. In the course of our field work, we will become familiar with the use of transects, techniques of population sampling, and statistical analysis. Field projects may be marine or terrestrially based and may involve environmental impact assessment, marine park design, working with local agencies, schools, or fisherman. Because everyone in the water must have a buddy and a staff member present, aquatic research is usually carried out in teams of four students.

Note: *If you intend to use SCUBA you must be certified before arrival; divers and snorkelers must bring their own equipment; weights and tanks may be rented on site.*

around the periphery of the Bank. We will examine the biology and habitat requirements for demersal and pelagic fishes and the potential for increasing harvests. Using computer simulations, we can predict outcomes and yields of various fishing decisions. Catch per unit effort and fishing gear efficiency appraisals, and value-added processing and market studies will be carried out to assess the economic potentials of the fisheries. Our recommendations will consider the social costs and economic costs of different harvest rates and management approaches.

Case Study #3:

Tourism: Economic salvation or environmental disaster?

Tourism is a rapidly expanding sector of the Turks and Caicos economy and much of the hope for future employment depends on its success. We will explore ways, such as developing an underwater nature interpretive trail, in which the parks and preserves can be managed to support tourism while minimizing negative environmental impacts. Hosting a mock tourist development conference with members of the tourist board and local entrepreneurs will enable us to examine the costs and benefits of increasing tourism and to explore ways in which small-scale ecotourism can be designed to involve and benefit the local community.



Photo: Bruce O'Neill

"So many times at my home institution I have been asked to do, but it was hardly my research. I was told to stop what I was doing and go to do it. Our SIS education gives us the freedom to make mistakes and discover on our own. It was exciting to find some decisions on my own and still have my advisor there if I was stuck."

William J. Davish, Doylestown, PA - St. Francis College

CENTER FOR COASTAL STUDIES

CENTER PROGRAMS

Coastal Rainforests and Marine Resources

Semester Program — Page 20

Conserving Marine Resources and Coastal Rainforests

Summer Course — Page 21

Center Objective

To study issues related to the restoration of degraded timberlands, watersheds, and fisheries in order to provide recommendations that may lead to: building a sustainable fisheries system; promoting the conservation of threatened species; creating a sustainable timber industry; and developing a diverse local economy.

Critical Environmental Issues

The future of this area is being hotly debated, from logging camps and the homes of native peoples to the seats of the provincial and national governments. The provincial economy is currently heavily dependent on logging and related industries. As a result, the irreplaceable coastal rainforests here (containing some of the largest and oldest trees in the world) are being cut; over a quarter of the region has already been denuded.

Old logging practices altered the critical flow of water from the coastal watershed to the estuaries and ocean, threatening migrating birds, fish and marine mammals in this unique marine ecosystem. There is a great need for ecological information and management recommendations during this critical period when future rates of logging are determined. If we are to help find new ways to support economic development of this coastal and old growth forest region while preserving its natural and cultural heritage, we must address issues including:

- ◆ How do old growth forest and near shore marine ecosystems interact and how can their diversity and productivity be maintained?
- ◆ What alternative uses of the rainforest and coastal areas might be ecologically and economically viable (e.g. ecotourism, fish hatcheries)?
- ◆ Where do logging, fishing, native peoples' and environmental interests overlap?
- ◆ What areas of Clayoquot and Barkley Sounds should be fully protected as wilderness, partially protected/partially developed and fully developed?

Center Clients/Partners

Current clients and partners include Pacific Rim National Park, the Tla-o-qui-aht, Uchucklesaht and Ohiat Tribes of Nuu-Chah-Nulth First Nations, Port Alberni-Clayoquot Regional District, Ministry of Forests, Long Beach Model Forest, MacMillan and Bloedel Ltd., Canadian Department of Fisheries and Oceans, Northwest Ecosystem Initiatives, Scientific Panel on Sustainable Development, and Community Futures.

Field Director: David Scott Silverberg, Ph.D., Massachusetts Institute of Technology (Earth, Atmospheric and Planetary Sciences).

Resident Faculty: Marian Weber, M.A., University of Alberta (Economics) and University of Toronto (Economic History).

Dennis Morgan, M.S., University of Oregon (Environmental Studies).

Additional adjunct faculty.



Site Description

The ruggedly beautiful west coast of Vancouver Island, British Columbia, is where much of the world's remaining temperate rainforest meets bountiful Pacific waters. The region's coastal rainforests and marine ecosystems are considered to be among the richest and rarest in the world. In one of the few wilderness areas left in North America, much of Vancouver's remaining unlogged coastal watersheds, comprising over a half million acres of timber resources claimed to be worth literally billions of dollars, flow into Barkley and Clayoquot Sounds.



Photo: David Silverberg

Our base at the Bamfield Inn is accessible only by boat. The fireplaced living room offers spectacular views looking out across Bamfield Inlet to the forested islands of the Deer and Broken Groups in Barkley Sound.

For much of the year, the villages where we are based - Bamfield, Tofino and Ucluelet - are home to small communities of both native and non-native people totaling several thousand people. During the summer months however, over a million visitors flock to the area to hike, camp, fish, sea kayak and whalewatch.

Awe-inspiring old growth forests of towering cedar, Sitka spruce and Douglas fir trees offer shelter to countless species of wildlife ranging from small forest mammals to bald eagles to wolves and black bears. The coastal marine zone supports unusually abundant fish and seabird populations as well as marine mammals including killer whales, porpoises and sea lions. The estuaries lying between these ancient forests and the sea support extensive shellfish beds, migrating waterfowl, and vital nursing grounds for fish including one of the world's largest salmon fisheries.

Center for Coastal Studies



Photo: David Silverberg

A sockeye salmon jumps a short distance from our boat in Henderson Lake. SFS students are working with the Uchucklesat First Nation to restore the famous sockeye runs here.



Photo: David Silverberg

Center Facilities

Our Center is based in the Bamfield Inn, overlooking the west shore of Bamfield Inlet and accessible only by boat. Stunning beaches and intertidal zones are a brief hike away. The Inn's main house contains the dining/study/lecture area, kitchen, lounge, library, workshop and discussion rooms and faculty and staff living quarters. An adjacent student residence building contains 2-3 person rooms, each with a bathroom and shower. There is a nearby laundry room as well as faculty offices with a computer/local area network room. We also have access to the laboratory and library facilities at the neighboring Bamfield Marine Station.

Living and Working Conditions

The coastal town of Bamfield offers a few restaurants, several fishing inns, a post office, Coast Guard station, Red Cross medical clinic, and a very small grocery. It lies at the end of a ferry run and a logging road and is bordered by the spectacular Pacific Rim National Park. We buy food locally - the same basics of meat, dairy, fruit and vegetables as we are used to in the U.S., plus fresh fish - and share the cooking and clean-up. Time is set aside for recycling. Center maintenance and community service opportunities such as building trails with a National Park crew, giving presentations at local high schools, or meeting with conservation groups.

This region boasts literally the mildest climate in Canada and has two major seasons: a wetter season from November

through March, and a drier season from April through October. Temperatures range from an average of 40° F in January to the low 70's in the summer. It rarely snows on the coast but, this is a rainforest, with over 120 inches of rain per year! Sunny spring and summer days will find us in tee-shirts but sturdy foul weather gear is also a must year-round.

Weather and tides often drive our lecture and field work schedule. Weekly schedules vary from the beginning of the program to the end. After several days of orientation, we will average 15 lectures a week plus other weekly meetings (*organizational, research/paper presentations, guest lectures*) in the first half of the program. Later in the program, more time is allocated for Directed Research projects with groups of 2 to 7 students and a staff member travelling to a research site to collect data. Additional meetings offer training in the skills (*statistics, paper writing formats, computer spreadsheets and laboratory analysis*) needed to complete the research.

Getting around in the dense virgin and secondary forests can be difficult. Curtains of ferns filter the few rays of sunlight that penetrate the evergreen canopy; moss carpets massive rocks and trees while countless species of wildlife find shelter in the jumble of ferns and bushes. Small and large boats will facilitate our water-based research activities along the rocky coasts and sandy beaches littered with driftwood.

Continued Next Page

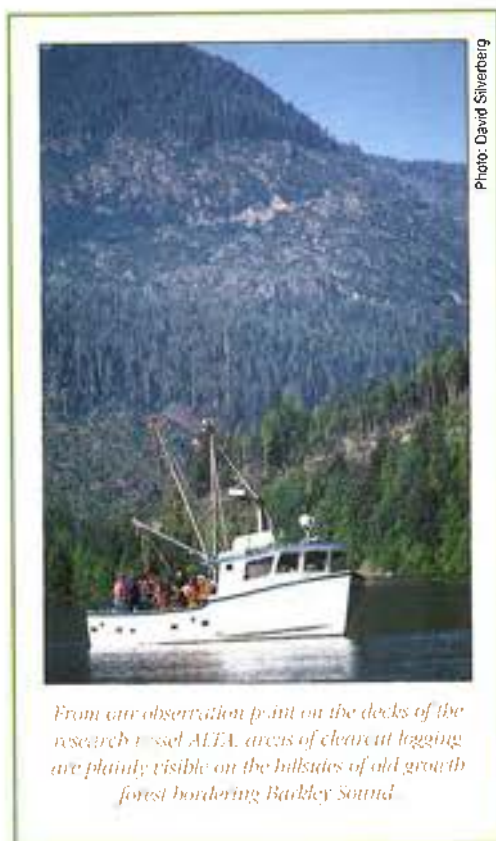


Photo: David Silverberg

From our observation point on the decks of the research vessel ALTA, areas of clearcut logging are plainly visible on the hillsides of old growth forest bordering Barkley Sound.

VANCOUVER ISLAND

COASTAL RAINFORESTS
AND MARINE RESOURCES

Program Dates:

September 4 – December 7, 1996

January 31 – May 6, 1997

Departure Point:

Vancouver Island, British Columbia

Students will be registered
in four academic courses:

BI/EE (NS) 379	Coastal Ecology
EE (NS) 374	Principles of Resource Management
EE (SS) 303	Economic and Ethical Issues in Sustainable Development
EE 491 or 492	Directed Research

Please see pages 38-39 for course descriptions.

Introduction

Coasts have provided a wealth of resources for humankind for thousands of years; it's no accident that a majority of great civilizations and cities have been established in coastal regions. The Clayoquot and Barkley Sound regions provide perfect laboratories for exploring the relationship between ecosystems and the economy. The coastal and rainforest systems here support fish, shellfish, marine mammals, shorebirds, agriculture, aquaculture, forestry, tourism, recreation and transportation.

Excessive logging threatens both the quality and quantity of fresh water flow and some recent studies have found extensive damage to salmon spawning streams from clearcutting. As fish catches diminish and the future of logging is debated, the region's small communities are struggling with potential changes in their way of life. While immediate job loss is of deep concern, destruction of the productive capacities of the ecosystems upon which their livelihood depends is also a threat. Over the past ten years, controversial land-use decisions for this area have further polarized not only the communities of Clayoquot and Barkley Sounds, but people across Canada and around the world.

We begin the semester with two weeks of orientation and preliminary lectures plus a week-long introduction to research techniques, statistics and scientific writing before moving into the three case studies and directed research projects.



Photo: David Silverberg

Case Study #1:

Can ecosystem management of forests maintain a healthy ecosystem as well as support the local, regional, national, and international logging economy?

"Ecosystem planning or management", incorporating issues of sustainability, landscape ecology, temporal and spatial scale, biodiversity, uncertainty and adaptive management, conflict resolution, and institutional change, is gaining favor as a guide for natural resource use. Traditional approaches to resource management have not led to sustainable resource use because they often fail to nurture the ecosystems and biodiversity or provide economic gain. We will explore the timber industry, examining the ecological, social, and economic issues involved in ecosystem planning on Vancouver Island, analyzing land-use decisions and generating alternative plans for ecosystem protection and sustainable resource use. Research may include mapping ecosystems, surveying and comparing forest structure and biota, documenting land-use approaches used by First Nations, analyzing alternative land use options, and assessing the economic and ecological potential for harvesting forest resources other than trees.



Photo: Linda Nichol

"During a recent plankton tow, our vessel was surrounded by 14 orcas! It's hard to believe there's no marine mammal management plan in an area abounding with whale-seeing ecotourists."

David Silverberg, Director,
SPS Center for Coastal Studies

Lessons learned working with a leading developed country as it attempts to solve these economic and environmental conflicts can be applied to situations you may encounter in a future career as an environmental professional in the U.S. or used as a model in developing countries facing similar challenges.

Case Study #2:

How can the coastal watershed be managed to support a healthy marine ecosystem as well as viable fisheries?

The near-shore areas of Clayoquot and Barkley Sounds support important shellfish fisheries and serve as a nursery ground for fish that spend their adult lives in the ocean. There is concern that the salmon and shellfish fisheries here are declining. Restoration of healthy fisheries involves marine and watershed habitat protection and enhancement, as well as changes in harvest pressure. The international dilemma of managing a common fisheries resource will be explored in depth. Working on the docks or from boats, we will focus on the physical, chemical, and biological characteristics of stream and near-shore habitats, and potential impacts of watershed logging practices on salmon and shellfish populations. Potential projects include comparisons of plankton abundance across space and time, surveys of harvesters' attitudes toward management, and analysis of ways that individual harvesters can economically diversify and ride out fluctuations in catch quotas. Because research on the water is dependent on weather conditions, we will also provide shore-based sociological and economic projects related to fisheries.



Meeting with families of the Sam-Chab-Suth First Nations at a community picnic.



Photo: David Silverberg

Case Study #3:

What are the Social and Economic Opportunities Implied by the Clayoquot Sound Scientific Panel Report?

The recommendations of the Scientific Panel Report have been endorsed by the provincial government, forestry companies, and some key environmental groups but will not be implemented without interpretation and consensus building among stakeholder groups in the Clayoquot and Barkley Sounds regions. Forest communities and decision making bodies throughout the country will be observing these processes to assess the feasibility of adopting ecologically driven management strategies in other regions. Key factors include political consensus among affected groups, ecosystem impacts of the recommendations, and impacts on community stability and employment. These socio-economic changes must be contrasted with the longterm benefits of a forest managed solely for timber. Working with local partners such as the First Nations, forest-based employees, and environmentalists, we will develop opportunities for community renewal. Students will identify and measure the community's assets and help generate project ideas (e.g. aquaculture, ecotourism) to develop these assets in an ecologically sensitive manner.

VANCOUVER ISLAND CONSERVING MARINE RESOURCES AND COASTAL RAINFORESTS

Course Dates:

Session I: June 13 - July 12

Session II: July 19 - August 17

Departure Point:

Vancouver Island, British Columbia

Course Number: EE (NS) 353

Case Study Question:

How can the coastal watershed be managed to support a healthy marine ecosystem as well as viable fisheries?

Field Work Focus

- ◆ Identifying and analyzing alternatives to current unsustainable land-use practices.
- ◆ Evaluating reforestation methods for stabilizing soils and restoring wildlife habitat.
- ◆ Investigating watershed and forest management options that preserve key marine resources.
- ◆ Examining the economic and ethical considerations regarding land-use alternatives.

Course Objectives

Research has indicated that logging can have detrimental effects on streams, impacting the spawning of adult fish and the rearing of juvenile fish. In addition, near-shore marine habitats, important for salmon and shellfish, can also be impacted by logging in watershed forests

because the health of these habitats is influenced by the quantity and quality of the water and materials delivered by the streams. There is concern that the salmon and shellfish fisheries of Clayoquot and Barkley Sounds are on a downward trend and groups, including the First Nations, are calling for studies on alternatives to current harvesting methods.

We will focus on stream and near-shore habitats, and analyze potential impacts of logging practices on salmon and shellfish populations. Lectures will introduce stream ecology, biotic integrity, nutrient cycles and energy flow and coastal zone management in preparation for our field work. Directed projects may focus on the ecological functions of coarse, woody debris in near-shore habitats; comparisons of stream characteristics and biota in old-growth, second-growth, and recently cut stands; stream restoration methods; costs of restoration vs. the costs of conservation; and an economic and ecological analysis of alternative logging methods. Assessments of salmon and shellfish abundance and plankton density would contribute to a long-term data base on stock and productivity trends. Research may be conducted from docks where catches are brought in or from power boats. Our efforts are intended to support the creation of a resource management plan that encourages sustainable economic development while preserving natural resources.

Note: We will be camping, away from the Center, throughout most of the summer program.



Photo: David Silverberg

The coastal rainforests here contain some of the oldest and largest trees in the world. A single old growth cedar tree, 300 feet tall and 18 feet in diameter can bring \$20,000 at the lumberyard.

CENTER FOR WETLANDS STUDIES

CENTER PROGRAMS

Wetlands Management: Preserving an Ecosystem, an Economy, and a Community

Semester Course—Page 24

Summer Courses will be offered in 1997

Center Objective

To assist local residents and scientists in understanding the critical impacts of exploiting the unique coastal wetland ecosystems in Baja California Sur and to develop environmentally sound, culturally sensitive and economically feasible recommendations for sustainable resource management and employment alternatives for resource dependent local communities.

Critical Environmental Issues

Conservation organizations have identified Magdalena Bay as one of the most important coastal habitats to protect in Mexico, and for good reason. Over half the world's fish catch is wetland dependent; wetlands are second only to rainforests in primary productivity. More than 90% of California's wetlands have been lost to development, highway construction, pollution and agriculture. Now the same forces threaten Mexico's Pacific coast. Mexican and U.S. natural resource managers agree, we cannot afford to lose the habitat provided by the Bay - it is the last of its kind.

The planktonic productivity of Magdalena Bay is unrivaled. For centuries the Bay has supported some of the world's most productive fisheries. Today, many economically important fish, shellfish and crustacean fisheries are near collapse, their stocks depleted. As related industries are impacted, causing a local financial crisis, the illegal harvesting of sea turtles and shellfish is escalating.

Resort developers, intrigued by the region's sheer physical beauty, unusual natural resources including gray whale and sea lion populations and over 100 species of birds, and easy accessibility from major U.S. and Latin American cities, have been buying coastal property. Large-scale aquaculture and ecotourism initiatives have also been proposed as economic alternatives for the area. The resulting coastline development, harbor dredging, highway and building construction, power plants, and human population growth will eliminate critical habitats and impact water quality.

The residents of Puerto San Carlos are economically dependent on the marine resources of the Bay. They have requested assistance in better understanding how they can sustainability utilize their natural resources and diversify the local economy. To assist them and help conserve one of North America's most important wetlands, we will address the following questions:

- ◆ How can local residents' needs to exploit marine resources be reconciled with the ecological limits of the Bay?
- ◆ How can a community-based model of development ensure ecological and social sustainability?
- ◆ What economic alternatives (e.g. *ecotourism, aquaculture*) can be developed that will reduce pressure on the area's overexploited fisheries?
- ◆ What is the status of threatened sea turtles, marine mammals and seabirds in the Bay?

Center Clients/Partners

The Center is sponsored in Mexico by the Universidad Autonoma de Baja California Sur, which offers local assistance and cooperation in the operation of Center programs. Our research is planned to dovetail with the needs of local scientists and management agencies as well local, state and federal government agencies and several Mexican and international conservation groups.

As this catalogue goes to press, we are in the process of hiring faculty for this new Center. Robert McCready, M.M.A., University of Washington (Marine Affairs) is directing the Center's development.



Site Description

The peninsula of Baja California, 800 miles long and, at its narrowest, only 26 miles wide - separates the Sea of Cortez from the Pacific Ocean. Located 700 miles south of the U.S. border, Magdalena Bay runs for approximately 200 miles along the peninsula's west coast, protected from the open waters of the Pacific by five barrier islands.

The Bay marks the transition zone between warm equatorial and cooler northern waters that combine to nurture a level of biodiversity and productivity matched by few other marine ecosystems in the world. At varying times of the year, several species of sea turtles, gray whales, bottlenose dolphins, an incredible



Photo: © Sergio Dardina

Magdalena Bay has the highest rate of sea turtle piracy on the Baja Peninsula and poaching is increasing with rising unemployment. All five species of endangered or threatened turtles found in the Bay face local extinction unless poaching abates. Despite the precipitous decline in their numbers, virtually no research has been conducted to date on the sea turtles here.

array of migratory and resident birds including pelicans, eagles, and herons as well as white ibis and brant can all be found here.

Economically important populations of sardines, lobster, scallops, shrimp, abalone, grouper and halibut support an internationally based fishery. On-shore, mangrove-filled lagoons give way to white sand beaches back-dropped by a colorful, cacti-strewn desert. Spectacular sunsets drape the hills and dunes of the off-shore islands in orange, purple and aqua shadows.

Center for Wetlands Studies

As part of our community development focus, we will offer environmental education programs in the local schools.

Photo: Bob McCready



Photo: Bob McCready



A major international development company has recently been purchasing large sections of coastline with the goal of constructing a 118 square mile resort with as many as eight development clusters, an international airport, and golf courses such as this one, spread throughout the Bay.

Magdalena Bay is a mangrove kingdom; although legally protected, white mangroves are being poached for firewood and fenceposts.

Center Facilities

Our Center is located in a small hotel in Puerto San Carlos, a 5,000 person fishing town situated on a small peninsula in the middle of the Bay. Two students share a room and bath. A computer room/library, classroom, kitchen, student lounge and study rooms and a laundry facility are also located in the two story hotel. We will eat our meals in the outdoor courtyard which is filled with flowers and shaded by palm trees.

Faculty live in nearby buildings. Our boats are a short walk away.

Living and Working Conditions

The town is bordered on the north and south by extensive mangrove channels, the desert of the Santo Domingo Valley lies to the east. Across the bay, the hills and dunes of Isla Magdalena are silhouetted against the western horizon. Local services include two clinics, a post office, small stores, restaurants, several elementary schools and two high schools and three fish canneries.

Dirt streets are lined with colorful plywood and cement houses surrounded by gardens filled with old boats, fishing nets and ornamental plants. The people who live here relate to their landscape, life, families and work in a way that has been all but lost in the United States - this is the real charm of Puerto San Carlos. Our central location in the town is ideally suited to the community-focused orientation of our program and ensures that we will have the opportunity to become integrated into the local community. The ability to converse in Spanish, even at a basic level, is welcomed and appreciated by the residents.

During a typical day we will rise early and alternate morning lectures with afternoon field work and data collection. Because this program is oriented toward helping the community conserve its natural resources and develop sustainably, we will spend a significant amount of our time

working with local fishing cooperatives, offering environmental education programs in the local schools, and designing and implementing community service projects.

Temperatures here are quite warm from July through September; the coolest months are April and May when a warm jacket is needed in the evening. Because most of our travel to field work sites will be in small skiffs known as pangas, and conditions can get quite choppy with the ever-present breeze, foul-weather rain gear is a necessity.

Center life will stress the concept of community and all students will be expected to do their share of site maintenance and clean-up. We will share cooking duties with a local cook, relying on the typical Mexican fare of beans, rice, fish, meat, poultry and vegetables.

Continued Next Page

Photo: Don Croll



"To have this beautiful marine world coupled with the desert sand, climate and landscape was absolutely amazing! Discovering a sweet-smelling plant that grows on a rocky desert cliff while sauntering through a hot, sunny research hike is guaranteed to put a smile on your face. That is, provided the spectacular view of ocean and desert hadn't already accomplished that."

Tom M. Schlosser, Jr. Old City, PA - Davidson College

Photo: Bob McCready



MAGDALENA BAY, MEXICO
WETLANDS MANAGEMENT: PRESERVING AN
ECOSYSTEM, AN ECONOMY, AND A COMMUNITY

Program Dates:
September 10 – December 13, 1996
January 31 – May 6, 1997

Departure Point:
La Paz, Baja California Sur, Mexico

**Students will be registered
in four academic courses:**

BI/EE (NS) 379	Coastal Ecology
EE (NS) 374	Principles of Resource Management
EE (SS) 303	Economic and Ethical Issues in Sustainable Development
EE 491 or 492	Directed Research

Please see pages 38-39 for course descriptions.

Introduction

Magdalena Bay has been called the Chesapeake Bay of the Pacific. Unusually productive waters here have given rise to an unparalleled diversity of plants, animals and marine life. The waters and shore of the Bay have been subject to intensive exploitation by foreign companies and local residents alike for the last 150 years. While most residents still depend on these marine resources for their livelihood, over-fishing has led to the collapse of economically important fisheries and the subsequent closing of several area canneries. The added pressure of a national economic recession has led to an increase in the illegal harvest of sea turtles and shellfish, further depleting the marine resource base. Alternatives such as resort development and large aquaculture operations may offer near term economic gain but for whom, for how long and at what eventual cost to the marine resource base and social sustainability of the local community?

We begin the semester with two weeks of orientation and Spanish-language lessons, and introductory lectures on the history, socio-economics, culture and resource-use patterns of Mexico and Magdalena Bay, before moving into the three case studies and directed research projects.



Photo © Sergio Dardina

Case Study #1:

Can a community-focused conservation and economic development model help the communities of Magdalena Bay protect their natural resources and meet the goals of sustainable development?

Much has been written about the need for Third World countries to find avenues of economic growth that are not based on the further degradation of the environment. Unfortunately, in communities dependent on natural resources like those in Magdalena Bay, the most common method for economic growth has been to increase exploitation of their already over-tapped resource base. This is clearly not supportable in the long run. A possible, more viable, option is for the communities of Magdalena Bay to explore alternative employment opportunities that are not reliant on the bay's scarce marine resources. Our goal will be to work with local residents and conduct research and create programs that facilitate this conversion. Specifically, we will develop and implement environmental education programs for local schools emphasizing the importance of preserving their vanishing sea turtle populations; we will conduct research with a goal of providing more employment opportunities for local women; and we will teach English to fishermen as part of training them to be eco-tour guides no longer reliant on fishing. Our partners will include the local schools, the Mexican government, and Mexican and international NGO's.



Photo: Steve Swartz

A growing ecotourism industry based on whale watching may cause the gray whale population to stop using the Bay as a winter calving and breeding grounds. In 1992, approximately 1,000 tourists came here to whale watch. In 1995, the number of whale watchers increased to 25,000.

Little research has been conducted on small scale fisheries in Magdalena Bay. SCS can provide a much needed contribution to the management of this declining but extremely important sector of the local economy.

Case Study #2:

What alternative management strategies will provide for the sustainable use of Magdalena Bay's marine resources?

Despite the critical importance of fisheries (shellfish, crustaceans, and fish) to the local economy, very little research has been conducted on fisheries management in the bay. This is especially true of the small-scale fishing sector that continues to be one of the most important sources of income and employment for the region. Our goal is to identify alternative management strategies for the fisheries of Magdalena Bay. This will include the collection of catch data to estimate population size and distribution. We will focus on large-scale fisheries such as shrimp, tuna and sardines, as well as smaller-scale fisheries such as grouper, halibut, lobster, scallops, oysters and abalone. We will interview fishers and accompany them fishing, explore changes in fishing technology, assess the effectiveness of fishing cooperatives as a management mechanism, and try to ascertain the traditional or informal management approaches that have evolved here. We will also analyze the viability of eco-tourism and aquaculture as alternative sources of employment for fishers.



Bottlenose dolphins are common sights in the Bay. "Participating in research which could help preserve this fragile ecosystem made me remember why I was majoring in biology and environmental studies. It is easy to lose sight of your goals when the textbook is your teacher and not the world around you. Working on my project made all the concepts and issues I've been studying for years more tangible."

Rachel Cohen, Newtonville, MA - Oberlin College



Photo: Don Croll



Photo: Bob McCreary

"We were fortunate to meet many local fishermen who taught us about their livelihood, traditions and culture. Talking with them forced almost everyone to improve their Spanish language skills."

Katherine Bossin, Redding, CT - Lynchburg College

Case Study #3:

Can the development of a comprehensive Integrated Coastal Zone Management plan help prevent the over-exploitation of Magdalena Bay's ecologically critical and economically important marine and coastal resources?

Historically, resources have been managed individually. For instance, if resource managers are interested in managing the harvest of scallops, they set catch limits and establish seasons when fishing could occur. This unfortunately does not take into consideration the impact on the scallop population from pollution from the nearby electric power plant, the effluent dumped into the bay by canneries, or the sewage outfalls of local residents. To avoid these kinds of problems, many have argued for comprehensive resource management models that integrate the activities of many groups of resource users. In Magdalena Bay, this would include a management strategy that takes into consideration the fisheries, gray whale tourism, resort and marina development, aquaculture, port and shipping, sewage disposal, and

agriculture. Our goal will be to conduct the research necessary to create and implement an integrated coastal zone management (ICZM) plan for the region as well as design processes for the continuous monitoring and evaluation of the plan. This will include defining coastal problems; collecting baseline data on the status of turtle, fish, bird, and marine mammal populations; generating statistics on the demographics of resource users of the bay; and collecting information on existing management agencies to produce a management plan for the largest Pacific wetland in Mexico.

Note: Applicants must have completed at least one semester of Spanish prior to the start of this program.



Photo: © Serge Dedina

"The Bay is a bird lovers paradise and, as one of the most important habitats on the Pacific flyway, is home to at least 100 species of birds. As the largest remaining intact Pacific wetland, this habitat is critical to both resident species and migrating birds flying north and south."

A summer course will be offered at this Center beginning in 1997. Please contact the Admissions Office for further details on this program.

THE SCHOOL FOR FIELD STUDIES
REPUBLIC OF PALAU

**CENTER FOR
ISLAND MANAGEMENT STUDIES**

C E N T E R P R O G R A M S

Island Management Studies

Semester Program — Page 28

Management of Tropical Island Resources

Summer Course — Page 29

Center Objective

To study issues related to managing impacts of economic development on the terrestrial and marine environments of a small island nation to help ensure the equitable distribution of economic benefits to Palauans while conserving natural resources for the use of future generations.

Critical Environmental Issues

The possible negative ecological effects of development are magnified in island communities because of limited availability of resources (*food, water, forests and fuel*) and options for waste disposal. The introduction of outside resources (*finances, labor, introduced species and technologies*) has economic, social, political and ecological implications. Studying the unique aspects of islands not only enables us to contribute to their preservation, appreciating their differences helps us understand mainland environmental issues as well.

Palauans view the imminent development facing their newly independent nation with hope and fear as they look to neighboring islands and see development run amok – dominated by foreign interests which have degraded the environment, brought in foreign workers, and left only menial tasks to the original residents. Our role in this process will be to support the planning efforts of the Palauan people by answering the following:

- ◆ What are the unique natural resources, both terrestrial and marine?
- ◆ What are the likely environmental and social impacts of development and how can they be optimized?
- ◆ Which technologies for electricity, water, sewerage, and transportation are most appropriate for this isolated area?
- ◆ In addition to tourism, what resources such as fishing, agriculture, crafts, and light industry can be sustainably developed?

Center Clients/Partners

The government of Ngaraard State has offered to help SFS develop a site in exchange for our professional cooperation in the planning process. We will work with the 16-member State Planning Commission as well as the national marine resources, forestry and agricultural agencies. Local fishermen/women and farmers are additional clients for our work.

Field Director: Bruce White, Ph.D., Union Graduate School (*International Development*) and Lisa M. White, B.S., University of California at Berkeley (*Business Administration*)

Resident Faculty: Ann Kittalong, M.S. University of Hawaii (*Zoology*)
Additional faculty to be announced.



Site Description

The island nation of Palau lies at the western edge of the Micronesian archipelago in the far western Pacific; Guam is 700 miles to the north and the Philippines about 500 miles to the west. The Republic of Palau consists of 300 islands stretching over 400 miles, but only eight are inhabited.

The sixteen States of Palau are based on ancient tribal territories and led by Tribal Chiefs. The nation's capital is Koror, connected to the island of Babeldaob and the international airport by a bridge. Babeldaob, the largest island, is densely covered by



The small village of Ulimang is home to about 25 families and our Center. We share classroom space in a local school in the village; student cabins are near the beach, a short walk away.

Photo: Kathy Abbott

Center for Island Management Studies



Photo: Joel Miles

Palauan waters are home to over 1,400 species of fish, more than 625 species of corals and anemones, and 7 of the 8 known giant clam species. Issues affecting marine resource management here include changes in fishing methods and technology and increasing demand for fish for internal use and export.

Photo: Lynne Meteparel



SFS students outside of a Palauan bai (a traditional meeting house).

"The day we left Ulimang, we shed many tears. Watching the school children half singing and half crying, as we motored away, I think we all realized the emotional attachment we had developed to them, the country and each other."

Nancy Stoner, Troy, NY - LeMoyne College



Photo: Lynne Meteparel

lush tropical forests in the uplands, with mangroves, beaches, and isolated hamlets along the coasts. There are few roads and no systems of electricity or telephones linking these hamlets, so communication is intermittent and largely by small boat.

The natural resources here are nothing short of spectacular. Verdant forests provide a haven for colorful native birds, wildlife, and endemic plant species. An offshore reef harboring more than 625 species of coral and over 1,400 species of fish offers protection from ocean tides, leaving a turquoise lagoon that rings the entire island. These clear, shallow waters afford opportunities for subsistence fishing and spectacular snorkeling. Estuarine crocodiles and dugong are rarely seen, but sea turtles can be spotted regularly.

Center Facilities

Our Center is located in the small village of Ulimang, along the east coast of Ngaraard State on the island of Babeldaob. This site has the greatest expanse of beaches in the country and spectacular hillside vistas. The road which will link all the States of Babeldaob is planned to go through Ulimang, bringing many changes in the next few years. Students live in cabins, each housing 8 students. Composting toilet facilities are in a building a short walk away. Classes are held in local school buildings which also house the library and cafeteria.

Living and Working Conditions

Our lecture and field work schedules will often be driven by weather and tides. Activities include long walks to work on resource inventories, near shore swims to study the fringing reefs, and interviews with local residents and officials. Most Palauans speak English, which is taught in the schools, and many residents speak Japanese. Students will be instructed in a few conversational phrases in Belauan, the local language.

Our presence in this small village of 25 families will hardly go unnoticed and we will have many opportunities to interact with the local community. The village has about 30 homes, an elementary and a girl's high school, a church, and a bai (meeting house). The one small store is stocked with canned goods. Local people fish or work for the schools or government; many women tend taro patches. Generators provide electricity every evening. As the government has one emergency telephone via microwave link to Koror and there is no

radio reception, we will need to be quite self-reliant as a group.

Our meals are eaten in a cafeteria, staffed by a local cook. We will eat Palauan whenever possible which includes fresh fish with taro, rice and local vegetables and fruits. These meals are supplemented with canned goods from the U.S. on occasion.

The climate here is truly tropical as the heat is moderated by the 80°F ocean. Daytime temperatures range from 80° to 90°F and cool slightly at night. Annual rainfall is about 150 inches, falling mostly in heavy showers at night, but sometimes lasting for a couple of days at a time, and humidity is always high. A steady breeze usually blows onto the beach, keeping the near-shore sites like ours relatively cool.

Continued Next Page

P A L A U

ISLAND MANAGEMENT STUDIES

Program Dates:

September 10 – December 13, 1996
January 31 – May 6, 1997

Departure Point:

Koror, Palau

Students will be registered in four academic courses:

EE (NS)	377	Tropical Ecology and Sustainable Development
EE (NS)	374	Principles of Resource Management
EE (SS)	302	Environmental Policy and Socioeconomic Values
EE 491 or 492		Directed Research

Please see pages 38-39 for course descriptions.

Introduction

Palau became an independent republic on October 1, 1994. Under the terms of a Compact of Free Association, the U.S. is obligated to support the development of infrastructure – roads, power, water, plumbing, and communications – which will leave the new nation capable of creating a self-sufficient economy. Since the Japanese left here nearly 50 years ago, the 14,000 Palauans have lived in a welfare economy administered by the U.S.

Palau's President has mandated that economic development be based on a three-part foundation: tourism, agriculture, and marine resources. He has made it clear that economic success requires a clean environment, carefully managed for long term sustainability. Our goal is to let Palauans make their own choices while providing them with the information they need to preserve the natural riches of the islands and surrounding waters.

We begin the semester with two weeks of orientation and preliminary lectures plus a week-long introduction to research techniques, statistics and scientific writing, before moving into the three case studies and directed research projects.



Photo: Lynne Meyerparel

Case Study #1:**How can the marine resources of Ngaraard State be managed in a sustainable manner?**

Potentially useful marine resources include the fin fish and shellfish fisheries, marinas, boat building and repair. Palauan society has a very powerful conservation and management ethic, particularly with regard to marine resources. Effective resource management practices, developed over thousands of years, now need to be documented and, in many cases, adapted to changes in economic conditions. We will assess the current status of various marine resources, investigate current utilization patterns, and evaluate options for managing these resources to strengthen the economy. Areas we will address include changes in fishing methods and technology; increasing demand for fish (both internally and for export); important species such as giant clams and trochus; mariculture/aquaculture; tension between tourists and fishermen; and gender roles in marine resource management. We will work closely with the state government, the national marine resources agency, non-governmental organizations, and local fishermen/women to develop plans for sustainable management of marine resources.

"We were surrounded by turquoise water, patch coral reefs, mangrove forests and white sand and I immediately felt the peacefulness of this place. Living in a tiny island nation brought many more environmental issues to my attention than I had recognized in the States. Much of the country remains pristine so that duty impacts are magnified."

Kelly Grace, Fredericksburg, VA – University of Virginia

Case Study #2:**How can farmers in Ngaraard State increase productivity and profitability in harmony with the environment and society?**

A growing population and increasing tourism are resulting in an increased domestic demand for agricultural products, especially flowers, fruits, and vegetables. There are also potential export markets in Guam, Saipan, and Japan, but work is needed to develop and supply them. Taro is the most important crop in Palau; women's lives have revolved around the production of taro in wetlands which is very labor-intensive and is no longer sufficiently remunerative. Using the Rapid Rural Assessment method, students will work as interdisciplinary teams assessing all aspects of the farm system. Concepts we will apply include importation of food; import substitution; evaluation of soil and other resources; current farming practices and alternatives; agroforestry; integrated pest management; water pollution; profitability; and labor inputs.



Photo: Joel Miles



P A L A U

As there is no system of roads linking villages, much of our travel and field work will be undertaken in small boats and our daily schedules will often be driven by weather and tides.

MANAGEMENT OF TROPICAL ISLAND RESOURCES

Case Study #3:

Is tourism, in comparison with other options, a viable alternative for the economic development of Ngaraard State?

Tourism has great potential for producing income and sources of employment for Palauans yet large numbers of tourists could have negative impacts on the terrestrial and marine environments. The government has expressed interest in ecotourism as an alternative to the mass tourism which has heavily impacted the societies and environments of other Pacific islands. There is no evidence, however, that ecotourism can make the anticipated economic contributions, nor is there clear information on the impacts even small-scale tourism can have on small villages such as the one where we are based.

Other issues include the effects of tourism on society including the introduction of foreign labor into a small community. More information is also needed on other development options such as small industries, agriculture, and fisheries.

Note: Palau is renowned for its reefs, which we will explore from shore with snorkeling gear. We will not SCUBA dive. Interested and qualified students may wish to set aside time and money and consider diving with commercial dive operators during the four-day mid-term break or at the end of the semester.



Despite the apparent tranquility of our tropical island setting, a sense of urgency permeates our first semesters here as decisions made in the next few years will irrevocably impact this unique developing island nation.

Photo: Lynn Meyerpal

Program Dates:

Session I: June 13 - July 12

Session II: July 19 - August 17

Departure Point:

Koror, Palau

Course Number:

EE (NS) 354

Management of Tropical
Island Resources

Case Study Question:

How can farmers in Ngaraard State increase productivity and profitability in harmony with the environment and society?

Field Work Focus

We will begin by asking our hosts to assess their information needs; we are likely to assume such tasks as:

- ♦ Determining which watersheds must be preserved to assure sustainable agricultural development, clean water, and control of sedimentation.
- ♦ Evaluating where roads should be routed to minimize impacts.
- ♦ Identifying special resources, including nesting sites, endangered species, and historic cultural sites.
- ♦ Assessing which crops are best suited for harvest.

Course Objectives

Agriculture is the third, and most neglected, of the three components of Palau's economy identified for emphasis by the national government. A growing population and increasing tourism are resulting in an increased domestic demand for agricultural products, especially flowers, fruits, and vegetables. Three-fourths of Palau's land mass is forested, and development plans call for it to remain as forest for protection of watersheds. Much of the remaining land is suitable for agricultural production, but with many constraints due to steep slopes, low fertility, and other factors. Traditional agricultural practices are very ecologically sound, the same land has been productively farmed for centuries. However, traditional farm production is very labor-intensive and Palau's small labor force, along with the attraction of higher income employment alternatives, have led to a decline in agricultural production.

Lectures introducing the natural history and culture of Palau, principles of resource economics, symbiosis, competition and nutrient and energy flow in tropical ecosystems provide a background for our field work. We will investigate traditional and alternative land-use practices, integrated pest management systems, agroforestry options and the impacts of resource use patterns on the coastal ecosystem. Interdisciplinary teams will utilize several land-use classification systems and procedures to assess impacts on resources. Using our own demonstration plots, we will work with villagers to develop management plans based on ecological and economic principles and cultural needs.

COSTA RICA

CENTER FOR
SUSTAINABLE DEVELOPMENT STUDIES

CENTER PROGRAMS

Studies in Sustainable Development

Semester Program — Page 32

Alternative Strategies for
Preserving Tropical Ecosystems

Summer Course — Page 33

Site Description

Two of Costa Rica's four borders are beaches; the Pacific lies to the west and the warmer, calmer Caribbean to the east. Similar in size to West Virginia, the country seems to tilt toward the Pacific; the sloping, hilly emerald terrain is sharply cut by swift rivers. More than half the population lives in the Central Valley, home to both the capital, San Jose, and Atenas, the 17,000-person county where our center is located.

Center Objective

To develop sustainable management models for Costa Rica's abundant but threatened natural resources using small communities as the operational unit and honoring the social, cultural and economic development needs of local residents.

Critical Environmental Issues

Costa Rica faces the challenge of protecting endangered ecosystems which are both environmentally and economically valuable without the option of placing additional land under federal protection; most of the land that can be preserved legally, more than one-fourth of the entire country, already has been so designated. Yet the need for productive agricultural land is escalating, and unsustainable practices outside of conservation areas threaten their longterm survival. Both traditional and alternative land-use options pose potential natural resource deterioration including water quality, soil erosion and pesticide build-up. To identify sustainable development options for the local community, we must answer such questions as:

- ♦ Can we use nature as a model for the design of new tropical agroecosystems?
- ♦ How can people and forests interact more effectively?
- ♦ What are the sociopolitical and economic factors affecting agricultural practices in Costa Rica?
- ♦ Is ecotourism a sustainable option for communities?
- ♦ What is the role of grassroots entrepreneurship in sustainable development?

Center Clients/Partners

A number of private organizations and government agencies look forward to sharing our research results, from Costa Rica's National Park Service and its central tourist authority to the Costa Rican Institute for Electricity to privately held preserves, the Forest Service, and the small cooperatives organized by farmers.

Field Director: Liana Babbar, Ph.D., University of Michigan (*Natural Resources*).

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

Jose Luiz Diaz, M.A., Vanderbilt University (*Economic Development and Social Planning*).

Lisa Bradshaw, Ph.D., University of California at Davis (*Ecology*).

The SFS Center for Sustainable Development Studies is the result of a cooperative effort between 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.



Photo: Liana Babbar

"When we first arrived, I bombard[ed] my professors with questions such as 'Should we burn coffee and bananas to save tropical ecology of low forest or maize to support sustainable agriculture?' One faculty simply smirked and said 'I should try to answer these questions for myself over the next three months.'"

Fred Werner, Chevy Chase, MD — University of Michigan

Costa Rica's natural resources have made it a prime destination for ecotourists and with good reason. Its cloud forests, rainforests and mountain plains shelter more than 6,000 plant species (including more than 1,000 orchid varieties). Costa Rica's butterflies are so famous that "butterfly ranching" has emerged as an economic sector; over 500 species are found here. More than 800 bird species — quetzals, toucans, hummingbirds, scarlet macaws — are found in the wet and dry forests. And the magnificent beaches are among the world's largest-known nesting grounds for sea turtles.

Center for Sustainable Development Studies

Photo: Meghan Kelley



Farms producing mangoes, oranges, lemons, avocados and papayas lie on all sides below our small farm on the crest of a hill above Costa Rica's Rio Grande. Not far away, four rivers run to meet it; significant patches of forest lie along their banks.

Local farmers, many working properties from 1-10 hectares in size, also grow vegetables, coffee, and sugar cane, and raise cattle. In the past five years, their concern for the future of their area has led them to replant more than 100 hectares with trees, and to organize into groups whose goal is ecosystem restoration.

"We had many opportunities to interact with the local community from daily encounters to a community clean-up to giving a lecture at the local school...the friendliness of the local people went well beyond anything I've been used to and we were always welcome to take part in any community activities."

Marcela Kostihova, Czech Republic • North Central College

Photo: Chris Vaughan



SFS students plant seedlings with the help of local children as part of efforts to stem erosion.

Our Center in the small town of Barrio Los Angeles, lies in the heart of Costa Rica's fertile Central Valley.

Center Facilities

The Center for Sustainable Development Studies is in Barrio Los Angeles, a small town on the outskirts of Atenas. The main property includes a large house where faculty live and meals are eaten. Students live in a refurbished chalk factory that has been converted to dormitory space; there are five large bedrooms (6-7 students to a room), two bathrooms, classrooms, a small laboratory, and a library/computer room.

Cooking is shared between students and a local cook. Meals are a feast for vegetarians and adventurous souls excited by ethnic cuisine: rice, beans, vegetables, plantains, and abundant, locally grown tropical fruit. For variety, locally raised meat and poultry are also available.

Living and Working Conditions

During the first half of the program, our days at the Center start with lectures and field work. An important feature in the early part of the program is Spanish lessons aimed at easing communication with local

Photo: Ed Slashko



residents. We will take numerous field trips, some short hops within the Central Valley, some to public and private preserves a distance away. Evenings are reserved for guest lectures and presentations from local experts, but we do slot in time for relaxation and group sports.

Because the population's land-use choices are among our chief concerns, we will spend sizable blocks of time on local farms and speaking with agricultural cooperatives. Community involvement, which may extend to community service projects or volunteering, is an important feature of this program.

At 2,600 feet above sea level, nights are cool, days warm and possibly damp. During the course, we visit other, very different regions: two areas of lowland tropical forest which include a rainforest, a cloud forest and a coastal ecosystem.



Photo: Uiana Babbar

"One of the most amazing experiences of the semester was the relationships I was able to develop with friends both in the program and from the local community. It was refreshing to be living with other students and staff who had such similar interests. We were able to learn a lot from each other, often about more than just schooling."

Shannon LaDena, Brattleboro, VT • Mount Holyoke College

Continued Next Page

C O S T A R I C A

STUDIES IN SUSTAINABLE DEVELOPMENT

Program Dates:

September 10 – December 13, 1996

January 31 – May 6, 1997

Departure Point:

San Jose, Costa Rica

Students will be registered in four academic courses:

- EE (NS) 377 Tropical Ecology and Sustainable Development
- EE (SS) 301 Sociopolitical Systems and Sustainable Development
- EE (SS) 303 Economic and Ethical Issues and Sustainable Development
- EE 491 or 492 Directed Research

*Please see pages 38-39 for course descriptions.***Introduction**

Costa Rica faces a struggle common to many developing countries: How to preserve its beautiful (and increasingly economically valuable) natural resources while fostering its population's desire for First World-style prosperity. The struggle is vividly evident in its land protection efforts: It has placed 27% of its land mass into preserved areas, yet at the same time suffers some of the world's highest rates of deforestation in unprotected lands just beyond the parks' borders.

Concern is growing that some of the abundant but separate preserved patches are too small to provide longterm wildlife habitat. At the same time, agricultural practices threaten the environment while the economic and cultural need for agriculture continues. And, although Costa Rica's remaining natural riches have attracted international attention, there is no concrete evidence that ecotourism is a sustainable solution to the economic dilemma. The development which follows on its heels may be as destructive as agriculture has been to date.

We begin the semester with a module introducing the problem-oriented case study approach, as well as Spanish-language lessons and lectures on the history, economics, culture and environment of Costa Rica before moving into the three case studies and pursuing directed research projects.



Photo: Liana Babbar

Case Study #1:

How can alternative conservation models in Costa Rica be sustainably managed to achieve both conservation and production?

Protected areas, ranging from a few to several hundred hectares, exist under both private and public ownership. The country's aggressive land-protection efforts and famous natural resources are a powerful magnet for tourism, which has just surpassed agriculture as Costa Rica's chief income source. No one knows whether tourism offers long-term economic viability; it may trigger negative social and cultural impacts, and further strain forest fragments. In addition, many protected areas do not provide sufficient habitat to protect some wildlife. During field trips to national parks, biological reserves, forest reserves, and private protected areas, we will quantify the extent to which actual management approximates stated reserve objectives and meets the requirements of key species for regeneration and maintenance within a community. Using this information, combined with an understanding of the pressures on protected areas, we can explore conservation alternatives.

We spend a third of our time on off-site field trips. Our case study on Sustainable Entrepreneurial Models will include a visit to an experimental mangrove charcoal business.

Trying a hand at picking coffee.



Photo: Moises Leon

Case Study #2:

How can agroecosystems promote sustainable management in Costa Rica's protected zones?

Despite its decision to place more than one-fourth of its land mass into protected areas, Costa Rica has one of the world's highest rates of deforestation. Because agriculture still represents one of the country's main sources of income, needs for productive land have overridden interest in forest preservation. As Costa Rica becomes more involved in the international market, important changes are occurring in the agricultural sector. New policies regarding agricultural practices (e.g. agroforestry, pesticide use), commercial relations (e.g. marketing and credit), and socio-political aspects (e.g. labor conditions) threaten the sustainability of farming systems. Using biometrics and field techniques such as measuring and censusing, we can assess local land-use choices and alternatives to conventional agricultural practices. Field trips to rainforest reserves and to coffee and organic farms can help us determine whether nature can be used as a model for local agriculture.



Photo: Liana Babbar



C O S T A R I C A

ALTERNATIVE STRATEGIES FOR PRESERVING TROPICAL ECOSYSTEMS

Program Dates:

Session I: June 13 – July 12

Session II: July 19 – August 17

Departure Point:

San Jose, Costa Rica

Course Number: EE (NS) 352**Case Study #3:**

What are the impacts of Foreign Direct Investment and Sustainable Entrepreneurial Models?

Development in a Third World country most often comes at the price of involvement by industrialized nations, usually by those countries in which the interested multinational corporations have their bases. These interests in Central America are most often fruit-producing concerns which, like their parent companies, are profit-driven. Such operations compete with local traditional and grassroots businesses for land, capital and labor. Since they are not locally based, they tend to show less concern than indigenous businesses for the health of local ecosystems. On the other hand, traditional agricultural businesses may be sustainable, but have slender economic success. Our search for a sustainable and profitable alternative will take us from the cloud forest to the mangroves of the Pacific coast to study three agricultural-product businesses – blackberries, bananas and mangrove charcoal. Using field observations and interviews, we will focus on ecosystem stability as well as on the cultural and economic factors affecting success.

Prerequisites: This program is offered at the intermediate level. Applicants must have completed a college level course in each of the following: ecology or environmental studies; international development or economics or anthropology; and Spanish; prior to participating.

Applicants from Allegheny, Colby, Dickinson and Middlebury Colleges and the University of Michigan should consult their Environmental Studies Department for application information.



Photo: Meghan Kelley

"Another wonderful surprise was students' attitudes towards learning. At my college, I used to be one of the few people willing to participate in classes. In my SES course, every single student contributed to the lectures, offering many different opinions, leading to interesting discussions that often lasted several hours."

Marcela Kosiňova, Czech Republic -
North Central College

history of Costa Rican national parks, models of natural resource protection, economics and sustainable development, and managing for diversity. Guest speakers will explain federal protection schemes and the operation of private reserves. During our visits we will conduct ecological inventories of protected areas, measure impacts on watersheds, and conduct community interviews with owners whose lands border the parks. Assessments of the economic and social impacts of preservation and degradation will be considered as we prepare to recommend the most viable preservation strategies.

Case Study Question:

Do the current management and design of Costa Rica's protected areas effectively meet the goals and objectives of conservation?

Field Work Focus

- ♦ Determining how much habitat protection is supplied by currently protected areas.
- ♦ Investigating whether current regulations protecting areas including buffer zones, create true protection or mere "paper parks."
- ♦ Determining whether private initiatives can preserve ecosystems as efficiently as protected areas.
- ♦ Investigating whether privately protected areas are economically viable.

Course Objectives

Encouraging protection strategies on private lands may hold the key to preserving wildlife populations both here and in other countries. This is particularly true now, when tourism is about to become Costa Rica's No.1 source of income. Success will require investigating both environmental and cultural impacts and identifying persuasive economic benefits that will result from sustainable use.

Our search to identify successful management strategies will take us to both officially protected and privately created preserves. Faculty lectures will address the

CENTER FOR RAINFOREST STUDIES

C E N T E R P R O G R A M S

Tropical Rainforest Management

Semester Program — Page 36

Tropical Reforestation

Summer Course — Page 37

Center Objective

To develop environmentally sound, culturally acceptable and politically and economically feasible alternatives for the conservation and management of the unique Queensland rainforest.

Critical Environmental Issues

The need to balance ecology and economics is acutely felt in North Queensland, which hosts Australia's remaining tropical rainforests. While many forests now have protected status, the country still struggles with the conflict between resource use and preservation and the fate of degraded lands. We will attempt to answer such questions as:

- ◆ What changes in wildlife laws, protected lands, zoning rules and land management practices would halt the slow demise of the cassowary locally?
- ◆ What combination of planting strategies, plot maintenance and catchment management procedures yield the greatest reforestation success?
- ◆ Will forest corridors reduce the negative effects of habitat fragmentation and improve the longterm preservation of plants and animals?
- ◆ What sorts of agricultural development and human settlement are compatible with preservation and maintenance of biodiversity in Australian tropical rainforest regions?

Center Clients/Partners

We will share our data with the Commonwealth Science and Industrial Research Organization, the Wet Tropics Management Agency, the Department of Environmental Heritage, the Atherton Shire Council, and the Cairns and Far North Environmental Centre as well as with the Queensland National Parks and Queensland Forest Service. Local farmers, ranchers and foresters have a particular interest in our findings.

Field Director: Michael Ghiglieri, Ph.D., University of California at Davis
(Biological Ecology)

Resident Faculty: Tony Cummings, M.E.S., Yale University (Forest Management)
Bruce MacNab, M.Sc., University of Alberta
(Natural Resource Economics)
John Grant, Ph.D., James Cook University
(Vertebrate Ecology)

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



Site Description

Australia's northeast corner, Tropical North Queensland, hosts the country's greatest biological, climatic and social diversity. Chief among its treasures: The country's only remaining rainforests, less than 1% of its land area, which lie cradled in a narrow, broken belt along the northeast coast.

Australia's dense and verdant rainforests are as rich and valuable as their better-known New World counterparts - in some respects, perhaps even more so. They are



Photo: Diana Swan

Students and faculty have planted over 6,000 trees in deforested areas. Over 5,000 seedlings are now growing in our shade house; our goal is to plant 2,000 trees per year.

treasure houses of primitive flowering plants, species long since extinct on other continents but surviving here since the Mesozoic. They shelter an astonishing array of bird species from the brilliant king parrot to the flightless, ostrich-like cassowary. And, they are home to a great range of marsupials such as possums, bandicoots, tree-kangaroos and gliders, evidence of an evolutionary pattern seen nowhere else in the world.

Our Center for Rainforest Studies lies in the midst of this bounty: Of the property's 153 acres, approximately a third is mature rainforest, and another 50 are forest regrowth. The site - called "Warrawee,"

Center for Rainforest Studies

Photo: Ed Stashko



Faculty member Tony Cummings has shared his knowledge and insights with hundreds of students in his five years of teaching with SFSS. "It's really refreshing to be good friends with your professors instead of just viewing them as teachers. I learned a lot from them, both in and out of the classroom. They gave my honest opinions and advice that will definitely help me in making future career decisions."

Michael Mutie, Thornton, CO - Claremont McKenna College

The Center for Rainforest Studies, called "Warrance" (you are welcome here) in the local Aboriginal language, is located amid 155 acres of rainforest and secondary growth forest.



Photo: David Wilson

aboriginal for "You are welcome here" - lies in the northern foothills of the Atherton Tableland. Although remote (the nearest town is a 20 minute drive away), the seclusion pays off the first morning you wake to the birds' dawn chorus, or the first time a group of flying foxes sweeps overhead at dusk.

Center Facilities

The field station lies at 800 meters elevation in the midst of a rolling, hilly property surrounded by protected World Heritage forests. Students live dorm-style in four, eight-person cabins; faculty occupy an additional two cabins nearby. The main building has lecture, computer and library rooms, a collection of research equipment, a kitchen and washing machine; solar and standard electricity provide our power.

Living and Working Conditions

The sounds of scurrying wildlife and singing birds outside our rustic cabin windows provide a natural alarmclock. After breakfast on the patio of the main building, we're off to one of several morning lectures. Lunch will often be eaten in the field, where we spend most of the afternoon engaged in field work or visiting sites of interest. Returning to the Center by nightfall, we may have an opportunity to glimpse platypuses before the darkening skies are dotted with flying foxes. Dinner may involve a culinary adventure to be shared with the group or with our neighbors at the regularly scheduled "barby" hosted by the Center.

Once we begin our directed research projects, lectures diminish and field work and data analysis increase. We will work in forest and modified habitats, protected forests and nearby private lands. The communities of The Atherton Tableland are small and residents get to know us quickly. As a result, volunteer opportunities - building trails, giving presentations at local high schools, meeting local conservation groups, and planting seedlings - are available. We buy food locally - the same basics of meat, fish, dairy, fruit and vegetables as we are used to in the U.S. - and we do the cooking and clean-up. Students also organize recycling and composting and participate in weekly Center maintenance.

At 17 degrees south of the equator, the Atherton Tableland has two seasons: wet and hot, or cool and relatively dry. The Australian summer stretches from November to March, and can produce heavy rains and soggy roads; dry season arrives in April, along with night temperatures that can sink as low as freezing. Winter days are usually about 25 degrees C.

Continued Next Page

Photo: David Ballingate



Students discuss the results of tree-planting efforts with a local forester. Increasingly, private landholders are seeking solutions to water-bred and water quality issues. Now that much of the forest around the Center is protected, we need to better understand the relatively new concept of reforestation.

A U S T R A L I A

TROPICAL RAINFOREST MANAGEMENT

Program Dates:

September 10 – December 13, 1996
January 31 – May 6, 1997

Departure Point:

Cairns, Queensland, Australia

**Students will be registered
in four academic courses:**

BI/EE (NS) 369	Rainforest Ecology
EE (NS) 370	Principles of Forest Management
EE (SS) 302	Environmental Policy and Socioeconomic Values
EE 491 or 492	Directed Research

Please see pages 38-39 for course descriptions.

Introduction

The narrow belt of rainforest which borders the Queensland coast has suffered the same fate as most other rainforests; agriculture, ranching, mining and logging have destroyed and disrupted habitat. Australia, realizing that its forests shelter unique primitive plant species and birds and marsupials found nowhere else on earth, moved to confront the threats to its rainforests faster than most tropical countries. In 1988, most of its remaining tropical forests were declared protected under World Heritage designation.

This decision was very controversial, and is still not fully accepted by some Queensland residents. Authorities still struggle with the question of how much land to allot to recreation, wilderness, reforestation, etc. Yet Australia's active exploration of these issues puts it years ahead of most tropical rainforest countries, and solutions developed here may serve as models for the rest of the world.

We begin the semester with two weeks of orientation and introductory lectures before moving into the three case studies. A week-long introduction to research techniques, statistics and scientific writing precedes the directed research projects in the latter part of the semester.



Photo: Maria Whitehead

Case Study #1:

What are the most viable reforestation strategies for the Atherton Tableland?

Rainforest areas protected by the Australian government may be too small, fragmented, or vulnerable to human activities to provide for the longterm viability of some plant and animal populations. Restoration of degraded areas which were cleared for farming may ease the problem, particularly in creating wildlife corridors to reduce fragmentation and extinction effects. Yet the success rates of different reforestation strategies, e.g. natural regrowth, low diversity plantings, and high diversity plantings are virtually unknown. Through field trips to natural areas and areas reforested in a variety of ways, we will seek to understand the role that reforestation can play in restoration, wildlife conservation and watershed protection. We will hear lectures from forestry professionals and grassroot reforesters; study and compare a variety of experimental plantings; and help to design experimental plots for longterm monitoring.



Photo: Bill Laurence

"I participated in the Australia summer program as a high school student and completed a Westinghouse Science Research paper based on my research. The work that I did that summer has been an integral part of my life. I was lucky enough to work as a National Park Service Interpretive Ranger in the Rockies this summer largely because of my SES experience."

Jennifer Ng • Wellesley College

One of our case studies focuses on developing recommendations to manage the area's dwindling population of endangered cassowaries.



Photo: John Grant

Case Study #2:

What is the best set of policies for conserving and managing cassowaries on the Atherton Tableland?

The flightless cassowary, a rare inhabitant of our surrounding forests, is the touchstone for conservation efforts in North Queensland. Though treasured, the bird is in slow but steady decline. A severe lack of data on its range, habitat needs, food sources, density and distribution have frustrated conservation



Students examining a lace monitor lizard. The chair of our biology department is one of the best school quality programs in the SFS Australia program.

Tom Schaeffer, Dismal, ND - MacLester College

and management efforts, and its interaction with the local ecosystem is little understood. Field trips to high density parts of its range (the well known Mission Beach management area), lectures by professional wildlife managers, scat censuses, and a habitat project will augment our contributions to the database on this shy and little-known animal. In addition, we will critique and revise a management plan for cassowaries on the Tableland to be submitted to the newly organized Conservation Research Center in Cairns.

Case Study #3:

How can the water resources of Lake Tinaroo watershed be managed so as to be consistent with both ecological integrity and economic well-being?

Watersheds are in many ways representative of the wide range of opportunities and limitations faced in environmental conservation and management. Watersheds are increasingly the focus of conservation efforts, both in terms of biodiversity and environmental services. At the same time, the past use and current state of watershed resources are in most cases, good examples of the conflicts and challenges associated with the management of common property resources. Our case study will focus on the Lake Tinaroo watershed, its development, past uses and current demands for watershed resources, and the importance of the conservation of the watershed in relation to broader environmental policy. We will then consider ways in which watershed management practices and policy can be refined so as to be consistent with sustainable development. This will include involvement in a local water quality monitoring scheme.



Meeting members of the community like Barry Harding was one of the highlights of the program. He and other farmers shared with us a wealth of knowledge that we would not have gotten elsewhere. We were able to see the environment through their eyes.

Johanna Rodriguez - Claremont McKenna College

Program Dates:

Session I: June 13 - July 12

Session II: July 19 - August 17

Departure Point:

Cairns, North Queensland, Australia

Course Number:

EE (NS) 355 Tropical Reforestation

Case Study Question:

What are the most viable reforestation strategies for the Atherton Tableland?

Field Work Focus

- ♦ Determining what forest birds, mammals and reptiles use replanted areas, and how they affect planted rainforest succession.
- ♦ Investigating the potential for creating wildlife corridors between fragmented rainforest parks.
- ♦ Investigating the success of different tree species and planting patterns in restored areas.
- ♦ Assessing interest of local land owners' in developing timber and wildlife values on their own lands.

Course Objectives

Designation as a World Heritage Site did not eliminate local pressures on the forest; struggles continue over how to manage the multi-use forests, which degraded patches to restore, and over sustainable use given the slow pace of forest regeneration. To investigate the dynamics of reforestation, we will develop and implement a plan to convert a stretch of farm land between two protected rainforest areas into a reforested habitat corridor. This will involve designing and assessing specific reforestation and management strategies and physically planting seedlings, some of which have been grown in the Center's shade house. We will also study the ecology and development of already planted rainforest projects.

Lectures addressing relevant topics in conservation biology, forest ecology, tropical resource management and population demographics provide a base for our fieldwork. This information will be supplemented by guest lectures on reforestation strategies. We will become familiar with a number of field research techniques such as transect use, quadrat measurement, resource mapping, and bird and animal live-trapping that will be useful in conducting our directed research projects.

SFS Faculty Profiles

**David Silverberg****Field Director
Center for
Coastal Studies**

David has a Ph.D. from MIT, where he focused his research on interdisciplinary

approaches to understanding the physical evolution of the Himalayan, the Alpine and the North American Cordillera mountainbelts. After a post-doc at Harvard, he was an Assistant Professor at the University of Connecticut where he designed and taught the University's first Global Change and Earth Systems Sciences course. In 1994, he left his position as Research and Executive Director of The Center for Field Research at Earthwatch to become one of the original staff in President Clinton's Corporation for National and Community Service and helped to develop environmental and education programs for AmeriCorps, VISTA, Senior Corps and the National Civilian Community Corps. David's work has taken him to montane, rainforest, desert and near-shore marine ecosystems and cultures in 70 countries. He is a contracted photojournalist in both North America and Europe and is a Fellow National of the Explorers' Club.

**Bernardo Aguilar
Resource Economist****Center for Sustainable
Development Studies**

Bernardo is an agricultural, resource, and applied economist as well as

an agrarian and environmental lawyer. Prior to joining SFS in the fall of 1992, Bernardo was a First Instance Judge on the Supreme Court of Justice, San Jose, Costa Rica. His teaching experience includes courses in Inferential Statistics at the Latin American University of Science and Technology and guest lectures at the Organization for Tropical Studies and the Institute for Central American Development Studies. He received a Masters' Degree from the University of Georgia, where he was a Fulbright Scholar from Costa Rica. In addition, Bernardo has a specialist graduate degree in law from the University of Costa Rica. His research interests and experience include ecological economic valuation, effectiveness of environmental regulation, and environmental ethics.

Semester Course Descriptions

BI/EE (NS) 369 Rainforest Ecology introduces the structure and function of tropical rainforests including the floral and faunal components. Ecological processes that maintain biodiversity and the evolutionary processes that generate it will be presented. We will examine the dynamic relationships between plants and animals including pollination and seed dispersal. On a larger scale, we will examine tropical vegetation patterns along climatic gradients and the discuss mechanisms for preserving and restoring tropical ecosystems.

BI/EE (NS) 371 Techniques of Wildlife Management introduces students to the questions, principles and tools used by resource managers in the Kenyan savannah ecosystem. Students will study habitat assessment, plant and animal identification, plant and animal associations and distributions, and other approaches to evaluating the savannah ecosystems. The behavioral, physiological, and social responses of animals to a changing environment will be examined. Selected field and laboratory techniques useful for monitoring ungulate populations and optimizing management practices will be presented. Decision-making processes on which wildlife management programs are based, will be addressed.

BI/EE (NS) 372 Wildlife Ecology presents students with the information and conceptual background necessary to understand the underlying ecological principles of the East African savannah ecosystem. We will focus on the fundamental processes and inter-relationships between the biotic and abiotic environment. We begin with a discussion of basic ecological principles, setting them against the background of East Africa. The factors underlying distributions, population biology and behavioral ecology will be examined along with competition and predation using African examples. Theoretical models will be discussed in light of our observations on the ranch and on field trips.

BI/EE (NS) 373 Tropical Marine Ecology discusses the interactions that determine the distribution and abundance patterns of tropical marine organisms, with emphasis on the ecology of near-shore areas. Basic principles of ecology are integrated with an understanding of the sea as a habitat for life. Physical, chemical, and geological oceanography are discussed. Major groups of dominant marine organisms of the region are described and examined in the field. Major near-shore marine habitats are examined, along with their associated biotic communities. Coral reef ecosystems are emphasized to illustrate basic concepts. Applications to the management of indigenous marine resources are discussed and demonstrated.

EE (NS) 370 Principles of Forest Management presents the ecological and analytical tools used in the management of terrestrial, living resources. We will use examples from the tropics and temperate regions to stress the theories and skills that provide the foundation for land management worldwide. The assessment and minimization of adverse environmental impacts caused by resource development, as well as the restoration and rehabilitation of areas suffering from chronic human induced disturbances, provide key foci for applying the principles learned in this course.

EE (NS) 374 Principles of Resource Management introduces practical tools used in addressing complex environmental problems including coastal zone planning, guidelines for ecologically sustainable development, environmental impact assessment, fisheries management techniques, and protected-area planning and management. We will review these tools in terms of their application to local issues and to case studies from the Caribbean, the United States, Central America, and East Africa.

EE (NS) 377 Tropical Ecology and Sustainable Development examines the ecological impact of human activity, especially agriculture in a tropical country. The agroecology of important crops will be studied with emphasis on biodiversity as the source of production means and materials. Students will identify renewable and nonrenewable resources and examine their historical use by people in the region. We will study the long term and large scale impact of local agricultural and other practices on the national and global environment (e.g. *water pollution, waste management, climate change*). Options for alternative resource use, land restoration and preservation will be examined from an ecological, socio-political and economic viewpoint. Factors that constrain or promote particular options will be included. Basic field techniques and measurements will also be covered.

"When I visited the SFS program in Australia, I found a group of students who were radiant and content despite the muddy conditions... In college students have labs in the rainforest they live in the lab seven days a week... Having their subject matter surround them is not only the experience of a lifetime, but one which cannot be duplicated on campus. Over time my students have taught me that mere words cannot do justice to the experience of studying the rainforest in the rainforest. Once I reached the site, I understood why."

Nicole Hamon
Director, Off-Campus
Study - Claremont
McKenna College



BI/EE (NS) 379 Coastal Ecology examines the ecological processes at the interface between land and sea in order to provide an understanding of how human perturbations can impact both marine and terrestrial systems. The watershed concept will be used to explore nutrient flow, energy cycling, erosion, coastal circulation, productivity, and biotic interactions. This course is designed to provide a basic understanding of how natural systems work in order to help guide resource managers toward ecologically sound and sustainable decisions. Field work exposes students to techniques of surveying and monitoring and the study of biotic interactions in a complex physical-chemical milieu.

EE (SS) 301 Socio-Political Systems and Sustainable Development examines the historical development of Costa Rica within an international context to understand the stages of economic, political and social development that have taken Costa Rica from social and economic isolation to a position of political and social leadership in the Central American isthmus. Topics to be discussed include: 1) pre-Columbian Central American and the Meso-american influence; 2) social and economic development during the colonial period; 3) the foreign presence in Costa Rica; 4) the banana republics; 5) coffee and economic development; 6) social and economic development during the 1980s-90s.

EE (SS) 302 Environmental Policy & Socioeconomic Values provides insight into the broad social context which surrounds the natural resources under study and which will determine, in part, which approaches to resource management are practiced. Objectives include the development of an understanding of: sociocultural context including hierarchies and power structures, formal and informal decision making processes, value systems relevant to natural resources including religious factors and environmental ethics, and past and present uses of natural resources; economic factors (*local, regional, and external*); ownership patterns; attitudes and other factors that affect change and their historical bases, and legal basis for enforcement of environmental policy. The course also introduces subjects such as the major constituencies which affect conservation (*NGO conservation groups, economic interests, etc.*) and their underlying philosophies.

EE (SS) 303 Economic and Ethical Issues in Sustainable Development develops the principles and applications of Ecological Economics, or the scientific and management aspects of sustainability. Allocation, distribution and scale will be presented as parameters to assess the sustainability of development models (*at a macro and micro level*). Basic concepts of ecological economics cost-benefit valuation techniques will be presented and applied. The roles of local people, the government, and private, national, and bilateral aid agencies will be examined as constraints for the implementation of sustainable development models. We will address the problem of designing and setting up sustainable development models with communities. The empowerment of local people and their reaction to non-local proposals for sustainable development will be examined through the review of specific case studies.

EE 491 (Fall) EE 492 (Spring) Directed Research prepares students to distinguish hidden assumptions in scientific approaches and separate fact from interpretation, cause from correlation, and advocacy from objectivity. Specific tools will include experimental design, field techniques, basic descriptive statistics and parametric and non-parametric quantitative analysis. Succinct scientific writing, graphic and tabular presentation of results, and effective delivery of oral presentations will be emphasized.

BI/EE (NS) — Students choose to register for either Biology or Environmental Studies credit

EE (NS) — Environmental Studies (*Natural Science*)

EE (SS) — Environmental Studies (*Social Science*)

Wayne Vos Wildlife Ecologist Center for Wildlife Management Studies



Wayne grew up in Natal, South Africa. He worked for the National Parks Board of Trustees as a research assistant in the Kruger National Park Trustees to complete the practical component of a three year National Diploma in Nature Conservation which he obtained in 1984 from Pretoria College. His professional experience includes working for the Natal Parks Board where he focused on large terrestrial and marine mammals and in several capacities in wildlife management and research. Some of his projects were conducted on Zulu-Nyala and Nyala Game Ranches in Natal, South Africa. He earned a B.Sc. in botany and zoology, an honor's degree in Botany, and a Ph.D. in Plant Systematics from the University of Natal, South Africa. He recently illustrated "The Trees of Natal" for the Natal Flora Publications Trust.

Marian Weber Resource Economist Center for Coastal Studies



Marian is a Canadian citizen and a Ph.D. Candidate in the Department of Economics at the University of Alberta. Her major research focus has been on the effectiveness of market instruments for controlling environmental pollution, and in particular the implementation process through legislation such as the Clean Air Act. She also has worked on projects studying economic and political issues surrounding forestry in both Canada and developing nations. Her teaching experience includes leading classes in Resource Economics and Canadian Economic History at the University of Alberta. She received an M.A. in Economics from the University of Alberta (1991) and an M.A. in Economic History from the University of Toronto (1986). Between her academic endeavors, she has developed a love of live forests and worked as a tree planter throughout British Columbia.

Letter from a SFS Participant

It has been over a year since I left Kenya. Each day I find myself speaking swahili to myself or thinking of the friends I made there. I am back at the University of Colorado, doing many of the same things I did before my SFS program.

But I'm also doing things I thought only professional scientists or managers could do. I'm finishing my senior thesis studying habitat use by ferruginous hawks. Friends from my SFS program have pursued their own newfound interests: Bridgette spent the summer in the northwest working with spotted owls and bald eagles; Becca spent time as a river guide in Colorado and is now in New England working with white-tailed deer.



Photo: Carrie Cox

Your SFS experience will not be just about what and who you see. It will equip you to prosper and thrive anywhere you choose to be. You won't leave your experience behind when you return home. Having been challenged in your new world, and having gone beyond the initial marvel and wonder, you will find you are able to put things into ecological, environmental and conservation oriented contexts. And, that you are capable of doing many things that were once seemingly out of your reach.

Whether your SFS experience leads to more fieldwork, an honors thesis, or simply a broadened worldview, is impossible to predict. What is certain, is that it will lead to a new self-confidence and ability to solve problems. And the one thing the adventure you are about to begin will never do, is leave you.

Good luck!

Pete Coppolillo

Peter Coppolillo
Kenya Semester Participant

All SFS participants are registered at and receive credit from Boston 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 page 41 regarding Affiliate schools and on Page 33 regarding Consortium schools).*

A non-refundable registration fee of \$150 for semester programs and \$100 for summer courses is due from all SFS students 10 days after acceptance into the program.

All SFS courses are approved and assigned course numbers by Boston University. SFS semester programs incorporate four courses and carry a total of 16 semester credits in biology or environmental studies from Boston University. Summer courses carry 4 semester credits in environmental studies. At the conclusion of the program, you will receive an official transcript from Boston University. Many students have arranged either to transfer credit from Boston University or to receive credit directly from their home school.

The following is a partial list of the home schools of previous SFS participants. Over 250 institutions, including 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, **you should check with your 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 automatic credit approval.

Albion College
Allegheny College +
American University
Amherst College
Barnard College
Barry University
Bates College
Baylor University
Bennington College +
Binghamton University
Boston College
Boston University
Bowdoin College
Bowling Green State University
Brandeis University +
Brown University
Brigham Young University
Bryn Mawr College
Bucknell University
Carnegie Mellon University
Case Western Reserve University
Claremont-McKenna College
Clark University +
Colby College +
College of William and Mary
College of the Atlantic
College of the Holy Cross
College of Wooster
Colorado College
Connecticut College
Cornell University
Dalhousie University
Dartmouth College
Davidson College +
Denison University +
DePauw University
Dickinson College +
Drake University
Drew University
Duke University
Earlham College
Emory University
Evergreen State College
Franklin and Marshall College
Georgetown University
George Washington University
Gettysburg College
Grinnell College
Hamilton College
Hamline University
Hampshire College
Harvard College
Hiram College +
Humboldt State University

SFS Affiliate Program

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. The current SFS Affiliate Members are:

Bennington College

- Dr. Kerry Woods

Brandeis University

- Dr. Attila Klein

Clark University

- Dr. Todd Lydahl

Colby College

- Dr. David Fennage

Davidson College

- Dr. Verna Miller Case

Denison University

- Dr. Juliana Mulroy

Dickinson College

- Dr. Janet Wright

Hiram College

- Dr. Matt Hills

Kenyon College

- Dr. Ray Heidhaus

Miami University

- Dr. Donald Kaufman

Mount Holyoke College

- Ms. Joanne Picard

Scripps College

- Ms. Valerie Eastman

SUNY College of Environmental Sciences and Forestry

- Dr. Neil Ringler

University of Miami

- Dr. Dan DiResta

Wells College

- Dr. Thomas Vawter

Indiana University

Ithaca College

Kenyon College*

Knox College

Lehigh University

Lewis and Clark College

Lynchburg College

Macalester College

McGill University

Miami University*

Michigan State University

Middlebury College+

Mills College

Mount Holyoke College*

Muhlenberg College

New York University

Northeastern University

Northwestern University

Oberlin College

Occidental College

Ohio State University

Ohio University

Ohio Wesleyan University

Oregon State University

Pacific Lutheran University

Pitzer College

Pomona College

Providence College

Purdue University

Reed College

Rice University

Rutgers University

Saint Lawrence University

Saint Michael's College

Saint Olaf College

Scripps College*

Skidmore College

Smith College

Stanford University

S.U.N.Y. College of Environmental Sciences and Forestry*

Swarthmore College

Texas A&M University

Trinity College

Trinity University

Tufts University

Tulane University

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 Dayton

University of Florida

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 Puget Sound

University of Redlands

University of Rhode Island

University of Richmond

University of Santa Clara

University of Tennessee

University of San Diego

University of the South

University of Utah

University of Vermont

University of Victoria

University of Virginia

University of Wisconsin

Vanderbilt University

Vassar College

Villanova University

Wake Forest University

Washington University

Washington and Lee University

Wellesley College

Wells College*

Wesleyan University

Wheaton College

Whitman College

Willamette University

William Smith College

Williams College

Wittenberg University

Yale College

Home school of 8 or more SFS participants in 1995

+ Member of Sustainable Development Studies Consortium (please see page 31 and 33 for details)

** SFS Affiliate School*

Key to the SFS experience are the faculty who guide your learning adventure. These men and women are selected for their interdisciplinary teaching and research approaches as well as their leadership qualities. They are successful practitioners in careers you may be considering and are the source of a wealth of information and advice. Before coming to SFS, current staff have, for example: served as a judge in Costa Rica; worked as an environmental specialist for a Fortune 500 corporation; managed environmental impact assessments; directed the Americorps environmental program; written texts and scripts for environmental television programs; and conducted research for the Leakey Foundation and the Gombi Stream Chimpanzee Center.



Wayne Vos, wildlife ecologist at the Center for Wildlife Management Studies

Centers are staffed by four, full-time, resident faculty (*one of whom is the Field Director*) who all live on-site for the duration of the program. Resident faculty hold an advanced degree (*often the Ph.D.*) and usually have several years experience in their area of expertise at the Center location. Additional staff include part-time faculty, guest lecturers, student affairs managers, interns and site managers.

This level of staffing offers provides students with a remarkably low student to faculty ratio (*no higher than 10:1*). Faculty are available throughout the program to offer guidance and assistance. Teaching and mentorship are a priority for the SFS staff and, as a result, many students tell us that one of the key benefits of their SFS experience was their constant access to faculty and the opportunity to get to really know these unique individuals.

Requirements for Admission

Admission to SFS courses is open to eager, motivated students. If you are willing to commit your emotional, intellectual, and physical energies to working toward a better understanding of crucial environmental issues, we encourage you to apply to join us.

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. Our goal is to create well balanced teams of students who will best benefit from and contribute academically and socially to this experience. Applicants should exhibit enthusiasm, character, compassion, flexibility and social concern. Also evident should be a willingness to, at times, put the needs of the group ahead of your own. The essay in which you define your motivation for participating in an SFS program is a strong determining factor in the admission process.

Participants are screened by the Admissions Committee to insure that they are choosing the appropriate course for the right reasons and that they have the background necessary for a successful academic and personal experience. The Committee strives to bring together students from diverse academic, economic, cultural and social backgrounds, with varied interests and talents, who support the mission of The School and are committed to working with others toward a common goal.

Before completing your application for admission, we would like you to carefully consider the fact that this experience will likely be very different from your academic experience to date. We are setting off together on a journey during which we ask that you consider yourself to be crew not passengers. We expect and encourage you to take a proactive role in all aspects of your education from scheduling activities to choosing research projects to risk management.

Admission to The School for Field Studies is open to qualified students without regard to sex, race, color, or national and ethnic origin or economic status.

HOW TO APPLY

An Application for Admission and SFS Reference Form can be found at the back of this catalogue.

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. In addition, all applicants must submit an official current transcript to complete their application

Applicants for semester programs should be 18 years of age and have completed at least one college-level ecology or biology course and, preferably, at least one semester of college.

Applicants for summer courses should be at least 16 years of age and have completed at least the junior year in high school.

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 you to apply early to join the course of your 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.

Financial Aid

We are committed to involving as many qualified students as possible in SFS programs and will work with you to facilitate your participation in an SFS program. SFS has been the recipient of generous contributions from foundations, corporations and individuals to help realize this goal.

Financial aid, in the form of scholarships and/or interest free loans, is available to qualified students based on need. We have historically assisted approximately 28% of our participants and we hope to continue this level of funding for 1996-97. For the 1996-97 academic year, we expect to have over \$250,000 in scholarship and \$250,000 in loan funds to make the SFS experience accessible to over 200 students facing financial challenges. Some applicants receive a combination grant and loan while others receive only loan funding. You do not need to be receiving financial aid at your home school to qualify for SFS financial aid for summer or semester programs.

If you will need financial assistance in order to participate, we strongly encourage you to request, complete and return an SFS Financial Aid Application as soon as possible. Aid is available by need until funds are exhausted. For more information on how to qualify for assistance, please call the SFS Admissions Office at (508) 927-7777.

Semester students: In determining need, we expect that you and your parents will contribute at least the same amount that you are paying per semester at your home school, and more if you are able. A growing number of schools allow students to take some or all of their institutional financial aid off-campus. Check with your financial aid office to see what aid you can apply to your SFS program. **We encourage you to investigate applying for federal financial aid funds, including Stafford Loans, through your home school.** Because the credits you earn for your SFS participation will, in all likelihood, be applied toward your degree, your school can process a Stafford Loan to assist your participation in an SFS program. If necessary, SFS and Boston University can sign a consortium agreement indicating that we will not be awarding you federal financial aid. If you encounter difficulty in arranging to use federal financial aid funds for your SFS program, please ask your financial aid officer to give us a call and we will try to help you out.

Expectations and Responsibilities



Photo: Chris Vaughan

"It was the most intense learning experience of my entire life. A complete ecological, social, academic, and intellectual immersion in the concept of sustainability."

Frederick Warner, Chevy Chase, MD - University of Michigan

Scholarship Donors

Generous support from numerous individuals and the following have made the SFS Financial Aid Program possible:

The Andreas Foundation

The Charles Engelhard Foundation

The Hunt Foundation

The Merck Family Fund

The Curtis and Edith Munson Foundation

The Laurance S. Rockefeller Trust

The Explorers Club

Archer Daniels Midland Company

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.

You are advised that these or other variables (*including staffing*) may result in changes before or during a course. **As the course catalogue is often written up to a year before a program actually goes into the field, students should rely on their program syllabus for up-to-date course descriptions.** Indeed, part of your challenge lies in adapting to changing conditions and overcoming the obstacles they may present. In other words, the elephants are not always where we want them to be, so please be flexible.

Student Conduct

You are expected to conduct yourself 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 your parents and return you to the point of course departure, at which time any and all responsibility on the part of The School for Field Studies will cease.

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 it's agents or employees, and/or airline, railroad, bus company, automobile rental agency, hotel, or other supplier of service.

The School for Field Studies is a charitable corporation located in Beverly, Massachusetts, U.S.A. All matters relating to or arising out of or involving in any way your relationship with SFS shall be governed by Massachusetts law and any legal dispute shall be determined by a Massachusetts court.

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 or 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.



Photo: Gregg Tivnan

"I had never gone camping before, not even in my backyard. The rest of the group had bombarded me with wonderful expectations but I simply didn't know how I would cope without running water overnight, let alone for three nights and four days! I survived the first night in a tent, in fact, I survived the five consecutive trips and was almost sad to return to the comfort of the last trip."

Paul M. Schenck, Fort City, PA - Tufts University

Tuitions, Costs and Refund Policies

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. Your tuition pays for instruction, room and board, and ground transportation during the course. It also covers 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. A non-refundable registration fee of \$100 for summer courses or \$150 for semester programs is due with your deposit. *(Deposits and registration fees for financial aid candidates are non-refundable 10 days following financial aid offer. You must complete and return the financial aid application within 10 days of acceptance to qualify for refund status.)*

Full tuition is due sixty days prior to course departure. You will not be allowed to participate in the program with an outstanding tuition balance. **Note:** The tuition fees listed in this catalogue are based on estimates made up to 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.

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 all travel. This agent will arrange travel to the program with any special arrangements you require. If you do not use the SFS agent, you **must** have your travel plans approved by the SFS Admissions Office. You will receive specific travel details after your acceptance. You are responsible for passport/visa fees as well as all transportation costs to and from the departure point.

Tuition

SFS Fall 1996 and Spring 1997 Semester Programs

(All semester programs have an additional \$150 registration fee)

Wildlife Management Studies/KENYA	\$11,600
Marine Resource Studies/BRITISH WEST INDIES	\$11,200
Coastal Rainforests and Marine Resources/CANADA	\$11,200
Wetlands Studies/MEXICO	\$11,200
Island Management Studies/PALAU	\$11,200
Sustainable Development Studies/COSTA RICA	\$11,200
Tropical Rainforest Studies/AUSTRALIA	\$11,600

Summer 1996 Programs (30 Days)

(All summer programs have an additional \$100 registration fee)

Community Wildlife Management/KENYA	\$3,350
Marine Parks Management/BRITISH WEST INDIES	\$3,020
Conserving Marine Resources and Coastal Rainforests/CANADA	\$2,770
Tropical Island Resources/PALAU	\$3,150
Alternative Strategies for Preserving Tropical Ecosystems/COSTA RICA	\$2,910
Tropical Reforestation/AUSTRALIA	\$3,270

Clothing and Equipment: SFS will provide food, cooking equipment, tents and all scientific and research equipment. You are responsible for personal gear including sleeping bags, backpacks, clothing, SCUBA gear (if applicable). You may find you already have much of what you need.

Physical Examination and Medical Insurance: You must present a completed SFS Medical Form, signed by a doctor, no later than 30 days before program departure. Students with late medical forms may forfeit their space. All medical forms must be approved by the SFS Medical Committee.

You must be able to meet the physical challenges presented by SFS programs without undue risk to yourself or others. Some applicants may be asked to provide additional documentation (eg. *individuals with a history of respiratory problems who wish to SCUBA dive*). Academically qualified individuals may be disqualified from participating on medical grounds. You will not be allowed to join an SFS program without proof of up-to-date medical coverage and a signed medical release.

Refund Policies

Summer Courses: Registration fees are non-refundable and non-transferable. Deposits are non-refundable. If you withdraw prior to 21 days before the start of the course, it may be possible to transfer your non-refundable deposit to another SFS program within a 12 month period. If you withdraw 21 days or less before the start of your 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 you withdraw 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 your non-refundable deposit to another SFS program within a 12 month period. If you withdraw from a course 30 days prior to the program commencement to 14 days after the 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 SCHOOL FOR FIELD STUDIES

THE SFS ORGANIZATION

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