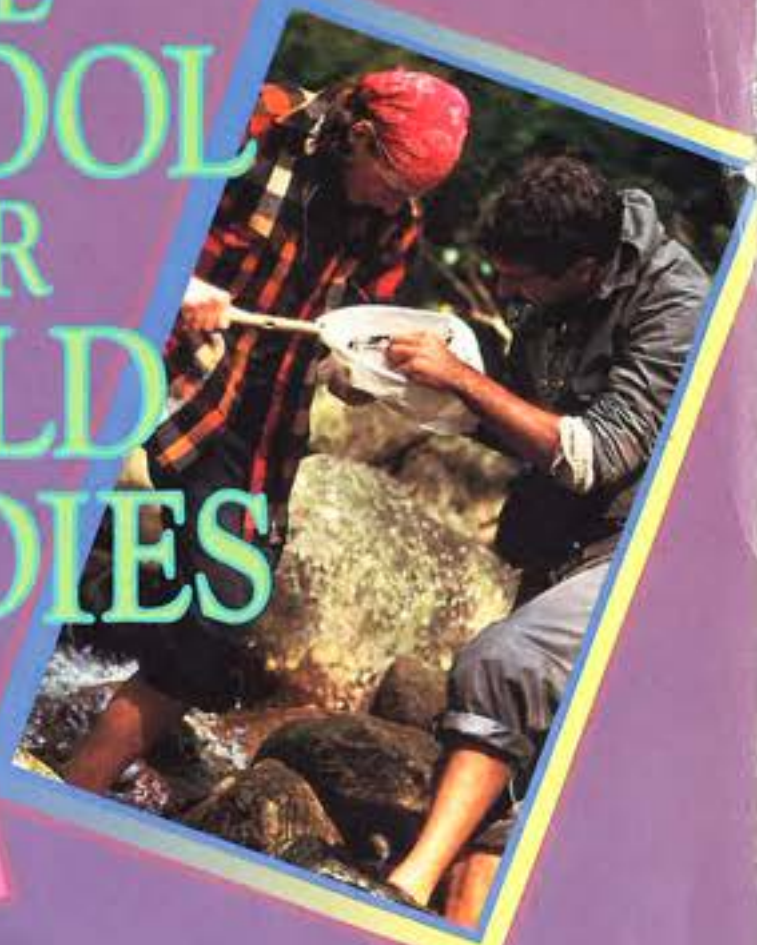
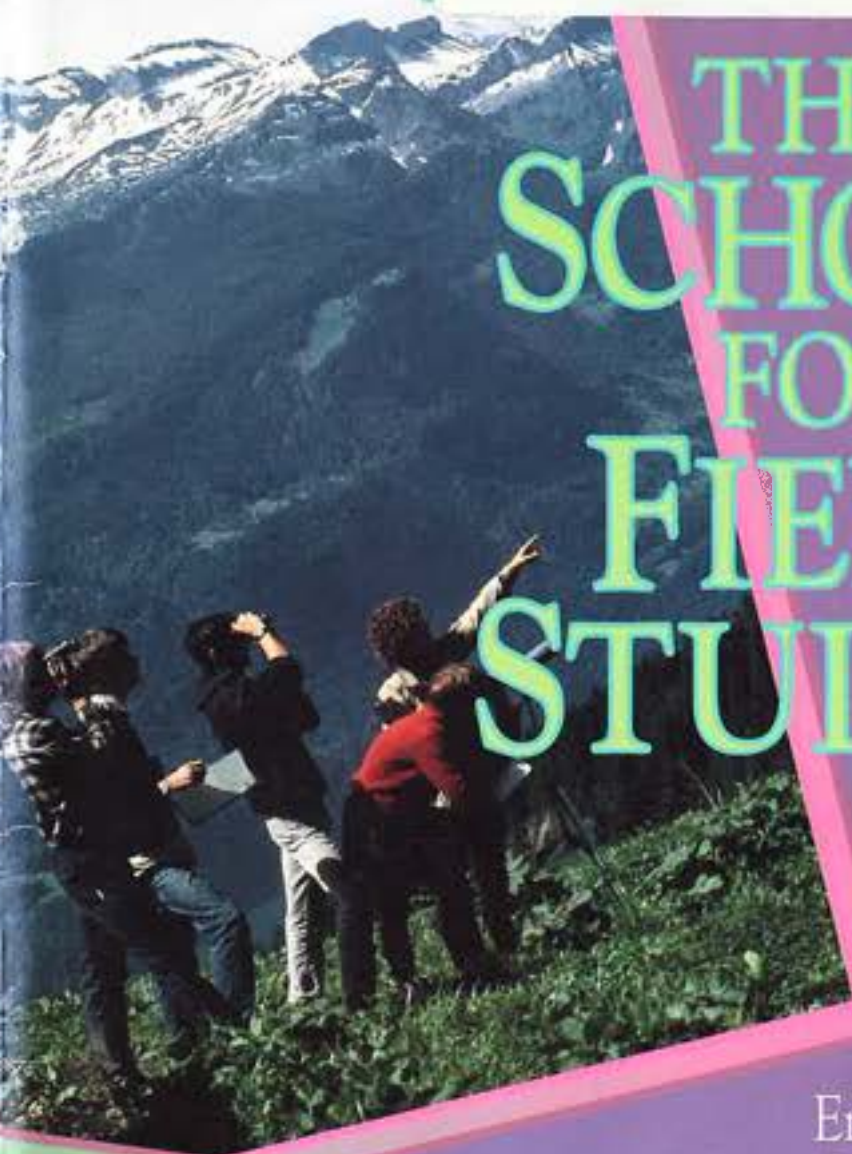


DESK COPY

THE SCHOOL FOR FIELD STUDIES



Environmental Semester Programs

Sustainable Development Studies – COSTA RICA

Wildlife Management Studies – KENYA

Island Management Studies – PALAU

Marine Resource Studies – CARIBBEAN

Marine Mammal Studies – MEXICO

Rainforest Studies – AUSTRALIA

Coastal Studies – BRITISH COLUMBIA

and Summer Courses
around the world

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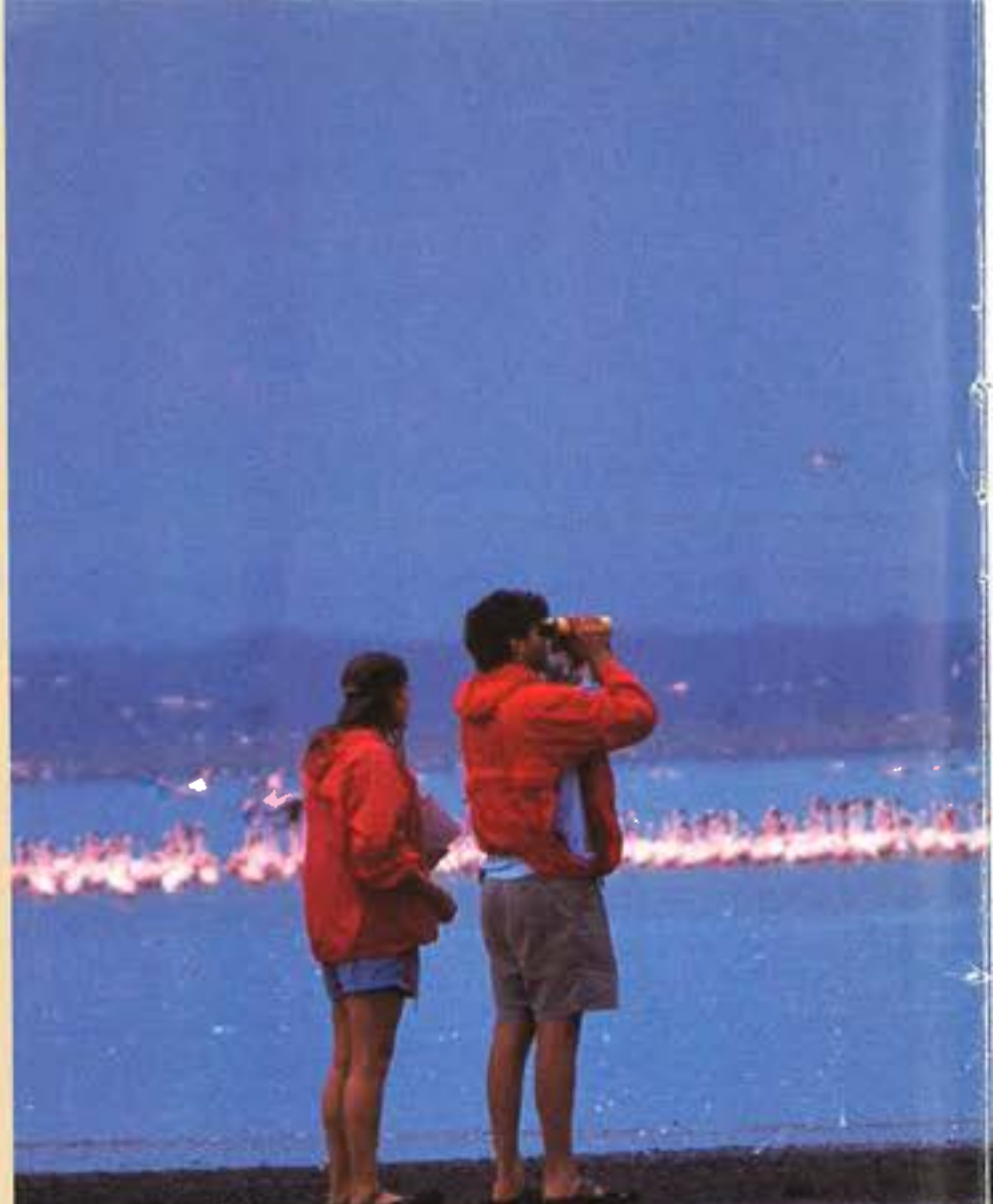
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The Mission
*of The School for Field Studies
 is to provide motivated young
 people from the U.S. and abroad
 with an excellent practical
 education in environmental
 studies, in order that they
 may become more
 environmentally literate and
 aware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

Viewing the flamingoes - Lake Nakuru, Kenya.

Photo: Pete Coppalillo



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 5,500 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 or 45 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 development and conservation, and finding ways to manage and maintain wildlife 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 longterm projects and to develop strong relationships with the local community and partnerships with regional management agencies. **In addition, SFS offers eight summer courses at satellite sites** where we have the flexibility to mount shorter-term projects addressing timely environmental issues worldwide.

SFS Centers & Satellites



The Center for Sustainable Development Studies Costa Rica

The Center for Wildlife Management Studies Kenya

The Center for Island Management Studies Palau

The Center for Marine Resource Studies Turks and Caicos Islands, BWI

The Center for Marine Mammal Studies Baja, Mexico

The Center for Rainforest Studies Queensland, Australia

The Center for Coastal Studies British Columbia

Summer Satellite Programs

Protecting Birds of Prey: *Montana*

Conservation Education: *Belize*

Ethnobotany: *Mexico*

Killer Whale Conservation: *Puget Sound, Washington*

Village Development in Fragile Mountain Ecosystems: *Nepal*

Planning Parks for Preservation: *Argentina*

Protecting the Rainforests of Home: *British Columbia*

Design and Delivery of Appropriate Energy Technologies: *Zimbabwe*

Ideas are keystone. They leave their mark on the landscape just as surely as chainsaws and bulldozers. Machines, after all, are only the agents of ethical precepts sanctioned by the members of a particular society. The most serious form of pollution is mind pollution. Environmental reform ultimately depends on changing values...

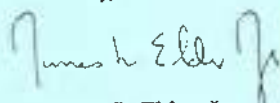
Roderick Nash

As the environmental crisis escalates, more and more people are recognizing the practical value of preserving ecosystems, balancing development and conservation, and finding ways to manage and maintain wildlife and marine resources. What has been lacking in the environmental movement, however, are leaders who can fully assess an environmental problem and then implement sustainable solutions. Several Trustees and I founded The School for Field Studies fourteen years ago to fill this void.

SFS offers you an effective means of channelling your environmental interest and commitment through field and course work at one of our seven centers or eight summer satellite sites, located in some of the world's most fragile ecosystems. As you study environmental problems first-hand, you will be able to make immediate contributions to their solutions while also heightening your understanding of global environmental issues.

Our environmental crisis presents us with a unique opportunity to unite for a common good. Through education and coordinated action, we can return the health of the planet to a sustainable course. Providing people with the education and motivation to change their values and their actions is a big task. SFS will provide you the tools and support you will need to take on this challenge. I hope that one of the opportunities presented in this catalogue will motivate you to get involved. The challenge awaits you, I invite you to accept.

Sincerely,



James L. Elder, Jr.
President



Photo: Robert Boss

P.S. Don't let financial concerns stop you from applying. If you would like information about our financial aid program, please call the Admissions Office at 508/927-7777.

Why Participate in The School for Field Studies?

Learn about environmental issues first-hand.

Help solve important environmental problems.

Gain practical field experience.

Experience the rewards of living in a natural environment.

Learn from experienced faculty.

Acquire valuable critical thinking skills.

Gain experience in teamwork and cooperative problem-solving.

Work closely with people who share similar goals and interests.

Explore a potential major or career and gain job skills.

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: Dick Cavallaro

"A friend of mine attended a SFS program...He was enthusiastic and admitted that although his course was two years before, he still thought of something he learned or someone he met at least once a day. It impressed me that a SFS experience could effect his life in so many ways."

"I would like to thank SFS for your efforts this past summer conducting raptor studies at and around Maverick Mountain Ski Area. As you know, detailed information on raptor nest sites and habitat is limited for this area... Your discovery of the goshawk nest was instrumental in the reroute of the Maverick/Grasshopper Snowmobile Trail. This type of information is extremely valuable in light of the permittee's wishes to expand the ski slope to the north face in Blue Creek. Thanks again for the great job..."

William Hicks
District Ranger
U.S. Forest Service

3 Gain practical field experience. One of our goals is to intro-

duce 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 environ-

ment. 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.

"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



Photo: Bill McComas



“The most fascinating thing about the SFS Kenya faculty is that they are not just ecology teachers or economics teachers but they are also teachers about Kenya ... all aspects of Kenya. They are teachers about life and the people, and that is a wonderful quality. It shows me that in life I cannot limit myself to learning one subject – that finding a solution can be an all encompassing search.”

“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

5 Learn from experienced faculty. SFS faculty are selected for their 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 are accessible, committed to helping you learn, and are successful practitioners of careers to which you may aspire.

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 and throughout your life.

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.

SFS semester teams consist of four faculty and no more than 32 students. Summer teams are comprised of 2 faculty and no more than 16 students or 4 faculty and no more than 32 students.

SFS students come from public and private high schools, colleges, and universities. They major in everything from science to liberal arts. They come from across North America and from many other countries. They are as young as 16 and as old as 25-26. Approximately 25% receive financial aid from SFS to enable their participation. (See page 46 for financial aid information.)

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.



8 Work closely with people who share similar goals and interests. 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 towards a common goal form the basis of friendships that endure over the years.

"I write to thank you for all the opportunities which SFS has provided me. As a result of that first Kenya semester program, I decided to pursue a career in wildlife management. I returned to Kenya as a Peace Corps volunteer, and then continued working for a local NGO. Since I began my research for my Master's degree, SFS has been very helpful and encouraging. Now, my Fulbright grant will hopefully enable me to contribute something to the process of developing wildlife management in Kenya. There is much I have to thank you for - no event in our lives occurs in isolation. The support for my project and the process involved to develop it began through being a student here. SFS is a brilliant concept and I wish you the greatest of continued success."

Heather Eves 1985 Kenya Semester Participant

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, 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 a SFS program,

students receive credit in biology, economics, anthropology or interdisciplinary study through Northeastern University, the nation's leader in hands-on cooperative education programs, 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 45.

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: Niels Godfredsen

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!

Peter Coppolillo

Peter Coppolillo
Kenya Semester Participant

Not Your Typical Classroom

Our mission calls for the School to provide students with an excellent practical education in environmental studies and, as an integral part of that education, a chance to participate in making a meaningful contribution towards solving environmental problems. To accomplish this, we have focused our field work in each SFS program to provide solutions to local and regional environmental problems, especially those problems which exist in other contexts across the globe.

All SFS programs begin with an investigation of one or more environmental problems. We then study the theories that are relevant to understanding these complex problems, usually including a combination of disciplinary perspectives including biology, ecology, resource management, economics, applied anthropology, and political science. We integrate these perspectives through the examination of specific case studies that illustrate the problems we are considering. 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. This concept is known as sustainable development.

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 learn in the SFS 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 as an essential part of our educational process.

Field work is 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. Mastering these challenges requires developing problem-solving and team building skills that are useful long after you leave the field.

We seek to put some control of the educational process in your hands. We trust that, if given the opportunity to own and to control the educational process, you will not only participate more fully in your education, but also benefit more fully from the results. Your responsibility to learn in a SFS program is not limited to academics but extends to many aspects of site management, group dynamics, community relationships, and institutional relations.

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

Photo: Bill McComas



Students in Costa Rica assessing potential economic and conservation impacts of setting aside private land, in this case the habitat for several primate species, as a preserve that would also attract ecotourism.

Our goal is for every student involved in a SFS program to:

- experience the opportunity to make a meaningful personal contribution toward improving the condition and/or sustainable management of the natural resources of the community in which they are studying;
- acquire an approach to problem-solving and decision-making that involves identification and comparison of alternative courses of action and consideration of the social, ethical, political, and biological implications of each;
- develop an integrated understanding of environmental issues;
- experience opportunities for personal growth and achievement.

Photo: Jack Shea



SFS Semester Programs

Clients/Partners

The case studies and conservation field work in our curricula can only be successful to the extent to which we develop partnerships and client relationships with local individuals, organizations, and agencies interested in conservation. A program partner is a collaborating organization, such as a university, government agency, non-governmental organization, or private group/individual. Our clients are working on environmental issues which we feel are important and will provide suitable material for an applied education - and most importantly, they need SFS's help. An example of a partner is the Universidad Autonoma de Baja California Sur in La Paz, which has an extensive marine research program in Baja Mexico. One of our clients in Baja is SEDESOL, the agency responsible for managing the islands in the Bay of La Paz. They have asked SFS to develop a management plan to restore the islands' natural ecosystems.

Field and Community Service Projects

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.

In addition, at each Center and in selected satellite programs, you may engage in conservation 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.

Fall and spring semester programs run for fourteen weeks and enroll 30-32 students each. Semester programs are offered at each of the seven Centers. For purposes of credit transfer and accreditation, we have separated the lectures and field work in the semester curriculum into four separate university courses. Three of these courses (*usually an ecology course, a resource management course, and a socio-economic or applied anthropology course*) 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, and 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 that addresses a component of the research objective for that particular semester. (Please see pages 28-29 for individual course descriptions). Together these four courses carry

21 quarter credits, which usually convert to approximately 16 semester credits.

Journal Entry, Week #4
The Centre for Rainforest Studies Warrabee, Australia
Monday — Tony's turn this week, initiating his case study with an overview lecture on Principles of restoration ecology. Paul followed leading a discussion pondering ... Why are there so many species of trees in rainforests and what does this mean for rainforest restorationists? Thus, the seeds of Tony's case study were sown (no pun intended). A post lunch jaunt into the rainforest kept us enthralled until dinner prep. Our focus was natural forest regeneration processes. After dinner, the "green committee" met to plan for this weekend's highway cleanup and to set up an alternative energy options booth at the Yungaburra market for inquiring locals.
Tuesday — Rain, rain and more rain - isn't this the dry season? While Carrie and Diana were restocking in Cairns, David led a discussion on the concept of "natural", focussing specifically on the ability of humans to create natural environments. This was followed by Tony's continuing case study on succession processes and rainforest dynamics. Mini-warrawork - (camp clean-up) followed. More exciting was our first batch of Mague Chow, one of Paul's delectable Louisiana dishes (corn and butter in a milk base with fried chicken and lots of cajun spice). HOT HOT HOT!!...

The Case Study Approach

We realize our educational goals through the investigation of three to four case studies. A SFS case study involves analyzing an actual environmental problem and will require you to make recommendations for actions or solutions, often with incomplete or conflicting data.

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. You will confront the need to make a decision, usually in the face of 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 students to reconcile a local economic need with local and international conservation interests. Debates, policy statements, or management plans often serve as a concluding and evaluative stage to the program.

Instructors routinely lecture together and cooperate in field exercises so that their skills and experiences are optimally utilized. Courses are linked by field work assignments and other activities. The goal of the case study approach is to integrate the lectures, discussions, debates, and field trips into a nearly seamless academic experience.

The case studies core of the semester is preceded by an Introductory Module which will orient you to the site and specific environmental issues. 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.

Faculty

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

Schedule

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

The program begins with a ten day-long introductory module. 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. 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*).

Our weekly schedule will vary significantly from the beginning of the semester to the end. 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 scheduling is normally maintained on a six day a week schedule.

Toward the latter half of the semester, there will be fewer lectures and organized classes and more time is allocated for Directed Research projects. Additional meetings are scheduled to offer training sessions in the skills (*statistics, paper writing formats, computer spreadsheets, word processing, 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. Throughout the semesters, Sundays are almost always reserved for studying and relaxing. Staff are provided one day off a week, which may or may not be on Sunday depending on their duty schedule.

Prerequisites

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

WILDLIFE ECOLOGY AND MANAGEMENT

Program Objective

To develop scientifically sound and culturally and economically appropriate guidelines for managing game on the Kenyan plains that respect both the country's need for agricultural production and its history and identity as a famous home for wildlife.

Critical Issues

Kenya's reputation and reality are on a collision course. Its need for food has so stressed its patterns of land-use that huge tracts of wildlife habitat have been reallocated to food production. Reductions in habitat size and destruction of migration corridors threaten the survival of wildlife populations and the tourist industry based on them. 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?
- ◆ How can the co-existence of wildlife and humans be encouraged?
- ◆ What are the cultural and economic barriers to changing land-use patterns in rural Kenya?

Clients/Partners

Our data will be used by the Kenya Wildlife Service, which is charged with conserving and commercializing the country's parks, and by private organizations hoping to assist this shift in Kenya's economy, such as the World Bank and the World Wildlife Fund. Private raisers of game (including Game Ranching Ltd., the home of our Center) welcome our research into the ecological impacts of game ranching. Our findings may also be of use to tribal cooperatives seeking alternative methods of food production.

Students will be registered in four academic courses:

- BIO 1821 Techniques of Wildlife Management
- BIO 1823 Wildlife Ecology
- ECN 1912 Environmental Policy and Socioeconomic Values
- INT 1191 Directed Research

(Please see pages 28-29 for course descriptions)

Program Dates: September 9 - December 12, 1994
February 1 - May 7, 1995

Departure Point: Nairobi, Kenya

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

Resident Faculty: Janet Rasmussen, Ph.D., Purdue University (Ecology).
Richard Hatfield, M.S., Cornell University (Agricultural Economics) and
M.I.M., American Graduate School of International Management.

Community Wildlife Management



Programs

Wildlife Ecology and Management
— Semester Program

Community Wildlife Management
— Summer Course

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 astonishing variety of wildlife: antelope, zebra, rhino, and elephant, as well as the lions, cheetahs and leopards which prey on them.



"I can't recall a class where one couldn't look up and see a giraffe, oryx, eland or kongoni less than fifty meters from the classroom. This setting offered us a 'hands-on' laboratory where the examples we discussed in lecture could be explored up close immediately after class."

Colinne Banel, Wooster, OH - UCLA

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 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 stunning 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

Continued Next Page

Photo: Fitch Ruggiero



experimental game ranch on the high plains. Eland and Grant's gazelle wander freely through our cluster of thatched roofed huts. The acacia trees surrounding our rustic compound are a favorite snack of local giraffes. You may look out from our open-sided lecture hall to find one of these slender giants blocking your view.

The wildebeest, zebra, impala and fringe-eared oryx roaming the ranch remind us hourly that we are in Africa. To complete the picture, Mount Lukenya dominates the eastern horizon; Dinesen's beloved Ngong Hills lie due north.



Photo: Pete Coppolillo

Our field work will include investigating cultural, economic and practical barriers to wildlife ranching as a sustainable land-use option. In doing so we must determine rural residents' attitudes toward purchasing and eating game meat.

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 camp. Students sleep in bandas, traditional thatched roofed huts. An open dining/lecture hall, library, outhouses and open-air shower complete our base camp.

Living and Working Conditions

Days follow a structured pattern early in the semester: Mornings are reserved for lectures, afternoons for field work, and after-dinner hours for presentations and guest lectures. But this schedule will soon be disrupted; we plan to make three extended field trips of at least a week each to sites in other parts of the country. 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 fill our days.

Even at rest, we will seem on safari; there is no telephone, computers are strictly lap-top, and vehicle access is entirely by four-wheel drive. We will prepare most meals, with the aid of a local cook; food stuffs are Western with an African influence (the Kenyan traditional diet lays heavy emphasis on animal protein, but we make an effort

Meetings with local residents, such as this park official, often provide a very different perspective on the conservation questions we are addressing. "I felt that we were discussing things that were happening to real people in real places."

Jessica Blish, Middlebury, VT • Wellesley College



Photo: Dick Garstang

One of the challenges we face early on is identifying an appropriate research methodology for our field work. Innovative students in Kenya designed and built a tower for observing bird behavior using locally available materials.

to procure fruit and vegetables). Game meat from animals raised and slaughtered on the ranch provides occasional unusual 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 belong to several Kenyan tribal groups, including the storied Maasai. Our field-trips and discussions with management officials will bring us into contact with other tribal groups and indigenous communities, providing exposure to the multifaceted basis of Kenyan rural society.

WILDLIFE ECOLOGY AND MANAGEMENT

Background

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. Kenya's traditional land allotment practices and the immense cultural importance of beef cattle now place tremendous stress on its agricultural land.

One result has been massive reallocation of formerly protected wildlife range, which has reduced habitat and undermines the longterm 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 income. Clearly, ecologically appropriate solutions to the conflict between food production and wildlife habitat must be found.



Photo: Pete Coppolino

Visits to two Kenyan parks – Tsavo West and Amboseli – provide dramatic illustrations for our case study of the dilemmas of elephant management.

Educational Objectives

We will begin the semester with a 10-day overview introducing the problem-oriented case studies approach and the environment and ecological concerns of Kenya. We spend the remainder of the semester examining three case studies and pursuing directed research projects which integrate material from the four courses.

Case Study #1: How Can Local Communities Live With Wildlife?

The tremendous strain placed on land in Kenya by its burgeoning population has pushed the government into reallocating public land to private land, and also directing tribal owners to farm the savanna for agricultural use. The wildlife which formerly roamed across an expansive range now finds itself hemmed in by human settlement. At Lake Nakuru, one of our field trip sites for example, demand for access to fresh water has created a ring of disturbance completely enclosing a narrow wildlife range along the shore. We will compare the situation in Kitengela Conservation Area, a protected region adjacent to our Center, and sites we visit during field trips. Using censusing and habitat assessment techniques, we will compare wildlife conditions at several sites. Interviewing community members will help us to assess attitudes toward wildlife as part of our efforts to determine whether economic and cultural incentives can be created to promote wildlife conservation.

Case Study #2: What are The Most Viable Strategies for Managing Elephants?

Two major Kenyan parks – Tsavo West and Amboseli – provide examples of the dilemmas of elephant management. In Tsavo, the elephant population is slowly climbing back after declining precipitously in the 1960s. Here vegetation is now luxurious and other wildlife is abundant; lions roar at night near our campsites. In Amboseli, elephants are abundant – a slow-moving elephant



Photo: Sue Natali

herd may completely surround our vehicles on an Amboseli road. A large elephant population creates a landscape that is lunar-like in its starkness and other wildlife are often seen as carcasses after dying from starvation. 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 the proper methods for managing elephant populations and ecosystems in a sustainable manner. We will make an extended safari to these parks to assess this contrast and learn the perspectives of regional wildlife managers. We can then explore options, including the ivory trade ban, for sustainable management of this emotionally focused and ecologically important wildlife species.

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 harsh environment, has not fulfilled its early promise. It remains largely the province of whites, and has not penetrated tribal culture. This is despite many tribes whose traditional inheritance practices have diced their land into agricultural uselessness and who now sorely need an alternative protein source. In the context of field trips to ranching establishments and in discussion with native experts on wildlife, we will explore whether wildlife is the most appropriate and sustainable land-use option. Utilizing economic analyses and anthropological interviewing techniques, we will investigate cultural, economic and practical barriers to wildlife ranching. Part of our work will be to determine rural residents' attitudes toward purchasing and eating game meat, as well the nutritional value of game meat for human consumption given protein content and parasite loads.

Center For Marine Resource Studies

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



Photo: Jim Elder

turquoise waters, where visibility is often 100 feet, one is amazed at the beauty and variety of fish and invertebrate species.

Over 40 species of corals and 100 species of fish have been identified on the pristine reefs including southern stingrays, eagle rays, several shark species, and grouper. The islands are inhabited by lizards, iguanas and birds, and are nesting sites for hawksbill and green turtles.

Most of South Caicos' 1000 residents (known locally as "Belongers") live in the island's only town, Cockburn Harbor. The town is the site of the island's only industry, three small fish processing plants.

Center Facilities

The SFS Center for Marine Resource Studies is based in a former hotel on the southern edge of South Caicos Island. Perched atop a small bluff, the Center overlooks clear Caribbean waters and undeveloped offshore cays as well as the town of Cockburn Harbor. The Caribbean-style architecture uses shade and trade wind ventilation to cool the rooms. 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, brightly muraled dining area, kitchen, classroom, library, study areas and small computer center. Each of the eight residence rooms houses four students and has a bath and an often necessary ceiling fan. We are fully equipped for marine operations with a private dock, five boats and a commercial SCUBA compressor. The site affords easy access to shallow expanses of turquoise waters or to the deep blue of the open sea.

Living and Working Conditions

A typical day during the first half of the semester includes 2-3, hour-long, morning lectures. Afternoons are devoted to field work, usually comprised of data collection using SCUBA or snorkeling, or, since we won't be diving every day, a field trip. Evenings may include a guest lecture, presentation 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 local residents.

This is a true tropical climate with hot (80-90's) days and warm (70-80's) nights. Tradewinds keep our rustic site comfortable and free of biting insects throughout most of the year. Ocean temperatures average in the upper 70's. Many of our field work sites can be accessed by snorkeling. When we dive, it will usually be in waters under 60 feet deep, although we will try to visit the drop off for deeper dives a few times during each program.

Although the Center employs a cook, we will all participate in kitchen duty. Meals primarily consist of simple food (rice, beans, canned fruits and vegetables) provided via regular shipments from the U.S.



Photo: Beth Bader

On SEA DAY, local children come to the Center to learn more about their ocean environment. The local head of government recently noted that "Since SFS has been on South Caicos, grades on high school science exams have gone from last in the country to first and I believe SFS's presence in the community and work in the schools is primarily responsible."

Background

The Turks and Caicos Islands (TCI) were once the world's largest exporter of conch and an important exporter of 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 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 are poised to become major issues for South Caicos. Rapid development may offer residents short term financial gain while threatening the island's resource base. If the TCI are 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: Bob Singer

During lobster season, individual local fisherman 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.

Educational Objectives

We begin the semester with a study model introducing the problem-oriented case studies approach and the environment and community of South Caicos. We then spend the remainder of the semester examining four specific case studies and undertaking directed field projects integrating material from our four courses.

Case Study #1: What can be done to Minimize Threats to Local Coral Reefs?

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. 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. During our dives we will survey corals for any signs of damage or disease. 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 these fragile ecosystems.

Case Study #2: What is a Sustainable Level of Lobster and Conch Harvesting?

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 field measurements of population size and distribution, we will discuss concepts of sustained yield and strategies for stock enhancement. Visits to lobster and conch processing plants and meetings with local fisherman and fisheries officials will engender discussions of catch restrictions and fishing controls. Case examples from other fisheries will be examined. Our recommendations for the TCI will consider the social costs of both over-fishing and planned restrictions.



Photo: Pam Buckman

"Not only do I now know what it is like to get down on my hands and knees in the dirt to search for data, I also know what it is like to analyze data, write a clear research report and stand up in front of a group to present my findings."

Heather Gureton, Hgou, TX • Trinity University

Case Study #3: What is the Potential for Fin Fish Fisheries?

The fin fishery, currently a less developed subsistence industry, 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 South Caicos, we must understand the potential and long and short-term benefits of intensified use of the fin fishery. We will examine the biology and habitat requirements for reef fish and the potential for increasing stocks. Using computer simulations, we can predict outcomes and yields of various fishing decisions.

Case Study #4: 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 Park 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.

TROPICAL RAINFOREST MANAGEMENT



Program Objective

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

Critical Issues

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

- ◆ What changes can be made to current agricultural practices that will promote longterm sustainability of agricultural and conservation efforts?
- ◆ What kind of human control can be exerted over degraded areas to assure the success of reforestation efforts?
- ◆ Can corridors be established that will reduce habitat fragmentation and improve the longterm preservation of plants and animals?
- ◆ Are continued agricultural development and human settlement compatible with preservation and maintenance of biodiversity in the tropical rainforest?

Clients/Partners

We will share our data with the Commonwealth Science and Industrial Research Organization, the Wet Tropics Management Agency, 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.

Students will be registered in four academic courses:

- BIO 1825 Rainforest Ecology
- BIO 1845 Principles of Forest Management
- ECN 1912 Environmental Policy and Socioeconomic Values
- INT 1191 Directed Research

(Please see pages 28-29 for course descriptions.)

Program Dates: September 9 - December 12, 1994
February 1 - May 7, 1995

Departure Point: Cairns, Queensland, Australia

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

Resident Faculty: Tony Cummings, M.E.S., Yale University (Environmental Studies)
David Bathgate, Ph.D., University of Colorado (Ecological Anthropology).
Amy Jansen, Ph.D., James Cook University (Vertebrate Ecology).



Programs offered

Tropical Rainforest Management

—Semester Program

Tropical Reforestation

—Summer Program

The State of Queensland constitutes Australia's northeast corner. Tropical Far North Queensland peninsula hosts the greatest biological, climatic and social diversity in all Australia. 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.



Photo: Diana Swan

Students and faculty have planted over 2,000 trees in deforested areas. Over 5,000 seedlings are now growing in our shade house; our ultimate goal is to produce and plant 20,000 trees per year.

Australia's dense and verdant rainforests are as rich and valuable as their better-known New World counterparts - perhaps even more so. They are treasure houses of primitive flowering plants, species long since extinct on other continents but surviving here since the Mesozoic period. 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 huge range of marsupials such as possums, bandicoots, tree-kangaroos and gliders, evidence of an evolutionary

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TROPICAL RAINFOREST MANAGEMENT

Background

The narrow belt of rainforest which lines the Queensland coast has suffered the same fate as rainforests everywhere; agriculture, ranching, mining and logging have destroyed and disrupted habitat. Australia, realizing that its forests shelter primitive



Photo: David Saffgate

plant species and unique birds and marsupials found nowhere else on earth, moved to confront the threats to its forests faster than any other tropical country. In 1988, its remaining tropical forests were declared protected World Heritage sites.

This decision was enormously 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, reforestation, etc. Yet Australia's active exploration of these issues puts it years ahead of other tropical rainforest countries, and solutions developed here may serve as models for the rest of the world.

Educational Objectives

We begin the semester with a week of preliminary lectures, plus a week-long introduction to research techniques, statistics and scientific writing. All three case studies we will undertake address local environmental problems, particularly conflicts between conservation and the use of natural resources. Our goal in the case studies and our directed research projects will be to emphasize problem-solving and conflict resolution.

Case Study #1: What are the Most Viable Reforestation Strategies for Patterson Creek?

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, is 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.

Case Study #2: How Can Cassowaries be Conserved and Managed on the Atherton Tableland?

The majestic 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 and management efforts, and its interaction with the local ecosystem is little understood. Field trips



Photo: Bill Lawrence

Many of the species we encounter in the rainforest are found nowhere else on Earth. Here, students examine a lace monitor lizard.

to high density parts of its range and the famous Mission Beach management area, lectures by professional wildlife managers, transect scat censuses, and a habitat mapping project will augment our efforts to add to the database on this shy and little-known animal. In addition, we will complete the first stages of a management plan for cassowaries on the Tableland to be submitted to the newly organized Conservation Research Center in Cairns.

Case Study #3: Are Agroecology and Food Production on the Tableland Sustainable and Compatible with Rainforest Preservation?

Classic Western agricultural methods - deep tilling and heavy chemical use - migrated to Queensland along with European settlers. The humans adapted, but the agricultural practices have severely stressed land on the Atherton Tableland. Intense crop and dairy farming has caused soil erosion and degradation, negative watershed impacts, habitat fragmentation, and chemical pollution. As landuse in the area shifts from traditional farming and ranching to a combination of tree farming, orchards, organic farms and retirement settlement, the debate over what to convert to what uses and how to do so becomes increasingly problematic. We will study landuse patterns, optimal use models, and both conventional and alternative low-input systems - organic farming, permaculture, integrated pest management. Our direct contact with local farmers and agricultural experts allows us to identify and evaluate sustainable methods of food production that have a low impact on the surrounding rainforests.

CONSERVATION OF MARINE MAMMALS AND ISLAND DIVERSITY

Program Objective

To assist local residents and scientists in understanding impacts on marine mammals and coastal ecosystems in Baja California and to provide information for the development of conservation guidelines that are culturally and economically sensitive and ecologically and scientifically sound.

Critical Issues

Stress on the resources of the Bay of La Paz and its islands is rising as tourism, development and sport fishing increase and the local economy changes to meet their needs. Yet the Bay's populations and ecosystems have been little studied. The interactions of humans, marine mammals, island flora and fauna, commercial and prey fish and birds must be investigated before sound management decisions can be made. Among the questions we must ask are:

- ◆ How much disruption is caused by tourism, including coastal disruption from building and development?
- ◆ How does increasing boat traffic, including our own, affect marine mammal populations?
- ◆ What impact does commercial or small-scale fishing have on the food chain of the bay?
- ◆ What are the longterm seasonal patterns in the Bay of La Paz ecosystems and of its marine mammal populations?

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. Our data are frequently presented at international marine mammal conferences, and are also shared with local resource managers and residents.

Students will be registered in four academic courses:

- BIO 1816 Marine Mammal Biology
- BIO 1822 Resource Ecology and Management
- ECN 1912 Environmental Policy and Socioeconomic Values
- INT 1191 Directed Research

(Please see pages 28-29 for course descriptions)

Program Dates: September 9 - December 12, 1994
February 1 - May 7, 1995

Departure Point: La Paz, Baja California Sur

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

Resident Faculty: Lisa Jerez, M.S., University of California at Los Angeles (Latin American Studies).
Carlos Alvarez, M.S., Universidad Nacional de Mexico (Biological Science).

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

SFS gratefully acknowledges The Homeland Foundation for their generous support of this Center



Programs offered

Conservation of Marine Mammals and Island Diversity

—Semester Program

Sea Lion Conservation

—Summer Course

The peninsula of Baja California, 800 miles long and, at its narrowest, only 26 miles wide - separates the warm Sea of Cortez from the cold currents of the open Pacific. These waters are among the most-productive on earth: More than 20 species



Working with the Mexican Ministry of Natural Resources, we will explore how fragile island ecosystems in the Bay of La Paz, which are coming under increasing pressure from camping, tourism and potential development, can be managed to maintain diversity and stability.



of whales and dolphins have been sighted here. Many groups of whale, dolphin, sea lion and porpoise are present year round; other species migrate thousands of miles to access the seasonally abundant supply of fish and plankton.

The Bay of La Paz on the Sea of Cortez teems with an astonishing variety of marine life - California sea lions, bottlenose dolphins, common dolphins, blue whales, Bryde's whales, manta rays, and sharks. Its shores are studded with nesting sites of

Center For Marine Mammal Studies

brown pelicans, terns, blue-footed boobies and Heermann's gulls. Rising from the warm bay waters are the rocky crests of the Espiritu Santo islands, a prime sea lion breeding site and the location for much of our field work.

On shore, the cacti-strewn desert ecosystem is back-dropped by the breathtaking heights of the Sierra de la Laguna mountains. The 160,000-person town of La Paz, nestled on the southern shore of the Bay, is a governmental, tourist, commercial and fishing center which has experienced explosive growth in the 20 years since it was declared a free port. Across a narrow inlet lies El Mogote, a two-kilometer wide peninsula of true desert wildness, which is the site of our SFS Center.

Center Facilities

The Center for Marine Mammal Studies is located in a former hotel which faces across the inlet toward La Paz; at its rear lie mangrove and desert wilderness, the fine sand beach of El Mogote, and the blue waters of the Bay. Students live in four dorm-style rooms equipped with bunkbeds; the building also has a darkroom and laboratory space, and a library and computer room.

The kitchen is commercial-style, and there is a large dining area. A local cook, who will emphasize Mexican dishes, prepares two meals a day. We are responsible for the remaining cooking and for helping the cook at other times; we also do our own clean-up. Time is also set aside each week for Center maintenance and local community service projects.



Photo: Don Crall ©

A portion of our field work will take place on Los Islotes island, an important sea lion rookery, where we will assess impacts of tourism on the marine mammal population.

Living and Working Conditions

During a typical day at the Center we will rise early; with an average of seven roommates, no one sleeps late. We will alternate morning lectures with afternoon field work and data collection; guest speakers and presentations are reserved for after dinner. Our schedule changes to accommodate field trips, which last for several days. Our destinations include inland sites to explore the desert environment; journeys by pangas or larger boats to census marine mammal populations or to access the remote islands to study off-shore conservation issues. Following the five day semester break, more time is allotted for research projects.

The ability to speak and understand Spanish is helpful for our occasional meetings with local fishermen and their families. The social and economic issues that drive their actions and perspectives must be taken into consideration when we develop our recommendations.

The climate is both beautiful and challenging: Be prepared for hot temperatures and strong sun. Baja is a desert environment, but free of tropical diseases - our greatest risks are from dehydration, sun exposure, and occasional encounters with sea urchins, scorpions, stingrays and jellyfish.

"Suddenly I was living as part of a working team of research scientists studying marine mammals. I was no longer just reading books and papers about natural resource management. I was participating in the research, discussion and creation of those papers!"

Elizabeth Mowbray, Atlanta, GA • Davidson College



Photo: Lissa Flemming

You will need strong swimming skills as much of our coursework takes place in small boats or near open water. You will be given a swimming test at the start of the semester. Snorkeling is optional but valuable for studying marine life in the intertidal zones, so bring equipment with you if you have it. SCUBA is not permitted.

Continued Next Page

CALIFORNIA CONSERVATION OF MARINE MAMMALS AND BIODIVERSITY

Background

Marine resources, including 20 species of whales and have drawn tourists to the state since it became easily accessible by land in the 1970s. Yet the environment catering to the tourist industry, commercial fishing and recreational sport fishing, is taxing the ecosystems. Coastal desert and open water and fragile island ecosystems are at risk as marine mammal populations along the coast is impacted. At the same time, local small-scale fisheries, an important source of food and income, is diminishing as fish stocks decline. The communities' dependence on the fishery and desire for income must be balanced while the ecosystems which are the basis of tourist attraction are

Educational Objectives

We begin the semester with a module introducing the problem-oriented case studies approach and an orientation to the environment and community of Baja. The rest of the semester is devoted to exploring three case studies and to pursuing research projects based on material from the four courses.

Case Study #1:

How Can the Human Use of Coastal Islands Be Managed to Maintain Ecosystem Diversity and Stability?

Large-scale commercial fishing usually targets one species, with little regard for impacts to the surrounding ecosystem. In Baja, sardine and anchovy have been heavily fished, particularly over the past five years. Yet these fish are vital to the diet of local seabirds such as pelicans and boobys and to marine mammals including the California sea lion, common dolphin and Bryde's whale. In order to balance Baja's need for fishing income against conservation of marine life, we must determine the relationship between marine mammals and seabirds and the fish they feed on. In order to assess this relationship, we will investigate the abundance and distribution of the mammals, birds and commercially valuable fish, estimate the drain placed on stocks by commercial fishing, and calculate the environmental, economic and social impact of different management strategies.

Case Study #2:

Can Coastal Islands be used as an Ecosystem Resource Without Severe Island Degradation?

Baja was largely inaccessible to visitors until the 1970s, when the first highway opened connecting the U.S. border to the peninsula's tip. Since fresh water is limited, much of Baja remains uninhabited. But tourism and development have gravitated to its spectacular coasts - which, since they contain such fragile ecosystems, are at the greatest risk of disturbance and degradation. Coastal islands, including those in the Bay of La



Photo: Steve Swartz

Paz, are in even greater danger. Because island ecosystems are extremely diverse and, having evolved in isolation from the mainland, they are very vulnerable to intrusion. We will conduct impact assessments to determine the effect of tourism and development on the Bay of La Paz coast and islands, census marine ecosystems, marine mammals and seabirds, and evaluate and recommend potential conservation and management strategies which might ease these strains.

Case Study #3:

How Can Impacts of Small-scale Fisheries on Ecosystems be Minimized?

Small-scale family fishing operations account for a tiny portion of fish catches in the Bay of La Paz, but they provide much of the local food supply and employ most of the local population. Their fishing is close to shore and labor-intensive, usually using gill nets - and in recent years, the quality and size of their catch has been dropping. The fishermen believe fish are stolen from their nets by sea lions, which breed on the near-shore island Los Islotes. On the other hand, many sea lions observed on the island are scarred from net entanglement; many others may have drowned while entangled. To balance local economic pressures with the need to conserve the sea lion population, we must find out more about this potential competition for food. We will study the cultural and economic importance of the fishing operations by interviewing local fishermen and evaluating the quality of fisheries catch. Additional field work may include diet analyses, estimating rates of survival based on population censuses, and conducting surveys to investigate how often marine mammals and sea birds become entangled. Our final product will be proposed management strategies for the fishery.



Photo: Don Croll ©

surrounded by several dynamic desert environments. Our studies focus on the desert ecology focusing on the interface between desert and marine

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SUSTAINABLE DEVELOPMENT STUDIES

Program 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 Issue

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; all 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?

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.

Students will be registered in four academic courses:

- BIO 1849 Tropical Ecology and Sustainable Development
- SOA 1907 Sociopolitical Systems and Sustainable Development
- ECN 1913 Economic and Ethical Issues in Sustainable Development
- INT 1191 Directed Research

(Please see pages 28-29 for course descriptions.)

Program Dates: September 9 - December 12, 1994
February 1 - May 7, 1995

Departure Point: San Jose, Costa Rica

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. Please see page 45 for details.

Prerequisites: This program is offered at the intermediate level.

Applicants must have completed at least one college level ecology, environmental studies, international development and spanish course prior to participating.

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).



Programs Offered

Studies in Sustainable Development

— Semester Program

Alternative Preservation Strategies for Tropical Ecosystems

— Summer Course

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,



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



home to both the capital, San Jose, and Atenas, the 17,000-person county where our Center is found.

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

Continued Next Page

Photo: Chris Vaughan



SFS students planting seedlings with local residents to help stem erosion. The fact that Costa Ricans are addressing their environmental problems with creativity and commitment may ensure the availability of critical resources for the next generation.

Photo: Moises Leon



Picking coffee: "I now recognize that there are many sides to an issue to be taken into account before reaching a solution. I also know that education and opportunities like I had in Costa Rica are ways to bridge the gap between thinking about solutions and taking action."

Tina Van Meter,
Keege Harbor, MI
University of Michigan

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.

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 sugarcane, and raise cattle. In the past three 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.

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 sometimes available.

Living and Working Conditions

During the first half of the semester, 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 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 four very different regions: two areas of lowland tropical forest which include a rainforest and a dry-forest region where cattle-raising and ecotourism are key; a cloud forest and a coastal ecosystem.

Photo: Oscar Luke



Costa Rica has placed over a quarter of its land into preserved areas, yet rates of deforestation outside of these preserves are among the highest in the world.

SUSTAINABLE DEVELOPMENT STUDIES

Background

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

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.

Educational Objectives

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. The remainder of the semester is spent examining three case studies and pursuing directed research projects based on the four courses.

Case Study #1: How Can Forests Be Integrated Into Production Systems?

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. Until recently, its economy was based entirely on agriculture; thus its need for productive growing land outstripped interest in ecosystem preservation. The farmers of Barrio Los Angeles have realized the need to preserve their forests and have organized around the goals of maintaining existing patches, replanting degraded ones, and compensating for contamination in the local river. Becoming familiar with biometrics and field techniques such as measuring and censusing, we can assess local land-use choices and alternatives to conventional agricultural practices. Visits to the rainforest-based La Selva Research Station as well as to coffee and banana plantations in the humid tropical lowlands will help us determine whether nature can be used as a model for local agriculture.

Case Study #2:

How Viable are Ecotourism and Other Alternative Resource Utilization Options?

Tourism has just surpassed agriculture as Costa Rica's chief income source: more than 600,000 tourists visited in 1992, contributing \$413 million to the economy. Most were ecotourists. The country's aggressive land-protection efforts and famous natural resources are a powerful attraction. Yet no one knows whether tourism offers longterm economic viability; it may trigger negative social and cultural impacts, and further strain fragile environments. Through field trips to national parks including Guanacaste, and to private protected areas, we will study tourism's potential impact on ecosystems and social frameworks. We will pay particular attention to ecotourism as a development option, interviewing local residents as we investigate potential positive impacts such as community participation and income redistribution.

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.



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

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

COASTAL RESOURCE STUDIES

for canoes, Sitka spruce for baskets, and Douglas fir for firewood - are now prized in international markets as well.

Rich ocean upwellings feed unusually abundant fish, seabirds, and marine mammals (killer whales, grey whales, Dall's porpoise, and minke whales). Local estuaries support extensive shellfish beds, migrating waterfowl and shorebirds, and vital nursing grounds for fish. Five species of Pacific salmon, steelhead, sea run cutthroat trout, and smelt cycle from freshwater to sea and back again to spawn, supporting one of the world's largest salmon fisheries.

BACKGROUND

Coasts have provided a wealth of resources for humankind for thousands of years; it is no accident that a majority of great civilizations and cities have been established in coastal regions. In many parts of the world, the area of transition from terrestrial to marine influences is of critical importance and is extremely stressed - some would say even more so than the world's tropical rainforests.

On Vancouver Island, this confluence of land and sea, native and non-native cultures, and old growth wilderness and logged forests, has recently generated as much conflict as opportunity. Over the past ten years, several province-sponsored processes have failed, and controversial land-use decisions for Clayoquot have further polarized not only the communities of Clayoquot Sound, but people across Canada and around the world. The forests here are being cut at a rate reported to be twice that of the Brazilian rainforest. While the provincial economy is heavily dependent upon timber, many people believe that

Clayoquot Sound is the place where British Columbia should draw the line on clear-cutting forests. To make their point, they recently mounted the largest civil disobedience campaign in Canada's history. Time is running out, over a quarter of the region has already been denuded.



Photo: Fred Felleman

The world's remaining temperate rainforests occupy less than 1% of the earth's surface. Yet the ancient forests of the Pacific northwest are being clear-cut at a rate reported to be twice that of the Brazilian rainforest.

Living and Working Conditions

Our base will be in or near the small coastal town of Tofino, home to about 1,000 year round residents. An additional 1,000 people live in three nearby native villages. Meares Island, in the main harbor of Clayoquot Sound, is home to many of the Tla-o-qui-aht people, who have inhabited this region for over 4,000 years. Over 750,000 visitors pass through this area annually.

This region boasts literally the mildest climate in Canada (one can work in shirt sleeves at times in January), and it rarely snows on the coast. But, this is a rainforest, with several hundred inches of rain per year! The heaviest rainfall occurs from December through March/April; summer is the sunniest time of year.

Getting around in these dense green forests can be difficult. Curtains of ferns filter the few rays of sunlight that penetrate the evergreen canopy; moss carpets massive rocks and trees trunks exceeding six feet in diameter. The forest floor is littered with fallen logs from trees hundreds of years old. Countless species of wildlife, from small forest mammals to wolves and black bears, find shelter in the jumble of ferns and bushes. Travel is often easiest along stream beds where eagles soar overhead in search of salmon and trout.

For updated details on this new opportunity, please call the SFS Admissions Office.

Photo: Adrian Dorst



Hundreds of thousands of tourists come to Clayoquot Sound each year to take in the fishing, marine mammals, and spectacular coastal and forest vistas. This seemingly idyllic region has recently been at the center of one of Canada's hottest controversies. While the provincial economy is heavily dependent upon timber, many people believe Clayoquot Sound is the place where British Columbia should draw the line on clear-cutting forests.

TRUST TERRITORIES OF THE PACIFIC
REPUBLIC OF PALAU
ISLAND MANAGEMENT STUDIES



The new SFS Center for Island Management Studies will open in Summer 1994 in The Republic of Palau. An island nation situated 500 miles east of the Philippines, Palau's five main islands and hundreds of small atolls and outcrops are tropical oases amid blue Pacific waters. Since the Japanese left here nearly 50 years ago, the 14,000 Palauans have lived in a welfare economy administered by the U.S. Department of Interior. An election in 1993 paved the way for independence by approving the Compact of Free Association, obligating the U.S. 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.

Critical 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 has economic, social, political and ecological implications. Because of the restricted ecology of islands, the introduction of outside agents often leads to loss of biodiversity as native species are decimated. Islands are critical natural resources in and of themselves. Studying their unique aspects enables us to contribute to their preservation, and more clearly understand mainland environmental issues as well.

This one-time opportunity to re-create a society ravaged by colonialism is a tremendous challenge. Examples of short-sighted development abound on other Pacific islands. Palauans are aware of the pitfalls; the path to successful development is much less clear. The role for SFS in this process will be to support the planning efforts by answering the following:

- ♦ What are the unique natural resources, both terrestrial and marine?
- ♦ What are the likely environmental impacts of proposed road building activities and how can they be minimized?
- ♦ 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?
- ♦ How can SFS help develop an environmental ethic in Palau that will support government conservation mandates?

Clients/Partners

One of the state governments of Palau has offered to help SFS develop a site on government land in exchange for our professional cooperation in the planning process. They have a 16-member State Planning Commission with whom we will be cooperating. Also, we hope to work with the Nature Conservancy, which has its Pacific office in Palau, having designated this island nation as one of the world's top ten critical conservation "hot spots."

Students will be registered in four academic courses:

- BIO 1849 Tropical Ecology and Sustainable Development
- BIO 1846 Principles of Resource Management
- ECN 1912 Environmental Policy and Socioeconomic Values
- INT 1191 Directed Research

(Please see pages 28-29 for course descriptions).

Program Dates: September 9 - December 12, 1994
February 1 - May 7, 1995

Departure Point: Koror, Palau

Island Resource Management



The sixteen States of Palau are based on ancient tribal territories and led by Tribal Chiefs. The island nation's capital is Koror, connected to the island of Babeldaob and the international airport by a bridge. Babeldaob, the largest island in the chain, rises 700 feet above the sea. The island is densely covered by lush tropical forests in the uplands, with mangroves, beaches, and isolated hamlets along the coasts. There is no system of roads, electricity, or telephones linking these hamlets, so communication is intermittent and largely by small boat.



Photo: Beth Bader

We will explore Palau's renowned reefs and shallow waters with snorkeling gear. These ecosystems are an ever-increasing draw for tourists and will require thoughtful management plans to insure their protection.

The natural resources here are nothing short of spectacular. The forests provide a haven for colorful native birds. Many plant species are endemic, and rich volcanic soils and heavy rainfall support a verdant forest teeming with wildlife. An offshore reef 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



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

Small cabins with few amenities will most likely serve as our Center base of operations.

seen, but sea turtles can be spotted regularly. These large reptiles and mammals are under threat from poaching and are part of the reason we are here.

Living and Working Conditions

The SFS Center for Island Management Studies will be based in a small village of about 50 families in one of the ten States on the island of Babeldaob. Lectures and field work will be timed to take advantage of local conditions. Typical activities will include long walks to work on resource inventories, near shore swims to study the fringing reefs, and time spent with local residents and officials. Palau is renowned for its reefs, which we will explore from shore with snorkeling gear. (Interested and qualified students may wish to set aside time and money to SCUBA dive with commercial dive operators during the four-day mid-term break or at the end of the semester).

The climate is truly tropical, temperatures vary only slightly from the average of 81°F. Rain averages 148 inches per year; February through May are the driest times, and June, July, and August are wettest. Typhoons come ashore an average of once every 20 years. Our base will most likely consist of small cabins with very few amenities such as electricity or indoor plumbing. Although most food will have to be imported, there is local production of chickens, goats, fish and vegetables including pineapple, yam, and coconut.



Photo: Adrian Boney

Background

Palau has a rich history, having been continuously occupied since 2,500 BC with people of Indonesian ancestry. Giant carved heads, pottery, and money from shells testify to the complexity and ingenuity of the indigenous people. Since 1785, Palau has been colonized alternatively by the British, Spanish, Germans, Japanese, and Americans. Colonization and disease decimated most of the original population. Today, traditional clan chiefs share the government with the elected legislature.

Palauans view the imminent development with hope and fear. Many Palauans look to the 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. A sense of urgency permeates our first semesters here as decisions made in the next year or two will irrevocably impact this unique nation. SFS has entered the fray with the desire 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.

For updated details on this new and unusual opportunity, please call the SFS Admissions Office.



Photo: Ed Stashko

Liana Babbar

Field Director

Center for Sustainable Development Studies

Liana has a Ph.D. from University of Michigan's School of Natural Resources. A Costa Rican citizen, Liana conducted her

thesis research on environmental impacts of the technological transformation in Costa Rican coffee production that has taken place in the past few decades. As an applied ecologist, she has hands-on experience in forestry, agroforestry and agricultural ecology. She taught natural resources and sustainable development at the Institute for Central American Development Studies, and has experience as a coordinator and educator for various field based programs such as the Organization for Tropical Studies (OTS).



Photo: Meghan Kelley

J. Bruce Neill

Field Director

Center for Marine Resource Studies

Bruce received his M.S. from the University of Guam and is a Ph.D. candidate in Biology from Montana State

University. Bruce came to SFS from Central Oregon Community College where he was an instructor. He worked previously as a lecturer in Biology and as the coordinator of problem-solving skills for the General Education Program at Hawaii Loa College where he helped create an interdisciplinary curriculum to teach students how to approach and solve quantitative problems. In addition to publishing a dozen articles, Bruce has conducted research on bald eagles in Montana, rattlesnakes in Florida, selected subtidal biota on PauPau Beach in Saipan and on fish grazing in coral reef communities in Guam.

BIO 1816 Marine Mammal Biology provides an overview of the biology and behavior of marine mammals, concentrating on cetaceans and pinnipeds. We will examine the evolution, systematics, social and behavioral ecology, anatomy, physiology, and adaptations to marine environments of marine mammals. We will discuss the history of marine mammal/human interactions and their ecological role in the past and present. Research will focus on cetaceans and the California sea lion and their interactions with the local human population.

BIO 1821 Techniques of Wildlife Management introduces students to the questions, principles and tools used by resource managers in the Kenyan savanna ecosystem. Students will study habitat assessment, plant and animal identification, plant and animal associations and distributions, and other approaches to evaluating the savanna 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.

BIO 1822 Resource Ecology and Management considers political, cultural, and scientific issues affecting marine systems. We will consider the conservation and management of both global and local resources and investigate how policies are made on a local level and their effect on global resources. Fishing, tourism, development, and pollution will be addressed in this context. We will emphasize the importance of interdisciplinary collaboration in conservation and management of biological diversity. We will also look critically at past and present conservation and management strategies.

BIO 1823 Wildlife Ecology presents students with the information and conceptual background necessary to understand the underlying ecological principles of the East African savanna ecosystem. We will focus on the fundamental processes and interrelationships 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.

BIO 1824 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.

BIO 1825 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 then discuss mechanisms for preserving and restoring tropical ecosystems.

BIO 1845 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 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 suffering from chronic human induced disturbances, provide key foci for applying the principles learned in this course.

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

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

Coastal Ecology examines the ecological processes at the interface between land and sea in order to provide an understanding of how human perturbations can affect marine and terrestrial systems. The watershed concept will be used to explore energy cycling, erosion, coastal circulation, productivity, and biotic interactions. This course is designed to provide a basic understanding of how natural systems function in order to help guide resource managers toward ecologically sound and sustainable development. Field work exposes students to techniques of surveying and monitoring and to biotic interactions in a complex physical/chemical milieu. (As this catalogue goes to press, this new course is pending approval by Northeastern University).

Socio-Political Systems and Sustainable Development examines the development of Costa Rica within an international context to understand the economic, political and social development that have taken Costa Rica from economic isolation to a position of political and social leadership in the Central American region. Topics to be discussed include 1) pre-Columbian Central American and Spanish 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.

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

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

Directed Research prepares students to distinguish hidden assumptions in research approaches and separate fact from interpretation, cause from correlation, and opinion from objectivity. Specific tools will include experimental design, field techniques, descriptive statistics and parametric and non-parametric quantitative analysis. Scientific writing, graphic and tabular presentation of results, and effective oral presentations will be emphasized.

Richard Hatfield

Resident Faculty
Center for Wildlife Management Studies
Richard received his Bachelor of Arts in Geography from King's College, London University. A

native of Kenya, he has worked on a variety of ranches and farms in Kenya, New Zealand, Dominican Republic, and the U.S.A. He subsequently earned a Master's degree in International Management from Thunderbird, before spending five years in international trade management involving Australia, U.S.A, South America and Europe. More recently, he received an M.Sc. from Cornell University in Agricultural Economics, specializing in natural resource economics, where his research concerned the economic and ecological aspects of rangeland overgrazing in Kenya. His most recent work concerned the planning and implementation of an integrated land use plan for rangeland in northern New Mexico.



Photo: Michelle Gaard

"As I end my tenure with SFS, I want to tell you, rather I want to emphasize, what the superlative opportunity to work for SFS has meant to me. As an SFS faculty member, I was exposed to some of the most profound experiences I've enjoyed to date, both through affiliation with professionals and students as well as exposure to natural phenomena. Close association as instructor and friend to the student body was extremely rewarding, perhaps because it demanded that I stretch my own boundaries... The SFS program goals are unique and operational. I willingly join the ranks of those committed to the School's continued campaign to provide exposure and education to the natural world and to the conservation techniques to preserve it for tomorrow."

— excerpt from a letter from Ann Weaver, M.S., as she leaves the SFS Faculty to pursue a Ph.D.

SFS Summer Programs

SFS offers summer programs at all Centers and at eight satellite sites around the world. Satellite programs offer us flexibility to mount shorter-term research efforts addressing timely issues. These projects may take place over one to four or five years. Like Center-based programs, each satellite program has a client and/or partner with whom we share our field work results.

Students attending courses at Centers live in Center facilities; participants in satellite programs usually live in tents or rustic cabins. When necessary, we use mobile camps in order to access the best research sites.

Schedule

Most SFS summer programs run for 30 days and enroll 16 students with two faculty or 32 students with four faculty. Each 30 day program is accredited for 8 quarter credits. We also offer several forty-five day programs comprised of two courses: a theory course (5 quarter credits) and a Directed Research course (6 quarter credits).

You will be involved in activities seven days a week in 30 day summer programs with only one or two days off during the program. These courses usually run from mid-June to mid-July and from mid-July to mid-August.

Longer, 45 day programs run from late June to early August with a 3 day midterm break (when you may be free to travel on your own, depending on the program). In either case, 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. In a typical program, we will awaken early and prepare breakfast as well as a lunch to be eaten in the field. We may either attend a morning lecture or head directly to our research site. We will devote a significant portion of the day to field work, returning to camp in the late afternoon to process our data or, if we haven't already done so, to participate in our daily lecture. After a dinner prepared by the cooking team of the day, we may have a guest lecture, group discussion or study time, before heading off to our sleeping bags.

In the latter half of the course, we will spend less time in lectures and more time working on our directed field projects. Additional meetings may be scheduled to offer training in the skills (statistics, paper writing formats, computer spreadsheets, word processing, and laboratory analysis) needed to complete your research.

Everyone should expect to be involved in kitchen/cooking duty and site clean-up.

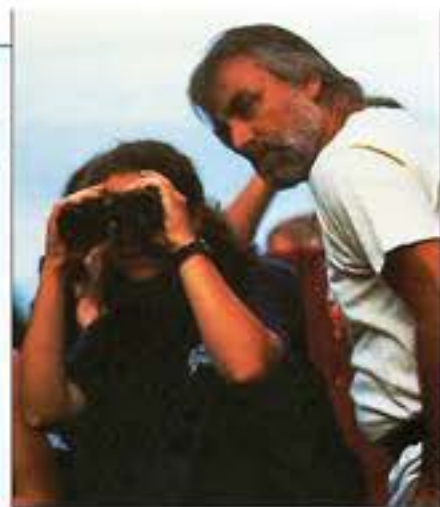


Photo: David Ballgate

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

Faculty

Summer programs at Centers are usually taught by the resident, fulltime, faculty. Satellite programs are taught by two faculty. Faculty all hold an advanced degree (usually the Ph.D.) and usually have at least several years experience in the program topic at the course location. Additional staff may include guest lecturers, interns or field associates. This level of staffing provides you with a remarkably low student to faculty ratio (no higher than 10:1).

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 to individual programs; please be sure to check the specific program descriptions.



Photo: Chris Vaughan

Students in summer programs focus on a single case study, examining a particular complex environmental issue from a combination of ecological, biological, resource management, economic, applied anthropology, and/or political science perspectives. (Please see page 8 for a detailed case study description).

Each program involves traditional 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 or program. 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.



COMMUNITY WILDLIFE MANAGEMENT

Critical Issues

Kenya's magnificent wildlife attract more than a half-million tourists each year who supply the country's primary source of income. The need to feed a rapidly growing human population has strained natural resources and triggered massive land reallocation. This has led to reductions in wildlife habitat and disruption of migration corridors, threatening the survival of wildlife populations and the tourist industry based on them. Imported food sources such as cattle ranching are proving unsustainable and may require sacrificing more land. It is essential to determine if developing Kenya's chief indigenous resource, its wildlife, as a food source, may provide a sustainable solution to this conflict.

Field Work Focus

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

Site: SFS Center for Wildlife Management Studies, based on an 81 square kilometer game ranch in the Athi-Kapiti Plains of Kenya.

Clients/Partners: Our data will be used by the Kenya Wildlife Service, which is charged with conserving and commercializing the country's parks. Private organizations hoping to assist this shift in Kenya's economy, such as the World Bank and the World Wildlife Fund, are also keenly interested. Game ranchers (including Game Ranching Ltd.) welcome our research on the ecological impact of game ranching. Our findings may also be of use to tribal cooperatives seeking alternative food production methods.

Course Number: BIO 1806

Course Dates: Session I: June 14 - July 13
Session II: July 20 - August 18

Departure Point: Nairobi, Kenya

Living and Working Conditions

Eland and oryx wander freely through our field station, an isolated cluster of grass huts which comprise the SFS Center for Wildlife Management Studies. Don't be surprised to look out from the open-sided lecture hall and find your view blocked by a giraffe grazing on a nearby acacia tree.

Sunrises and sunsets here are equally inspiring. This close to the equator, they arrive with breathtaking speed and flood the surrounding savanna with blazing rainbow-hued light. Days are hot; nights are cool enough for long sleeves.

Rising early, we spend most mornings in lectures and afternoons engaged in field work. We will spend a third of the course on safaris to game parks and other communities. During these trips we camp in tents; on the way we may encounter antelope, zebra, rhino, and elephant, as well as the lions and cheetahs which prey on them.

Returning to the Center, we can wash away the road dust in our open-air solar showers. A dining/lecture hall, library, and outhouses complete our camp. We all assist in meal preparation, often using game meat raised on the ranch.



Photo: Rich Ruggiero

When thinking of Kenya, one often has visions of giraffes, zebras, lions and elephants. A number of SFS students have focussed their field work on some of Kenya's spectacular bird species, such as the raptor shown here at our basecamp.

Educational 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, animal identification and social organization, plant/herbivore interactions, and theories of island biogeography. Guest speakers may include experts in ecology and East African history as well as local game ranchers discussing range management techniques.

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



MARINE PARKS MANAGEMENT

Critical Issue

Faced with potential reductions of the lobster and conch catches that provide the base of their economy, residents of South Caicos Island are contemplating tourism, increasingly popular on nearby islands, as a lucrative new resource. Potential development here threatens one of the Caribbean's few remaining pristine marine environments. A national park program recently initiated by the local government hopes to protect marine resources while encouraging economic development. Cataloging species and predicting impacts of development on them will give park planners and fishermen vital information on which to base future management decisions.

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 national parks for comparison with habitats outside the park system.
- ◆ Evaluating the potential environmental and social impact of planned construction and development.

Site: The SFS Center for Marine Resource Studies, based in the town of Cockburn Harbor, South Caicos, BWI.

Clients/Partners: Our data have been requested by the National Parks Department, the British Overseas Development Administration and the Department of Fisheries to support their attempts to balance marine resource preservation against economic development. SFS findings can have a direct impact on management of one of the Caribbean's most unspoiled ecosystems.

Course Number: BIO 1826

Course Dates: Session I: June 14 - July 13
Session II: July 20 - August 18

Departure Point: South Caicos Island

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.

Living and Working Conditions

Steps from our small, converted hotel lie brilliant blue-green waters. Over 100 species of fish have been identified on or near the reefs that fringe these islands. The shore and ocean floor are studded with a mosaic of rich habitats: mangrove swamp, sand flats, seagrass beds, and reefs. We will spend much of our time on or in the water; strong swimming skills are essential, while SCUBA is optional.

On land, we will face the challenge of life in a serene island environment with limited fresh water and off-island contact. Four to five students share each dorm room and bath. Days are hot (80-90's); nights are warm (70-80's) but tradewinds and ceiling fans keep our rustic site cool. Although the Center employs a cook, we will all participate in some phase of kitchen duty. Meals consist of food (rice, beans, fruits and vegetables) provided via shipments from the U.S. and local markets.

Most days will begin with one or more lectures. Afternoons are spent on marine field work, trips to terrestrial sites, or in interviews with the friendly local residents

who call themselves "Belongers". Many of our field sites can be accessed by snorkeling. We will not dive every day and, when we dive, it will usually be in waters under 60 feet deep.

Educational Objectives

Our goal is to provide recommendations for the sustainable development of the area's marine resources. 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 fisheries management and interviews with local residents and fishermen will provide a social and economic context for our investigations.

We will catalog resources within and outside of the park. 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, we will need to coordinate our projects and share data collection.



Photo: Chris Neelus

Upcoming decisions regarding resource development here will influence the fate of one of the most beautiful and unspoiled coastal ecosystems in the Caribbean.



A U S T R A L I A

TROPICAL REFORESTATION

Critical Issue

Tropical rainforests occupy less than 5 percent of the planet's land surface while sheltering at least 50% and perhaps as much as 90% of the earth's species.

Worldwide, rainforests are being destroyed or altered at an estimated rate of 50 acres per minute.

Australia's remaining rainforest was given federal protected status in 1988, in a controversial designation that remains unpopular with some Queensland foresters, miners and farmers. Continued protection and attempts at sustainable use require determining the speed and success rate of forest regeneration.

Exploration of these issues puts Australia years ahead of other tropical-rainforest countries; management solutions developed here may serve as models for the rest of the world.

Field Work Focus

- ♦ Determining what forest birds, mammals and reptiles are most prone to extinction.
- ♦ Investigating how logging alters forest structure and microclimate.
- ♦ 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.

Site: SFS Center for Rainforest Studies, North Queensland, Australia.

Clients/Partners: We will share our data with the Commonwealth Science and Industrial Research Organization, the Wet Tropics Management Agency, and the Cairns and Far North Environmental Center. We frequently work alongside local farmers, ranchers and foresters, who also request our research results.

Course Numbers: BIO 1852 Tropical Reforestation
INT 1191 Directed Research

Program Dates: June 22 - August 5
(Note: This six week program carries 11 quarter credits.)

Departure Point: Cairns, North Queensland, Australia

Living and Working Conditions

The dawn chorus - the singing of myriad birds - and the scurrying of small mammals easily penetrates our camp in the Queensland forest. As we emerge from our 8-person cabins, we are surrounded by 153 acres of lush rainforest, regrowth forest, pastures and orchards. Threaded through with streams and small waterfalls, our property provides habitat for hundreds of species of plant and animals. Wallabies, lorikeets, tree kangaroos, and monitor lizards have all been seen on Center grounds, and flying foxes darken the sky at dusk.

Within minutes, team members can be seen heading toward the main building for breakfast and one or more morning lectures. Afternoons are devoted to field work in the forest and modified habitats of our remote property in the foothills of the Atherton Tableland, 20 minutes from Yungaburra, the nearest small town. It will be winter in the southern hemisphere - but "winter" in North Queensland means cool, misty dawns that brighten to days of more than 20 degrees Celsius.

We buy food locally and do all the cooking and clean-up. In addition to our center and community-based reforesting efforts, students also organize recycling and composting and participate in weekly Center maintenance.



Photo: David Burghelle

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

Educational Objectives

Designation as a World Heritage Site did not eliminate local pressures on the forests; struggles continue over how to manage the multi-use forests, which degraded patches to restore, and whether sustainable use is achievable 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 reforesting 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 conservation biology, forest ecology, tropical resource management, reforestation strategies and population demographics provide a base for our fieldwork. We will become familiar with 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.



B A J A, M E X I C O

Center Description
See Pages 18-20

SEA LION CONSERVATION

Critical Issues

Protecting marine mammal populations requires maintaining delicate coastal and marine ecosystems. Since Baja California became accessible by land in the 1970s, development catering to tourists has increased. Small-scale indigenous fishing and international sport fishing are further taxing local ecosystems. Recent surveys indicate that Sea Lions coming ashore at breeding sites show scars from fishing-net entanglement. Yet fishermen contend the animals steal from their nets. Could the benefit to the Sea Lions of such a concentrated food source outweigh the loss of individuals to entanglement and drowning? Successful preservation of marine mammal habitat will require understanding and balancing the competing requirements of scientific concerns, the indigenous economy, tourism and municipal development.

Field Work Focus

- ◆ Assessing the degree of human disturbance of marine and coastal habitat.
- ◆ Estimating the magnitude and the consequences (physiological, reproductive and behavioral) of Sea Lion entanglement in fishing nets.
- ◆ Evaluating the cultural and economic importance of the fishery.
- ◆ Determining to what degree Sea Lions and the local fishing industry compete for the same food resources.

Site: SFS Center for Marine Mammal Studies, La Paz, Baja California.

Clients/Partners: Our collaboration with local agencies and the Autonomous University of Baja California Sur (UABCS) has produced mapping and descriptions of sea lion populations. This year's findings will be used to assess the balance between development and resource conservation.

Course Number: BIO 1855

Program Dates: Session I: June 14 - July 13
Session II: July 20 - August 18

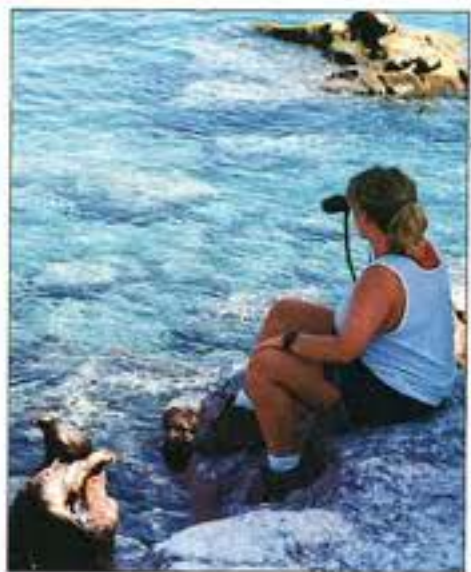
Departure Point: La Paz, Baja California

Living and Working Conditions

Rocky cliffs, cacti-strewn deserts, and sandy beaches ring the blue waters of the Gulf of California. The Bay of La Paz is crowded with an astonishing variety of marine life - bottlenose dolphins, Bryde's whales, manta rays, and sharks - while its shores are dotted with the nesting sites of brown pelicans, terns, blue-

footed boobies and Heermann's gulls. Rising from the warm bay waters are the rocky crests of the Espiritu Santo islands, a primary breeding site for California Sea Lions.

For much of the course, we will stay at the Center for Marine Mammal Studies, based in a rustic hotel across the Bay from the city of La Paz. We will sleep in large dorm rooms, assist the cook with meal preparation, and attend several lectures a day while we are at the Center. During four-day stretches of field work on the islands, we will sleep in tents on the beach or on the deck of our boat. Trips by boat to the islands will be hot and sometimes uncomfortable, but we will be rewarded with immersion in spectacular habitats and the opportunity for close observation of Sea Lions. Good swimming skills are essential - you will be given a swim test upon arrival - and snorkeling experience will enable you to fully appreciate the range of marine resources found here.



Our field work will assess impacts of increased tourism at an important Sea Lion breeding site and the potential competition between small scale fisherman and Sea Lions for fish.

Educational Objectives

Small-scale family fishing operations account for a small portion of fish catches in the Bay of La Paz, but provide much of the local food supply and employ many of the local population. Their fishing is close to shore and labor-intensive, usually using gill nets. To balance local economic pressures with the need to conserve the Sea Lion population, we must find out more about the potential competition for food between fisherman and Sea Lions.

Lectures will address marine mammal ecology, fisheries management, shoreline and ocean pollution, population pressures and fragmentation, species interaction and competition, and environmental ethics and decision-making. We will study the cultural and economic importance of the fishing operations by interviewing local fisherman and evaluating the quality of fisheries catch. Additional field work may include diet analyses, estimating rates of survival based on population censuses, and conducting surveys to investigate how often marine mammals and sea birds become entangled. Our final product will be an evaluation of proposed management strategies for the islands and coastal fisheries.



C O S T A R I C A

ALTERNATIVE STRATEGIES FOR PRESERVING TROPICAL ECOSYSTEMS

Critical Issues

In efforts matched by no other country in the world, Costa Rica has placed 27% of its land area, including forests which shelter an astonishing variety of wildlife and draw tourists from around the world, into an acclaimed national park system. At the same time, the rest of the country has one of the planet's highest rates of deforestation. Intensive deforestation and agriculture on the parks' borders limit habitat and deprive species of corridors for seasonal migration and movement. Private land-protection programs - emphasizing ecotourism, non-destructive harvesting and sustainable use - may preserve enough contiguous habitat to support wildlife. To determine if this is a real possibility, we must first examine the social, political and economic pressures faced by local residents and understand what it really means to "protect the forest".

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."
- Investigating whether privately protected areas are economically viable.
- Determining whether private initiatives can preserve ecosystems as efficiently as protected areas.

Site: SFS Center for Sustainable Development Studies, Atenas, Costa Rica.

Clients/Partners: We will help Costa Rica's National Forestry Directorate and the local government of the county of Atenas to develop management plans for protected zones around designated parks as well as guidelines for assessing landuse practices in those areas. Our findings will be shared with the local natural resource commission, the national park service, and the ministries of agriculture and natural resources. Operators of private reserves have also expressed interest in our results.

Course Number: BIO 1859

Program Dates: Session I: June 14 - July 13
Session II: July 20 - August 18

Departure Point: San Jose, Costa Rica

Living and Working Conditions

Verdant slopes studded with small fruit-growing properties - sources of mangoes, oranges, lemons, avocados and papayas - stretch from all sides of our small farm on the crest of a hill over-

looking Costa Rica's Rio Grande. We are based in Barrio Los Angeles, near the town of Atenas in the fertile Central Valley. At 2,600 feet above sea level, nights are cool, days warm and humid.

While at the Center, we will live, six to a room, in a refurbished chalk factory that has been converted to a dormitory and lecture hall. Meals are a feast for adventurous souls excited by ethnic cuisine: rice, beans, and abundant, locally grown tropical fruit, vegetables, meat and poultry.

Although we will fit in at least one lecture on most days, it will be difficult to keep to a typical schedule as we will spend much of our time on one-day field trips to as many as 15 protected areas near our Center. These include Costa Rica's best known parks, volcanoes, rainforests, cloud forests, and wildlife preserves.



Photo: Bill McComas

We will visit and compare as many as 15 of Costa Rica's best known protected areas and private initiatives including parks, volcanoes, rainforests, cloud forests and wildlife preserves.

Educational 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 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.



BRITISH COLUMBIA

PROTECTING THE RAINFORESTS OF HOME

Critical Issue

The world's remaining temperate rainforests occupy less than one percent of the earth's surface. One example, the ancient forests of Clayoquot, on Vancouver Island, includes some of the most productive timberland in the world. Many of the species valued so highly by First Nations - cedar for canoes, Sitka spruce for baskets, and Douglas fir for firewood - are now prized in international markets as well. These forests are being cut at a rate reported to be twice that of the Brazilian rainforest - over a quarter of the region has already been denuded. Although they live in one of the richest and rarest ecosystems on earth, these timber and fishing dependent communities are experiencing high unemployment and lowered per capita income. While immediate job loss is of concern, destruction of the productive capacities of the ecosystems upon which their livelihood depends is a greater threat. Identifying options that enable economic development that is compatible with the preservation of these old growth forests offers a potential reprieve.

Field Work Focus:

- ◆ Identifying and analyzing alternatives to current destructive land-use practices.
- ◆ Assessing how tourism impacts local communities and old growth forests.
- ◆ Evaluating reforestation methods for stabilizing soils and restoring wildlife habitat.
- ◆ Investigating watershed and forest management options that preserve key forest resources.

Site: Near the village of Tofino, on the Clayoquot Sound, Vancouver Island, British Columbia.

Clients/Partners: We will join with the Clayoquot Biosphere Reserve Project, native communities, and the provincial government in exploring alternative land-use practices that will protect the Pacific old growth forest resources that are unique to this region.

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

Program Dates: Session I: June 14 - July 13
Session II: July 20 - August 18

Departure Point: Vancouver Island, British Columbia

Living and Working Conditions

Our base will be a tent camp near the small coastal town of Tofino, home to about 1,000 year round residents. Another 750,000 visitors pass through this area annually, some of whom come for the fishing, others to view the spectacular forest and coastal vistas.

Although this is a rainforest, during the summer there are

only 2 or 3 rainy days per month and most days will be warm and sunny. Early in the course, we will attend several lectures per day. Most lectures will be held in camp, where we will cook for ourselves and take advantage of locally available fish, fruits and vegetables. Lecture time will be reduced later in the course so that we can spend more time on field work in the forest and local community. Getting around the dense green forests where few rays of sunlight penetrate the evergreen canopy can be difficult. Rather than trying to make our way between towering trees with trunks six feet in diameter and around huge rocks and fallen logs carpeted in moss, we will often follow alongside streams over which eagles soar in search of salmon and trout.



Photo: Paul Valluis

Much of the world's remaining temperate rainforest in British Columbia is being cut at a rate reported to be twice that of Brazilian forests - over a quarter of the region has already been denuded.

Educational Objectives

In order to identify alternative land-use options, we must understand this complex ecosystem and the role of the forest in the lives of local community members. Introductory lectures will introduce the geology and natural and cultural history of Clayoquot Sound. Additional lectures on forest ecology, watershed management and timber practices provide the basis for our field work.

We will examine impacts of logging on soils and on the future productivity of logged areas. Interviews with loggers, fishermen, farmers and other residents, including members of native communities, will help us understand competing interests here. Our efforts are intended to support the creation of a resource management plan for the region that encourages sustainable economic development for local populations while preserving essential natural resources.



P A L A U

MANAGEMENT OF TROPICAL ISLAND RESOURCES

Critical Issues

Situated 500 miles east of the Philippines, The Republic of Palau's five main islands and hundreds of small atolls and outcrops are tropical oases amid blue Pacific waters. Since the Japanese left here nearly 50 years ago, the 14,000 Palauans have lived in a welfare economy administered by the U.S. Department of Interior. An election in 1993 approved the Compact of Free Association, obligating the U.S. to support the development of infrastructure - roads, power, water, plumbing, and communications - which will leave the nation capable of creating a self-sufficient economy. The possible negative effects of development are magnified in island communities; the introduction of outside resources has economic, social, political and ecological implications. Can SFS help local authorities evaluate alternatives that provide needed jobs, communications, and opportunities while still preserving the environment?

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 and fishery species are best suited for harvest.

Site: A small village, on the island of Babeldaob, Republic of Palau.

Clients/Partners: One of the state governments of Palau has offered to help SFS develop a site on government land in exchange for our professional cooperation in the planning process. They have a 16-member State Planning Commission with whom we will be cooperating. Also, we may work with the Nature Conservancy, which has its Pacific office in Palau, having designated this island nation as one of the world's top ten critical conservation "hot spots."

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

Program Dates: Session I: June 14 - July 13
Session II: July 20 - August 18

Departure Point: Koror, Palau, Trust Territories of the Pacific

Living and Working Conditions

Our summer base will be in small 4-6 person cabanas on the site of a former guest house. Daily lectures will be held in the dining facility or outside - while it is always warm, rain showers are frequent at this time of year. Without regular electric service or indoor plumbing, this site is rustic, beautiful, and charming. Although most food will have to be imported, we will have

access to locally produced chickens, fish, and vegetables including pineapple, banana, and coconut.

Field work will take place in the nearby forests, along the coastline and in the shallow nearshore waters where those proficient in snorkeling will inventory the marine resources. The clear waters will provide us all with opportunities for occasional refreshing swims. (Interested and qualified students may wish to investigate SCUBA diving with commercial dive operators after the course as diving will not be permitted during the program).



Photo: Bill McComes

Field work will take place in both terrestrial and marine habitats. Our goal is provide needed information so that Palauans can make their own choices regarding the preservation of the natural riches of this tropical island paradise.

Educational Objectives

During our short stay, we will come to realize that the ecology of this lush island has vast potential but is also very fragile. Lectures introducing the natural history and culture of Palau, principles of resource economics, symbiosis, competition and nutrient and energy flow in tropical ecosystems will provide a background for our field work.

At our forest and marine based research sites, we will use survey methods and sampling techniques to conduct resource inventories and needs assessments. Completing an Environmental Impact Assessment will expose us to many tools needed by resource managers. Government officials will discuss their plans with us and interviews with local people and hikes along proposed roads will help us to gain an appreciation of the scale of planned developments and the value of the natural resources at risk.



A R G E N T I N A

PLANNING PARKS FOR PRESERVATION

Critical Issue

Northwest Argentina is one of the world's most biologically and physiologically diverse areas, containing four distinct biomes within 300 square miles: the Chaco, Puna, Pre-Puna and Yungas. Their concentration of plant and animal communities rivals the better-known Costa Rican rainforest, and includes more than 20 endangered species. The dry-forest Chaco, a fragile lowland community which provides habitat for jaguar, tapir, capybara and giant anteater, is the best-known of the four. To both protect these resources and attract ecotourists, the provincial government wishes to develop management plans for the parks here, but lacks the resources to do so. Before park management plans can be established, an inventory of biological and natural resources must be undertaken and stresses on local ecosystems must be identified.

Field Work Focus:

- ◆ Determining which plant and animal species are rare and threatened and if they are adequately protected.
- ◆ Determining the home-range size for different animal species at different altitudes within the park.
- ◆ Identifying potential conflicts with the community over activities in buffer zones and recommending possible solutions.
- ◆ Determining how the park is currently used and what facilities are lacking.
- ◆ Designing trails, camping areas, shelters and interpretive materials for tourists.

Site: Calilegua National Park, province of Salta, northwest Argentina.

Clients/Partners: The National Park Service of Argentina cannot draft management plans for its parks because it lacks the money and personnel to research their ecosystems and plant/animal communities. The agency has asked for our data to produce management and development plans for Calilegua National Park.

Course Number: BIO 1857

Program Dates: Session I: June 14-July 13
Session II: July 20-August 18

Departure Point: Salta, Argentina

Living and Working Conditions

The unfamiliar stars of the Southern hemisphere blaze in the clear skies above our Aguas Negros campsite, only 10 kilometers below the tropics' southern border. During the time of our course, the southern winter, cool nights give way to sunny days of hiking from our base in the subtropical lowlands through mountain forests clothing the lower flanks of snow-capped peaks that rise 3,000 meters high.

We will spend most nights in sheltered sleeping bags at Aguas Negros, a campsite which lies at 600 meters altitude within Calilegua National Park. Daily lectures and hikes will familiarize us with varied flora and fauna along the park's rugged trails. We will erect two open-sided shelters, one for use as a kitchen, the other as a lecture area.



Photo: Warren Whithead

One of our goals will be to determine which plant and animal species found in the park are rare or threatened and if they are adequately protected.

Educational Objectives

Our goal this summer will be to identify potential tourist impacts and to inventory current park resources. Faculty and guest lectures covering plant and animal taxonomy, dry forest ecology, bufferzone management theory and island biogeography will prepare us for field work. Using wildlife censusing and vegetation sampling techniques, we will gather baseline data on park flora and fauna, paying particular attention to threatened and rare species.

Some group members will interview tourists using questionnaires that we have designed. We will also identify potential community conflicts in buffer zones around the park. A two-day field trip to the Chaco will allow us a glimpse of a threatened but little known system. The dry-forest ecosystems of South America have received little research attention and possess poorly understood ecosystems; our work will not only contribute to general conservation knowledge but can help to preserve some of the most threatened ecosystems in the New World.



M O N T A N A

PROTECTING BIRDS OF PREY

Critical Issue

Birds of prey are important indicators of environmental change and ecosystem health. Populations of raptors (bald eagles, ospreys, peregrine falcons) have declined precipitously since the 1940s and only recently have shown signs of recovery. Habitat fragmentation and loss due to human activity appear to play a major role in the decline of raptor species. In order to protect these indicator species, we must understand the effects of human disturbance (e.g. timber harvesting) on raptors and on the small mammals and birds which are their prey base.

Field Work Focus:

- ◆ Determining locations of raptor nests.
- ◆ Identifying hunting areas for adults and fledglings.
- ◆ Assessing how types and abundance of prey vary with elevation and habitat (e.g. ski slopes compared to heavily timbered areas).
- ◆ Evaluating how animal distributions, raptor nesting locations, and foraging areas change in response to new ski slopes.
- ◆ Developing landuse recommendations that will protect nesting raptors and their prey.

Site: Beaverhead National Forest, West Pioneer Mountains, near Dillon, Montana.

Clients/Partners: Our data have been requested by the US Forest Service, and ski resort developers to support efforts to protect wildlife populations as human activity increases. Our findings may influence design of proposed ski slopes to minimize impacts on nesting hawks, owls and other wildlife. SFS efforts in 1993 led to rerouting a new snowmobile trail to protect goshawk nest sites.

Course Number: BIO 1856

Course Dates: Session I: June 7 - July 6
Session II: July 13 - August 11

Departure Point: Butte, Montana

Living and Working Conditions

Snowcapped peaks and deep green forests greet us as we emerge from our tents each morning. After preparing breakfast and a bag lunch in our rustic ski lodge base, we will hike to our survey areas. The beauty of a sunny day in the Rockies is legendary, but we should be prepared for sudden thunderstorms. After spending most of the day in the field, we will return for dinner that we all help to prepare and an evening lecture. A group discussion in the lodge or around the campfire ends early as we head off to our sleeping bags. Occasional visits to a nearby hot springs will provide us with opportunities for bathing. Plan to be in good physical condition as we will be hiking daily to collect data.



Banding raptors, such as this ferruginous hawk, is part of our field work. "I found it challenging, yet very rewarding to learn in this way, especially knowing that I would use my knowledge in the field the next day."

Sonia Szlyk, Rutland, MA
Wachusett Regional High School

Educational Objectives

Resource managers making landuse decisions can be stymied by how little information exists on management activities' impact on wildlife. Almost no research has been conducted on how habitat disturbance affects deep forest raptors - owls, hawks, falcons and eagles - in part because they can

be often difficult to locate and track in wooded areas.

Lectures and readings in raptor ecology and conservation, social and breeding biology, habitat preferences, and hunting and foraging ecology will provide a theoretical background for our fieldwork and directed field projects. Visiting resource managers will discuss research methodologies and current conflicts in managing public lands.

Using binoculars, spotting scopes and radio-telemetry, we will monitor raptors and their young, and map nest locations. In addition, we will band nestling raptors on Forest Service and Bureau of Land Management Lands. In order to complete our population surveys and to identify key foraging habitats, we will need to be able to identify bird and mammal species. We may encounter up to 20 different raptor species - including bald and golden eagles, northern goshawks, Swainson's hawks and ferruginous hawks - during field trips to other important raptor habitats, such as nearby prairie and high elevation wetlands.



B E L I Z E

CONSERVATION EDUCATION

Critical Issue

Because Belize has the lowest population density and relative deforestation rate of all Central American countries, its environment has suffered less human impact than in most neotropical countries. Seizing this opportunity, the government has tried to shield its resources from tourist development, timber cutting and plantation agriculture by creating an aggressive protection program which has placed almost one-third of the country's land area into reserves. The continued success of its environmental protection program hinges on sustainable management plans and conservation awareness, particularly among indigenous populations living near the reserves. Lacking, so far, is the first step: an evaluation of local attitudes toward land use and awareness of conservation principles.

Field Work Focus:

- ◆ Determining local peoples' understanding of ecosystem dynamics and conservation.
- ◆ Identifying special local resources.
- ◆ Identifying target audiences for education programs (elementary, secondary, adult, teacher).
- ◆ Developing curricular objectives and materials for use in school and adult-education programs.

Site: A field station at Rio Bravo Reserve, northwest Belize.

Clients/Partners: We will work in collaboration with the Programme for Belize, a private conservancy group which seeks to link conservation and development in the country. Our research will be immediately useful since the Programme's mandate for sustainable use of the rainforests necessitates the active participation and support of local communities.

Course Number: INT 1180

Program Dates: Session I: June 14 - July 13
Session II: July 20 - August 18

Departure Point: Belize City, Belize

Living and Working Conditions

More shades of green than artists have names for filter the tropical sun above our heads. The thick canopy of vegetation, lined with steamy mist, does little to muffle the shrieks and calls of howler and spider monkeys; the soft, silent passage of jaguar, puma and ocelot are much harder to hear. Our tent camp lies in a rainforest clearing 12 miles from the forest preserve's field station; more than 60 Mayan archaeological sites, some being excavated by the station's staff, lie within its borders. Perched on the border of Belize, Mexico and Guatemala, the forest is truly tropical - it holds more than 70 species per hectare, with mahogany dominating.

Summer is the rainy season here and conditions will be humid and very warm. As we emerge from our tents, we face the first task of the day - preparing breakfast as well as a lunch to be eaten in the field. After a morning lecture, we will set out for our research site, which changes from day to day, but will often be at a village within the newly designated preserve. As the sun sets, we are back at our base, preparing dinner over Coleman stoves.

Educational Objectives

Our goal is to have a positive impact on the relationship between nearby communities and the preserve

by helping to develop formal and informal education programs. To do this, we will need to understand the issues involved in preserving tropical lands and the community dynamics tied to land preservation. Working with the nonprofit Programme for Belize, we will research the attitudes of a community living within the newly designated protected area. After interviewing local residents, analyzing attitudes and identifying educational needs, we will develop potential education approaches, strategies and curricula - all aimed at developing and supporting a local conservation ethic.

Our first step will be to become familiar with the ecosystems of Belize. Lectures will address the history and culture of Belize, rare and endangered species, land use and preservation patterns, environmental economics, and theories of learning, motivation and behavior change. Guest speakers will include Programme staff and officials from government ministries such as Education, Natural Resources, Environment and Tourism.



Then continued success of environmental protection programs hinges on the conservation awareness and practices of communities living near reserves. To foster this awareness, SPS students will help develop curricula for local conservation education programs.



Z I M B A B W E

DESIGN AND DELIVERY OF APPROPRIATE ENERGY TECHNOLOGIES

Critical Issues

Appropriate technology which improves quality of life while it relieves stress on natural resources is a key factor in longterm environmental protection for a developing country. In Zimbabwe, alternative technologies such as more efficient wood stoves, solar crop dryers and solar distillers may enable villagers to manage three of their biggest environmental challenges - the unsustainable use of wood and charcoal for cooking; loss of valuable crops to rotting during storage; and affordable access to safe drinking water. If villagers can be convinced to use them, small-scale appropriate technologies could conserve energy and natural resources while maximizing villagers' health benefits.

Field Work Focus:

- ♦ Identifying viable strategies to conserve and renew Zimbabwe's rural energy sources.
- ♦ Identifying the appropriate technologies that will support rural renewable energy projects?
- ♦ Determining the key design factors for successful implementation of specific technologies.
- ♦ Comparing the environmental impact of renewable-energy technologies with traditional methods of energy production.
- ♦ Determining what cultural and design factors control the success of introduced technology.

Site: A small village near Lake Mutirikwi, central Zimbabwe.

Clients/Partners: We will collaborate with Intermediate Technology Development Group, a London-based organization whose Zimbabwe branch develops appropriate technologies. We will also work with the Development Technology Center at the University of Zimbabwe. Expansion of their innovative research program has been limited by lack of funds.

Course Number: BIO 1860

Program Dates: Session I: June 14 - July 13
Session II: July 20 - August 18

Departure Point: Harare, Zimbabwe

Living and Working Conditions

Long before dawn, the cry of a rooster pierces the stillness of the African night. Through the mudwalls come the sounds and smells of a rural village waking: the bleat of goats, the smoke of woodfires, the rustle of women preparing millet gruel - the first act in a long day's labor. As the sun slants across the brown landscape, the men set out to work the fields and the women begin long walks to gather firewood and water.

Our first week will be spent at a hostel on the outskirts of Harare, the capital city, where we will meet with researchers from the University and other developers of appropriate technologies. We will move upcountry to our base in a small village near Lake Mutirikwi in central Zimbabwe. Here, we will become immersed in village life, working alongside villagers, testing and adapting new technologies that may make village life easier and healthier.

Information from daily lectures and interviews with local villagers will be supplemented by our own personal experiences with the experimental stoves, water purifiers, and solar food dryers we utilize as we go about our daily routines. We will cook for ourselves at our small tented camp, eating local foods often based on grains and beef stews.

Educational Objectives

Zimbabwe is internationally known for creating small-scale solutions to problems with housing, sanitation, and scarce natural resources. New technologies have succeeded here because designers have sought solutions using indigenous knowledge rather than importing them.

An intensive lecture schedule during our first week in Harare will prepare us for field work with topics including Zimbabwean geography and ecology, soil conservation, water resources and technology, ethnography and an introduction to appropriate technology. Guest speakers will discuss environmental change in Zimbabwe and the potential impact of agroforestry.

Field activities at Lake Mutirikwi will include field testing of technology, conducting environmental impact studies, and collecting household and community data. We will measure the energy efficiency of improved designs of cookstoves, examine the fuel alternatives in use in Zimbabwe, identify water protection strategies and the health benefits that rural households receive from the use of appropriate technology in water pumping and safe water storage. We will also examine impacts of seasonal variations on the environment and appropriate technology, an area that has received little research attention.



We will test out the design, delivery and acceptance of appropriate energy technologies, such as this innovative stove, while living in a small village in rural central Zimbabwe.



MEXICO

ETHNOBOTANY

Critical Issue

The fragile and irreplaceable cloud forests of southern Tamaulipas in eastern Mexico are under severe stress from nearby communities. While too cold and wet to accommodate many human residents, the forests are being depleted as villagers cut down trees and use the area for grazing. Their eventual destruction will not only deprive villages of these resources but will trigger further economic and social hardships as well as the environmental consequences of forest destruction. A possible route to preserving this unique ecosystem lies in establishing that the forests provide sustainable sources of income. Plants with medicinal, insecticidal, herbicidal, ornamental and food uses lie within the forest, but their potential must be evaluated against the degree of forest disturbance that producing them would cause. Equally useful plants - including alternative, economically viable crops - may lie outside the forest in the inhabited tropical buffer zone; they must also be evaluated for production potential.

Field Work Focus:

- ◆ Determining the distribution and accessibility of ethnobotanically or economically important plants within the cloud forest.
- ◆ Examining the dynamics of cloud forest reproduction and maintenance.
- ◆ Investigating the economic and ethnobotanical value of tropical plants from this area.
- ◆ Investigating whether traditional plant usage can provide alternative crop and income sources.

Site: Gomez Farias Field Station,
Universidad Autonoma de Tamaulipas, Mexico.

Clients/Partners: Our data will be published in the scientific literature and will be used by researchers from the University Autonoma de Tamaulipas. Research establishing ethnobotanic uses of plants will be shared with indigenous communities; conservation findings will be shared with government agencies and with teachers from local schools.

Course Number: BIO 1801

Program Dates: Session I: June 14 - July 13
Session II: July 20 - August 18

Departure Point: Monterrey, Nuevo Leon, Mexico

Living and Working Conditions

The friendly clamor of a rural Mexican town beginning another day - crowing roosters, cackling chickens and braying donkeys - carries easily to our small field station on the outskirts of the 5,000 person town of Gomez Farias. After rising from our bunk-style beds and preparing breakfast plus a lunch to eat in the field, we will set off into the mountains. At 1500 meters above the field station we reach our destination, the cloud forest at El Cielo Reserve. This fragile and unusual ecosystem grows where rising moisture from the ocean condenses in the mountain air. Conditions vary from cool and foggy in the forest to tropically warm and humid at our lowland base just south of the Tropic of Cancer. This is an area of exceptionally high biodiversity - we can expect to encounter colorful hummingbirds, bees and butterflies as well as multi-colored orchids and passion flowers.

Our daily schedule will include at least one lecture a day; field trips and other travel provide additional "teachable moments". Come prepared for some culinary adventures based on interesting local foods, including chilies, fruits and vegetables, that we pick up during frequent trips to local

markets. Our market forays provide an opportunity to meet local villagers and assess the economic value of certain plants.

Educational Objectives

We will work with local researchers and informants from indigenous communities to identify plants known as food sources and folk medicines. Lectures on ethnobotany, conservation biology, tropical biogeography, systematics, statistics, and the history and culture of tropical Mexico will provide a basis from which we can begin field our work. Our newly acquired plant identification skills will be useful for conducting vegetation analyses. After observing the biological interactions (plant-plant, plant-fungal, plant-insect) for indicators of bioactivity, we will then preserve the plants we have collected and evaluate them for bio-active components.

Field trips will include visits to Jamaube, an arid site 20 miles from the cloud forest and to the Sierra San Carlos, an isolated mountain range 100 miles north. Visits to markets and interviews with community members will help us to understand the economic potential of cloud forest and tropical products.



Photo: Brad Bennett

In order to determine which cloud forest plants have potential ethnobotanic or economic value, we have to learn how various forest products are used and valued by local residents. For instance these palms may be used in constructing roofs.

VILLAGE DEVELOPMENT IN FRAGILE MOUNTAIN ECOSYSTEMS

Critical Issue

Nepal boasts both the awesome peaks of the Himalayas and the prolific Kathmandu Valley, the largest fertile area in Central Asia. In the face of such spectacular scenery and rich cultural heritage, it is easy to forget that Nepal is one of the 21 poorest countries in the world. The situation here continues to worsen as mountainside erosion and agricultural degradation reduce the income and nutrition of its people. The pressure of population growth and the need for more arable land is accelerating that process. Forests on the mountain slopes protect low-lying agricultural lands from landslides and siltation, yet farmers need forest products for fuel, compost, and fodder. Severe mountainside deforestation not only leads to soil erosion and reduces valley agricultural production, it also destroys irreplaceable mountain ecosystems. Changing farmers' crop-planting and tree-cutting practices will reduce impacts on mountain systems while improving village health and economic benefits and fostering sustainability.

Field Work Focus:

- ◆ Exploring how tree clearance affects soil erosion and soil nutrient levels.
- ◆ Investigating the key uses of forest products by animals and humans.
- ◆ Tracing the path of energy exchange from forest to field use.
- ◆ Exploring agricultural decision-making within farming communities.
- ◆ Promoting planting of rapidly maturing tree species among farmers.

Site: An experimental organic farm 13 miles from Kathmandu.

Clients/Partners: Our data will be used by managers of the organic farm that serves as our base and other non-government groups in Nepal which do not have the funds to undertake pre-program and monitoring research. Using our findings, these organizations will work with local farming communities to promote alternative planting and tree-harvesting practices.

Course Numbers: BIO 1858 Village Development in Mountain Ecosystems
INT 1191 Directed Research

Program Dates: June 22 - August 5
(Note: This six week program carries 11 quarter credits)

Departure Point: Kathmandu, Nepal

Living and Working Conditions

The astonishing peaks of the Nepal Himalaya tower above the serene fields of the Kathmandu Valley where our farm lies. The Nepalese landscape is dominated by small-scale agricultural ventures similar to those which surround us during our six week stay.

We will be plunged immediately into the rich rhythms of

Nepalese village life: working alongside local farmers in the fields; eating traditional food – rice, lentils, vegetables – grown on our organic farm and prepared by a Nepalese cook; sleeping in a mud-brick, thatched-roof dormitory; waking each morning to the clamor of a small farming community readying itself for work in the clear valley air. This is one of the most agriculturally productive times of the years; days will be warm (in the 80s) and very humid, with frequent rain showers as monsoon season approaches. Nighttime temperatures are usually in the temperate 60s. The storied city of Kathmandu, a chief stop on the fabled silk route across Asia, lies a mere 13 miles down the road.



Photo: David Bathgate

Its rich cultural heritage and stunning scenery belie the fact that Nepal is one of the 21 poorest countries in the world. We will live and work alongside local farmers as we seek to identify sustainable agricultural practices to preserve this fragile mountain ecosystem.

Educational Objectives

Before we can recommend strategies for sustainably utilizing the area's resources, we must understand the ecosystem dynamics and the local economic and social

situation. Introductory lectures will help us understand the geology and natural history of the area, the ecology and management of mountain systems, resource characterization and zonation, and Rapid Environmental Assessment techniques. A field trip involving a short trek to a high mountain ecosystem will allow us an opportunity to evaluate human adaptation to conditions there.

As we work alongside local farmers in the field, we will observe traditional farming practices and decision-making, and gather data on siltation and erosion rates. To assist us in our directed research projects, faculty will introduce techniques used for conducting ethnographic research and controlled experimental design. Our results will provide information for use in developing recommendations for improved land-use and extension and education programs to encourage sustainable resource use.

PUGET SOUND

KILLER WHALE CONSERVATION

Critical Issue

The San Juan Islands lie at the crossroads of the summer feeding and mating area for a large and stable killer whale population. The natural splendor of this area is a magnet for tourists leading to increases in whale watching and recreational boating that are stressing whale populations at the same time that shoreline development and industrialization are disturbing their food sources. Strong public awareness of killer whales may serve as a lever to shift the behavior of local whale watchers and recreational boaters to help conserve this marine mammal population.

Field Work Focus:

- ◆ Determining shifts in longterm whale behavior patterns and tracing the causes.
- ◆ Measuring the effects of vessel-based whale watching on whale behavior and vocalizations.
- ◆ Investigating the link between whale-watching vessels and levels of air pollution in the breathing zone near the water's surface.
- ◆ Assessing killer whales' adaptive capacity.

Site: San Juan Island, Puget Sound, Washington, U.S.A.

Clients/Partners: We will share our results with researchers at the Whale Museum and Center for Whale Research in Friday Harbor, Washington and with the Marine Mammal Research Group in Victoria, B.C.. Our findings in 1992 and 1993 added significant data on whale behavior and movements to a longterm whale database. Draft whale-watching regulations based on our observations will be submitted to the U.S. National Marine Fisheries Service and the Canadian Federal Committee on Whales and Whaling.

Course Number: BIO 1853

Course Dates: Session I: June 14 - July 13
Session II: July 20 - August 18

Departure Point: San Juan Island, Washington

Living and Working Conditions

The early morning sunshine which threads through the woods strikes our clustered tents erected in the forest on the edge of Haro Strait, on the west side of San Juan Island. San Juan,

the second largest of Puget Sound's glacier-carved islands, houses black-tailed deer, raccoons, red fox, osprey and ravens. Surrounding waters hold whales, porpoises, sea lions and seals; gulls, cormorants, and herons nest along broad intertidal zones.

We will aim to disturb this natural beauty as little as possible: Cooking will be by Coleman stove, fresh water is limited, and electricity is confined to an on-site trailer that serves as a lecture hall. Bouts of cool rain, grey skies and fog will alternate with days of spectacular sunshine. In our daily field work we will investigate how modern pressures have altered this ancient environment; our goal will be to reconcile the existence of both.

Educational Objectives

Effective wildlife management can be achieved by either manipulating animal populations, species or ecosystems, or by influencing the human behavior which affects the natural system. One of our tasks this summer will be to evaluate one attempt at changing behavior. During each course a two-day period will be designated during which boaters will be encouraged to shut down engines when whales pass by. We will analyze the success of this attempt to create a zone of passive quiet around migrating whale groups. We will also monitor atmospheric pollutants present near the water's surface to determine whether whales' breathing space is being polluted by boat exhaust.

Lectures on marine mammal ecology, anatomy, behavior, conservation and management will prepare us for our field work. Much of our field time will be spent interviewing fisherman, whalewatchers and boaters, and conducting population censusing and focal behavioral observations using theodolites and spotting scopes. Working in small teams from four observation posts: on the island's shore, on a cliff high above the water's surface, in an inflatable boat and in a museum-owned lighthouse. Video and underwater acoustic recording equipment will help us document whale-boat interactions and record whale behaviors such as breaches and spyhops.



Photo: Fred Felleman c

Because of their proximity to a large commercial and human population center, the resident orcas in Puget Sound are thought to be the most "urban" killer whale population in the world.

Academic Credit

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

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.

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

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

The following is a partial list of the home schools of previous SFS participants. Over 200 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*
Berea College
Boston College
Boston University
Bowdoin College
Brandeis University*
Brown University
Brigham Young University
Bryn Mawr College
Rutgers University
Carnegie Mellon University
Case Western Reserve University*
Chamont-McKenna College
Clark University*
Colby College*
College of Charleston
College of William and Mary
College of the Atlantic
Colorado College
Colorado School of Mines
Connecticut College
Cornell University
Dartmouth College
Davidson College*
Denison University*
Dickinson College*
Drake University
Drew University
Duke University
Emory University

Evergreen State College
Franklin State College
Franklin and Marshall College
Franklin Pierce College
Georgetown University
George Washington University
Gettysburg College
Goddard College
Guilford College
Hamilton College
Hampshire College
Harvard College
Hiram College*
Holy Cross College
Ithaca State University
Ithaca College
Kenyon College*
Knox College
Lehigh University
Lewis and Clark College
Macalester College
Marlboro College
McGill University
Miami University*
Middlebury College*
Mills College
Mount Holyoke College*
Mount Union College
New York University
Northeastern University
Northwestern University
Oberlin College
Occidental College
Ohio State University
Ohio University
Ohio Wesleyan University
Oregon State University
Pennsylvania State University

Pitzer College
Pomona College
Prescott College
Providence College
Purdue University
Randolph Macon College
Rutgers University
Saint John's College
Saint Lawrence University
Saint Michael's College
Saint Olaf College
Salem College
Scripps College*
Shimer College
Simon's Rock of Bard College
Skidmore College
Smith College
Stanford University
Stockton State College
S.U.N.Y. College of Environmental Sciences and Forestry*
Swarthmore College
Trenton State College
Trinity College
Trinity University
Tufts University
Tulane University
Union College
University of Alberta
University of California/Berkeley
University of California/Los Angeles
University of California/Santa Cruz
University of California/San Diego
University of Cincinnati
University of Colorado

University of Connecticut
University of Iowa
University of Kansas
University of Maryland
University of Massachusetts
University of Miami*
University of Michigan*
University of Minnesota
University of New Hampshire
University of North Carolina
University of Pennsylvania
University of Pittsburgh
University of Puerto Rico
University of Puget Sound
University of Rhode Island
University of Tennessee
University of Utah
University of Vermont
University of Victoria
University of Virginia
University of Wisconsin
Vanderbilt University
Vassar College
Villanova University
Virginia Polytechnic Institute and State University
Warren Wilson College
Washington University
Washington and Lee University
Wellesley College
Wells College*
Wesleyan University
Whitman College
William Smith College
Williams College
Wittenberg University
Xavier College
Yale College

* Member of Sustainable Development Studies Consortium

* SFS Affiliate School

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. Students at Affiliate Schools should contact the SFS Admissions Office for the name of their representative. The current SFS Affiliate Members are:

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

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

The Sustainable Development Studies Consortium

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

Requirements for Admission

Admission to SFS courses is open to eager, motivated students. A strong background in science is not required. Participants are screened by the Admissions Committee to insure that they are choosing the right course for the right reasons. 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 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. Applicants should exhibit enthusiasm, character, compassion, flexibility and social concern. Also evident should be a demonstrated promise to benefit academically and socially from this experience as well as a willingness to, at times, put the needs of the group ahead of 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.

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.

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.

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

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

For further information regarding admission, please call the SFS Admissions Office at

508-927-7777

Acceptance

Applications for all programs are reviewed on a rolling admission basis, as soon as all required information is received. The Admissions Committee meets on the 1st and the 15th of every month. *Teams fill quickly. We strongly urge 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. Whenever possible, course faculty will call accepted students to discuss their participation in the program.

Financial Aid

We are committed to involving as many qualified students as possible in SFS programs and will work with you to insure 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 1994-95. For the 1994-95 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 a Stafford Loan 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

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. Indeed, part of your challenge lies in adapting to changing conditions and overcoming the obstacles they may present. In other words, the whales are not always where we want them to be, so please be flexible.

Student Conduct

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 its 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.

Northeastern 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.

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



"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 Werner, Chevy Chase, MD – University of Michigan

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.

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*

Tuition

SFS Fall 1994 and Spring 1995 Semester Programs	\$10,350
<i>(All semester programs have an additional \$150 registration fee)</i>	
Summer 1994 Programs (30 Days)	
<i>(All summer programs have an additional \$100 registration fee)</i>	
Community Wildlife Management/KENYA	\$ 3,090
Marine Parks Management/CARIBBEAN	\$ 2,850
Sea Lion Conservation/BAJA, MEXICO	\$ 2,880
Alternative Strategies for Preserving Tropical Ecosystems/COSTA RICA	\$ 2,690
Island Resource Management/PALAU	\$ 2,650
Protecting the Rainforests of Home/BRITISH COLUMBIA	\$ 2,550
Conservation Education	\$ 2,690
Selecting Sustainable Solutions/ZIMBABWE	\$ 2,820
Ethnobotany/MEXICO	\$ 2,740
Planning Parks for Preservation/ARGENTINA	\$ 2,740
Protecting Birds of Prey/MONTANA	\$ 2,450
Killer Whale Conservation/PUGET SOUND	\$ 2,880
(45 day programs)	
Village Development in Fragile Mountain Ecosystems/NEPAL	\$ 3,650
Tropical Reforestation/AUSTRALIA	\$ 3,980

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.

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. 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.

VANCOUVER ISLAND COASTAL RESOURCE STUDIES



The new SFS Center for Coastal Studies, based on the narrow strip of coast where much of the world's remaining temperate rainforest meets bountiful Pacific waters, is scheduled to open for the Fall 1994 Semester Program. The future of Canada's Pacific Northwest coast, considered to be one of the richest and rarest ecosystems in the world, is being hotly debated, from logging camps and the homes of native peoples to the seats of the provincial and national governments. Our goal is to work with local groups, the provincial government and other non-governmental organizations to help find new ways to support economic development of this coastal and old growth forest region while preserving its natural and cultural heritage.

For example, the Clayoquot Biosphere Project has initiated a longterm scientific research program aimed at understanding changes in coastal ecosystem diversity, resilience, and productivity. We will initially identify areas of this project which can use SFS help. We also hope to assist local restoration projects, especially salmon and shellfish enhancement programs, by conducting stock assessments and spawning surveys, and developing management recommendations. Further details of the specific resource management projects we will engage in are being worked out in meetings in British Columbia this spring.

Critical Issues

Encompassing far more than just the beach, the coastal zone stretches from terrestrial watersheds through floodplains, mudflats, deltas, marshes, estuaries and islands to coastal waters (often as far out as the edge of the continental shelf). Extremely important both ecologically and economically, these habitats are sensitive and vulnerable to stress. A key factor affecting the health of each of these ecosystems is the condition of the fresh water that passes through them as it flows from the land to the sea.

The Clayoquot Sound region provides a perfect laboratory for exploring the relationship between ecosystems and the economy. The coastal and rainforest systems here support fish, shellfish, marine mammals, shorebirds, agriculture, aquaculture, forestry, recreation and transportation. Excessive logging in British Columbia's old growth forests, located within the coastal watershed, threatens both the quality and quantity of fresh water flow. Recent studies, for example, have found extensive damage to salmon spawning streams from clearcutting. As technology improves and natural resources diminish, timber and fishing dependent communities often experience high unemployment rates and lowered per capita incomes (though new economic opportunities can arise as well). While immediate job loss is of concern, destruction of the productive capacities of the ecosystems upon which their livelihood depends is a greater threat.

Students will be registered in four academic courses:

- BIO T.B.A. Coastal Ecology
- BIO 1846 Principles of Resource Management
- ECN 1913 Economic and Ethical issues in Sustainable Development
- INT 1191 Directed Research

(Please see page 28-29 for course descriptions)

Program Dates: September 9 - December 12, 1994
February 1 - May 7, 1995

Departure Point: Vancouver Island, British Columbia

Clayoquot Sound on Vancouver Island's west coast symbolizes the richness and complexity of coastal temperate rainforests worldwide. Home to small communities of both native and non-native people, these forested islands and rich nearshore waters are important to a variety of industries:



Photo: Jim Elder

We hope to assist local restoration projects, especially salmon and shellfish enhancement, by conducting stock assessments and spawning surveys and developing management recommendations.

tourism, fisheries, logging, to name but a few. They nourish a vast array of fish, wildlife, and the largest and oldest trees in the world. Wedged between the open ocean and coastal mountains, three of Vancouver's five remaining large unlogged coastal watersheds flow into the Clayoquot Sound. These watersheds comprise over a half million acres claimed to be worth literally billions of dollars in timber resources.

The ancient forests of Clayoquot include some of the world's most productive timberland. Many of the species valued so highly by First Nations - cedar



Photo: David Baillgate



Now that the area around our Center has been protected from further deforestation, we need to better understand the relatively new concept of reforestation. Students discuss results of tree planting efforts with a local forester.

Photo: David Wilson



The Center for Rainforest Studies, called "Warrawee" - 'you are welcome here' in the local Aboriginal language, is located on 153 acres of rainforest and secondary growth forest.

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 half are primary rainforest, and another 20 are forest regrowth. The site - called "Warrawee," 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), you will stop regretting the seclusion the first morning you wake to the birds' dawn chorus, or the first time a group of flying foxes sweeps overhead at dusk.

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



Center Facilities

The field station lies at 800 meters elevation in the midst of a rolling, hilly property surrounded by protected state and federal forests. Students live dorm-style in four newly constructed, eight-person cabins; faculty occupy an additional two cabins nearby. The main building has a lecture room, computer room, library, collection of research equipment, and facilities for cooking, refrigeration and clothes-washing; 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 our resident platypuses before the dark. Dinner may 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 in earnest, lectures diminish and are replaced with time for field work and data analyses. We will work in forest and other modified habitats on the SFS property as well as in the adjoining 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 National Park trails, giving presentations at local high schools, meeting local conservation groups, and planting seedlings - are available.

We buy food locally - the same basics 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 almost always about 20 degrees C.



SOUTH CAICOS ISLAND BRITISH WEST INDIES MARINE RESOURCE MANAGEMENT

Program Objective

To assist local managers in developing scientifically sound, culturally acceptable, and politically and economically feasible policy recommendations that will result in the sustainable development of the marine resources of the Turks and Caicos Islands.

Critical Issue

Developing sustainable fisheries is an immediate concern for this fishing community. In addition, funding for a new national parks system, the Admiral Cockburn Land and Sea Park, was approved in 1992. The new National Parks Department must determine how to develop and manage the park for the use and benefit of residents without destroying or degrading the valuable marine resources. There are many questions that must be answered in the process of developing a park management plan:

- ♦ What are appropriate levels of park use for diving, boating and other water-based recreation?
- ♦ Can the Park provide a means to supplement the nations' economy? If so;
- ♦ How can a marine park be used to encourage tourism?
- ♦ What are sustainable levels of harvest for lobster and conch?
- ♦ What is the potential for sustainable exploitation of shallow water reef fish?

Clients/Partners

The National Parks Department, the British Overseas Development Administration and the TCI Department of Fisheries have actively solicited SFS input in conducting baseline resource assessments, training in fisheries enhancement methods and in the development of a resource monitoring program for South Caicos and the surrounding waters. Faculty and students at the Center are in a unique position to contribute to policies and decisions that will influence growth and development here.

Students will be registered in four academic courses:

- BIO 1824 Tropical Marine Ecology
 - BIO 1846 Principles of Resource Management
 - ECN 1912 Environmental Policy and Socioeconomic Values
 - INT 1191 Directed Research
- (Please see pages 28-29 for course descriptions)

Program Dates: September 9 - December 12, 1994
February 1 - May 7, 1995

Departure Point: South Caicos Island, BWI

Field Director: J. Bruce Neill, Ph.D. candidate,
Montana State University (Biology).

Resident Faculty: Edmund Green, Ph.D., London University (Marine Ecology). Marie-Christine Aquarone, Ph.D., University of Paris (Geography). Andrew Gude, M.S., Portland State University (Natural Resource Management).

Note: SCUBA certification is required for semester participation. Divers must bring their own SCUBA and snorkeling equipment, although weights and tanks may be rented on site.

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

Marine Parks Management

see page
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Programs Offered

- Marine Resource Management
— Semester Program
- Marine Parks Management
— Summer Program

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. At South Caicos, the banks plunge 7000 feet into the deep ocean abyss, and to the



Photo: Bob Singer

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

Jesse Williams, Richmond, VA - Middlebury College

west, a vast shallow bank area, averaging 10 feet deep, stretches for nearly 60 miles. This highly productive area supports one of the world's largest spiny lobster and conch fisheries.

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 swamps, sandy shoals, patch reefs, fringing reefs and deep reefs - that surround the islands. Diving into the clear

THE SCHOOL FOR FIELD STUDIES

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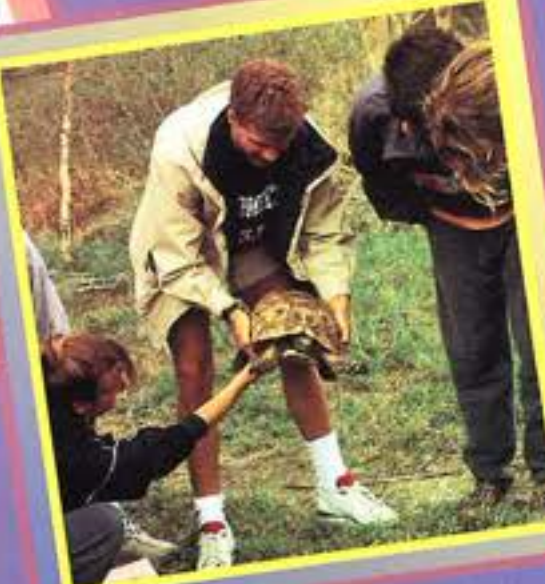
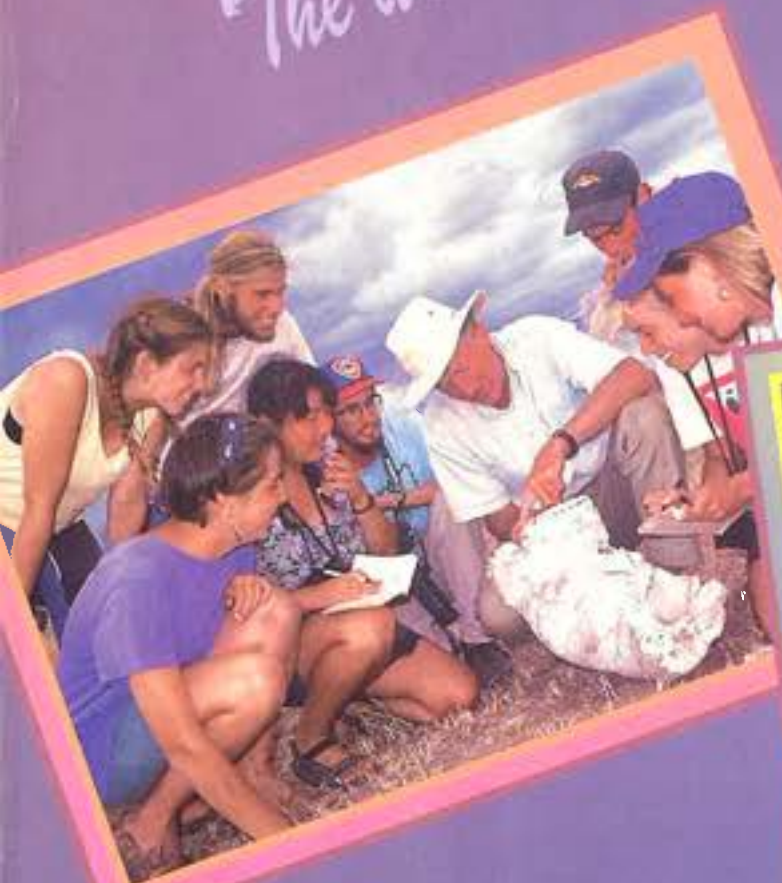
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