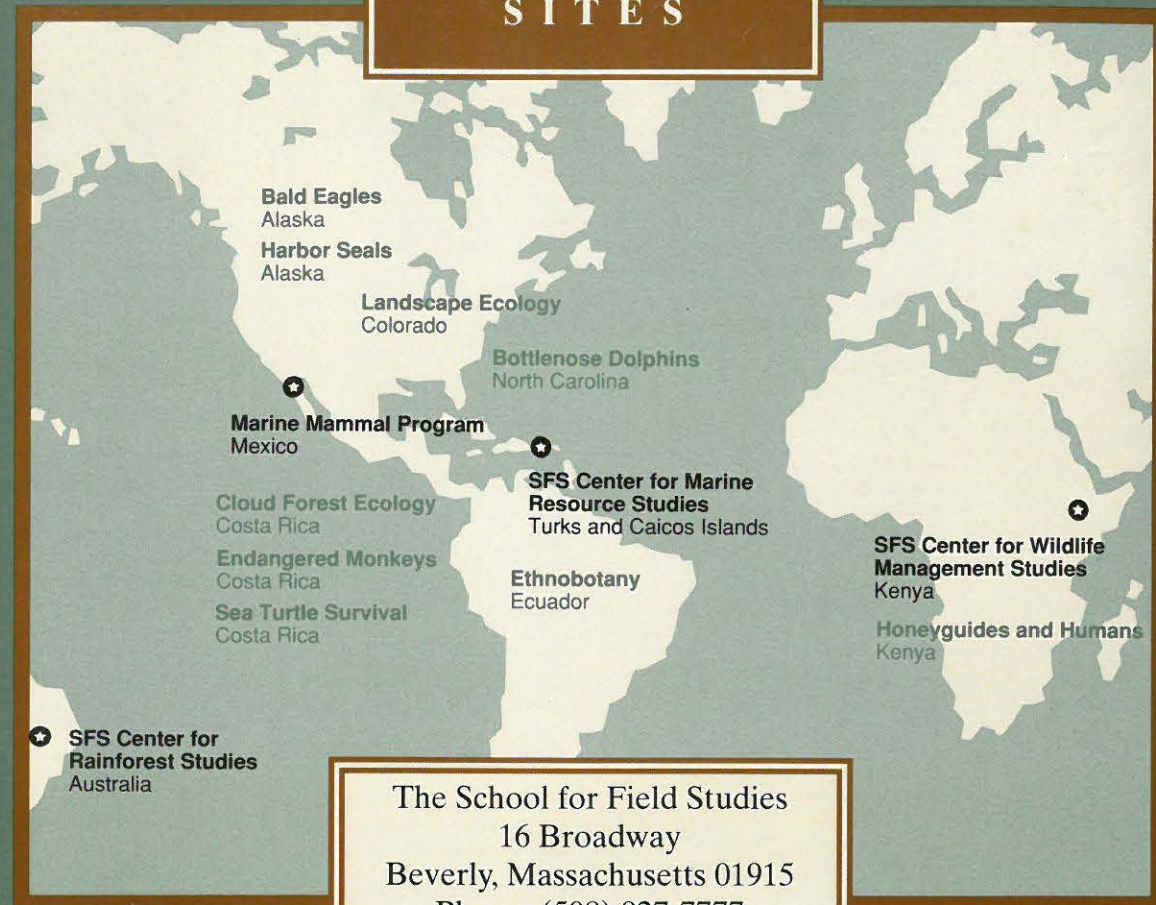


1990 PROGRAM SITES



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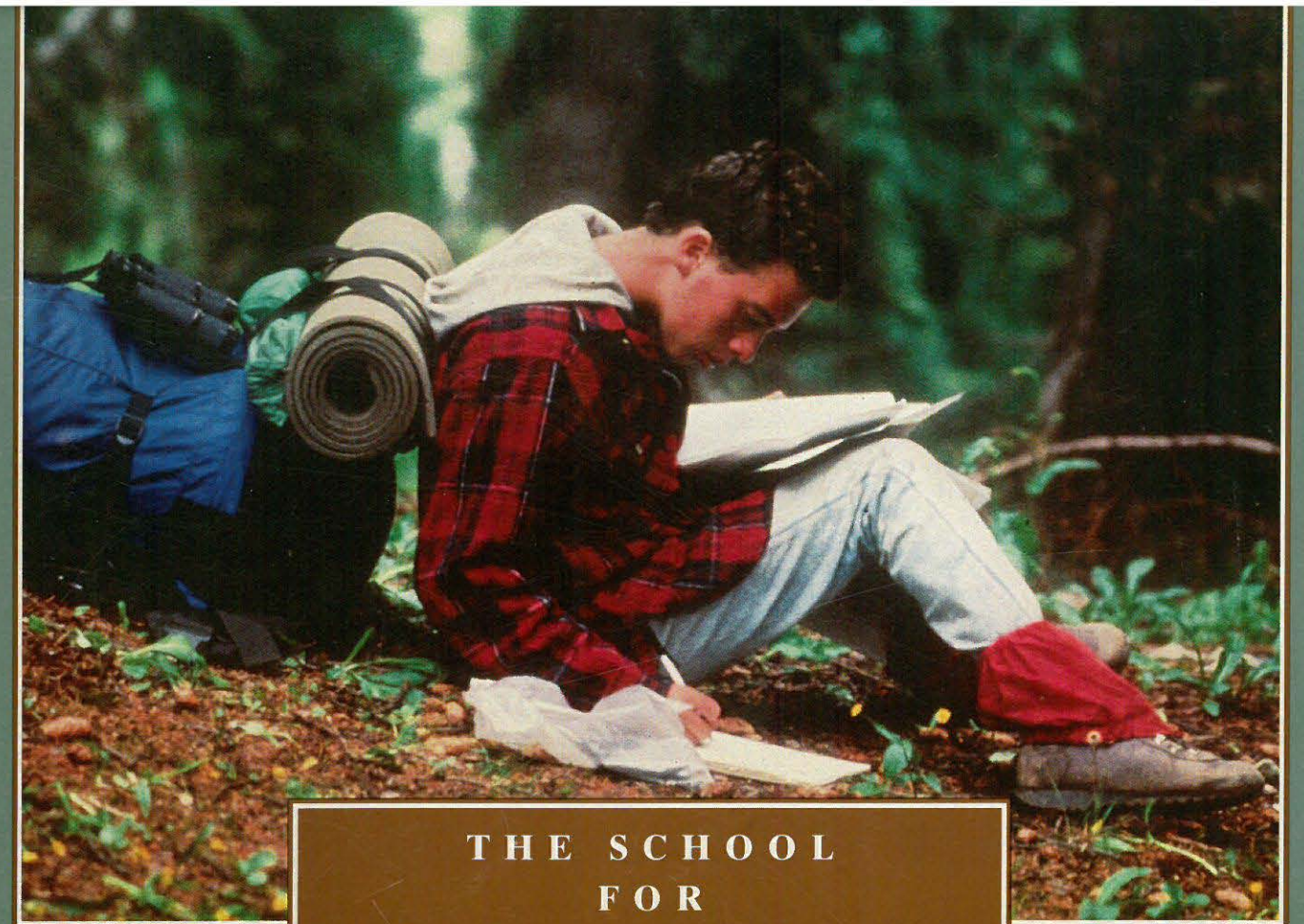
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THE SCHOOL FOR FIELD STUDIES 1990 ANNUAL REPORT

The mission of The School for Field Studies is to provide highly motivated young people from the U.S. and abroad with an excellent practical education in environmental studies, in order that tomorrow's leaders may become more environmentally literate/aware as well as make immediate and future contributions towards the sustainable management of the world's natural resources. A practical education is defined as an education which is action-oriented, experience-based, capable of being put to good use, manifested in practice, and concerned with voluntary actions and ethical decisions.

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The School for Field Studies admits students of any sex, religion, race, color, national and ethnic origin to all the rights, privileges, programs and activities generally accorded 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 and loan programs, and athletic and other School-administered programs. SFS is an affirmative action, equal opportunity institution.

SFS is a member of the International Union for the Conservation of Nature and Natural Resources (IUCN).

SFS is an independent, non-profit educational institution.

1989-1990 Curriculum

	SEMESTERS		June 18 to July 17	July 24 to Aug 22
	Fall	Spring		
Wildlife Ecology and Management				
SFS Center for Wildlife Management Studies/Kenya Wildlife Ecology and Management Wildlife Management	X	X	A	I
Ecology of Bald Eagles/Alaska			I	A
Study in Symbiosis: Honeyguides and Humans/Kenya				A
Marine Biology and Management				
SFS Center for Marine Resource Studies/Turks and Caicos Islands Marine Ecology and Management Coral Reef Management	X	X	I	A
Marine Fisheries:Threatened Tropical Resources			A	I
Plant Community and Ecosystem Ecology				
SFS Center for Rainforest Studies/Australia Biogeography: Patterns of Ecological Diversity Deforestation: Threats to Biological Diversity (6 weeks)	X	X	I	
Ethnobotany: Uses of Plants by Native Peoples/Ecuador			A	A
Tropical Cloud Forest Ecology/Costa Rica			I	A
Landscape Ecology: Designing Parks for Preservation/Colorado			A	I
Animal Behavior and Conservation				
Marine Mammal Program/Mexico Marine Mammal Biology and Conservation		X	I	A
Biology and Behavior of Bottlenose Dolphins/ North Carolina			A	I
Harbor Seals: Dynamics of a Population in Crisis/Alaska			A	A
Endangered Monkeys: Social Ecology of Stumptail Macaques/Costa Rica				I
Conflicts in Ecological Management: Sea Turtle Survival/Costa Rica				I

I=Introductory Course
A=Advanced Course

The SFS Promise

Students participating in an SFS program will:

- * 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 conservation issues that emanates from a case-based study of:
 - a. ecology/biology;
 - b. applied science and research techniques;
 - c. resource management;
 - d. the role and implications of the cultural context, including the political and economic implications; and
 - e. the inter-relationships of the above;
- * experience opportunities for personal growth and achievement, including:
 - a. the opportunity to function productively as part of a group;
 - b. the challenge to achieve at his or her maximum personal potential;
 - c. the opportunity to pursue and realize extraordinary achievement; and
 - d. the opportunity to accept responsibility for his or her personal learning and growth.

Letter from the Chairperson and the President

As most of you know, humankind is in a race to save this planet. By necessity, this is a relay race -- involving not only our generation, but those who come after us. To whom do we plan to hand off the baton? Of the 20 largest environmental organizations in this country, not one has environmental education as its primary mission. From where is the next generation of environmental leadership to come? Even if our generation is able to make some headway in land protection, preservation of biological diversity, energy conservation, and pollution abatement, these gains are temporal. The next generation, if environmentally illiterate, can reverse all these gains in a blink of an eye. Laws can be changed, ceasing to protect land, ignoring extinction, squandering energy, and polluting air and water.

The most important task of all in environmental affairs -- and the most neglected -- is that of education. If we fail to develop in the next generation a sensitivity to the finite nature of the natural resources upon which human life depends, none of today's successes can have lasting value. Shutting down a polluting corporation through new laws or improved enforcement is a short-term strategy to pollution abatement; educating that corporation's future management about the real cost of their waste disposal practices is the true long-term solution to this serious environmental problem.

Other than SFS, who is concerned about educating tomorrow's leaders? At the moment, very few people or organizations acknowledge this need; of those who are concerned, most focus on training students who are already committed to a career in environmental protection. Unfortunately, these students are not likely to hold the future positions of power necessary to make a major and lasting difference. Rather, it will be the students who go on to leadership roles in all sectors of society who hold the potential to make the greatest impact in the 21st century.

How can we reach these young people? Where can we find them? How can we make the point that improvements in our quality of life by definition must include improvements in our environment, so that environmental awareness becomes a way of seeing the world, if not a way of living?

The answers to these questions aren't simple, but at SFS we are facing them head on, every day, as we reach to a growing body of young people with

diverse interests and backgrounds, offering them the unique experience of learning and living the key issues behind responsible environmental management.

This past year has seen progress in our efforts on a number of fronts, most specifically on our long-term strategy to migrate SFS to a Center-based operation, with a corresponding dominance of semester programming over our traditional one-month summer courses.

Other notable gains for the year include:

- * an increase in semester enrollment of 28%, and a small increase in total student field days (3%) for the ninth consecutive year;
- * an increase in fund balances (of 8%) for the 7th year, with the additional funds being invested primarily in two Center physical plants;
- * the highest ever fundraising results (\$405,000), including the largest single gift ever received by SFS, from the Richard King Mellon Foundation;
- * the continued expansion of our physical plant, most notably through the acquisition of a new campus on South Caicos, Turks and Caicos Islands, to house the Center for Marine Resource Studies;
- * our tenth year of maintaining a positive safety record; and
- * the relocation of our Marine Mammal Program from Hawaii to Baja, Mexico.

In spite of these gains, our overall growth rate was smaller than in earlier years, due to an intentional effort to consolidate in anticipation of strong growth through the nineties. To this end, a few of our most notable challenges for the coming year are: attracting and keeping qualified faculty; continuing to improve our physical plant; developing a broader fundraising base; and continuing the development of affiliations.

We also want to acknowledge several significant changes in personnel not noted elsewhere in this report. First, the newly created position of Senior Vice President was temporarily filled for the first year with great success by Joseph Madison; it is now permanently occupied by Kathleen Savesky, who comes to SFS with 16 years of educational management experience,

and most recently served as Administrative Director for Tufts University's Boards of Overseers. Deborah Roberts, after three years of hard work helping SFS to establish the Center for Marine Resource Studies, left to take on the new and equally challenging jobs of motherhood and part-time consulting. We thank Joe and Deb for their extraordinary contributions and wish them well in their new endeavors. We also note Andrea Walgren's promotion from Director of Marketing/Admissions to Vice President for Student Affairs, in recognition of her outstanding performance and eight years of service to the School.

The SFS staff and faculty are actively preparing young people to "accept the baton" and assume their roles as environmentally literate and responsible individuals and leaders. With your continued help, we will be able to make an even greater impact on the century ahead as we work to make the SFS vision a reality.

James L. Elder, Jr.
President

Terry L. Andreas
Chairperson



Photo credit: Barry Canner



Photo credit: James Elder

Field Report

The Center for Wildlife Management Studies: Kenya

For many, the conservation dilemmas facing the East African nation of Kenya epitomize many of those facing the whole planet. One of the world's fastest growing human populations is competing for space with ever-dwindling wildlife populations. Efforts to increase agricultural and industrial productivity often conflict with attempts to conserve wildlife and natural areas. These issues are echoed throughout the world, in developed as well as developing countries. Ready solutions which resolve this tension between development and conservation are hard to come by; nonetheless, alternatives to the present path must be developed.

Throughout the world, innovative researchers and policy-makers have begun to investigate the utilization of wildlife as a way of assuring its perpetuation while meeting human needs. The SFS **Center for Wildlife Management Studies** in Kenya is part of this effort. The Center, now entering its sixth year of operation, was established to give students an opportunity not only to experience some of Africa's wildlife and environmental issues from both ecological and cultural perspectives, but to contribute to the body of scientific knowledge which is being applied to current management problems. Our work in Kenya is being conducted at an opportune time, as the country plans to open new areas to game ranching and other forms of wildlife utilization as part of their overall wildlife conservation strategy.

In 1990, 88 students took advantage of this unique opportunity, with 47 joining our two semesters and 41 enrolling in two month-long summer courses. Their SFS experience was directed by Dr. Richard Ruggiero, who joined the Center as Field Director shortly before the academic year began. Dr. Ruggiero recently completed his Ph.D. in Wildlife Ecology and Management at Rutgers University, after spending several years in the Central African Republic as a Wildlife Biologist for a joint World Wildlife Fund/Peace Corps project.

The faculty team this year consisted of Drs. Toloumbaye Tadingar and Susan Cooper, and Sam Thomas. Dr. Tadingar's graduate work was done at the University of Nebraska in Range Science and Ruminant Nutrition. He has taught Wildlife Biology courses at SFS since 1988. Dr. Cooper earned her degree in Ecology at the University of Witwatersrand. Her most recent long-term work was conducted at Chobe National Park in Botswana, where she studied predator/prey relationships. Our Cultural Ecologist, Sam Thomas, is a doctoral candidate in Anthropology at the University of Florida. He brings expertise in several areas of Kenyan culture and history, specifically concerning Meru society.

A major modification in our curriculum in 1990 concerned a new emphasis on the human ecology, culture and history of East Africa. Because most of the problems facing the wildlife of Africa and the rest of the world have their origins with humankind, the only solutions lie with humans. In order to be effective, management and conservation techniques must be developed and applied with consideration of the cultural, as well as biological and physical implications. Our course work and field trips focus on these issues; building on the foundation of ecological theory, the tools needed by a wildlife manager are presented and are taught to be wielded prudently to address the needs of people and wildlife in Kenya.

Student research in 1990 continued to build on previous efforts and has also developed some new directions. The ecological efficiency and economic implications of utilizing certain species of wild ungulates are complicated, and most of our work is designed to help predict the viability and desirability of the game ranching concept.

Our continuing study of Maasai giraffe assists ranch researchers to understand the forage needs of the species

on a year-round basis. Through this, we have been able to more accurately estimate the carrying capacity of the range and suggest a management strategy. We also helped to address the fact that livestock producers and wildlife managers in our area are faced with a serious weed problem which reduces the quality of their rangeland. Our controlled experiments based on the comparison of burning and mowing techniques will eventually suggest an optimal strategy for improving rangeland in southern Kenya. Other student research focused on the basic ecology of impala, fringe-eared oryx, ostrich and yellow-necked spurfowl.

Center research continued to find its way into the scientific literature. Last year, our ongoing work on the recovery rate of pasture land that has been disturbed by cattle enclosures was introduced in the *African Journal of Ecology*. A new study conducted by several consecutive SFS groups on the effects of prescribed fires on rangeland quality is in its final stages of preparation for publication.



The Center's good relations with National Park management and local researchers allow students to observe wildlife in rarely visited areas. Trips to the Maasai-Mara Reserve and Lake Nakuru and Amboseli National Parks provide unique opportunities to compare alternative park design and management strategies. Shown here, Spring semester participants examine the remains of a Defassa's waterbuck on the shores of Lake Nakuru. Photo Credit: Sue Natali

Field Report

The Center for Marine Resource Studies: Turks and Caicos

Recent decades have brought tremendous challenge to those concerned with marine resource management. Humankind is rapidly depleting ocean resources worldwide, and this problem is particularly critical in the Caribbean. Many fishing practices have led to depleted stocks, and are also destroying non-target species. Various forms of pollution, industrial debris, and recreation are impacting the seagrass beds, mangrove stands, and coral reefs which are the source of most marine life, and are rendering critical habitat areas unsuitable for numerous species.

The SFS **Center for Marine Resource Studies** was established in 1985 to address these critical issues from an educational point of view. Last year, 112 students from campuses across the country as well as Canada, Greece, Mexico, and Japan, took advantage of the Center's semester program -- **Marine Ecology and Management** -- and two sessions each of two summer programs--**Marine Fisheries: Threatened Tropical Resources** and **Coral Reef Management**.

The Fall semester operated out of a leased facility on the island of St. John, U.S. Virgin Islands, the Center's home for five years. Shortly after the students' arrival, Hurricane Hugo devastated the Virgin Islands. The students and faculty were safely evacuated to a local shelter, but from that point forward, the

program content was dominated by the impact of the storm. Students took the opportunity provided by the hurricane to shift their research foci to a comparison of pre- and post-hurricane ecological baseline data. Since the baseline data that SFS students had collected over several years were so comprehensive, we were able to conduct detailed evaluations of hurricane damage to local reefs and seagrass beds and its possible impact on future conservation efforts for use by the U.S.V.I. National Park Service.

In January, the Center relocated to South Caicos, Turks and Caicos Islands, B.W.I. During the previous two years, a team of Center faculty and Headquarters staff had considered numerous Caribbean sites to purchase as a permanent home for the Center. With the enthusiastic support of the Turks and Caicos Ministry of Natural Resources, we eventually selected and purchased a small former hotel with 8 acres of waterfront property on the best harbor in the Islands. These waters offer immediate access to some of the region's most critical conservation research subjects. Until very recently, South Caicos was one of the world's largest exporters of conch and a significant exporter of lobster, both which served as the major source of income for the island. Shellfish exports have dropped dramatically in the past few years, and a major focus of the Center's current research is to identify causes of and possible solu-

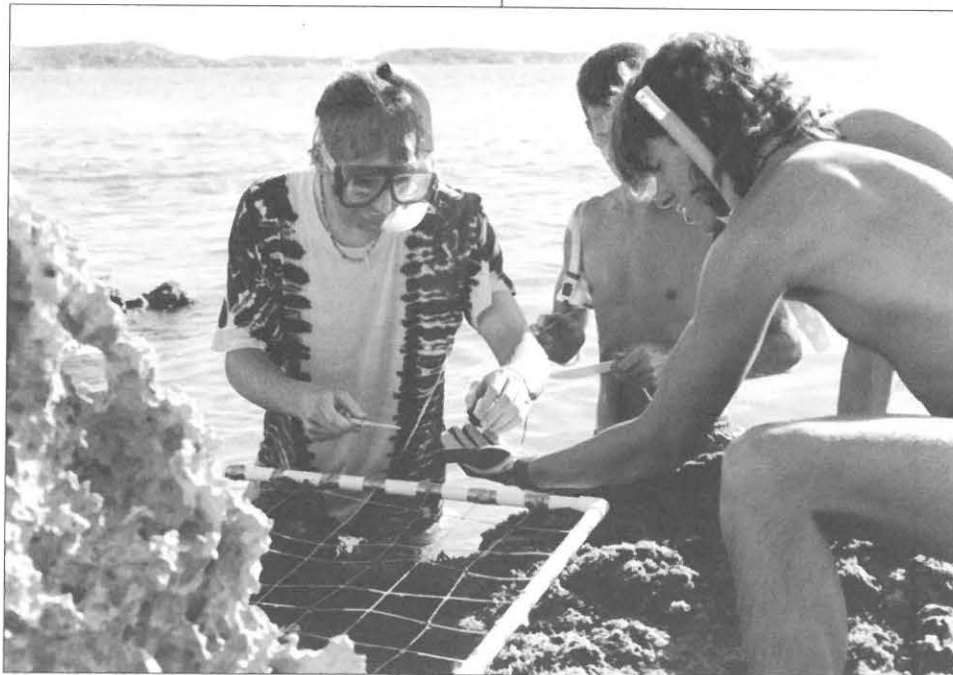
tions to this decline.

Faculty and students are working in several research areas as part of the process of bringing a focus to the Center's research on those specific projects which will ultimately have the greatest impact on the local marine resources. One particularly relevant student project was a comparison of shell length size with "wet" meat weight of Queen conch; it was designed to contribute to a new size limit enforcement strategy for the region.

Other examples of individual students' work from Spring and Summer demonstrate the great diversity of intriguing subjects in South Caicos and its waters: "Size distribution and density of Queen conch (*Strombus gigas*) at night," "Fishing pressure on *Strombus gigas*, and abiotic environmental parameters at East Bay and Mangrove I," "A study of the current and surge in East Bay," and "A coastal zone management plan for South Caicos." Group work included marine habitat mapping, the development of a species list for a proposed park offshore of the Center, and a survey of local attitudes toward fisheries and marine resources.

The formal opening of the Center on South Caicos occurred on April 27th, with a luncheon for local and national dignitaries. This provided our students with a truly unique opportunity to present new marine species population data to the Governor, Chief Minister, several members of Parliament, and several senior members of the Fisheries Office of the Islands.

Lastly, due to the Center's relocation and historically high summer enrollment, we chose to invite more faculty and staff than usual to be involved in the spring and summer programs. While space here does not permit us to acknowledge each member of this large team for his or her individual efforts, it is important that they all be commended for a job well done. The challenges of Center start-up are tremendous, and judging from all reports, the faculty and staff met them with great success.



A student team collects data on species living within a transect, as part of a long-term effort to document shoreline resources and determine conservation needs and potential management strategies. Photo credit: Olof Ehrenstrom

Field Report

The Center for Rainforest Studies: Australia

Of all environmental crises, rainforest destruction is perhaps the greatest single threat to Earth's biological diversity. Nevertheless, while many young people are aware of the extent of this crisis, few have the opportunity to develop a detailed knowledge and the practical, hands-on skills needed to impact conservation efforts. In 1987, the SFS **Center for Rainforest Studies** in North Queensland, Australia was established to meet this need. The 153-acre campus, adjacent to a World Heritage site, is ideally situated for training in rainforest ecology and conservation. It is the only full-time field center in the world offering this educational opportunity to undergraduates.

In 1990, 47 highly qualified students from selective colleges nationwide enrolled in our two **Biogeography: Patterns of Ecological Diversity** semester programs, and 15 students participated in our summer course, **Deforestation: Threats to Biological Diversity**. Overseeing these programs was Field Director Dr. William Laurance. Dr. Laurance brought to the program his expertise in mammal conservation research, which he had gained only a few miles from the Center as a graduate student at U.C. Berkeley. Faculty during the semesters included Drs. Nicky Goudberg and John Duggin, who have both contributed to almost all the Center programs since it was founded. Dr. Goudberg's graduate work was done at James Cook University, and she has brought to SFS many years of fieldwork experience in Australian rainforest. Dr. Duggin earned his degree in Resource Management from Yale University, and is an assistant professor at the University of New England, Australia. His expertise lies in the fields of Forestry and Land Use.

Dr. Francis Putz joined the Faculty as our Botany expert for the Spring semester, while on sabbatical from Cornell University. Doctoral candidates JoAnn Resing (James Cook University, Zoology) and Rod Fensham (University of Tasmania, Geography) completed the teaching team in Associate Faculty positions. Dr. Colin Matthews continued his tireless efforts as Site Manager, and Pat Zollner serves as Administrative Assistant. Amy Jansen and SFS alumnus, Richard Camp, served as Interns.

The past year was one of exciting growth at the Center, particularly in regards to the physical plant. Students now live in four large cabins, completed just as Spring semester began, thanks in part to the

generosity of the **Archer-Daniels-Midland Company**. The Center's Administrative Center now receives main-line electricity; lighting and water heating in all other buildings is accomplished with solar power. Our computer facilities have been significantly upgraded to four microcomputers with an array of advanced software, housed in a new computer room and workstation. In addition, the Center now boasts a collection of over 1,000 scientific papers on rainforest research.

Student and faculty research is focused on two vital conservation goals: assessing the impacts of habitat fragmentation on native animal and plant communities, and the restoration of degraded and regenerating tropical forests. A sampling of 1990 students' independent projects demonstrates the wealth of research opportunities at the Center: "Avian community structure in rainforest and regrowth forest in tropical north Queensland;" "The effects of experimental stream sedimentation on aquatic insect communities;" and "Lizard abundances in rainforest and regrowth corridors in tropical north Queensland."

This and other student work has provided important data concerning the ability of various bird, mammal and reptile species to survive in regenerating forest.

Results of several Center projects have been submitted for publication to highly regarded journals, including the *Australian Journal of Botany* and *Australian Wildlife Research*.

In addition, the Center continues to expand its involvement in the local community. At the conclusion of each semester, we host a public meeting in the town of Yungaburra, where students give informative talks about their research for local residents. We also participate in local environmental fairs and tree-planting operations, provide occasional Center tours for school groups, and offer presentations to scientific seminars as well as talks to civic and religious groups.

We plan to form a Board of Advisors to assist the Center in enhancing its curriculum, research focus, and interactions with local and regional government agencies. The coming year will also see construction of a large classroom attached to the Administrative Center and two faculty duplex houses, further investment in research equipment, and improvement of the Center's library. This physical plant development should allow the Center to realize its full potential as a first rate training and education facility.



The foundation of the SFS curriculum is our belief that the world itself is one's best classroom. Australia semester students in this photo are assessing data collected at their stream ecology "lab", the stream itself. Photo credit: Jennifer Taylor

Field Report

The Marine Mammal Program: Mexico

The Sea of Cortez has long been recognized for its biological diversity and ecological importance. The geologically young sea supports a surprising number of resident and migratory marine mammal species, including finback, humpback and grey whales, sea lions, and dolphins. It also provides critical resources to the local human population by way of a small but steadily growing fishing industry.

Despite its significance, the Sea and the species which it supports have received relatively little attention from the scientific community until recently. The rapid growth of tourism and international fishing around the Baja Peninsula demands that concern for the continued health of these marine ecosystems grow.

Currently, scientists associated with three La Paz area research institutions are seeking to protect the sea's wildlife through both legal means and the sustainable development of this marine ecosystem. There is general agreement that a dramatic increase in the level of base-line research and education about the region is needed in order to manage its threatened resources successfully. This is particularly necessary in the Bay of La Paz region, where both human and marine mammal populations are concentrated.

With start-up funding from the **Island Foundation**, SFS established the **Marine Mammal Program** (MMP) in Baja, the world's first year-round field program offering undergraduates training in marine mammal conservation. This was done in close cooperation with the Universidad Autonoma de Baja California Sur (UABCS), one of the three local institutions involved in marine research. The pioneer semester of the MMP began in February.

The student body of twenty-six in the first program was truly international, with participants from Brazil, England, Canada, Mexico, and the U.S. The exchange of ideas and cultural practice was constant, and contributed greatly to the overall educational mission of the Program. Several UABCS students were involved in the first semester, and through an agreement with the University, two additional students were granted full scholarships to attend SFS summer courses.

Lorayne Meltzer joined SFS as Field Director in October to prepare for the Spring semester. Ms. Meltzer earned her M.Sc. in Teacher Education and Natural Sciences at California State University. Most recently, she served as

Adjunct Faculty at San Francisco State University, holding responsibility for their program in marine and desert ecology and resource management in Baja.

Henk Nienhuis (Site Manager) and Joel Barnes (Teaching Assistant) joined Ms. Meltzer at the start of the Spring semester as the core of the current resident staff, and will be joined by several Resident Faculty in 1990-91. Mr. Nienhuis holds a Masters degree in Marine Biology from State University of Leiden, The Netherlands, and has worked as a researcher in Baja for several years. Mr. Barnes completed his graduate work in Marine Resources at Humboldt State University, and has extensive experience in environmental education and expedition leadership in Mexico and elsewhere.



The learning that occurs at SFS is active and comes out of direct, hands-on experiences. Students are shown here recording data on the measurements, sex and age of a common dolphin that washed up on the shores of the Baja site. They would later dissect the animal to investigate the cause of death and to learn about its anatomy. Photo credit: Lissa Flemming

In the Spring semester, they were joined by several short-term appointments. Long-time SFS summer faculty member, Dr. Gary Miller, was responsible as Senior Faculty for the Marine Biology course. He was assisted by Mark Hansen, an expert in bottlenose dolphin behavior. The Cultural Ecology course was taught by Dr. Charles Case, with the assistance of Chris Nichols, Intern. The UABCS Faculty associated with the program included Professor Jorge Urban, a marine mammalogist and Dr. Juan Guzman, an ornithologist. This team worked very well to meet the challenge of carrying full teaching responsibilities while working to resolve numerous issues around the start-up of a new Center.

While the MMP's broad research goal is to contribute to a marine mammal conservation strategy in the Sea of Cortez, our immediate objective in 1990 was to assess the diversity, distribution, abundance and density of baleen whales in the Bay of La Paz. Other work included an assessment of the effects of tourist boats on California sea lion behavior, the results of which are now being used not only by UABCS researchers, but by the largest tour company in Baja in an effort to evaluate environmental impacts of its commercial activities.

Other student research focused on terrestrial ecosystem issues, bottlenose dolphin behavior, bioenergetics, and brown pelican feeding patterns. The diversity of SFS student work contributed greatly to the local research effort, which has always stressed the need for an interdisciplinary approach to marine resource management.

One of our primary objectives for the coming year is to select and acquire a permanent campus for the MMP. We have identified several areas on the Pacific Ocean, the Sea of Cortez, and the Bay of La Paz as possible locations. The purchase of a permanent site will provide the continuity and stability which this young program needs to reach its full potential.

Satellite Sites Worldwide

SFS offers summer courses at "satellite" sites in addition to semester and summer programs offered at the four SFS Centers. This component of the SFS curriculum provides a broader range of course topics from which students can choose, and gives students, who for various reasons are unable to participate in the longer semester programs during the school year, the opportunity to enjoy the SFS experience. Our satellite courses also serve non-science majors who want a short but intense learning experience in the field of environmental studies.

This year's satellite curriculum was comprised of nine courses. Twenty-five faculty, 7 interns, and 250 students participated in these programs. Three continents were home to our summer offerings, with sites in Alaska (2 courses), Colorado, Costa Rica (3 courses), Ecuador, Kenya, and North Carolina.

Three of these programs were new versions of previously taught courses. They brought students to the dry forests of Costa Rica to study monkey behavior and conservation; to Costa Rica's east coast to study sea turtles at one of their most famous nesting sites; and to Prince William Sound, Alaska to research the impact of the Exxon oil spill on the harbor seal populations there.

We also developed a new satellite program in Kenya. Dr. Hussein Isack, who previously served in a teaching capacity at our Center in Kenya, led the first

Master Teacher Course. The focus of this course is the fascinating honeyguide bird and its ecology and unique relationship to humans. SFS's goal with the Master Teacher Program is to foster excellence and continuity in satellite programming by attracting and supporting highly qualified faculty who, in turn, are willing to make a long-term (3-5 years) commitment to the School. As with the **Honeyguides** course, the continuity in research over consecutive years that is offered by MTP courses provides an outstanding opportunity for students to contribute to the resolution of critical conservation problems.

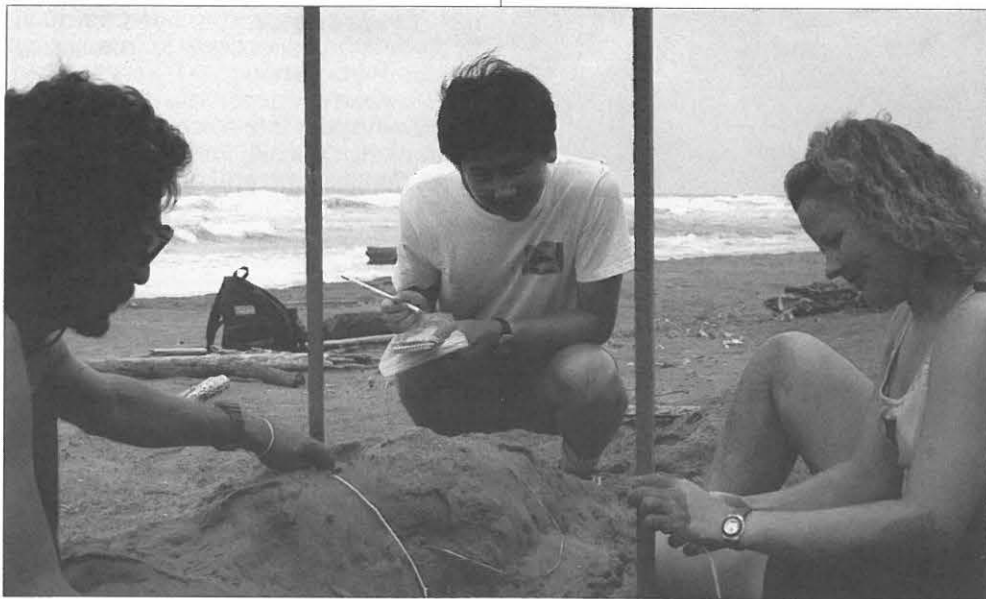
A significant amount of research can be accomplished when 250 highly motivated young people make a commitment to contribute their energies to solving environmental problems. For example, students in our **Endangered Monkeys** program in Costa Rica completed a rare census of the monkey populations on a private landholding; personnel at the Curu Wildlife Refuge expect to make use of our results in planning a management strategy to protect the species we counted. This SFS team also identified some notable behavioral and demographic differences both within and between the howler and capuchin monkey populations; this work may have important implications for conserving the two species.

Sea Turtle Survival students were able to provide important demographic data on nesting green turtles which

will be used by the Caribbean Conservation Corporation in its long-term study of the species. Students also provided park managers useful data which suggests that, contrary to previous assumptions, human impact on nesting success cannot be reliably measured by counting the number of "half moons" seen on beaches; they brought attention to this issue by demonstrating that "half moons" appear to be a normal exploratory behavior of the turtles on undisturbed beaches as well as on disturbed beaches.

In Alaska, participants in the **Bald Eagles** course continued the SFS tradition of supplying the U.S. Fish and Wildlife Service with valuable data on bald eagle foraging behavior and nesting habitat. The Service will also use data on prairie dog towns collected by students in the **Landscape Ecology** course while in Colorado. This information is very important to them in the design of their scheme to reintroduce the endangered black-footed ferret to that area.

Overall, the summer's activities at SFS were a resounding success. While exciting and useful research projects are one evidence of that success, so is the enormous degree to which this year's students were positive in their evaluations of faculty. It is rare that faculty receive such high marks from students, and the Programming Department looks forward to working with many of this past summer's faculty again in the future.



SFS introduces young people with budding interests in conservation to the challenges and rewards of a career in field research, which often involves physically demanding and repetitive work. In this photo, participants in the Sea Turtle Survival program collect data on soil erosion at a beach frequented by endangered turtles. Photo credit: Tom Kleinert



Generous support by our contributors has provided the high quality scientific equipment that students need for developing and meeting meaningful research objectives. Photo credit: Jack Shea

The Center for Sustainable Development Studies

The SFS **Center for Sustainable Development Studies** has grown out of a recognition that industrialized countries must find ways to cooperate with developing countries to discover environmentally sustainable paths for socio-economic change. This is necessitated by many factors of mutual interest, not the least of which are the need to slow global climate change, the growing scarcity of natural resources, and the need to preserve biological diversity. If such efforts are to be achieved successfully, with sensitivity for the agendas of developing countries, environmental professionals in the U.S. will need to expand and deepen their understanding of sustainable development concepts. SFS seeks to address this need through its Center for Sustainable Development Studies.

The Center, which will become SFS's fifth permanent campus, was the inspiration of Dr. Harold Ward, Director of Brown University's Center for Environmental Studies. Dr. Ward approached the School in 1988 with a proposed collaboration between SFS and a consortium of colleges and universities that have strong undergraduate environmental programs. SFS would create and operate a Center where students from these programs could get actual field experience. The Consortium's role would be to

provide academic guidance, program development support, students, and technical assistance for the Center. Zimbabwe was soon identified as the site for the program, which was to begin in Spring, 1990. Long-range plans included a second Center for Sustainable Development Studies on another continent. Costa Rica was preliminarily selected as a potential site for this second Consortium initiative. The **Arnold D. Frese Foundation** provided partial start-up funding for the Center with a generous three-year grant.

By the end of 1989, formal contracts with seven member institutions were signed: Brown University and Allegheny, Bowdoin, Colby, Dickinson, Middlebury and Williams Colleges. Dr. Ward, with help from the Consortium and SFS, invested a great deal of time creating a particularly innovative curriculum, and was prepared to direct the first semester program. We initially obtained verbal support for the Center from the Zimbabwean Embassy in Washington, the Ministry of Foreign Affairs, and the Ministry of Natural Resources. Nonetheless, at the last minute, the Government of Zimbabwe felt the current design of the program was not in the country's best interests, and we were forced to postpone the opening of the program indefinitely.

The Consortium then approved Costa Rica as the new Center site in May. SFS has been operating satellite programs in Costa Rica for three years, and our preliminary investigations again indicate good support for the program within Costa Rica. SFS President James Elder took an investigatory trip there with Middlebury College's Consortium representative and Associate Professor of Biology, Dr. Steven Trombulak. Their visit successfully confirmed the viability and desirability of operating the Center in Costa Rica.

At this writing, five schools, four of which are original members, have committed to participating in the Costa Rica program. The remaining schools are currently reviewing the new plan. In addition, several newly interested schools are considering participation, and we expect the number of Consortium members to grow before the Center opens in 1991.



Soil erosion is a critical sustainable development issue facing much of the planet. Uncontrolled land use in some regions has resulted in depletion of wildlife and the necessary migration of humans displaced as land becomes non-arable. The Center for Sustainable Development Studies curriculum will focus on this issue and related global environmental dilemmas, most of which can be examined in Costa Rica. Photo credit: Jack Shea



SFS students visit a logging site near our Center in Australia to learn first hand about the loggers' perspectives on the complex issue of deforestation. Similar investigations will comprise the core of the SFS program in Costa Rica. Photo credit: Erv Peterson

Department Report

Admissions

The burgeoning public interest in the environment translated into a surge of interest in SFS programs over the past twelve months. During this period, inquiries about SFS offerings increased by almost 25% as close to 16,000 students and educators sought program information from us. This growth represents our biggest inquiry increase in more than five years.

This interest further translated into increased enrollment in our semester programs. During the past year, participation in semester programs was up 28%. Semester students now account for one third of the total SFS enrollment, up from 24% last year, and for two thirds of the School's total tuition income. Only one of the 177 available semester spaces went unfilled, as semesters continue to be our fastest growing programs. Students now apply up to a year and a half before the start of the semester to guarantee a space in the program.

Applications for summer courses were up 18%, and the 362 students who went into the field filled 98% of all available spaces. Total enrollment for the year was 538 students, down a few students from last year due to fewer available SFS programs this year.

Scholarship funds raised by SFS enabled 130 highly motivated young

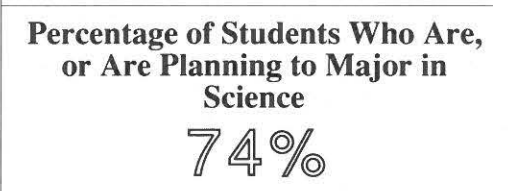
people, who otherwise might not have had such an opportunity, to participate in SFS programs. While 24% of our student body received SFS financial aid, due to the increase average need of our participants, we actually assisted 15 fewer students than last year. Financial assistance totaled over \$220,000, including 138 student loans totaling over \$106,000 from the Merck Family Revolving Loan Fund.

Four newly created full scholarships were awarded for the first time in 1990. Three students from the Universidad Autonoma de Baja California Sur attended SFS programs; Jose Sanchez participated in the *Marine Mammal Biology and Conservation* semester in Baja, Manuel Olguin-Mena attended the *Sea Turtle Survival* program in Costa Rica, and Serafin Roldan joined the *Coral Reef Management* program at the Center for Marine Resource Studies. Paul Ma, of Harvard University, was the first recipient of the *Lands' End Scholarship*, which he used to attend the *Wildlife Conservation* program at our Center in Kenya.

This year's SFS participants came from 45 states, the District of Columbia, Austria, Brazil, Canada, England, Spain, Portugal, Mexico, Nepal, Sweden, Bermuda, Greece, Ecuador and the Philippines. The students represented over

300 different colleges, universities and secondary schools. The home institutions with the highest representation among our students were: Colby, Tufts, Brown, Vassar, Davidson, Middlebury, the University of Vermont, Smith, Williams, Bowdoin, and Cornell.

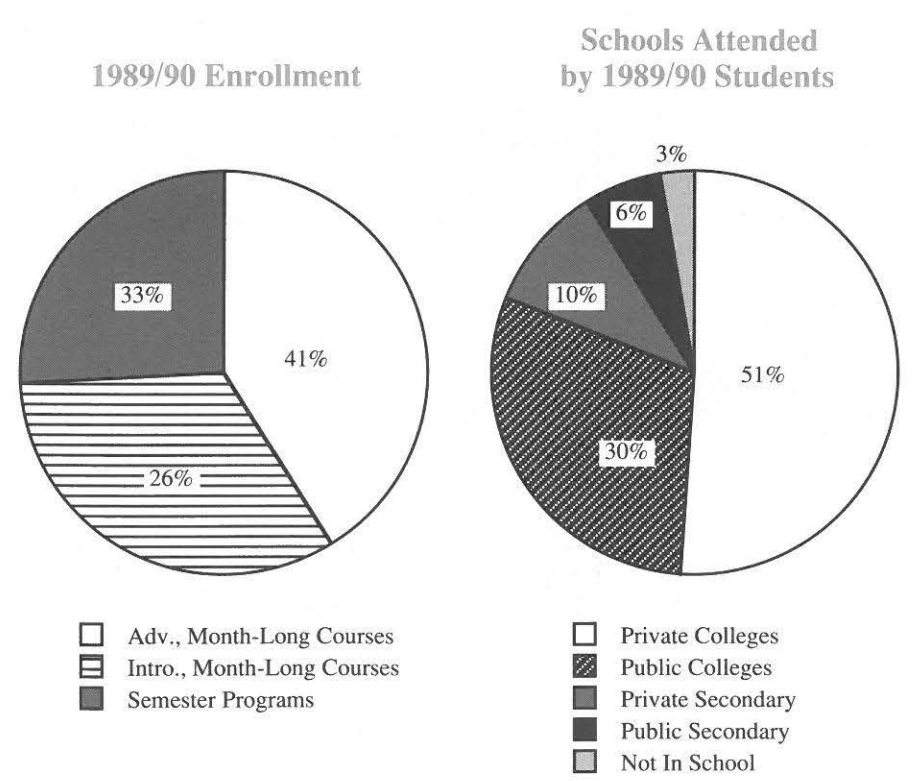
One of our goals at SFS is to see our graduates become "Ambassadors for the Environment." During the course of this year, we have heard from a number of early SFS alums who are now going forward in a variety of careers. We are proud to verify that we have indeed launched some very committed and effective "Ambassadors" who, as environmental lawyers, field scientists, Peace Corps volunteers, teachers, lobbyists, environmental consultants, bankers and informed citizens, are doing their part to ensure the sustainable development of our planet's resources. We eagerly await the results of such commitment from our 3,500 alumni as they find their places in the world and make an impact on improving our environment.



AMBASSADOR FOR THE ENVIRONMENT:

SARAH LAMPORT LAURENCE

Sarah attended her first SFS course, *Wildlife Management* in Kenya, after completing her junior year at the Dalton School in New York. The following Spring, due in part to the experience she gained in Kenya, Sarah was asked to teach a credit course in environment and conservation to her fellow students at Dalton. From Dalton she entered Harvard University, where she would major in Government. After her freshman year, Sarah returned to SFS as a student in *Dolphin Biology and Behavior* in the Gulf of Mexico. After her sophomore year, she worked as an intern with Defenders of Wildlife, helping to develop a grassroots strategy for wolf reintroduction to Yellowstone Park. On leave from Harvard, she spent the following year working as a Greenpeace canvasser in Cambridge, MA, and then as an Assistant Wildlife Campaigner for Greenpeace U.K. While in London, she conducted market research for Greenpeace's whales campaign. Sarah returned to Harvard, graduating cum laude in June, 1990. Sarah and her husband are living in Cambridge, and Sarah is currently seeking employment in an environmental field and/or education.



Administration and Finance

The Department of Administration and Finance provides the infrastructure support required to assure that SFS programs are able to operate successfully. The Department is responsible for managing SFS's financial systems, legal affairs, logistical issues, and widespread physical plant and equipment purchase and maintenance. Our department's commitment to add, replace, and upgrade facilities and equipment is intended to minimize the energies of field staff in resolving site and operational issues, and thereby allow concentrated focus on the academic program. In addition, the provision of quality equipment assures that our courses will operate safely with little or no loss of educational time due to faulty or inadequate resources.

One of the Department's primary goals has been, and will continue to be, the improvement of the quality of our various facilities as well as the acquisition of new Center facilities when financially possible. We made two major steps toward this goal in FY90. First, we completed the construction of four 8-person student dormitories at the **Center for Rainforest Studies** in Australia. Second, we completed our planned acquisition of a small hotel on South Caicos Island (Turks and Caicos Islands, B.W.I.), to which we relocated the **Center for Marine Resource Studies** from the island of St. John, U.S.V.I. We began major improvements at this site as well, focusing initially on upgrading the quality and quantity of scarce water resources. The purchase of this campus, at a cost of over \$300,000 plus another \$200,000 in improvements and new equipment, will provide us the same type of operational stability that we enjoy in Australia and expect to achieve in our other locales as funds become available.



With generous support from the Archer-Daniels-Midland Company, we were able in 1990 to near completion of some substantial improvements in academic and residence facilities at the Center for Rainforest Studies. Pictured here is one of several new buildings under construction at the site. Photo Credit: Colin Matthews

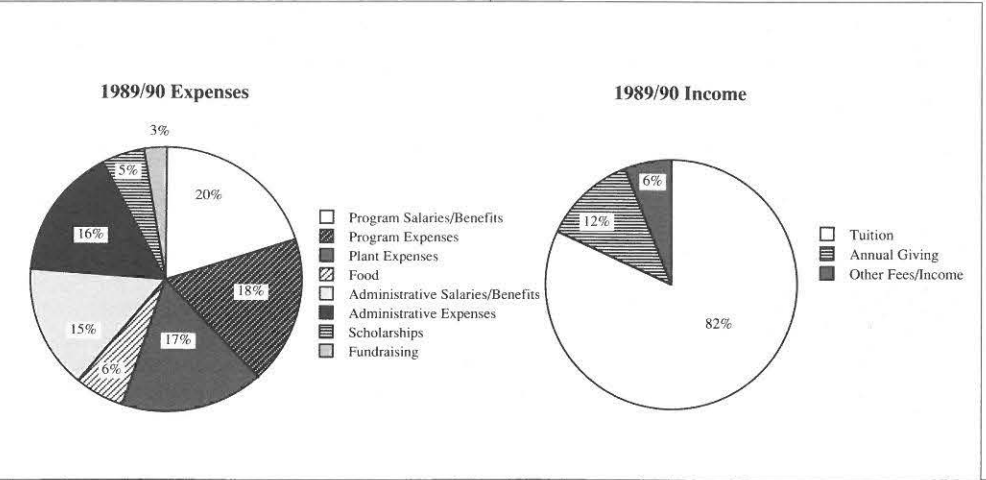
We also successfully supported the opening of the **Marine Mammal Program** in Baja last January in a leased facility, and have been working with our Field Director to locate a more permanent site from which we can run our semester and several summer programs. In FY90, we invested well over \$100,000 in new capital equipment in our academic programs.

A departmental priority continues to be the management of our fiscal resources. Three of our four Centers came in within budget this year, as did most of our satellite programs. The remaining programs had several unanticipated expenses, most of which involved addressing safety issues, replacing equipment, or committing funds to the miscellaneous activities needed to establish and operate a new facility. In addition, the unexpected termination of the **Center for Sustain-**

able Development Studies in Zimbabwe cost SFS substantially in both lost revenues and non-reimbursable expenses, only some of which will be recouped when the Center opens next year in Costa Rica. However, even with the unprecedented commitment of funds to our two new Centers, our ongoing commitment to complete the development plan for Australia, and the disappointment of the Zimbabwe program's cancellation, we completed the year with a positive cash flow and only a small mortgage in Australia for long-term debt.

Total fund balances increased 8% to \$507,000 during FY90. Operating costs increased 15% to \$2,427,000, while income also increased by 17% to \$2,235,000 this fiscal year. Tuition income in FY90 represents over 82% of our operating needs. We continue to maintain the goal of having tuition income cover our operating expenses (excluding scholarships, capital and new program development costs), thereby allowing the use of unrestricted contributions for program and physical plant development.

Copies of SFS's complete audited statements, which are the unqualified opinion of our independent auditor Peat, Marwick, Main and Company, are available from SFS upon request.

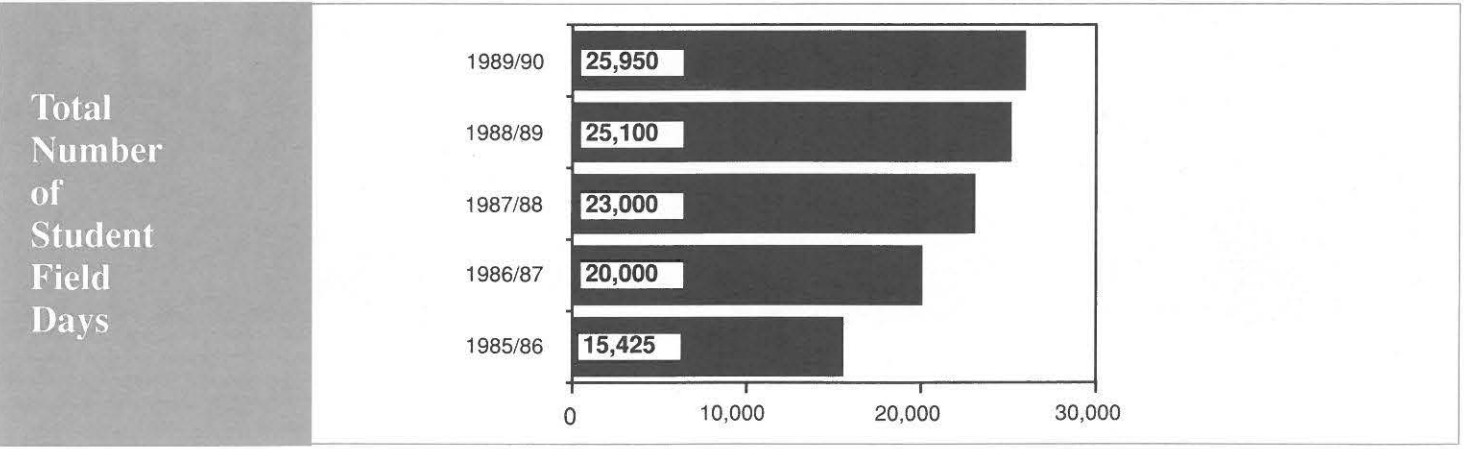


SFS Financial Summary 1986-1990*

All figures are expressed in thousands

Fund Activity	1985/86	1986/87	1987/88	1988/89	1989/90 (Preliminary)	1990/91 (Projected)
Tuition and Other Income	\$929	\$1,328	\$1,692	\$1,903	\$2,235	\$2,837
Restricted and Unrestricted						
Contributions	399	492	414	255	342	321
Less:						
Operating Expenses	1,198	1,484	1,876	2,114	2,427	2,833
Less:						
Scholarships Granted	66	74	99	98	112	120
Net Increase/(Decrease)	\$64	\$262	\$131	\$(54)	\$38	\$205
Fund Balances						
Beginning Balances	\$66	\$130	\$392	\$523	\$469	\$507
Net Increases	64	262	131	(54)	38	205
Ending Balance	\$130	\$392	\$523	\$469	\$507	\$712
Working Capital						
Current Assets	\$114	\$498	\$661	\$884	\$717	\$720
Less:						
Current Liabilities	277	502	604	668	790	800
	\$(163)	\$(4)	\$57	\$216	\$(73)	\$(80)
Fixed Assets						
Fixed Assets (Prior Year)	\$184	\$353	\$418	\$572	\$577	\$1,072
Capital Expenditures	169	65	252	55	547	350
Less:						
Fixed Asset Sales	--	--	98	50	53	33
Total Fixed Assets	\$353	\$418	\$572	\$577	\$1,072	\$1,389
Less:						
Accumulated Depreciation	45	85	107	164	206	270
	\$308	\$333	\$465	\$413	\$866	\$1,119

*The Fiscal year of SFS runs from September 1 to August 31. SFS was founded on October 20, 1980.



Department Report

Development

The staff and faculty of SFS gratefully acknowledge the corporations, foundations, and hundreds of individuals who have contributed to the School's success in 1990. The generous support they have provided, totalling a record **\$405,000**, has allowed existing programs to expand, new programs to flourish, and worthy students to attend SFS regardless of their financial resources.

The **Andreas Foundation** continued its tradition of generous support for general operating expenses and the SFS Scholarship Fund. The Foundation has played a unique role in the development and expansion of SFS programming, and its assistance has been invaluable for nine consecutive years. Additionally, in an extraordinary effort last fall, **Mrs. Dwayne O. Andreas** organized a highly successful premiere of the movie "Steel Magnolias" to raise much needed scholarship funds.

The **Richard King Mellon Foundation** again demonstrated its deep commitment to environmental education by awarding the School one of the largest grants we have received to date. These funds have enabled the School to embark on significant curricular and physical plant developments in an effort to achieve its full potential as a principal educator of future conservation professionals.

Students and faculty at our **Center for Marine Resource Studies** benefited from continuing support from **The Laurance S. Rockefeller Charitable Trust**. Funds were used to upgrade the Center's research equipment and, more importantly, to award several deserving young people with the scholarship assistance they needed in order to participate.

Lands' End Direct Merchants, Inc. established an exciting new scholarship competition through which two participants have received full tuition assistance. The program is part of the company's overall effort to support education and to build awareness of the special opportunities we offer among its customers who might apply to SFS.

In 1990, **The Charles Engelhard Foundation** fulfilled its final pledge for development of the Affiliation Program. For the past three years, the Foundation's assistance has allowed staff to devote considerable attention to the Program, and has resulted in increased opportunities at SFS for the students of affiliated colleges and universities. We are also very grateful to **The George Gund Foundation**, whose three-year grant provided much needed funds for the development of the Program in the Ohio region.

Trustees of the **Arnold D. Frese Foundation** also showed their support of our efforts to build closer ties and collabora-

tions with the traditional academic community by commencing a generous three-year grant to partially underwrite the start-up costs of the **SFS Center for Sustainable Development Studies**.

The **Archer-Daniels-Midland Company** continued its tradition of course sponsorship with a large grant to the **SFS Center for Rainforest Studies** in Australia. Funds were used to support students with scholarship needs and to complete significant capital improvements at the site, including the building of new academic and residential facilities.

Several individuals made continuing and substantial contributions in 1990, including **Astra Davis**, **David and Alexandra Ayer**, and the trustees of **The Roy A. Hunt Foundation**. In addition, we gratefully acknowledge the special efforts and contributions of those at the law firm of Brown Raysman & Millstein of New York who have been involved with the School. Without the assistance of these people and others, SFS would not reach its potential as the foremost environmental education institution in this country.

In 1990, SFS students reaped great benefits from the generous support provided by the more than 400 individuals, foundations and corporations whose names follow. Such assistance is the foundation of the quality and the power of the SFS experience. Our sincerest thanks.



Chairperson Terry L. Andreas presents the Rector of Universidad Autonoma de Baja California Sur, Dr. Jose Eduardo Ruiz Castro, with a Certificate of Appreciation from the SFS staff and trustees. His and several others' efforts were instrumental in the creation of the Marine Mammal Program, a unique educational and scientific collaboration between the two institutions.
Photo credit: Shaun Bennett



One of the School's primary objectives is to purchase our own permanent sites for all Center programming as soon as capital fundraising allows. This photo shows the main building at the recently relocated Center for Marine Resource Studies in the Turks and Caicos Islands. A few structural renovations, currently being implemented, will soon make this former hotel an ideal home and work space for the Center's faculty and students.
Photo credit: Jim Elder

Department Report

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A key component of the SFS educational model is the unique working relationship between undergraduates and faculty who share research goals.
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Selected Research Papers Resulting from SFS Field Courses

Plant Community and Ecosystem Group

Acid Rain, Adirondack Mountains, New York, 1983
SINGER*, R., D.A. ROBERTS*, and C.W. BOYLEN
Biological effects of acidification on small oligotrophic Adirondack lakes. Proceedings of the Second New York State Symposium on Acid Deposition; Ithaca, New York, 1983.

Community Ecology, Mount St. Helens, 1982, 1983, 1984
ADAMS*, A.B., and V.H. DALE
"Vegetative succession following glacial and volcanic disturbances in the Cascade mountain range of Washington, USA." In *Mount Saint Helens 1980 Botanical Consequences of the Explosive Eruptions*. D.E. Bilderback (ed.), Los Angeles; University of California Press.

Biogeography: Patterns of Ecological Diversity, Australia, 1990
LAURANCE*, W.F.
Rainforests in the Land Down Under. *Wildlife Conservation Magazine*, July/August:26-45, 1990.

LAURANCE*, W.F., and E. YENSEN
Predicting the impacts of edge effects in fragmented habitats. *Biological Conservation*, Vol. 55, 1990.

PUTZ*, F.E.
Growth habitats of climbing palms (*Calamus spp.*) in north Queensland rainforest. *Australian Journal of Botany*, 1990.

Marine Biology and Management Group

Coral Reef Ecology, St. John, USVI, 1982, 1983, 1984
BRODY*, M., S.J. MILLER*, M.T. BALBACH**, J.M. EAGLES**, M.L. FINDLEY**, H.C. FOWLER**, R.D. ING**, R.A. MADON**, W.S. MALDONADO**, D.P. REMSEN**, N.A. ROSE**, P. SIMPSON**, and T.R. WHITE**
Man and the biosphere: ground truthing coral reefs for the St. John Island Biosphere Reserve. Report to the Virgin Islands National Park Service, 1984.

Sources of Reef Fish Toxins, St. John, USVI, 1986, 1987
KOHLER*, C.C., D.R. TINDALL, P.C. PHILLIPS*, and S. KOHLER*
Ecology of organisms involved in Ciguatera poisoning in Great and Little Lameshur Bays, St. John, United States Virgin Islands. Report submitted to the United States National Park Service, St. John, USVI; 1987.

Marine Biology and Management, St. John, USVI, 1988, 1989
EDMUNDS*, P.J., D.A. ROBERTS*, and R. SINGER*
Reefs of the northeastern Caribbean I. Scleractinian populations. *Bulletin of Marine Science*, 46(3):780-789, 1990.

Animal Behavior and Conservation Group

Marine Mammal Biology and Conservation, Glacier Bay and Kenai Peninsula, Alaska, 1982, 1983, 1984, 1986, 1987
CALAMBOKIDIS*, J., and G.H. STEIGER**
Bald eagles (*Haliaeetus leucocephalus*) consumption of harbor seal (*Phoca vitulina*) placenta in Glacier Bay, Alaska. *Raptor Research*, 19:(2), 1985.

CALAMBOKIDIS*, J., and B.L. TAYLOR*, S.D. CARTER*, G.H. STEIGER**, P.K. DAWSON*, and L. ANTRIM*
Distribution and haul-out behavior of harbor seals in Glacier Bay, Alaska. *Canadian Journal of Zoology*, 65:1391-1396, 1987.

Primate Social Behavior, Costa Rica; Endangered Monkeys, Panama, 1984, 1985, 1986
CLARKE*, M.R., E. ZUCKER*, and R. SCOTT
Population trends in the howler monkey (*Alouatta palliata*) in Costa Rica. *American Journal of Primatology*, 1986.

Dolphin Biology and Behavior, Florida Keys and Alabama, 1985, 1986, 1987
HEIMLICH-BORAN*, J., and S. HEIMLICH-BORAN*
Population estimation and seasonal habitat use patterns of bottlenose dolphins (*Tursiops truncatus*) off the Gulf coast of Alabama. Presented at the Seventh Biennial Conference on the Biology of Marine Mammals; December 5-9, 1987.

Veterinary Ecology: Pronghorn Antelope Population Collapse, Wyoming, 1988
REEVE, A.F.*
Pronghorn productivity studies in the Fifteenmile herd unit. Prepared for the U.S. Bureau of Land Management and the Wyoming Fish and Game Department; 1988.

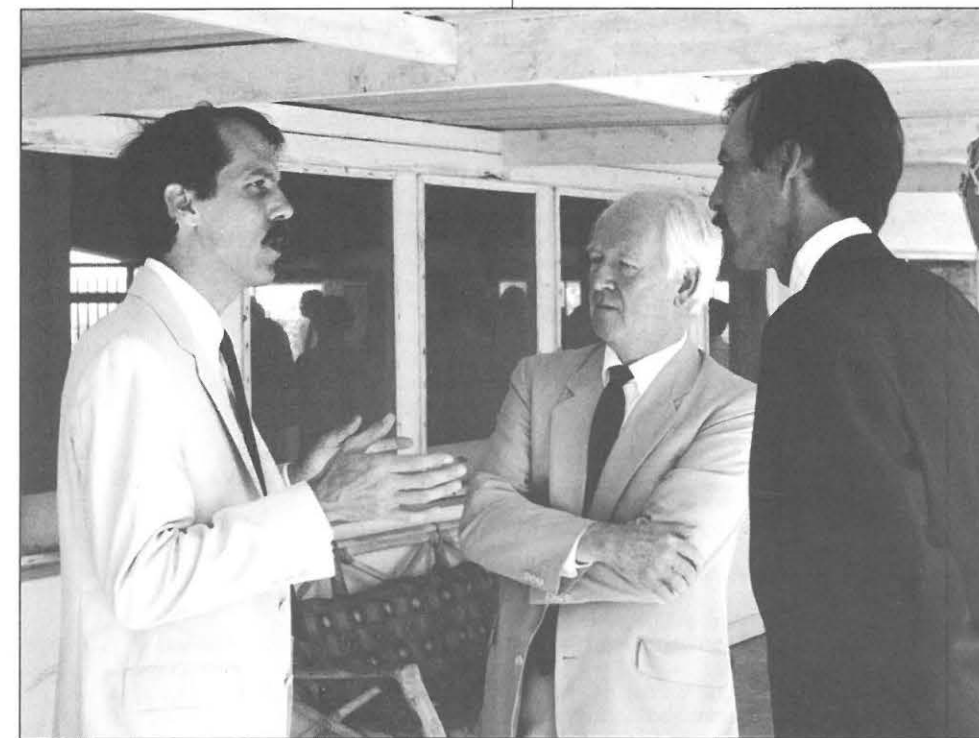
Wildlife Ecology and Management Group

Population Dynamics of Endangered Species, Greece, 1983, 1984
HUSBAND*, T.P., and P.B. DAVIS*
Ecology and behavior of the cretin agrimi. *Canadian Journal of Zoology*, 62:441-420, 1984.

Center for Wildlife Management Studies, Kenya, 1982, 1983, 1984, 1985, 1986, 1987
STELFOX*, J.B.
Thompson's and Grant's gazelle in relation to seasonal environments and resource use. *African Journal of Ecology*, 24:111-120, 1987.

MADDEN**, D.
Thorns, browsing mammals, and the management of an East African rangeland. Presented at meeting of the Association for Arid Land Studies and Western Social Science Association; Albuquerque, New Mexico; April, 1989.

* SFS Faculty
** SFS Student



SFS President James Elder speaks with Turks and Caicos Governor M.J. Bradley and Spring semester Acting Field Director Paul DeOrsay at the opening ceremonies of the Center for Marine Resource Studies. The School has cooperated with government and interested parties in the fisheries industry to determine ways in which the Center's three programs can assist in the successful management of local marine resources.
Photo credit: Olof Ehrenstrom

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Long-time member of the SFS Resident Faculty, Dr. Gary Miller, gives an impromptu outdoor lecture at the Spring home of the Marine Mammal Program in Baja. Dr. Miller is just one of our many faculty whose hard work is greatly appreciated by the staff and students of the School. Photo credit: Shaun Bennett