

Training and Education for Tropical Conservation

Introduction

Biodiversity conservation depends on the capacity of people to implement successful conservation initiatives. A broad consensus exists that there is a shortage of trained conservation professionals, particularly in the tropical countries that hold much of the world's biodiversity. Between January and October 2002, the Conservation Strategy Fund (CSF) conducted a survey of demand for conservation education and training in the tropics and reviewed existing training programs in six countries: the United States, the United Kingdom, Brazil, Peru, Madagascar, and Indonesia. Here we briefly summarize our findings and recommendations. The full 260-page report is available at the following website: <http://www.conservation-strategy.org>.

Tropical conservation faces challenges stemming from many quarters: poverty, newly globalized industries, weak governments, limited awareness of conservation problems, and a lack of trained conservationists within the movement, to name but a few. Education and training can make inroads in all these areas.

Conservation movements in the tropics vary tremendously across countries and regions. Latin American civil society is well developed. In Brazil, for instance, there are large national nongovernmental organizations (NGOs) with strong technical capacity, a voice in public policy, and entirely Brazilian staffs. In smaller Latin American countries, however, university conservation programs still struggle for funding and support, and NGOs have less influence in the national policy arena. In East Asia, civil society is still incipient and biodi-

versity conservation occurs mainly through government management or local community action. Many NGOs and resource management departments in Africa face basic infrastructure limitations, contend with weak or corrupt governments, and compete with economic development and poverty-alleviation agendas. In countries such as Papua New Guinea and Madagascar, environmental initiatives are often overwhelmingly driven by large multilateral and bilateral donations. These programs create jobs for professionals, some of whom may have only a passing interest in conservation, and the jobs often disappear when the projects end.

Demand for Training

We conducted a survey of training needs for conservation in developing countries and collected data on basic demographics, past education and training, and perceptions of capacity-building needs.

Before conducting our survey, we envisioned several target groups for conservation education, with a decided emphasis on the first one in the following list: professionals implementing conservation programs (NGO or government), activists (running environmental campaigns), researchers, politicians, and university students.

We distributed our training survey through a variety of international networks and posted it on CSF's website in English, Spanish, Portuguese, and French. Using the Internet as the main tool for distribution of the survey excluded those people without computer or Internet access, notably many staff of remote protected areas.

Who Are Conservationists?

Our survey obtained 438 responses from 77 countries. Eighty-four percent of respondents were from developing countries. Our sample was mostly young and well educated in the sciences. Sixty percent were male. Most respondents were professionals implementing or overseeing conservation programs, and over half of the respondents worked for NGOs. As expected, the conservation ranks were dominated by those trained in natural or environmental sciences. Sixty-eight percent of respondents had an educational background in biology or some form of environmental science or studies. The other third were scattered among eight other disciplines. The youthful age of our sample might be explained by the distribution of our survey by email and the Internet. It was therefore more accessible to younger computer-savvy professionals, or it could be indicative of growing environmental movements in many developing countries. Table 1 summarizes characteristics of the respondents by geographic region.

What Do They Want?

We gave respondents a list of 20 training topics—basic natural sciences, conservation biology, forestry, sociology and anthropology, economics, law, policy analysis, research methods, project design, accounting and financial management, monitoring and evaluation, protected-areas management, conservation enterprise development, negotiation and conflict resolution, lobbying, communication and outreach, organization management and adminis-

Table 1. Profile of survey respondents from developing countries.

Region (% of sample)	Average age (years)	Highest degree received (%)			Male (%)	Organization type (%)*			
		bachelor's	master's	Ph.D.		gov.	NGO	acad.	other
South America (54)	34	36	40	24	60	18	52	17	13
Central America (17)	36	26	43	31	60	15	36	27	22
Asia/Pacific (16)	35	23	43	29	57	12	57	19	12
Africa (13)	38	16	52	31	81	15	52	15	17
Overall	35	30	43	27	61	16	52	18	14

*Abbreviations: gov, government; NGO, nongovernmental organization; acad., academic.

tration, fundraising, information technology and computer skills, and other—and asked them to list the most important subjects in which training is needed. Needs were segmented into the respondents' own needs, in the short- and long-term, and the general needs of the conservation movement as a whole within their country. Table 2 presents the top seven topics listed for each of these three categories.

We also asked participants what training they have already had outside their degree programs. The average respondent had taken around three nondegree training courses within the last 5 years and found them useful (mean = 4.3 on a 1–5 scale, with 5 being the most useful). One-quarter of these training courses were <1 week in duration, and almost 50% were <1 month in duration. The most common topics taught in these courses were conservation biology, monitoring and evaluation, project design, research methods, and basic science.

General Needs

The data point to a strong perception that the movement as a whole

needs an underpinning of conservation biology. Conservation biology scored high both among people trained in that field and among people trained in other disciplines. Many of the people who have been drawn to conservation careers come from a conservation biology background, and in many developing countries biology is the area in which conservationists have become the unquestioned experts. Indeed, governments often rely on NGOs for biological data and analysis.

The next three most frequently mentioned topics—monitoring and evaluation, fundraising, and project design—are all topics related to internal management of organizations and projects. The next most-mentioned topic, protected-areas management, is an umbrella concept that wraps together a broad set of organizational management and technical skills. Rounding out the list of topics were policy analysis and negotiation, signaling the need for conservationists to be more influential in environmental policymaking. Policy analysis is another topic that rolls up several disciplines, economics first and foremost, but also law and organizational analysis. When we ex-

cluded those with a background in natural sciences and environmental studies, policy analysis moved up to second in importance.

Own Needs

Respondents identified the same seven topics as priorities for their own short-term training, but ordered them differently. Training in fundraising was deemed the most critical need, which suggests that short-term priorities focus on organizational survival.

Only when respondents were asked about their long-term training needs did the list change substantially. Policy analysis topped the list by a healthy margin. Enterprise development and economics jumped to the second and third spots on the list, whereas fundraising and project design fell out of the top seven topics. That economics is at the core of all three of these top priorities might indicate a recognition that economic forces are largely driving resource use and that long-term conservation success requires understanding these forces and intervening to influence policies and business practices.

Table 2. Ranking of training needs according to survey data.

General needs	%	Own short-term needs	%	Own long-term needs	%
conservation biology	54	fundraising	32	policy analysis	26
monitoring and evaluation	41	monitoring and evaluation	24	enterprise development	20
fundraising	37	project design	24	economics	19
project design	35	negotiation	21	negotiation	18
protected-areas management	35	conservation biology	19	conservation biology	18
policy analysis	33	protected-areas management	19	protected-areas management	16
negotiation	31	policy analysis	18	monitoring and evaluation	15

Chief executive officers were most concerned with fundraising. Program directors, program managers, and junior professionals shared this concern, but gave it a lower priority. Nonetheless, with slight variation in the order of priorities, the list of long-term training needs was basically the same up and down the ranks of conservation organizations.

The least-cited topics were forestry, lobbying, accounting and financial management, basic natural science, and information technology and computer skills.

Supply of Conservation Education and Training

Building a person's ability to contribute to nature conservation can be done at various points in their career path, from undergraduate degrees to on-the-job training, and with different kinds of interventions that range from scholarships to short courses.

On the supply side, we sought to compare the training and educational opportunities provided to conservation professionals with expressed training needs. We researched programs available to tropical conservationists at universities and NGOs in the United States and United Kingdom and investigated training supply in Madagascar, Indonesia, Peru, and Brazil (organizations listed in Appendix 1).

For the purposes of this study we divided training into three categories, the last of which has been the most difficult to identify and track: (1) academic training; (2) professional development, which includes formal courses taken on topics relevant to profession but not part of an academic degree program; and (3) on-the-job training and mentoring, which includes short-term training that is specific to job responsibilities in order to improve an employee's efficiency.

Universities and NGOs in the United States and United Kingdom

offer myriad training programs relevant to conservation professionals. Many of the programs are relatively new. The last 20 years has seen a surge of interdisciplinary conservation degree programs and capacity-building efforts at both academic and professional levels. Of 20 U.S. and U.K. university programs reviewed, 16 were established after 1980 and 11 since 1990. Similarly, over half of the nonacademic training programs we researched had been established since 1990.

University Suppliers of Training

Dozens of U.S. universities offer environmental degree programs, mostly in areas of natural science and resource management. In most developing countries there is one leading university where almost all conservation professionals receive their undergraduate training. In larger countries, like Brazil, several schools turn out serious conservation talent. In the United States and Europe, environmental degrees have been offered for decades, and interdisciplinary programs have flourished in the past 10 years. A growing minority of these programs caters to students from developing countries. In contrast, most schools in tropical developing countries have rigid disciplinary boundaries, though a small handful now offer multidisciplinary advanced

degrees under titles such as Amazonian Studies, Conservation Biology and Wildlife Management, and Economic Management of the Environment. A number of universities in the United Kingdom and some in the United States are also developing flexible and condensed degree programs that are more relevant to conservation professionals in developing countries.

A few salient characteristics help differentiate programs in the United States and United Kingdom, including the focus of the program and the degree of service it provides to tropical conservationists. Programs can be roughly divided into three areas: (1) practical resource management; (2) policy analysis, business, or leadership training; and (3) academic research. Within these divisions, some programs focus on global-scale processes and systems and others focus on site-based issues and management.

Figures 1 and 2 present a framework for comparing university programs relevant to environmental conservation. Although each program we examined had a diversity of activities, faculty interests, and students, these qualitative figures provide an overall picture of the core focus of available degree programs. One generality that emerges is that the majority of programs targeting students in developing countries have a practical science-based cur-

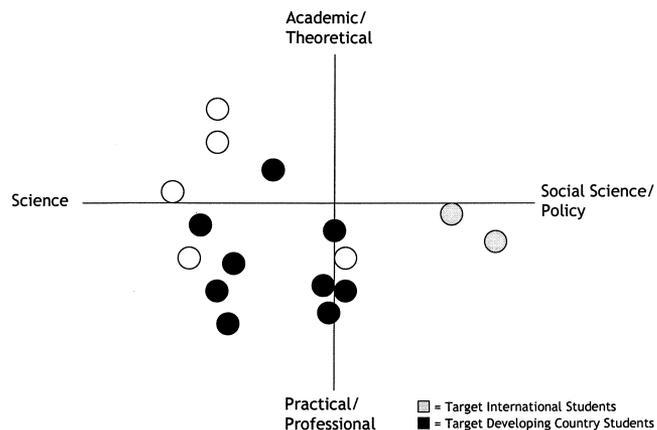


Figure 1. University environmental conservation programs by training type and student body.

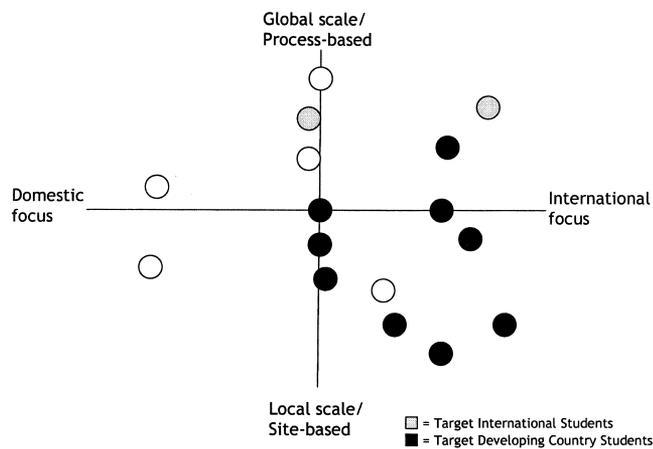


Figure 2. University environmental conservation programs by region and scale of focus.

riculum that addresses conservation issues at a site-specific or local scale.

Despite a large international student population at many of these programs, northern university programs have had only limited success in attracting conservationists from globally important ecosystems. Tropical conservationists from areas with high biodiversity represent less than one-fifth of the total number of students attending programs we reviewed: approximately 300 students from tropical developing countries are being trained each year, a significant but inadequate number. Some programs do train students from developing countries, but they reach few conservation professionals. Many students from tropical developing countries apply to these programs each year without success because of a lack of financial resources or poor academic preparation and qualifications. Most students from developing countries pursuing degrees at U.S. and U.K. universities depend on external support from NGOs, foundations, and government programs.

Geographic proximity and geopolitical history were strong determinants of where students from developing countries pursue academic degrees, although there were students from a variety of countries in each program reviewed in this

study. Universities in the United States had more students from Latin America and Asia, whereas universities in the United Kingdom had more Africans and students from Commonwealth countries. Many conservation practitioners from Southeast Asia, Micronesia, and Melanesia were in universities in Australia and the Pacific region.

Although Brazil, Peru, Madagascar, and Indonesia differ socially, politically, and culturally, they share certain limitations at the university level: (1) public universities are weak due to lack of public financial support; (2) field stations and field research opportunities are severely limited or nonexistent; (3) programs have difficulty updating information and staying on the cutting edge of conservation; (4) interdisciplinary programs are lacking that incorporate socioeconomic disciplines, such as law, policy, economics, and negotiation and conflict resolution; and (5) job markets for graduates are poor.

Important long-term interventions in all four countries we studied were field-based research and the application of conservation learning to a local context. At the same time, any strong university program needs to be closely tied to resources, institutions, and other academic departments in urban centers.

Faculty members at many U.S. and U.K. universities are involved in conservation research and capacity-building efforts with graduate students, research assistants, national and local academic institutions, national NGOs, and local communities from developing countries. Over the past decade, collaboration has grown between universities and nonacademic institutions. Large international NGOs have a number of project-based collaborations with both developing country institutions and northern universities. These arrangements represent one way to bridge the gap between formal and practical training and to take advantage of faculty interests in conservation.

Nonacademic Programs

Conservation challenges themselves are varied, and most institutions and organizations address a specific capacity-building niche. Organizations can be broadly divided according to whether they are service providers, focusing primarily on training, or whether they provide training as part of a larger project or program goal. A number of the larger organizations work at a global level, whereas others focus on one or two regions. Interestingly, we found no U.S. or U.K. conservation organizations with a specific focus on Asia. Some NGOs focus on training their own staff and partners, others offer training accessible to conservationists from other organizations, and some provide a combination of the two.

Activities of organizations can be divided into broad categories based on the type of support they provide (a number of organizations fall into multiple categories): specific skills, institution building, awareness training for decision-makers, scholarship funding, and large and diverse programs providing aspects of all the above. These divisions can be further characterized by whether the training is targeted at individuals or institutions and whether it is given in formalized courses or on the job.

Organizations with a specific focus on capacity building are more likely to target training at individuals than institutions, and to provide formal courses and workshops. Large international conservation organizations pursue more ad hoc mentoring activities and focus more training efforts on institutional partners as part of larger conservation programs. Overall, conservation organizations show a bias towards training in the biological rather than the social sciences and are more likely to provide training in the application of project tools than in organizational management.

Our training survey and supplier interviews found that most NGO training in each of the focal countries is project-driven. For the most part, training is sporadic and focuses on subjects dictated by the needs of the project or external funding sources. Likewise, access to training is often limited to those directly involved in a given project. A strong demand exists for NGO training that is provided independent of conservation projects. High-quality programs, of both universities and NGOs, are currently driven by foreign funding. In Peru the premier university in natural resource management, La Molina Agricultural University, diminished in its effectiveness at training conservationists when funding dried up in the mid-1990s. Likewise, funding is a major limitation to professionals who want to participate in formal training programs, especially the staff of national and local NGOs.

Problems with Available Training and Education

We found a vast number of training and education opportunities offered by the various organizations we interviewed. Although they were a self-selected group, most conservationists we surveyed had advanced degrees and on average had participated in three training courses over

the last 5 years. This raises the question of whether there is a shortfall in tropical conservation education and training.

We believe there is a problem, but that it is more manageable than we expected. First, truly interdisciplinary university conservation education is still rare, and nonexistent in most countries. Second, the quality of instruction in many tropical countries is low as a result of insufficient funding. Third, instruction in many developing countries, particularly at the undergraduate level, is often dominated by memorization, leaving graduates without critical thinking and problem-solving skills. Fourth, conservationists from high-biodiversity wilderness areas are not attending education programs abroad in sufficient numbers, deterred primarily by tuition costs. Fifth, instability in the conservation job market still makes this a risky career path. Sixth, there are real gaps in professional development offerings, particularly related to long-term priorities and to the area of policy analysis.

First-Tier Recommendations

Build the movement from the bottom; strengthen it from the middle and top. This statement encapsulates our findings in one sentence. It reflects the need in the conservation movement for more people and better skills for those individuals already involved. Conservation is part career and part cause, so the best way to swell its ranks is to attract young people as they make life choices. People already in the movement often have education limited to one discipline and are handicapped in their ability to confront the social, economic, biological, and political factors wrapped up in environmental problems. Others have degrees from universities woefully understaffed and ill equipped and therefore unable to provide quality education. These professionals need the chance to build their skills, in

both short courses and degree programs.

To build and strengthen conservation movements in the tropics we suggest four interlocking initiatives and provide rationale for their implementation.

(1) Create regional hubs for conservation education at leading universities in the developing world, and invest in truly interdisciplinary conservation studies programs.

- The cost of in-country education is much lower because of basic economic differences and because leading universities are often state-supported.
- Almost all conservationists in developing countries obtain undergraduate education in-country, even those “stars” who go on for advanced degrees abroad.
- Students need access to the ecosystems of global concern for fieldwork.
- Drawing talented teens into the conservation movement is the key to expansion.
- Exposure to nature in the formative years will produce conservationists with personal commitment.
- Interdisciplinary training builds critical thinking skills.
- Support for these university programs will help build excellence at the Ph.D. and faculty levels in conservation biology and environmental science, which are the foundation of many conservation interventions.
- Our survey results showed a broad-based demand for training in conservation biology.

This recommendation reflects the reality that most tropical conservationists now come from one of a select group of in-country universities, but even these schools are still struggling to provide high-quality, relevant curricula for conservation. Further, these existing centers often have a disciplinary tradition in forestry, agronomy, or biology that

hampers implementation of interdisciplinary education. The regional hubs envisioned here would allow students to specialize in a particular discipline while acquiring basic knowledge of several others and learning synthetic problem-solving skills. The spokes of these hubs would connect faculty, graduate students, and postdoctoral exchanges with foreign universities. The hub would need a modern field station, laboratory, and facilities, with funds to support research and hands-on learning. Links with conservation organizations would allow universities to contribute to solving environmental problems with research. Within the university, connections would have to be forged among departments to ensure the interdisciplinary nature of programs. Further, schools would be supported in adopting the joint-degree model used in the United States to mate disciplinary content with professional training in business, public policy, and law.

(2a) Expand access to graduate programs in the United States and Europe through highly targeted scholarships, attaching conditions and incentives for graduates to return home and remain in conservation.

- Conservationists from tropical wildernesses and other global biodiversity priority areas are not attending northern graduate programs in sufficient numbers.
- The cost of study abroad is the greatest obstacle to students from developing countries.
- There are no scholarships that specifically target conservationists from globally important ecosystems.
- Northern universities already have excellent faculty, programs, and infrastructure in place, so large institutional grants are not needed to make them attractive to conservationists.
- Education at top schools abroad confers prestige, builds an international network, facilitates access to international funds, and gives

students world-class training. Tropical countries need a pool of conservation leaders with these advantages.

- Graduates often land more attractive jobs in the United States or Europe and do not return to their countries; this is particularly common among Ph.D.s.

This program would be a “Fulbright for Nature.” It would designate regions eligible for scholarships and specify universities in the United States, Europe, and Australia where scholarships could be used. The application process would be handled by a third party with expertise in this area, such as the Institute for International Education, which handles Fulbright scholarships, and would involve a set of field advisors. Most scholarships would be for terminal master’s degrees and joint degrees, with some for Ph.D.s. Both conservation scientists (natural and social science) and conservation practitioners would be targeted in order to strengthen the foundations and the implementation capacity of the environmental movement in developing countries. Scholarships would be contingent on scholars returning to work in their home country for a certain number of years.

(2b) Create prestigious apprenticeship program for new graduates to work with conservation organizations in their home countries.

- Conservation is still a risky career choice. Prestige and starter opportunities will draw more people into conservation careers and ensure that talented graduates go to work in conservation organizations.
- First jobs can determine the rest of a career path.
- Apprenticeships will lower the cost and risk for organizations to build staff and create results that can be used to raise funds to make staff expansion sustainable.

The purpose of an apprenticeship program would be to channel the

best conservation talent directly into conservation organizations, thereby smoothing budgetary bottlenecks and creating a prestige-based attraction for new graduates. The program would be very competitive, much like the U.S. Government’s Presidential Management Internships, the World Bank’s Young Professionals program, or the American Association for the Advancement of Science Fellows program. Organizations would be required to provide the apprentice a mentor and a substantive job related to his or her studies. Apprenticeships would last for a year, giving the apprentice time to complete a project and allowing the mentor and apprentice the chance to decide whether or not to pursue a long-term relationship. The program would be implemented by a non-profit grantee agency that would act as a matchmaker between organizations and prospective apprentices.

(3) Fill skill gaps with in-stream professional training, focusing on subjects that can be taught in short modules, such as biological monitoring, policy analysis, negotiation, economics, and business skills.

- Our survey identified needed skills that are not being provided in university programs and can be supplied in short-term training courses.
- Many conservationists do not have access to professional training because of high costs or because training is only open to staff of certain projects.
- Little training is being given in topics identified in our survey as crucial over the long term, especially in developing skills with which to influence policy.
- Proven courses exist but are still only available on a small scale.

Ideally, conservationists would have thorough university training in all key subjects, but this is impractical: it would leave them little time to actually do conservation work, and it would be an overinvestment in

any particular individual. There are a number of skills that lend themselves to a short-course format and that we found to be in short supply. Among the most remarkable gaps is the area of public-policy analysis, a topic that rated high on the demand side no matter how we posed the questions on training needs. Nonetheless, only 5% of the courses taken by our respondents over the last 5 years were on this subject. Other areas that rated high in our survey and should be considered in a portfolio of short courses include enterprise development and biological monitoring (captured under the rubric of monitoring and evaluation). Another area that should be considered is conservation biology and ecology for nonscientist conservationists.

Both NGOs and universities can effectively implement short courses. Almost all the northern universities in our survey offer courses on professional development or executive education. Few focus on environmental issues or target participants from developing countries. Tuition costs are usually beyond the reach of conservation organizations in developing countries.

(4) Provide training in protected-areas management.

- Protected-areas management registered as a top priority on both an emergency and a long-term basis in our survey.
- Few degree programs or professional courses exist specifically for protected-areas management.
- Protected areas are the foundation of wilderness conservation efforts.
- There will be broad opportunities to expand protected areas if park management improves over the short run.

Our survey did not reach park staff in a significant way. The only comprehensive look at this topic was a study of parks in eastern, central and southern Africa (Pitkin 1995). Pitkin found that the top priorities of

protected-area managers were skills with which to better serve park visitors and to improve relations with surrounding communities. After those came a laundry list of internal management skills but not much in the way of natural science or policy—topics important to the conservation professionals that made up our respondent pool. An ongoing review of Peruvian and Ecuadorian parks by the Center for Applied Biodiversity Science is also finding that the top demand is for conflict resolution to smooth relations with surrounding communities. Care should be taken in extrapolating these findings too broadly without some further investigation in tropical regions.

Training can be done either in formal degree programs or as in-service training. Africa's wildlife colleges in Cameroon and Tanzania offer the best examples of degree programs, though as of Pitkin's study they were in decline due to funding shortages. In Latin America and Asia, options that deserve consideration are creating several such schools or augmenting some of the existing programs to a level that they are becoming respected regional centers for protected area management. The Wildlife Conservation Society's 6-week training in francophone Africa and the Organization for Tropical Studies' 8-week wildlands management training in Costa Rica may provide useful models for in-service training. One of Pitkin's key recommendations is to provide in-service training at the parks. She reasons that job perks are often concentrated at park service headquarters, drawing the best talent away from the front lines. The people who desperately need the skills in an era of decentralized threats are the people who live and work in the parks.

Second-Tier Recommendations

The following two measures are interventions that are promising but did not fulfill our criteria as com-

pletely as the set of four recommendations described above.

(1) Provide institutional capacity building among nongovernmental organizations.

- Among the highest-rated topics were fundraising, monitoring and evaluation, and project design.
- Poor organizational infrastructure and competence is widespread and a major bottleneck to effective action by NGOs.
- This is not a first-tier opportunity because, with the exception of fundraising, there is already a lot of training being offered in these areas, particularly monitoring and evaluation, and because accounting and finance and information technology and computer skills rated as low training priorities in our survey.

Most of our report focuses on building the capacity of individuals. This recommendation points to the need to strengthen organizations. These two concerns are not entirely separate because organizations are made up of people, who take their skills with them wherever they go. Management infrastructure, standard operating procedures, and strategic focus are all areas in which training can take hold within groups and persist when key individuals leave.

(2) Provide awareness training for powerful officials, and set up prestigious training tours that put influential people in contact with nature.

- The real decision-makers are not the "choir" of the conservation movement that the rest of these recommendations seek to help. Sensitized about nature, top officials could have an enormous positive impact on conservation outcomes.
- Prestige and firsthand experience are more effective than classroom

experiences. People can't simply be "taught" values and priorities.

- This is not a first-tier priority because the best way to do this work is informally, with big conservation groups organizing nature tours for influential people.
- Existing courses for decision-makers do not usually reach high-level decision-makers; it may not be possible to get this audience to a formal training.

All of the other recommendations in this report are aimed at upgrading the skills of conservationists. People who do not fit that label make most of the important decisions that affect conservation. Training them to be more sympathetic to biodiversity will make great progress toward successful biodiversity conservation. Three elements would be needed to make this kind of training effective: prestige, contact with nature, and economic arguments. Having a prominent university or corporation run the session could confer prestige. Contact with nature should be guided by field biologists in places that look spectacular, offer recreation, and generate some economic benefits. Economic arguments should focus on (1) the low costs of biodiversity conservation, (2) the positive outcomes for all when inefficient development schemes are avoided, and (3) the economic benefits of conservation.

Conclusion

Capacity-building efforts in and aimed at tropical developing countries must account for the underlying

social realities of weak basic education, rigid academic disciplines, a precarious job market in conservation, and poverty alleviation as a social priority. A wealth of training opportunities is available to conservation professionals, but gaps exist in critical training areas, and people from countries high in biodiversity have difficulty accessing these opportunities. Although conservation biology and natural sciences underpin the environmental movement, conservation success requires many different tools. Conservation professionals need skills in fundraising and organizational management for organizations to survive in the short term and for stable programs to persist. In the longer term, conservation professionals must develop skills in policy analysis and economics so they can understand factors driving environmental problems and evaluate strategies to influence decisions and negotiate solutions. Perhaps most important, all aspects of effective conservation require problem-solving and analytical thinking skills. To fill these gaps, links need to be built between universities and NGOs, between the field and urban centers, and between institutions in northern and developing countries.

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Literature Cited

- Pitkin, B. 1995. Protected area conservation strategy (PARCS) training needs and opportunities among protected area managers in eastern, central, and southern Africa. Biodiversity Support Program, U.S. Agency for International Development, Washington, D.C.

Appendix 1. Organizations participating in the survey.

Universities in United States and United Kingdom

Cambridge University, Zoology Department
 Duke University
 Center for Tropical Conservation (CTC)
 Nicholas School of Environment and Earth Sciences
 Sanford Institute of Public Policy, Program for International Development Policy (PIDP)
 Harvard University, John F. Kennedy School of Government
 Oxford University, Environmental Change Institute (ECI)
 Stanford University
 Center for Conservation Biology (CCB)
 Interdisciplinary Program in Environment and Resources (IPER)
 University of California at Santa Cruz (UCSC), Environmental Studies
 University of Florida
 College of Natural Resources and the Environment (CNRE)
 Program for Studies in Tropical Conservation (PSTC)
 Tropical Conservation and Development (TCD), Center for Latin American Studies
 School of Forest Resources and Conservation (SFRC)
 University of Kent, Durrell Institute of Conservation and Ecology (DICE)
 University of Michigan, School of Natural Resources and the Environment (SNRE)
 Yale University, School of Forestry & Environmental Studies (F&ES)

Other institutions in United States and United Kingdom

American Museum of Natural History (AMNH), Center for Biodiversity and Conservation
 BirdLife International
 Fauna and Flora International (FFI)
 Institute for International Education (IIE)
 World Conservation Union (IUCN)
 Organization for Tropical Studies (OTS)
 Smithsonian Institution, Monitoring and Assessment of Biodiversity Program (SI/MAB)
 Tropical Biology Association (TBA)
 The Nature Conservancy (TNC)
 United Nations Environment Program, World Conservation Monitoring Center (UNEP-WCMC)
 United States Agency for International Development (USAID)
 Wildlife Conservation Society (WCS)
 World Bank Institute (WBI)
 World Resources Institute (WRI)
 World Wildlife Fund (WWF)

Universities and institutions in Brazil

Boticário Foundation for Nature Protection (FBPN)
 Federal University of Mato Grosso (UFMT)
 Federal University of Mato Grosso do Sul (UFMS)
 Federal University of Minas Gerais (UFMG)
 Federal University of Pará (UFPA)
 Federal University of Rio de Janeiro (UFRJ)
 Federal University of Rio Grande do Sul (FURG)
 Federal University of Uberlândia (UFU)
 Institute for Ecological Research (IPÊ)
 International Institute for Education in Brazil (IIEB)
 National Institute for Amazon Research (INPA)
 Universidade de Campinas (UNICAMP)
 University of Brasília (UnB)
 University of São Paulo (USP)

Universities and institutions in Indonesia

Bogor Agricultural Institute (IPB)
 Cyclops Environmental Education Foundation
 Fauna and Flora International
 Forest Watch Indonesia
 Gadjah Mada University (Yogyakarta)
 Indonesian Institute for Forest & Environment
 Natural Resources Management Program (EPIQ-USAID)
 Papua State University (UNIPA)
 Telapak Indonesia Association
 The Nature Conservancy
 The World Bank
 University of Indonesia
 World Wildlife Fund for Nature Indonesia
 World Wildlife Fund for Nature Indonesia—Sahul

(continued)

Appendix 1. (continued).

Universities and institutions in Madagascar

Adventist Development and Relief Agency (ADRA)
 Center of Professional Forestry Training (CFFP)
 Communication Agency (AGECO)
 Conservation International Miray Moramanga
 Ecole Supérieure des Sciences Agronomiques (ESSA)
 Experimentation and Training Center for Natural Resources Management for Rural Communities (FAFIALA)
 Faculty of Natural Sciences (FSM), National University
 Fafiala
 Halieutic Institute of Marine Science (IHSM)
 Landscape Development Intervention/Chemonics International (LDI)
 Libanoa Ecology Centre (CEL)
 Madagascar Fauna Group (MFG)
 Madagascar Institute for Tropical Ecosystem Conservation (MICET)
 National Agronomy High School (EASTA)
 National Association for the Management of Protected Areas (ANGAP)
 National Institution for Tourism and Hotelery (INTH)
 National Office for Environment (ONE)
 Pact Madagascar
 Savaivo
 Support Services for Environmental Management
 Tefy Saina Association (TS)
 Training Center for Agricultural Skills (FORMAGRI)
 Training Center for Community Development Namana (CCDN)
 Training Center for GIS and Environment (CFSIGE)
 USAID-Madagascar
 Wildlife Conservation Society
 World Wildlife Fund Andringitra Project (WWF Andringitra)
 World Wildlife Fund Community-Based Forest Management Project (WWF-CAF)

Universities and institutions in Peru

Amazonian Center of Environmental Education and Research (ACEER)
 Center of Conservation Data (CDC) at Universidad Nacional Agraria La Molina
 Conservation International—Peru
 Econews Peru
 Institute of Peruvian Amazonía Research (IIAP)
 International Resources Group (IRG)
 National Environmental Council (CONAM)
 National Fund for Natural Protected Areas (PROFONANPE)
 National Institute of Natural Resources Management (INRENA)
 German Service of Technical Cooperation (DE)
 Peru Association for the Conservation of Nature (APECO)
 Peruvian Foundation for Nature Conservation (ProNaturaleza)
 Peruvian Society of Environmental Laws (SPDA)
 Project to Strengthen the National System of Natural Protected Areas (FANPE)
 The Nature Conservancy - Peru (TNC)
 Universidad de la Amazonía Peruana (UNAP)
 Universidad Nacional Agraria La Molina (UNALM)
 Universidad Nacional Mayor de San Marcos (UNMSM)
 Universidad Nacional San Antonio Abad del Cusco (UNSAAC)
 U.S. Agency for International Development—Peru (USAID)
 World Wildlife Fund—Peru

