

COMMENTARY

Putting the Community Back in Community Ecology and Education: The Role of Field Schools and Private Reserves in the Ethical Training of Primatologists

P.A. GARBER^{1*}, A. MOLINA², AND R.L. MOLINA³

¹Department of Anthropology, University of Illinois, Urbana, Illinois

²Hacienda Merida and Ometepe Biological Field Station, Volcan Maderas, Isla de Ometepe, Nicaragua

³Maderas Rainforest conservancy and La Suerte Biological Field Station, Cariari, Pococi, Limon, Costa Rica

In 1993 and 1999, with the assistance of a Nicaraguan family, we founded La Suerte Biological Research Station in northeastern Costa Rica and Ometepe Biological Research Station in southern Nicaragua as a privately owned conservation-oriented business. Our goal was to develop a program of sustainable community ecology focused on education, research, and the conservation of primates and tropical forests. In order to accomplish this we developed field courses in which undergraduate and graduate students conduct scientific research, experience local cultures, and learn about conservation. Over 120 of these students have received doctoral degrees or are currently in graduate programs. Four doctoral dissertations, several MA theses, and some 20 scientific articles have been published based on research conducted at our field stations. In order to achieve our long-term goals of preserving the environment, we also needed to engage directly with local communities to address their needs and concerns. To this end, we developed a series of community-based initiatives related to health care, bilingual education, and conservation education using traditional and on-line teaching tools. In this article, we describe our efforts in Costa Rica and Nicaragua teaching conservation-oriented field courses and working with the local human communities. Building upon these experiences, we outline a set of ethical considerations and responsibilities for private reserves, conservation-oriented businesses, NGOs, and conservancies that help integrate members of the local community as stakeholders in conservation. *Am. J. Primatol.* 72:785–793, 2010. © 2010 Wiley-Liss, Inc.

Key words: ethics; conservation education; field school; sustainable community ecology

INTRODUCTION

Humans are primates just as lemurs, monkeys, and apes are primates. Although this is obvious from evolutionary, genetic, and behavioral perspectives, primatologists and field biologists have sometimes treated the human primate component of an ecosystem as something distinct or separate from the nonhuman primate component of that ecosystem. In some cases the human component has been totally ignored or viewed as a hostile agent, despite the fact that our long-term efforts to protect, conserve, and study the nonhuman primate community are inextricably linked to our efforts to form long-term partnerships and mutually beneficial relationships with the local human communities [Dolhinow, 2002; Estrada et al., 2006; Strier, 2002]. In this regard, we use the term *sustainable community ecology* to describe our efforts and ethical responsibilities at La Suerte Biological Research Station, Costa Rica and Ometepe Biological Research Station, Nicaragua to use the tools of education, field schools, and

research to preserve and expand tropical forests and protect wildlife, and to provide incentives for the local community to become an important stakeholder in rainforest conservation.

Background and Brief History of La Suerte

In 1987 the Molina's, a Nicaraguan family purchased a 700 ha farm (hereafter referred to as La Suerte) and cattle ranch in the Atlantic lowland rainforest region of northeastern Costa Rica (10°26' N, 83°46'W). As a working farm La Suerte originally had some 500 head of cattle and an orchard of over 1,000 trees (palm hearts or pejibaye, *Bactris*

*Correspondence to: P.A. Garber, 607 South Mathews Ave, 109 Davenport Hall, Urbana, IL 61801. E-mail: p-garber@illinois.edu

Received 3 February 2010; revised 4 March 2010; revision accepted 29 March 2010

DOI 10.1002/ajp.20837

Published online 29 April 2010 in Wiley InterScience (www.interscience.wiley.com).

gasipaes). The property also contained over 300 ha of primary and secondary rainforest, swamps, marshes, and regenerating pasture that are home to over 250 species of birds, hundreds of species of amphibians and reptiles, and tens of species of mammals [Emmons, 1997], including three of Costa Rica's four species of nonhuman primates: white-faced capuchin monkeys (*Cebus capucinus*), mantled howler monkeys (*Alouatta palliata*), and Geoffroy's spider monkey (*Ateles geoffroyi*).

The Atlantic region of northeastern Costa Rica was heavily forested, sparsely populated, and largely undisturbed during most of the first half of the 20th century. However, beginning in the 1970s private industry expanded banana production in Costa Rica, and this resulted in a significant increase in deforestation as tropical rainforests were converted to agricultural fields [Ploetz, 2000] (currently pineapples top bananas as Costa Rica's most important agricultural commodity, and many banana fields have been converted to pineapple plantations, <http://faostat.fao.org/site/339/default.aspx>). During this period, the government of Costa Rica provided incentives for citizens to resettle in the northeastern part of the country to serve as laborers for the banana plantations. The town of La Primavera, located approximately 1 km from La Suerte was founded in 1981 by 25 relocated families. As of 2009, there were some 60 families totaling approximately 400 people living in La Primavera.

During the 20-year period from the early 1970s through the early 1990s Costa Rica maintained one of the highest rates of deforestation in the world averaging 3.7% per year [Sanchez-Azofeifa et al., 2003]. At the same time, Costa Rica developed an effective and aggressive set of conservation policies and a system of 132 national parks, protected areas, and biological reserves [Estrada et al., 2006]. However, given that virtually all of the remaining unprotected forests in Costa Rica are located on private land, local co-operatives, conservation-oriented businesses, NGOs, and conservancies have a critical role to play in protecting forests and developing biological corridors to link privately owned forests with national parks.

Turning Pastures into Ph.D.s: Ethical Responsibilities of Primate Field Schools

In 1993, Paul Garber was contacted by a member of the Molina family, Alvaro Molina, who had strong interests in conservation and developing La Suerte into a privately owned biological reserve that offered educational opportunities through field courses, and research opportunities for students and professionals in tropical ecology, botany, primatology, and conservation biology. We hoped that we could preserve the forests of La Suerte and reverse the negative environmental impact of cattle ranching

and agricultural production through programs of reforestation, small-scale ecotourism, and sustainable community ecology. On June 20, 1994 Dr. Garber offered the first field course at La Suerte to a group of 20 undergraduate and graduate students. In December 1999 we opened up a second biological research station on Isla de Ometepe, Nicaragua (11°40'N, 85°50'W) and began offering courses in primate behavior and conservation. Dr. Garber was appointed as the Director of Education and Research at both field sites, and from the outset we adhered to a set of ethical principles in which our primate field courses were taught by highly qualified primatologists, the ratio of students to faculty was 5:1 (this included graduate teaching assistants working with the professor), classes ran 7 days per week, and lectures, exams, and student research projects were expected to be of high quality.

The 3-week advanced primate field courses at La Suerte and Ometepe are designed to be a "classroom in nature," in which each student is required to conduct an individualized research project. The graduate teaching assistants and professor work closely with each student as she/he goes through all of the stages of conducting scientific research. This includes identifying a set of testable hypotheses, writing several drafts of a research proposal, developing an appropriate research methodology, collecting the data, analyzing the data, and writing up the results of their project in the form of a journal article. Although most of the student projects have focused on issues of conservation, tropical ecology, or evidence of age and sex-based differences in primate diets, social interactions, or habitat utilization, students with the appropriate language skills and academic background have conducted surveys on community attitudes toward ecotourism, rainforest conservation, and the effects of our primate field school on the local economy. Our last day at the field site we hold a Primate Symposium in which each student gives a 15 min presentation detailing their findings. The course is intensive but it is our experience that most students rise to the challenge and are proud of the work that they have accomplished.

Although we have not kept complete records of the total number of students who have taken our field courses over the past 15 years (we estimate some 600 students have taken primate classes and over 1,000 students have taken other courses ranging in duration from 1 week to 3 weeks), we can list 36 students (Table I) who have completed a course in primatology or served as a teaching assistant in one or more of our courses and have gone on to receive their Ph.D. In addition, four doctoral dissertations, several M.A. theses, and some 20 journal articles and book chapters have been published based on research conducted at our field stations. Many of these young professors have university positions in the United

TABLE I. La Suerte/Ometepe Alumni who have Received a Ph.D. degree

Adam Boyko	Ph.D.	Purdue University
Anita Stone	Ph.D.	University of Illinois
Anneke DeLuyker	Ph.D.	Washington University-St Louis
Barth Wright	Ph.D.	University of Illinois
Bernardo Urbani	Ph.D.	University of Illinois
Celine Devos	Ph.D.	University of Liège, Belgium
Carolina Valdespino	Ph.D.	University of Missouri, St. Louis
Christy Hoffman	Ph.D.	University of Chicago
Cory Miller	Ph.D.	Harvard University
David Bergeson	Ph.D.	Washington University-St Louis
Elizabeth Erhart	Ph.D.	University of Texas-Austin
Falk Huettmann	Ph.D.	University of News Brunswick
Jane Gerson	Ph.D.	Duke University
Jennifer Rehg	Ph.D.	University of Illinois
Jessica Whitham	Ph.D.	University of Chicago
Jill Pruetz	Ph.D.	University of Illinois
Joanna Lambert	Ph.D.	University of Illinois
Joshua Linder	Ph.D.	City University of New York
Julienne Rutherford	Ph.D.	Indiana University
Kristin Wright	Ph.D.	Northwestern University
Lisa Paciulli	Ph.D.	SUNY, Stony Brook
Magda Muchilinski	Ph.D.	University of Texas-Austin
Martin Kowalewski	Ph.D.	University of Illinois
Mathew Slocum	Ph.D.	Miami University
Melissa Raguet-Schofield	Ph.D.	University of Illinois
Michelle Bezanson	Ph.D.	University of Arizona
Nathaniel Dominy	Ph.D.	University of Hong Kong
Ricardo Vasquez	Ph.D.	SUNY, Albany
Richard Lawler	Ph.D.	Yale
Roberto Delgado	Ph.D.	Duke University
Simone Teleen	Ph.D.	Yale University
Sophia Zahed	Ph.D.	University of Wisconsin
Susan Lappan	Ph.D.	New York University
Tanya Smith	Ph.D.	SUNY, Stony Brook
Thomas Gillespie	Ph.D.	University of Florida
Tiffany Tung	Ph.D.	University of North Carolina

States. In addition, we are very proud of the fact that there are La Suerte/Ometepe alumni from Costa Rica, Mexico, Argentina, and Venezuela who have academic positions in their home country. In most cases, we have provided these students with scholarships or other forms of funding so that they could participate in our programs. We believe that all field schools should set as one of their fundamental ethical priorities the goal of training, educating, and mentoring students from primate habitat countries.

An additional 90–100 La Suerte/Ometepe alumni either have obtained Master's Degrees or are currently in M.A. and Ph.D. programs in primatology and related fields. For hundreds of other students, taking our field courses has allowed them to grow personally and intellectually by experiencing the cultures of Costa Rica/Nicaragua, observing the natural behavior of animals and the diversity of plants in a tropical rainforest, and learning first-hand about the adverse environmental affects of deforestation, cattle ranching, and commercial pineapple and banana plantations.

Reforestation Pastures and Live Fence Projects

Although income earned from cattle ranching had provided much of the initial funding to develop La Suerte into a teaching and research station, given our commitment to sustainable community ecology, by 2005 we had successfully removed virtually all of the cattle from the field site (at present there are no cattle from La Suerte). This allowed us to design and initiate a series of reforestation projects across areas of grasses, ferns, and shrubs that had previously been used as cattle pastures. The objective was to connect two patches of forest (that combined totaled some 150 ha). One of the forest patches contains three groups of howler monkeys and one group of capuchin monkeys. The other forest patch contains 6–8 groups of howler monkeys, one group of capuchin monkeys, and one community of spider monkeys. Our goal in developing a forest corridor was to expand the opportunity for individuals to migrate between social groups and to increase the genetic diversity of primate populations at La Suerte.

We began with an initial planting of some 150 trees along a narrow forest corridor. Most of these were native trees whose seedlings were collected from the forest. Trees were planted 3 m apart and in rows separated by a distance of 5 m. Our method of tree planting and procedures for monitoring the growth and survivorship of trees were based on techniques established by the Smithsonian Tropical Research Institute [Comita et al., 2007; Goldsmith et al., 2006]. Over the next 3 years an additional 812 trees were planted as a part of this initiative. Based on sample plots, approximately 75% of these trees have survived, with some trees having reached a height of 5 m in 3 years.

The La Suerte Reforestation project offers students the opportunity to participate in a scientifically based program of monitoring the survival, growth, and health of tree species in a regenerating pasture. In addition, both students from Costa Rica and our field courses learn first-hand about concepts such as restoration ecology, biological corridors, edge effects, and long-term forest management. Perhaps, most importantly by actively planting trees each student can feel that she/he is directly responsible for contributing to rainforest conservation.

Living Fences

On Isla Ometepe, we have submitted a proposal to develop a network of forested corridors across an area of approximately 10 km² that contains small patches of tropical forest separated by agricultural fields and highly disturbed secondary forest. Individuals who own these properties demarcate their boundaries using fences made of wooden posts and barbed wire. Our goal is to work with the local landowners and provide them with live fences to replace wooded posts. Live fences are native tree species, such as *Bursera simaruba* (*gumbo limbo*) and *Gliricidia sepium* (*Cacao de nance*), that are easy to root, more durable than traditional wooden fencing, and highly resistant to insect and fungal damage [Cherry & Fernandes, 2009]. Live fences grow quickly into a line or corridor of trees that can be used by arboreal animals, such as primates, for refuge and food (mantled howler monkeys consume *B. simaruba* leaves and white-faced capuchins consume *G. sepium* fruits), as well as arboreal pathways to travel between otherwise isolated forest patches [Estrada et al., 2006]. These corridors also play a critical role in animal migration, or the movement of individuals into and out of social groups, facilitating genetic diversity across populations. The planting of live fences is one of the least expensive and most effective ways to work with local landowners to modify private land to serve a larger conservation purpose [Zahawi, 2005].

COMMUNITY OUTREACH

Community outreach is an essential component of primate research and an ethical responsibility of privately owned reserves and eco-friendly businesses. From the beginning La Suerte/Ometepe contributed to the local economy by hiring members of the nearby community as station managers, carpenters, electricians, cooks, field guides, guards, and laborers to help build and renovate the facilities. We purchased building materials, food to feed students, and other supplies from local vendors or businesses in the nearby towns. For each class of 20 students, we estimate that we contribute between \$6,000–\$8,000 US dollars to the local economy.

We also realized that in order to develop a strong partnership with the local community it was essential to include them as stakeholders in our conservation efforts. Local communities and conservation organizations often are most effective in facing the environmental challenges of deforestation and habitat change imposed by the demands of the global market place when they work together as allies [Fuentes, 2002; Horton, 2009]. In Table II and Figures 1A–F we detail the goals and outcomes of several community-based projects that we have engaged in at La Suerte and Ometepe. These projects fall into six main categories, including health care, scholarships and bilingual education, infrastructure, environmental awareness, interactions with local and global communities, and conservation (Table II). To be candid, we did not begin with a clear plan of what our ethical responsibilities were to the local communities, how best to engage the local communities to promote conservation awareness, and how to measure success or failure. We made many false starts and missteps. Often, we were guided by our own cultural notions of what the community needed rather than directly asking the community what they felt was needed. We did not engage a cultural anthropologist or initially meet with community leaders to help us better understand local culture and politics. If we had done so, we might have been successful earlier on in communicating our long-term commitment to the community and in promoting local education, conservation, and health care. Our efforts were initially viewed in much the same way as any new business moving into a community would be viewed...with both anticipation and skepticism, but something apart from the community. However over several years, as we have continued to engage and listen to individuals in the local community, we have become partners in a joint effort of sustainable community ecology.

CONCLUSIONS

In many parts of the world, private reserves, conservation-oriented businesses, NGOs, and conservancies are playing an increasingly important role

TABLE II. Community Outreach Projects

Community outreach	Goals and outcomes
Medical care	Over the past 8 years we have sponsored and housed medical students and doctors from the United States at our field station on Isla de Ometepe. These trained medical personnel treat approximately 1,200 patients per year, providing them with free high-quality medical care. At La Suerte we donated funds to transport an ambulance from the US to Costa Rica so that it would be permanently available for medical emergencies in the local community. We sponsored a volunteer group from the United States to build a medical clinic and renovate four lunchrooms in the community of La Primavera adjacent to the La Suerte Biological Research Station
Veterinary care	For the past 2 years, a group of veterinarians and veterinary students from Oregon State University has traveled to Ometepe to provide veterinary care and new methods of animal husbandry to the local people. The group offers basic preventative health measures to dogs, cats, horses, cows, pigs, and goats. In particular, the overpopulation of domestic dogs on Ometepe poses a public health risk to the local community by increasing the animal-to-human transfer of diseases such as toxoplasmosis and leptospirosis. The dogs also prey on howler monkeys that are forced to travel on the ground to move between isolated forest patches. We have witnessed several instances of dogs killing howler monkeys on the island [Raguet-Schofield, 2008]
Bilingual scholarship program	As 2007 we have provided funding and scholarships for students 5–18 years of age on Isla de Ometepe to attend English speaking classes. Currently there are 40–50 students attending these classes. We are planning a similar scholarship program in Costa Rica
School uniform project	In January 2009 we provided school uniforms to 20 students attending the grade school in La Primavera (Fig. 1A). Twenty additional students received school uniforms in summer 2009. Our goal is to continue this project until all children in the local community have the proper uniform to attend school. We have a similar project underway on Ometepe
Children's book project	Katie McCulloch, one of our alumni has written and beautifully illustrated a children's book called "Anita Conguita: A Howler's Journey" (Fig. 1B). The book is written in both Spanish and English and tells the story of a young female howler monkey, as she confronts problems of a shrinking forest, and roads and farms that block her way. The book raises awareness of environmental issues and conservation, and motivates the young reader to think about what can be done to ensure that humans and animals coexist peacefully. The book has been distributed to students in the local community
Infrastructure	We sponsored a volunteer group from the United States to build a medical clinic and renovate four lunchrooms in the community of La Primavera adjacent to the La Suerte Biological Research Station
Internet project	We provide free wireless internet to all members of the local community of Merida on Isla de Ometepe
Community-based environmental awareness education program	We have submitted a grant proposal to develop and monitor the success of a community-based conservation education program on Isla de Ometepe, Nicaragua. This will be administered through the Maderas Rainforest Conservancy (www.maderasrhc.org/Conservation.html), and consists of a series of community workshops for both children and their families. Given the strong family orientation of Nicaraguan culture, our approach is to include entire families in our conservation efforts and to present conservation as a family value [Holt-Gimenez & Cruz Mora, 1993]. The goal of these workshops is to provide educational materials, information, and suggest relatively simple behavioral changes that promote environmental sustainability so that people living on the island can re-evaluate their place and actions within the ecological community, and better understand that deforestation is a direct threat to their economic interests and the long-term viability of their community. As a part of this initiative, we will evaluate the effectiveness of these workshops through individual responses to a series of pre and postworkshop questionnaires
Wildlife workshop project	We have initiated a series of powerpoint presentations and workshops for small groups of students to teach them about the forest, the local fauna and flora, and their role and their communities' role in conservation

TABLE II. Continued

Community outreach	Goals and outcomes
Migratory bird project	For the past 8 years, partnering with the Smithsonian Tropical Research Institute, we have developed a system in which students from 20 grade schools across Nicaragua learn about and exchange drawings of Nicaraguan migratory birds
Photographic story exchange project	We have donated point and shoot digital cameras to the school in San Ramon, Nicaragua so that children can create and share photographic stories about their lives and experiences with students in the United States and the United Kingdom. This project was initiated by Jesse Stephen
Conservation project	We have posted fiberglass Conservation Signs in Spanish and English on Isla de Ometepe that provide short slogans and simple pictures designed to educate and discourage people from poaching sea turtle eggs, capturing birds and mammals for the pet trade, and harassing wild animals (Fig. 1C). We hired experienced craftspeople in the local community to teach school children how to make these signs. The children are paid for their work that involves carving wooden molds of each letter or image, and sanding, polishing, and waxing the wood
Recycling project	As there is no plastic recycling on Isla de Ometepe, Nicaragua, we have worked with the local community to develop an innovative program for the management of plastics and other nonbiodegradable materials. We have placed signs on the island encouraging children and adults to collect and fill 1.5l plastic bottles with environmental unfriendly materials (Fig. 1D). We use these filled plastic bottles as bricks (Fig. 1E and F) to construct circular tables that we donate to the local schools. We process an average of 600 filled plastic bottles per month that would otherwise be burned or be buried as land fill

in primate conservation, research, and education. As professors and educators, we have an ethical responsibility to share our knowledge with others and to educate students and members of the local community about issues of conservation and ecological sustainability. A major contribution of La Suerte and Ometepe Biological Research Stations is that we have helped to educate and train a generation of dedicated primatologists and biological anthropologists who now have classrooms filled with their own students and are actively involved in conservation education and research. In addition, primatologists working with owners of private reserves need to develop ethical guidelines and best behavioral practices that are compatible with both profit-oriented goals that are required to maintain these reserves/businesses and a commitment to education, research, community outreach, and conservation.

Based on our 15 years of experience as La Suerte/Ometepe, we offer the following ethical guidelines for field primatologists and administrators of privately owned reserves and eco-friendly businesses.

1. A responsibility to educate, train, and financially support students from habitat countries. To this end, scholarships or other forms of financial assistance need to be made available to recruit students and interns. These young scholars and local leaders will one day be in a position of authority to make critical conservation decisions that affect nonhuman and human primate communities and preserve tropical forests. At La Suerte/Ometepe we

have offered scholarships that help subsidize course costs to several students from Latin American countries and have provided salaries and expenses for students serving as teaching assistants in our classes. Several of these students are now professors in their home country.

A responsibility is to provide high-quality conservation education and research training to students and others from countries that over consume and exploit the world's resources. For example, although the United States comprises only 4.6% of the world's population, in 2004 it accounted for 33% of all consumption [Earth Trends, 2007]. Thus, as primatologists we have an ethical responsibility to educate people in our home communities, grade schools, secondary schools, and universities by sharing with them our first-hand experiences and by encouraging them to alter their behavior in ecologically responsible ways. If people strive to conserve things that they value, then education is the primary tool we have to promote a conservation ethic [Alexander, 2008].

2. Engagement or collaboration with professional educators, cultural anthropologists, and local teachers in primate habitat countries to develop an effective set of pedagogical tools (workshops, children's books, computer games, field trips into the forest, videos, powerpoint presentations, community reforestation projects) to enhance the local community's appreciation for their natural world, and the benefits to them of environmental sustainability. A recent special issue of the *American*



Fig. 1. (A) Students from La Primavera, Costa Rica receiving school uniforms (uniforms are in plastic bags) donated by La Suerte Biological Research Station. (B) Cover of the bilingual children's book Anita Conguita: A Howler's Journey written and illustrated by Katie McCulloth and distributed to the school children on Isla de Ometepe. (C) Conservation signs made by local school children on Isla de Ometepe, Nicaragua. (D) Signs posted on Isla de Ometepe encouraging people to bring us plastic bottles for recycling. (E) 1.5l plastic bottles filled with nonbiodegradable material and used to construct tables for the local schools in Nicaragua. (F) Students from Merida, Nicaragua sitting at tables and stools made of recycled plastic that were donated to local schools by Ometepe Biological Research Station.

Journal of Primatology (Volume 72 no. 5, 2010) presents several articles and a set of instructive commentaries on the effectiveness of conservation

education projects across Africa, Madagascar, and South America, including assessment tools for identifying what worked and what did not work.

3. A strong commitment and ethical responsibility to listening to the concerns of the local community. Just as all politics is local...all conservation is local as well. For example, we have been told by members of the community of La Primavera that hiring workers on a rotational basis fits better with local cultural practices than hiring the same employees year after year. Similarly, based on the request of the local community we have imposed a curfew such that students at La Suerte are required to return to the field site by 8:00 pm each evening. In addition, members of the local communities have indicated the importance of learning English as a second language as a way to increase employment opportunities. To that end, we have provided scholarships and opportunities for Nicaraguan and Costa Rican students to attend English speaking classes at our field sites. Over time, we will need to assess the ethical implications of how we determine which students receive scholarships to learn English, and the career and economic outcomes of students who are bilingual compared with others in the community who do not have this opportunity. Such an assessment is critical in order to be perceived as a fair partner in the community.

4. A commitment in time, money, and energy for rigorous assessment of the outcomes of community, educational, and research programs [see Dietz et al., 2010; Jacobson, 2010 for details on conducting such assessments]. Such an assessment should include a detailed ethnographic study of the positive and negative effects to the local community and economy of the presence of reserves, research stations, and field schools, as well as a fine-grained evaluation of whether community programs are benefiting all age and sex classes equitably. A second form of assessment is to engage other primatologists involved in similar community-based research and conservation projects for their professional evaluation [for example, Anne Savage and colleagues working in Colombia, Pat Wright and colleagues working at Ranomafana National Park, Madagascar, Alison Jolly and colleagues working at Berenty Reserve, Madagascar, Sussman and colleagues working at Beza Mahafaly, Madagascar, Tammie Bettinger and colleagues working in Uganda, and Fuentes and colleagues working in Bali]. Critical assessment from experienced peers and sharing of data on successes and failures should serve to facilitate more effective community and conservation outcomes and promote a standard set of ethical practices for field schools, national parks, and private reserves.

5. Finally, we stress that that even small steps to work with the local community can provide large benefits for conservation and human-well being. For example, our plastic recycling project on Isla de Ometepe has addressed an environmental concern

associated with burning noxious materials in the community and has benefited local schools by providing them tables and stools for their students. These are inexpensive tangible outcomes that promote sustainable community ecology by protecting the environment, and forage strong partnerships between scientists and member of the local community.

ACKNOWLEDGMENTS

We acknowledge Don Rene Molina and Doña Lillian Molina for working with us to protect the forests of Costa Rica and Nicaragua. We also thank all of the La Suerte and Ometepe students, teaching assistants, faculty, and friends for their commitment to conservation and rainforest ecology. PAG thanks Jenni and Sara who first came to La Suerte at the age of 6 and 9. If not for them, my participation in all this would not have been possible. PAG thanks Chrissie McKenney for taking the La Suerte primate field course in 1995. We also acknowledge the dedication and contributions of Michelle Bezanson who has been a part of La Suerte/Ometepe for 15 years, and Andrew Halloran for his commitment to La Suerte/Ometepe and for his contributions to the Maderas Rainforest Conservancy (www.maderasrfc.org/Conservation.html). Research presented in this commentary adhered to the American Primatological Society principles for the ethical treatment of nonhuman primates, the laws of Costa Rica and Nicaragua, and was approved by the appropriate institutional committees at the University of Illinois. We thank Mike Huffman and two anonymous reviewers for constructive comments on an earlier draft of this manuscript.

REFERENCES

- Alexander M. 2008. Ethics and conservation management or why conserve wildlife? In: Alexander M, editor. Management planning for nature conservation. New York: Springer. p 77-93.
- Cherry SD, Fernandes ECM. 2009. Live fences. Available from: www.ppath.cornell.edu/mba_project/livefence.html
- Comita LS, Aguilar S, Perez R, Lao S, Hubbell SP. 2007. Patterns of woody plant species abundance and diversity in the seedling layer of a tropical forest. *Journal of Vegetation Science* 18:163-174.
- Dietz LA, Brown M, Swaminathan V. 2010. Increasing the impact of conservation projects. *American Journal of Primatology* 72:425-440.
- Dolhinow P. 2002. Anthropology and primatology. In: Fuentes A, Wolfe LD, editors. Primates face to face: the conservation implications of human-nonhuman primate interconnections. Cambridge: Cambridge University Press. p 7-24.
- Earth Trends. 2007. Available from: <http://earthtrends.wri.org/updates/node/236>
- Emmons LH. 1997. Neotropical rainforest mammals: a field guide, 2nd ed. Chicago: The University of Chicago Press.
- Estrada A, Garber PA, Pavelka MSM, Luecke L. 2006. Overview of the Mesoamerican primate fauna, primate studies, and conservation concerns. In: Estrada A,

- Garber PA, Pavelka MSM, Luecke L, editors. New perspectives in the study of mesoamerican primates: distribution, ecology, behavior, and conservation. New York: Springer. p 1–22.
- Fuentes A. 2002. Monkeys, humans and politics in the Mentawai Islands: no simple solutions in a complex world. In: Fuentes A, Wolfe LD, editors. Primates face to face: the conservation implications of human-nonhuman primate interconnections. Cambridge: Cambridge University Press. p 187–207.
- Goldsmith GR, Comita LS, Morefield L, Condit R, Hubbell SP. 2006. Researcher impacts on seedling community structure in a permanent study plot. *Forest Ecology and Management* 234:34–39.
- Holt-Gimenez E, Cruz Mora O. 1993. Farmer to farmer: the Ometepe Project, Nicaragua. In: Alders C, Bertus H, van Veldhuizen L, editors. Linking with farmers: networking for low-external-input and sustainable agriculture. London: Intermediate Technology Publications. p 51–65.
- Horton LF. 2009. Buying up nature: economic and social impacts of Costa Rica's ecotourism boom. *Latin American Perspectives* 26:93–107.
- Jacobson S. 2010. Effective primate conservation education: gaps and opportunities. *American Journal of Primatology* 72:414–419.
- Ploetz RC. 2000. Panama disease: a classic and destructive disease of banana. Online. *Plant Health Progress*. DOI: 10.1094/PHP-2000-1204-01-HM.
- Raguet-Schofield M. 2008. The effects of human encroachment and seasonality on the risk of mantled howler monkey (*Alouatta palliata*) predation by dogs on Ometepe Island, Nicaragua [Abstract]. *American Journal of Physical Anthropology* S46:176.
- Sanchez-Azofeifa GA, Daily GD, Pfaff ASP, Busch C. 2003. Integrity and isolation of Costa Rica's national parks and biological reserves: examining the dynamics of land-cover and change. *Biological Conservation* 109:123–135.
- Strier KB. 2002. Foreword. In: Fuentes A, Wolfe LD, editors. Primates face to face: the conservation implications of human-nonhuman primate interconnections. Cambridge: Cambridge University Press. p xv–xvi.
- Zahawi RA. 2005. Establishment and growth of living fence species: an overlooked tool for the restoration of degraded areas in the tropics. *Restoration Ecology* 13:1:92–1102.