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Conservation Biology, Vol. 12, No. 2. (Apr., 1998), pp. 263-267.

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Introduction

In a recent issue of *Conservation Biology*, Saberwal and Kothari (1996) call for developing countries to integrate human dimensions into conservation biology and wildlife management training. The authors bemoan the lack of social science courses in their curriculum as a consequence of patterning wildlife management training in developing countries from models in the West. They contend that the need is more acute in developing countries for training in the social aspects of conservation biology, given the increasing wildlife-human conflicts and human dependence on natural resources in these countries.

We argue that the need for human dimensions in conservation biology training as presented by Saberwal and Kothari extends to industrialized, "developed" countries as well. Granted, natural resource management differs among areas such as the United States, India, and Africa. Yet worldwide, humans influence and are affected by natural resource management issues. Whether the issue involves elephants raiding a farmer's cassava fields in Cameroon or Florida residents voting down sugar taxes to restore the Everglades, conservation problems are people problems. As Teague (1979) states, "Most wildlife management problems start out as biological problems but eventually become people problems." In reality, people

are in the beginning, middle, and end of all management issues. Recognition of this central role will improve our ability to conserve nature.

Conservation is a human endeavor driven by people's values toward the management of land and resources. Preservation of biodiversity depends upon public commitment to its protection. We use the term *human dimensions* to refer to a variety of people-oriented management considerations and a cross-disciplinary range of inquiry. An understanding of human dimensions provides the ability to respond to varied social interests in conserving nature and stewarding resources for future generations.

The conservation biologists who will be playing key roles in academic fields and conservation organizations in the next century are presently enrolled in our university programs. Yet conservation biologists, whether trained in the ecological sciences or in natural resource management, traditionally focus on scientific and technical aspects of species or ecosystems (Jacobson 1990). Skills in policy processes, social sciences, or communications, which are not viewed as part of our professional identity, largely go unaddressed. Scientists and managers alike have reiterated the need to expand our training and understanding of the human dimensions of natural resource management, yet educators typically ignore these pleas. We may, in fact, be training *idiot savants*—individuals skilled in certain areas—(in this case, the technical biological aspects of conservation)—but largely inept in other aspects of the field.

Such calls for broader education are not new, and the mix of skills needed spans a number of disciplines. In "What kind of wildlifers will be needed in the 1980s?," Culter (1982) summarizes suggestions from a survey of scientists from the U.S. Forest Service and Soil Conservation Service. These professionals emphasized the need to broaden their training and improve their skills not only in ecology but also in economics and communication. As Schaller (1992) succinctly notes, "Conservation problems are social and economic, not scientific, yet biologists have traditionally been expected to solve them." Indeed, the complexity of challenges facing land and resource conservation and the increasing number of stakeholders reflects the interdisciplinary nature of real-world problems and solutions.

Human Dimensions in Conservation Efforts

Examples from the United States demonstrate the pivotal role of the public in affecting the success or failure of conservation efforts. Public influence is especially prevalent in controversial conservation issues such as the reintroduction of species. In the case of reintroduction of the gray wolf in Yellowstone National Park, biologists working with the recovery plan concluded that "many recovery issues are perceptual, having more to do with deeply held personal values about the government, outside influences, people's relationship to 'nature,' and

the political role of special interest groups than to wolves themselves" (Fritts et al. 1995). In essence, researchers could spend years studying the biology of gray wolves in preparation for reintroduction, but recovery efforts could fail without adequate public support, cooperation, and participation. In such issues, failure to accurately assess and target public opinions can result in opposition to conservation initiatives and costly political battles.

In their book, *Endangered Species Recovery*, Clark et al. (1994) maintain that the challenges of conserving biodiversity lie in the realm of organizational behaviors, human values, policy-making processes, legal structures, communication flows, public education, and agency culture. Like the reintroduction of wolves to Yellowstone, the Florida Panther Recovery Plan (FPRP) reveals the potential of the public to sway the direction of reintroduction efforts. Biologists involved in the project note that "public attitudes and fears will probably be the major factor affecting success of reintroduction efforts" (Belden & McCown 1996). In this case, public opposition may jeopardize future efforts at reintroduction.

As part of the FPRP, the experimental release of Texas cougars in north Florida focused on the biological aspects of panther foraging, behavior, and habitat needs (Alvarez 1994). Little baseline analysis occurred of the policies and problems of panther reintroductions, institutional partnerships needed, and perceptions and involvement of property owners, special interest groups, and the general public. Data on all these factors in conjunction with the biological information are needed to develop an effective strategy to deal with complex conservation programs that integrate diverse stakeholders, policies, and human values.

Attempts at restoration of the Florida Everglades present another example of a conservation issue involving multiple stakeholders whose interests are crucial to the project. "Lever-

aging public support is vital to restoring this ecosystem. This issue is not just about the ecology of the system but involves politics, money, emotions, and values," according to Wiley Kitchens, senior research scientist for the Florida Cooperative Fish and Wildlife Service at the University of Florida.

In sum, conservation biologists must recognize the importance of front-end research on the human dimensions of conservation issues. Such research can result in improved communication efforts and public participation in formulating positive environmental policy. The safety net for maintaining biodiversity in the United States and abroad depends on the ability of conservation biologists to better integrate disparate approaches and views and to explore beyond traditional disciplines to solve increasingly complex conservation problems.

Need for Skills in Human Dimensions

These examples support the assertion that conservation biologists in the trenches need skills to communicate with the public and assess the interests of stakeholders. At a 1989 conference on conservation and sustainable development, scientists from international conservation and development organizations identified characteristics needed in future employees (Jacobson & Robinson 1990). They lauded real-world, interdisciplinary problem-solving skills and communication and leadership abilities and placed less importance on disciplinary technical skills. A recent survey of representatives from 18 environmental organizations and government agencies in Washington, D.C., provided a list of critical skills needed by conservationists (Touval & Dietz 1994). The ability to communicate across disciplines and work in teams were two of the skills most frequently cited.

Orr (1991) maintains that the failure of scientists to communicate with

the public partly explains the gap between strong public support for the environment recorded in polls and the lack of support for the environment as a key political issue. In a recent survey of 136 conservation organizations in the United States, a majority of respondents cited a need for training of conservation biologists in human interaction skills such as written and oral communication, explaining science and values of biodiversity to the public, group decision-making skills, interpersonal skills, and group planning, leadership, and advocacy (Cannon et al. 1996).

Investigations of natural resource agencies also emphasize the need for broader training (Jacobson 1995). Schmidley et al. (1990) surveyed descriptions of all wildlife-related positions at 50 state wildlife agencies and 26 regional offices of the U.S. Fish and Wildlife Service, Soil Conservation Service, Bureau of Land Management, Army Corps of Engineers, Forest Service, Environmental Protection Agency, Animal Damage Control, and National Park Service. They found that entry-level wildlife positions, requiring bachelor's or master's degrees, stress communication, public relations, and technical and mechanical abilities as much as biological knowledge.

Many educators and scientists have added to the dialogue. Clark (1992) states that to manage natural resources effectively, a person must be knowledgeable about the wildlife management sciences, several social sciences, and the policy sciences. He emphasizes the need to understand the decision, policy, and social processes that influence the impact of our technical, biological knowledge (Clark 1997). Wilkins et al. (1989) note the need for students to enroll in natural resource policy courses that illustrate the importance of both biological and human components in management decisions and emphasize the social and political structures within which these decisions are made.

Jack Ward Thomas, former chief of

the U.S. Forest Service, urged professional biologists to learn how to package and market conservation initiatives as politically and economically viable strategies: "The effective biologist, in addition to biology, understands the role of economic and political considerations in conservation decision-making, and the increasing and diverse expectations of people" (Thomas 1985, cited in Salwasser et al. 1990). Biologists must have appropriate education and training to enhance the competitiveness of their concerns in the marketplace. As Salwasser et al. (1990) note, "The business of fish and wildlife conservation is in competition with all other businesses for access to the great land and water resources of this nation."

Training in Human Dimensions for Conservation Biologists

Despite repeated professional demands for these skills, the education of conservation biologists continues to address the human dimensions in an ad hoc manner. Cannon et al. (1996) surveyed faculty in U.S. conservation biology programs and found that less than half of the 85 responding universities offer courses in human interaction skills. Although faculty recorded a high perceived need for such training, only a few institutions in the survey required conservation biology students to take coursework in human interaction skills. Of note, 22% of the 136 conservation organizations in the study responded that human interaction skills are *more important* than scientific knowledge and skills for their employees.

A survey taken in the early 1990s of 79 colleges and universities offering wildlife management courses in the United States found that human dimensions courses were available at only 28% of the schools (Gigliotti & Decker 1992). Ninety percent of responding professors noted that human dimensions were covered in other subjects outside the wildlife

management curriculum (such as economics, sociology, and psychology). But core classes in the social sciences such as psychology do not teach wildlife students how to apply concepts in the human dimensions such as theories of human behavior to real-life natural resource management issues (Gigliotti & Decker 1992). At the institutional level, Jacobson and Jacobson (1997) conclude that graduate training, reward systems, and funding discourage interaction between ecologists and society.

Similar needs exist at the level of in-service training for conservation professionals in natural resource management agencies (Jacobson 1995). A survey by Kennedy and Roper (1989) found that wildlife biologists with the U.S. Forest Service complained that their training was deficient in skills for understanding public attitudes and values and managing people.

Understanding the Human Dimensions of Biological Conservation

To approach this training need, we should begin with a common understanding of human dimensions in conservation biology. Human dimensions involves the beliefs, attitudes, values, behaviors, and socioeconomic, demographic, and organizational characteristics of the stakeholders involved in natural resource conservation issues. As a field, human dimensions blends specialties such as sociology, psychology, education, communications, economics, and anthropology into the study of the interaction of humans with the conservation of biological diversity. Human dimensions seeks to integrate the social and ecological sciences for an interdisciplinary understanding of conservation issues (adapted from Gigliotti & Decker 1992).

As conservation biologists in the field, we must gain an understanding of how human behaviors, values,

and attitudes affect our respective research interests, from individual species to entire landscapes. For example, an avian ecologist discovers that the habitat of the threatened Caracara in Florida exists primarily on private landholdings. Her research expands into exploring new ways to encourage cooperation with cattle ranchers. A landscape ecologist seeks to establish wildlife underpasses in public roadways. He must devise a campaign to win approval from the administrative officials of the department of transportation in order to conduct his research.

In setting an agenda for training in conservation biology, our goal is to instruct students in understanding these social and ecological interactions as an integral component of their education, not as an on-the-job revelation. The need exists for integrating human-dimensions training into the curriculum at the university level, as well as at the in-service level for current professionals in conservation biology. Such training would allow individuals to operate effectively in the real world, thus avoiding the idiot savant syndrome.

A graduate advisor in ecology would not dream of sending a student into the field to study wildlife populations without knowledge of sampling techniques and statistics. Yet we send graduates into the job market and the field to confront diverse stakeholders and communication issues without any training on how to assess and address public and institutional responses to biological conservation.

Integrating Human Dimensions with Conservation Biology

Although the study of human dimensions has yet to be integrated into our field, there is a growing recognition of its importance (Meffe 1997). This increased awareness in both developed and developing countries has resulted in some concrete steps

toward integration. For example, the University of Maryland's graduate program in conservation biology has established a curriculum focused on preparing students to work in teams to address real-world problems (Touval & Dietz 1994). These problems require skills in policy making, communication, and economics, as well as biology. The faculty in the Department of Wildlife Ecology and Conservation at the University of Florida recently voted to require *all* graduate students to take coursework in the human dimensions. At the U.S. Forest Service, a continuing education program was established for biologists to include not only technical and scientific expertise but—equally important—new courses in leadership and communication skills, natural resource policy, social values, and economics (Salwasser et al. 1990).

Effective teaching about human dimensions will require a rigorous research base to advance our knowledge of the human dimensions of conservation biology. C. E. Adams (1989) bemoaned the dearth of published articles on the human dimensions in wildlife and fisheries management. Yet human dimensions symposia at the North American Wildlife and Natural Resources Conference are becoming more frequent. This past year the International Symposium on Human Dimensions in Natural Resource Management in the Americas met in Belize. A new journal, *Human Dimensions of Fish and Wildlife*, was launched and joins older fora such as the journals *Society and Natural Resources* and *Environmental Conservation*, analyzing issues in human dimensions. An Internet discussion group on human dimensions now has more than 275 members. Although these changes represent small steps, they are steps in the right direction. The challenge for conservation biology as a field is to establish methods for improving the training of students and professionals in human dimensions.

As our understanding of the field matures, so too will our ability to make education in human dimensions available to all conservation biologists—synthesized into current courses and as a separate topic. This integration of human dimensions into conservation biology does not require an exact recipe for change because individual students, institutions, and organizations have different needs. But a general menu for training must be defined to include specific skills needed by conservationists to deal effectively with the human factors in the conservation equation. For institutions in developing countries, Saberwal and Kothari (1996) point to the need for integrating course material in two categories: social issues, focused on the political, economic, and cultural origins and patterns of human resource use, and policy issues, emphasizing the analysis and development of conservation policy, legislation, and management strategies.

In the United States, we suggest that an understanding of the sociopolitical arena and communication fields is paramount for the effective practice of conservation biology, a sentiment repeated by many of the researchers cited in this article. Exposure to social science paradigms and approaches teaches students systematic methods for identifying problems, for understanding stakeholders or specific target audiences, for comprehending different cognition and value systems, and for analyzing alternative activities for achieving goals and objectives. Knowledge of the range of social science methods and development of communication skills will allow conservation biologists to work more effectively with people from diverse disciplines and backgrounds and to view conservation problems within their broader socioeconomic context.

In addition to courses in the human dimensions of biological conservation that explicitly encompass the sociopolitical and communication sciences and tools, training can

be further enhanced through educational experiences developed to provide interdisciplinary breadth and real-world training to conservation biologists. These experiences include research projects that integrate social and ecological conservation issues, workshops and seminars involving university faculty and students with external agencies, involvement of professionals from outside groups in student graduate committees, student internships with agencies and organizations, community-based projects, joint conferences, opportunities for adjunct status and advisory board participation by outside professionals, joint degree programs among departments, and field experiences (Jacobson 1995). These types of activities can enhance students' abilities to work in groups, apply concepts and methods from outside their field of specialization, practice communication skills, and formulate goals and solutions involving the human dimensions of conservation biology.

Increased recognition of the importance of the human dimensions of natural resource management by state and federal agencies should lead to employment opportunities for more graduates in these areas (Adams 1989). This will be echoed by conservation organizations and industry and should be reflected in academia if we heed the call for this training.

Because environmental problems encompass human factors, conservation biologists must be skilled in the human dimensions of natural resource conservation. Without these skills we operate in a dangerous vacuum that isolates us from the policies, economies, and key players involved in the conservation issues we research. In *Conservation Biology*, Soulé (1986) stated that the discipline of conservation biology should "attract and penetrate every field that could possibly benefit and protect the diversity of life. . . ." Now a human dimensions component must penetrate conservation biology.

Acknowledgments

We thank A. Lyons, S. Marynowski, and G. Meffe for helpful reviews of drafts of this manuscript. This is no. R-05815 of the Florida Agricultural Experiment Station Journal Series.

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