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Understanding the Human Factor in Endangered Species Recovery: An Introduction to Human Social Process

Tim W. Clark and
Richard L. Wallace

Biologists often take a technical biological view of species recovery overlooking the necessity of attending to the human factor. The Hawaiian monk seal and grizzly bears in Yellowstone region cases well illustrate negative consequences to a recovery program when social process is overlooked, underattended to, or ignored. Understanding human social process in practical terms is essential as species will be recovered only if human social process can be made to effectively support restoration. A practical model of social process (i.e., participants, their perspectives, situation, values, strategies, outcomes, and effects) is described and a method to realistically "map" it is introduced. Also, seven kinds of public participation in species recovery are described. It is recommended that more attention be given to social process dimensions of species recovery at the same time biological issues are addressed and that the public be involved actively in support of species conservation.

Most biologists have been trained to understand the species loss problem and the recovery solution primarily in technical terms. The importance of the human factor can be overlooked, ignored, or viewed as a constraint to the central biological task of species recovery. From this standpoint human interactions are often labeled as "politics" and dismissed as outside of recovery professionals' immediate concerns (see Kellert 1985). We know that people's interactions affect the environment; some interactions may lead to protection of biodiversity and some may lead to species endangerment, depending on the type of interaction and its outcomes. Understanding human social process in practical terms is important because endangered species will be saved only if social process can be made to effectively support that goal. Social process "mapping" describes the interaction among people in the context of a recovery challenge, for example, between managers and biologists, between nongovernmental organizations and government agencies, or between conservationists and the public. Social process mapping also describes the interaction between

people and the problem itself, for example, the effect that recovery actions such as habitat protection have on people's lives and values. These two types of social interactions are both the ultimate cause of the endangered species crisis and the site of its ultimate solution. Endangered species recovery professionals must understand social process in species recovery work and learn to participate in it productively if they want to be maximally effective. This article examines human social process in general terms, offers an approach to understanding it, and surveys the kinds of social participation possible in recovery.

Endangered species case examples

Two cases illustrate the importance of mapping, understanding, and participating in social process during the recovery process. Ignoring the social dimensions of management can (1) result in overlooking allies and support for conservation, (2) lead to intractable negative public perceptions, and (3) draw down trust in government officials and professional biologists. In some cases, under-appreciating and not working

with social process can lead to failure to conserve species!

Hawaiian monk seals in Hawaii

In 1994 National Marine Fisheries Service (NMFS) biologists attempted to solve a long-standing problem facing monk seals in the Northwest Hawaiian Islands. The seals, numbering fewer than 1,500 and listed as endangered under the federal Endangered Species Act (ESA), suffered from an aberrant behavior displayed by select mature males. This behavior, called "mobbing," occurs when a male monk seal attacks a female in an attempt to mate, injuring or even killing her. In the summer of 1994 NMFS biologists moved 21 male monk seals known to exhibit mobbing behavior from Laysan Island in the Northwest Hawaiian Islands to areas throughout the main Hawaiian Islands. In the main islands, there were no known resident monk seals and thus threats to females would be minimized. NMFS's view of the relocation was specific: it was a monk seal protection measure, an action that needed to be taken in order to safeguard the health and well-being of female seals crucial to the breeding

success of the population. The relocation was technically successful. The animals were moved and the integrity of the original populations was safeguarded.

NMFS perceived the relocation as a management action that had physical affects limited to the seals themselves. When NMFS decided to relocate the animals, it had a small window of opportunity to implement the decision because of the limited availability of ships and equipment needed to capture, relocate, and release the seals. NMFS considered contacting the fishing industry, specifically the Western Pacific Fishery Management Council (WPFMC), to explain the plan before capturing and releasing the seals. Doing so, however, would have created the need for potentially lengthy discussions between agencies concerning the possible impacts of the seal relocation on fishermen. Beginning such discussions so close to the proposed time of relocation would likely have caused NMFS to miss its window of opportunity to move the seals. Therefore, NMFS chose not to alert the council or local fishermen on the main Hawaiian Islands about its intentions.

Once the seals were moved, NMFS issued a press release explaining what it had done and why. This upset local fishermen and the WPFMC, NMFS's strongest and most influential constituent in Hawaii. Fishermen perceived the movement of seals to be a threat to their operations in the main Hawaiian Islands. NMFS began to field complaints from fishermen that monk seals were taking their catch. Some fishermen even accused NMFS of covertly attempting to establish a population of monk seals in the main Hawaiian island in order to justify regulatory limits on fishing in areas where there had previously been no seals and therefore no conflicts with

fisheries. NMFS underestimated the level of frustration and the strength of public reaction. As a result, the agency had to undertake damage control, including pacifying angry fishermen and bringing in high level officials to address the issues before the WPFMC.

For an agency in charge of overseeing the nation's fisheries, this episode was unfortunate. While it protected monk seals, it reflected a lower priority for the agency's main constituency, the fishing industry, thus creating conflict for the agency's local and regional leadership. Although conflicts between marine mammals and fisheries occur frequently, rarely are marine mammal interests put before those of fisheries when a management action affects both, especially when the fishing interests are considered before the action is taken.

Grizzly bears in Yellowstone region

In 1996 grizzly bear #209 was intentionally trapped in Grand Teton National Park (GTNP), Wyoming, and later killed under the auspices of the U.S. Fish and Wildlife Service (FWS, chief administrator of ESA) in cooperation with the National Park Service, the Forest Service (FS), and the Wyoming Game and Fish Department (WGFD) (Cromely, in press). The grizzly is a threatened species under the ESA and afforded special protection. Grizzly bears, which number about 300 in the Yellowstone region, are large predators that can and do kill livestock. Because GTNP permits livestock grazing, this brings bears into direct conflict with rancher special interests in the Park. The agencies try to accommodate both bears and cattle, but there are situations where bears are trapped and relocated (or in this case killed) to protect private cattle on public lands. Bear #209 was previously implicated in killing cattle

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Cover: Siberian tiger, (*Panthera tigris altaica*). Photograph © Chicago Zoological Society.

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inside GTNP and outside the park on a nearby FS allotment. When #209 moved back into GTNP near cattle grazing under a special grazing arrangement and into a management zone which permitted killing the bear, agency officials decided to act. The decision was influenced by the agencies' aggregate view that bears are recovered in the Yellowstone region, or very nearly so, and that the loss of one or a few bears would not jeopardize the population's status and might diffuse rancher opposition to bears.

Many people were upset that a threatened species, in a national park set aside to conserve wildlife, was killed to aid ranchers who were grazing cattle under a special permit, the legality of which was openly being questioned at the time. One long-time area resident organized a petition—signed by over 800 people within a few days—and gave it to officials in GTNP, the FS, and the Secretary of Interior to protest the killing. Newspapers printed letters criticizing the killing and covered the issue prominently. Local, regional, and national conservation groups were taken aback by the incident and made their disapproval widely known. Among the concerns expressed were questions about the competence and trustworthiness of the agencies, government employees, and their bear management policy.

This episode added to the growing public distrust of officials and the sense that public lands and wildlife are being chronically mismanaged. Other events in preceding years fueled this public view (e.g., Primm 1994), including a court ruling the year before that showed the FWS grizzly bear recovery plan was flawed and needed to be revamped. The judge declared that the FWS and others "have acted in a manner that is arbitrary and capricious and contrary to law by issuing a Recovery

1. **Participants.** Who is participating? Identify both individuals and groups. Who would you like to see participate? Who is demanding to participate?
2. **Perspectives.** What are the perspectives of those who are participating? Of those you would like to see participate? Of those making demands to participate? What would you like their perspectives to be? Perspectives include:
 - A. **Demands**, or what participants or potential participants want, in terms of values and organization.
 - B. **Expectations**, or the matter-of-fact assumptions of participants about past and future.
 - C. **Identifications**, or on whose behalf are demands made?
3. **Situations.** In what situation do participants interact? In what situations would like to see them participate?
4. **Base Values.** What assets or resources do participants use in their efforts to achieve their goals? All values, including authority, can be used as bases of power. What assets or resources would you like to see participants use to achieve their goals?
 - A. **Power** is to make and carry out decisions.
 - B. **Enlightenment** is to have knowledge.
 - C. **Wealth** is to have money or its equivalent.
 - D. **Well-being** is to have health, physical and psychic.
 - E. **Skill** is to have special abilities.
 - F. **Affection** is to have family, friends, and warm community relationships.
 - G. **Respect** is to show and receive deference.
 - H. **Rectitude** is to have ethical standards.
5. **Strategies.** What strategies do participants employ in their efforts to achieve their goals? Strategies can be considered in terms of diplomatic, ideological, economic, and military instruments. What strategies would you like to see used by participants in pursuit of their goals?
6. **Outcomes.** What outcomes are achieved in the ongoing, continuous flow of interaction among participants? Outcomes can be considered in terms of changes in the distribution of values. Who is indulged in terms of which values? Who is deprived in terms of which values? Outcomes also refer to the ways in which values are shaped and shared. The particular ways in which values are shaped and shared are called practices or institutions. How are practices changing? How would you like to see practices change? What is your preferred distribution of values?
7. **Effects.** What are the new value/institutions, if any? Are new practices put into place? Are old practices maintained? What forces promote new practices? What forces restrict new practices?

Table 1. Some questions to ask in order to map the social process of a specific endangered species recovery problem (modified from Lasswell 1971, Willard and Norchi 1993).

Plan that fails to establish objective, measurable criteria in a determination...that the grizzly bear be removed from the threatened species list" (Thuermer 1995a:13A, b).

In response to the public outcry over the #209 incident, officials offered more complete explanations. Officials of the WGFD, which administered the lethal injection, said it was done because the bear "would not stop eating cows grazing in the Park" (Thuermer 1996a:14A). Other officials defended their actions by saying that #209 was a known cattle killer on an adjacent FS grazing lease (where bears were nonetheless protected) and that cattle grazing was legal in this national park. GTNP Superintendent noted he allowed grazing because ranching helps keep open space which supports the tourist-based economy of Jackson Hole (Thuermer 1996b). These explanations did not satisfy protesters, but after some weeks the issue seemed to die down in the press. It persists, however, in many people's minds.

Like the monk seal case, this was another distressing episode for federal (and state) agencies in charge of overseeing endangered species restoration. While agencies in the Yellowstone region generally protect grizzly bears and work for their recovery, this incident reflected a lower priority for bears than for the interests of cattle ranchers. This episode created a conflict that has yet to be satisfactorily resolved in some people's minds. These two cases show that social process is a key variable in endangered species recovery.

A practical model of social process

Social process is the interaction of people as they influence the actions, plans, or policies of other people, even if they are unaware of each other. It is the process by which

we create and sustain the human community. In trying to understand social process in general or in endangered species cases, most people merely impose conventional classification systems extrapolated from everyday life. The terms used in these schemes and the scope permitted by them are often wanting in analytic strength and insight. For example, how many times have you heard someone use terms like "politics" or "personality" to "explain" away troublesome social dynamics and outcomes?

A much more useful model of social process has been devised based on functional anthropology and the policy sciences that enhance understanding of complex policy problems (Lasswell and Kaplan 1950). The model focuses on participants with perspectives interacting in particular situations. Drawing on whatever base (power) values they have, they adopt strategies to pursue particular value outcomes, which have effects on future interactions (Table 1). These terms are described in detail in theoretical and applied works by Lasswell and Kaplan (1950) and Lasswell (1971) and discussed in the context of conservation biology by Clark (1997a) and others. Another way to highlight these categories is to ask seven questions: Who participates in the recovery process? With what perspectives? In which situations? Using which power bases? Manipulating them in which strategies? With what outcomes? And with what longer effects?

This model is well documented in the social sciences literature and has been widely used internationally. It is applicable to any context in which people interact (Lasswell and McDougal 1992). Indeed, it functions as more than a model. Its integrated concepts constitute a "stable frame of reference" that allows users, both participants and

analysts, to look not just at the particulars of recovery efforts, but, more importantly, at the functional relationships that propels them and all human activity. This model and mapping method is not simply a cookbook approach to adding social science data to biological data in analyzing endangered species problems or finding solutions to them. The power of this analytical, highly flexible framework is its simultaneous comprehensiveness and selectivity in mapping human dynamics and their implications. It offers insights into social process simply not available from using conventional views and terms. By using this model and method, data, both hard and soft, that might otherwise be overlooked or misconstrued can be appreciated and incorporated more fully and accurately into a view of any endangered species conservation task.

In all interactions, people tend to act in ways they perceive will leave them better off than if they had completed them differently. Because of the subjective character of perceptions, people perceive themselves, their environments, other participants, and in this case, endangered species recovery efforts, differently. The differences among people—in identities, expectations, demands, values, strategies, and other variables—may be vast and irreconcilable. No amount of "cold, hard fact," collected by "objective, neutral" scientists and "equally accessible" to all participants, and no amount of "education" and "exchange of ideas" can completely eradicate the inherent differences among people. This fact, however, does not disaffirm our common interests or obviate the need to strive for common goals. The social process model provides (1) a practical method of accounting for these myriad differences, (2) a vehicle for

explaining their dynamics, and (3) insights for preventing or correcting weaknesses to clarify and secure common interests. This kind of social process knowledge and skill would greatly improve the effective practice of endangered species professionals.

One of the central concepts in the social process model is the interplay of human values. People's values underlie their perspectives on the world. They are the medium of exchange in all human interactions. Values constitute the goals for which people strive: an education, skill in performing their jobs, good health, good government, healthy environments, and security, among others. But values also constitute the assets or resources on which people draw to achieve these goals. Wealth is used, for instance, to buy the necessities of life, although it may also be used to "buy" power. People use the respect of their peers or the power of their status to build support for a cause they believe is right. Or to build strong communities or political alliances, they draw on the well-being they feel from knowing that other life forms are secure and healthy. Values are also manifest in the outcomes of social interactions, not only in the achievement of individual goals, but also in changes in institutional practices. For instance, a new law rolling back environmental protection may advance the power or wealth of a special interest group while diminishing public health. Similarly, the decisions to translocate monk seals or kill grizzly bears are value outcomes that reflect institutional practices.

Policy scientists have classed all human values—everything that people in all cultures in all times at all ages at all levels have strived for—into eight functional categories: power, wealth, enlightenment, well-being, affection, skill, respect,

and rectitude (Lasswell and Kaplan 1950). These are functional categories in that these terms can be used to describe how people's actions actually function in society despite how they may be conventionally described, understood, or promoted by participants or observers. For instance, the Hawaiian monk seal and Yellowstone grizzly bear cases could be analyzed functionally in terms of these values. All eight values were involved in the social transactions that took place. How were these values "traded," and how did they influence each other in the social transactions? In value terms, who was indulged and who was deprived? In other words, how were values shaped and shared through these two recovery efforts? It is beyond the space here to answer these questions. But, both cases involved all eight values interacting in a complex manner. Power figured into both cases, as did respect, wealth, and rectitude. A value analysis of these two cases based on empirical study can provide insight and improved understanding of the actual social dynamics at play. An ongoing mapping of the social process of any recovery program can reveal trends and why those trends are taking place that may not be evident otherwise. In turn, future developments might be anticipated and any foreseeable problems averted. This knowledge about value trends, conditions, and projections can be used to manage social process and all the values, especially power, respect, wealth, skill, rectitude. In these two cases, this kind of knowledge was potentially available to managers and could have been skillfully used to advance social process in favor of endangered species recovery.

In endangered species recovery, the American public has declared via the ESA that it is the goal of the United States to "provide a means

whereby the ecosystems upon which endangered species and threatened species depend may be conserved, and to provide a program for the conservation of such endangered species and threatened species" (FWS 1988:1). This means that we have set national rules or guidelines for ourselves about how we will deal with each other, with other species, and with ecosystems in certain contexts. In functional terms, all eight values are always involved in the ESA and species conservation. For instance, such a statement of national intent or policy is based on power and requires a commitment of collective national wealth to implement it. Enlightenment and skill are also required for implementation. Achieving the national goal of biodiversity conservation produces outcomes involving respect (both self-respect and the regard of the international community), affection, and well-being. The ESA is also a statement of our rectitude standards. It is clear that restoration efforts affect people's lives in many ways. Indeed, all eight values are always at play at some level in all human interactions. Understanding which values are predominantly at play and how they are exchanged functionally—figuring out who is indulged and who is deprived in specific recovery cases—is the key to understanding social process practically. The social process method, as an analytic and comparative approach, produces insight and reveals ways to learn, intervene, and improve recovery efforts far beyond conventional, ordinary, and particularized understanding.

Mapping social process

Professionals confronted with complex policy-relevant problems, such as biologists working on endangered species recovery, need a practical guide to map and under-

Participation Type		Descriptions
1.	Passive participation	People are told what is going to happen or what has happened. Communication is unidirectional. Information being transmitted belongs to outside experts.
2.	Participation in information giving	People answer questions put them by experts in questionnaires of other surveys. People do not influence the process otherwise.
3.	Participation by consultation	People are consulted and outside experts listen. Outside experts define problems and solutions. No concession to public.
4.	Participation for material incentives	People provide resources such as labor for food, cash, or information.
5.	Functional participation	People form groups and meet objectives. This may happen once a recovery effort has been set up by experts.
6.	Interactive participation	People involved in joint analysis, production of action plans, and enhanced organized participation.
7.	Self-mobilization	People take independent initiatives apart from experts and government. This may or may not challenge existing experts and government.

Table 2. The seven types of public participation possible in endangered species recovery (modified from Pimbert and Pretty 1995).

stand the social process dimensions of their work (Table 1). The model described here and the categories and questions in Table 1 can guide professionals in building a map to orient to any social context. Because every detail of a problematic situation is affected by interaction with the entire context, problem solvers must use a method that places the problem within the social setting. With a contextually-relevant, functional map of social process, people involved in recovery programs can more easily see how their decisions and actions would be perceived by other participants and they could better understand others' actions.

To illustrate the value of social process analysis, in the monk seal and grizzly bear cases ask yourself who are the participants, what is their perspective in terms of identities, expectations, and demands. Also, discern what the situation is in terms of geography/ecology, time,

institutions, and whether a crisis exists or not. Further, determine what base values are involved, what strategies are being used, and whether they are coercive or persuasive. Finally, assay what outcomes are sought and what outcomes actually resulted in terms of values and institutional practices and what are their effects. To answer these questions in realistic detail you need to do research on the endangered species recovery effort in question. Remember the purpose of social process mapping is to understand a given case so that practical improvements might be made.

Both the monk seal and grizzly bear cases are complex and it is impossible to fully illustrate in this paper how the social process model can be used to practically map these cases for improved management. But, for example in the monk seal case, moving seals was perceived by agency officials as the responsible and ethical thing (rectitude value) to do to aid

species recovery based on their knowledge (enlightenment value) of the situation. They had the power, wealth, and skill values to make and carry out decisions. But to the fishing industry, the situation and other aspects of social process looked quite different. These people perceived that they would be deprived of wealth (wealth value) by having seals moved into new areas. They may also have feared a loss of power, respect, and well-being values. The remaining values were functionally involved as well. The issue is whether the agencies' knowledge was adequately contextual and their use of power, skill, and wealth were appropriate in this context. Moving seals was a functional value clash wherein participants were differentially indulged or deprived of values. Being fully cognizant of the direct values clash in moving the seals argues for having positive social relationships firmly in place in advance so that when

rapid decisions and actions are necessary public or special interest backlash can be avoided or minimized. Thinking and acting contextually in terms of social process permits professionals to better appreciate and manage recovery efforts.

Again, in the grizzly bear incident, killing #209 was consistent with agency officials' values of rectitude, respect, well-being, affection, power, wealth, enlightenment, and skill. But many outsiders perceived that officials were misusing their power, knowledge, skill, and public funds, and they felt the community's rectitude standards were violated in failing to protect the bear. Cromely (in press) analyzed this case in detail relying in large part on the social process model introduced in this paper. She focused on how differing expectations of participants making up the social process came into direct conflict. As a result of her analysis, numerous practical management recommendations were made to avoid this kind of problem in the future and to better manage the social process dimension of grizzly bear recovery.

Because social process is not static, it must be continuously mapped over the life of any conservation "decision process" (see Clark and Brunner 1996) and as the nature of the problem changes over time (i.e., as problems are defined, acted upon, and results evaluated). Remember that the social process model and mapping procedure is not a simple cookbook method (Clark 1977b). Mapping and understanding social process in practical terms requires study, skill, and judgment. Nevertheless, it is vital for professionals to integrate social process knowledge into problem solving for endangered species recovery. The framework devised by Lasswell (1971) is a means to meet this challenge integrative challenge. Like

any method, this one can be learned through study and application, and skill in its use can develop through practice overtime.

Effective public participation in recovery efforts

Recovery personnel can interact with each other, the public, or in social process in a variety of ways. They can make decisions and take actions based on contextual professional assessments—thus largely ignoring the public and social process. Or they can involve the public directly and meaningfully in problem solving. The two cases above detail how the public was and was not involved in recovery and what the consequences were.

Organizing effective public involvement is not always easy, and endangered species recovery has had a mixed history of public participation. Participation has too often been construed simply as "getting more citizen input." But there is growing recognition that conserving wildlife and restoring species require local involvement in more substantive ways. Contemporary recovery efforts are beginning to see more diverse people as important problem solvers and nature conservers (Pimbert and Pretty 1995). Regardless of how the public is viewed, local involvement can be very helpful, so social process must be part of a comprehensive and rigorous understanding of the conservation problem prior to exploration of solutions. Public participation must also be done in a deliberative and democratic way (Dryzek 1990). Local involvement for its own sake will not lead to species recovery or improved social process: what is needed is responsible, constructively critical, political participation (Forester 1980). Remember also that regional or national involvement is also vital and may

even be more important in some cases than local involvement.

Pimbert and Pretty (1995) have identified a continuum of participation types in conservation, ranging from passive to active (Table 2). It is believed that lasting conservation measures will result from the more active "functional," "interactive," and "self-mobilized" participation modes. It only makes sense in a democracy that long-term success will come when people's ideas and knowledge are valued and power is given to them to make key decisions in close cooperation with experts and governments. In fact, without the real commitment of local people, conservation is probably impossible.

There are existing theories on how social process should be carried out in a democracy and these are directly relevant to setting up and running recovery and other conservation programs. Dryzek (1990) notes, for example, that "discursive democracy" can overcome many of the common weaknesses in public policy and decisionmaking. And Barber (1984) describes a "strong democracy" dominated by "communicative rationality" (the reflective understanding of competent participants), which he feels is urgently needed today. Both Dryzek and Barber's ideas can lead to coordination of community actions through discussion (see Habermas 1984). In short, the quality of public or social participation is what counts. According to Dryzek (1990:23) "communicatively rational policy science of participatory democracy, oriented to the public sphere rather than the state, is well placed to reconcile the twin demands of effective social problem solving and democratic principles." In addition to these, there are many theories about how to reconcile rationality and democracy. Knowing about these theories and practi-

cally applying them in species conservation is indeed challenging.

There are several incipient designs in currency today that attempt to resolve conflictual social problems, that improve rationality and democracy—among them are mediation, alternative dispute resolution, regulatory negotiation, policy dialogue, principled negotiation, and problem-solving workshops. None of them fully acknowledges the need to understand and map social process. A rational problem-solving approach to conservation problems, including appreciation of the social process involved, and practically finding consensus are ideals for which to strive. Being knowledgeable of the social process dimension of recovery, as well as being skilled in mapping it practically, can significantly aid professionals in achieving their goals.

Conclusions

As the two examples illustrate, recovering species involves human social process. Effective problem solving in conservation must account for the social dimension. This can best be done by employing a practical model to help you map the social process of the case in which you are interested. The social process categories—participants, perspectives, situation, base values, strategies, outcomes, and effects—can guide conservationists in systematically examining whatever situation about which they are concerned. A challenging task in social process is to involve the public in genuine problem solving that maximizes chances of successful species recovery. The social process model and mapping method offered in this paper can aid species recovery and conservation in practical and substantial ways.

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A New Approach to Tiger Conservation: Integrating Top-Down and Bottom-Up Strategies

Mary Cox

Abstract

Tiger populations have declined from estimates in the tens of thousands at the turn of the century to 4,400 to 7,700 today, and three of the eight tiger subspecies have gone extinct in the past 50 years. In the late 1960's and early 1970's, international alarm at rapidly declining tiger populations generated tiger conservation efforts in many of their range countries, but tigers remain one of the most critically endangered animals in the world. Early conservation initiatives relied on top-down "command and control" methods of conservation, and focused on setting aside reserves to protect important tiger habitat. These methods have come under criticism for neglecting the needs of local communities surrounding protected areas and failing to adequately protect biodiversity. In response, conservationists developed Integrated Conservation and Development Projects (ICDPs), which attempt to link biodiversity conservation with local development by giving local people a stake in maintaining protected areas. ICDPs, however, have not clearly provided greater biodiversity protection than the traditional approach. Nepal's Royal Chitwan National Park (RCNP), which encompasses some of the best tiger habitat in the Indian Subcontinent, has combined elements of the command and control approach with the local development focus of the ICDP approach, resulting in increased tiger habitat and population, lower poaching and improved local economic conditions. This combination of the two approaches can serve as a model for tiger conservation initiatives elsewhere in Asia, and for biodiversity protection in general.

Introduction

Eight subspecies of tiger once ranged throughout Asia. Three of these eight subspecies, the Caspian (*Panthera tigris virgata*), Javan (*Panthera tigris sondaica*) and Balinese (*Panthera tigris balica*), went extinct within the past 50 years. The five remaining subspecies are severely endangered. In the wild, approximately 4,400 to 7,700 tigers now remain in 14 countries: 230-400 Siberian tigers (*Panthera tigris altaica*) in far western Russia and North Korea; 1,000-1,500 Indochinese tigers (*Panthera tigris corbetti*) in Cambodia, Laos, Malaysia, Myanmar, Thailand and Vietnam; 30-50 South China tigers (*Panthera tigris amoyensis*) in China; 500-1,000 Sumatran tigers (*Panthera tigris sumatrae*) on the island of Sumatra in Indonesia; and approximately 3,000-3,750 Bengal tigers (*Panthera tigris tigris*) in India, Nepal, Bhutan and Bangladesh (Highley 1993; Kenney et al. 1995). These tigers exist primarily in small, scattered,

isolated populations through a broad range of habitats.

In the late 1960's and early 1970's, alarm over rapidly declining tiger populations spurred international efforts to save the tiger from extinction. In India alone, the tiger population declined from estimates of up to 40,000 at the turn of the century to less than 2,000 in the early 1970's (Panwar 1987). Despite global efforts toward tiger conservation, extinction due to habitat loss and poaching still threatens remaining tiger populations. In this paper, I discuss two different strategies for biodiversity protection in the context of tiger conservation: the "command and control" approach and community-based Integrated Conservation and Development Projects (ICDPs). I suggest that neither is sufficient to protect remaining tiger populations on its own, and that more effective conservation requires integrating both approaches through strategically targeted national strategies aimed at facilitating conservation at the local level.

Approaches to tiger conservation

Command and control

In the traditional command and control approach to conservation, national governments and national or international non-governmental organizations (NGOs) generally implement conservation policies from the top down, setting aside core reserves or protected areas free from human disturbance and managing these areas solely for the purpose of biodiversity conservation. Recently, however, critics have faulted this approach as failing to preserve biological diversity and neglecting needs of people most directly affected by conservation policies (Barrett and Arcese 1995). Often, governments designate reserves without regard to the needs of local human populations that depend on resources within the reserve for survival. Setting aside a protected area can deprive neighboring communities of valuable economic resources, such as wood products, grazing land, and game animals,

without their participation or consent, and gives them little in return. Consequently, conflicts often arise between local people and park management as growing local populations encroach on protected areas (Wells and Brandon 1992; Wells and Brandon 1993).

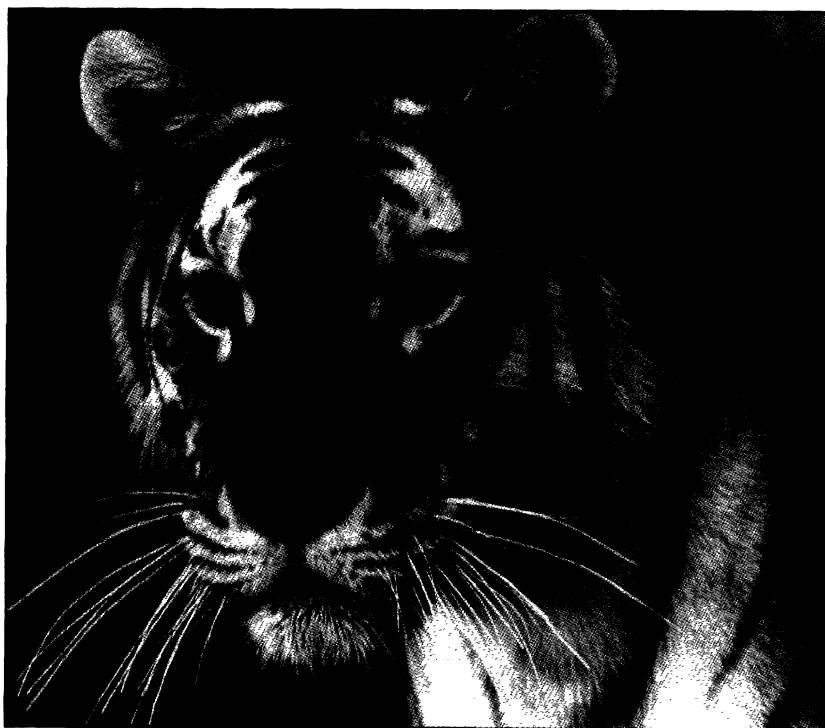
Early tiger conservation efforts followed the command and control model. For example, the Indian government passed a ban on tiger hunting in 1970 and comprehensive wildlife protection legislation in 1972, and designated nine "Project Tiger" reserves in 1973 with the objectives of ensuring viable tiger populations and protecting biologically important areas (Panwar 1987). This approach showed initial success: India's official tiger census in 1989 counted a total of 4,334 tigers, more than double the 1972 count. Project Tiger, however, seems to be suffering from some weaknesses of the command and control approach: reserve managers have faced land use conflicts with local people and reserves may not be adequately protecting tiger populations (MacKinnon et al., in press; Panwar 1984; Saharia 1984). The Indian government created Project Tiger reserves from land formerly under commercial forestry operations or used by local communities for livestock grazing, and in some cases, entire villages had to be relocated outside of reserve boundaries (Panwar 1984). Areas surrounding reserves have become severely degraded because, with productive land set aside in reserves, larger numbers of people depend on a smaller resource base, and reserves themselves are increasingly under threat from competing land uses. Moreover, recent tiger census figures indicate India's tiger population may again be declining. The 1993 census reported a total of 3,750 tigers, and in 1995, the number of tigers residing in Project Tiger reserves declined from 1,266 in 1993 to 1,077 (Wildlife Protection Society of India 1995).

Integrated conservation and development projects

In response to the shortcomings of traditional conservation methods and recognizing that long-term biodiversity protection requires support from local residents, the World Conservation Union's 1980 World Conservation Strategy stressed linking biodiversity conservation and management to economic development for local residents (Wells and Brandon 1992). Governments, park managers and conservation NGOs then developed and began implementing the Integrated Conservation and Development Project (ICDP) model for natural resource protection. ICDPs are based on the premise that increasing local peoples' standard of living will enhance biodiversity conservation by reducing conflict with local communities and decreasing pressure to exploit park resources (Wells and Brandon 1992; Alpert 1996). To facilitate these objectives, ICDPs attempt to link conservation with development by enabling local people to benefit from conservation efforts through revenue-sharing arrangements, direct employment, development of alternative

sources of natural goods and exchanging development benefits for foregone resource use. ICDPs usually involve collaboration between the national agency charged with wildlife or natural resource protection, a national or international NGO, and representatives from local communities. They are implemented with three management areas: a core area managed as a traditional park emphasizing biological resource protection; a "buffer zone" surrounding the core area where human activity consistent with protection of the core area is permitted; and finally the surrounding communities where social and economic development initiatives take place.

ICDPs, however, are also falling out of favor for several reasons. First, they do not clearly provide greater biodiversity protection than traditional reserves. Data are lacking to determine the biological impact of ICDPs because little research to monitor and inventory biological diversity within ICDPs has been carried out (Alpert 1996). Of 36 ICDPs studied, only five showed a positive correlation between development and biodiversity conservation (Kremen et al. 1994). Second,



Siberian tiger (*Panthera tigris altaica*). Photograph © Chicago Zoological Society.

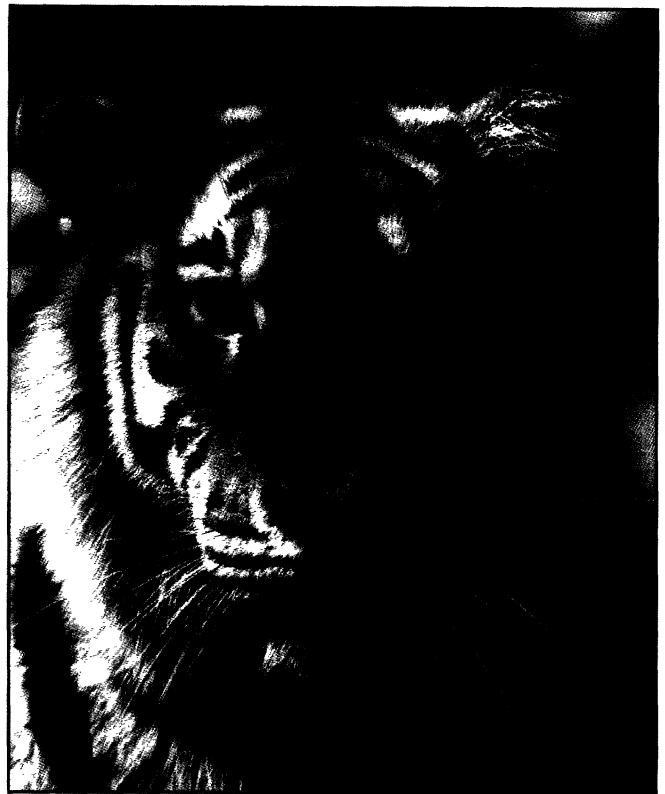
human behavior at the local level may be influenced by factors beyond the immediate vicinity of the protected area, such as economic forces or national laws and policies (Wells and Brandon 1992). Park managers may not be able to establish a viable buffer zone because they lack legal authority or sufficient resources to control activity outside the core protected area, particularly in developing countries where resources are strained and conservation objectives are not government priorities. Finally, the link between conservation and development in a particular project may be weak or obscure, and in some cases conservation may be incompatible with development. Development based on use of natural resources surrounding a protected area may seem "sustainable" in the short run, but may become unsustainable as the population grows and puts increasing pressure on the protected area itself. More fundamentally, determining a truly sustainable level of use may be impossible (Kremen et al. 1994).

Several current projects attempt to apply the ICDP model to tiger conservation initiatives. In 1994, the Global Environment Facility (GEF), a collaboration between the U.N. Development Programme, the U.N. Environment Programme and the World Bank, launched a pilot demonstration project applying the ICDP concept to tiger conservation in India, Indonesia and China (MacKinnon et al., in press). Results showing these projects' performance in protecting tiger populations is not yet available, but given results from other ICDPs (Kremen et al. 1994), whether the ICDP approach can help tiger populations rebound is questionable.

Ecological requirements for tiger conservation

Maintaining a viable tiger population requires a large amount of land relatively free from human distur-

bance. Tigers are generally solitary and territorial. Range sizes vary, depending on the availability of mates, habitat quality and cover, and prey abundance, but range from 20 to 400 km² (Wikramanayake et al., in press). Males exclude other males from their ranges, and, with the exception of their own young, females exclude other females (Smith et al. 1987a). Female young tend to settle in territories adjacent or near their mothers' territories, and male tigers' territories overlap those of several neighboring females with whom the males mate. Male tigers, therefore, mate with a restricted number of females and these females may be related to each other, as well as to their male mate. The precise genetic implications of this pattern are unclear, but "male genes will not spread through the population as rapidly as they would if males mated with a random sample of females" (Smith et al. 1987a). This pattern also increases the potential that males will mate with related females, which further decreases genetic variability. A disproportionate sex ratio exists among adult tigers, with females outnumbering males by estimates varying from 2:1 to 5:1 (Schaller 1967). Since males are few and far between compared to females, effective population size will be relatively small compared with the overall tiger population. A viable tiger population would therefore have to be relatively large.



Siberian tiger (*Panthera tigris altaica*). Photograph © Chicago Zoological Society.

Because tigers occupy sizable exclusive territories, maintaining a large tiger population would require a large amount of intact tiger habitat (Wikramanayake et al., in press).

Protected areas currently cover only a fraction of existing prime tiger habitat (Wikramanayake et al., in press). Only 34% of India's tiger population currently lives in reserves (Wildlife Conservation Society of India 1995). Existing protected areas are small and isolated, and will not support viable tiger populations unless linked to other habitat (Wikramanayake et al., in press). Moreover, tiger habitat must be buffered from human use because tigers are sensitive to excessive human disturbances (Dinerstein et al. 1997). Maintaining viable tiger populations will therefore require protecting additional habitat and minimizing human disturbance in these areas. Much prime tiger habitat, however, is also home to growing human populations. These communities often depend on the same resources that tigers require for habi-

tat, such as vegetation, land area and prey animals (MacKinnon et al., in press). Loss of human lives and livestock to tiger predation increases conflict between tiger conservation and local communities.

In addition to habitat loss and degradation, tigers are threatened by poaching for use of their parts in medicinal trade. Actual poaching statistics are unreliable, but poaching levels in India have increased to alarming levels since 1988 due to an increasing demand for tiger parts used in traditional medicines in Pacific Rim countries coupled with rising incomes (Kenney et al. 1995; Seidensticker 1997). Even a moderate level of poaching over an extended period of time can have devastating effects on tiger populations." There is a critical zone of poaching pressure in which a small, incremental increase greatly increases the probability of population extinction; at lower levels of poaching pressure, the same incremental increase has little or no effect" (Kenney et al. 1995). In practice then, poaching may not initially appear to be a problem, but could suddenly become a significant threat. Anti-poaching efforts must therefore be vigilant and sustained, even when they have been successful in reducing poaching pressure.

A combined approach

Because of tigers' ecological needs, a single conservation strategy based either on the command and control or the ICDP strategy will not provide adequate protection. Large areas of tiger habitat are not currently protected, but a top-down approach designating additional reserves is problematic because local communities already deprived of significant resources are not likely to support taking additional land out of economic use. An ICDP may provide economic incentives to maintain or increase available tiger habitat, but may not adequately address poaching problems.

Poaching pressure arises far beyond protected areas and adjacent communities because the principle markets for tiger parts are not tiger range states, and trade crosses international boundaries. A truly effective anti-poaching program thus requires top-down strategies such as a strong enforcement infrastructure and support at the national level to address national and international aspects of illegal trade in tiger parts (Mills and Jackson 1994, Hemley and Bolze 1997). Protection efforts in Nepal's Royal Chitwan National Park (RCNP) demonstrate how cycling between top-down and bottom-up approaches can achieve more effective tiger conservation than a single strategy (Dinerstein et al., in press).

RCNP holds some of the best remaining tiger habitat in Asia (Wikramanayake et al., in press), but is bordered by more than 320 local communities (Mishra et al. 1987). RCNP started as a traditional command and control conservation project: land that is now RCNP was first set aside in the 1960's as a royal hunting preserve and designated a national park in 1973. Soldiers from the Nepalese Army were stationed in the park to guard against poaching and illegal trespassing. Over time, however, conflicts between park management and surrounding villages arose because local people suffered substantial social and economic hardships from the park. Tiger predation caused losses of human life and livestock, park regulations prohibited cattle grazing and firewood collection within the core protected area, and wildlife from the park destroyed crops (Mishra et al. 1987). Residents did not receive substantial benefits from the park because park management and tourism provided few jobs, and revenues from park fees and tourism went to the Ministry of Finance or to private, non-locally-owned business rather than to local communities.

To provide some benefit from

designation and maintenance of the park, park managers began allowing local people to collect thatch grass for building materials once a year (Mishra et al. 1987). Still, this provided little benefit relative to the opportunity cost of the park. Furthermore, the core protected area of the park and adjacent Parsa Wildlife Reserve was too small to support a viable tiger population, habitat surrounding the park was severely degraded because park management lacked resources to manage it adequately, and residents put additional pressure on these areas for firewood and grazing. Buffer zones surrounding the park therefore needed better management to meet both human and wildlife needs.

Recent changes in national policy and new initiatives funded by USAID, World Wildlife Fund and the Biodiversity Conservation Network, have removed barriers to additional local development and provided for greater local participation in and benefits from conservation efforts (Dinerstein et al. 1997). In 1993, changes in Nepal's national forest policy created buffer zones around the park and allowed local User Group Committees (UGC's) to manage the zones if they developed effective management plans. Allowing local management provides incentive to prevent further degradation and encourage regeneration to provide both habitat for tigers and wood products for communities. UGC's have since expanded their activities to include a community-based "ecotourism" project, which hired local people as guards to protect against poaching and trespassing in the buffer zone. In 1995, the Nepalese parliament passed legislation requiring that half of revenue generated by the park be recycled back into the community for local development projects.

The RCNP example shows that successful conservation requires not only combining elements of both command and control conservation and

the ICDP approach, but also cycling between both to identify barriers to effective tiger conservation and make strategic policy changes to overcome these barriers. Top-down strategies keep core tiger habitat relatively free from human interference and provide strict protection against poaching, whereas community-based initiatives provide incentives and resources to protect additional habitat outside RCNP necessary to support a viable tiger population. Toward this end, the Nepalese government made targeted changes in national policies to overcome barriers to conservation by local residents.

RCNP has overcome weaknesses associated with both approaches. First, data on effectiveness of conservation efforts is available because researchers have consistently monitored populations of tigers and other wildlife in RCNP and the surrounding area. Second, local community development is clearly linked to conservation because sustainable management of buffer zone forests and revenue-sharing with park directly benefit local communities. Third, residents are actively involved in management activities through UGCs. Finally, and most importantly, a recent census estimates the tiger population in RCNP and the Parsa Wildlife Reserve have rebounded from 45-60 in 1989 to 118 in 1996 (Smith et al. 1987b; Dinerstein et al. 1997).

Conclusion

RCNP's successful cycling between traditional top-down conservation and the bottom-up ICDP approach provides a model for other conservation efforts. Past experience shows that conservation projects based on strict top-down protection have failed, but the ICDP approach, which attempts to take into account the needs of local people affected by conservation efforts, has weaknesses as well. Strategies that incorporate elements of both—strict protection and appropriate laws and policies at the national level com-

bined with development programs closely tied to conservation and specifically tailored to local economic and ecological conditions—can enhance not only tiger conservation efforts, but biodiversity protection in general.

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NEWS FROM ZOOS

AZA Condor SSP assists Andean condor release in Argentina

In 1996, the La Plata and Roque Saenz Pena (Chaco) Zoos donated condor eggs to the Condor In Situ Conservation program at the Buenos Aires Zoo. Under the direction of zoo biologist Luis Jacome and the consultation of AZA Condor Species Survival Plan Coordinator, Michael Wallace of the Los Angeles Zoo, biologists followed the two-month incubation period and hatching process. Condor-shaped puppets were then used to nurture the chicks, thus avoiding direct human contact. After a year, the birds were released into the wild with a visible number tag and transmitter in their wings. Their survival after release will depend on them joining wild flocks where the young condors learn localized food-finding techniques from adults.

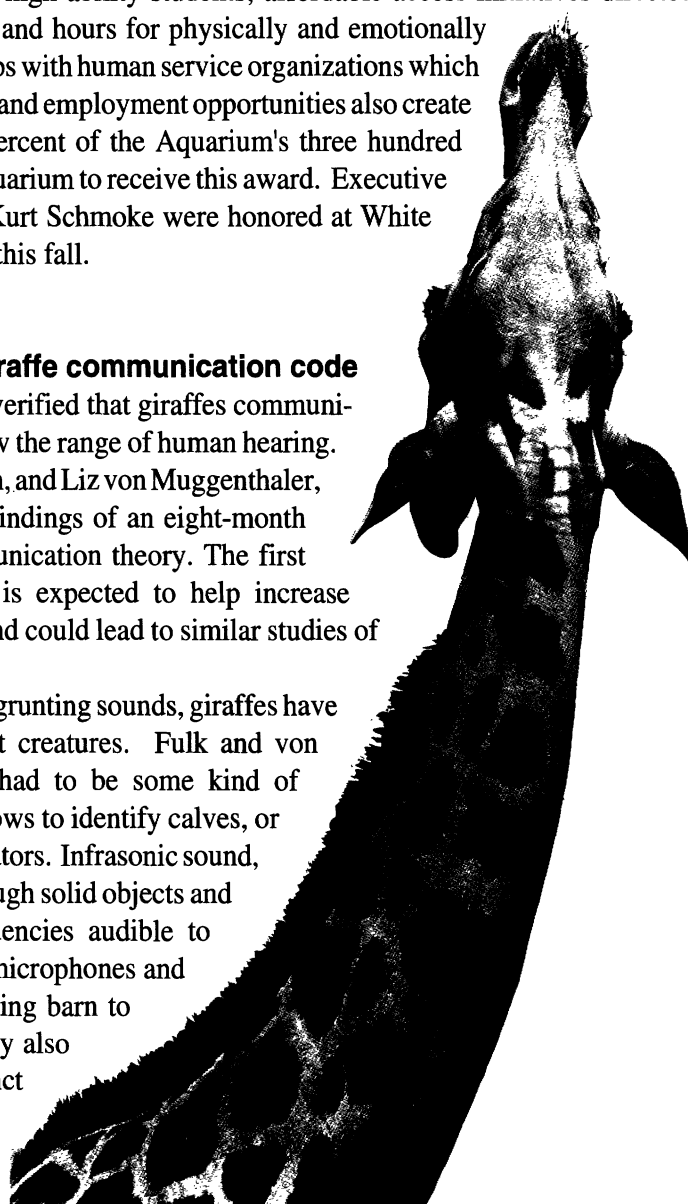
National Aquarium in Baltimore wins prestigious award

The National Award for Museum Service was recently bestowed upon the National Aquarium in Baltimore for its contributions to community service. Presented by the Institute of Museum and Library Sciences, this award recognizes NAIB's innovative programs that reach out to schools, libraries and community centers; career training and mentoring programs for at-risk and high-ability students; affordable access initiatives directed toward low-income local residents; special days and hours for physically and emotionally challenged groups and individuals; and partnerships with human service organizations which focus on youth/job training. Numerous internship and employment opportunities also create a vibrant and diverse work force, where sixty-percent of the Aquarium's three hundred employees are City residents. NAIB is the first aquarium to receive this award. Executive Director David Pittenger and Baltimore Mayor Kurt Schmoke were honored at White House ceremonies by First Lady Hillary Clinton this fall.

North Carolina Zoo researchers break giraffe communication code

Researchers at the North Carolina Zoo have verified that giraffes communicate by using infrasonic sounds—frequencies below the range of human hearing. Dr. Randy Fulk, the N.C. Zoo's Curator of Research, and Liz von Muggenthaler, an independent animal researcher, released the findings of an eight-month study they believe verifies the infrasonic communication theory. The first study of its kind on giraffes, the zoo project is expected to help increase understanding of the social behavior of giraffes and could lead to similar studies of other animals.

With the exception of a couple of rare audible grunting sounds, giraffes have traditionally been thought of as relatively silent creatures. Fulk and von Muggenthaler, however, speculated that there had to be some kind of communication to allow males to find females, cows to identify calves, or for members of the herd to warn each other of predators. Infrasonic sound, or "infrasound," which can travel more easily through solid objects and over far greater distances than the sonic frequencies audible to humans, seemed a plausible answer. They used microphones and video cameras mounted in the zoo's giraffe holding barn to record the animals' sounds and movements. They also made behavioral observations, noting two distinct head movements that seem to be associated with the production of infrasonic sounds. They will continue to collect data and will soon publish a paper on the findings.



Giraffe at the N.C. Zoo. Photograph by Clay Nolen.

Bulletin Board

Web pages of interest

Pronatura Peninsula de Yucatan A.C. is now on the World Wide Web at <http://www.pronatura.org.mx>. Pronatura is an NGO dedicated to preserving the rich diversity of habitats and the species they contain in the Yucatan Peninsula of Mexico.

The Morris Arboretum of the University of Pennsylvania announces a new website of interest to gardeners, botanists, students and land managers at <http://www.upenn.edu/paflora> which provides information on noxious weeds, native plants, and endangered Pennsylvanian species.

Wildlife Law Conference

On March 31, 1998, the Third International Wildlife Law Conference will be held at American University's School of Law in Washington, D.C. The Conference will utilize a three-panel format. The panels for the conference are: 1) the Interface of the World Trade Orga-

nization and International Wildlife Treaty Regimes/ National Wildlife Conservation Legislation; 2) Sustainable Use of Wildlife Conservation Legislation; and 3) Regional Wildlife Treaty Regimes; Problems and Prospects.

Please contact Wil Burns at the GreenLife Society with questions or requests for registration materials at: GreenLife Society-North America, 5208 Claremont Ave., Suite B, Oakland, CA 94618; Tel.: (510) 658-4380; Fax: (510) 658-5946; E-mail: EELINK.umich.edu/~greenlif/iwlc.html.

Protection of world forests

World Wildlife Fund (WWF) and the World Bank have announced a global partnership for forest protection and environmentally sound management. Both organizations will work to establish a network of protected areas covering at least 10% of each of the world's forest types by the year 2000, and also cooperate to ensure that 200 million hectares of

forest are "certified" as well managed by 2005. WWF and the World Bank will share four specific programs as part of this project: 1) identification and establishment of forest protected areas; 2) promote investment in, and purchase of, products from well-managed forests; 3) move priority countries from broad forest conservation commitments to specific agreements based on sound biological information; and 4) develop innovative approaches to forest conservation, such as "transition funds" that will encourage local communities to invest in sound forest management.

So far this year, 20 countries are committed to the target of the establishment of an ecologically representative network of protected areas, so hopefully by the year 2000 at least 10% of each of the world's forest types will be protected.

Announcements for the Bulletin Board are welcomed. Some items from the Bulletin Board have been provided by Jane Villalobos, Smithsonian Institution.

Endangered Species UPDATE

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