

**Sumatran Rhino Conservation**

I would like to commend Alan Rabinowitz for his excellent and insightful article on Sumatran rhino conservation (*Conservation Biology* 9:482-488).

Rabinowitz is correct that the Sumatran Rhino Trust (SRT), a consortium of four North American zoos, has not been successful in its goal of slowing the species' decline through a scientifically managed captive breeding program. Formed in 1988 under the auspices of the American Association of Zoological Parks and Aquariums (AAZPA), the SRT represents the last gasp of what might be termed the "Noah's Ark Paradigm," the concept that our response to species endangerment should always be to establish a captive breeding program. The idea was that captive-bred animals could be reintroduced at some unspecified future date (i.e., once human populations had stabilized or declined and habitats could be restored) (Seal 1986; Foose 1987). However, the professional zoo and aquarium community has learned much since the formation and dissolution of the SRT, and the Noah's Ark Paradigm is currently being reexamined (Hutchins et al. 1995; Hutchins & Conway, in press).

The American Zoo and Aquarium Association (formerly the AAZPA) and its 171 member institutions are making careful decisions about which taxa should receive their attention as well as seeking more immediate ways that living collections can contribute to wildlife and ecosystem conservation (Wiese et al. 1994; Hutchins et al. 1995).

Our new more holistic approach recognizes that captive breeding for reintroduction will continue to play a critical role in the conservation of carefully selected species, particularly those that have become extinct in the wild or those whose popula-

tions have become so small that they cannot persist without human intervention (e.g., the black-footed ferret, red wolf, golden lion tamarin, and Arabian oryx). However, the AZA does not promote captive breeding for reintroduction as a panacea for the endangered species problem, nor does it suggest that this approach will be appropriate or successful in every case. Whatever the conservation options selected, our primary goal must be to preserve wild animals and their habitats in nature.

Our approach also recognizes that living collections can make important contributions to wildlife and ecosystems conservation beyond captive breeding for reintroduction. These contributions include public education, scientific research, development of relevant technologies, professional training and technology transfer, ecotourism and fund-raising to support field conservation efforts (Hutchins et al. 1995; Hutchins & Conway, in press). For example the AZA Rhino Advisory Group is now working closely with the International Rhino Foundation and Indonesian wildlife authorities to support in situ conservation efforts for the Sumatran rhino. Similarly, the Minnesota Zoo is providing long-term support for the Ujung Kulon National Park, the last stronghold of the highly endangered Javan rhino. It is my hope that such trends will come to characterize all progressive zoos and aquariums.

**Michael Hutchins**

American Zoo and Aquarium Association, 7970-D Old Georgetown Road, Bethesda, MD 20814, U.S.A.

**Literature Cited**

Foose, T. 1987. Riders of the last ark: The role of captive breeding in conservation strategies. Pages 141-163 in L. Kaufman and K. Mallory, editors. *The last extinction*. MIT Press, Cambridge, Massachusetts.

Hutchins, M., and W. Conway. In press. Beyond Noah's Ark: The evolving role of modern zoos and aquariums in field conservation. *International Zoo Yearbook*.

Hutchins, M., K. Willis, and R. Wiese. 1995. Strategic collection planning: theory and practice. *Zoo Biology* 14(1):5-25, 67-80.

Seal, U. S. 1986. Goals of propagation programmes for the conservation of endangered species. *International Zoo Yearbook* 24/25:174-179.

Wiese, R., K. Willis, and M. Hutchins. 1994. Is genetic and demographic management conservation? *Zoo Biology* 13:297-299.

The essay "Helping a Species Go Extinct: The Sumatran Rhino in Borneo" (*Conservation Biology* 9:482-488) by Alan Rabinowitz of the Wildlife Conservation Society (WCS) has several serious errors of commission and omission. These problems are summarized in the points below:

- The Asian Rhino Specialist Group (AsRSG) meetings in 1986 and 1987 were convened not "because of lack of cooperation between countries in the region" but rather as part of a participatory process to better delineate the conservation strategies and action plans for Asian rhino range states. This process was part of a larger and systematic program for all IUCN SSC Specialist Groups to produce or update conservation action plans. The 1984 session in Singapore was not a full meeting of the AsRSG but rather an ad hoc workshop to evaluate proposed ex situ programs as part of the overall strategy for this species. The Singapore workshop was convened by the IUCN Species Survival Commission at the recommendation of the Captive (now Conservation) Breeding Specialist Group (CBSG). The workshop formulated and endorsed the "Singapore Proposals" for an integrated in situ-ex situ approach to conservation of this species.

Moreover, there was an explicit, not "loose," definition of "doomed" as any animal that is considered to have no possibility of contributing to the survival of the species in its current situation because: (a) it is not part of a population large enough to be viable in genetic or demographic terms, and/or (b) the animal cannot be protected from habitat destruction or poacher activity with acceptable or available levels of resources" (Khan 1989. Asian rhinos: An action plan for their conservation. World Conservation Union, Gland, Switzerland.)

- The AsRSG Action Plan (Asian Rhinos: an Action Plan for Their Conservation) cited as Khan 1989 did not emphasize ex situ in favor of in situ. In fact, it did just the opposite.
- The AsRSG recognizes, and has published statements, that the ex situ captive propagation program has not succeeded in its primary goal of propagating rhinos. It should also be noted that much of the chronicle and most of the criticisms of the Save the Rhino Trust program presented in the Rabinowitz essay were presented to the WCS in a document prepared by one of us (Foose) in late 1992 for WCS.
- Recognition of problems with the ex situ programs and other conservation activities for this species has resulted in significant changes in the range state and AsRSG efforts including attempts to develop an in situ managed breeding program (being designated a "sanctuary") using the survivors of the unsuccessful ex situ captive breeding program. This initiative implements a concept proposed as a "gene pool" by one of us (Khan) early in the development of the strategies and action plans for this species. Its implementation was deferred while more traditional captive approaches were attempted.
- The AsRSG has also been very ac-

tive in assisting range states in recruitment of international donor support for improved in situ programs. In this regard, the current Global Environment Facility (GEF) Project for Conservation of South East Asian Rhinos facilitated by the AsRSG is to implement previously developed strategies and actions plans, not to establish a new one. Moreover, this GEF Project is exclusively concentrating on development of in situ antipoaching teams and programs, exactly what Dr. Rabinowitz advocates. His statement that "the strategy ignores the fact that the only means likely to save the rhino in the wild involves intensive on-the-ground protection and management activities" represents arrant ignorance of the GEF Project. The characterization of the GEF Project in this essay is simply false.

- Once the significant difficulties associated with the ex situ programs became evident in 1989, the SSC Asian Rhino (AsRSG) and Conservation Breeding (CBSG) Specialist Groups provided proposals to the SRT to reorient their programs toward more in situ and in country activities. These proposals suggested how SRT might use its already committed funds differently to provide in situ support while achieving ex situ objectives. The primary members of the SRT (of which Dr. Rabinowitz's own organization the WCS was one of the founders and from September 1990 the co-leader along with the Zoological Society of San Diego) did not accept these suggestions.
- Although various aspects of the conservation efforts such as the ex situ breeding programs for Sumatran rhino may not have performed as we had hoped, the activities have improved awareness and knowledge of this species. Moreover, there have been

advances with respect to in situ conservation of this species over the last decade. The task of conserving the Sumatran rhino is biologically challenging and politically complex. Contrary to Dr. Rabinowitz's contention, it is the perception of the AsRSG that range state government commitment to rhino conservation in Malaysia and Indonesia has increased and is considerable. Lack of funds have limited what has been and can be accomplished. Much of the previous money expended on the ex situ program was not available for in situ. The AsRSG has been involved with attempts to provide positive advice, construction criticism, and resource recruitment for rhino conservation efforts in the region. We hope that other conservation organizations interested in the plight of the Sumatran rhino will do the same.

**Thomas J. Foose**

IUCN SSC AsRSG and International Rhino Foundation,  
14000 International Road, Cumberland, OH 43732,  
U.S.A.

**Nico Van Strien**

IUCN SSC AsRSG Julianaweg Z, 3941 DM Doorn,  
Netherlands

**Mohd Khan bin Momin Khan**

IUCN SSC AsRSG, No. 10, Jalan Bomoh, Off Jalan Keramat  
Hujung, 56100 Kuala Lumpur, Malaysia

---

The essay "Helping a Species Go Extinct: The Sumatran Rhino in Borneo" by Alan Rabinowitz (*Conservation Biology* 9:482-488) makes a number of allegations in relation to Indonesia that misrepresent the current situation. The following statements are corrections of these and are restricted to Indonesian matters.

- (1) The Sumatran rhino has been a protected species in Indonesia since 1931 (during a period of Dutch administration). This status was reaffirmed in the even tougher laws introduced in 1982

and 1990 which replaced earlier law. Under this law a sentence of up to 10 years can be passed on a rhino poacher.

- (2) At present 13% of the Indonesian land mass is protected. In Sumatra the three areas considered most important for rhino conservation total over 22,000 km<sup>2</sup>. The amount of protected area has not and will not be a limiting factor of viable populations of Sumatran rhino. In addition, the production forest areas, if well managed, may well be suitable habitat.
- (3) The comments and criticisms in relation to the imbalance of ex situ over in situ conservation was addressed in the Indonesian Rhino Conservation Strategy (PHPA. 1993. Jakarta, Indonesia) (not cited). The strategy recognizes the importance of ex situ or in situ intensive management but clearly states the priority is for protection in situ.
- (4) Population and habitat viability assessment (PHVA) is a management tool that enables predictions to be made on the chances of a given population surviving, given certain facts (where facts are lacking assumptions are used). The author fails to note the inextricable link between the research efforts under the "declining population paradigm," which need not lack "scientific rigour," and the PHVA process in providing the facts and assumptions for the population model. The recommendations made remain just that. In the case of the Javan rhino PHVA (1991) it was recommended to establish captive populations and translocate a number of individuals. The recommendations were not accepted by the government of Indonesia because the risks of doing so at this stage are too high given the limitations of the data used to reach the conclusions, as outlined in a letter to the journal of the Wildlife Conservation Society, the authors own organiza-

tion, earlier this year (Soemarna et al., editors. 1994). Sumatran Rhino in Indonesia Population and Habitat Viability Analysis Report. IUCN, SSC Conservation Breeding Specialist Group, Apple Valley, Minnesota.

- (5) The PHVA for the Sumatran rhino in Sumatra carried out in 1993 (not cited) made strong and specific recommendations in relation to increased protection and highlighted the risks to certain populations and the need for the whole population to be managed as a metapopulation. The recommendations were based on facts and observations made from the field personnel of the Ministry of Forestry and from three research projects ongoing at that time. The recommendations and field information collated at the PHVA were used as part of the basis for the Indonesian section of the GEF/UNDP Conservation Strategy for Rhinoceros in South East Asia which is currently being implemented. Another recommendation of the PHVA was the creation of a sanctuary where rhinos can be protected and studied in natural forest enclosures. These Rhinos would be some or all the captive animals from Indonesia with possible additions from the wild of Rhinos the Ministry of Forest consider unprotectable or nonviable in the long term.
- (6) The Indonesia part of the GEF/UNDP funding package is being used primarily for the creation of nine rhino protection units and one rhino mobile unit. Also, there is a community outreach program and some institutional strengthening. This is not a "new" strategy but an implementation of the conservation priorities already established. The project is being executed by the Government of Indonesia which is also providing funds to support the project. No part of this money will be used for ex situ conservation.

(7) Rabinowitz fails to note what "political, cultural, and socio-economic issues in Indonesia" continue to interfere with Sumatran rhino protection, and in the absence of any first-hand knowledge on the subject, he should acknowledge that this is only his opinion.

- (8) The comments made in relation to the shortcomings of the Save the Rhino Trust program are very much after the event. The operations were closed down in Indonesia in 1993. Any complaints the author has relating to the lack of funds being used to improve protection and management should be addressed to his parent organization, the Wildlife Conservation Society (formerly the New York Zoological Society), which sent their final installment of funds to be used for antipoaching units only in 1994.

The Government of Indonesia, as a range state country, recognizes its responsibility to ensure the continued survival of the Sumatran and Javan rhino. It is a signatory of CITES and the Convention on Biodiversity developed during the past UNCED conference in Rio de Janeiro. Rhino conservation in Indonesia includes education, strong laws, law enforcement, and good management to fulfill its responsibilities. With the support of the GEF/UNDP a project is being executed specifically to prevent the poaching of rhino, the threat of which will be ever present while the demand for rhino products remains.

**Effendy A. Sumardja**

Director of Conservation Programme, Directorate General of Forest Protection and Nature Conservation, Ministry of Forestry, Indonesia

---

The gist of the essay by Dr. Alan Rabinowitz (*Conservation Biology* 9:482-488) is a claim that efforts toward the conservation of the Sumatran rhino have been devoted to un-

successful captive breeding at the expense of protecting wild rhino populations in natural forest habitat. Rabinowitz focuses on the situation in Sabah over the past 15 years or so.

Malaysia aims to become a fully-developed nation, in every sense of the word, and the target date for this achievement is the year 2020. There are a number of government policies aimed at achieving this goal, some of which have significant implications on conservation of rare species such as the Sumatran rhino. For example, during the 1970s up to 80s, timber-rich states like Sabah concentrated on selected timber harvesting to supply funds for development. In 1984, Sabah established a permanent forest estate, whereby 48.8% of the state's land area will remain under forest cover. As for in situ rhino conservation, in 1979 the Wildlife Section of the Forestry Department in collaboration with WWF Malaysia conducted a 2.5-year state-wide survey on the status of large mammals and birds. The 1982 report on this survey identified five specific areas that would need to be conserved to secure the survival of Sabah's large mammals. All five areas have, in fact, been included in Sabah's permanent forest estate. These areas include Tabin Wildlife Reserve (established in 1984; formerly parts of the Silabukan and Lumerau Commercial Forest Reserves) and Danum Valley Protection Forest Reserve (designated as a conservation area in 1982 and provided with statutory protection against any logging in 1995; formerly part of the Ulu Segama Commercial Forest Reserve). Amongst the reasons that the latter two areas were proposed in 1982 for conservation was for in situ protection of wild rhino populations. At that time it was believed that these areas were the only two areas in Sabah that might contain potentially viable populations of this species. Subsequent surveys and currently available information indicate this was a correct assessment. It is true

that much of what is now Tabin Wildlife Reserve was logged during the 1970s and 1980s, based on plans and commitments made before the importance of the area for rhinos had been established. It also has become apparent that the Sumatran rhino in Sabah can readily tolerate and breed entirely within logged forest. Although in the early 1980s there existed considerable pressure for up to one third of what is now Tabin Wildlife Reserve to be released for agriculture, the government decided to retain over 1200 km<sup>2</sup> of forest land on the basis of its importance for rhino conservation. At Danum Valley there have been considerable pressures to allow logging. However, because of the importance of the area for conservation of biological diversity, the government has retained about 430 km<sup>2</sup> of old-growth forest, centered on the rhino population within more than 100,000 km<sup>2</sup> of forest managed for timber production. We believe these achievements are remarkable by any standards.

Dr. Rabinowitz's statement, "Political differences between the state of Sabah and the national government," suggests, wrongly, lack of cooperation or differences of opinion. Rhino breeding programs were set up separately in Sabah and Peninsular Malaysia simply for administrative reasons because the Sabah wildlife authority comes under a state government ministry and is state-funded and the Peninsula wildlife authority comes under a federally-funded federal ministry.

In his summary of lack of breeding success Dr. Rabinowitz does not clarify that the Sabah and Peninsular Malaysia rhino populations are regarded by taxonomists as different sub-species nor that all the rhinos except one caught in Sabah were males, whereas almost all those caught in Peninsular Malaysia were females. Since the rhino capture programs commenced, many people involved have felt that the Bornean and Peninsular Malaysian sub-species should not be interbred.

Dr. Rabinowitz refers to "walk-through surveys in Tabin" and "intense surveying" at Danum Valley, but fails to highlight the similarities and differences between the two areas and techniques. In fact, the ground survey methods were very similar: many competent people spend as much time as possible simultaneously seeking and collecting simple data on rhino signs (mainly footprint size, feces, wallows, and feeding signs). The Tabin surveys typically involved six teams of four people each, each covering a few thousand hectares over five days, whereas the Danum survey involved seven teams of six people each, each covering a few thousand hectares over nine days. The difference was due to the availability of funds and competent personnel at the time the surveys were done. The reports on the Tabin surveys indicate the minimum numbers of rhinos present in the areas surveyed, whereas the Danum survey (prepared by Dr. Rabinowitz) extrapolates, assuming that the minimum density of rhinos in the areas surveyed represents the minimum density throughout the Danum area. We are of the opinion that neither of the above, very similar methods yields a reliable estimate of rhino population density. We suspect that the only practical and reliable method is to have an intensive, full-time study led by one specialist over a period of several years, which would include the taking of plaster casts of rhino footprints. This method, used by Dr. Nico van Strien in Sumatra, was not used in Tabin or the Danum Valley perhaps because it demands an extraordinary commitment from a dedicated individual.

Referring to rhino poaching in the Danum valley area, Dr. Rabinowitz states that "there was no attempt by the Wildlife Department to look into the situation". This is not true. The patrols conducted in the area by the Wildlife Department since the 1992 rhino survey, and also by the Fauna Conservation Unit of the Sabah Foundation, were, of course, not publicized.

Dr. Rabinowitz believes defining doomed rhinos as any rhino outside a protected area did little to encourage protection of forests where rhinos survive, and he mentions the capture of two rhinos along the Kinabatangan River. The proposed Kinabatangan Wildlife Sanctuary (approved by the Sabah government in November 1994) is a long, thin sanctuary of riverine and swamp forests designed primarily to protect proboscis monkeys, otters, and waterbirds. Its size and location are inadequate to support a breeding population of rhinos. There is no doubt that, if the two rhinos referred to (which were actually moving back and forth between the proposed Sanctuary and land allocated for oil palm plantation) had been left in situ, they would have either been poached or died without contributing to the survival of the species.

**Mahedi Andau**

Sabah Wildlife Department, Jabatan Hidupan Liar, Tingkat 5, Blok B, Wisma Muis, 88100 Kota Kinabalu, Malaysia.

Numerous issues have been raised in response to my article "Helping a Species Go Extinct: The Sumatran Rhino in Borneo." I wrote the article with a very simple goal in mind. During my very first trip to Borneo in 1987 I became concerned with the fate of the Sumatran rhino. Nearly a decade later, I wrote this article to explore: Why do we still not know the true status of such a remarkable, big, distinctive species whose numbers we have watched decline for nearly a century? Why haven't the countries where these animals still occur, or the international conservation community, accomplished serious on-the-ground protection of the Sumatran rhino in the forest and in trade? Why, as this species now takes on the status of one of the most endangered large land mammals in the world, does the Asian Rhino Specialist Group think that new, larger inputs of money (14 mil-

lion dollars over the next three years) can change the "will" to save the Sumatran rhino and to implement laws that have been on the books for decades?

In the correspondence from Tom Foose et al., Effendy Sumardja, and Mahedi Andau, angst was expressed for my failure to acknowledge all that has been done for the Sumatran rhino. Yet, that is exactly my point. A tremendous amount of money and effort has gone into Sumatran rhino conservation yet has not stopped the decline of the species. We conservationists must ask why; only then can we learn from our past mistakes.

Successful conservation, like good science, involves a process of observation or experimentation, analysis of good results, and careful evaluation of what should come next based on those results. Greater inputs of money will not necessarily remedy past mistakes. Success comes more from good science and the will to act appropriately. So what have we learned in the case of the Sumatran rhino? Several mistakes are obvious.

(1) In most areas of the Sumatran rhino's current range, we have not carried out the necessary surveys to estimate reliably the abundance and distribution of this species.

Mr. Andau suggests that none of the surveys previously carried out in Sabah, including my own, was done in a way that would best estimate rhino densities, that only an intensive full-time study over a period of several years would give any truly reliable estimates. I concur. One might ask why nothing was done if the lack of good survey data was so obvious.

(2) We have been too quick to bring the Sumatran rhino into captivity.

The letters from Foose et al. and Andau defend the concept of "doomed" rhinos as candidates for capture and removal into a captive situation. I agree, in theory. If a rhino resides within a patch of forest that is being cleared for some form of alternate land-use, that rhino should be saved. But most such forests have not been

adequately surveyed nor seriously considered for protection and management. Removal of rhinos is not justified under these circumstances. The dependence on rhino removal as opposed to creating effective in situ reserves reflects a lack of will. The proposed Kinabatangan Wildlife Sanctuary in Sabah, which is mentioned in my article and Mr. Andau's letter, is a case in point. The present reserve is nothing more than a long thin strip of riverine forest, probably not viable as a rhino sanctuary. The much larger reserve, which was originally proposed, was known to contain rhinos, but the conviction to create the reserve was never there.

We must take a closer look at the 35 "doomed" Sumatran rhinos that were previously captured for captive breeding programs. More than one-third of these rhinos died and the remaining individuals were held in 10 separate facilities in four different countries. Mr. Andau states that I ignore the fact that the rhinos of Sabah and Peninsular Malaysia are regarded by taxonomists as two different subspecies and thus had to be kept apart. This perhaps should not matter when a species is near extinction, but even if we ignore this argument, I must point out that results of genetic analyses sent to Mr. Andau, Mr. Foose, and others more than two years ago showed no significant genetic differences between Sumatran rhino populations in West Malaysia, Borneo, and Sumatra (Amato et al., in press *Zoo Biology*).

(3) We have not put enough time, money, and effort into on-the-ground, or in situ, protection of the Sumatran rhino.

Both Foose et al. and Sumardja defend the current \$2 million Global Environment Facility (GEF) Project for Conservation of South East Asian Rhinos. They state that the project concentrates on in situ conservation and intensive on-the-ground protection and management activities for the rhinos. Although I feel that this strategy, despite its expense, is better than what I have

seen before, I am not convinced that it is properly focused or that it will stop the Sumatran rhino's decline.

First of all, the terminology being used for these new rhino conservation efforts no longer includes words such as "wild" or "captive." Dr. Foose and others involved in rhino conservation are apparently redefining "in situ conservation" to include new phrases such as "intensive management centers (IMCs)". In other words, captive breeding facilities placed within particular forest areas are now defined by Foose and others as in situ conservation. Although I am not opposed to this idea under certain circumstances, I feel the way in which it is being presented is a misuse of the term in situ conservation, which should describe the conservation of animals in their natural wild habitat.

Furthermore, according to even my most liberal interpretation of the \$2 million GEF budget for rhino conservation in Indonesia and Malaysia, far less than 50% of the budget is for the salaries and operations costs of the forest guards assigned to protect rhinos in nature and for necessary research. The rest of the budget is for such things as managerial and administrative staff, consultants, travel, vehicles, and office equipment. While it may be said that large sums of money are needed for effective rhino protection, I would argue that money per se is not the issue. The one component that must be present for the survival of the Sumatran rhino is the desire of governments, and the people they represent, that the Sumatran rhino survives. And governmental leadership is possible: consider the effect of former Prime Minister Indira Ghandi, who initiated Project Tiger in India and helped reverse the decline of that species.

Yet, with or without this government support, money would still be better and more effectively spent if most of it went into salaries, hiring, improvements in standards of living, and training the forest guards and workers who are protecting the rhi-

nos in nature. These are the people being asked to care and who put their lives on the line. These are the people who can make a difference, and it will take large numbers of these people to guarantee that the Sumatran rhino survives.

If I have offended any individuals, governments, or nongovernmental organizations involved with the Sumatran rhino issue, it was unintentional. My own organization, the Wildlife Conservation Society (WCS), which was not mentioned by name in my paper, was grouped into that category of "international conservation organizations" that must share responsibility for the current situation. I am concerned that most of the present efforts by the Asian Rhino Specialist Group and the associated funding agencies are still pursuing the unsuccessful series of approaches that have gone on in the past. Perhaps others see it differently. Frankly, there is only one fact that is important right now—the Sumatran rhino is in desperate trouble and, to the best of our knowledge, is still sliding toward extinction. Good intentions and the most articulate of excuses mean nothing in this light. If this species is lost, after having watched its decline for so long, we have only ourselves to blame.

**Alan Rabinowitz**

Wildlife Conservation Society, 185th Street & Southern Boulevard, Bronx, NY 10460, U.S.A.

---

**The Society for Conservation Biology:  
Progress or Stasis?**

After I attended the SCB's ninth annual meeting in Fort Collins, a number of things became clear to me about the society and the direction we are heading. It became particularly evident after the session on "activism versus objectivity" that the prevailing view of the membership is that we must be more active. Although I agree that we must maintain our scientific credibility, I feel we are falling short of our goal as a

"mission-oriented" discipline. It is extremely important that we appear unbiased by our overall goal to preserve species, yet there is a middle ground between "waiting for more data until we can be certain" and "flying by the seat of our pants." The nature of ecosystem and global science is stochastic, and as scientists we must face the reality that we may never be able to make large-scale predictions with any real precision. Therefore, I believe that it is not only our goal as a society but our responsibility as conservation scientists to become more outspoken. This was the prevailing view at the meeting and the unanimous view of the individuals with whom I spoke.

What should we do? I feel, in some circumstances, that we can be clear in our predictions. It is fairly widely accepted that habitat destruction will result in the (at least local) loss of species. Therefore, one clear stance that the society can take is a strong opposition to the loss of habitat. In other circumstances where the data are more unclear, we can still present data in a scientific and professional manner to the public. We need to make more statements like, "based on the best available data at this time, we think 'x' will happen." Conservation biology is a crisis discipline. We must present our scientific knowledge about what we think will happen as a result of various human activities to the public, resource managers, and policy makers. Then these groups will at least be making decisions based on some scientific data, rather than no real data at all. Our message needs to be heard; otherwise, we will only be preaching to the choir at SCB annual meetings and through our publications.

I provide three specific suggestions to accomplish the goal of getting our message out:

- (1) Create an acceptable atmosphere in universities. As Steve Trombulak from Middlebury College said, senior faculty must create an atmosphere where it is ac-

ceptable for junior faculty to spend time promoting conservation issues in ways that are not traditionally accepted in academic institutions. These time expenditures may include joining nonacademic steering committees, testifying in court, writing articles for nonacademic journals, setting up co-operatives in other countries, etc. Senior faculty with tenure have the security with which they can try to influence tenure committees and deans to make these activities an acceptable and valid contribution from junior conservation biology faculty. These types of activities are widely accepted in agricultural colleges, so why not biology departments? As these activities become acceptable, junior faculty can devote the time that they otherwise would not have to get the word out (see Trombulak 1994).

- (2) Increase empirical research. Although the idea of getting more empirical data to test the general conservation theories is not new, it is especially pressing at the present time. The number of good empirical studies presented at this year's meeting was higher than in past years, but was still quite small. To improve our credibility as a discipline we must conduct more empirical tests of our theoretical models. As our model predictions are verified by empirical results, our credibility will increase.
- (3) Our scientific studies need to be seen. I suggest that on an individual basis we need to write versions of our research papers for lay people and release them to our college and local newspapers. The more the public reads about conservation, the more it will be on their minds. Much of the problem with garnering public support is the general lack of awareness. I came to these meetings with little knowledge of what is happening to the Endan-

gered Species Act, for example. I recommend the society form a media committee. At the very least, this committee should release our annual resolutions to all of the large newspapers, magazines, and television stations. This will increase public awareness of the Society's existence and its agreed upon goals and messages. This media committee (presumably made up of people with media experience) will foster media contacts. In turn, when individuals come out with interesting new information, the channels for public release of the information are established.

I hope members of our society will start taking more active, yet scientifically professional, roles as conservation advocates. Many of us will readily criticize our government for fostering a status quo attitude, yet if we are so cautious as to withhold our findings from the public because we need more data, then we too are maintaining the status quo. Not stating our findings and predictions "to the best of our knowledge" is also a conscious decision, and I believe, not in accordance with our mission.

#### Andrew Storfer

Center for Ecology, Evolution, and Behavior, 101 T.H. Morgan Building, University of Kentucky, Lexington, KY 40506-0225, U.S.A., email [astor01@ukcc.uky.edu](mailto:astor01@ukcc.uky.edu)

#### Literature Cited

Trombulak, S. C. 1994. Undergraduate education and the next generation of conservation biologists. *Conservation Biology* 8: 589-591.

#### Homeless Endangered Species

I would like to applaud the journal's emphasis on such a broad topic: "conservation vs. restoration" which is unfortunately spoken in the same breath by many ecologists. I would suggest that Noss and Murphy continue to attack such broad topics of ultimate importance. I was confronted with the ecologically undereducated majority whom unfortu-

nately are timber industry workers (as pointed out by Noss and Murphy) in the Cascades region. These occurrences took place during the pinnacle of the Northern Spotted Owl (*Strix occidentalis caurina*) debates while I was conducting ecological surveys in Washington. This obviously made any type of aggressive educational efforts difficult during this time frame. Any attempts at educating the public in such areas led to tree-spiking and attempts to kill any endangered or threatened species within the area.

The authors made an excellent effort in attacking the issue of conservation of large habitat tracts; however, I'm a bit unclear relative to what was meant by *aggressive* educational efforts. Is it the opinion of the authors that these efforts should lie in academia, or are there other mediums more suitable for such efforts? Finally, how does one mount an aggressive educational effort without causing the kickbacks discussed earlier? Should we mix aggressive activism and academia?

#### Matthew C. Chorley

Department of Biology, University of Wisconsin-Eau Claire, Eau Claire, WI 54702-4004, U.S.A.

I think I can speak for both Dennis Murphy and myself in saying that by *aggressive*, we meant active as opposed to passive. In other words, don't wait for decision-makers, the media, and the public to come to us with questions. Instead, get information on principles of conservation biology—as they relate to policy and management—out to everyone in language that can be understood. This aggressive education might include white papers, editorials, and the like.

#### Reed F. Noss

#### But Is It Science?

While visiting my academic colleagues at various college and univer-

sity campuses, where conservation biology courses and degree programs are sprouting up like mushrooms, I am often asked "But is conservation biology *science*?" Five years ago, I heard this question from ecologists. Today, I hear it from my colleagues in the field of animal behavior. The question seems to prey upon the minds of whichever group of scientists are considering, usually for the first time, the possibility of expanding their research into conservation biology, an area they fear may be beyond the safe limits of undeniably "pure" science.

Science, like the proverbial elephant, is no doubt an entity that is perceived somewhat differently by various individuals who are familiar with only one small part of it. Certainly, in my experience, conservation biology closely resembles science. When carrying out research in conservation biology I use the same problem-solving skills I learned in graduate school (when, I am *quite* certain, I was doing science). That is, I formulate questions, review relevant literature, refine my questions, decide on appropriate data collection and analysis procedures, produce answers that lead to new questions, and have the sense I am contributing to a growing body of knowledge. So I am willing to accept, as a working hypothesis, the proposition that conservation biology is a science.

But perhaps conservation biology, or some parts of it, are not science. Should we care? It is understandable if young scientists whose academic careers are still more or less at the mercy of tenure committees are concerned with the question of whether conservation biology is science. However, I believe that those of us who have achieved more secure positions should care not a whit. Science is, after all, an edifice created by scientists, and its frontiers are continually expanding as more and more of the questions humans ask become susceptible to its methods. Conservation biology will become what we collectively make it. If enough of us do it, and do

it well, conservation biology, at least those parts of it created by individuals trained as scientists, will certainly become a science if it is not one already.

Meanwhile, hesitating to use our scientific expertise and skills to help prevent the loss of biological diversity because we are unsure whether or not conservation biology is science strikes me as akin to fiddling while Rome burns. We should remember that scientists tend to be conservative creatures and that the temporal sequence of our colleagues' responses to any development of more than moderate novelty will proceed as follows: "It can't be true." "Well, it may be true in some situations." "Of course, we've known for a long time that it is true." With respect to conservation biology these responses can be rephrased as "Conservation biology is not science." "Well, some parts of conservation biology may be science." and "Of course conservation biology is science."

The most recent expression of concern over the status of conservation biology in this journal (McCoy 1995, *Conservation Biology* 9:473-474) was not whether conservation biology was perceived as science but whether it was perceived as poor science. Perhaps we are making progress! Meanwhile, overconcern for the question of whether or not our colleagues in other disciplines consider conservation biology science or good science is more likely to keep us on the trailing rather than the cutting edge of science.

#### Katherine Ralls

National Zoological Park, Smithsonian Institution, Washington, DC 90008, U.S.A.

#### Hyman and Wernstedt's Analytical Framework

Hyman and Wernstedt's article "A Value-Informed Framework for Interdisciplinary Analysis" (1995) demonstrates that the policy sciences rival the field of economics for the title of most dismal "science." The

authors plot stereotyped human attitudes about one fragment of the Snake River endangered salmon recovery controversy as poles on "value axes" (preferably "orthogonal," whatever that means with respect to human values), and call the results an analytical framework. They use Latinate, engineering-based, pseudoscientific terminology to mask the circularity of their reasoning. The authors failed to establish the analytical utility of their framework. Indeed, the article is so loaded with qualifications, disclaimers, caveats, and fudge words that the most reasonable conclusion the authors could have drawn is that they successfully falsified the hypothesis that their framework has utility.

Decision analysis frameworks do have applications in conservation biology (e.g., Maguire & Servheen 1992). They can help people to organize and structure information from diverse sources and to set objectives, develop decision criteria, and document the decision process (U.S. Congress 1993). These frameworks are generally useful only when the participants in the process mutually agree to use them. Hyman and Wernstedt's ponderous, untested framework looks like little more than an attempt to manufacture their own expertise.

#### Peter Jenkins

Center for Wildlife Law, Institute of Public Law, The University of New Mexico, School of Law, 1117 Stanford NE, Albuquerque, NM 87131-1446, U.S.A.

#### Literature Cited

- Hyman, J. B., and K. Wernstedt. 1995. A value-informed framework for interdisciplinary analysis: application to recovery planning for Snake River salmon. *Conservation Biology* 9:625-635.
- Maguire, L. A., and C. Servheen. 1992. Integrating biological and sociological concerns in endangered species management: augmentation of grizzly bear populations. *Conservation Biology* 6:426-432.
- U.S. Congress, Office of Technology Assessment. 1993. Harmful non-indigenous species in the United States. U.S. Government Printing Office, Washington, DC.