ISSN 0974-0953

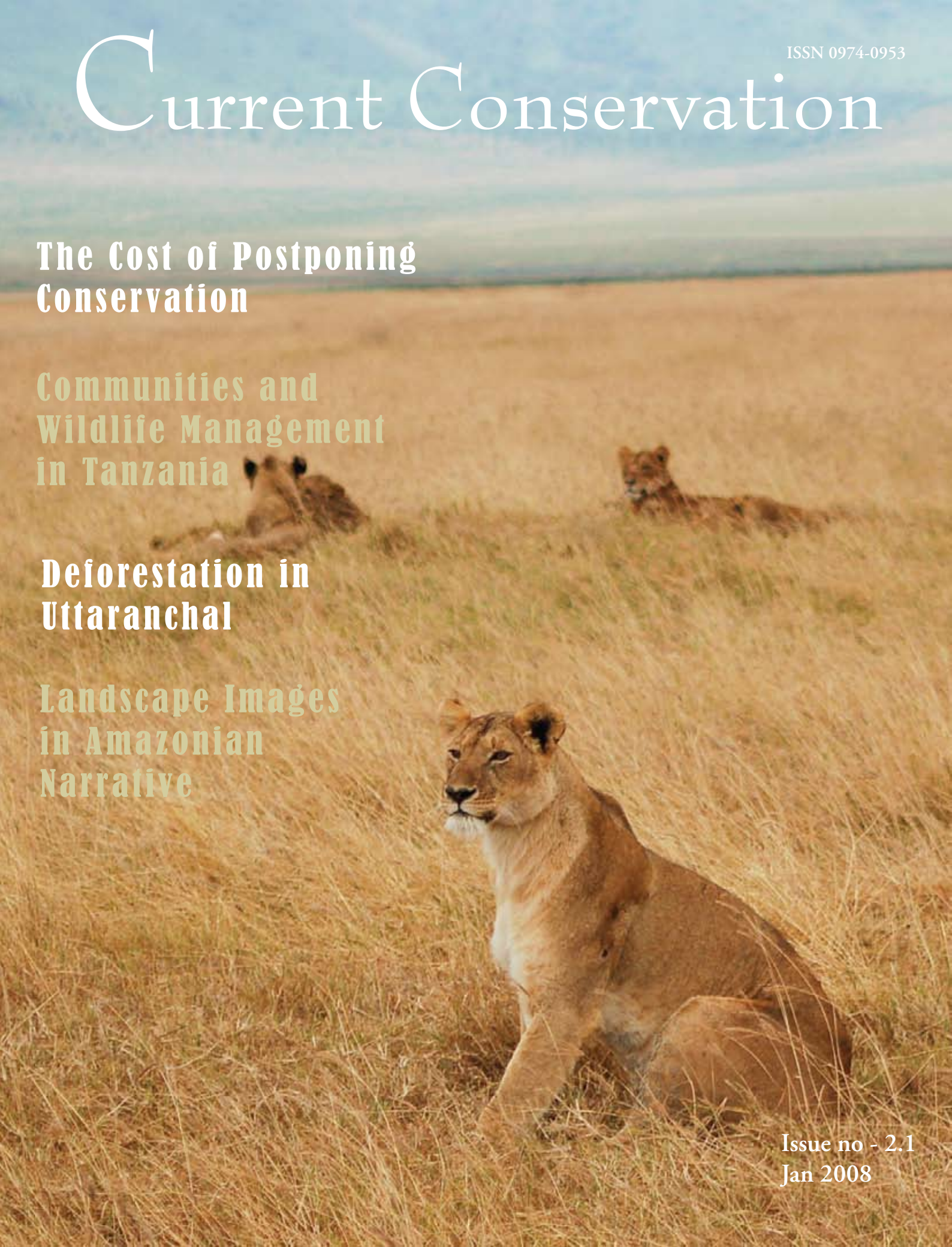
Current Conservation

The Cost of Postponing Conservation

Communities and Wildlife Management in Tanzania

Deforestation in Uttaranchal

Landscape Images in Amazonian Narrative



Issue no - 2.1
Jan 2008

CURRENT CONSERVATION ONLINE IS AVAILABLE AT www.currentconservation.org

Cover Photo - Wendy Sterling

ISSN 0974-0953

Current Conservation

Issue no - 2.1
Jan 2008

Linking Forests, Trees, and People: From the Air, on the Ground, and in the Lab

Elinor Ostrom and Harini Nagendra

Governing natural resources sustainably is a continuing struggle. Major debates occur over what types of policy 'interventions' best protect forests, with the types of property and land tenure systems being central issues. Evaluating the impacts of different tenure regimes in a systematic manner is not an easy task. Ecological systems rarely exist isolated from human use. The challenge of good scientific observation of linked social-ecological systems is made even more difficult because relevant variables operate at different scales and their impacts differ radically. We provide an overview of findings from a long-term interdisciplinary, multiscale, international research program that studies factors affecting forest cover. We describe insights obtained from a series of explorations from the air (landscape scale), on the ground (forest-patch scale), and in the lab (individual decision-maker scale).

From the Air: Observations Over Time

Remotely sensed images generate important information about the landscape dimensions of forest processes, and allow us to go back in time. Based on a rigorous set of methods developed over the past decade at the Center for the Study of Institutions, Population, and Environmental Change (CIPEC, www.cipec.org), we have studied forests managed under a variety of tenure arrangements across the world. Here, we follow forest change in three landscapes, two located in the Indian states of Maharashtra and West Bengal and the third in Chitwan District of Nepal. By overlaying boundaries of different management regimes on these images, we are able to interpret the impacts of management regime on forest change. Through in-depth interviews conducted with local inhabitants, we can understand the major social factors associated with overharvesting in these forested landscapes.

From these and other CIPEC studies, the official designation of a forest as government, community, or co-managed does not appear to impact forest conservation as much as the legitimacy of ownership and degree of monitoring that takes place on the ground. In the Nepal buffer-zone and community forests, where user groups are provided with secure tenure rights to their forest resources and ownership is perceived as legitimate and fair, communities themselves engage in monitoring efforts to successfully manage their forests. In the Mahananda Wildlife Sanctuary of West Bengal, we see that traditional, strict public protection of parks can work to protect forests but has a high fiscal cost as well as a high cost in terms of increased conflicts with local communities. Such strict protection approaches are not feasible in all government protected areas, as seen in the Tadoba Andhari Tiger Reserve in Maharashtra, indicating the difficulties in sustaining such efforts over the long term.

From the Ground: Cross-Sectional Data

In order to examine the performance of diverse institutional arrangements using "on-the-ground" measures, we rely on data gathered by the International Forestry Resources and Institutions (IFRI) research program initiated in 1992, with research locations in over 13 countries across the world (see www.indiana.edu/~ifri). This program uses 10 research protocols for obtaining reliable information about users, forest governance, and the ecological conditions of sampled forests.

A long-term goal of the IFRI research program is to use the forest mensuration data collected at each site to compare measures over time for the same forest (thus, holding the ecological zone constant over time). We now have long-term data from 42 forests: five in India, three in Kenya, 10 in Nepal, 18 in Uganda, and six in the USA. Number of stems, diameter at breast height (DBH), and basal area were obtained for all trees within randomly sampled 10 m circular plots. We find that the type of ownership of these 42 forests does not have a statistically significant relationship with any of these three dependent variables. However, the involvement of at least one user group in regular monitoring of compliance with the rules related to entry and use patterns is significantly associated with maintenance of or improvement in forest condition.

From the Lab

The repeated findings from the field, of high levels of cooperation in activities such as monitoring, challenge core economic theories of human behavior. This is because the benefits of well-enforced rules regarding entry and harvesting from a resource are shared by all members of a group while the costs are borne by the individual. We have conducted a series of laboratory experiments of behavior in common-pool resource (CPR) situations. The subjects were undergraduate students at Indiana University who voluntarily agreed to participate.

We find that providing opportunities for face-to-face communication between subjects greatly increased cooperation, and allowed them to substantially increase the maximum attainable returns from their investments. Next, we examined the impact of a diverse set of sanctioning experiments. When the sanctioning rules were imposed by the experimenters, subjects received lower returns than in contexts where they were given the opportunity to choose whether they would implement their own sanctioning institution.

Discussion

The temptations to overharvest from natural resources are always large. We conclude that a simple formula focusing on formal ownership, particularly one based solely on public ownership of forest lands, will not solve the problems of resource overuse. If the formal rules limiting access and harvest levels are not known to or considered legitimate by local resource users, substantial investment in fences and official guards to patrol boundaries are needed to prevent 'illegal' harvesting. Without these expensive inputs, government-owned, 'protected' forests may not be protected in practice. When users are genuinely engaged in decisions about rules affecting their use, the likelihood of users following the rules and monitoring others is much greater than when an authority simply imposes rules on users. These results help to open up a new frontier of research on the most effective institutional and tenure arrangements for protecting forests. This moves the debate beyond the internal and external boundaries of protected areas into much larger landscapes where protection also occurs, and helps us understand when and why protection, recovery, and clearing occur in specific regions within these larger landscapes. Further, focusing on a single research method used by one academic discipline for understanding complex, multiscale processes does not provide a cumulative understanding of how individuals in dynamic, complex social-ecological settings react to institutional rules and affect ecological systems. Multidisciplinary research in diverse international settings is essential for developing an integrated perspective to achieving sustainability.

Originally published as:

Ostrom, E. and H. Nagendra. 2007. Insights on linking forests, trees, and people from the air, on the ground, and in the laboratory. *PNAS* 103(51): 19224–19231.

Elinor Ostrom is the Arthur F. Bentley Professor of Political Science at Indiana University, Bloomington. She is also Co-Director, Workshop in Political Theory and Policy Analysis at Indiana University and Founding Director of the Center for the Study of Institutional Diversity, Arizona State University, Tempe (ostrom@indiana.edu).

Harini Nagendra is the Asia Research Coordinator of the Center for the Study of Institutions, Population and Environmental Change (CIPEC), Indiana University and a Adjunct Fellow at the Ashoka Trust for Research in Ecology and the Environment (ATREE), Bangalore. She is also a Branco Weiss Fellow of the Swiss Federal Institute of Technology (ETH), Zurich (nagendra@indiana.edu).

Photo: Sajid Pareeth

Mounds of bicycles confiscated from people caught illegally removing large logs from Mahananda Wildlife Sanctuary and the adjacent Baikunthapur Forest Reserve in West Bengal. Note the circular modifications in the cycle frames made to enable people to secure and easily move large, heavy logs of teak wood.

The Cost of Postponing Conservation Planning and Implementation

Sahotra Sarkar

Even when social institutions agree on conservation goals, for instance, the protection of endemic, rare, or at-risk species in regional conservation area networks, there is typically a long waiting period between setting goals and the formulation of an explicit action plan to achieve those goals, and an even longer period before the plan is funded and implemented on the ground. Meanwhile habitats continue to be transformed through human habitation, resource extraction, agricultural and industrial development, etc. There is plenty of evidence showing that such habitat transformation disproportionately affects regions of high species richness and endemism, particularly in the tropics. This raises the possibility that ongoing habitat transformation also disproportionately affects areas with high "complementarity" value, that is, those areas that have unique biological features not represented in other potential conservation areas. Areas with high complementarity value have the highest priority for conservation management if the goal is to conserve biodiversity in as little total area as possible, that is, the goal is to minimize the economic and social cost of a conservation plan.

Until recently, the hypothesis that ongoing anthropogenic habitat transformation disproportionately affects high priority areas for conservation, though widely regarded as plausible, had not been seriously tested against data. However, during the last two years, methods of systematic conservation planning have been used to subject this hypothesis to a stringent test in México, a megadiverse country with severe levels of deforestation, especially of tropical humid forests. This work was a collaboration between the Laboratorio de Sistemas de Información Geográfica at the Universidad Autónoma de México and the Biodiversity and Biocultural Conservation Laboratory at the University of Texas at Austin.

Because México has an elevated degree of endemism, especially among mammals, the biodiversity surrogates that were tracked in the study were all 86 non-volant endemic mammal species of México. These must be adequately protected in any reasonable conservation plan for the country. The geographical distributions of these species were modeled using a genetic algorithm on the basis of extensive field records and the predictions were verified for a representative subset of the regions. These "niche" models produce the "fundamental niche" or hypothetical distribution of a species purely on the basis of climatic, topographic, soil, and other similar ecological factors. The predicted range or "realized niche" of the species must then be identified using other exigencies such as historically contingent patterns of presence, barriers to dispersal, etc. In this study, for each of four time slices (1970, 1976, 1993, and 2000), the predicted range of the species was restricted to regions of the potential distribution which maintained either primary or secondary vegetation cover. This choice was dictated by previous work that indicated that most species only managed to maintain self-sustaining viable population within such forests. As elsewhere in the tropics, between 1970 and 2000, large areas of México were progressively deforested, with the rate of deforestation increasing rapidly after 1980. Concomitantly, the habitat of almost all of the modeled species progressively shrank during this period.

Next, area prioritization algorithms were used to find optimal sets of nominal conservation areas which would represent all these species in as little area as possible. The particular algorithm used was an optimal branch-and-bound algorithm implemented in the CPLEX software package. Heuristic algorithms, such as the rarity-complementarity algorithm implemented in the ResNet software package, gave similar results but an optimal algorithm was preferred to ensure that no potential inaccuracy, however slight, was introduced through the use of heuristics.

For different runs of the algorithm, the targeted representation for each species was set at 10 %, 12 %, 15 % and 20 % of its original (pre-1970) habitat. In these optimal solutions it was uniformly found that, as time went on and deforestation took its toll, progressively more area was needed to protect the same fraction of the original habitat of the species (see Figure 1). In other words, assuming that the area of land that must be protected is positively correlated with the social and economic cost of a conservation plan, these results indicate that achieving the same level of conservation has progressively become significantly more expensive in México. In particular, the cost rises sharply in the 1980s and 1990s, after only rising slightly in the 1970s. Presumably, this behavior reflects the increased rate of deforestation in the later decades. Such is the cost of postponing conservation action. While these results are limited to non-volant mammals, analyzing the performance of other taxa is unlikely to change their basic import because patterns of endemism and complementarity in México are similar for the other taxa for which data can be obtained.

As yet, similar analyses have not been performed for any other region of the world. However, because México encompasses a wide diversity of habitats, especially in its tropics, these results are likely to be replicated in other tropical regions with similar deforestation pressures and other land use—land cover (LULC) change patterns. It is almost certainly generally true that optimal cost-effective conservation action requires immediate formulation of explicit plans to achieve goals, followed by timely implementation of those plans. The cost of achieving conservation goals progressively increases with the time lag between setting goals and formulating and implementing explicit plans to achieve them. The salience of this problem is underscored by the fact that all signatories of the 1992 Rio Convention on Biodiversity have in principle committed themselves to the goal of protecting representative samples of their biota in conservation area networks. Yet very few have translated those goals into explicit conservation plans during the last fifteen years and even fewer have begun implementing such plans.

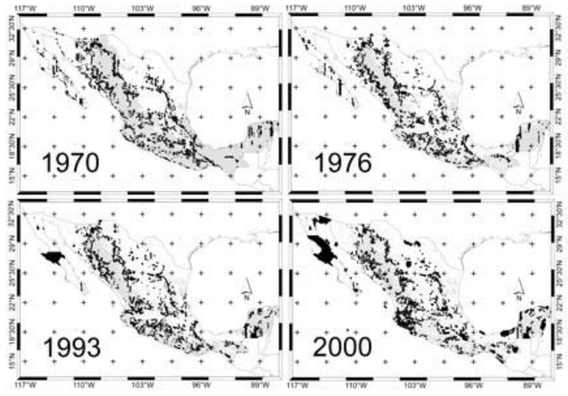
These considerations strongly suggest that serious analyses of the impediments to conservation action should be part of the process of identifying conservation goals for every region right from the very beginning. Typically, these impediments arise from: (i) the various (forgone) costs associated with excluding an area from potential LULC change (through development, intrusive agriculture, resource extraction, etc.); and (ii) the traditional presence of communities within nominal conservation areas. Negotiating these impediments requires that economic and community stakeholders should be meaningfully included in the process of identifying conservation goals even before the stage at which explicit plans are formulated to achieve those goals (let alone the implementation stage of those plans). Unfortunately, this is a lesson that conservation biologists are yet to learn sufficiently well.

This article summarizes the results of:

Fuller, T., V. Sánchez-Cordero, P. Illoldi-Rangel, M. Linaje, and S. Sarkar, 2007. "The Cost of Postponing Biodiversity Conservation in Mexico." *Biological Conservation* 134: 593 - 600.

Sánchez-Cordero, V., P. Illoldi-Rangel, M. Linaje, T. Fuller, and S. Sarkar, 2008. "Por qué hay un costo en posponer la conservación de la diversidad biologica en México." *Biodiversitas* 76: 7 - 12.

Sahotra Sarkar is a Professor at the Section of Integrative Biology, Department of Philosophy, University of Texas at Austin, USA (sarkar@mail.utexas.edu).



Increasing Diseconomy of Nominal Conservation Area Networks in Mexico

This figure shows the increased area needed (regions in black) to achieve the adequate representation of 86 non-volant endemic mammal species in protected areas. The target of representation for this set of maps was 10 % of the predicted original (pre-1970) habitat of each species which falls within areas that retain primary or secondary vegetation (shown in grey). The amount of land required was less than 0.45 % or the total area of Mexico in 1970, 0.6 % in 1976, but 4.69 % in 1993, and 71.25 % in 2000. That the grey region decreases over time shows the toll of continued deforestation.

Female Biased Sex Ratios in Loggerhead Turtle Hatchlings in a Mediterranean Rookery

Judith A. Zbinden, Christina Davy, Dimitris Margaritoulis and Raphaël Arlettaz

Whether a sea turtle embryo in its beach-sand nest develops into a female or male depends mainly on incubation temperature rather than genetic makeup. More females are produced at warmer and more males at colder temperatures. Naturally, air and therefore sand temperature fluctuates over time and so the hatchling sex ratio naturally fluctuates between years. But direct and indirect human action may consistently change hatchling sex ratios into one direction. For example, clutches are sometimes transferred to a hatchery as a conservation tool, but sand temperatures at the hatchery location may be different from temperature at the site chosen by the mother turtle.

Different protection of cold (producing more male hatchlings) and warm (producing more female hatchlings) parts of nesting beaches can also lead to systematic changes of hatchling sex ratio. Finally, human induced climate change may feminize hatchling sea ratios. Monitoring the proportion of male and female hatchlings over time and space and understanding the inherent variation may therefore be essential for effective conservation of sea turtle populations. Knowledge on hatchling sex ratios provides the baseline to detect changes and if appropriate install corrective measures. This study investigated hatchling sex ratio at the largest known rookery of the loggerhead sea turtle (*Caretta caretta*) in the Mediterranean (on the Greek island of Zayknthos, see figure). Our first aim was to estimate the current loggerhead hatchling sex ratio of Zakynthos. Secondly, we aimed at investigating spatial variation among the six individual beaches making up this rookery (see figure). Since the sex of hatchling sea turtles cannot be assessed from external morphology, we used information on incubation duration.

Incubation duration is a valid proxy to estimate hatchling sex ratio because it is strongly determined by incubation temperature which in terms determines whether a sea turtle embryo develops into male or female. We collected information on clutch incubation duration from a representative sample of clutches of each of the six beaches during two seasons. The conversion from this data to hatchling sex ratio was based on the results of a published study relating hatchling sex to incubation duration by scarifying artificially incubated eggs. The estimated hatchling sex ratio on Zakynthos was female-biased in both years (68 and 75% females estimated). This deviation from a balanced hatchling sex ratio is not surprising given that a female-skewed hatchling sex ratio was found in most sea turtle populations so far studied.

We found significant differences in clutch incubation durations among the six nesting beaches of Zakynthos. These differences are estimated to result in significant differences in hatchling sex ratio. Two beaches apparently produce a high proportion of males (less than 30% female hatchlings even under conservative scenarios) with the other 4 beaches producing a female-biased hatchling sex ratio (above 65% females even under conservative scenarios). The differences among beaches in the proportion of male and female hatchlings produced are important for conservation because so far the individual beaches have not been equally well protected. Namely, the beach with the highest protection afforded seems to produce mainly female hatchlings and the beaches that apparently produce a high proportion of male hatchlings suffer particularly badly from tourism development (the main threat to nesting habitat in the Mediterranean). Our results provide additional arguments to afford these colder beaches better protection so as to minimise systematic changes in hatchling sex ratio.

This work was funded primarily by the MAVA Foundation for the Protection of Nature.

Originally published as:

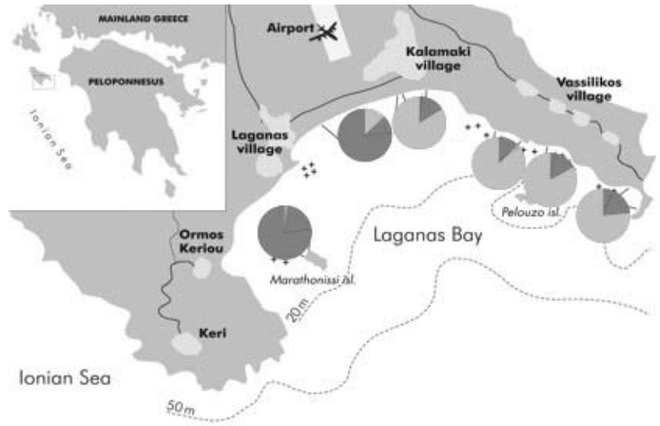
Zbinden, J.A., C. Davy, D. Margaritoulis, and R. Arlettaz. 2007. Large spatial variation and female bias in the estimated sex ratio of loggerhead sea turtle hatchlings of a Mediterranean rookery. *Endangered Species Research* 3: 305–312.

Judith A. Zbinden Centre for Ecology and Evolution, University of Exeter Cornwall Campus, UK.

Christina Davy is at the Department of Natural History, Royal Ontario Museum, Toronto, Canada.

Dimitris Margaritoulis is with the The Sea Turtle Protection Society of Greece.

Raphaël Arlettaz is at the Zoological Institute, Division of Conservation Biology, Bern, Switzerland.



Hatchling sex ratios (dark: males; light: females) of the six individual nesting beaches of Zakynthos. Proportions shown are estimates from incubation duration data of the 2002 season, results for 2003 are indicated by dashed lines.

Photo: Judith A. Zbinden

One of the nesting beaches of Zakynthos exemplifying a typical Mediterranean sea turtle nesting habitat

Deforestation in Uttaranchal in the Nineteenth and Twentieth Centuries

Dhirendra Dangwal

Photo: Dhirendra Dangwal

The British began extending their control over forests in India (including Uttaranchal, or Uttarakhand) after passing the Forest Acts of 1865 and 1878. This was driven by the increasing demand for timber, and hence the growing significance of forests as a source of revenue. Forests also acquired strategic importance with the growing requirement for timber for the expanding railway network. During the period of colonial rule tree-felling in Uttaranchal can be distinguished into three phases. In the first phase (1815-1865) the demand for wood was low and there was only limited interest in managing forests. The demand for timber began to grow toward the end of this period, and it gained momentum in what can be seen as the second phase (1865-1913). During this phase the government built roads and improved waterways to ensure rapid transport of wood. As a result, between the 1860s and the early 1910s timber production, on average, increased from 0.72 to 4.5 million cubic feet per annum. In the third phase (1913-1947), timber out-turn fluctuated and was quite low between 1925 and 1935. However, the felling of trees peaked during World War II.

Several factors contributed to the increased extraction of wood from forests. Some scholars attribute increased extraction to the growing local population. However, they overlook the fact that the amount of timber exported out of the region far exceeded local consumption. Villagers definitely collected large quantities of fuelwood from forests, but this was mostly in the form of dry fallen wood. Other demands for wood came from urban centres; the forests of Uttaranchal constituted the main source of timber and firewood for the inhabitants of the Gangetic plains. Moreover, in the twentieth century, the establishment of industries increased the demand for raw material and fuel from these forests.

Nevertheless, it is largely unknown that the demand for timber and fuel by the railways during the colonial period put tremendous pressure on these forests. According to one estimate, the railways consumed approximately one-third of the timber out-turn of the country in the early twentieth century. Wooden sleepers were used to lay tracks. Initially, only sal, deodar, and teak were used; later, creosoted chir sleepers were also found to be sufficiently durable for use as sleepers. As the railway network expanded (from 1,349 km in 1860 to 65, 217 km in 1946-7) the demand for wooden sleepers increased many fold. Moreover, as it was expensive to transport coal over great distances, wood was also used as fuel for trains in many places.

Till recently, only the conversion of forest land to other uses has been regarded as deforestation. Such an approach does not take into account the declining quality of forests. However, in reality forests were overexploited, since wood extraction was unsustainable. This would have led to forest degradation, if not denudation, though the degradation would not have been apparent till much later. I suggest that recognizing the degradation of forests due to timber extraction links deforestation to the production of wood, and not just to land conversion. This historical dimension to deforestation has not been adequately analysed by scholars.

Originally published as:

Dangwal, D.D. 2005. Commercialisation of Forests, Timber Extraction and Deforestation in Uttaranchal, 1815-1947. *Conservation and Society* 3(1):110-133.

Dhirendra Dangwal is at the Department of History, Himachal Pradesh University, Shimla, India (dhirendra_dangwal@yahoo.com).

Revisiting India's Biodiversity Planning Process

Nikhil Anand

After much active negotiation with countries of the North and South, India signed the Convention for Biological Diversity in 1992. The Convention required every member country to formulate its own National Biodiversity Strategy, and Action Plan. In 1999, the Indian Ministry of Environment and Forests (MoEF) nominated Kalpavriksh, an NGO long engaged with conservation and environment issues, to coordinate the process. I review the ways in which NGOs, state agencies and activists participated in the preparation of India's National Biodiversity Strategy and Action Plan (NBSAP) between 1999 and 2004 .

Biodiversity is a concept particularly conducive to collaboration—it is an idea that holds interest for both scientists and the wider public. Taking the need for a widely consultative process seriously, Kalpavriksh made special efforts to encourage and solicit participation from a range of actors. They sent out a call for participation in eighteen languages, through both the radio and print media, and nominated over seventy groups to produce as many plans at the state, ecoregional, thematic and substate levels. They also invited experts to present sub-thematic reviews, and constituted a core group that sought participation from a wide range of sectors including different central and state ministries, citizens, and corporate entities. In the words of the MoEF, the NBSAP was 'India's biggest environment and development planning process.'

The Power of Structure

From its very inception the core group was mandated to produce a series of planning documents on biodiversity, for which they sought extensive participation. In preparing and formatting this document, power was exercised and consolidated at different levels. Its framing as a *planning* process for *biodiversity* determined who would take part and what could be said. The process inherited the contentious history of conservation, and could mobilize only those who saw biodiversity as threatened, and planning as one of the necessary solutions. One person familiar with the NBSAP resented how 'the very format in which management plans were required – identifying gaps, setting timeframes and monies required' actually confined participants to a limiting structure. This format did not provide space for discussing the kinds of dynamic processes and activities that others favored (NBSAP interview, July 2003).

The format of planning itself required a certain set of strategies to be identified, fixed, and written down. Here, state agencies exerted significant pressure. Because their participation was necessary and unavoidable, government agencies exercised a disproportionate amount of influence in determining the final form of the planning document. Much to the chagrin of several participants, officials in state agencies refused to compromise on certain issues, and forced discreet changes in the plan's language to suit the their offices.

Contradictory Participations

Yet officials in state agencies could not control the NBSAP process entirely. Not all NGOs and activists who participated were equally bound by the demands of state control. The different frameworks, innovativeness, and creativity of these groups introduced a degree of agency and institutional diversity that is not generally seen in planning exercises. With the space opened up for participation, various researchers, and community and NGO activists joined the planning process to make sophisticated critiques of various

threats to biodiversity.

While several of the threats and their attendant interventions seemed familiar to conservation practitioners (e.g., park fences for reducing threats from grazing livestock), the plan also identified 'root causes' that generally do not get included in plan documents. As a result, the final NBSAP draft, compiled from the different state and regional plans, also contained criticisms of the state itself, including a critique of its chemically driven agricultural development paradigm, and its command-and-control forest policy.

For several participants, engagement in the NBSAP process was contingent and strategic. It was inclusion in the NBSAP process that gave certain groups legitimacy to speak, act and collaborate. As activists, researchers, and state officials developed professional relationships, they frequently took the work of conservation beyond the constraints and demands of this planning effort. Understanding the ultimate implementation of the plan as unlikely, they sought to make it as open and inclusive of their agendas as possible. Activists saw their participation as a temporally limited space within which they could maneuver, and as an opportunity to establish a degree of plurality and creativity within a project of government. By working restively and conditionally with a government planning process, some participants sought to engage *tactically* to reach particularly defined ends different from those that the state desired.

That this was a precarious and temporary opportunity was soon made very clear by the Ministry of Environment and Forests. First by stalling its completion, then by delaying its confirmation, the Ministry resisted the final draft presented by the Technical and Policy Core Group (TPCG). Then, on 5 October, 2005, it summarily rejected the plan, citing *technical inaccuracies* as the reason. In doing so, the Ministry went from celebrating the initiative as an example of good governance to calling the document 'unscientific.' They proposed to start the entire NBSAP process over again with a different NGO, perhaps with a more diluted version of participation. Kalpavriksh, meanwhile, has made both the process documentation, and the final technical report available to the public.

Originally published as :

Anand, N. 2006. Planning Networks: Processing India's NationalBiodiversity Strategy and Action Plan. *Conservation and Society* 4(3):471-481.

Nikhil Anand is at the Department of Anthropology, Stanford University, USA. (nikhil.anand@stanford.edu).

Dilemmas in British Conservationism in Zimbabwe, 1890-1930

Vimbai Chaumba Kwashirai

During the first 40 years of British colonial rule in Zimbabwe, from 1890 to 1930, European farmers and miners established commercial farms and mines (in prime natural regions 'i' and 'ii'; Figure 1). The Mazoe District of northeastern Zimbabwe embodied the two major pillars of the settler cash economy – mining and commercial agriculture. Its capital city was Bindura, which, together with Trojan and Concession, were booming centres of gold and nickel exploitation, facilitated by good road and rail networks to Harare (Salisbury). The colonial state sought to orient settler farmers towards the production of export crops, tobacco, maize and cotton. It encouraged the production of minerals, and cash and food crops, envisaging that a diversified economy would provide 'greater self-sufficiency' for the colony. It also envisaged benefiting the ruling British South Africa Company (1890-1923) by cutting the food import bill and raising the value of land, as well as by building and sustaining a stable European community.

White miners and farmers depended on state support in expropriating natural resources at the expense of the indigenous population, which was largely composed of the Shona and Ndebele.

The extractive economic activities of colonialists directly caused a fundamental transformation in soil and forest use. This led to widespread deforestation and soil erosion, resulting from unregulated clearing of vegetation and timber cutting, especially in the Mazoe River valley. The rehabilitation of lands around abandoned Mazoe mines was expensive and often difficult due to waste material polluting the soil, vegetation, and water. The state provided preferential treatment to miners in meeting their timber and energy requirements because they contributed the bulk of state revenue. This policy was a source of protracted conflict over soil and forest exploitation between miners and farmers. Soil erosion and deforestation were major environmental impacts arising from the competing interests of mining and agriculture. Environmental degradation highlighted the negative effect of settler farming, particularly the perennial cultivation of the same crop – notably tobacco and maize – on the same field. Land was 'mined' for short-term economic gain. The settler community was unwilling to acknowledge and deal effectively with the problems of deforestation and erosion. There was no radical change in individual or collective attitudes towards natural resource management.

The ignorance, neglect, and greed of early settler society contributed to the permanent loss of biodiversity and wildlife from various habitats. Much wild flora and fauna gradually became extinct as a result of new techniques of farming and mining, such as the use of artificial fertiliser-chemicals and processes, respectively. However, with Responsible Government in 1923, new conservation initiatives were introduced to control the exploitation of resources. Nonetheless, old habits were difficult to change and the rapacious exploitation of natural resources by some farmers and miners persisted well into the late colonial era. There were wider impacts on African men, women, and children who worked for the colonial system as ultra-cheap labourers, earning parsimonious wages under conditions of overwork, inadequate food rations, and the absence of proper housing. African poverty and environmental degradation were the two outstanding consequences of British colonisation, specifically in the Mazoe District, and in Zimbabwe more generally.

Originally published as:

Kwashirai, V.C. 2006. Dilemmas in Conservationism in Colonial Zimbabwe, 1890–1930. *Conservation and Society* 4(4):541-561.

Vimbai Chaumba Kwashirai is a Leverhulme Research Fellow at the University of Liverpool, UK (v.c.kwashirai@liverpool.ac.uk).

Area under different farming regimes

Region	Area (million ha)	Percent of Total	Description
i	0.62	1.6	*Specialised and diversified farming:* High annual rainfall (> 1000 mm), temperature <15°C. Suitable for dairying, forestry, tea, coffee, fruits, maize, beef ranching.
ii	7.31	18.8	*Intensive farming:* Annual rainfall 750-1000 mm. Ideal for rain-fed maize and tobacco, beef, cotton, winter wheat and vegetables.
iii	6.85	17.6	*Semi-intensive farming:* Annual rainfall 650-800 mm, mostly as infrequent heavy storms, with severe mid-season dry spells. Marginal for maize, tobacco and cotton. Favours livestock production with fodder. Requires good management to retain moisture during growing season.
iv	12.84	33.0	*Semi-extensive farming:* Annual rainfall 450-650 mm, subject to seasonal droughts and severe dry spells during the rainy season. Found in hot, low-lying land. Marginal for rain-fed maize. Ideal for drought-resistant fodder crops.
v	11.28	29.0	*Extensive farming:* Annual rainfall < 450 mm and too low and erratic for most crops. Very hot, low-lying region. Suitable for animal husbandry, and for growing drought-resistant fodder crops under irrigation. Below the Zambezi escarpment, this region is infested with tsetse fly.

Landscape Images in Amazonian Narrative: The Role of Oral History in Environmental Research

Javier A. Arce-Nazario

Landscape and land-use change in the Amazon are most commonly addressed by the standard tools of land-cover change research: remote sensing, demographic methods, and political ecology approaches. These methodologies are used to construct a description of the causes and effects of land-use transitions at broad scales. In contrast, studies that incorporate a very specific, human scale – individuals' memories of the land – have already proven useful for correcting this picture in other regions. Here I evaluate the use of oral histories with ribereño residents of the Muyuy-Panguana archipelago in the Peruvian Amazon, with the primary goal of integrating this information into ecosystem studies.

Oral history approaches differ from other interviewing techniques in that they impose less structure on the conversation, and encourage evaluation rather than merging of the relationship between interviewer and interviewee. In this study individuals, couples, and small groups were interviewed about their personal histories, the formation of their communities, and their perception of culture-nature changes. Conversations progressed from short, specific questions to more open-ended queries intended to direct the discussion towards the interviewee's personal history in relation to the landscape, and his or her ecological knowledge. I found that the recorded Amazonian landscape narrative exposed through this technique is a blend of environmental factual information and narrative art, and that both elements are useful in conservation and landscape change research.

Some of the factual information in the interviews is difficult or impossible to obtain through more traditional methods. For example, the narratives reveal a more precise history of a prominent river channel in the archipelago. Neither a typical remote sensing analysis using multi-temporal images, nor a study of historical maps, could determine that before the 1970's the channel was sometimes almost dry and could be crossed by people and animals on foot. Through the interviews, I also obtained descriptions of forest successional patterns. The interviewees described processes that echo and sometimes extend the knowledge accessible in the ecological literature. The narrative art demonstrated in these interviews is useful for historical analysis since

Photo: Pinedo-Padoch private collection

many experiences were shared, resulting in structural similarity. In some instances, the narrative includes precise descriptions of change processes. In other cases, the narrative of the floodplain's dynamism is intertwined with mythological figures. Myth can arise alongside a conventional story of forest succession, or to account for more drastic and inexplicable changes in the landscape. As I overcame my bias towards the factual components of the interview and became more attuned to the contexts in which mythology entered the conversation, I found that they often reflected the relationship of the community to specific landscape features, or even my own relationship with the interviewee. The myths can serve as explanations for dramatic events, or to encourage certain codes of conduct in using resources or interacting with the landscape.

Integrating oral historical techniques into conservation research is not only another way to access historical and ecological facts or represent cultural interactions. The narratives also present the conservation goals of the interviewees. The goals of a conservation program are ultimately subjective judgments, and it is important to understand local preferences and techniques in devising conservation strategies. Oral history is especially appropriate for collecting this information, since people are allowed to explore their memories and evaluate their experiences. Through this freedom preferences and aesthetics enter the interview. Hence, the ribereño oral history is not only useful for understanding ecosystem dynamics and environmental history, but also for promoting a more inclusive conservation agenda for the communities of the Amazon.

Originally published as:

Nazario, J.A. 2007. Landscape Images in Amazonian Narrative: The Role of Oral History in Environmental Research. *Conservation and Society* 5(1):115-133.

Javier A. Arce-Nazario is at the Division of Society and Environment, Department of Environmental Science, Policy and Management, University of California at Berkeley, USA (jarce@berkeley.edu).

Local Communities and Wildlife Management Reform in Tanzania

Fred Nelson, Rugemeleza Nshala and Alan Rodgers

During the past 20 years, community-based natural resource management (CBNRM) has become a central element of efforts to support rural livelihoods and sustain natural resources worldwide, including in Sub-Saharan Africa. The widespread interest in CBNRM is rooted in the empirical failures of strictly centralized natural resource management policies and practices, broader trends in favour of decentralization in rural development and economic policy, and the desire to create stronger synergies between local economic interests and global conservation objectives. The main challenge facing CBNRM efforts, however, is that centralized resource management systems are often historically rooted, and develop their own sets of institutionalized interests. Reforming such systems is inherently challenging, and in many instances efforts to devolve or decentralize authority for valuable resources to local communities have made limited progress.

The historical and contemporary experiences of wildlife policy and management in Tanzania provide an instructive set of experiences in relation to these broader ecological, economic, and institutional trends and issues. Tanzania possesses one of the world's richest populations of large mammals, which continue to occupy not only state protected areas but many unprotected landscapes as well. Wildlife management has been a prominent social and political issue in Tanzania since the early colonial era, when regulations were first passed to control wildlife utilization and to set up game reserves. Both the colonial and post-colonial state worked to increase central control over wildlife use and over the substantial economic value of wildlife generated by safari hunting and, more recently, by ecotourism. By the 1980s, regulation of wildlife use was entirely subject to state authority, with both foreigners and local people only able to hunt using government-issued licenses. By this time, though, Tanzania's wildlife populations were widely depleted as a result of the declining capacity of state law enforcement and the absence of any local incentives for conserving the resource. Given the need to address these problems, and influenced by the ideas and interests of foreign donors and international conservation organizations, Tanzania revised its wildlife policy in the 1990s. These reforms called for the devolution of management of wildlife outside the core protected areas to local communities.

During the past decade this reformist narrative has continued, but in a rhetorical sense. The legal and administrative reality has been defined by further expansion of state agencies' authority over wildlife, and the erosion of community rights and benefit flows. This discrepancy between policy and practice is explained by the institutional incentives that state wildlife management agencies have for maintaining control over this valuable resource, while adopting a reformist narrative to legitimize continued support from foreign donors. Donors and NGOs have not possessed the capacity to force the adoption of reforms that state authorities view as contrary to their underlying interests, and there has been very little civic or local-community engagement in the wildlife policy development process since its

inception. Key lessons that emerge from the Tanzanian experience include:

•Natural resource management reforms in Africa face fundamental institutional challenges in terms of devolving authority over valuable resources to the local level.

•Donors and NGOs often promote such reforms without an adequate understanding of the institutional barriers to their adoption, and may therefore fail to develop effective strategies for negotiating such constraints.

• Ultimately, moving CBNRM from popular narrative to institutional practice will require greater grassroots participation in natural resource policy formulation, and popular demand for devolution; in this way, CBNRM is fundamentally tied to broader discourses on resource rights and governance in Sub-Saharan Africa and throughout the developing world.

Originally published as:

Nelson, F., R. Nshala and W.A. Rodgers. 2007. The Evolution and Reform of Tanzanian Wildlife Management. *Conservation and Society* 5(2):232-261.

Fred Nelson is at the School of Natural Resources and Environment, University of Michigan, USA and an Independent Consultant based in Arusha, Tanzania (fnelson@habari.co.tz).

Rugemeleza Nshala is at the Harvard Law School and Yale School of Forestry and Environmental Sutides. He is a co-founder of the Lawyers' Environmental Action Team (LEAT)

W.A. Rodgers is with the United Nations Development Programme - Global Environment Facility, Nairobi, Kenya.

Landowner Experiences Regarding Biodiversity Outside Protected Areas in Kenya

Oscar Wambuguh

Substantial biological diversity exists on lands outside protected areas and its survival depends on the goodwill of people who own those lands. To ensure that these landowners contribute to biodiversity conservation efforts in mutually beneficial partnerships, it is important to understand their socio-economic backgrounds and historical heritage, their land-use patterns and expectations, and their biodiversity education needs, as a basis of formulating conservation policies that do not exclude them.

In Kenya today private landowners receive only minor direct benefits from wildlife. With no compensation to mitigate wildlife damages, public attitudes toward wildlife are very unfavourable, especially among landowners who practice small-scale farming and pastoralism. The goal of this study was to explore some of the issues arising from interactions between local landowners and wildlife in a prominent wildlife area in Kenya. I conducted interviews with 377 private landowners of three categories, small-scale, pastoralist and large-scale, in Laikipia District of north-central Kenya. The results give us a glimpse of important landowner perspectives regarding conservation and biodiversity in Laikipia. These can provide some direction for wildlife policy analysis and other conservation needs, including focus points for further research.

Landowners in Laikipia differed in many respects regarding benefits from wildlife, wildlife damage and mitigation, and possible solutions, depending on their economic backgrounds, land parcel size and land use, traditional history, and knowledge about biodiversity. Regardless of ownership type, over 90% of all reported cases of threats due to wildlife, and injuries and deaths caused by wildlife, were attributed to one animal, the elephant. The remaining 10% of cases were attributed to buffalo, lion and hippopotamus, in that order. Many landowners routinely reported damages to the Kenya Wildlife Service (KWS). Of the small-scale landowners, less than 30% of those sampled reported damage and up to 94% of them used an assortment of methods to keep wildlife away. Amongst small-scale landowners and pastoralists the most favoured methods of deterring wildlife were the traditional ones. These included lighting bonfires, and beating iron-sheets or cracking whips to make a sound. The large-scale land owners primarily preferred shooting in the air using firearms to deter wildlife. Compensation for wildlife damage was a major issue in Laikipia, and all landowners felt strongly about the initiation of some form of government compensation scheme. According to KWS, no wildlife crop or property damages are compensated at this time except cases of wildlife-caused human death, which is compensated at a meagre US$ 215.

Considering benefits from wildlife, more than half (67%) of all small-scale landowners believed they gained nothing directly; 19% of pastoralist and 4% of large-scale landowners concurred with this view. However, many landowners appreciated the role of wildlife in general, and the importance of conserving biodiversity for foreign exchange, for aesthetic reasons, and as a reservoir of genetic diversity. Among the wildlife utilisation methods favoured, landowners highlighted the need for programmes in wildlife cropping, safari hunting, ecotourism, and game farming. The existing wildlife utilisation programme in the district was unpopular with a majority of landowners particularly due to delays in the derivation and sharing of benefits, lack of landowner commitment to programme meetings and deliberations, general illiteracy among most landowners, organisational logistics characterised by low managerial capacity and poor operational skills, existence of more economical and dependable alternatives, and the uncertainty of the current wildlife utilisation programme.

With interactions between landowners and wildlife expected to increase in the future, some preventive and management measures that emphasize direct wildlife benefits, compensation for property damages, problem animal control, investment in development projects, and biodiversity education must be incorporated (Table 1). Those can be combined with support for some of the effective traditional methods of wildlife deterrence, provision of incentives including cash and development projects tied to wildlife conservation and training opportunities, devolution of partial ownership responsibilities to landowners, and improving access to biodiversity education materials and opportunities for local landowners.

To achieve success in biodiversity conservation outside protected wildlife areas in Kenya and elsewhere, multiple partnerships

Percentages (with 95% C. I.) of landowners advocating various solutions to wildlife problems in Laikipia District of north-central Kenya. Relative preferences for various solutions differed among categories of landowners.

	Small-scale (N=279)	Pastoralist (N=83)	Large-scale (N=15)	$\chi 2$	p
Benefits to landowners	95 (88-99)	90 (82-98)	100 (93-100)	4.01	NS*
Keep wildlife away	78 (72-84)	32 (27-37)	23 (20-28)	71.64	<0.001
Compensate for losses	72 (66-78)	88 (81-95)	68 (62-72)	10.43	0.022
More ranger outposts	41 (36-46)	15 (11-19)	8 (4-12)	28.42	0.009
Developmental assistance	38 (33-43)	45 (39-71)	12 (9-15)	5.98	0.018
Biodiversity education	12 (8-16)	9 (6-12)	85 (78-92)	43.52	<0.001

* Not Significant

must be developed with local landowners emphasizing direct benefits, transparency, trust, patience, and indeed, some sacrifices. Our ability to conserve habitats and their biodiversity will be judged by what we have done in practice, rather than by what we have found theoretically possible. As the conservation of wildlife outside protected areas will ultimately depend on the goodwill extended to wildlife by private landowners, it is imperative that as information becomes available from research, it is evaluated and translated to guide future policies that are sensitive to the needs of people, wildlife, and the environment.

Originally published as:

Wambuguh, O. 2007. Interactions between Humans and Wildlife: Landowner Experiences Regarding Wildlife Damage, Ownership and Benefits in Laikipia District, Kenya. *Conservation and Society* 5(3):408-428.

Oscar Wambuguh teaches at California State University, East Bay, USA (oscar.wambuguh@csueastbay.edu).

Photos: Oscar Wambuguh

Reducing Negative Impacts of Road Paving in the Amazon

Elsa Mendoza, Stephen Perz, Marianne Schmink and Daniel Nepstad

Infrastructure projects are crucial for regional development, but they also bring negative social impacts such as land conflicts, as well as ecological impacts such as deforestation along with carbon emissions and loss of biodiversity. A reason for these negative impacts is that large-scale infrastructure projects lack a process to incorporate public participation. The result is marginalized communities, and consequent degradation of the ecosystems on which these communities depend.

To address this problem we organized participatory workshops with stakeholders in municipalities along the Inter-Oceanic Highway in the southwestern Amazon. This area is a biodiversity 'hotspot' and the Andes-Amazon interface has particularly high species diversity. Approximately 30 indigenous groups are located along the Inter-Oceanic Highway, as well as rubber tappers, *castaña* ('Brazil nut') collectors, and other groups who have long managed local natural resources.

The Inter-Oceanic Highway passes through the tri-national 'MAP' frontier, where Madre de Dios (Peru), Acre (Brazil) and Pando (Bolivia) meet. Concerns about cross-border impacts of the Inter-Oceanic Highway stimulated the emergence of the MAP Initiative, a grassroots movement that integrates stakeholders on all three sides of the MAP region (www.map-amazonia.net). Since 2000, the MAP Initiative has organised tri-national meetings for dialogue and planning activities, which are open to the public. Imperative in this process is the need to work with local communities. Workshops provide a means for communities to receive information about potential changes as well as to articulate their preferences about possible futures. The Scenarios programme of the NGO, IPAM (the Institute for Amazon Environmental Research), features public workshops that incorporate the perceptions of local peoples into planning for road corridors receiving new infrastructure investments (www.ipam.org.br).

We adapted the IPAM Scenarios workshop process to the case of communities along the Inter-Oceanic Highway in the southwestern Amazon. This allows for comparisons of stakeholder perspectives among the three sides of the MAP frontier. This is especially important, for the Inter-Oceanic Highway has been paved in Brazil, allowing Peruvians and Bolivians to see what problems Brazilians face after road paving.

We conducted workshops in 18 municipalities in the MAP region through which the Inter-Oceanic Highway passes. In each municipality, 25 to 30 local leaders participated, including municipal government representatives, local representatives of national environmental agencies, and diverse community leaders.

We asked participants to list concerns regarding infrastructure, social problems, environmental damage, economic difficulties, and local politics. Tabulations of concerns showed which problems were mentioned most often. We also asked participants to rank the problems they mentioned. Such rankings showed which problems were considered the most serious, and provided a means for prioritizing planning around specific concerns. In addition, the multi-stakeholder workshops included a participatory mapping exercise. This allowed participants to identify locations where they expected problems due to paving of the Inter-Oceanic Highway.

Data from workshops in Brazil demonstrated that not all problems are resolved by road improvements, and, in fact, new social, environmental, and economic problems (drugs, alcoholism, and violence;

deforestation and water pollution; and land-ownership turnover) can arise in the wake of road paving. In addition, participatory maps of municipalities revealed specific locations where participants felt problems would be most likely to arise.

Information from these workshops can be joined with information from other sources to support development of future scenarios in dynamic simulation models. These scenarios provide visual representations of possible future changes as mapped over a landscape. Because the models are based, in part, on local stakeholder input, they can inform local planning and improve local environmental governance, thereby avoiding negative outcomes of road paving.

Originally published as:

Mendoza, E., S. Perz, M. Schmink and D. Nepstad. 2007. Participatory Stakeholder Workshops to Mitigate Impacts of Road Paving in the Southwestern Amazon. *Conservation and Society* 5(3):382-407.

Elsa Mendoza is at the Instituto de Pesquisa Ambiental na Amazônia (IPAM) Brazil (elsa_mendoza@uol.com.br).

Stephen Perz is an Associate Professor of Sociology at the University of Florida at Gainesville, USA (sperz@soc.ufl.edu).

Marianne Schmink is a Professor of Anthropology and Director of the Tropical Conservation and Development Program, and is affiliated to the Center for Latin American Studies, University of Florida at Gainesville, USA.

Daniel Nepstad is a Senior Scientist at the Woods Hole Research Center, USA.

Photos: Stephen G. Perz

Ecological Services of Exotic and Native Tree Plantations in Northwest India

Kamaljit Kaur

Pre-1988 forest policies in India promoted wide-scale plantations of exotic *Eucalyptus tereticornis* mainly for the short-term visible gains from timber because of its straight bole, fast growth rate, high productivity per unit area, and minimal requirement for post-plantation care. However, the scientific community, private growers, and the public have been divided over the merits and demerits of *Eucalyptus* plantations in the past. One reason for this is that our current accounting system considers only the economic gains from wood and fails to consider the cost of lost ecological services when comparing exotic vs. native trees. Instead, we compared the total value of exotic *E. tereticornis* plantations in comparison with native *Dalbergia sissoo* plantations.

Total value included estimating economic (monetary) gains from wood (timber and fuel-wood), soil nutrients and their return through litter decomposition, and understorey plant diversity. Two age groups of plantations, i.e., 6-8 y (young) and 19-21 y (old), were selected to compare net benefits as exotic *E. tereticornis* plantations deliver most of their benefits (especially wood) by 8 y of age, while native *D. sissoo* plantations deliver benefits after 12-15 y of age. The diversity of plant species, nutrient content in soil, and nutrient return through litter were greater in *Dalbergia* than in *Eucalyptus* plantations. A comparison of plantations at 8 y suggested that the total monetary value of ecological services (tangible and non-tangible) was 1.6 times greater from *Eucalyptus* than from *Dalbergia* plantations, chiefly because of timber (Table). However, ecological benefits (intangible) were 1.8 times greater from *Dalbergia* than from *Eucalyptus* plantations. At 19-21 y of age, total benefits were 2.7 times greater from *Dalbergia* than from *Eucalyptus* (Table).

The study suggested that exotic plantations are more profitable than native tree plantations only over the short term and in terms of timber, which is at the cost of many ecological services. However, over the longer term the total benefits from native plantations are far greater where the value of intangible and tangible products and services increases over time, and adds to the continuum of services and sustainability of a system. The study suggests a need to consider both tangible and intangible services over the long term and to carry out total value assessment of exotic and native tree plantations for sustainable gains and to design policy accordingly.

Originally published as:

Sangha, K. and R.K. Jalota. 2005. Value of Ecological Services of Exotic *Eucalyptus tereticornis* and Native *Dalbergia sissoo* Tree Plantations of North-Western India. *Conservation and Society* 3(1):92-109.

Kamaljit Kaur is at School of Marine and Tropical Biology, James Cook University, Australia. Email: Kamaljit.kaur@jcu.edu.au

Monetary Gains (Rs./ha)	8 y old plantations		21 y old plantations	
	E. tereticornis	*D. sissoo*	*E. tereticornis*	*D. sissoo*
Use and non-use ecological services (for recreation, education, solitude, shade and wildlife value)	26	46	26	46
Soil nutrients	85,087	113,647	64,418	87,383
Plant diversity	31,680	58,095	11,053	63,894
Nutrient return from litter (N, P and K)*	2,561	6,709	2,56	6,709
Calculated benefits for 1, 3 and 4 services (Rs./ha) over plantation age, i.e., 8 yr and 21 yr	274,136	518,800	286,440	1 483,629
Total benefits for 1, 2, 3 and 4 -services over plantation age	359,223	632,447	350,858	1,571,012
Timber and other non-wood products (fuel, eucalypt oil, ash, fodder)	1,339,671	458,205	5,211,669	13,438,843
Total returns (Rs./ha) for 1, 2, 3, 4 (ecological services) and 5 (tangible services) over plantation age	1,698,894	1,090,652	5,562,527	15,009,855

The total monetary value (in Indian Rs./ha) of various tangible and intangible benefits from *Eucalyptus tereticornis* and *Dalbergia sissoo* plantations.

Current Conservation carries the latest in research news from the natural- and social-science facets of conservation, such as conservation biology, environmental history, anthropology, sociology, ecological economics and landscape ecology. *Current Conservation* translates the content into language that is accessible to a wider readership. Source publications include Biological Conservation, Community Ecology, Conservation and Society, and Endangered Species Research at present.

Current Conservation is published by an informal alliance of natural and social science professionals to promote interdisciplinary research in conservation and to foster communication among scientists, resource managers, educators and policy makers. *Current Conservation* is an open access journal, published and distributed under the terms of the Creative Commons Attribution License (http://www.creative-commons.org/licenses/by/2.5/).

SUBMISSION OF MANUSCRIPTS

Current Conservation articles are peer reviewed by a member of the editorial board and a reviewer.

Manuscripts should be submitted by email to: hiremath@atree.org or kshanker@ces.iisc.ernet.in

Authors should provide complete contact information including an email address, phone and fax numbers. Manuscripts should be submitted in standard word processor formats or rich text format. Figures should not be embedded in the text; they may be stored in XLS, JPG, TIF or BMP formats. High resolution figures may be requested after acceptance of the article.

In the text, citations with single, two and multiple authors should appear as (Gaston 1996), (Forman and Godron 1986) and (Pomeroy et al. 1982), respectively. If there are multiple references, they should be arranged chronologically, and may be separated by a semi colon.

Reference styles in list:

Articles from journals: Pomeroy, M., R. Primack and S.N. Rai. 2003. Changes in four rainforest plots of the Western Ghats, India. *Conservation and Society* 1:113-136.

Books: Forman, R.T.T. and M. Godron. 1986. *Landscape Ecology*. John Wiley, New York, USA.

Edited volumes: Gaston, K.J. (ed.). 1996. *Biodiversity: A Biology of Numbers and Difference*. Blackwell Science, Oxford, UK.

Articles from edited volumes: Lakshman, W.D. 1989. Lineages of Dependent Development: From State Control to the Open Economy in Sri Lanka. In: *The Challenge in South Asia: Development, Democracy and Regional Cooperation* (eds. P. Wignaraja and A. Hussain), pp. 105-163. Sage Publications, New Delhi, India.

Unpublished work: Sandee, H.1995. *Innovations in Production*. Ph.D. thesis. Amsterdam: Free University. Netherlands.

Current Conservation carries the latest in research news from the natural- and social-science facets of conservation, such as conservation biology, environmental history, anthropology, sociology, ecological economics and landscape ecology. *Current Conservation* translates the content into language that is accessible to a wider readership. Source publications include Biological Conservation, Community Ecology, Conservation and Society, and Endangered Species Research at present.

Hard Copy Subscriptions

	South Asia	Asia, Latin America, Africa	North America, Europe, Australia
Individual	Rs. 200.00	USD 10.00	USD 25.00
Institutional	Rs. 500.00	USD 25.00	USD 50.00

Cheques or Demand Drafts should be in favour of 'Ashoka Trust for Research in Ecology and the Environment' and mailed to ATREE, 659, 5th 'A' Main Road, Hebbal, Bangalore, 560 024, INDIA. See website for order forms and online payments.

This newsletter is produced with support from: