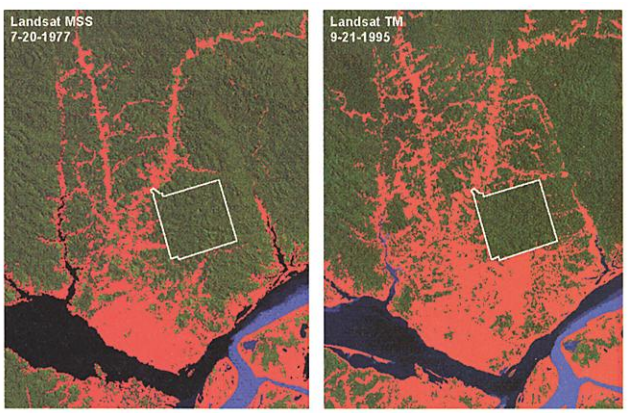
Parks and Factors in Their Success

TO MEASURE HOW EFFECTIVE PARKS ARE IN protecting tropical biodiversity, A. G. Bruner and co-authors assessed the relative decreases in land clearing, logging, hunting, fire, and grazing within 93 protected areas in 22 tropical countries over time or in relation to surrounding lands (Reports, 5 Jan., p. 125). Analysis of only these factors reveals little about the prospects for sustaining conservation efforts. Although short-term conservation might be possible without considering them, political, cultural, and humanitarian concerns can overwhelm conservation initiatives. Without constituency-building among local people, the costs of protecting an area can rise immeasurably, not only monetarily but also in the form of political upheaval and social conflict (*1*).

Data concerning local support for parks and the level of local participation within Bruner *et al.*'s study are at best questionable. In no case were local people surveyed as to their opinions of the management. Disparate views of local support and participation on behalf of local residents and officials have been demonstrated in the literature (*2*). Thus, basing the measurement of such indicators on surveys of officials alone is an inaccurate proxy.

Bruner and co-authors underestimate the significance of social factors to affect park success by not considering, for example, political stability, land tenure policies, market involvement of local people, extent of tourism in the protected area, availability of subsistence options for residents, constituency-building activities, and characterization of local land management practices. Without local support and subsistence guarantees, populations marginalized by restricted access to commonly used resources might pose the most significant threat to park protection. Although park guards might help to deter illegal land clearing, devising systems of more sustainable use and appropriate compensation could achieve conservation goals while respecting the rights and aspirations of the people associated with them.



Under park protection. The expansion of deforestation between 1977 (left) and 1995 (right) near the Adolpho Ducke Forest Reserve, Manaus, Brazil, stops abruptly at the reserve boundary. Mature forest appears as green, water as black to blue. Deforestation was estimated by spectral classification and appears as red. The reserve encompasses 100 square kilometers (10,000 hectares), and its borders are shown in white. (See the Response by Bruner *et al.* on the following page.)

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BRUNER AND CO-AUTHORS CONCLUDE THAT most tropical nature reserves are effectively protecting biodiversity. However, we find several shortcomings in their study.

First, a park does not prevent exploitation and degradation of ecosystems, but merely displaces them. The presence of a park might increase pressure on the surrounding area as a source of land and resources (*1*). Hence, Bruner *et al.*'s comparison of a park and its surrounding 10-kilometer zone is flawed. A more meaningful comparison would be with a similar (climate, topography, geology) landscape far enough away from the park to escape from its negative impacts on resource use.

Second, parks are located in areas that are typically in better condition than the surrounding areas (*2*). Any differences between parks and their surrounding areas might reflect preexisting differences in habitat quality.

Third, Bruner *et al.*'s study is entirely based on questionnaire surveys. Of the total respondents, 70% are directly involved in park management and therefore have a vested interest in promoting its effectiveness. A similar questionnaire survey by the International Union for Conservation of Nature and Natural Resources (IUCN) of local experts' views on the status of forest protected areas found that only 1% were regarded as secure and many were suffering serious degradation and loss (*3*). Rigorous fieldwork is essential to cross-check the accuracy of information such as this.

Protected areas and community management are not alternatives; rather, they are complementary (*4*). Bruner and colleagues maintain that parks are better for habitat integrity than no protection; however, parks should still be compared with community-based conservation systems to determine the conditions under which strict protection is preferable and those

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 6 months or issues of general interest. They can be submitted by e-mail (science_letters@aaas.org), the Web (www.letter2science.org), or regular mail (1200 New York Ave., NW, Washington, DC 20005, USA). Letters are not acknowledged upon receipt, nor are authors generally consulted before publication. Whether published in full or in part, letters are subject to editing for clarity and space.

where other IUCN categories (*5*) or community-based conservation approaches would work better.

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6. We acknowledge and thank all the colleagues at Ecology and Silviculture Laboratory in Oxford Forestry Institute for stimulating discussions.

Response

STERN IDENTIFIES SEVERAL SOCIAL FACTORS that might influence the effectiveness of park management. In suggesting that these factors should be included in calculating a measure of park effectiveness, however, he confuses the means with the end. The current condition of a park reflects its past effectiveness in addressing all of the threats faced since its establishment, including the social threats mentioned by Stern. Although it may be important to monitor these social indicators to identify and mitigate threats that might compromise future effectiveness, it is not necessary to include them in a judgment of how effective a park has been to date. Stern's statement that our measure of effectiveness does not address the "sustainability of conservation" is misguided for the same reason. Over the past two decades (park median age is 21 years), parks have undoubtedly faced the threats listed by Stern. The fact that most are still in relatively good condition attests that conservation through parks is indeed "sustainable."

We agree with Stern that a range of management activities contributes to park success and that more research is needed to evaluate the relative contribution of each activity. However, implementing a broader approach to management should not come at the expense of basic management activities such as enforcement and border demarcation, which we found to be among the most important factors correlating with park effectiveness.

In response to Bhagwat and colleagues' first comment (*1*) that parks displace rather than prevent environmental degradation, we disagree that this effect is as straightforward as they suggest. Protected areas more often serve to prevent future encroachment than to displace existing uses. We are unaware of examples of protected areas ringed by clearing where the broader landscape is not also heavily impacted, as might be expected if Bhagwat *et al.*'s claim were correct. In evaluating the effectiveness of management, therefore, park surroundings are the logical point of contrast, as these areas face the same threats as parks but don't have the benefit of management.

Even if park establishment did result in some level of displacement, a central function of parks is to protect areas of the

Discussion of how effective parks are at protecting biodiversity continues in Technical Comments at www.sciencemag.org/cgi/content/full/293/5532/1007a

highest biological importance and to direct development to less sensitive areas. Ample evidence exists to suggest that protection is necessary: Where there is demand for resources, those resources are likely to be lost to land conversion or overuse if they are not actively protected (*2*).

Bhagwat *et al.* also suggest that current differences between parks and their surroundings might reflect preexisting differences, although they present no evidence to support their claim. It would not be true for parks created in remote wilderness areas, for example, because their surroundings would also be wilderness. Further, our finding that natural vegetative cover increased in 40% of parks after establishment suggests that these areas faced threats before park establishment and that the park subsequently mitigated these threats enough to allow recovery.

Concerning study design, respondents had little incentive to overestimate effectiveness. We guaranteed anonymity and agreed to publish only aggregate findings that could not be linked to any particular protected area. In this context, respondents' "vested interest in promoting [park management] effectiveness" would seem best served by providing accurate information, which could in turn provide them with useful findings to guide management. Lack of bias is suggested by the fact that many managers reported that their parks were effective against some threats, but ineffective against others. Regarding the IUCN study mentioned by Bhagwat *et al.*, despite broad differences in methodology, the conclusions of both studies are in fact similar concerning effectiveness. Both show that protected areas face high degrees of threats, and both found that protected areas maintain ecosystems of high value for conservation.

In conclusion, although parks are only one of several conservation options, our study clearly demonstrates that they have been an effective long-term strategy against a range of threats. These findings suggest that increased support for existing parks, and creating new ones, should remain a central focus of tropical conservation efforts.

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1. For a more technical treatment of some of these issues, please also see the Technical Comment exchange with J. K. Vanclay, available at www.sciencemag.org/cgi/content/full/293/5532/1007a
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In Defense of Antisense

IN HIS ARTICLE "A FASTER WAY TO SHUT DOWN genes" (News of the Week, 25 May, p. 1469), R. John Davenport describes a promising technique called RNA interference for selectively silencing genes in a range of organisms. But in comparing the new approach to antisense methods, he makes a false assertion: "Fifteen years ago, antisense methods for gene silencing and gene therapy offered similar hopes, but that has been largely a bust."

Like any new method, antisense has faced significant and complex methodological and practical challenges since the first useful demonstration of this method in 1978. Although important issues remain, problems such as drug stability, deliverability, and targetting have been significantly addressed, if not solved. As evidence for these points, there are numerous successful companies that have