Rapid Assessment of Protected Area Management Effectiveness in Four Countries

JAMISON ERVIN

Assessing the management effectiveness of a protected area system can enable policymakers to develop strategic, systemwide responses to pervasive management problems. The World Wide Fund for Nature International has developed the Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) methodology. This article summarizes results from the implementation of the RAPPAM methodology in Bhutan, China, Russia, and South Africa. Five threats emerged warranting concerted policy effort: poaching, alien plants, tourism, logging, and encroachment. Similarly, five management issues emerged that influence protected area management effectiveness: funding, staffing, research and monitoring, resource inventories, and community relations. By identifying the most pressing issues in protected areas, an assessment of management effectiveness can be used to improve protected area management.

Keywords: protected areas, management effectiveness, threats, international parks

Assessing the management effectiveness of a protected area system is a critical step toward achieving the goal for which protected areas are established: the conservation of biological diversity. Management effectiveness assessments are an essential component of systematic conservation planning processes (Margules and Pressey 2000). They can help policymakers identify discrepancies between design considerations, such as protected area representativeness, and actual ground conditions, such as forest intactness (Jepson et al. 2002). They can identify broad trends in management strengths and weaknesses; indicate areas of high biological and social importance; and reveal the scope, severity, prevalence, and distribution of an array of threats and pressures. By doing so, systemwide protected area assessments can enable policymakers to refine their conservation strategies, reallocate budget expenditures, and develop strategic, systemwide responses to the most pervasive threats and management weaknesses.

To this end, the World Wide Fund for Nature (WWF) International has developed the Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) methodology (Ervin 2003). WWF developed the methodology between 1999 and 2002, field-testing it in France, Cameroon, Gabon, China, and Algeria. In 2002 WWF supported implementation of the RAPPAM methodology in Bhutan, Russia, China (forests of the upper Yangtze [FUY] ecoregion), and South Africa (KwaZulu-Natal [KZN] Province). This article summarizes the findings of those assessments and recommends priorities for improving the effectiveness of protected area management.

Case studies and methods

The Bhutan assessment (Tsering 2003) was sponsored by WWF Bhutan, the World Bank, and the Nature Conservation Division of Bhutan, the governmental department responsible for park management in this Himalayan kingdom. The assessment covered four of the country's five operational national parks and went into greater detail for each protected area than the other three case studies. The goal of the Bhutan assessment was to analyze the strengths and weaknesses of the first decade of park management, identify areas for improvement, and establish baseline data for future assessments.

The China assessment (Diqiang et al. 2003) was sponsored by WWF China, Beijing Forestry University, and the Chinese Academy of Forestry. The assessment focused on the FUY ecoregion and included 88 forest protected areas under the jurisdiction of the national government. The goal of the China assessment was to assess the management effectiveness of protected areas within a particular ecoregion as one step of a larger systematic conservation planning process. This broader process sought to prioritize support to critically threatened protected areas and identify areas where new reserves might be warranted.

Jamison Ervin (e-mail: jervin@sover.net) works for Hardscrabble Associates, 1061 Mountainview, Duxbury, VT 05676, and consults for the World Wide Fund for Nature International.

The Russia assessment (Tyrlyshkin et al. 2003), which was sponsored by WWF Russia and IUCN (World Conservation Union), focused on 197 national protected areas across the country. The goal of the Russia assessment was to understand the nature and extent of management weaknesses within the entire national protected area system and the prevalence and severity of a variety of threats and pressures.

The South Africa assessment (Goodman 2003), which focused on KZN Province, was sponsored by KZN Wildlife, the governmental department responsible for park management and wildlife conservation. The assessment covered all 110 state-protected areas within the province, with areas ranging in size from 4 hectares to several hundred thousand hectares. The assessment also covered a variety of biomes, including forest, grassland savannah, scrub forest, and marine ecosystems. The goal of the South Africa assessment was to enable park administrators to prioritize and reallocate budget expenditures for the recently consolidated parks department. KZN Wildlife was also involved in a systematic conservation planning exercise for the province and planned to use the data to inform that broader assessment process.

The primary data collection tool of the RAPPAM methodology is the rapid assessment questionnaire. The questionnaire covers all aspects of the international evaluation framework developed by the World Commission on Protected Areas (WCPA) (table 1; Hockings 2003) but emphasizes two major areas: (1) contextual issues, including future threats, past pressures, vulnerability, and biological and socioeconomic importance; and (2) management effectiveness, including a variety of measures under planning, inputs, and processes. The questionnaire also includes a series of questions that look at system-level design issues, protected area policies, and the broad policy environment.

Data collection entailed administering the rapid assessment questionnaire during one or more participatory workshops. Because the data in the RAPPAM methodology rely on perception-based, qualitative scoring without direct field verification, a participatory workshop of park managers, staff, administrators, and other stakeholders was essential for establishing a negotiated and mutually agreed basis for consistent scoring across different parks. The assessment focused more on comparative than on absolute threats and weaknesses.

In scoring the various elements of management effectiveness (e.g., biological importance, planning, inputs, and processes), respondents replied to statements such as "The siting of the protected area is consistent with the protected area's objectives" with a "yes," "mostly yes," "mostly no," or "no" response, providing additional data as needed to qualify their responses. Respondents also assessed past pressures and future threats within their protected areas. Past pressures were defined as forces, activities, or events that had already had a detrimental impact on the integrity of the protected area (i.e., that had diminished biological diversity, inhibited regenerative capacity, or impoverished the area's natural resources). Such pressures included both legal and illegal activities and resulted from both direct and indirect impacts of these activities. Future threats were potential or impending pressures that were likely to cause a detrimental impact to occur or continue. The rapid assessment questionnaire measured extent (the range in which the activity occurred), impact (the degree to which pressures affected overall protected area resources), and permanence (the length of time needed for the protected area resource to recover with or without management intervention).

Protected area threats: Findings and analyses

The degree of each pressure and threat was calculated by multiplying its extent, impact, and permanence, using the numerical values shown in table 2. A degree of 1 to 3 was considered mild, 4 to 9 moderate, 12 to 24 high, and 27 to 64 severe.

Figure 1 shows the average degree of threats and pressures across each of the protected area systems. In all four assessments, the most serious threats were also the most pervasive within each country. For example, the top five threats in Russia occurred in more than 80% of the protected areas assessed. Such widespread occurrence indicates that threats to protected areas are indeed systemic, reflecting consistent underlying causes rather than the idiosyncratic results of individual park management.

The threats facing all four countries can be broadly grouped according to their tractability and degree of threat (table 3). Tractable threats include activities whose impacts can be prevented, mitigated, or reversed through a reasonable degree

Table 1. Elements addressed in the rapid assessment questionnaire.

Context	Protected area design and planning	Inputs	Management processes	Management outputs	Outcomes
Threats	Protected area objectives	Staff	Management planning	Threat prevention	Pressures
Biological importance	Legal security	Communication and information inputs	Management practices	Site restoration	
Socioeconomic importance	Site design and planning	Infrastructure	Research, monitoring, and evaluation	Wildlife management	
Vulnerability	Protected area system design	Finances		Community outreach	
Protected area policies				Visitor management	
Policy environment				Infrastructure outputs	
				Planning outputs	
				Monitoring	
				Training	
				Research	

of funding, capacity building, policy reform, or management intervention. The impacts of tourism, for example, can probably be contained by developing a systematic tourism policy, improving visitor facilities, providing educational materials, and increasing the number and capacity of park staff (Li and Han 2001). Threats may also be tractable if they involve manageable policy negotiations. The exact location of a road, for example, could probably be negotiated with the Department of Transportation to minimize its impact on a protected area.

Intractable threats, on the other hand, are akin to what Rittel and Webber (1973) call "wicked problems," or problems "which are ill formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing." In contrast to more manageable problems that can be defined, structured, and solved through information and analysis (Rittel and Webber 1973), wicked problems have no definitive formulation, no clear boundaries, no test for a solution, and no exhaustible set of solutions (Friedmann 1987). In the context of protected area assessments, wicked problems are threats that require unrealistic amounts of resources or staffing or that cannot be solved easily with existing technology. The activities and their impacts are often difficult to detect and monitor, are the result of multiple underlying causes, and are deeply embedded in a protected area's social and cultural milieu (e.g., subsistence poaching or the collection of nontimber forest products [NTFPs]). Some intractable threats, such as the isolation of protected areas, extend well beyond the influence of a protected area manager or administrator, requiring broad-scale reform of one or more sectors. Intractable threats also involve large-scale processes, including those caused by anthropogenic factors (e.g., pollution, introduction of alien species) and those resulting from natural processes intensified by human influences (e.g., catastrophic fires).

Table 3 subdivides tractable and intractable threats into four categories: strategic, background, wicked, and pernicious. Strategic threats are likely to have a high degree of impact and yet are relatively easy to resolve, in some cases with the simple stroke of a pen. Background threats can typically be resolved with a modicum of policy reform or improved management and are unlikely to be major sources of park degradation. Wicked threats, like a low-grade fever, can exhaust management efforts and gradually erode protected area resources over time. Pernicious threats are those critical and intractable problems on which the success or failure of protected area management may ultimately depend.

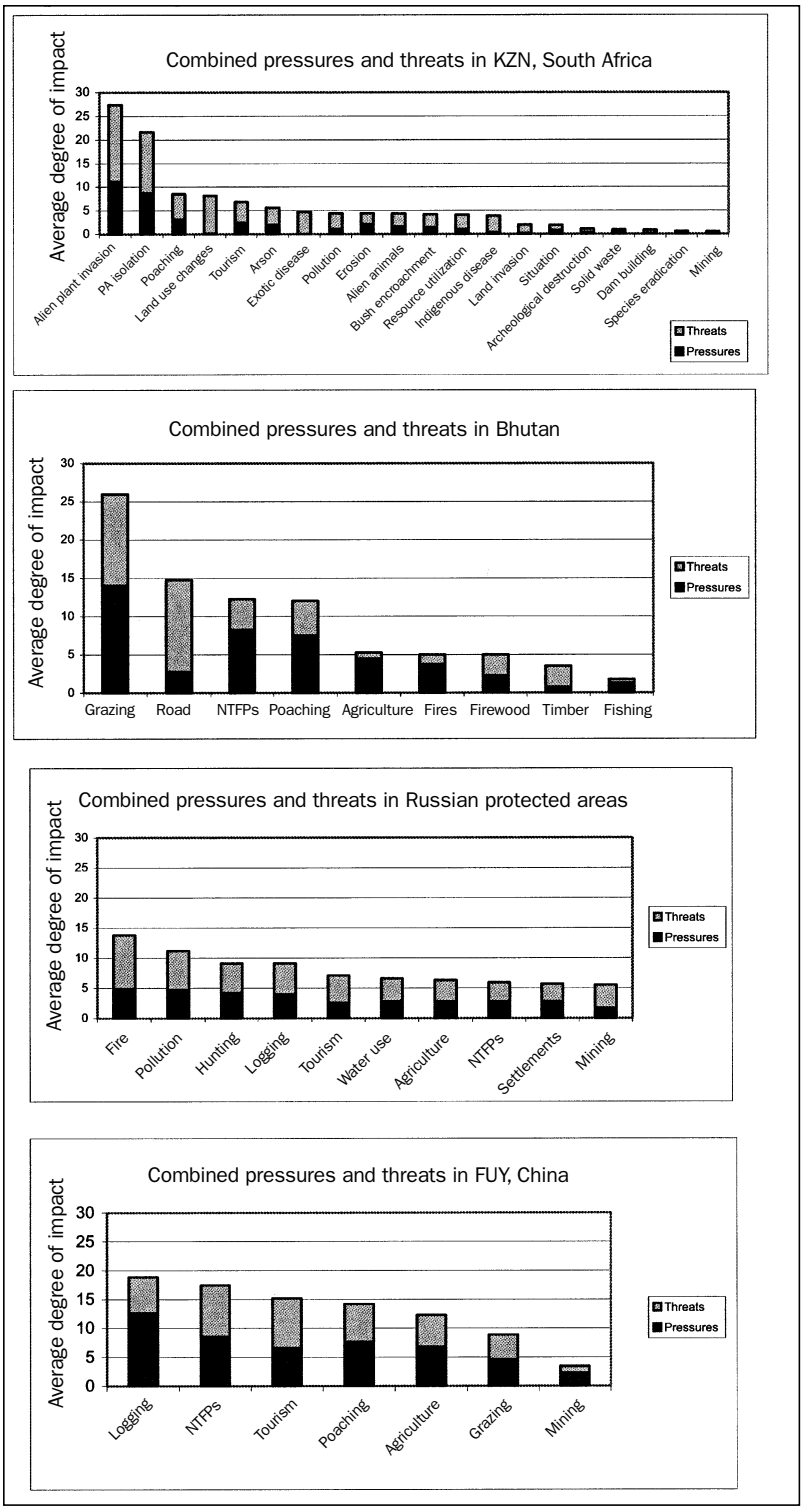

Figure 1. Comparative degrees of impact from past pressures and future threats. FUY, forests of the upper Yangtze; KZN, KwaZulu-Natal; NTFPs, nontimber forest products; PA, protected area.

The assignation of a threat to one of these four categories depends entirely on the protected area context. For example,

Table 2. Numerical values assigned to extent, impact, and permanence of environmental pressures and threats.

Indicator	Value 1	2	3	4
Extent	Localized	Scattered	Widespread	Throughout
Impact	Mild	Moderate	High	Severe
Longevity	Short term	Medium term	Long term	Permanent

Note: A separate value was assigned to each quality, and the three values were multiplied to calculate the degree of each pressure or threat.

agriculture in Bhutan is a background threat, because land-use policies have limited and will continue to limit the level of swidden agriculture within protected areas, whereas agricultural encroachment in Russia and China remains a persistent and intractable problem, warranting the designation of wicked threat.

Some recommendations for protected area policymakers

The RAPPAM methodology can help to answer some of the basic questions a policymaker might ask about protected area effectiveness, such as "Which protected areas are the most threatened?" "Which threats are causing the most damage systemwide?" and "Which threats require systemic and sustained policy efforts rather than a quick fix?" However, the utility of any assessment tool is limited by the accuracy of the data collected. For most of the threats in each of the four studies, the true extent, impact, and permanence of each threat was largely unknown. Particularly for wicked threats, such as the collection of NTFPs, the respondents admitted that their scores were mostly based on perceptions, hearsay, and intuition rather than on monitoring data. Even for more measurable threats such as alien plants, for which the extent could reasonably be quantified, the true impact (e.g., modification and loss of habitat) could not. If threat assessments are to become an integral part of assessing management effectiveness, and if they are to inform planning, they must be based on more accurate and reliable data than are typically available across most protected areas.

Collectively, the four studies examined 28 different threats and pressures. (Examples are listed in table 4.) The myriad threats detailed by researchers such as Brandon and colleagues (1998) and Terborgh and colleagues (2002) suggest that the full list of potential threats facing protected areas is long indeed. Nonetheless, there are a handful of threats whose constant resurfacing warrants closer investigation. These threats are the poaching of animals and NTFPs, the invasion of alien plants, tourism, logging, and encroachment.

Poaching. Poaching of animals and NTFPs merits shortlisting by prevalence alone. Poaching affected more than 80% of a sampling of 201 parks from 16 tropical countries across three continents (van Schaik et al. 1997). Collection of NTFPs, which ranked highest of 15 incompatible park uses, occurred in 85% of Myanmar's protected area system (Rao et al. 2002). Hunting and NTFP collection occurred in 97% and 92%, respectively, of 197 Russian parks assessed (Tyrlyshkin et al. 2003). While in many cases the actual degree of harvesting is largely unknown and the ecological impacts even less well known, the systematic removal of plants and animals can have significant and cascading effects throughout different trophic levels. Moreover, there is a strong potential for hunting and NTFP collection to cross the threshold from a mild or moderate threat to a high or even severe threat as overharvested species become vulnerable to local extirpation and even extinction.

Table 3. Type and level of threats in protected area systems.

Protected area	Tractable threats: Strategic[a]	Tractable threats: Background[b]	Intractable threats: Pernicious[a]	Intractable threats: Wicked[b, c]
Bhutan	Road building	Agriculture	Grazing	Fire, firewood and timber, fishing, nontimber forest products, poaching
China		Logging, mining, tourism		Agriculture, grazing, nontimber forest products, poaching
Russia		Logging, mining, tourism		Agriculture, fire, nontimber forest products, poaching, pollution, settlements
South Africa	Land-use change	Archeological destruction, dam building, erosion, mining, resource utilization, solid waste management, species eradication, tourism	Alien plants, protected area isolation	Alien animals, bush encroachment, exotic disease, fire, indigenous disease, poaching, pollution, siltation

a. Strategic and pernicious problems pose a high to severe degree of threat systemwide.
b. Background and wicked problems pose a mild to moderate degree of threat systemwide.
c. Terminology is from Rittel and Webber (1973).

Table 4. Examples of threats and pressures within protected areas.

Activity	Extent	Impact	Permanence	Degree	Description and rationale for scoring
Nontimber forest product collection	Localized (1)	Mild (1)	Short term (1)	Mild (1)	The collection of nontimber forest products consists primarily of mushroom harvesting for consumption by local residents. Harvesting occurs near an adjacent village, and harvesters generally leave large areas undisturbed.
Road	Scattered (2)	Moderate (2)	Medium term (2)	Moderate (8)	A road is planned through a portion of a protected area. It is a gravel access road and will be used only seasonally by park staff and visitors with permits. The actual impact of construction will be minimized by using environmental best practices.
Tourism	Widespread (3)	High (3)	Short term (1)	Moderate (9)	Tourists have recently begun to drive motorized off-road vehicles through sensitive wetlands. Springtime vehicle use has already disrupted the mating and denning habits of large numbers of bears, considered a key species in this protected area.
Poaching	Widespread (3)	High (3)	Medium term (2)	High (18)	The main species poached is tiger, which is extensively poached in the protected area. A significant percentage of the tiger population is killed annually, threatening the viability of the population.
Alien species	Widespread (3)	High (3)	Long term (3)	Severe (27)	*Chromolaena,* an aggressive alien plant, is present throughout a quarter of the park. It has rendered large areas of rhino and elephant habitat unsuitable and is extremely difficult to control or eradicate.
Dam building	Throughout (4)	Severe (4)	Permanent (4)	Severe (64)	There is a large-scale hydroelectric dam planned that would flood most of the protected area.

Note: These threats are based on hypothetical examples. Numbers in parentheses represent the degree of a threat, which is calculated by multiplying the threat's extent by its impact and permanence.

Alien species. The invasion of alien species, which Wilson (1992) calls one of the "four mindless horsemen of the environmental apocalypse," warrants short-listing because of its perniciousness. Fifty percent of all federally listed threatened and endangered species in the United States are imperiled by alien species, second only to the number imperiled by habitat degradation (Wilcove et al. 1998). Yet the identification of alien plants rarely registers as a significant threat, even in areas where such species flourish. If unchecked, alien plants and animals are likely to usher in what Putz (1998) calls the "Homogeocene epoch," a "frightening future filled with too few species." Yet preventing, mitigating, or reversing damage from alien species typically requires vast amounts of human and financial resources.

Tourism. Although tourism in protected areas registered as only a mild or moderate threat in the four case studies and is likely to be relatively tractable, it merits short-listing because of its massive potential for expansion in many park systems worldwide. One study found that 2.5 million tourists visited China's 77 national nature reserves in 1995 and that the average increase in growth of tourism in those parks from 1995 to 1998 was 88% per year, nearly twice the growth of tourism nationwide (Li and Han 2001). This growth, which is paralleled in other countries (e.g., Russia, Brazil, and the United States), is coupled with inadequate planning for the influx of tourists. Despite the enthusiasm for promoting tourism in China's protected areas, for example, there is no national strategy for nature reserve ecotourism; there is poor coordination among the tourism, forestry, and parks departments; and there is a widespread expectation that ecotourism will become a panacea for economic self-sufficiency (Li and Han 2001).

Logging. Logging is an obvious candidate for the short list. Its impacts include loss of habitat, modification of fire regimes, compaction and erosion of soil, and development of roads—the precursor to so many other threats. Despite this, many countries persist in maintaining policies that allow widespread, intensive logging in national parks. One study found that logging affected nearly 70% of more than 200 parks sampled from throughout the tropics (van Schaik et al. 1997). In some cases, logging in parks remains a threat because of the unclear jurisdiction over forests between parks departments and forestry departments. In other cases, logging is a threat because the park's remoteness, high economic value, and low levels of monitoring invite illegal harvesting, with or without the complicity of park officials.

Encroachment. Encroachment makes the list by virtue of seniority. Since its establishment as the first protected area of its kind in the United States, Yellowstone National Park has faced encroachment caused by the competing interests of railroad owners, tourists, businesses, and park managers, a

battle that continues today (Satchell 1997). Similar battles raged over Venezuela's oldest national park, Henry Pittier, after President Chavez's new "Law of Lands" was widely misinterpreted to mean that protected areas were open for settlement. Whether in the form of agriculture, settlements, park infrastructure, or businesses, the threat of encroachment embodies the fundamental struggle over a park's potential economic or ecological benefits, and few parks are immune.

Management effectiveness: Findings and analysis

The rapid assessment questionnaire included questions for each of the WCPA framework elements (see table 1). Table 5 summarizes the findings of the four case studies, indicating

Table 5. Summary of strengths and weaknesses across protected area systems in four countries.

Elements of assessing management effectiveness	Bhutan	FUY, China	KZN, South Africa	Russia
Objectives				
PA objectives provide for biodiversity protection.	S	S	S	S
Management plan includes specific biodiversity-related objectives.	—	S	S	—
Management policies are consistent with PA objectives.	S	S	S	—
Employees understand the PA objectives.	S	S	—	S
Local communities support the PA objectives.	—	—	—	—
Legal security				
The PA has long-term, legally binding protection.	S	S	S	S
There are no unsettled disputes regarding tenure or use rights.	—	S	—	—
The boundary demarcation is adequate to meet PA objectives.	—	S	S	S
Resources are adequate to conduct critical law enforcement activities.	W	—	—	—
Conflicts with local communities are resolved effectively.	S	W	—	—
Design				
The siting of the PA is consistent with the objectives.	S	S	S	S
The PA layout and configuration optimize biodiversity conservation.	S	—	W	S
The PA zoning system is adequate to achieve PA objectives.	W	S	—	—
The land use in surrounding areas enables effective PA management.	—	S	W	S
The PA is linked to other conserved or protected lands.	S	S	—	—
Staffing				
The level of staffing is sufficient to effectively manage the area.	W	—	—	W
Staff members have adequate skills to conduct critical management activities.	S	—	S	—
Staff members have adequate training and development opportunities.	S	—	—	—
Staff performance is adequately monitored.	—	S	—	—
Staff employment conditions are sufficient to retain staff.	S	W	—	W
Communication and information				
There are adequate means of communication between field and office.	W	S	S	—
Ecological and social data are adequate for management planning.	W	—	—	W
There are adequate means of collecting new data.	—	—	W	—
There are adequate systems for processing and analyzing data.	—	—	S	—
There is effective communication with local communities.	S	—	—	—
Infrastructure				
Transportation is adequate to perform critical management activities.	S	—	—	W
Field equipment is adequate to perform critical management activities.	—	W	W	W
Staff facilities are adequate to perform critical management activities.	—	—	—	W
Maintenance and care of equipment is adequate for long-term use.	S	—	—	W
Visitor facilities are appropriate for the level of visitor use.	S	—	—	W
Finances				
Funding is adequate to conduct critical management activities.	S	W	W	W
Management planning				
There is a comprehensive, recent management plan.	S	S	W	W
There is an inventory of natural and cultural resources.	W	—	—	—
There is a strategy for addressing PA threats and pressures.	W	—	—	—
There is a detailed work plan with specific targets and objectives.	S	—	S	—
The results of research are routinely incorporated into planning.	—	—	S	—
Research and monitoring				
The impacts of PA uses are adequately monitored.	W	—	S	—
Research on key ecological issues is consistent with PA needs.	W	—	W	—
Research on key social issues is consistent with PA needs.	—	W	W	—

FUY, forests of the upper Yangtze; KZN, KwaZulu-Natal; PA, protected area; S, strength, where 60% or more respondents answered "yes" or "mostly yes" (Bhutan and South Africa) or where the systemwide average was 3 or greater on a 0–5 scale (China and Russia); W, weakness, where 60% or more respondents answered "no" or "mostly no" or where the systemwide average was 2 or lower on a 0–5 scale. A dash (—) indicates that the element was neither a strength nor a weakness.

Note: Statements have been edited for brevity. For the full text of the questionnaire, see Ervin (2003).

Table 6. Weaknesses and their relation to inputs, processes, and context.

Weaknesses directly related to financial inputs	Weaknesses related to management practices and policies	Contextual weaknesses related to macro-level policies and multiple sectors
Resources to conduct critical law enforcement activities	Conflicts with local communities	Layout and configuration of protected area
Staffing levels	Zoning of protected areas	Surrounding land use
Staff employment conditions	Ecological and social data and research	
Means of collecting new data	Management plan	
Transportation	Threats analysis and strategy	
Field equipment and maintenance	Record of protected area uses	
Staff facilities and visitor facilities		

systemwide strengths and weaknesses. Compared with other assessment elements, planning ranked as qualified strength across all four case studies. For the most part, protected area objectives provided for the protection and conservation of biodiversity; management plans and policies were consistent with those objectives; and protected area employees were generally familiar with the objectives. Furthermore, the protected areas were legally secure, and their siting was consistent with their objectives.

Weaknesses were not as consistent; a weakness in one country was often a strength in another. Table 6 includes all weaknesses that were found in any of the four countries, showing which weaknesses were directly related to financial resources, which ones were related to management practices and policies, and which were related to broad macro-level policies involving other sectors.

Like the threats discussed above, a handful of management weaknesses appear concurrently in the four case studies as well as in protected area literature. The study found weaknesses in five areas: (1) funding, (2) staffing, (3) research, (4) inventorying of biodiversity and threats, and (5) community relations. Addressing these weaknesses would probably go a long way toward improving not only the protected area systems in the four regions assessed but many other protected area systems as well.

Funding. Inadequate funding was a serious weakness for all the countries studied except Bhutan, which had established an environmental trust fund to cover recurring park costs. Throughout Russia, KZN Province in South Africa, and the FUY ecoregion of China, funding was not considered adequate to conduct critical management activities, defined as any management activities that prevent irreplaceable or unacceptable losses to natural or cultural resources. Inadequate funding has led directly to a raft of other management problems, including inadequate field equipment, transportation, and facilities. Underfunding of protected areas appears to be a systemic problem in other areas of the world; James and colleagues (2001) have documented that protected areas across Africa and Latin America are managed on less than US$150 per square kilometer (km^2), far less than the generally accepted US$250 per km^2 needed to adequately manage tropical parks.

Spergel (2002) identifies a variety of potential financing mechanisms for protected areas, including annual government allocations; park visitor fees, resource extraction, and hunting; taxes on property and gasoline; fines from illegal activities; carbon emissions trading; international donor contributions; conservation trust funds; and debt-for-nature swaps. However, in most cases, protected areas rely on one or at most two sources of revenue (e.g., fees from tourism in China, trust fund revenue and grants from international donors in Bhutan) rather than developing a comprehensive, long-term financial strategy. Such strategies are likely to become more important as protected areas are increasingly expected to pay for themselves or to become privatized.

Staffing. The major staffing weakness across the four protected area systems was number of staff. Lack of funding was the indirect cause of this shortfall, except in Bhutan, where restrictive governmental hiring policies and an inadequate pool of qualified applicants were the limiting factors. Inadequate staffing is not limited to the four case studies. Rao and colleagues (2002), for example, found that 5% of Myanmar's parks had no staff at all, while 40% had some staff but not enough to adequately perform management duties. Similarly, Singh (1999) reported that 10% of India's national parks and 13% of its wildlife sanctuaries did not have staff allocated to them. Numerous other studies (e.g., Brandon et al. 1998, Terborgh et al. 2002) corroborate that inadequate staffing is a widespread phenomenon in many protected area systems.

Research and monitoring. The inadequacy of research, including sociological, ecological, and threat-related research, was a weakness in all four protected area systems assessed. Equally troubling is the logical conclusion that data are not systematically used to inform management planning and decisionmaking. For example, while at least 60% of respondents in KZN Province answered "yes" or "mostly yes" to the statement "The results of research are routinely incorporated into planning," an equal number responded "no" or "mostly no" to statements about the adequacy of ecological research, social research, and means of collecting new data. The systemic lack of adequate data and research means that

protected area staff are unlikely to be able to test their assumptions, adapt their strategies, learn from their mistakes, or share their lessons—the hallmarks of effective, adaptive management (Salafsky et al. 2001). Inadequate research and monitoring efforts are not unique to the four regions assessed; indeed, many protected area systems, including those in the United States, face similar problems even though their resources are comparatively ample.

Natural resource inventories. Although the quality of natural resource inventories ranked as a weakness only in Bhutan, it was not a strength in the other three areas studied. In South Africa, for example, 40% of the respondents felt that natural resource inventories were inadequate because of, for example, incomplete data on threatened species, inappropriate map resolution, and nonexistent soil and vegetation maps (Goodman 2003). Moreover, many of the qualifying comments for a "mostly yes" response to the statement about natural resource inventories indicated that, while biodiversity inventories do exist, the vast majority of them are based on theoretical data (e.g., potential vegetation maps and probable species lists) rather than on ground-truth data (data based on observations or measurements made at Earth's surface). Rabinowitz (2002) noted this phenomenon when he described how conservation organizations had plans for saving Sumatran rhinos in Myanmar's Tamanthi National Park, even though ground surveys indicated the complete absence of rhino and the previously unknown presence of tigers, Asiatic leopards, and Asian elephants. Natural resource inventories that account for the full range of species within a park are rare; rarer still are those that account for the distribution, habitat, and processes of those species. Without a detailed and accurate natural resource inventory, a management plan is a mere chimera, and the management activities that flow from it are fanciful exercises in chasing paper rhinos.

Community relations. The three elements that related to community relations—community support of the park objectives, conflict resolution, and effective communication with local communities—had a lackluster performance in all four protected area systems. Bhutan, which showed the only strengths in this area, did so primarily because of its compensation program for livestock depradation and its extensive community outreach as part of an integrated conservation and development program. Nearly half the respondents in South Africa felt that communication with local communities was not effective. Although none of the assessments tested for a correlation between poor community relations and community-related threats (e.g., poaching and NTFP collection), a positive correlation would not be surprising. Jacoby (2001), for example, analyzes the intimate relationship between community relations and threats in three US national parks.

Conclusions

The bad news is that the assessments in Bhutan, China, South Africa, and Russia confirm what study after study has shown—that protected areas are indeed vulnerable to an array of threats and management weaknesses, many of them severe and debilitating. There is reason for hope, however. Many of the most prevalent and serious threats could, through sustained national and international cooperation, be prevented, mitigated, or reversed. A concerted policy effort to address the most pervasive and widespread threats—encroachment, tourism, logging, alien plant invasion, and poaching of animals and NTFPs—would probably result in significant improvements to protected area systems worldwide. Similarly, the most urgent management weaknesses—funding, staffing, research, natural resource inventories, and community relations—could be addressed with a modicum of resources, capacity building, and policy reform. The challenge is not the difficulty of improving the management effectiveness of protected areas; it is the will to take serious steps to do so.

The RAPPAM methodology is one of several tools recently developed to assess the management effectiveness of protected areas (see Hockings 2003). The primary aim of such assessments is to elucidate threats and management weaknesses, which can enable protected area managers to improve management practices and reduce threats. Increasingly, however, the results of protected area assessments are being used as lobbying and advocacy tools to increase governmental funding and public support for protected areas (Lemos de Sá et al. 2000), revise budget allocations and spending priorities (Goodman 2003), enhance civic participation in protected area decisionmaking (Tyrlyshkin et al. 2003), and promote governmental transparency and accountability (Tsering 2003). Ultimately, such steps may be as important for the long-term success of protected areas as improving management practices on the ground.

References cited

Brandon K, Redford KH, Sanderson SE, eds. 1998. Parks in Peril. Washington (DC): Island Press.

Diqiang L, Jianhua Z, Ke D, Bo W, Chunquan Z. 2003. China Case Study: An Assessment of the Management Effectiveness of Protected Areas in the Forests of the Upper Yangtze Ecoregion of China. Gland (Switzerland): World Wide Fund for Nature.

Ervin J. 2003. Rapid Assessment and Prioritization of Protected Area Management (RAPPAM). Gland (Switzerland): World Wide Fund for Nature.

Friedmann J. 1987. Planning in the Public Domain. Princeton (NJ): Princeton University Press.

Goodman P. 2003. South Africa Case Study: Protected Area Management Effectiveness Assessment in KwaZulu-Natal, South Africa. Gland (Switzerland): World Wide Fund for Nature.

Hockings M. 2003. Systems for assessing the effectiveness of management in protected areas. BioScience 53: 823–832.

Jacoby K. 2001. Crimes against Nature: Squatters, Poachers, Thieves, and the Hidden History of American Conservation. Berkeley: University of California Press.

James A, Kanyamibwa S, Green MJB. 2001. Sustainable financing for protected areas in sub-Saharan Africa and the Caribbean. Pages 69–88 in Anderson TL, James A, eds. The Politics and Economics of Park Management. New York: Rowman and Littlefield.

Jepson P, Momberg F, van Noord H. 2002. A review of the efficacy of the protected area system of East Kalimantan Province, Indonesia. Natural Areas Journal 22: 28–42.

Lemos de Sá R, Bensusan N, Ferreira L. 2000. NGOs and PA management agencies working together to assess protected area effectiveness: Successes, problems and prospects—the experience of WWF Brazil. Pages 303–310 in Rana D, Edelman L, eds. The Design and Management of Forest Protected Areas. Conference Proceedings for Beyond the Trees Conference, 8–11 May 2000, Bangkok, Thailand. Gland (Switzerland): World Wide Fund for Nature.

Li W, Han N. 2001. Ecotourism management in China's nature reserves. Ambio 30: 62–63.

Margules CR, Pressey RL. 2000. Systematic conservation planning. Nature 405: 243–253.

Putz FE. 1998. Halt the Homogeocene. The Palmetto 18 (1): 7–10.

Rabinowitz A. 2002. Ground truthing conservation: Why biological exploration isn't history. Conservation in Practice 3 (4): 20–25.

Rao M, Rabinowitz A, Khaing ST. 2002. Status review of the protected-area system in Myanmar, with recommendations for conservation planning. Conservation Biology 16: 360–368.

Rittel H, Webber MM. 1973. Dilemmas in a general theory of planning. Policy Sciences 4: 155–169.

Salafsky N, Margoluis R, Redford KH. 2001. Adaptive management: A tool for conservation practitioners. Washington (DC): World Wildlife Fund.

Satchell M. 1997. Parks in peril. US News and World Report 23 (3): 22–28.

Singh S. 1999. Assessing management effectiveness of wildlife protected areas in India. Parks 9 (2): 34–49.

Spergel B. 2002. Financing protected areas. Pages 364–382 in Terborgh J, van Schaik C, Davenport L, Rao M. Making Parks Work: Strategies for Preserving Tropical Nature. Washington (DC): Island Press.

Terborgh J, van Schaik C, Davenport L, Rao M, eds. 2002. Making Parks Work: Strategies for Preserving Tropical Nature. Washington (DC): Island Press.

Tsering K. 2003. Bhutan Case Study—Evaluation of Management Effectiveness in Four Protected Areas. Gland (Switzerland): World Wide Fund for Nature.

Tyrlyshkin V, Blagovidov A, Belokurov A. 2003. Russia Case Study—Management Effectiveness Assessment of Protected Areas Using WWF's RAPPAM Methodology. Gland (Switzerland): World Wide Fund for Nature.

van Schaik C, Terborgh J, Dugelby B. 1997. The silent crisis: The state of rain forest nature preserves. Pages 64–89 in Kramer R, van Schaik CP, Johnson J, eds. The Last Stand: Protected Areas and the Defense of Tropical Biodiversity. New York: Oxford University Press.

Wilcove DS, Rothstein D, Dubow J, Phillips A, Losos E. 1998. Quantifying threats to imperiled species in the United States. BioScience 48: 607–615.

Wilson EO. 1992. Biodiversity. Washington (DC): National Academy Press.