Reinventing the Commons: An African Case Study

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INTRODUCTION

Political scientist Elinor Ostrom writes that, over generations,

> Swiss and Japanese villagers have learned the relative benefits and costs of private-property and communal-property institutions related to various types of land and uses of land. The villagers in both settings have chosen to retain the institution of communal property as the foundation for land use and similar important aspects of village economies.[1]

Lest we think this institution must simply be a vestige of an earlier, more primitive culture, Ostrom adds:

> One cannot view communal property in these settings as the primordial remains of earlier institutions evolved in a land of plenty. If the transaction costs involved in managing communal property had been excessive, compared with private-property institutions, the villagers would have had many opportunities to devise different land-tenure arrangements.[2]

What is an optimal ownership pattern for contemporary societies? History is full of examples of people converting communally held land into private parcels.[3] How often do people voluntarily move the other way? Not often. On our most recent trip to South Africa, though, we were surprised to find a constellation of economic, ecological and cultural forces leading landowners voluntarily to convert private parcels into commons.[4]

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[1] ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION 61 (1990).

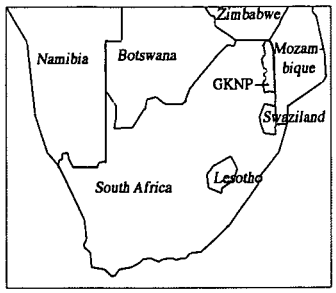
[2] *Id.*

[3] For several examples, see Robert C. Ellickson, *Property in Land*, 102 YALE L.J. 1315 (1993).

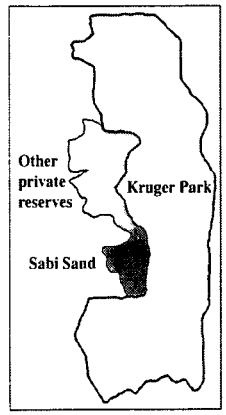
[4] For what it is worth, we were in Africa on other business, namely to meet Ian Whyte at Kruger Park. Ian was preparing an essay for a textbook we were editing. What we report in this essay was not what we were expecting to see. We did not conduct interviews

This essay treats South Africa's Sabi Sand Game Preserve as a case study of incentives and pressures that lead people to switch from one land ownership regime to another, in this case from private to communal management.

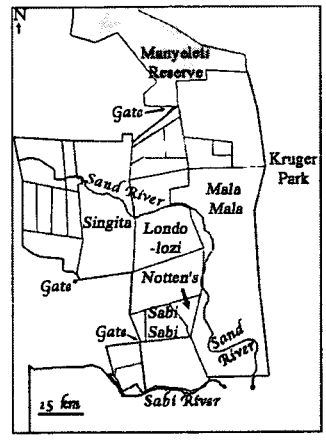
Figure 1



Location of Greater Kruger National Park (GKNP)



Location of Sabi Sand within GKNP



Map of Sabi Sand

I. PRESSURE FOR CHANGE

A. From Private Ranchers

What is now the Sabi Sand Game Preserve was once a patchwork quilt of privately owned ranches. Many of them tried at some point to raise cattle but ranching in the area was never very profitable. Hoof and mouth disease was a problem. The soil is not rich. Water is not plentiful. Predators abound.[5] The local customer base is limited and

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as we would have done had we been expecting from the start to find ourselves in the middle of an experiment in the conversion of land from private to communal management. We did, however, follow up with telephone and e-mail correspondence and have since found evidence that similar processes of converting private rangeland to jointly managed communal game preserves are not uncommon in southern Africa. We will return to South Africa in 2005 to continue this research. Meanwhile, we present this as a preliminary result.

[5] *See* Greenlife South Africa, *African Safari Web Site*, *at* http://www.e-gnu.com (last visted Oct. 10, 2003) (noting: "In the early 1900s attempts were made to substitute Mala

mostly cash-poor, and getting products to distant markets is not easy. Before the development of malaria prophylactics, no one wanted to live there during the wet season. Under the circumstances, ranchers were open to new ideas about how they might use their land more profitably.

The new idea was to use the land as a game preserve. According to Arend Lambrechts, "the most expensive rangeland in South Africa is the Sabi Sand Game Reserve."[6] Lambrechts estimates that the value of "prime privately owned wildlife habitat has increased by as much as 2500% during the last 20 years."[7] A PriceWaterhouse study of game reserves in Zimbabwe in 1994 said wildlife utilization could return 11% on capital compared to just 1% for cattle ranching.[8]

Although a given rancher might have seen this coming, it would have been hard for him to tap the tourism market on his own.[9] First, there is the "shopping mall" factor. While it may seem optimal for a single business to capture the entire demand for tourist amenities, a business often does better in the company of other businesses, even direct competitors, because only together are they a salient destination for potential customers. Second, there is also a cost-savings issue. While there is a grain of truth in the cliché that "good fences make good neighbors," erecting and maintaining fences is costly and labor-intensive. David Evans, business manager of Mala Mala, Sabi Sand's largest resort, says one of the issues leading to the formation of Sabi Sand was "the economy of scale of a larger community. Our 53 miles of fencing is substantially less than were we to be individually fenced. This is an enormous cost savings. So too is the issue of entrance gates, security at such gates, a single administrative structure, a common voice with authorities, etc. . . ."[10] Similar economies of scale provided a

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Mala's wildlife with cattle farming. A losing battle with lions and a constant struggle with wildlife, diseases and drought soon proved that it was not a viable option.").

[6] Arend Von W. Lambrechts, *Meeting Wildlife and Human Needs by Establishing Collaborative Nature Reserves: a Transvaal System, in* INTEGRATING PEOPLE AND WILDLIFE FOR A SUSTAINABLE FUTURE 37-40 (John A. Bissonette & Paul R. Krausman eds., 1995).

[7] *Id.* at 39.

[8] W. Krug, *The World Bank/OECD International Workshop on Market Creation for Biodiversity Products and Services, in* PRIVATE SUPPLY OF PROTECTED LAND IN SOUTHERN AFRICA: A REVIEW OF MARKETS, APPROACHES, BARRIERS AND ISSUES, 31 (Center for Social and Economic Research on the Global Environment, 2001). In addition to ecotourism, wildlife uses include safari hunting, subsistence hunting for meat and live game sales of meat and skins.

[9] To the best of our knowledge, all of the owners were male.

[10] Personal communication from David Evans to David Schmidtz and/or Elizabeth Willott (June 4, 2003).

rationale for medieval Europe's open field agricultural practices.[11] The institutions on their face have little in common, so it is interesting to find a similar logic in their emergence and persistence.

Some of the factors driving the emergence of a commons in Sabi Sand are historically unique, although hardly uncommon in contemporary sub-Saharan Africa. First, the physical scale of individual ranches was not ideal for tourism. Customers do not fly across the ocean for the experience of being in something that resembles a zoo. They want open space. They want their wildlife wild, not "potted." They want to see animals fending for themselves in a natural ecosystem, born to the land rather than stocked by owners. The kind of customer who flies to Africa tends to want reality, not the programmed experience of an amusement park. Second, the scale of the ranches was wrong for the animals. A parcel size optimal for a cattle ranch would tend to be too small for African megafauna. An elephant spends eighty percent of its life, day and night, eating. Adult elephants can eat five hundred pounds of forage per day. They need room. As we explain below, even Kruger National Park, massive as it is, is not a self-contained ecosystem.[12] In short, the parcels were scaled for cattle ranching. To succeed as commercial game preserves, the parcels had to get bigger.

B. From Kruger Park

Immediately to Sabi Sand's east is its massive neighbor, Kruger National Park. Sabi Sand is approximately 250 square miles (65000 hectares). Kruger Park is about 8000 square miles (two million hectares). Fencing separated Kruger Park and Sabi Sand since 1961. People at Sabi Sand say the fence was never their idea and people at Kruger Park say the same. Ian Whyte is the chief scientist in charge of large herbivore management at Kruger Park.[13] According to Whyte, the fence was mandated by the Animal Health Department, known then as Veterinary Services, to control the spread of disease from wildlife to livestock.

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[11] Ellickson, *supra* note 3, at 1390.

[12] Tangentially addressed in Ian Whyte et al., *Managing the Elephants of Kruger National Park*, *in* 1 ANIMAL CONSERVATION 77-83 (1998). *See also* Ian Whyte & Richard Fayer-Hosken, *Playing Elephant God: Ethics of Managing Wild Elephant Populations*, *in* NEVER FORGETTING: ELEPHANTS AND ETHICS (K. Christen & C. Wemmer eds.) (forthcoming) (on file with Smithsonian Press).

[13] Whyte, incidentally, is co-author of the birdwatcher's canonical field guide for the region. IAN SINCLAIR & IAN WHYTE, FIELD GUIDE TO THE BIRDS OF THE KRUGER NATIONAL PARK (1991).

Some of the owners of Sabi Sand and nearby Timbavati, though, had already dispensed with cattle and had been managing their land as private game reserves since the 1950s, and in some cases longer.[14] According to David Evans, Sabi Sand Wildtuin (an Afrikaner name meaning "wild place") formed as a conservation body with a written constitution in 1950. As interest in raising cattle waned, Sabi Sand began collectively to agitate for removal of the fences. Whyte and other Kruger Park officials were sympathetic because the larger the area, the closer it comes to being a self-contained ecosystem and the easier it is to manage.

There were two catches. First, for public relations purposes, commercial hunting would need to be prohibited before the private preserves could become part of Greater Kruger Park. Second, to satisfy the Animal Health Department, cattle would need to be separated from wildlife areas.[15] Commercial hunting in Sabi Sand ended by 1986, so the hunting issue was moot. Also, by that time, no livestock remained within Sabi Sand, so a boundary fence to Sabi Sand's west could serve the quarantine purpose originally served by the fence to Sabi Sand's east, between it and Kruger Park.[16] There was little cattle ranching immediately to the west of Sabi Sand but the preserve and the park had other reasons to erect the new fence to the west: to protect animals from poachers, and villagers from big cats and from crop-raiding animals such as hippo, rhino, and elephant. Meanwhile, Sabi Sand and Kruger Park were free to take down the fence between them and did so in 1993.[17]

II. THE RESULT

Sabi Sand, as part of Greater Kruger Park, is now a single, constitutionally governed management unit. Although individual parcel ownership is retained, restrictions are significant. There is an Executive Committee, consisting of eleven elected members, that meets every three months. There is an annual meeting to which each of the thirty-six properties sends a voting representative.[18] Each property has exactly one

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[14] Krug, *supra* note 8, at 24.

[15] E-mail from Ian Whyte to David Schmidtz and/or Elizabeth Willott (May 7, 2003) (on file with Elizabeth Willott).

[16] Personal communication from Gavin Hulett, Warden of Sabi Sand, to David Schmidtz and/or Elizabeth Willott (June 2, 2003).

[17] Krug, *supra* note 8, at 24, reports this as 1994, but in private correspondence, Ian Whyte confirms the 1993 date. Whyte notes, in Krug's defense, that Krug was relying on Whyte, who inaccurately reported the date as 1994 in his thesis.

[18] Personal communication from Gavin Hulett to David Schmidtz and/or Elizabeth Willott (June 2, 2003).

vote but each vote is weighted according to the size of the property that the vote represents.

There can be multiple owners of a given parcel. Parcels can be sold. They can be inherited. However, parcels cannot be developed for uses other than as part of a wildlife preserve. Gavin Hulett, the warden of Sabi Sand, says the land may not be subdivided into portions smaller than 856 hectares. Portions smaller than 856 hectares do exist but these were created before the subdivision clause was added to the constitution.[19]

The number of "beds" per resort is restricted to one bed per 150 hectares (just under two beds per square mile).[20] By limiting the number of beds — that is, the number of guests — Sabi Sand controls overall traffic on the land. Each owner, although constrained in terms of numbers of customers, freely decides what clientele he wishes to attract. Some resorts are extravagant while others are rustic. Most decisions about how to do business remain matters of private choice. If one prefers the experience of going without electricity, enjoying blissfully quiet evenings by candlelight at a relatively moderate price, one goes to a place like Notten's Bush Camp. If one wants world-renowned luxury, with a full bar, refrigerator, "his and hers" bathrooms, and a private swimming pool with each cottage, one goes to a place like Singita Private

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[19] E-mail from Gavin Hulett to David Schmidtz and/or Elizabeth Willott (n.d.) (on file with author). Interestingly, on details like this we often found that people said different things. One source said subdivisions were not allowed, another that properties could not be subdivided into parcels of less than two thousand hectares. For most resorts, it is not important to know the real terms in the constitution on such matters since they are not planning to subdivide; so presumably people remember how the constitution applies to their resort or to a nearby one, and hence misremembering the exact details of a rule ought to be considered normal.

[20] Personal communication from Gavin Hulett to David Schmidtz and/or Elizabeth Willott (June 2, 2003). There is an extra bed-tax if the number of beds exceeds one per 150 hectares. Like the above point, other people gave slightly different versions; all consistent with the idea that it should not be easy for a resort to regularly exceed carrying capacity in guests. Since the constitution can change, and is changing, the legal details are less important to most managers and resorts than that the practices of other resorts be appropriate. So their memory of the "rules" is likely to be inexact. We should expect the same for long-enduring commons. OSTROM, *supra* note 1, at 51. Ostrom notes the difference between formal laws and working rules, and focuses on working rules in her book. *See id.* We might expect that to be the case when few people are literate. However, even with high rates of literacy and when access to the written formal rules is easy, the formal rules may not be as important as custom. *See* ROBERT C. ELLICKSON, ORDER WITHOUT LAW: HOW NEIGHBORS SETTLE DISPUTES (1991) (standing as key work addressing importance of custom over legal rule in Twentieth century California agricultural communities).

Game Reserve or Mala Mala Game Reserve.[21] Each resort finds its own niche and its own clientele. Managers seem to regard each other with respect, privately voicing philosophical differences about the proper way to experience the bush but not regarding themselves as competing for the same pot of money.

Each resort offers two land rover safari tours per day — one at dawn, one at dusk.[22] Other than this, the animals are left in peace. Land rovers routinely leave their home resorts, touring neighboring lands for the sake of a change of scenery (and sometimes in response to hot tips from neighbors about special sightings — see "Matters of Scale" below). This requires a neighbor's invitation, and presupposes reciprocity, but understandings regarding mutual traverse tend to work out easily enough among neighbors. Pairs of neighbors do not need to involve the whole group of owners in day-to-day negotiations that are of interest only to them.

Resorts profit by showing animals in a more or less wild habitat so each resort has an incentive to preserve the land. By keeping its own land attractive to wildlife, a resort maintains its stock of wildlife and acts as a good neighbor, making sure it has something to offer in exchange for reciprocal access rights. There is little room for free-riding.

Management of wildlife is unobtrusive. The Preserve does not feed animals.[23] Feeding would make the animals dangerously and unattractively tame. However, individual owners are free to make sure that the waterholes do not run dry. Ecologically, the institution seems to be working (although see "Ongoing Problems" below). Lambrechts says the private preserves to the west of Kruger Park "contain virtually the full spectrum of wildlife that occurred in the area during historic times.

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[21] Mala Mala was judged the top hotel in the world by a *Travel & Leisure* magazine poll in 1997. *Conde Nast Traveller* judged Mala Mala the top resort in the world in 1996, as reported on Mala Mala's web site, *at* http://www.malamala.com/accolades.htm (last visited Oct. 10, 2003). In 2001 and again in 2002, *Harper's Hideaway Report* judged Singita to be the top international resort under fifty rooms, as reported on Singita's web site, *at* http://www.singita.co.za (last visited Oct. 10, 2003); Piers Fuller, *Lodge stays in world's best list*, WAIRARAPA TIME-AGE, Sept. 4, 2002, *available at* http://times-age.co.nz/news2002/020904b.html (last visited Oct. 10, 2003).

[22] The animals are most active early morning and around dusk, so this practice makes sense.

[23] We have read of one exception, in the mid-1980's, concerning a female cheetah that wounded her foot in a poacher's trap. Five cubs relied on her. By agreement of Sabi Sand owners, she was temporarily fed so these six rare animals could survive. *See* N. Seijas & F. Vorhies, *Private Preservation of Wildlife: A Visit to the South African Lowveld*, FREEMAN, Aug. 1989, *available at* http://www.theadvocates.org/freeman/8908seij.html (last visited Oct. 11, 2003).

The contribution of the three largest and oldest collaborative nature reserves (i.e., the Sabi Sand, Timbavati, Klaserie) to nature conservation is evident."[24] Our personal experiences confirmed that the diversity of wildlife at Sabi Sand is astounding.

III. WHY?

To explain why Sabi Sand's property institutions evolved as they did, we begin with a general discussion of why communal regimes tend to evolve into private ones then apply the same logic to questions about why Sabi Sand went the other way. We then consider problems that owners of Sabi Sand face as a consequence of going communal. We discuss how successful communes historically faced similar problems, and found analogous solutions.

A. Why People Privatize

The trend toward land privatization is driven by a collision of economic and ecological forces. Private ownership of land often is the best way to prevent overgrazing. An unregulated commons is a recipe for economic and ecological waste. As the level of use exceeds the land's carrying capacity, which is the level of use that the land can sustain indefinitely, the land will be degraded.[25] When access to a pasture is unregulated, an individual herdsman has little incentive and little opportunity to conserve the pasture. Regardless of what an individual herdsman does, the resource is being depleted by unregulated numbers of unregulated users. Accordingly, private ownership often is offered as the solution to the so-called "tragedy of the commons."[26] Private

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[24] Lambrechts, *supra* note 6, at 39.

[25] The concept of carrying capacity is somewhat problematic. Obviously, it points to something real, because there really are limits to what the land can support. On the other hand, such limits are not fixed. Carrying capacity is somewhat fluid, and is a function of many variables. Whether Kruger Park can carry fifteen thousand elephants, for example, depends on whether we want to leave room for rhinos, which is not simply an ecological issue.

[26] Garrett Hardin, *The Tragedy of the Commons*, 162 SCI. 1243 (1968), *reprinted in* ENVIRONMENTAL ETHICS: WHAT REALLY MATTERS, WHAT REALLY WORKS 331-40 (David Schmidtz & Elizabeth Willott eds., 2002). The phrase "the tragedy of the commons," refers to the idea that in an unregulated commons, the level of use eventually *will* exceed carrying capacity. *Id.* The phrase was invented by Hardin, although Hardin credits the idea to Lloyd. *Id.*; *see* W. F. LLOYD, TWO LECTURES ON THE CHECKS TO POPULATION (1833). H. Scott Gordon also did much to develop the idea. *See* H. Scott Gordon, *The Economic Theory of a Common-Property Resource — The Fishery*, 62 J. POL. ECON. 124 (1954); *see also* THOMAS MALTHUS, ESSAY ON THE PRINCIPLES OF POPULATION AS IT AFFECTS THE FUTURE

ownership gives an owner a right to exclude. By conferring a right to exclude, the system gives an owner the opportunity to conserve a resource. In giving such an opportunity, the system also provides an incentive, because whatever owners save, they save for themselves.

The tragedy of the commons is one version of a more general problem of externalities. An externality, also called an "external" or "spillover" cost, is that portion of the cost of a decision borne by someone other than the decisionmaker. One purpose of property institutions is to "internalize" externalities, preventing people from shifting the cost of their activities onto others. Private property is among the preeminent institutions developed for the purpose of internalizing externalities.

Ideally, property regimes should evolve, internalizing externalities as they become significant — both "positive" externalities associated with productive effort and "negative" externalities associated with misuse of commonly held resources. A system is more likely to be economically and ecologically sustainable when people profit from their productivity and when they pay for their own — and not their neighbors' — mistakes.

For a real-world example of an unregulated commons evolving into a regime of private parcels as increasing traffic began to exceed carrying capacity, consider economist Harold Demsetz's classic account of how property institutions evolved among indigenous tribes of the Labrador Peninsula.[27] As Demsetz tells the story, the tribes had, for generations, successfully used the land as an unregulated commons. The human population was small. People had plenty of small game to eat. The resource base maintained itself. The unregulated commons worked as long as the pattern of exploitation stayed within the land's carrying capacity. With the advent of the fur trade, however, the scale of hunting and trapping escalated. Game populations began to dwindle. The unregulated commons that had worked for a time was now heading for a tragedy.

In response, tribal members began to mark out family plots. The game animals in question were small animals like beaver and otter that tend not to migrate from one plot to another. Thus, marking out plots

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IMPROVEMENT OF SOCIETY (T. Bensley ed., 1803); David Schmidtz & Elizabeth Willott, *The Tragedy of the Commons, in* BLACKWELL COMPANION TO APPLIED ETHICS 662 (R.G. Frey & Christopher Wellman eds., 2003).

[27] Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. at 347 (1967). Our discussion of Demsetz largely is borrowed from David Schmidtz, *The Institution of Property*, in ENVIRONMENTAL ETHICS: WHAT REALLY MATTERS, WHAT REALLY WORKS 361-72 (David Schmidtz & Elizabeth Willott eds., 2002), *originally published in* 11 SOC. PHIL. & POL'Y 42 (1994).

effectively privatized small game along with the land. In sum, tribes converted the commons in non-migratory game to family parcels as the fur trade began to spur a rising demand that exceeded the land's carrying capacity.

The example shows that people are capable of seeing when they have a commons problem and of responding with judicious institutional change. At the same time, we do not want to paint an overly rosy picture of human history. By no means do things always turn out well. Waves of extinctions of megafauna occurred in the Americas around twelve thousand years ago, at the same time as waves of humans were arriving. There are places where American tribes, before acquiring guns and horses and becoming able to hunt more selectively, hunted bison by stampeding whole herds over the edge of a cliff. (The Blackfoot name for one such place translates as "Head-Smashed-In Buffalo Jump.")[28] So we accept the warning of legal scholars Dukeminier and Krier against forming "an unduly romantic image of Native American culture prior to the arrival of 'civilization.' There is considerable evidence that some American Indian tribes, rather than being natural ecologists who lived in respectful harmony with the land, exploited the environment ruthlessly by overhunting and extensive burning of forests."[29]

Labrador's successful privatization of fur-bearing game had an interesting nuance. Although fur was privatized, meat was not. There was still plenty of meat, so tribal law allowed people to hunt for meat on each other's land. Unannounced visitors could kill a beaver and take the meat, but had to leave the pelt, prominently displayed to signal that they had eaten and had respected the owner's right to the pelt. Demsetz observes that when people voluntarily change land management customs, changes tend to go to the heart of the problem. People privatize what has to be privatized, leaving intact liberties people had always enjoyed regarding resources with respect to which unregulated access was not a problem.[30]

One lesson of Sabi Sand is that the point of changing only what needs changing goes both ways. When private owners have reasons to switch to a form of collective management and cannot institute more sweeping

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[28] Head-Smashed-In is near Fort MacLeod, Alberta, which is near the city of Calgary where we both grew up. According to the Head-Smashed-In Interpretive Centre, it is one of the oldest and best preserved of such sites. *Head-Smashed-In Buffalo Jump Interpretive Centre* web site, *at* http://www.head-smashed-in.com (last visited Oct. 10, 2003). Many such buffalo jumps have been found across the western plains.

[29] JESSE DUKEMINIER & JAMES E. KRIER, PROPERTY 62 (1993).

[30] See Demsetz, *supra* note 27.

changes by force, they do not fix what "ain't broke." Needing to achieve consensus, their changes tend to be conservative, communizing only what needs to be communal to solve the problem. In creating Sabi Sand Preserve, what needed to be communal was land management, for all the reasons mentioned in Part I. There was no need to share land rovers or guests. The advantages of communal management are limited, so at Sabi Sand, communal management was implemented in a judiciously limited way.

B. Matters of Scale [31]

Not all problems are of equal scale; some are more local than others. As a problem's scale changes, there will be corresponding changes in which responses are feasible and effective. An individual sheep eating grass in the pasture is what we might call a "small event," an event that affects only a small area relative to the prevailing parcel size. If the commons is being ruined by small events, there is an easy solution: cut the land into parcels. We see this solution everywhere. If we can divide the land into parcels of a certain size, such that the cost of grazing an extra sheep is borne entirely by the individual owner who decides whether to graze the extra sheep, then we have internalized externalities and solved the problem. If we divide the pasture into private parcels, then what a particular sheep eats on a particular owner's pasture is no one else's concern. The grass is no longer a common pool. People may ruin their own land but they do so at their own expense. Whatever problems remain, the commons problem has been solved.

For better or worse, events come in more than one size. For the sake of example, suppose six parcels are situated over a pool of oil in such a way that, via oil wells, each of the six owners has access to the common pool. The more wells individual owners sink, the more oil they can extract, up to a point. As the number of wellheads goes up, oil pressure per wellhead declines. Not only is the amount of oil ultimately fixed but the amount of it that is practically extractable eventually begins to decline with the number of wells sunk. Past a point, we no longer have a situation in which what individual owners do on their property is of no concern to other owners. Instead, the six owners become part of a "medium event," a kind of problem that neighbors cannot solve simply by putting up fences. This kind of problem occurs when an event is too

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[31] This section is inspired by and substantially borrowed from Ellickson, *supra* note 3, along with Demsetz. *supra* note 27.

large to be contained on a single parcel, does not have a precise and confined location or migrates from one location to another. For one reason or another, the event is large enough to have effects beyond the immediate area. In a regime of private parcels, the event is large enough that its effects spill over onto neighboring parcels.

Nevertheless, even here privatization has advantages. First, it immediately restricts the number of potential users, to six neighbors in the oil pool example, thereby avoiding a potential avalanche of transient users whose only concern is to extract whatever they can from the common pool in the short term. The resource is jointly controlled by a handful of people who own parcels in the immediate area of the medium event. There may be no easy way to privatize the underground pool of oil, unless one of the six owners is rich enough to purchase the other five parcels. Failing that, the group sharing the common pool needs to develop conventions governing their respective rights to drill and extract oil. The smaller and more stable the membership of the group, the better their chances will be.

Suppose we are dealing with a larger problem, an externality with far-flung negative effects dispersed among people who do not have face-to-face relationships. If someone is refining oil via an industrial process that affects air or water quality for miles around, this is a "point source" externality, more or less easily traced to a single emitter. If people are driving gas-powered automobiles in large enough numbers to foul the air, then we are dealing with a dispersed cause as well as a dispersed effect. In either case, we face what legal scholar Robert Ellickson calls a "large event."[32] All property regimes struggle with the difficulty of detecting such large externalities, tracing them to their source, and holding the right people accountable.

It is not easy to devise institutions that encourage polluters to take responsibility for their actions while at the same time also encouraging everyone else to take reasonable steps to avoid being harmed by large-scale negative externalities. Ellickson says private regimes are clearly superior as methods for minimizing the costs of small and medium events. When it comes to large events, though, there is no general answer to the question of which mix of private and public property is best.

In an unfenced commons, there is in effect only a single parcel, so the words "small," "medium" and "large" would refer simply to the radius over which the effects of an event are felt, that is, small, medium or large

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[32] *See* Ellickson, *supra* note 3.

parts of the whole parcel. In a regime that has been cut into smaller parcels, the more interesting distinction is between a small event that affects a single owner, a medium event that affects immediate neighbors, and a large event that affects remote parts of the community. In a regime that is divided into parcels, whether an event is small, medium, or large will depend on the size of the parcels. For example, loud music is a medium event in an apartment complex but a small event on an isolated ranch. Whether a regime succeeds in internalizing externalities will depend on whether it succeeds in carving out parcel sizes big enough to contain those events whose effects it is most crucial to internalize. If the parcel size can be increased without limit, then any event can be made "small." A single owner could have purchased all of Sabi Sand and run the preserve as a single large business. In that limiting case, all events within the reserve would be small in the technical sense, with externalities fully internalized. Given two dozen owners who had no interest in selling, though, the situation required the sort of cooperation that characterizes medium event management.

Sabi Sand's owners continue to manage their property as a set of privately owned parcels in the sense that is relevant for responding to small and medium problems. Neighbors are expected to handle their own affairs and to negotiate with each other on matters of common concern. Individual resorts have problems of their own (i.e., small problems) or problems in concert with immediate neighbors (i.e., they jointly face medium problems). In order to make decisions in the easiest and most informal way, neighbors minimize the number of owners involved in any given decision. They let small events remain small and they avoid turning medium events into large ones.

In particular, agreements between neighbors that allow guests to tour neighboring properties benefit both neighboring property owners and their guests. The degree of cooperation in this matter is impressive. If a neighbor has just seen a pride of lions run down a wildebeest, he will treat his own guests to the spectacle, at the same time contacting one or two neighbors by walkie-talkie to let them know he will drive off in a few minutes and they are welcome to come and take a look at the feasting lions. This is made easier by the fact that all land rovers are presumed to be touring at the same time. If access is negotiated between neighbors rather than at the preserve level, owners retain rights to regulate access on an ad hoc basis. Neighbors form agreements more readily and fall out of agreement when that is appropriate. Incentives to cooperate and opportunities to coordinate are retained. Thus the

tendency to bureaucratize is minimized.[33]

C. Patterns of Successful Communal Management

Privatization is one, but only one, solution to the tragedy of the commons. Many medieval commons lasted, non-tragically, for hundreds of years. Open-field agricultural practices of medieval times often gave peasants exclusive cropping rights to scattered thin strips of arable land in each of the village fields. The strips were private only during the growing season, after which the land reverted to the commons for the duration of the grazing season.[34] Thus, ownership of parcels was "usufructuary" in the sense that once the harvest was in, ownership reverted to the common herdsmen without negotiation or formal transfer.[35] The farmer had an exclusive claim to the land only so long as he was using it for the purpose of bringing in a harvest. The scattering of strips was a means of diversification, reducing the risk of ruin from a small fire, pest infestation, or other disaster. The post-harvest commons in grazing land exploited economies of scale in fencing and herd-tending. The scattering of strips also made it harder for a communal herdsman to position livestock exclusively over his own property, thus promoting more equitable distribution of manure (i.e., fertilizer).[36] "Customary use of the medieval commons had been hedged with restrictions limiting depletion of resources,"[37] prohibiting activities inconsistent with the land's ability to recover. In particular, the custom of "stinting" allowed villagers to own livestock only in proportion to the relative size of their (growing season) land holdings, thus maintaining the total livestock at a level consistent with estimates of the land's carrying capacity.

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[33] Individual partners face a tradeoff when decision making falls to the group as a whole: they gain a measure of control to the extent that other partners need to get their consent before doing anything, and lose control to the extent that they too need to get consent before doing anything.

[34] Ellickson, *supra* note 3, at 1390.

[35] For an excellent discussion of this and other ideas related to the issue of adverse possession, see Carol Rose, *Possession as the Origin of Property*, 52 U. CHI. L. REV 73, 73-88 (1985). A "usufructuary" right is an entitlement that persists only so long as the owner is using an item for its customary purpose. *See id.* For example, you establish a usufructuary right to a park bench by sitting on it, but you abandon that right when you leave.

[36] Ellickson, *supra* note 3, at 1390.

[37] Carol Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 U. CHI. L. REV. 711, 743 (1986).

Elinor Ostrom describes a Swiss commons whose written records date back to the thirteenth century.[38] Cattle are privately owned but graze in communal highlands in the summer. People grow private crops on individual plots in the valleys, intending to use part of their crops to sustain their cattle over the winter. The basic limitation on communal summer grazing is that owners can send only as many cattle to the highland meadows as their private land parcel can sustain over the winter, with fodder grown during summer.

The arrangement solves the central problem of how to prevent overgrazing: how to govern decisions regarding herd size. Allowing individual owners freely to decide whether to add to their individual stock is above all what governors of a commons cannot do. In order to avoid tragedy, governors of a common pasture must manage the overall livestock population, based on their estimate of the pasture's overall carrying capacity. To manage overall numbers, communal managers must constrain individual decision making. There are several ways to do this. Managers can allow a given owner to graze cattle on common land only in proportion to: (a) how much hay he produces, (b) what proportion of the land belongs to him, or (c) the number of shares he owns in the cooperative.

Whatever institutions people create must be able to respond to change. Suppose people discover some way to increase crop yields in the valley, increasing their ability to produce winter fodder. As a consequence, the valley's winter carrying capacity rises but the highland's summer carrying capacity does not. In that case, the rule tying summer grazing rights to winter feeding capacity no longer works; it has become a prescription for summer overgrazing. Managers of the highland meadow will need to change the rule for allocating grazing rights.

Ostrom writes, "All of the Swiss institutions that used to govern commonly owned alpine meadows have one obvious similarity — the appropriators themselves make all major decisions about the use of the common property resource. . . . Thus, residents of Törbel and other Swiss villages who own communal land spend time governing themselves. Many of the rules they use, however, keep their monitoring and other transactions costs relatively low and reduce the potential for conflict."[39] The lesson is twofold: Successful commons are: (1) flexible and (2) under local control. Rules sometimes need to change in response

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[38] OSTROM, *supra* note 1, at 61.

[39] *Id.* at 65.

to circumstances and local people know what needs changing locally.[40]

D. Of Sheep and Ecotourists

In the medieval commons, a basic resource, land, was held in common. Individual members remained, in a sense, private businessmen — private owners of their livestock. The parallel with Sabi Sand is that a basic resource, land and its wildlife, is managed as a common unit while the business per se remains private. Each individual business within Sabi Sand has its own "flock" of guests. Thus, the analog at Sabi Sand of privately owned but communally grazing sheep is the customer, not the wildlife. In the medieval case, sheep graze the land and owners profit on a per sheep basis. At Sabi Sand, customers "graze" on wildlife (and other features of the land) and owners profit on a per customer basis.

In the Swiss commons, "No citizen could send more cows to the Alp than he could feed during the winter."[41] Similarly, no partner in Sabi Sand unilaterally decides how many customers to "graze" on the preserve. The problems differ in detail, but the logic is the same. Partners recognize an imperative to avoid the tragedy of the commons and in each case do so by taking the option of overgrazing out of the hands of individual partners. In the case of Sabi Sand, this means Executive Committee decisions about carrying capacity — in particular, the land's capacity to carry guests without long-term degradation. On the medieval common, this meant deciding when overgrazing would affect flocks to the point where a head of sheep would be worth less. The parallel at Sabi Sand: at what point will overgrazing by guests begin to reduce a prospective customer's desire to visit Sabi Sand?

IV. KEYS TO SUCCESS

In writing of the keys to long-term survival of any common pool resource, Ostrom lists several principles. In particular:

> 1. Boundaries are well-defined both physically and in terms of people. The resource is clearly delimited. Insiders who do have a right to access a resource are clearly distinguished from outsiders who do not.

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[40] *Id.* at 62. In some cases, the recorded history of these legal arrangements and their changes dates back to the 1200s.

[41] *Id.* at 62 (citing R. Netting, *What Alpine Peasants Have in Common*, 4 HUM. ECOLOGY 135, 139 (1976)).

2. Rules are sensitive to local conditions.

3. Users get involved in monitoring each other.

4. Users generally can participate in modifying operational rules.[42]

Sabi Sand's owners have faced many of the same problems as communal herdsmen of medieval Europe and have developed many of the same solutions. According to economist Wolf Krug, the general reasons for the success of private reserves include: efficient monitoring of wildlife stocks, well-trained staff, and high levels of investment in anti-poaching measures.[43] Although Krug speaks of the contributions a well-trained staff can make to the success of private reserves, we should not confuse training with professional certification. Many of the people at Sabi Sand with whom we talked acknowledged invaluable contributions by natives who grew up in the bush.

Time spent in classrooms is time not spent developing one's capacities to hear, smell, see, and integrate one's learning about the bush. A bush-savvy local staff helps maintain connections with local villagers, which minimizes poaching. If a manager discreetly learns that the impala snared a few days ago was eaten by a desperately poor family, it makes a difference in how the case is handled. The manager can decide to look the other way, hoping the motivation is limited by the poacher's need. In contrast, poaching a rhino for its horn is more or less a declaration of war; if the reserve does not defend itself from those seeking rhino horns for world markets, it will be overrun. So some poaching of small game by neighboring villagers is tolerated but Sabi Sand's perimeter is designed to minimize the costs of excluding and monitoring would-be poachers while maximizing the area for wildlife and wildlife observation.

There is no fence at the boundary with Kruger Park or with Manyeleti Preserve, a private reserve to Sabi Sand's north that is also part of Greater Kruger National Park. [See Figure 1.] A perimeter fence remains or was installed on other boundaries. Main roads at times follow this perimeter. Visitors are exposed to a minimum of fences and traffic while on safari, thereby enhancing the safari experience. Land alongside the fence and road also serves as a firebreak — it is cleared and sometimes burned. The fence is hardly impenetrable but getting through it takes work. The clearing of perimeter land, together with strategic

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[42] *Id.* at 61.

[43] Krug, *supra* note 8, at 25.

placement of roads, makes trespass easier to spot; breaches of the fence are likely to be spotted by the next vehicle coming along the road. The perimeter road thus reduces trespass and poaching in the preserve.

The main boundary road is packed dirt, suitable for rental cars and wide enough to leave room for passage of oncoming traffic. Narrow internal roads branch from the main boundary road allowing access to individual resorts. These may be shared by a few neighbors. The main purpose of sharing is to minimize the land that roads consume but sharing also facilitates contact among neighbors. There are also internal tracks suitable for land rovers so that there is limited off-track movement. However, the land here evolved to withstand elephants and can handle occasional rover use. We saw a mild degree of visible degradation in 2001 (flattened grass and shrubs) but were told it was from elephants, not land rovers. The animals themselves use the roads; walking along the road is easier and quieter than wading through thickets. Roads thus minimize wear and tear on the land by providing established trails not only for vehicles but also for megafauna.

Although hunting is banned at Sabi Sand, if an animal is seriously injured, it can be killed.[44] If there is time, a veterinarian is consulted before the animal is killed; if not, a veterinarian certifies after the killing. We asked one resort manager whether the hunting ban was absolute or whether a wealthy would-be hunter could get away with bribing a particular owner or tour guide to look the other way. The manager said no resort would ever risk that. If discovered, there would be legal penalties and there would be little chance of avoiding discovery given the constant observation of neighbors. The system thus discourages defection.

Regular scheduling of land rover tours, at dawn and dusk, means animals know when rovers are coming, owners know when rovers are expected, and everyone knows something is wrong if rovers are heard when or where they shouldn't be. Everyone knows they should never hear gunshots.[45] So monitoring becomes simpler. As one manager said, "There are too many eyes and ears to make illegal hunting much of an

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[44] Personal communication from Gavin Hulett to David Schmidtz and/or Elizabeth Willott (June 2, 2003). Hulett reports one exception. In 2001, a male cheetah broke its leg. Unable to hunt, it would have died. Since cheetah are endangered, and since it could still serve in the cheetah gene pool, this cheetah was sent to the De Wildt Cheetah Breeding Station.

[45] Poachers often hunt with snares, not rifles, though. Snare-hunting is quiet, uses only inexpensive materials, and does not require a lot of time on the part of the poacher. It is also a ghastly way for an animal to die.

option." Indeed, guests pay to be the eyes and ears! Internal monitoring problems often are the downfall of communal managers, but at Sabi Sand, internal monitoring is part of the package that resorts are selling.

Knowledge is a prerequisite for successfully managing the preserve's ecosystem. Day-by-day observations supplemented by high technology such as remote sensing or aerial photography can help managers gauge an ecosystem's long-term viability. To do this well, one wants collaboration between bush-savvy people and high-tech scientists. Note that hiring people who know and love the land is not enough. Also needed are employees who know and love people — who can run resorts and interact well with villagers outside the park. The preserve needs to understand its customer base, so it needs to understand marketing and sociology.

Different resorts use different strategies for catering to guests, hiring staff, and long-term monitoring of wildlife. Some of these strategies will work, some will not. But the temporary failure of one resort need not jeopardize the whole preserve. Failure of one resort can remain a small problem. Resorts that do not adequately monitor ecosystem sustainability may (perhaps quickly) become less profitable but they need not take the rest of Sabi Sand down with them. Conversely, if they have a new idea, they need not wait for everyone else to be convinced. They can go ahead and experiment, and if the experiment goes well, other owners can imitate. Some managers know the local ecology. Others are newly emerged from management schools and know next to nothing about the bush. That will be fine if other staff are knowledgeable and if a manager respects their knowledge. Little is locked in place. The system at Sabi Sand has room to evolve and thus to endure.

V. PROBLEMS

A. External Problems

Several obstacles limit private investment in sub-Saharan wildlife conservation. There are perverse economic and political incentives as well as difficult legal and social problems to overcome. For example, the South African government subsidizes cattle ranching while the European Community guarantees quotas of imported beef at above market prices.[46] It is hard to imagine the South African government subsidizing cattle

[46] Krug, *supra* note 8, at 32.

ranching to a point where Sabi Sand would be tempted to abandon ecotourism in favor of cattle. Still, people elsewhere are making a living as ranchers. Subsidies keep them in business when market price signals otherwise might be tempting them to turn their land over to wildlife conservation.

Problems also arise from the lack of an appropriate legal framework, especially a lack of secure property rights, for the wildlife business. The problem is most acute in Zimbabwe but as managers of Sabi Sand are aware, there is no guarantee that such problems will not spill over into South Africa. The manager at Singita said his family fled political oppression and civil war in Zimbabwe when he was a child. Just before we visited Singita in 2001, some of his Zimbabwean cousins needed to flee to relative safety in South Africa with only one suitcase each. With that kind of uncertainty, people may choose not to make long-term investments, such as developing the kind of infrastructure necessary to profitably convert from ranching to game preservation.

David Evans says that at present, Sabi Sand is facing claims of people who say they were there first and that they were displaced. Evans says current owners can (with one exception) trace their claims back to Crown grants in 1869. Moreover, it is generally acknowledged that the area was only sparsely and intermittently inhabited before then on account of the prevalence of malaria. The law allows claims for reparation going back only to 1913. Thus, Sabi Sand appears to be on solid legal ground. Still, the law is only as solid as a ruling party's respect for it. Most of Sabi Sand's owners are confident in the current regime but history has not been kind to Africa. Like all Africans, Sabi Sand's owners know that things can change with little warning.

A third kind of problem involves social pressures created by international wildlife groups and restrictions on international trade in wildlife products, which reduce a reserve's profit opportunities.[47] When hunting is not allowed, not even to control overpopulation, profits drop. When ivory sales are banned, profits drop. When trade in meat and other wildlife products is not allowed, profits drop. One lesson of wildlife conservation efforts in Africa is that we can go too far trying to preserve nature *sans* people. Unable to profit from wildlife because they were defeated by animal rights groups insufficiently sensitive to local ecology (including human ecology), rural people who could have made a good living from wildlife instead drive the wildlife off their land to make

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[47] *Id.*

room for (relatively unprofitable) crops and cattle.[48]

David Evans notes that Mala Mala is storing ivory, rhino horn, and other wildlife products, collected from animals that died on its land, pending the lifting of CITES bans on the trade of such products.[49] Evans argues that the ban ought to be lifted, perhaps on the condition that revenue from sales be used to acquire additional land for wildlife reserves.[50]

B. Incentives to Solve External Problems

There are ecological reasons why legislators would want to solve these problems. Lambrechts says that as of 1993, the Transvaal region had about 2.5 million hectares of national and provincial parks and 4 million hectares of private reserve. The latter figure is over 17% of the region's total land area.[51] Given other pressing problems, such as AIDS, illiteracy, and unemployment, little prospect exists for devoting further government resources to biodiversity. At the very least, private conservation is strongly complementing governmental efforts.

There are also economic reasons for solving these problems. Private wildlife preserves such as the properties of Sabi Sand often are primary employers. Mala Mala properties, owning over a quarter of the land within Sabi Sand, has three lodges, which Lambrechts estimates employ a staff of 220, 190 of whom, with an estimated 2,000 dependents, come from surrounding rural communities. Lambrechts adds, "Although accurate figures are impossible to obtain, the number of individuals employed within the private sector wildlife industry in Transvaal is estimated at 12,000, with 100,000 dependents."[52]

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[48] *See* RAYMOND BONNER, AT THE HAND OF MAN (1993), *a relevant excerpt is reprinted in* ENVIRONMENTAL ETHICS: WHAT REALLY MATTERS, WHAT REALLY WORKS 306-19 (David Schmidtz & Elizabeth Willott eds., 2002). For further commentary on the philosophical issues, see David Schmidtz, *When Preservationism Doesn't Preserve*, 6 ENVTL. VALUES 327, 327-39 (1997), *reprinted in* ENVIRONMENTAL ETHICS: WHAT REALLY MATTERS, WHAT REALLY WORKS 320-29 (David Schmidtz & Elizabeth Willott eds., 2002).

[49] E-mail from David Evans to Elizabeth Willott (June 2, 2003).

[50] *Id.*

[51] Lambrechts, *supra* note 6, at 38, table 1. The former Transvaal Province has since been split into the Limpopo (or Northern), Northwest, Gauteng, and Mpumalanga Provinces.

[52] *Id.* at 39. Anna Spenceley and Jennifer Seif estimate that Sabi Sabi Resort employs 60 local villagers who support 460 residents of the village (Huntingdon, population 6500) located just outside Sabi Sand; Sabi Sabi Resort is but one of many employers in Sabi Sand. *See* ANNA SPENCELEY & JENNIFER SEIF, STRATEGIES, IMPACTS AND COSTS OF PRO-POOR TOURISM APPROACHES IN SOUTH AFRICA 14 (Pro-Poor Tourism Working Paper No. 11, Jan. 2003), *available at* http://www.propoortourism.org.uk/ppt_pubs_workingpapers.html (last

C. A Huge Internal Problem: Too Many Elephants

Greater Kruger Park is home to several endangered species, including rhinoceros and cheetah. The rhinoceros is threatened by an overabundance of elephants since the elephants consistently out-compete the rhinoceros for forage. Elephants are bigger, smarter, and socially organized in a way that is beyond the rhinoceros. There is a bit of a biological mystery here. Accurate records from Kruger National Park and elsewhere in southern Africa indicate elephant populations increase roughly five to seven percent per year in the absence of human killing.[53] What can account for these high rates of increase? Why isn't everything else in Africa (or for that matter, in other parts of the world historically populated by elephants and their ancestors) already extinct? What normally controls elephant populations?

In North America, humans are what we call an exotic or introduced species. Although the figure is debated, large populations have been in North America for approximately twelve thousand years. We typically see nature as something separate from humans and as something that would carry on nicely but for human interference. That may be true in North America but it is not true in Africa. Humans appeared in Africa about five million years ago.[54] Elephants also appeared in Africa about five million years ago.[55] Humans and elephants co-evolved. Humans have hunted elephants for a long time, since before humans and elephants evolved to become what they are today.

Elephants are too big, too smart, and too well organized for a feline predator, even a lion, to have much chance of taking a baby elephant, unless a herd is disrupted. We have no evidence of elephants ever being routinely hunted by any species other than humans. Just as in North America, where exterminating wolves and cougars caused deer and elk populations to explode, so too in parts of Africa where hunting by humans has been stopped, elephant populations have exploded. Without its keystone predator, any ecosystem is unstable. We can let

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visited Oct. 10, 2003).

[53] A minimum of five percent increase is reported in the unpublished internal memorandum, S.C.J. Joubert, Master Plan for the Management of the Kruger National Park: National Parks Board Conference, Skukuza, Republic of South Africa 1-23 (1986), *cited in* R.A. Fayrer-Hosken et al., *Contraceptive Potential of the Porcine Zona Pellucida Vaccine in the African Elephant (Loxodonta africana)*, 52 THERIOGENOLOGY 835 (1999). Kruger National Park's elephant population was increasing at an average of 7-8% annual growth rate. Victoria Butler, *Elephants: Trimming the Herd*, 48 BIOSCIENCE 76 (1998).

[54] Michael D. Lemonick & Andrea Dorfman, *Up From the Apes: Remarkable New Evidence is Filling in the Story of How We Became Human*, TIME, Aug. 23, 1991, at 50.

[55] PETER JACKSON, ELEPHANTS AND RHINOS IN AFRICA: A TIME FOR DECISION 15 (1983).

natural processes control impala populations but if we ask why we cannot likewise let natural processes control elephant populations, the answer is that, when it comes to elephants, hunting by humans *is* the natural process, or the closest thing to it. In Africa there is no such thing as humans simply "letting nature be."

How much damage could humans in Africa do before acquiring guns? More than one might imagine. Just as some Native Americans hunted bison by stampeding herds over cliffs, there is evidence that *Homo erectus* hunted elephants by stampeding whole herds into swamps.[56] Note that elephant herds consist entirely of females and their young. Since the introduction of firearms, trophy hunters have hunted the more solitary bulls. Before firearms, stampede-style hunters took out whole herds, in effect targeting multiple generations of breeding age females. The contrast between this method and the more selective post-firearm bull hunting might help to explain how the elephant could exist, eating and reproducing as much as it does, without driving itself and its ecosystem into oblivion.

The Kruger Park area may never have had many elephants or people. Elsewhere in Africa, pictographs record evidence of ancient elephant hunting. Of the 109 shelters containing rock art so far discovered in Kruger Park, only one depicts elephants. This suggests there were elephants in what is now Kruger Park somewhere between 7000 B.C. and 300 A.D. but they may have been rare.[57] Since the park's formation in the early 1900s, elephant populations have increased. In the 1960s, scientists and rangers estimated the park's carrying capacity to be about 7000 elephants. Culling began in 1972 to maintain the elephant population between 6800 and 7200. Even at the peak of poaching, during the 1980s, culling was needed to stabilize elephant numbers.[58] In response to

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[56] *See* DONALD JOHANSON & MAITLAND EDEY, LUCY: THE BEGINNINGS OF HUMANKIND 73 (1981). F. Clark Howell discovered evidence of *Homo erectus* living in Spain and hunting elephants as long as 400,000 years ago. He found large numbers of elephant fossils, together with evidence of fires used to stampede them, and stone tools used to butcher them.

[57] Ian Whyte, *Headaches and Heartaches: The Elephant Management Dilemma, in* ENVIRONMENTAL ETHICS: WHAT REALLY MATTERS, WHAT REALLY WORKS 295-305 (David Schmidtz & Elizabeth Willott eds., 2002).

[58] Kobus Krüger was among a handful of rangers who took responsibility for putting an end to the poaching, at great personal risk. He spent days and weeks on his own in the bush, without fire and without radio contact, tracking and apprehending poachers. Kobus was also one of the rangers principally responsible for the culling. Kobus was famous for his marksmanship, and it takes a superb marksman to hit an elephant's brain with a single shot from an AK-47 rifle while standing on a helicopter platform. But Kobus loves animals as much as anyone we have ever met, and the task of shooting elephants was literally the

pressure from animal rights groups, the culling stopped in 1995. There were 7,200 elephants at the time. Today there are 10,500[59] and it is visibly apparent that the Park cannot sustain them indefinitely. If a park has few elephants, then adding a few promotes biodiversity. If a park already has too many, adding more reduces biodiversity. A maximum elephant population is not compatible with maximum biodiversity.

One key ecological role of elephants is to keep forests in check and maintain open savanna habitat. Adult male elephants will push over four or five trees per night and nibble on the roots. At high numbers, instead of keeping forests in check, elephants destroy too many trees and endanger other flora and fauna, including rhinoceros. Mpalo Setshwantsho was our guide in Botswana's Okavango Delta in 1999. He had been working as a guide for eighteen years and had lived in the neighborhood of the Delta his whole life. When we asked him whether he had seen major changes in the Delta in his life, he said there were more animals now. He also said there were fewer trees. In Chobe National Park, as elephant populations rose, woodland vegetation decreased from 60% coverage to 30% between 1962 and 1998.[60] In 1999, Aari Schreiber, a Kruger Park section ranger who manages roughly a quarter of the park, told us that if all elephants were removed, Kruger Park would need twenty years to recover from elephant damage done since 1995.

Kruger Park gave away as many elephants as it could — one hundred and forty as of 1999 when we first visited the Park — but not many people want to own an African elephant and not many can be trusted with the responsibility. (Indian elephants are cuter, smaller, and more docile, and are the kind found in circuses and most zoos.) The cost of translocation is also prohibitive. Ian Whyte estimated the cost of moving eleven hundred elephants to adjacent land in Mozambique to be fifteen million rand (two million dollars).[61] Social elements also need to be

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stuff of nightmares.

[59] *See* Ian Whyte & Richard Fayer-Hosken, *Playing Elephant God: Ethics of Managing Wild Elephant Populations, in* NEVER FORGETTING: ELEPHANTS AND ETHICS (K. Christen & C. Wemmer eds., forthcoming) (on file with Smithsonian Press). This is Ian Whyte's estimate as of 2003. Whyte estimates that at this size, 735 elephants would have to be culled each year to stabilize the population. Of course, if the population base were smaller to begin with, as when it was kept around 7,200, fewer elephants would need to be culled.

[60] David K. Mosugelo et al., *Vegetation Changes During a 36-year Period in Northern Chobe National Park, Botswana*, 40 AFRICAN J. OF ECOLOGY 232 (2002). For more references on destruction of woodlands by elephants, see Ian Whyte et al., *Managing the Elephants of Kruger National Park*, 1 ANIMAL CONSERVATION 77 (1998).

[61] Personal communication from Ian Whyte to David Schmidtz and/or Elizabeth

considered when moving elephants. Apparently, in their normal social setting, juveniles are kept in check by older relatives. In the past, juvenile males translocated without their educational support groups (e.g., adult males) became delinquents, harassing rhinoceros and other animals, and sometimes humans too.

Kruger Park has a problem with elephant overpopulation, a problem that, because of pressure from animal rights groups, it cannot readily solve. When the factor that prevents an ecosystem from being stable is that it lacks a keystone predator, merely enlarging the ecosystem will not solve the problem. Ultimately, something must play the role of that missing predator. The park is not a viable ecosystem in the long run unless something is done about the elephants, which is also to say the private reserves that now form part of Greater Kruger are not ecologically viable unless something is done. Adding more land does no more than buy time during which other solutions may emerge.

One approach is to develop a method of birth control suitable for elephants. Personnel of Kruger National Park, in conjunction with other scientists, have been investigating several methods. The first test of hormone-based birth control, analogous to the human birth control pill, was technically successful insofar as females did become temporarily sterile. However, the method failed for a different reason. Bulls thought the treated females were in estrus and continually harassed the treated females, causing them to panic and leave their young unprotected and unfed. The test was stopped for humane reasons.[62]

Another method currently is being tested. Zona pellucida proteins, which normally surround the egg, are injected into female elephants. The resulting immune-response in the female creates proteins (antibodies) that bind to the egg, thereby preventing sperm from fertilizing the egg. Females are thus temporarily rendered sterile. Since this method does not directly affect hormone levels, it has not led to the same problem as the initial method. So far, no side effects are known, although there has not yet been enough time for social side effects to manifest.[63]

Social impact is largely unknown. A female elephant can bear a calf every four and a half years. Females reach calf-bearing age at twelve and remain fertile until menopause, which in elephants occurs in the

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Willott (2001).

[62] Discussed in Butler, *supra* note 53.

[63] R.A. Fayrer-Hosken et al., *Immunocontraception of African Elephants*, 407 NATURE 149 (2000).

mid-forties. If conditions are good, a cow may have eight calves in her life of which half could be expected to be female. Herds are matriarchal and led by the oldest female, typically a post-menopausal female in her fifties. Males leave the herd at the onset of puberty. Females remain for their whole lives. The herd is thus an extended family consisting of the old matriarch, her surviving daughters, and their offspring: perhaps five generations of females. Young animals learn essential lessons in life — about the land and elephant society.[64] If a contraception program aimed to stabilize elephant numbers, each cow would theoretically have only two offspring.[65]

Notice that this does not mean elephants would go on as before, albeit with slightly smaller families. Given standard probabilities, about half the matriarchs would have one daughter and a quarter would have two. A quarter would have two sons, thus no daughters. If a female had only sons, the sons would leave the herd at puberty, leaving the female with no herd over which to be a matriarch. She would be the end of the matrilineal line and if, like half of all females by hypothesis, she has no sisters, or if her one sister has no daughters, then she is the end of her mother's line as well. The probability of having one or two daughters but no granddaughters in her herd is nine out of sixty-four. (We leave aside daughters of male offspring because granddaughters produced by male offspring are members of some other matriarch's herd.) Adding this to the quarter of females who have no daughters, and therefore no daughters of daughters, the total proportion of females with no granddaughters in their own herd would be twenty-five out of sixty-four. So it is not merely numbers within a generation that would be thinned out. The other number that would decline is the number of generations per herd. Would remnant females, no longer having infants to tend and thus losing their central reason to constitute themselves as a herd — or, for that matter, to live at all — want to join another herd, helping to raise a small number of offspring to which they may not be closely related? Would remnant females be welcome in another herd? Is it really so obvious that limiting population this way would be more humane than culling? There is so much that is not known.

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[64] Karen McComb et al., *Matriarchs as Repositories of Social Knowledge in African Elephants*, 292 SCI. 491 (2001).

[65] Our society appears to be adapting to parents *choosing* to have only two children. Can elephants make a similar transition (when they did not choose and do not understand what is happening to them)? Butler, *supra* note 53, at 80, notes that this question also is raised by Kruger scientist D. Grobler.

There is a logistical problem too. To stabilize populations, approximately seventy percent of breeding females would need to be under treatment at any one time. In Kruger Park alone, this means thousands of cows. Animals require repeated dosages. Each animal would need to be individually radio-collared or tagged in some way. This expense would be astronomical. However, it might be feasible on private preserves with larger staffs and smaller numbers of elephants.

What is the situation in Sabi Sand? Before the removal of the fence in 1993, there were sixty elephants in Sabi Sand. The trend since then is as follows:

1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
60	116	202	202	311	429	497	531	601	757

This trend is obviously worrisome. Kruger Park's carrying capacity traditionally is estimated to be a little less than one elephant per square mile. In 2002, the population density within Sabi Sand rose to three per square mile. Plants that elephants most favor became rarer in Kruger Park but proliferated in Sabi Sand while elephants were mostly absent. That may be why elephants are migrating to Sabi Sand. Ian Whyte guesses Sabi Sand's elephant population density will return to something like Kruger's when elephants damage Sabi Sand to the same degree that they have damaged Kruger Park since 1995, when the culling stopped.[66] Presumably Sabi Sand does not want to go down that road. There may come a day when the moratorium on elephant culling at Kruger Park will force Sabi Sand's managers to put the fences back up again.

One solution to the overpopulation problem that would also raise revenue would be to run the game preserves as part-time hunting lodges, as many were run in the past. In 1999, we visited Khami Game Preserve in Zimbabwe. At the time, Khami operated as a hunting lodge one month of the year and as a no hunting game preserve for the other eleven. Although this option is ethically or politically unacceptable to some people, it would have advantages over current alternatives, insofar as it is technologically and financially feasible. Indeed, unlike the

[66] The situation in Sabi Sand is being monitored and sometimes results are published. *See, e.g.*, K. Hiscocks, *The Impact of an Increasing Elephant Population on the Woody Vegetation in Southern Sabi Sand Wildtuin, South Africa*, 42 KOEDOE 2, 47 (1999). Tree damage increased considerably and bull elephants were responsible for 92% of uprooted trees in the area studied.

alternatives, hunting would generate income that could be plowed back into communities and conservation efforts.

Another possibility would be to sell, perhaps only at selected times, permits for "green" hunting. These permits might allow people to hunt elephants with guns loaded with darts that would deliver a targeted elephant's next scheduled birth control treatment. No doubt this would be fraught with problems but conceivably could help finance the cost of sterilizing elephant populations. The bottom line is that whatever policy Sabi Sand adopts, it will have to help local people make a living in order for it to be sustainable.

CONCLUSION

Looking at the principles derived from the study of long-enduring commons, it becomes clear that wherever possible, people let small events remain small. This, too, is evident at Sabi Sand, where many decisions are made at the level of the individual resort or jointly between neighbors. Individual resorts profit from making good decisions, suffer from making bad decisions, and neighbors learn from example. Ellickson summarizes:

> The agricultural activities for which there were efficiencies of scale — harvesting, fencing, shepherding — were performed jointly on commonly accessible land according to explicit bylaw or implicit contract ("the custom of the manor"). The small agricultural events that lacked returns to scale — planting, weeding, thinning — were stimulated through the direct material incentives of private land ownership.[67]

We see similar separations at Sabi Sand. Activities for which there are efficiencies or necessities of scale — managing the larger herbivores or predators that require large areas, fencing, securing legal rights to river water — are performed jointly.

Another key characteristic of long-enduring commons is their ability to change their rules when required. Formerly, hunting was allowed in Sabi Sand. In the 1960s, photographic safaris started increasing in popularity and profitability and by the 1980s, several resorts had eliminated trophy hunting entirely. Now there is an outright ban on hunting. The preserve's customs and rules change. Sabi Sand currently is revising its constitution, with ratification expected in 2004. As with

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[67] Ellickson, *supra* note 3, at 1391.

historic long-enduring commons, change is a part of Sabi Sand's existence. To be long-enduring, it needs to modify its rules and customs to meet new ecological, financial, social, and political challenges. Being an organized group of owners committed to building a sustainable preserve puts Sabi Sand's owners in a better position to address many of the larger challenges. Being privately owned individual resorts gives each an incentive to take individual responsibility and tend well its own small problems. We will have to wait and see whether Sabi Sand can meet all challenges, internal and external, but Sabi Sand's structure, so far as we can tell, is a wise and creative response to its circumstances.