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Article *in* Culture & Agriculture · June 2008

DOI: 10.1525/cuag.1993.13.45-46.29

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Social Realities of Environmental Ideologies: A Case Study of the Mapimí Biosphere Reserve

by Andrea Kaus

Consortium on Mexico and the United States (UC MEXUS)
University of California, Riverside

Over the last two decades, the international conservation community has changed its emphasis from the 'hands-off' policies typical of U.S. National Parks to efforts which address the concerns of local human populations in and near protected areas. Government-sanctioned conservation and natural resource management programs throughout the world traditionally have been based on one of two environmental policies: 1) a preservationist model which protects aesthetically pleasing or ecologically valuable environments from human use by creating national parks, wildlife refuges or ecological reserves; or 2) a 'wise-use' model which regulates the use of economically valuable resources through usufruct permits or leases on government-owned protected areas (e.g., U.S. National Forests or Bureau of Land Management lands).¹ Yet, such conventional policies have failed to provide long-term protection of natural resources and habitats from encroaching human settlement, increasing tourism, or mining, lumber and ranching interests.

In both cases, national or international interests in the land supersede the needs and rights of the local inhabitants despite their prior claims to the land. By excluding local people from areas traditionally used to support their daily existence, whether physical or spiritual, the establishment of a protected area often creates the very problems of resource exhaustion and poaching that it is intended to prevent (see Lusigi 1981). A combination of anthropological and ecological research on the relationship between humans and their physical environment also has led to new concepts of local resource management reflecting greater understanding of the real and potential contributions of local inhabitants to environmental conservation, even under condi-

tions of high population density (Gómez-Pompa and Kaus 1992).

Thus, for both ethical and practical reasons, the conservation community has developed an increased awareness of the need to include local inhabitants in con-

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servation efforts. Terms such as 'local participation' and 'community development' have become common in the conservation literature. The goal of these approaches is 'sustainable development', where conservation and development are perceived as containing compatible philosophies "to ensure that [humanity] meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987:8).

However, despite the best intentions driving the newest approaches for environmental conservation, little information and few studies exist on how to successfully put this new philosophy and awareness into practice. While many conservationists have eloquently presented the need for local participation in conservation programs, they have excluded the viewpoint of the local resi-

dents whose sources of livelihood are affected by the implementation of a conservation program. Because their views have not been considered fully, 'local people' often are portrayed as a homogeneous, self-contained unit with one unanimous opinion and one predictable reaction to conservation policies.

A Case Study

The project presented here was developed specifically to bring the perspective and methods of anthropology directly into the conservation arena by presenting the human diversity that affects biodiversity. The social realities of a progressive and international conservation policy, exemplified by the UNESCO Man and the Biosphere Programme (MAB), were examined in the context of a specific site: the Mapimí Biosphere Reserve in Mexico. Part of the anthropological approach was to present the developing relationship between the Reserve's residents and its researcher-managers as a linkage between two distinct cultural groups.

The basic premise for the fieldwork was that a conservation program seeks security for the natural resources on the land while local inhabitants seek security for their way of life. Cooperation with a conservation program was thus expected to increase with the inclusion of locally perceived benefits, such as land-tenure security, economic gains and local representation in the conservation program management. The research problem, then, was to determine the following: the important natural resources; their cultural and economic value; the sociopolitical systems in place to control the access or use of these resources; the incentives and constraints for alternative forms of land use; and the subsequent

relations between local human populations and the Reserve management.

Fieldwork was undertaken in the Mapimí Reserve during a prolonged stay from July, 1988, through November, 1989, followed by shorter fieldstays in 1990 and 1991. A survey and census was conducted of the properties in and surrounding the Reserve, including 71 households, 16 settlements and 9 different properties, covering over 3,000 sq. km. Participant observation in both the local residents' and researchers' daily work, combined with informal interviews, was used to determine work patterns, land use and resource management techniques. Two men and three women in three different settlements also kept daily activity diaries for two and a half years.

In order to elicit information regarding perceptions of the environment, a map of the Reserve was made with the help of the local residents (along with the equipment and unsolicited comparative commentary from the researchers). Outside the Reserve, the regional government agencies and extension agents provided some information on the area. Finally, 35 formal interviews were conducted with researchers and residents regarding their views of their work, the environment, the Reserve and each other. A comparative study also was begun in the sister biosphere reserve of La Michililla, in the sierras of southern Durango (Mexico).

The resident population in the Reserve is very small. However, it has a crucial role in determining environmental conditions in the Reserve, for better or worse. For this reason, the many different methods for data collection were considered important since any one data set by itself was not wholly informative. Instead, the combination of the results and the trends over time presented a pattern of social relations in the Reserve that corresponded to my own personal observations during the fieldstay. A short description of the site and a summary of the results of the census and survey indicate the value of this type of anthropological research for ecological impact and assessment studies, as well as for developing and administering management plans in protected areas.

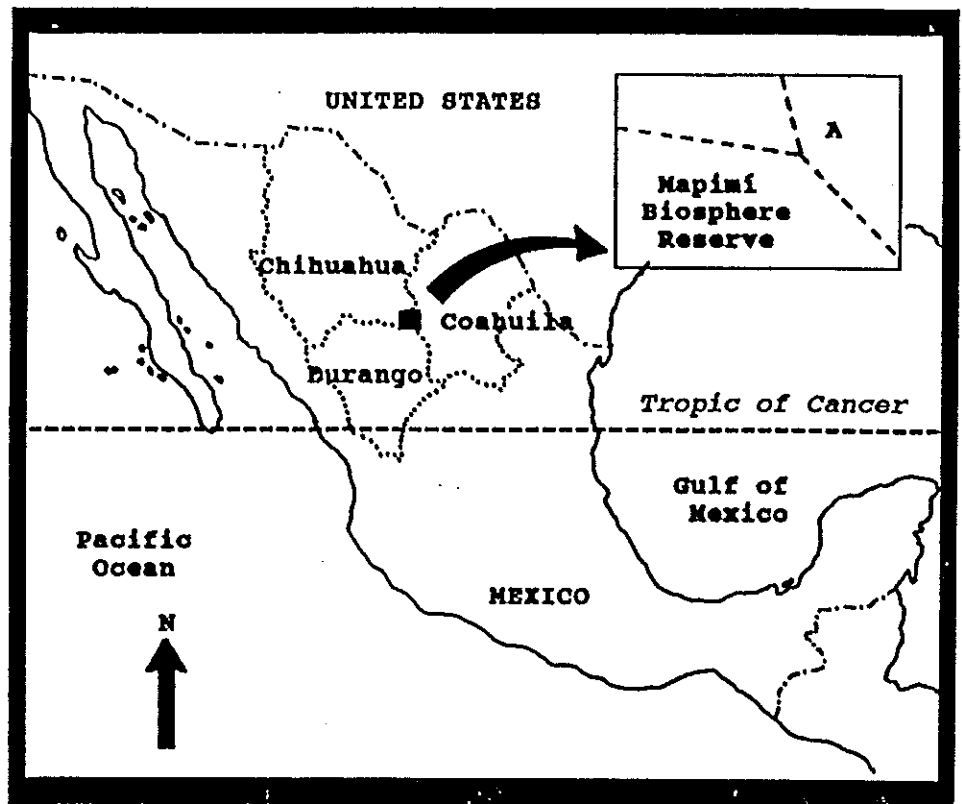


Figure 1: Location of the Mapimí Biosphere Reserve.

The Mapimí Biosphere Reserve

The Mapimí Biosphere Reserve is located where the three Mexican States of Durango, Chihuahua and Coahuila meet (Figure 1). This province is known as the Bolsón de Mapimí, referring to a series of closed watersheds in the center of the Chihuahuan Desert. It is an arid region that receives an average of 10 inches (264 mm) of rain a year with the majority (71%) of the rain falling between the months of June and September. The rain is usually in the form of brief, localized thundershowers and it varies greatly from site to site and year to year (Cornet 1988). The years of 1988 through mid-1990 were drought years, where approximately 8 inches (198 mm) and 7 inches (168 mm) of rain fell in 1988 and 1989 respectively. The drought was broken in the summer of 1990 when 90% of the yearly rainfall of 13 inches (325 mm) fell between June and September.

This arid land forms part of MAB's global strategy to establish an international network of protected areas called 'biosphere reserves' as sites for *in situ* conservation of genetic and biological diversity in the major biogeographic provinces of the world. In contrast to other categories of protected areas, such as national parks, biosphere reserves are intended to include areas of managed, disturbed or degraded ecosystems as a buffer zone around or adjacent to a core zone of restricted human use.

The purpose of the buffer zones is to involve local human populations in the management and research activities of the reserves and to provide research sites for comparative and applied studies. The biosphere reserves are thus typically divided into three separate zones: a core zone of restricted use, a buffer zone of integrated conservation and productive use, and a transition zone to encourage the extension of conservation philosophies and practice to the surrounding region.

The Mapimí Biosphere Reserve was established in 1977 to protect an endemic species of desert tortoise (*Gopherus flavomarginatus*), considered a delicacy throughout Northern Mexico. This large tortoise was endangered not only by poaching, but by other human activities such as road building or clearing land for agriculture in the region (Morafka 1988). The local residents of the Bolsón de Mapimí cooperated with the Reserve management by stopping their own consumption of the tortoise and protecting it from outside poachers. They also stopped serving as guides for the sport hunters who threatened local populations of Desert Mule Deer (*Odocoileus hemionus*). They now report any evidence of hunters to the Reserve management.²

The residents cooperated with the Reserve's policies principally because they also considered the poachers and hunters as a threat to their livestock and properties. The presence of an internationally recognized protected area gave the residents the perceived authority to limit or exclude intruders on their land.

Conservation policies in the Reserve to prohibit hunting, poaching and the collection of firewood or plants (e.g. cactus) are combined with a comprehensive ecological research program managed by the *Instituto de Ecología*, the institution responsible for the administration of the Reserve and its field station. The field station, *el Laboratorio del Desierto*, includes a captive breeding and release program for the Bolsón Tortoise, one of only three such facilities in North America for the husbandry and protection of desert tortoises (Morafka, pers. com. 1992).³

The ecological research program involves collaboration with researchers and institutions from other countries, primarily France, Spain, Argentina, and the United States. During the period 1988 to 1990, some 47 researchers and students undertook fieldwork in the Reserve, including studies of vertebrates, invertebrates, geological characteristics, vegetation, rainfall, climate, soils and grazing impacts. Part of the original plan for research in the Reserve was to inte-

grate the basic ecological research with applied studies on water and forage availability, range management and cattle production. This applied orientation reflected the concerns voiced by the local ranchers, but it remains undeveloped in the overall research program.

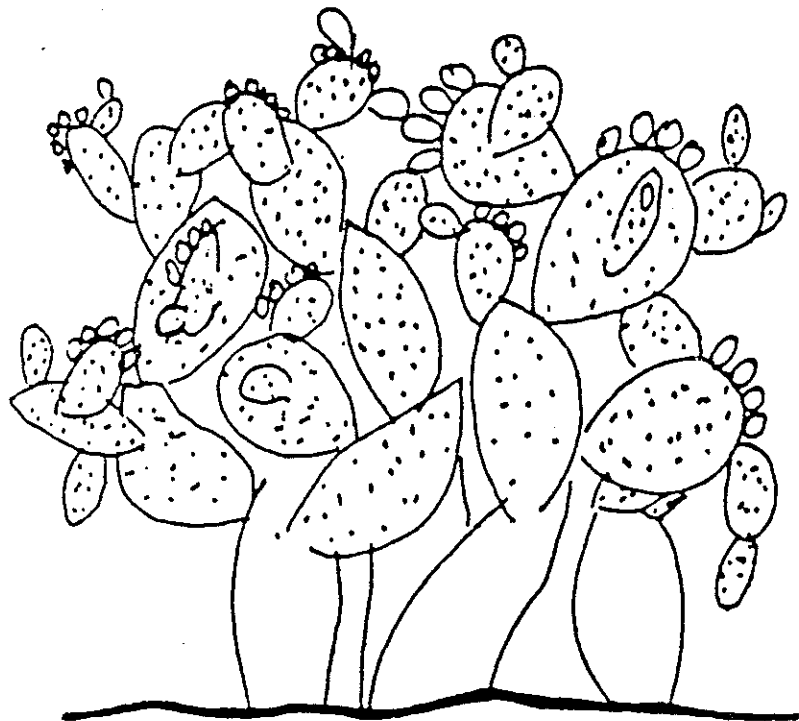
What most distinguishes the Mapimí Biosphere Reserve from other protected areas is that the Reserve's management coexists and interacts with socio-political systems for allocating land and usufruct rights which precede the Reserve's establishment. The Reserve's core and buffer zones overlap the borders of three states, four municipalities and seven properties. The resources in these zones are used by the residents of ten separate settlements. In the zone of influence, nine more settlements, including six additional properties, use the land that borders the Reserve's buffer zone.

Although the Reserve supposedly protects over 100,000 hectares (Maury 1988), the *Instituto de Ecología* legally owns only 20 hectares directly surrounding the field station. Thus, the legal authority to decide on land use for 99% of the Reserve lies in the hands of local landholders, the government agency for land reform and the rural credit bank.

Land Use

For the last century, extensive cattle ranching has been the major form of land use in the Reserve region, originally to supply beef to the surrounding mining towns of Nueva Vizcaya, and today for export to the United States. In the zone of influence, the residents of a few settlements produce a crude wax product from the candelilla plant (*Euphorbia antisiphilitica*) or extract salt from two ephemeral saline lakes. Commercial agriculture for cotton, sorghum, alfalfa and melons can be found on the irrigated areas of the nearest towns, but within the Reserve, small rainfed plots, known as *temporales*, are used to raise corn, beans, squash and melons for the household and livestock.

Farmers wishing to extend their fields for larger-scale production compete for water and land with the ranchers, and cattle production remains the principal drawing factor to the region. Extensive cattle ranching represents a way to convert the surrounding scrub into protein and then into income, and the successful cattlemen portray an image of power, wealth and heritage embodied by the Mexican *charro*. The ranchers say that



D. Soleri. *Food from Dryland Gardens*, 1991.

agriculture is good, but the work with horses and cattle is "*más noble* (more noble)."

What distinguishes the Mapimí Biosphere Reserve from the remainder of the Bolsón de Mapimí is its most recent form of land use: scientific investigation. Researchers form their careers based on the

"A more integrative definition of the Reserve's population is based on those individuals who cooperate in safeguarding the land and natural resources in the protected area."

field data collected during their sporadic stays, and their activities provide a very small source of temporary wage labor to some of the local residents. For the researchers and the Reserve management, the critical resource is the Bolsón de Mapimí's biodiversity, and the activities of the local and regional residents are potentially some of the most damaging forms of land use for the environment. As a result, the researchers' perceptions of appropriate land use to protect desert biodiversity hold potential for direct conflict with local land use which, in turn, relies on the abundance of only a handful of forage species.

Land Tenure and Settlement

Land in the Bolsón de Mapimí is officially divided into properties which are either federally, privately or collectively managed. However, the collective management detailed under Article 27 of the Mexican Constitution (recently revised to encourage privatization) is not locally enforced, even though this represents the principal official form of land tenure. Of the 386 heads of households who have legal rights to use collective land within the Reserve's core and buffer zones, only 39 individuals (10%) and

their families actually exercise that right.

These ranching families have several unofficial systems by which they limit access to the rangeland in and surrounding the Reserve. Private landholders also have ways of gaining access to collective rangeland and excluding its use and settlement by other would-be cattlemen. This presents a two-edged sword for the Reserve management. On one hand, the reduced access means that several socio-political systems already exist to control and limit land use in the Reserve. On the other hand, there is no guarantee that these systems will result in land use that will be in accordance with the conservation objectives of the Reserve, or that the activities of the researchers themselves will not be restricted by the landholders. All of the independent systems for land management run the risk of overgrazing, particularly in unfenced and unguarded areas.

The government directly encourages increased cattle production through its agricultural extension and rural credit programs. Extensive cattle ranching is seen also as a mechanism that provides a person with control over large expanses of land for power and prestige as much as income. The unofficial land tenure system in the Bolsón de Mapimí operates on the tenet that possession is the better part of ownership, and possession is demonstrated by the presence of a herd of cattle in a given area.

The land tenure and land use situation affects the patterns of settlement and demography in the Reserve. The economic and cultural incentives are to have as few cattle enterprises and as many cattle as possible, so that each enterprise occupies and controls large territories. The property sizes in and surrounding the Reserve range from 4,685 to 151,510 hectares which support (in total) over 6,800 head of cattle and horses belonging to 42 households.

The cattle herd sizes per property range from 200 to 3,000 head, although the cows disperse into smaller bunches throughout the range. Each herd corresponds to one or two resident households which guard their rights to use the pas-

ture areas and water sources by living close by or by maintaining a household representative on site. The cattle ranching settlements are thus isolated, dispersed and very small, consisting of one to eleven households each. However, the small population figures in the Reserve are deceptive because they consist of representatives from a much larger regional population. This situation became increasingly apparent from the combined population and household data gathered from 1988 through 1990.

Population and Household Characteristics

Curiously, the population and household data showed apparently contradictory trends during the period of drought from 1988 to 1990. At the start of my fieldstay in the summer of 1988, 168 people lived in the Reserve's core and buffer zones, and 282 people were recorded in all the settlements surveyed. By the time the drought broke in mid-1990, the core and buffer zones' population had dropped to 97 residents. No 1990 data were gathered for the outlying settlements due to the poor road conditions from the rains, but in 1989, the population had decreased to 248 individuals. Yet, the number of households in all settlements surveyed from 1988-1989 did not decline, but increased slightly instead: three families left and were replaced by five others. By 1990, the number of households in the core and buffer zones had dropped by only two.

Closer analysis revealed that this was not inconsistent with the population data, but the visible effect of two related phenomena: 1) a division of labor between men and women; and 2) the protection of usufruct rights to rangeland by maintaining cattle herds in prime pasture and watering areas.

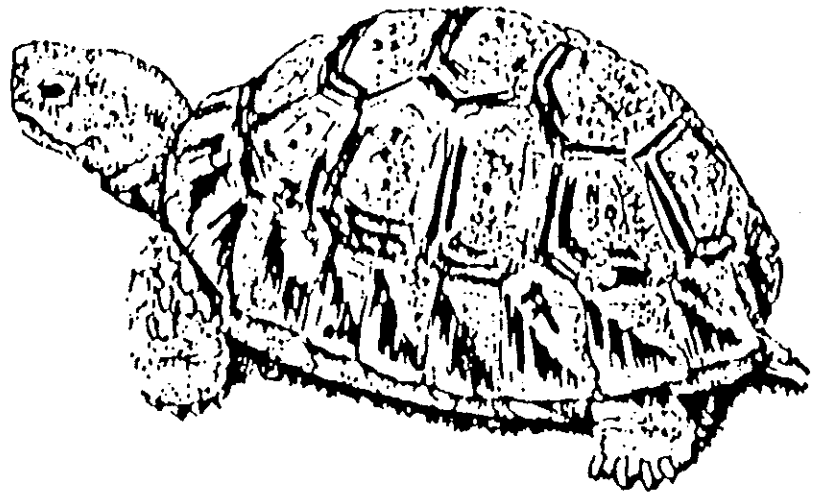
The women are responsible for all aspects of the home (from children to the small livestock), but the ranching settlements are isolated from the conveniences and essential services provided by the towns, such as running water, electricity, schools, medical care and even companionship. As a result, many households maintain two homes: one in town and

one in the Reserve area. It is common for the women to move into the family residence in town at least while their children are attending school. The men and older boys (or a hired hand) remain in the ranching settlements to care for the cattle and guard the household's rights to land.

As the drought persisted into 1990, living conditions in the settlements worsened. More of the women and children moved away, but few households left altogether. As a result, a closer look at the household data from 1988 through 1990 showed a doubling of the number of nuclear families which divided their members between town and range residences and also a small increase in the households which contained only single individuals, siblings or unrelated individuals. These were mostly single or widowed men, teenage boys or hired hands who were caring for the livestock and equipment (e.g., water pumps) for their families or employers during the drought. A breakdown of the population data by age and sex showed a corresponding increase in the percentage of men and older boys (15 to 50 years of age) during this period, although the overall population numbers decreased for both sexes.

The dual residency pattern indicates that the local residents are part of a much wider population which is not bounded by the geographical limits of the Reserve's various zones. This corresponds with the observed lack of cohesive social ties among the various settlements within the Reserve which would help to integrate Reserve policies for the cooperative long-term use of natural resources. In fact, local kin, political or economic ties link the Reserve's households and settlements not to each other but to the outlying towns and cities.

The tiny population of the Reserve thus integrates with a larger regional population of over 400,000 inhabitants. Census data from a wider geographical range and from better, rainier years are now needed to confirm whether the 1988 to 1990 population trends are unidirectional or are part of a cycle of seasonal flight out of the Reserve area in bad times followed by subsequent recolonization in good times.



Conclusions

What social group is then defined by the establishment of the Mapimí Biosphere Reserve? What is the relevant unit of study and discussion for research and policy?

The narrowest definition of the Reserve's human population includes only those individuals who reside in the core and buffer zones. Yet this collection of individuals does not represent a cohesive social or cultural unit since the Reserve's boundaries are based on ecological rather than sociopolitical characteristics. A broader definition includes those individuals who have usufruct rights (whether collective or private) to land in the core and buffer zones. This encompasses a wider social network from the surrounding region, but is still not necessarily representative of any social ties between the individual ranching enterprises within the Reserve.

A more integrative definition of the Reserve's population is based on those individuals who cooperate in safeguarding the land and natural resources in the protected area. This would include the Reserve's administrators and researchers as well as local residents and landholders. A population defined in this manner would not include everyone with vested interests in the Reserve's land, but it would be more indicative of the human group involved in the conservation and management of the area's natu-

ral resources. This definition blurs the physical boundaries of a protected area and fosters a perception of the Reserve that integrates conservation policies with local systems for land allocation and use.

Most important, it places the responsibility for cooperative social relations on researchers and administrators as much as on local populations. The term 'local participation' often refers only to the compliance of local residents or landholders with conservation policies but neglects the role of researchers and administrators and the ways they might impact the social systems already in place.

The relationships between extensive cattle production, land tenure, settlement and population characteristics in the Bolsón de Mapimí influence the Mapimí Biosphere Reserve's acceptance and effectiveness. To begin with, the strong tradition and incentives for cattle ranching in the region make it unlikely that the ranchers will voluntarily abandon this activity in the near future, despite the destructive potential grazing holds for the Reserve.

Second, the ranchers fiercely defend their independence and land use rights. Several individuals stated that they would rather be poor than have anyone give them orders. Suggestions for community development or land-use improvements are thus regarded with some suspicion or even amusement. The majority of ranchers do not have the

labor, capital, infrastructure or equipment with which to improve their ranching enterprises, and research recommendations need to take into consideration the ranchers' actual situations and cultural values.

Third, the Reserve's field station is set up almost exclusively to facilitate research rather than to serve as a police entity for conservation policy. It thus relies on public relations for self-regulation of hunting and poaching by the local residents, and continued local cooperation has been based more on the absence of costs rather than benefits to the ranchers or the general region.

To date, the interactions between ranchers and researchers remain at an individual level. Many local residents say they tolerate, accept, or like the Reserve's presence because of the friendships they have formed with some of the researchers. The key to their continued cooperation with the Reserve is that they view this relationship seriously as a social contract. The concept of sticking to one's word holds more weight than a legal edict. However, if the Reserve management plans to extend its influence beyond the core and buffer zones (or to affect more than hunting and poaching activities), it will need to pay close attention to the transient nature of residency in the Bolsón de Mapimí coupled with the apparent permanency of the ranching enterprises. That is, the people come and go, but the cattle stay. Future social relations in the Reserve will depend on the Reserve management's awareness of its own community, including both researchers and residents, and the wider social systems that influence social relations and the physical environment in the Reserve.

Some concern needs to be raised as to the combined effects of the proposed North American Free Trade Agreement and the privatization of collective land following the amendment to Article 27 of the Mexican Constitution. The ranchers depend on the export of feeder calves to the United States, and an increase in trade may provide incentives to overstock the range. In addition, a change in

land tenure threatens the poorer ranchers who fear that their land may be divided into smaller parcels or usurped by cattlemen with greater economic or political influence. This is a critical time for the Reserve management to work with the ranchers to create a social environment which will enhance the protection of the physical environment.

The objective of the MAB program is "to predict the consequences of today's actions on tomorrow's world and thereby to increase man's ability to manage efficiently the natural resources of the biosphere (di Castri 1976:237)." This practical approach will not work unless the social realities of protected areas are considered in ecological evaluations and management recommendations.

To date the role of human actions in protected areas has not received the same attention as basic ecological research. Systematic monitoring and site comparisons of social variables such as land use, land tenure, population density and distribution, natural resource values (economic and cultural) and the levels of organization for regulating land use are needed to match with the ecological data for a comprehensive evaluation of a protected area's environment.

The challenge is to understand how changes in the social environment affect the perceptions and land-use decisions of the local residents, and thereby identify the areas of potential conflict or cooperation with researchers and administrators in conservation and natural resource management programs.

Acknowledgements

Field research was supported by a National Science Foundation Grant for Doctoral Dissertation Research, a University of California Consortium on Mexico and the United States (UC MEXUS) Thesis/Dissertation Grant, the U.C. Riverside Chancellor's Patent Fund and a Humanities Graduate Students Research Grant. The *Instituto de Ecología* provided logistical support in the Mapimí Reserve. Any opinions, findings and conclusions or recommendations are my own and do not necessarily reflect the organizations listed above.

Notes

1. The preservationist versus wise-use approaches follow a century-old philosophical split between John Muir and Gifford Pinchot which led to the separate establishment of the U.S. National Parks and National Forests. The conflict between the intrinsic and economic value of wilderness areas has been alternatively referred to as the "conservation dilemma" (Ehrenfeld 1978) or the "environmentalists' dilemma" (Norton 1991).

2. For safety and legal reasons, the Reserve management has requested that the residents not confront the hunters directly or stop them indirectly. A few zealous residents had started to bury planks with nails in some of the remote access roads to the Reserve area, causing some tension with neighbors who occasionally used these roads.

3. The other sites are located in the Mojave Desert at Ft. Irwin (California) and Las Vegas (Nevada) for the protection of *Gopherus agassizi*.

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