

# PROTECTED AREAS FOR THE ANDEAN BEAR IN SOUTH AMERICA

EDGARD YERENA, Apartado 68409, Altamira, Caracas 1062, Venezuela, email: eyerena@etheron.net

**Abstract:** The Andean bear (*Tremarctos ornatus*) has a human-induced fragmented distribution along the Andes Cordillera. A viable conservation strategy for this species can be achieved through natural protected areas. On the assumption that Andean bears have large home ranges and low-density populations, a conservation strategy designed to protect isolated areas may not preserve bear populations. To maintain viable bear populations in the Andes, it is probably necessary to maintain the connectivity of protected areas to other surrounding natural areas. In the Andes Cordillera there are many designated conservation areas. It is necessary to know how many of them are capable of supporting bear populations. I identified 42 conservation units for Andean bear, ranging between 100–25,360 km<sup>2</sup>, but the number of units with a significant role in bear conservation may be <15 in the whole species range. A major goal must be to increase the effective area of suitable habitat for bear conservation. This may be achieved by establishing ecoregional systems of protected areas whereby the conservation units are legally and physically connected. Such a conservation scheme to protect the Andean bear as a flagship species would benefit most of the terrestrial non-flying Andean species. Additionally, human social benefits may be achieved with this approach. These benefits include essential watershed protection for hydropower systems, irrigation, and human consumption, as well as the protection of natural landscapes. The latter is the basis for international and local tourism, which in turn may help to support sustainable rural development.

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**Key words:** Andean bear, Andes Cordillera, conservation, dispersal corridors, natural protected areas, *Tremarctos ornatus*.

The Andean bear is adapted to most biome types of the Andes Cordillera, from lowland tropical forests to meadows or paramos above the altitudinal tree growth limit (Peyton 1980, Suárez 1985, Rodriguez et al. 1986, Mondolfi 1989, Goldstein 1990, Yerena 1992). Today the species has a fragmented distribution along what probably was a continuous distribution in the inter-tropical section of that mountain system (Yerena 1987). The tropical Andes comprise nearly 1.6 million km<sup>2</sup> (Saavedra and Freese 1986) across the countries of Bolivia, Perú, Ecuador, Colombia, and Venezuela. The conservation of this species may be accomplished using different methods, but probably the most cost effective is through natural protected areas. In the Andes Cordillera there are many designated conservation areas. It is necessary to know how many of the areas inhabited by bears are large enough to support populations of this species and to assess the role the areas play for bear conservation. The objective of this paper is to help clarify this subject.

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## METHODS

A map of the approximate distribution of the Andean bear was based on reported Andean bear presence in each country (Fig. 1). A database of all protected areas within this range was created, and the central coordinates of the locations were plotted on a map. I considered every protected area containing confirmed bear reports and falling between management categories I–V of the International Union for Conservation of Nature and Natural Resources (IUCN 1985) for my analysis. I defined conservation units as those protected areas that are physically or legally isolated from other protected areas; I considered 2 or more contiguous protected areas as 1 conservation unit.

The next step was to define criteria to assess the conservation potential of an isolated conservation unit. According to Peyton (1988), the minimum size for an Andean bear protected area is 1,200–1,900 km<sup>2</sup>. Also, Andean bear conservation areas should have the widest possible altitudinal gradient and total precipitation above 500 mm/year. The bear might tolerate moderate levels of human interference (Peyton 1988, Yerena 1992). This 1,200–1,900 km<sup>2</sup> range is considered a preliminary or initial “minimum area” criteria. Future research will modify this criteria by defining it from what bears occupy and not from park sizes. Conservation units were classified as below, within, or above the size criteria. Based on these results, I discuss the conservation biology criteria and reported management problems. To include management perspective, I asked officers of the national parks services of all the 5 Andean countries to determine the 3

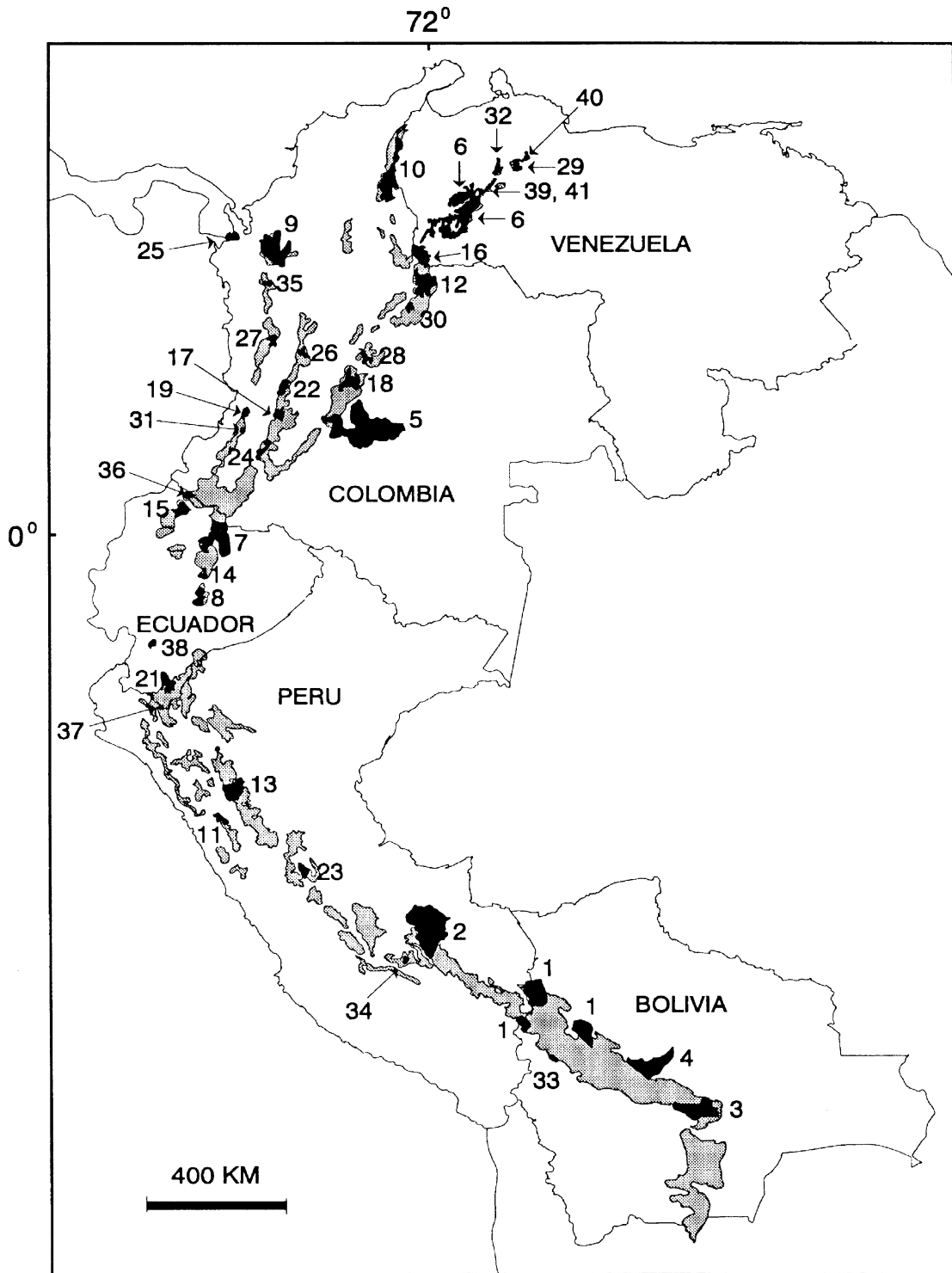


Fig. 1. Distribution of the Andean bear (light-shaded) and protected areas (dark-shaded) with bear populations in South America as of 1995 (Armstrong and Macy 1979, Peyton 1980, Suárez 1985, Cuervo et al. 1986, Yereña 1987, Mondolfi, 1989, Salazar and Anderson 1990, Peyton et al. 1998, Orejuela and Jorgenson In Press). Numbers reference parks listed in Table 1.

most important global threats to the integrity of each country's Andean parks system at a recent meeting of the Latin American Technical Cooperation Network of National Parks (Food and Agriculture Organization) held in Huarinilla, Bolivia (Apr 1995).

## RESULTS

There are 42 integrated conservation units with bears in the 5 Andean countries ( $n = 58$  individual parks), with sizes ranging between 100–25,360 km<sup>2</sup> and comprising a total area of 139,357 km<sup>2</sup> (Table 1). Comparing them with the size criteria of 1,200–1,900 km<sup>2</sup> minimum, only 15 units (36.71%) were above the range, 8 units (19.05%) within the range, and 19 units (45.24%) below 1,200 km<sup>2</sup>. According to this criteria, most units (64.3% = 19.05% + 45.24%) are either too small or are located in the critical threshold for bear conservation. The results of the parks officers' interviews (Table 2) revealed 4 threats with some differences between countries in their importance to bears. Three countries consider deforestation as the most important threat; grazing was selected by Peruvians and hunting by Venezuelan park officers as the most important threat.

## DISCUSSION

Because the Andean bear has a relatively large body with high metabolic needs (Dierenfeld 1988), it should have large home ranges and low density populations. Field observations support this (Peyton 1984, Goldstein 1990, Yerena and Torres 1994). A conservation strategy based on isolated protected areas that ignores these biological characteristics probably will not be effective. As a consequence, it may not be sufficient to base the strategy on protected areas, most of which were at or below the minimum area. The strategy should also consider the protected areas' position in the landscape and the connectivity to other natural protected areas, to maintain sufficient ecological integrity to include entire bear populations. Size of the protected area alone is not an adequate criteria for a conservation strategy in the Andes. This is because the amount of habitat bears occupy or could occupy in some conservation units is known to be less than the actual park size. For example, only 10% of Huascarán, 15% of Manú, and 95% of La Culata national park are suitable for Andean bears (Peyton 1988, Yerena 1994). Therefore it is necessary to quantify the amount of available bear habitat within each protected area and how much of that habitat bears use. When available habi-

**Table 1. Area and country of the conservation units with reported Andean bear presence in South America as of 1996. All conservation units are national parks except the following: ecological reserve (ER), historical sanctuary (HS), national reserve (NR), national sanctuary (NS), and natural monument (NM). Hyphenated parks are physically connected.**

Conservation unit	Area (km <sup>2</sup> )	Country
1 Ulla-Ulla NR-Pilon Lajas-Alto Madidi	25,360	Bolivia
2 Manú	15,328	Perú
3 Carrasco-Amboró	12,610	Bolivia
4 Isiboro Sécure	12,000	Bolivia
5 S. La Macarena-C. Los Picachos-Tinigua	11,180	Colombia
6 Sierra Nevada-La Culata-Tapo Caparo-Batallón-Chorro Indio	8,329	Venezuela
7 Cayambe Coca ER-Sumaco Napo-Antisana ER	7,280	Ecuador
8 Sangay	5,180	Ecuador
9 Paramillo	4,600	Colombia
10 Perijá-Catatumbo Bari	4,532	Venezuela-Colombia
11 Huascarán	3,400	Perú
12 El Cocuy	3,060	Colombia
13 Rio Abiseo	2,745	Perú
14 Llanganates	2,197	Ecuador
15 Cotacachi Cayapas ER	2,044	Ecuador
16 Tamá-Tamá	1,870	Venezuela-Colombia
17 Nevado del Huila	1,580	Colombia
18 Sumapáz	1,540	Colombia
19 Farallones de Cali	1,500	Colombia
20 Illinizas ER	1,499	Ecuador
21 Podocarpus	1,460	Ecuador
22 Las Hermosas	1,250	Colombia
23 Yanachaga Chemillen	1,220	Perú
24 Puracé	840	Colombia
25 Los Katios	720	Colombia
26 Los Nevados	583	Colombia
27 Macizo de Tatamá	543	Colombia
28 Chingaza	503	Colombia
29 Yacambú-Guache	500	Venezuela
30 Pisba	450	Colombia
31 Munchique	444	Colombia
32 Dinira	420	Venezuela
33 Cotopata	400	Bolivia
34 Machu Picchu HS	325	Perú
35 Las Orquideas	320	Colombia
36 El Angel ER	300	Ecuador
37 Tabaconas-Namballe NS	295	Perú
38 Cajas	290	Ecuador
39 Guaramacal	214	Venezuela
40 Terepaima	186	Venezuela
41 Niquitao Guirigay NM	160	Venezuela
42 Guanenta-Alto Rio Fonce NS	100	Colombia
Total	139,357	

**Table 2. Top threats to protected areas with bears in 5 Andean countries as reported by park officials, 1995.**

Country	Threats			
	Deforestation	Hunting	Grazing	Mining
Colombia	1	2	3	
Bolivia	1	3	2	
Ecuador	1	3		2
Perú	2	3	1	
Venezuela		1	2	3

tat rather than absolute size of protected area is considered, the number of conservation units playing a significant role in bear conservation may be <15 in the whole species range. A major goal for bear conservation policy should be to increase the effective area of suitable habitat for conservation. This can be achieved by either (1) expanding the already established units, (2) creating new units linked to existing ones, or (3) ensuring the existence of dispersal corridors among them. A recommended strategy is to establish systems of protected areas on an ecoregional basis where the conservation units are legally and physically connected. Examples of this approach have been achieved in Venezuela (Yerena 1992, 1994; Yerena and Torres 1994).

I am more certain of the validity of the ranking of threats affecting bears in the whole Andean region than I am of their ranks within countries, because the sample of interviews was small and confined to employees of protected areas. However, the results indicate that 4 threats are the most relevant to the integrity of these protected areas from the managerial view. These threats to bears and bear habitat have the following characteristics irrespective of the size or degree of connectivity of parks.

First, deforestation is caused mainly by humans clearing forests to grow illegal crops. In Bolivia and Peru, coca (*Erythroxylum coca*) plantations are eliminating bear habitat up to the agroecological limit of 1500 m above sea level (m.a.s.l.). In Colombia, establishing both coca plantations that provide the alkaloids that are processed into cocaine and the newly introduced plantations of poppy flower (*Papaver* spp.), from which heroin is processed, are devastating cloud forests between 1,000–2000 m.a.s.l., even within national parks such as Serranía de La Macarena. This is also happening in the Venezuelan transfrontier Perijá National Park.

Second, illegal hunting is depleting bear population even in areas which have no problems of deforestation, grazing, or mining (e.g., Sierra Nevada National Park in Venezuela). Although there is little evidence of international or structured trade in bear parts, it is widely prac-

ticed throughout the Andes both within valleys and between regions such as the mountains and coast. Of all these threats, poaching may have the most significant short-term effect on local bear extirpation because its incidence is high and uncontrolled, exerting a pressure on presumed fragmented and low density bear populations.

Third, grazing by exotic fauna like cattle or sheep threatens bear populations when grazing animals trample native vegetation that provide food and cover for bears. Bears are also hunted by people who venture far into the wilderness while locating and caring for their livestock. Lastly, the destruction of forests and pollution of waterways due to uncontrolled mining reflects both the lack of legal and institutional strength to contain it and the extraordinary pressure of powerful economic interests.

## MANAGEMENT IMPLICATIONS

Most terrestrial non-flying species of Andean ecosystems probably require smaller geographical areas than bears do to maintain genetically viable populations. The Andes Cordillera is one of the richest biogeographical regions of the world (Saavedra and Freese 1986). Due to the extensive range of the Andean bear, which includes most of the Cordillera Oriental, many species benefit from conservation schemes proposed for Andean bear. As a consequence, bears may be a key management species for regional or landscape planning. Additionally, presence of bears may be an excellent criteria to pinpoint areas for biodiversity conservation in the Andes. Because of this, bears have been proposed as a good flagship species (Eisenberg and Harris 1989, Dietz et al. 1994). The feasibility of using the Andean bear as an index of biodiversity conservation is positive not only at a small regional scale or within a country but at a tropical Andean scale. In this regard, transfrontier parks or linked conservation units across international borders are important steps toward large-scale regional planning. For example, along the Andean border between Colombia and Venezuela there are already 2 pairs of contiguous national parks: Tama (Colombia) and Tamá (Venezuela), and Perijá (Venezuela) and Catatumbo Barí (Colombia). These pairs comprise an almost isolated wilderness track shared by both countries. The long-term survival of bear populations in transfrontier protected areas requires a joint management effort between the 2 countries. Such effort should include studying the connection of these transfrontier parks to adjacent wilderness areas. This same situation may be found along the borders of the other Andean countries. Such a regional strategy based on designating protected areas, making them functional institu-

tions of conservation with effective management, and incorporating them into a system of both protected and non-protected wilderness is a starting point for a long-term strategy to maintain bear populations.

Designating conservation units alone cannot protect bears and biodiversity. Nevertheless, it must be given a high priority because with each new year it will be increasingly difficult to designate new conservation units in the tropical Andes. Political considerations and loss of habitat are the main impediments to new park designation.

Management, including habitat protection and law enforcement, is the most important step in a short-term conservation strategy. Lack of adequate management is critical in most South American protected areas (Amend and Amend 1992) as is clearly evidenced by the type and degree of the threats that menace Andean protected areas (e.g., hunting and deforestation within protected areas are only possible where inadequate management and law enforcement exists). Lack of economic resources is the usual explanation of this lack of management (Amend and Amend 1992). My experience allows me to propose another reason: lack of political support to park managers and inadequate personal commitment of field staff toward their jobs. Managers and their staff do not spend enough time in the field to know the degree bears are threatened by human action. One way to change this is through training focused to inspire individual motivation, increase management skills, and broaden scientific-based knowledge and communication abilities.

Finally, among other benefits, implementation of an Andean bear and biodiversity conservation system could be achieved by advertising the real social benefits it provides to Andean countries and local people. First, protection of bear habitat is essential to ensure adequate water for the continued operation of hydropower systems, irrigation, and direct human consumption. Second, the conservation of natural landscapes is important to maintain or increase levels of domestic and international tourism. Third, this conservation system is a vehicle to implement regional planning schemes necessary for rural sustainable development.

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