PHVA

Mountain Tapir

Tapirus pinchaque

Mountain Tapir (*Tapirus pinchaque*) Conservation Workshop
Population and Habitat Viability Assessment (PHVA)
Otún-Quimbaya Flora and Fauna Sanctuary, Colombia
12 to 15 October 2004

Final Report

A contribution of the IUCN/SSC Tapir Specialist Group (TSG), IUCN/SSC Conservation Breeding Specialist Group (CBSG) in cooperation with the Red Danta de Colombia. Mountain Tapir (*Tapirus pinchaque*) Population and Habitat Viability Assessment (PHVA) Workshop. Final Report. CBSG Mexico and CBSG Headquarters.

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Workshop organized by: *IUCN/SSC Tapir Specialist Group (TSG) and Colombian Tapir Network (Red Danta de Colombia).*

Financial support provided by: *Association of Zoos and Aquariums (AZA) - Tapir Taxon Advisory Group (TAG), World Wildlife Fund - WWF Colombia - Northern Andes Program, Conservation International - Colombia, Special Administrative Unit of Colombia's Natural National Parks System (Unidad Administrativa Especial del Sistema de Parques Nacionales Naturales de Colombia - UAESPNN), U.S. Fish & Wildlife Service - Division of International Conservation, Houston Zoo Inc., Copenhagen Zoo, Los Angeles Zoo, and Cheyenne Mountain Zoo.*

Institutional support provided by*: IUCN/SSC Tapir Specialist Group (TSG), IUCN/SSC Conservation Breeding Specialist Group (CBSG), Colombian Tapir Network (Red Danta de Colombia), Association of Zoos and Aquariums (AZA) - Tapir Taxon Advisory Group (TAG), European Association of Zoos and Aquaria (EAZA) - Tapir Taxon Advisory Group, Houston Zoo, WWF Colombia - Northern Andes Program, and Conservation International - Colombia.*

Workshop facilitated by: *IUCN/SSC Conservation Breeding Specialist Group (CBSG www.cbsg.org).*

Lizcano, D. J.; Medici, E. P.; Montenegro, O. L.; Carrillo, L.; Camacho, A.; Miller, P.S. (Editors). 2005. Mountain Tapir Conservation Workshop: Final Report. IUCN/SSC Tapir Specialist Group (TSG) & IUCN/SSC Conservation Breeding Specialist Group (CBSG), Apple Valley, MN, United States.

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Executive Summary

Introduction

Until recently, tapirs had received relatively little international support and attention, in comparison with that received by their closest relatives, the rhinos and wild equidae. Tapirs are disappearing from their original distribution ranges, the Central and South American and Southeast Asian forests, mainly due to habitat destruction and hunting. The current distribution of the mountain tapir (*Tapirus pinchaque*) goes from the Andes at the North of Peru in the Pirua and Cajamarca states, and also in the northern region of the Condor Cordillera (Mittermeier *et al.* 1975) through the Eastern Cordillera of Ecuador, and up to the Colombian Andes, where it occurs in the Eastern and Central Cordilleras. The species is listed as Endangered (A1de + 2cde + 3cd, C1, E) in the IUCN Red List of Threatened Species (2007 Assessment) what means that it faces a high extinction risk in the wild. Besides, the species is listed in the Appendix I of CITES, which then prohibits its trade within and between the signatory countries, and is also considered as Endangered by the governments of Peru, Colombia, and Ecuador and by the U.S. Fish & Wildlife Service. The IUCN/SSC *Tapir Status Survey and Conservation Action Plan* (Brooks *et al.* 1997), the National Program for Tapir Conservation and Recovery in Colombia (Ministry of Environment, Housing and Land Development and Natural Sciences Institute, Colombia National University) and previous long-term fieldwork results have identified habitat destruction, hunting and extensive cattle ranching as the most serious threats to the species survival. Another factor to consider is that, in many parts of its range, the mountain tapir occurs outside protected areas.

The slow reproductive rate of tapirs (2-year inter-birth interval and usually only 1 offspring per litter) makes it difficult for the species to recover from low population levels, especially if we consider that the remaining habitats have been almost completely fragmented in recent years, leaving, in the majority of cases, small remnant populations isolated from one another. Tapirs have a critical role in creating and maintaining biological diversity, and they work as indicators of the health of various tropical ecosystems. The local extinction or population reduction can trigger adverse effects to the ecosystem, causing a breakdown of some key ecological processes (*e.g.* seed dispersal and predation, nutrient recycling), and eventually jeopardizing the ecosystem biodiversity and integrity in the long-term. These factors justify the urgency in the development and implementation of conservation and management plans for the mountain tapir populations in the three countries where it occurs - Colombia, Ecuador and Peru.

IUCN/SSC Tapir Specialist Group (TSG)

The Tapir Specialist Group (TSG) is a scientific organization founded in 1980 as one of the 120 Specialist Groups of the Species Survival Commission (SSC) of the International Union for the Conservation of Nature (IUCN). The SSC works as the main advisor of IUCN and its members in the technical aspects of species conservation. The SSC is a network comprised of Specialist Groups and Taskforces, some of which addressing conservation issues related to particular groups of plants or animals, while others focus on specific conservation issues such as species reintroduction or sustainable use of natural resources. Furthermore, the SSC is responsible for the elaboration of IUCN Red List, publication of Action Plans, press releases, formulation of policies, organization of workshops etc. The SSC is composed by more than 8,000 volunteer members (researchers, government officials, veterinarians, zoo employees, biologists, protected area managers etc.) working in almost every country of the world.

The Tapir Specialist Group's mission is to preserve biological diversity by stimulating, developing, and executing practical programs to study, save, restore, and manage the four tapir species and their remaining habitats in Central and South America and Southeast Asia. The TSG attempts to fulfill this mission through the implementation of the following strategies: a.) Frequent revision, status determination, and promotion of tapirs and their needs; b.) Promoting and supporting research and distributing informative materials; c.) Promoting conservation and management programs by the appropriate organizations and governments; and d.) Establishing effective and strong relationships among conservationists focused on tapirs in order to stimulate cooperation.

Nowadays, the TSG has 107 members, including field researchers, environmental educators, veterinarians, governmental agencies, non governmental organizations (NGOs) representatives, zoo personnel, university professors and students, from 27 countries worldwide (Argentina, Australia, Belize, Bolivia, Brazil, Burma, Canada, Colombia, Costa Rica, Denmark, Ecuador, France, French Guyana, Germany, Guatemala, Honduras, Indonesia, Malaysia, Mexico, Panama, Paraguay, Peru, Thailand, The Netherlands, United Kingdom, United States, and Venezuela). All members are directly or indirectly involved in field research and/or captive breeding in their respective regions.

The TSG, alongside the Association of Zoos and Aquariums (AZA) Tapir Taxon Advisory Group (TAG), the European Association of Zoos and Aquaria (EAZA) Tapir Taxon Advisory Group (TAG), Copenhagen Zoo, Denmark, and Houston Zoo Inc. are the key groups working in the development and implementation of tapir conservation, management and research projects. An important aspect of the mission of these five organizations is to contribute to the development of a coordinated international conservation strategy for these species.

TSG Action Planning Committee

During the First International Tapir Symposium held in San José, Costa Rica, in November 2001, participants agreed that the revision and updating of the first version of the IUCN/SSC *Tapir Status Survey and Conservation Action Plan* (Brooks *et al.* 1997) would be one of the priority goals for the Tapir Specialist Group in the medium term. As a consequence, an Action Planning Committee was created and it was discussed the most efficient and practical ways to revise the 1997 Action Plan. The final conclusion of these discussions was that carrying out Population and Habitat Viability Assessments (PHVAs), within the framework of the IUCN/SSC Conservation Breeding Specialist Group (CBSG), would be the most efficient and appropriate methodology for developing updated versions of the Action Plans for each one of the four tapir species.

The first step towards achieving the goal of carrying out a PHVA workshop for each one of the four tapir species was the Malayan Tapir Population and Habitat Viability Assessment (PHVA) Workshop, held in Krau Wildlife Reserve, Malaysia, in August 2003. The workshop organizers were the IUCN/SSC Tapir Specialist Group (TSG); European Association of Zoos and Aquaria (EAZA) Tapir Taxon Advisory Group (TAG); IUCN/SSC Conservation Breeding Specialist Group (CBSG) and the Malaysian Department of Wildlife and National Parks (DWNP). The largest financial support came from the Copenhagen Zoo in Denmark. Other contributors were the Wildlife Conservation Society of Thailand, the DWNP, and Idea Wild, USA. The workshop included a group of 35 participants, representing the Malayan tapir range countries in Southeast Asia, including Malaysia, Indonesia and Thailand, and also TSG representatives from other countries. The final result was an updated Malayan tapir Action Plan listing and prioritizing strategies and actions for the conservation of the species.

Some months later, during the Second International Tapir Symposium, held in Panama City, Panama, from 10 to 16 January, 2004, participants agreed that the next PHVA should focus on the mountain tapir. Although there were already some previous local efforts for mountain tapir conservation, it was deemed important to identify larger scale strategies that included all three countries in the distribution range – COLOMBIA, ECUADOR AND PERU.

IUCN/SSC Conservation Breeding Specialist Group (CBSG)

The main objective of the Conservation Breeding Specialist Group, as a member of the Species Survival Commission (SSC) of the International Union for the Conservation of Nature and Natural Resources (IUCN), is to contribute for the development of holistic and viable conservation strategies, as well as the management of Action Plans. With that aim, CBSG is cooperating with agencies and other specialist groups in the world in the development of scientifically-based procedures both at the global and the regional level, having the facilitation of a comprehensive approach for species management and conservation as its goal. One of the tools to achieve that goal is the process of the Workshop of Population and Habitat Viability Assessment (PHVA).

CBSG-Mexico has organized several PHVA (Population and Habitat Viability Assessment) and CAMP (Conservation Assessment and Management Plan) workshops, such as: CAMPs of Mexican felids, primates, cactaceae and lagomorphs, and PHVAs of howler monkey, scarlet macaw, horned guan, peninsular pronghorn, harpy eagle, whale shark, and mountain tapir. Besides, CBSG-Mexico, aiming at training more and more professionals involved with wildlife management, care and research, also organizes capacity-building workshops in order to offer valuable tools to those specialists in whose hands lie the wild fauna and flora in the country. Those were the cases of the workshops carried out in 2002: operation of VORTEX (July 2002), a computational model through which one can make predictions about the future of a given species, according to the current management data; and the Disease Risk Assessment Workshop (October 2002), whose objective was to provide, to fauna management professionals, field biologists and veterinarians, some practical procedures to evaluate the risk of emergence or introduction of diseases in wild animal populations, especially those at extinction risk,.

The Colombian Tapir Network

The Colombian Tapir Network (Red Danta de Colombia) was created in 2001 during the First International Tapir Symposium held in San Jose, Costa Rica, as an effort to improve communication and to promote conservation and exchange of information in Spanish on Neotropical tapirs. The participants of the network belong to several institutions, both private and public or national ones. It currently has 68 members, including field researchers, environmental educators, veterinarians, NGOs representatives, staff from zoological institutions, and university students from Colombia, Ecuador and Peru, working directly or indirectly with tapirs and their conservation. The network participants communicate through an e-group and the members maintain a webpage with information about tapirs in Spanish. In its short lifetime, its members have participated in the International Tapir Symposia of Costa Rica and Panama, as well as in the development and implementation of the National Program for the Conservation and Recovery of Tapirs in Colombia.

The PHVA - Population and Habitat Viability Assessment

The IUCN/SSC Conservation Breeding Specialist Group (CBSG) has the philosophy that the effectiveness of the conservation actions for an endangered species is based, among other things, on critical knowledge revision and on the use of the best biological information available, but also on the attitudes of the people that share the habitat with the species in question.

At the beginning of each PHVA workshop, participants agree on the objectives of the meeting, which are to prevent the extinction and maintain viable populations of the species. The PHVA process goes through an in-depth look at the species ecology, populations, conservation status, threats and conservation measures.

The Population and Habitat Viability Assessment (PHVA) is a very efficient and systematic process for species action planning. Managing endangered species is an extremely complex conservation problem. It requires the involvement and collaboration of experts from different professions and areas, an interchange of knowledge and technology, a building up of a consensus about threats and solutions, and a mobilization of resources. The PHVA workshop process balances the need to integrate the necessary information for evaluating alternative strategies for species conservation with the need to integrate, or at least connect, individuals from different disciplines and backgrounds that are centrally concerned with the species of interest. The process is done on the hope of obtaining some realignment of priorities among individual stakeholder groups, taking into account the needs, views and initiatives of other groups. Key to this process is the use of VORTEX, a computer software that models population dynamics, performs a risk assessment, and provides both a tangible focus for quantitative evaluation of conservation options for a species and a vehicle for integrating different biological species and human sociological data. Taken together, the risk assessment modeling and the discussions among stakeholder participants are designed to address the issues affecting the species in a straight way, so that alternative strategies can be rationally and systematically analyzed. When such analyses happen, they result in better conservation decisions and specific action steps with targeted responsibilities.

One of the main results of PHVA workshops is the unpublished information which is gathered and compiled. It is estimated that around 80% of the useful information about a given species is inside the minds of experts and this may never come to be published. This information will lay the basis to build simulations of each population through the use of models that will allow the analysis of stochastic and deterministic effects as well as the interaction of genetic, demographic, environmental and catastrophic factors on the population dynamics and extinction risk. The process of gathering information to be included in the model requires not only some assumptions to be made, but also available data for explaining the assumptions. This process leads to the elaboration of a baseline species model based on consensus. The model simulates the biology of the species, as it is currently known, and allows the continuation of the discussion about management alternatives and the adaptive management of the species or population as more information on the species is obtained. Lastly, it allows the establishment of management programs that, via scientific exercises through the continuous evaluation of new information, both allows a strategy in the management procedures and has the benefit of the power to adjust them as needed.

In a PHVA, all participants are equivalent and the contribution of everyone for the success of the process is acknowledged. The information brought by researchers, government officials, members of local communities, park rangers, hunters etc. has one and the same importance. Another significance of the PHVA process lies on communication. Frequently, there are different people who have been working with the same species for years, yet never shared information face to face. During the PHVA workshop, participants work in small groups to discuss those issues previously identified as central for the species recovery. Those issues may include, for example, prevention of mortality causes, habitat conservation, management of prey species, human pressure, captive breeding etc.

The Mountain Tapir Population and Habitat Viability Assessment (PHVA) Workshop was held at Otún-Quimbaya Flora and Fauna Sanctuary, Pereira, Colombia, from 12 to 15 October, 2004. The organizations that provided institutional support for the workshop were the IUCN/SSC CBSG; Association of Zoos and Aquariums (AZA) Tapir Taxon Advisory Group (TAG); European Association of Zoos and Aquaria (EAZA) Tapir Taxon Advisory Group (TAG); Colombian Tapir Network (Red Danta de Colombia); Houston Zoo Inc., United States; World Wildlife Fund (WWF), Colombia; and Conservation International (CI), Colombia. Financial support came from AZA Tapir TAG; WWF - Colombia; Conservation International - Colombia; U.S. Fish & Wildlife Service, Division of International Conservation, United States; Special Administrative Unit of Colombia's Natural National Parks System (Unidad Administrativa Especial del Sistema de Parques Nacionales Naturales de Colombia - UAESPNN); Houston Zoo Inc., United States; Los Angeles Zoo, United States; Copenhagen Zoo, Denmark; and Cheyenne Mountain Zoo, United States. A total of 66 representatives from the mountain tapir range countries (Colombia, Ecuador, and Peru), as well as TSG officers from other countries, attended the workshop.

The main goal of the Mountain Tapir PHVA Workshop was to compile, organize and discuss all available data and information on mountain tapirs (population demographic parameters, such as age structure, birth, dispersal, and mortality rates, and other biological data; the current species status and its distribution; threats to survivorship on its range; available habitat etc.). Ultimately, the workshop aimed at using all this information to develop a new, updated Mountain Tapir Action Plan. This involved establishing conservation, management and research priorities of the species in the wild, but also paying attention to the captive population, education, and funding and research priorities. The objectives of the workshop were: **1.)** To define the limits of the mountain tapir populations in the remaining habitats; **2.)** To determine the status of the sub-populations of mountain tapir; **3.)** To determine the threats faced by mountain tapirs in these sub-populations **4.)** To define geographical areas where the mountain tapir would have long-term survivorship prospects; **5.)** To prioritize management, conservation and research actions needed to protect the mountain tapir throughout these areas **6.)** To develop a communication strategy to approach politicians and decision-makers.

The workshop was officially opened by Dr. José Sinisterra Santana from the Special Administrative Unit of Colombia's Natural National Parks System. Subsequently, there were the presentations given by representatives from the IUCN/SSC Tapir Specialist Group (TSG): Diego J. Lizcano, Mountain Tapir Coordinator, and Patrícia Medici, Chair. Additionally, Dr. Claudia Rodríguez from the Ministry of the Environment of Colombia made a presentation about the ministry's program on "Management Plans for Focal Species with Emphasis on Threatened, Endemic and Migratory Species of Colombia". Next, participants were asked to introduce themselves and to consider which were, on their point of view, the main threats faced by the species and the main factors and challenges for the conservation of mountain tapirs in the next 25 years. Lastly, there were introductory presentations about the CBSG, the PHVA workshop process and about VORTEX modeling.

Once the introductory presentations were concluded, we proceeded with range country status reports: National Program for Conservation and Recovery of Tapirs (Genus *Tapirus*) in Colombia: 1.) MOUNTAIN TAPIR (*Tapirus pinchaque*) by Olga Lucía Montenegro; 2.) Mountain Tapir Conservation Status in Colombia by Diego Lizcano; 3.) Mountain Tapir Conservation Status in Ecuador by Leonardo Ordóñez Delgado, Jaime Camacho, Armando Xavier Castellanos Peñafiel and Leonardo Arias; and, 4.) Mountain Tapir Conservation Status in Peru by Jessica Amanzo.

Based on the recognized challenges for the conservation of the species, the group and workshop facilitators identified five working groups: **1.)** Population and Habitat Management; **2.)** Population Biology and Simulation Modeling; **3.)** International and Regional Cooperation; **4.)** Participation of Local Communities and **5.)** *Ex-Situ* Conservation

Each working group was given the following tasks:

- To discuss and refine the issues and problems faced by the species;

- To prioritize the issues;

- To develop and prioritize short- and long-term goals for each issue;

- To develop and prioritize detailed action steps for each high-priority goal;

- To identify the different types of resources required to implement each action step.

Each group presented the results of its deliberations in plenary sessions to guarantee that everyone had the opportunity to contribute to the work of the other groups and to ensure that every issue was revised and discussed by the whole group.

In order to estimate the risk in possible future ecological scenarios, the Population Biology and Simulation Modeling working group developed simulation models (VORTEX) and identified the critical factors for population extinction/survival. Moreover, the group considered some alternative management strategies that could improve the situation of the mountain tapir.

During the workshop, participants had several open and productive discussion sessions about the general viability of mountain tapir conservation.

Every working group elaborated a report of its deliberations, which is included in this Final Report. The success level of a PHVA depends on the general working out, in which everyone, many with quite different interests, feels they have "won" in the development of demographic simulation models and management strategies that best represent the reality of the species and that these are achieved by consensus.

Prioritization of Goals of all Working Groups

In an effort to achieve a significant consensus level among all workshop participants about the most important goals for the conservation of mountain tapirs, workshop facilitators led the group through a process where the goals of each one of the working groups were prioritized by all participants according to a single selection criterion.

Below are the prioritized goals produced by all five working groups:

1. To improve the evaluation and monitoring of mountain tapir demography, distribution, population viability and genetics.

2. To develop and implement alternatives for the integration of different systems of production into conservation and management plans designed for mountain tapirs and their remaining habitat.

3. To evaluate the feasibility of different management strategies, involving the local communities.

4. To evaluate hunting levels and reach an agreement with the local populations in order to reduce or eliminate hunting through population and/or habitat management.

5. To assess the frequency, intensity and acceleration of the anthropogenic and natural threats, as well as their impact on mountain tapir populations.

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Section 2

Population and Habitat Management Working Group Report

Population and Habitat Management

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PROBLEMS

The group carried out a brainstorming process and listed a series of sub-topics, addressing each one of them in order to find out the aspects encompassing the most important problems related to the current mountain tapir conservation status and the relevance of each factor for the implementation of priority actions. Likewise, the group established clear definitions for the terms "habitat" and "management" in order to have a common understanding for further discussions throughout the workshop.

> **Habitat:** Set of characteristics which allow the species to be present in a certain area.
>
> **Management:** Activity to maintain a good quality habitat for the maintenance of viable populations of a given species.

1. Problem Identification

a. Problems Related to Habitat

Habitat use and distribution:

- Lack of information.
- Lack of integration – to consolidate information.
- Local deficiency and researchers' community.
- Criteria unification.

Identification of critical habitat:

- Lack of information on community and population ecology.
- Cartographic outdating and lack of cooperation among institutions.
- Lack of information about socio-economic aspects, land-use, land cover and trends.
- Taxonomy - lack of knowledge on subspecies or races.

Threats to the habitat:

- Habitat fragmentation due to inappropriate models of production: cattle ranching, agriculture, crops.
- Armed conflict in Colombia.
- Emerging infectious diseases

Policies and legislation:

- Productive sector interests stay above the conservation ones.
- Development policies have not taken environmental issues into account.
- Deficiency in land-use planning (conservation implementation and concepts).
- Lack of interest to enforce the policies for National Parks in Colombia, Ecuador and Peru.
- The 111 policy, law 99 and 93, is not enforced – Land acquisition.
- The decree nº 622 of the Colombian legislation on National Parks is outdated.
- The national categories of Protected Areas are not within a legal framework which allow them to receive help and incentives – there are no unified criteria.
- There is no social consensus for the establishment of new protected areas.

b. Problems Related to Mountain Tapir Populations

Lack of knowledge on the status of the wild populations:

- Lack of surveys of the presence of mountain tapir populations in different areas and the altitudinal distribution limits of the species in the range countries.

High levels of anthropic interventions in the sites with mountain tapir populations.

- Deforestation, advancement of the agricultural and cattle ranching frontiers (including transmission of infectious diseases).
- Hunting.
- Road infrastructure.
- Mining activities, mainly in Ecuador and Peru.
- Aerial chemical fumigations in Colombia affect neighboring countries, such as Ecuador.
- Human settlements.

The largest part of the mountain tapir populations occur outside protected areas:

- Low representativeness of protected habitat for the mountain tapirs within the systems of national parks.
- Although there are areas of the mountain tapir distribution under other categories of protected areas, we are still lacking data on local, municipal and/or regional reserves, as well as, in the case of Colombia, on private reserves of the civil society (Red de Reservas de Colombia).

The enforcement of mountain tapir protection law is not effective:

- "Extralegal" protection by some armed groups in the case of Colombia.
- Although the armed groups do not protect the tapir, they may control the exploitation of natural resources, but only at their convenience.

Lack of participation of institutional and social actors:

- Peasants' and indigenous' communities

2. Problem Prioritization

When analyzing all the ideas proposed by the group in conjunction, it was possible to identify four big problems for the habitat and five for the mountain tapir populations, which encompassed the sub-issues that were dealt with. Immediately afterwards, it was carried out an exercise of problem prioritization with the paired-ranking technique, using as a criterion the previously detailed vision: "To find out the aspects encompassing the most important problems related to the current mountain tapir conservation status and the relevance of each factor for the implementation of priority actions."

Priority grade	Identified Problem HABITAT MANAGEMENT	Score	Identified Problem POPULATION MANAGEMENT	Score
1	Habitat changes	16	Lack of knowledge on the status of wild populations	22
2	Policies and legislation	12	High levels of anthropic interventions	20
3	Lack of ecological information	10	Largest part of the wild populations occur outside protected areas	10
4	Emerging infectious diseases	3	Lack of participation of institutional and social actors	10
5			Enforcement of mountain tapir protection law is not effective	8

Note: In light of the problems and issues identified and their similarity, and also considering the fact that the issues pertaining to habitat and population management could not be separated if we were to deal with the conservation problems as a whole, the working groups and all participants in plenary decided to unify these two themes from this point on.

The following problem categories encompass the issues of the two working topics: Habitat and Population Management. Each problem is listed below in order of priority after weighing up the scores given to them.

PROBLEM 1 Anthropic Intervention – Habitat Changes

PROBLEM 2 Governmental policies and legal framework on the environment are not articulated with the policies of the productive sectors.

PROBLEM 3 The majority of the mountain tapir populations occur outside protected areas.

PROBLEM 4 Lack of monitoring and assessment of distribution of existing mountain tapir populations.

PROBLEM 5 Lack of involvement of institutional and social actors in conservation actions for the species.

PROBLEM 6 There are no evaluations of the health status of mountain tapir populations. Additionally, there is no assessment of the integrity of the ecosystems where the species occurs and the relationships between mountain tapirs and etiological pathogens.

DATA ASSEMBLY

Based on the bibliographical compilation available in the document provided by the workshop organizers (Briefing Book – Mountain Tapir PHVA Workshop) and on the participants' experience and background on the topic, the working group compiled the state of the art and/or the documentation which could be used to analyze each one of the identified sub-problems. In addition, a few known existing facts and assumptions supporting information gaps were noted, all of which detailed in the following table:

PROBLEM 1: Anthropic Intervention – Habitat Changes				
Evaluated Item	**Fact**	**Assumption**	**Information Required**	**References**
Habitat Fragmentation	Preliminary information about the conservation status of mountain tapir habitat in the Eastern Andean Region		Habitat fragmentation rates – habitat loss	Corpochivor 2002 (in Spanish)
	Paramos and Andean ecosystems listed as *Hotspots*		Studies on habitat quality, connectivity, corridors (altitudinal gradients)	IDEAM 2002 (in Spanish)
	Mountain Tapir in the Northern Andean Region		Habitat vulnerability (threats) studies	Downer 1996
	Vision of the biodiversity in the Northern Andean Region		Validation of habitat cartographic information in the field and list of the priority and potential areas	WWF 2001
	Natural resources assessment			WRI 2001
Inappropriate production models	Deforestation for plantations			Cavalier & Etter 1995
	Report Eco-Regions			Corporaciones Eje Cafetero 2002 (in Spanish)
	Deforestation for Plantations – Analysis of the Natural National Park Los Nevados and Buffer Zone (Colombia)			Fandiño & Wyngaarden & Fandiño-Lozano 2002 (in Spanish)
	Ecuatorian National Parks			Fundación Natura 1992 (in Spanish)
	Population density and habitat distribution			Lizcano & Cavelier 2000
	Patterns of landscape transformation in Colombia			Etter & Wyngaarden 2000
	Biological Corridors Chingaza-Sumapaz – Colombia			Matallana 2001 (in Spanish)
	National Sanctuary Tabaconas-Namballe: Annual Report & Socio-economic evaluation - Peru		Proposals and planning of alternative models	INRENA-Perú 2000 (in Spanish)
	Presentation of a panel on sustainable management of tropical forests, concessions, forest management plans		Study design on of goods and services from the fauna-habitat resource	Ríos 2001

PROBLEM 1: Anthropic Intervention – Habitat Changes				
Evaluated Item	**Fact**	**Assumption**	**Information Required**	**References**
Extensive cattle ranching	Mountain tapir home range and habitat use, and cattle entry			Downer 2003
Illegal crops		Fumigations affect the habitat and human health	Evaluate the impact on the human health and the habitat	
Resource extraction (mining, hunting, logging etc.)	Hunting and the likelihood of extinction		Evaluate hunting quotas to propose extraction models	Bodmer *et al.* 1997
	Distribution and use of páramo fauna in Valle and Cauca departments- Colombia			Velasco 1991 (in Spanish)
Armed conflict (land mines)	The habitat has hostile groups (FARC etc.) - Colombia	Use of bush meat	Strengthen participative process with the actors of a given region	Semple 2000
Infrastructure and human settlements			Evaluation of the impact of road infrastructure projects and other projects related to habitat connectivity	
Deforestation	High rates in Ecuador 48.7% during the 1980s while Colombia lost 67.4% in the same period			Simpson 1990
Advancement of agricultural frontier				Land Use Map - CARs (Verweij 1995)
Hunting		Lack of hunting statistics		Simpson 1990; Downer 1996; Castellanos 1999; Amanzo *et al.* 2003, 2004
Road infrastructure	This problem has been identified mostly for Ecuador and Peru			Castellanos, pers. com.; Amanzo, pers. com.; Amanzo *et al.* 2004
	Road warnings			Downer 1995
Mining activities	Expounded mostly for Ecuador and Peru			Castellanos & Amanzo, pers. com.
Chemical fumigations				Paya, pers. com.
Human settlements				Downer 1981; Amanzo *et al.* 2003 (in Spanish), 2004

PROBLEM 2: Governmental policies and legal framework on the environment are not articulated with the policies of the productive sectors.				
Evaluated Item	**Fact**	**Assumption**	**Information Required**	**References**
Productive sector interests stay above the conservation ones	National Development Plan	Government and State policies are not coherent		Murillo & Baena 1999 (in Spanish)
	Andean Highway violates international treatises –			Downer 1991
	Land use plan for the Otún River Basin – Colombia			UAESPNN Colombia 2004 (in Spanish)
	Strategy for Research and Monitoring the Colombian Protected Areas		Analysis of the possibilities for the inclusion of mountain tapir distribution areas in Land Use Plans	
Lack of clarity in the land use concepts and their posterior implementation	Law nº 338 from 1997 - Land Use - Colombia			MAVDT-Colombia 2000 (in Spanish)
	Lack of an unified environmental management legislation – Ecuador and Peru			
	Pacts, treatises, and agreements at the international level		Integration of the different levels of management categories (protected areas) Criteria for the environmental authorities	IUCN 2004
Deficient/non-existent definition of local categories of Protected Areas. Criteria and legal frameworks which allow them to access resources and incentives	Categories of protected areas		Participative elaboration of the management plans of the areas set aside for the biological corridors	

PROBLEM 2: Governmental policies and legal framework on the environment are not articulated with the policies of the productive sectors.				
The enforcement of mountain tapir protection law is not effective	"Extralegal" protection by some armed groups			
	Lack of inclusion of social concepts in the process of establishment of management areas			
	The Resolution 574/60 issued by INDERENA (Hunting prohibition of mountain tapir and other species) has not been effective			
	Natural Resources Code / 71 (Colombia)			
	Resolution 586/2001 from MAVDT (Colombia)			
	Supreme Decree Nº 034-2004-AG (2004) from the Agricultural Ministry protects the mountain tapir in Peru			
	Official Registry / 72 in Ecuador			Tirira & Castellanos 2001 (in Spanish)
	Insurgent groups "control and create prohibitions on wildlife" in certain areas (Colombia)			

PROBLEM 3: The majority of the mountain tapir populations occur outside protected areas.				
Evaluated Item	**Fact**	**Assumption**	**Information Required**	**References**
The majority of the mountain tapir populations occur outside protected areas	In Colombia, only 13% of the current mountain tapir populations are found in Natural National Parks (estimated current population 2,451-2,611 individuals)		Contribution of areas under different categories of protection (besides Natural National Parks)	Lizcano *et al.* 2002
	In Peru, 8.2% of the current mountain tapir populations are found in National Parks (estimated current population 350-375 individuals)			Lizcano and Sissa 2003
	There is no estimation of the area of the SIRAPs (Colombia) which protect mountain tapir populations			
	In Peru, it is possible to include communal or private land as protected areas for the conservation of the species populations, although this has not been implemented yet within the mountain tapir distribution range			Amanzo *et al.* 2004
	In Ecuador, there are no specific management plans for wildlife, but the mountain tapir is considered as a conservation object within a project labeled "Bio Reserva del Cóndor". THERE ARE NO NATIONAL POPULATION ESTIMATES, only for the Sangay and Llanganates National Parks: 1,000 individuals			Downer 1990

PROBLEM 4: Lack of monitoring and assessment of distribution of existing mountain tapir populations.				
Evaluated Item	**Fact**	**Assumption**	**Information Required**	**References**
Lack of monitoring and assessment of distribution of existing mountain tapir populations.	Lack of assessment of the presence of the species in different areas	The data supplied by the National Survey conducted during the development of the National Action Plan for Tapir Conservation in Colombia are assumed to be correct	Colombia: To verify the presence of populations in localities according to the National Survey conducted during the development of the National Action Plan for Tapir Conservation in Colombia	Montenegro 2002 (in Spanish)
			Ecuador: Confirmation about the presence of populations in the Western Cordillera	Tirira & Castellanos 2001 (in Spanish)
			Peru: Confirmation of the record obtained in the south of the Chamaya River and in the Condor Cordillera	Peyton, pers. com.
Systematic lack of knowledge about mountain tapir populations in the wild in all range countries				
Lack of integration of the available information – including research methodologies		Lack of dissemination of results		
Deficiency in the number of researchers working on mountain tapirs, including members of local communities				

PROBLEM 5: Lack of involvement of institutional and social actors in conservation actions for the species.				
Evaluated Item	**Fact**	**Assumption**	**Information Required**	**References**
Lack of involvement of institutional and social actors in conservation actions for the species.		Dichotomy between basic and conservation applied research	Community feedback and effective involvement	
		Deficiency in numbers of researchers working on this topic		
	Experience of the Paéz ethnic group; respect to the mountain tapir management - Colombia			Paya, pers. com.
	National Program for the Conservation and Recovery of Tapirs in Colombia - Final Report		Lack of integration among biological, social and economic information (coverage and tendencies)	MAVDT-Colombia 2002 (in Spanish)
	Point experiences of Ecuatorian local communities with mountain tapir management			Downer 1992; Castellanos, pers. com.; Schauenberg 1969 (in French); Fradrich 1970
	Participation of members of the community in mountain tapir captures for installation of radio-collars for scientific research - Mountain Tapir Project, Colombia			Lizcano & Cavelier 2000

PROBLEM 6: There are no evaluations of mountain tapir population health. Additionally, there is no assessment of the integrity of the ecosystems where the species occurs and the relationships between mountain tapirs and etiological pathogens.				
Evaluated Item	**Fact**	**Assumption**	**Information Required**	**References**
Emerging infectious diseases			Deepen the knowledge of disease ecology, in particular host-pathogen interactions	
			To include veterinarian issues in the protocols for biological sampling of mountain tapirs	
Mountain tapir populations diseases			Complete lack of knowledge about the occurrence of etiological agents in the wild	Gale & Sedgwick 1968; Lee 1993; Hernández-Camacho in Downer 1996; Amanzo, field notes

GOAL IDENTIFICATION AND PRIORITIZATION

1. Goal identification

The group took each one of the identified problems and assigned them one or several specific goals, proposed for a five year period. These goals were developed to reduce extinction risk and contribute to mountain tapir conservation programs. As a final exercise, the goals were prioritized employing a paired-ranking technique. The results are presented after the depiction of goals for each one of the problems.

PROBLEM 1: Anthropic Intervention – Habitat Change
Anthropic intervention at different intensities modifies mountain tapir habitats

Goals

1. To develop and implement alternatives for the integration of different systems of production into the conservation and management plans for mountain tapirs and their habitat (COLOMBIA, ECUADOR and PERU).
2. To establish population and habitat monitoring programs (COLOMBIA, ECUADOR and PERU).
3. To evaluate hunting levels and reach an agreement with local communities on hunting reduction or elimination through the management of the habitat or the mountain tapir populations (COLOMBIA, ECUADOR and PERU).

PROBLEM 2: Governmental policies and legal framework on the environment are not articulated with the policies of the productive sectors.
The enforcement of the laws related to mountain tapir protection is not effective. Similarly, there are difficulties on the coordination of the legally recognized local authorities (indigenous communities) with the state authorities for designing conservation and management plans.

Goals

1. To develop management indicators for the environmental institutions regarding threatened species management (ECUADOR and PERU).
2. To include and strengthen the inclusion of wildlife-related environmental issues into developmental plans at the local and regional authority levels (COLOMBIA, ECUADOR and PERU).

PROBLEM 3: The majority of the mountain tapir populations occur outside protected areas.

Goals

1. To promote, coordinate and consolidate the establishment of a system of protected areas that ensures the conservation of mountain tapirs (COLOMBIA, ECUADOR and PERU).

PROBLEM 4: Lack of monitoring and assessment of distribution of existing mountain tapir populations.
There are reported populations but the information needs to be checked. Likewise, it is necessary to monitor the populations that are found.

Goals

1. To assess the distribution and monitor the mountain tapir populations

PROBLEM 5: Lack of involvement of institutional and social actors in conservation actions for the species.

Goals

1. To establish formal agreements among different institutions and also with local communities, aiming at implementing the actions of this Action Plan (COLOMBIA, ECUADOR and PERU).
2. To provide training and capacity-building on mountain tapir conservation issues to members of both the institutions and the associations of local communities (COLOMBIA, ECUADOR and PERU).

PROBLEM 6: There are no evaluations of the health status of mountain tapir populations. Additionally, there is no assessment of the integrity of the ecosystems where the species occurs and the relationships between mountain tapirs and etiological pathogens.

Goals

1. To evaluate and monitor the health status of mountain tapir populations and parameters related to the integrity of the ecosystems where the species occurs (COLOMBIA, ECUADOR and PERU).
2. To strengthen long-term research on the functions and inter-relations of the species within the ecosystems (COLOMBIA, ECUADOR and PERU).

2. Goal Prioritization

GOAL 1 To evaluate hunting levels and reach an agreement with the local population on its reduction or elimination through the management of the habitat or its populations (COLOMBIA, ECUADOR and PERU).

GOAL 2 Development and implementation of alternatives for the integration of production systems into the conservation and management plans for the species and its habitat (COLOMBIA, ECUADOR and PERU).

GOAL 3 To strengthen long-term research on the functions and inter-relations of the species within the ecosystems (COLOMBIA, ECUADOR and PERU).

GOAL 4 To promote, coordinate and consolidate the establishment of a system of protected areas which ensures mountain tapir conservation (COLOMBIA, ECUADOR and PERU).

GOAL 5 To verify the current distribution and monitor the mountain tapir populations (COLOMBIA, ECUADOR and PERU).

GOAL 6 To manage achieving agreements among the institutions and also with the communities in order to implement the elements of the current program (COLOMBIA, ECUADOR and PERU).

GOAL 7 To build capacity of members both from the institutions and the community associations regarding mountain tapir conservation (COLOMBIA, ECUADOR and PERU).

GOAL 8 To evaluate and monitor the health of the populations and the integrity of the ecosystems where the mountain tapir occurs (COLOMBIA, ECUADOR and PERU).

GOAL 9 To include and strengthen the fauna-related environmental issues within the development plans at the local and regional authority levels (COLOMBIA, ECUADOR and PERU).

GOAL 10 To establish population and habitat monitoring programs (COLOMBIA, ECUADOR and PERU).

GOAL 11 To develop management indicators for the environmental institutions regarding threatened species management (ECUADOR and PERU).

It is important to stress that there was a bias in the results of the prioritization exercise, given that ECUADOR and PERU were represented by only one person each in the working group. For that reason, it is important to us to explain that their priority assessment is not necessarily the same than the consensus hereby being presented. This is the reason behind the decision of detailing the actions steps for each country within the higher-priority goals.

Likewise, in the case of the indigenous communities, Dom Ovidio Paya, Governor of the Paéz de Gaitana Indigenous Community in Tolima, Colombia, explained that Goal 9 had great importance for the indigenous territories, reason why it must be given priority at the municipal and local levels, especially in Colombia.

Following the current exercise, the first seven prioritized goals were presented to all workshop participants during a plenary session.

ACTION PLAN

Actions were identified for the first four priority goals. The definition of actions was based on the opinions and expertise of each member of the working group, who identified the most appropriate ways to reach the goals.

GOAL 1: To evaluate hunting levels and reach an agreement with the local population on its reduction or elimination through the management of the habitat or its populations.						
Action	**Indicators**	**Responsibility**	**Deadline**	**Collaborators**	**Costs US$**	**Country**
To quantify and analyze hunting levels at three critical areas in each range country						COLOMBIA, ECUADOR and PERU
COLOMBIA: Los Nevados NNP, Chingaza NNP and Huila NNP Guacharos-Puracé Corridor	After three years, we must have at least three analysis and at least 50% of local communities taking part	COLOMBIA: David Bejarano Bonilla	January/2007	CARs and Universities	US$12,000	
ECUADOR: Sangay NP, Podocarpus NP and Cayambe-Coca		PERU: Jessica Amanzo	January/2007	NGOs and Andean Tapir Fund	US$6,000	
PERU: Ayabaca-Huancabamba, SN Tabaconas-Namballe and Chaupe,		ECUADOR: Luis Fernando Sandoval	January/2007	Local communities and Andean Tapir Fund	US$6,000	
To coordinate and implement pilot projects on strategies of sustainable management with the communities from the three critical areas in each range country	After three years, we must have at least one management strategy established per country	COLOMBIA: Rocío Polanco and Ricardo Sánchez	January/2008	Universidad Javeriana (Germán Jiménez)	US$200,000	COLOMBIA, ECUADOR and PERU
		PERU: Jessica Amanzo	January/2008		US$100,000	
		ECUADOR: Luis Fernando Sandoval	January/2008	Andean Tapir Fund	US$100,000	
To promote incentives which allow reducing hunting in one of the critical areas in each range country	After three years, we must have three communities that have been given incentives	COLOMBIA: Ricardo Sánchez and Ovidio Paya	January/2008	IAvH	US$10,000	COLOMBIA, ECUADOR and PERU
		PERU: Jessica Amanzo	January/2008	INRENA & WWF-Peru	US$10,000	
		ECUADOR: Luis Fernando Sandoval	January/2008	Fundación Espíritu del Bosque & Fundación ArcoIris	US$10,000	

To establish long-term hunting monitoring programs in at least one community per range country	After five years, we must know the hunting trends in at least one critical community in each range country	COLOMBIA: Dom Ovidio Paya	January/2010	CATIE, UTP, IAvH, Resguardos Indígenas (Indigenous Communities)	US$10,000	COLOMBIA, ECUADOR and PERU
		PERU: Jessica Amanzo	January/2010		US$10,000	
		ECUADOR: Luis Fernando Sandoval	January/2010	Andean Tapir Fund	US$10,000	

GOAL 2: Development and implementation of alternatives for the integration of production systems into the conservation and management plans for the mountain tapit and its habitat.						
Action	**Indicators**	**Responsibility**	**Deadline**	**Collaborators**	**Costs US$**	**Country**
To identify existing production models and their impact on mountain tapir populations	By 31st December, 2008, at least 3 production models and their impacts will have been identified	COLOMBIA: Germán Jimenez and Joaquín Sánchez	December/2008	UAESPNN-CRQ, Universidad Javeriana, CARs, MAVDT, Municipalities, NGOs, GEF, Fundación ArcoIris (Ecuador), Andean Tapir Fund	US$300,000	COLOMBIA, ECUADOR and PERU
			December/2008		US$100,000	
		ECUADOR: Leonardo Ordóñez Delgado	December/2008		US$800,000	
Implementation of a community-based management plan based on the participative rural diagnosis	By 31st December, 2008, at least three community-based management proposals will have been implemented based on the participative rural diagnosis	COLOMBIA: Jaime Suárez Mejía and Joaquín Sánchez	December/2010	UAESPNN-CRQ, Universidad Javeriana, CARs, MAVDT, Municipalities, NGOs, GEF, Fundación ArcoIris (Ecuador), Andean Tapir Fund	US$500,000	COLOMBIA, and ECUADOR
		ECUADOR: Leonardo Ordóñez Delgado	December /2010		US$300,000	
Identification of markets for goods and services from the habitats where the mountain tapir occurs	By 31st December, 2008, at least 1 market will have been identified	COLOMBIA: Jaime Suárez Mejía and Rocío Polanco	December/2008	CATIE - Colombia, UTP, IAvH, Resguardos Indígenas and Andean Tapir Fund	US$500,000	COLOMBIA

GOAL 3: To strengthen long-term research on the functions and inter-relations of the species within the ecosystems.						
Action Description	**Indicators**	**Responsibility**	**Deadline**	**Collaborators**	**Costs US$**	**Country**
To formulate at least one long-term research plan for each range country consistent with the priorities listed during the Mountain Tapir PHVA Workshop	To have, within one year, one research plan for each range country: COLOMBIA, ECUADOR and PERU	COLOMBIA: Jaime Suárez Mejía, Olga Lucía Montenegro, Germán Jiménez and Joaquín Sánchez	January/2006	MAE, IAvH, WWF-Perú, WWF-Colombia, INRENA-Perú, UAESPNN-Colombia, Fundación Espíritu Del Bosque (Ecuador), Fundación ArcoIris (Ecuador) and Andean Tapir Fund, UPCH	US$20,000	COLOMBIA, ECUADOR and PERU
		ECUADOR: Fernando Nogales and Armando Castellanos	January/2006		US$15,000	
		PERU: Jessica Amanzo	January/2006		US$10,000	
To develop three research proposals on each range country aimed at population and habitat studies in the previously selected critical areas: ECUADOR-PERU: Study of mountain tapir habitat modeling in the Eastern Cordillera Real and in northern Peru COLOMBIA, ECUADOR and PERU: Study of mountain tapir habitat use and preference COLOMBIA, ECUADOR and PERU: Estimates of mountain tapir population sizes and health status	To have partial results of each defined research topic after two years	COLOMBIA: Diego Lizcano, Sergio Sandoval Arenas, Franz Kaston , Germán Jiménez, José Sinisterra Santana and Joaquín Sánchez ECUADOR: Armando Castellanos, Jaime Camacho and Fernando Nogales PERU: Jessica Amanzo	January/2008	IAvH/ICN, Universidad Javeriana - Colombia, Universidad de Tolima - Colombia, UAESPNN-Colombia, UTPL, FUNDEBO, Ecociência-Ecuador, Fundación ArcoIris (Ecuador), Andean Tapir Fund, INRENA-Peru, WWF-Peru, UPCH and CONOPA	US$365,000 / project	COLOMBIA, ECUADOR and PERU

GOAL 4: To promote, coordinate and consolidate the establishment of a system of protected natural areas which ensures mountain tapir conservation.						
Action Description	**Indicators**	**Responsibility**	**Deadline**	**Collaborators**	**Costs US$**	**Country**
To identify potential habitat inside the distribution range and to establish conservation partnerships with organizations, local communities and/or researchers in order to ensure the long-term viability of mountain tapir populations	To have, at the end of five years, one integrated system of conservation areas under different categories, which will increase by 20% de current mountain tapir protection area.	COLOMBIA: Jaime Suárez Mejía, José Sinisterra Santana, Germán Jiménez and Joaquín Sánchez PERÚ: Jessica Amanzo	January/2013	UAESPNN-Colombia, INRENA- Peru, SIRAP-EC-Colombia, MAE and Andean Tapir Fund	us$365,000 / project	COLOMBIA, ECUADOR and PERU

GOAL 1 – Note: the methodological discussion around the **evaluation of hunting** stressed the importance to carry out the hunting diagnoses employing several techniques, such as the permanent and direct participation of hunters and the need not to limit oneself to the questionnaires. These questionnaires can have information biases which are difficult to identify and do not necessarily correspond to a real approximation to a quantification of hunting.

GOALS 3 and 4 – Note: The **proposed long-term research** was considered a desirable pre-requisite for the establishment of systems of protected areas.

General observations of the last plenary:

- To include the GEF, currently working in the paramos region;
- To include Joaquín Sánchez from Colombian Natural National Parks, Bio Macizo Project, in the monitoring of the populations;
- To include TSG's Exclosure Plots International Project as an additional research initiative providing useful data and information, and which works with the three Latin American tapir species.

Mountain Tapir (*Tapirus pinchaque*) Conservation Workshop Population and Habitat Viability Assessment (PHVA)

Otún-Quimbaya, Pereira, Colombia
12 to 15 October, 2004

Section 3

Population Biology and Simulation Modeling Working Group Report

Population Biology and Simulation Modeling

Participants: Andrés Guarnizo Díaz (Colombia), Camilo Pineda (Colombia), Carlos Pedraza (Colombia), Craig Downer (United States/Ecuador), Diego Lizcano (Colombia), Gioconda Remache (Ecuador), Gustavo Kattan (Colombia), Javier Adolfo Sarriá Perea (Colombia), Jessica Amanzo (Peru), Juliana Rodríguez Ortiz (Colombia), Luís Fernando Sandoval Cañas (Ecuador), Maria del Pilar Rivas (Colombia), Maria Piedad Baptiste (Colombia), Olga Lucía Montenegro (Colombia), Philip Miller (United States) and Silvia J. Álvarez (Colombia).

PROBLEMS

BRAINSTORMING:

- Lack of knowledge about population sizes.
- Difficulty in studying / obtaining data about the species.
- Lack of knowledge about geographic / local distribution: use of habitat.
- Number of non-adjacent populations / impact of habitat fragmentation that affects the populations.
- Conservation scale: local population or metapopulations – migration rate among populations.
- Extinction risk for local populations.
- Destruction rate of natural areas and population decline.
- Quantification of risk factors: the pressure of hunting, habitat destruction, agricultural and cattle raising activities, global warming, contamination, mining and mystic-religious tourism (Peru).
- Natural death rates.
- Lack of knowledge about demographic parameters: fertility, longevity, pregnancy, number of offspring, survival, age of first reproduction, reproduction intervals etc.
- Genetic viability and the consequences of homozygosity.
- Distribution range.
- Elements of habitat, elevation, specific resources, saladeros (pastures).
- Humidity needs.
- Level of endurance to human disturbance.
- Natural predators.
- Incidence of diseases, parasites and their cycles.
- Interaction with (natural or introduced) competitors.
- Natural catastrophes and anthropological catastrophes.
- Effects of wars on mountain tapir populations.
- Use by local communities (native and settled), sustainable?
- Percentage of effectively protected habitat.
- Non-protected habitat available.
- Lack of consciousness and laws, and also the lack of compliance with them.

General groups in which these factors may be organized:

- Demography and population genetics.
- Threats and their impacts.
- Extinction risk for local populations in all 3 countries where the species lives;
- Impacts of management strategies.

The second step was revising the identified factors, which were divided into 4 broader issues. Issues related to habitat management were excluded, since there is another group in charge of them. These were written in the form of the problem and then were organized hierarchically according to each one's importance. Their details follow below:

1. **Extinction risk for local populations:** It is difficult to estimate the extinction risk due to the lack of information on demography, population genetics, and threats and their impact.

2. **Lack of information to estimate demography and the population genetics situation.**
   - Lack of knowledge about population sizes.
   - Difficulty in studying / obtaining data about the species.
   - Need to identify the populations which are geographically isolated due to fragmentation, as well as fragmentation's impact on these populations.
   - Conservation scale: local population or metapopulation – migration rate among populations.
   - Extinction risk for local populations.
   - Natural death rates.
   - Lack of knowledge about demographic parameters, such as: fertility, longevity, gestation period, number of offspring, survival, age of first reproduction, reproduction intervals etc.
   - Genetic viability (level of genetic diversity) and consequences of homozygosity.
   - Natural predators.
   - Incidence of diseases, parasites and their cycles.
   - Interaction with natural and introduced competitors.

3. **Lack of information to quantify threats and their impact on population viability.**
   - Difficulty of studying / obtaining data about the species.
   - Number of non-adjacent populations – impact of fragmentation of the populations.
   - Destruction rate in natural areas and population decline.
   - Quantifying risk factors – the pressure of hunting, habitat destruction, agricultural and cattle raising activities, global warming, contamination, mining and mystic-religious tourism (Peru).
   - Level of endurance to human disturbance.
   - Interaction with introduced competitors.
   - Natural catastrophes.
   - Anthropological catastrophes.

- Effects of wars on mountain tapir populations (some researchers suggest that the armed conflict in Colombia contributes to preserving some populations where human settlements were displaced, stopping habitat destruction and hunting practices. On the other hand, participants of the conflict also contribute to habitat destruction by establishing illegal cultures).
- Lack of consciousness and laws, and also the lack of compliance with them.

4. Difficulty in predicting the impact of management strategies on extinction risk.

- Impact of different management strategies.
- Difficulty in studying / obtaining data about mountain tapirs.
- Use by local communities (native and settled), sustainable?
- Percentage of effectively protected habitat.

BASIC PARAMETERS FOR STOCHASTIC SIMULATIONS OF POPULATION VIABILITY

PVA can be an extremely useful tool for research projects to assess current and future risks of decline or extinction of wild animal populations. Moreover, the need for and the consequences of alternative management strategies can be modeled in order to suggest which practices may be most effective in managing mountain tapir populations in their natural habitat in Colombia, Ecuador and PerU. Vortex, a simulation software package developed for analyzing population viability, was used here as a tool for studying the interaction of a number of population parameters and the mountain tapir life history, treated stochastically, in order to explore which demographic parameters would be more sensitive to alternative management practices, and to measure the effects of selected management scenarios.

Vortex software is a simulation, of Monte Carlo type, of the effects of the deterministic forces, as well as demographic, environmental and genetic stochastic effects on wild populations. Vortex models the dynamics of populations as sequential discreet events (e.g. births, deaths, sex ratios among offspring, catastrophes etc.) that occur according to predefined probabilities. The probability of events is modeled as constant or random variables that follow specified distributions. The package simulates a population through the series of events that describe the typical life cycles of sexually reproducing, diploid animals.

The PVA method, as well as Vortex, is not intended to give absolute and precise answers, since it is stochastically projecting the interactions of the many parameters used as input to the model, and because of the considerable uncertainty of the typical demographic data about wild populations. Due to these limitations, many researchers have suspicions about the use of PVA results in promoting specific management action on threatened populations (e.g. Ludwig 1999; Beissinger & McCullough 2002; Reed et al. 2002; Ellner et al. 2002; Lotts et al. 2004). However, the real value of this kind of analysis lies in uniting and analyzing the available information on the species and its ecology, and on the ability of comparing the quantitative production of the population that emerge from a series of simulations, each one of them representing a specific scenario and its inherent assumptions about the available data and a suggested method of population and/or site management. The interpretation of results depends on our knowledge about the biology of mountain tapir in its habitat, the environmental conditions that affect the species and the eventual future changes in these conditions. For a more detailed explanation of Vortex and its use in population viability analysis, refer to a brief description in Appendix I as well as Lacy (2000) and Miller and Lacy (2003).

As a first step, it was decided to take one population representing each country: in Colombia, the population of Parque Nacional Natural Los Nevados

and its surroundings; in Ecuador, the population of Parque Nacional Sangay and Llanganates; and in PerU, both Santuario Nacional Tabaconas-Namballe de Peru and Parque Nacional Podocarpus, at Southern Ecuador, were taken and considered as one population since they are adjacent areas. Special help was solicited from specialists from each country for estimating the parameters: in Colombia, Diego Lizcano; in Ecuador, Craig Downer; and in PerU, Jessica Amanzo.

PARAMETERS FOR EACH POPULATION

Reproductive System: We supposed that the mountain tapir has a monogamous reproductive system.

Age of first reproduction: *VORTEX* considers the age of first reproduction as the age at which the first offspring are born, not simply the age of sexual maturity. The reproduction data used here came from Rick Barongi's publication and from information provided by Michael Dee, from the Los Angeles zoo. The age at first copulation is from 2 to 3 years among females (F), and from 3 to 4 years among males (M). However, as the gestation period lasts 13 months, the age of first reproduction is 3 years for females and 4 years for males. In order to measure our model's sensitivity to the uncertainty related to this parameter, we have developed additional models in which the age of first reproduction was fixed as 4 years.

Maximum age of reproduction: *VORTEX* package initially assumes that animals can reproduce (at normal rate) throughout their adult life. Data over this specific parameter are very scarce but general observation indicates that mountain tapir can live and reproduce up until 15 years of age in the wild. In order to measure the sensitivity of our models to the uncertainty of this parameter, we have developed additional models fixing this variable as 12 and 18 years of age.

Breeding: As concerns the number of females available for reproduction per year, we considered the most usual numbers in other mammal species: 50% $\pm$ 12.5 (PVA *Tapirus bairdii*, Panama, 1994). In order to measure the sensitivity of our models to the uncertainty of this parameter, we have developed additional models in which the percentage of females successfully reproducing ranged from 33% to 66%.

The annual environmental variation that affects female reproduction is modeled in *VORTEX* by specifying a standard deviation (SD) for the proportion of adult females that successfully produce 1 offspring within a given year. Since there are no available data for this parameter, it is suggested that the annual deviation is relatively moderate. For this reason, the standard deviation was fixed at 12.5% of adult females reproducing.

The maximum offspring is 2, which is the maximum number of calves born in one parturition. Generally, only one calf is born per gestation, and rarely they give birth to twins. So, it was established that the probability of one calf born per parturition is 95%, and the probability of twins is 5%. According to Michael Dee (pers. com.), the sex ratio is 1:1 (50% male and 50% female).

Density dependent reproduction: *VORTEX* can model density dependence with an equation that specifies the proportion of adult females who reproduce as a function of the total population size. In addition to including a more typical reduction in breeding in high-density populations, the user can also

model an Allee effect: a decrease in the number of females that reproduce in low-density populations due, for example, to difficulty in finding mates that are widely dispersed across the landscape. At the moment, there are no available data that can guarantee the density dependence of reproduction of mountain tapir populations within their category. Because of this, this opinion was not included in the models presented in this document.

Males in the Reproductive Group: In many species, some adult males are socially excluded from the group of breeders although they are physiologically capable. This can be modeled in *VORTEX* by specifying the percentage of males that will be available to breed each year. In this parameter we assume that some adult males are excluded from reproduction through social exclusion. Specifically, we assume that 75% of adult males are available for breeding.

Mortality: As to survival, there was conflict on how to estimate it, since there were doubts in classifying the causes of death. Initially, it was based on comments by Craig Downer, who estimated higher survival rate for females than for males, but it was decided later to consider the same probability for both genders. Since there are not much available data about specific mortality rates by sex/age, Craig Downer's work was used for developing the following table, including estimates of annual environmental variation with average rates (besides, we assumed that the basic mortality rate was the same for all three focal populations):

Age (years)	Mortality % (SD)	
	Females	Males
0 – 1	20.0 (5.0)	20.0 (5.0)
1 – 2	10.0 (3.0)	20.0 (5.0)
2 – 3	10.0 (3.0)	10.0 (3.0)
3 – 4	10.0 (3.0)	10.0 (3.0)
4+	10.0 (3.0)	10.0 (2.0)

In order to measure the uncertainty of the selected mortality numbers, we have developed additional models in which the mortality among youngsters (0-1 year) was modified as 10% and 30%, and the mortality among adults was independently modified as 5% and 15%.

Catastrophes: Catastrophes are singular environmental events that are outside the normal environmental variation affecting reproduction and/or survival of the species. Natural catastrophes can be fires, droughts, epidemics etc. These events are modeled in *VORTEX* by assigning an annual probability of occurrence, with a severity factor for each age category and for the proportion of females successfully breeding in a given year. These factor range from 0 (maximum or absolute effect) to 1 (no effect), and are imposed during the single year of the catastrophe, after which the demographic parameters rebound to their baseline values.

Regarding catastrophes, stochastic events that are happening or have happened in the distribution areas were established, such as volcanic eruptions, earthquakes, fires, droughts and introduced disease characterizing epidemics. Regarding the catastrophes in PERU, the foot and mouth disease was introduced; according to Jessica Amanzo, the disease appeared as severe outbreak 20 to 50 years ago. The death rate considered was 25%, with occurrence frequency of 3 per 100 years, i.e. 3%; we considered that there were no negative effects on reproduction, according to the pattern of other animal species.

Inbreeding depression: *VORTEX* considers the possibility of modeling detrimental effects of consanguinity as a decrease in offspring survival during their first year of life. Because of the lack of information for analyzing specific data about depression by consanguinity among wild or captive tapirs, the evidence of the harmful impact of consanguinity among mammal populations suggests that this can be a very important factor for small tapir populations. For this reason, we decided to include this process in some of our models, with a genetic load of 3.14 lethal equivalents and around 50% of this expressed load as lethal genes. In order to measure the sensitivity of our models to the uncertainty of this parameter, we have developed additional models by removing the depression by consanguinity from our analysis.

Initial population size: There was no agreement about the established parameters regarding population size, since the available data were estimated from the analysis carried by Downer (1996) and Lizcano & Cavalier (2000). As they were estimated from the analysis of habitat use, they could correspond to "carrying capacity". According to Downer (1996), the density in ECUADOR is 587 ha/animal, and according to Lizcano & Cavalier (2000), it is 551 ha/animal in COLOMBIA. The average taken from these figures is 569 ha/animal, but we took 550 ha/animal as a reasonable figure for all 3 countries. Based in density figures, we estimated that the size of Sangay population, ECUADOR, is 385 individuals; the population of Los Nevados, in COLOMBIA, is 105 individuals; and the population in the Podocarpus (Ecuador) -Tabaconas Namballe (PERU) corridor is 633 individuals.

Carrying Capacity: The carrying capacity (K) of a given habitat is defined as the upper limit for the population size, above which mortality is randomly imposed across all age classes in order to return the population to the value set for K. The carrying capacity in COLOMBIA was calculated as the current estimated population size (550 ha/ individual;/ total area), plus 25%. This means the area could bear 25% more of the current population size. We assumed that Sangay population has a slightly lower density and is only at 50% of its carrying capacity. Consequently, we established 770 individuals as K in this population. On the other hand, we assumed that the other populations are much closer to K. Our general estimates fix these figures as 130 individuals in Los Nevados and 750 in Podocarpus-Tabaconas.

The group participants outlined the importance of considering the future loss of habitat based on current estimates of deforestation in areas where mountain tapir live. Regarding habitat pressure, Diego Lizcano, Craig Downer and Jessica Amanzo agreed that there is a tendency to loose habitat in the long run, which due to social/political changes is believed that will last at least another 50 years in COLOMBIA, and probably longer in other countries. Therefore, additional scenarios were built, where K is reduced to a specified percentage for a given period of time. We assumed that the carrying capacity of the Sangay population will decrease at a rate of 0.24% per year for the next 100 years, while K of Podocarpus-Tabaconas will decrease at a rate of 1.6% during the same period of time. We assumed that Los Nevados will lose habitat (and, therefore, will have its K reduced) at a rate of 0.03% per year for 50 years.

Harvest: Regarding harvest, we decided to remove its effects from survival rates, and introduced them into the harvest item, since the number of animals annually removed from the populations is considered constant. In COLOMBIA, these figures were taken from field data collected by Diego Lizcano at Parque Nacional Natural Los Nevados. In ECUADOR, we used data from COLOMBIA and extrapolated it by area.

Each one of the 3 populations has its size reduced every year by harvesting by local communities. Data by Diego Lizcano (COLOMBIA), Craig Downer (ECUADOR) and Jessica Amanzo (PERÚ) suggest that 4, 20 and 25 mountain tapirs are removed every year from these 3 populations, respectively. The initial harvest estimates for the mountain tapir in Sangay suggest highly unsustainable removal rates, based on this preliminary analysis that shows high and unrealistic population depression rates; the harvest figures were reduced by re-analyzing the data.

The harvest rate in PERU-ECUADOR was estimated to be 10 individuals/year, with equal sex ratios and depending on the number of hunters (estimate made by Jessica Amanzo for SN Tabaconas-Namballe). In ECUADOR: Armando Castellanos considers that hunting in Podocarpus is: 65% females and 35% males, and Fernando Nogales considers that 15 animals are hunted every year. The sex ratio is considered to be even. So, the total hunting figures in the ECUADOR population are 25 animals per year, 13 females and 12 males, all adults.

Number of Interactions and Years of Projection: All population projections (scenarios) were simulated 500 times. Each projection was extended for 100 years, with demographic information obtained at annual intervals. All simulations were conducted by using *VORTEX* version 9.45 (June 2004).

TABLE 1, below, summarizes the baseline input dataset in which all subsequent *VORTEX* models are based.

Table 1. Demographic input parameters for the baseline *VORTEX* model of mountain tapir populations in COLOMBIA, ECUADOR and PERU. See attached text for more information.

Parameter	Colombia	Ecuador	Peru-Ecuador	Source
POPULATION PARAMETERS				
Location	PNN Los Nevados	PN Sangay-Llanganates	Tabaconas\Namballe-Podocarpus	Suggested by Lizcano, Downer and Amanzo
Available area	57,948 ha	211,600 ha	347,889 ha	Lizcano and Remache
Isolation	Isolated	Semi-isolated	Isolated	Lizcano, Downer and Amanzo
Estimated size	105	385	633	Lizcano and Downer[1]
Carrying capacity	131	770	750	Lizcano, Downer and Amanzo[2]
REPRODUCTION				
Age of 1st reproduction (♀)	3	3	3	Downer, Dee (LA Zoo)
Age of 1st reproduction (♂)	4	4	4	
% ♂ available for reproduction	Yes (100%)	75%	Yes (100%)	Lizcano, Downer and Amanzo
Maximum # of calves/breeding	2	2	2	Downer[5]
% ♀ repro. / year (SD)	50% (12.5%)	50% (12.5)	50% (12.5%)	PHVA *T. bairdii* 1994
% 1 calf / breeding	95%	95%	95%	
% 2 calves / breeding	5%	5%	5%	
MORTALITY (By age class)				
0-1 year F	20%+5	20% +5	20% +5	Craig Downer[6]
1-2 years F	10% + 3	10% + 3	10% + 3	
2-3 year F	10% + 3	10% + 3	10% + 3	
Adults F	10% + 3	10% + 3	10% + 3	
0-1 year M	20% + 5	20% + 5	20% + 5	
1-2 years M	20% + 5	20% + 5	20% + 5	
2-3 years M	10% + 3	10% + 3	10% + 3	
Adults M	10% + 3	10% + 3	10% + 3	
CATASTROPHES (VOLCANIC ERUP./EARTHQUAKE, APHTHOUS FEVER, FIRE/DROUGHT)				
VOLCANIC ERUP. / EARTHQUAKE				COLOMBIA: Diego Lizcano ECUADOR: Craig Downer PERU: Jessica Amanzo
Probability	**0.01**	**0.1**	**0**	
Effects on reproduction	**0.99**	**0.95**	**1**	
Survival	**0.99**	**0.95**	**1**	
FOOT AND MOUTH DISEASE				
Probability	**0**	**0**	**0.03**	
Effects on reproduction	**1**	**1**	**1**	
Survival	**1**	**1**	**0.75**	
FIRE / DROUGHT				
Probability	**0**	**0.33**	**0.33**	
Effects on reproduction	**1**	**0.98**	**0.98**	
Survival	**1**	**0.98**	**0.98**	
HABITAT LOSS				
Is there?	Yes	Yes	Yes	COLOMBIA: Diego Lizcano ECUADOR: Craig Downer PERU: ITDG, 2002
For how long?	50 years	Undefined. (100 years)	Undefined. (100 years)	
loss % /year	0.03 %[3]	0.24 %	1.6 %	
HARVEST				
Is there?	Yes	Yes	Yes	COLOMBIA: Diego Lizcano ECUADOR: Craig Downer PERU: Jessica Amanzo
Annual interval	Annual	Annual	Annual	
Years	50 years	Undefined item	Undefined item	
Total harvest	4	20	25	
Age 1 (F)	0	2	2	
Age 2 (F)	1	2	3	
Age 3 (F)	2	8	11	
Age 1 (M)	0	1	1	
Age 2 (M)	0	1	1	
Age 3 (M)	1	1	1	
Age 4 (M)	0	5	6	
Added animals	No	No	No	

[1] Population size is an estimate of density (551 ha/animal) according to Lizcano & Cavelier (2000), multiplied by the area (57,948 ha) of forest fragment calculated at SIG.

[2] Carrying capacity was estimated as 25% over current population size. Carrying capacity in Colombia was calculated as the current estimated population size (550 ha x individual x total area), plus 25%. I.e., the area was considered as being able to support 25% over current population size. In Peru, ITDG (2002) developed information of deforestation rates at Chinchipe valley; this information was used in the analysis of Podocarpus-Tabaconas

[3] Habitat loss in COLOMBIA was calculated as: 1 ha per family per year. At the area, there are 18 families. Deforestation per family data were based on research conducted by Verweij & Beukema (1992). Number of families in the area was based on research by Diego Lizcano, in PERU. Deforestation rate in ECUADOR. The rate was assumed as similar to the one calculated at Cayambe-Coca reservation, a result from Ecociencia work (Maldonado & Cuesta year??): 2.67% from 1990 to 2001, i.e. 0.24% annually.

[4] Harvest rate. In COLOMBIA, it was based on field data collected by Diego Lizcano at P.N.N. Los Nevados (not published). For the ECUADOR harvest data, we used data from Colombia, which were extrapolated by area. Survival rates in PERU: we used the same estimates made for Colombia. In PERU, the harvest rate was estimated as 10 individuals/year, with equal sex ratios and depending on the number of hunters. Jessica Amanzo's estimates for Tabaconas-Namballe. ECUADOR: Armando Castellanos: he considers that hunting in Podocarpus is: 65% females and 35% males, and Fernando Nogales considers that 15 animals are hunted every year. The sex ratio was considered equal. Therefore. Total hunting: for this population, it is 25 animals per year, 13 females and 12 males, all adults.

References

MALDONADO P., CUESTA F, ALVARADO M. Impacto de las intervenciones de la conservación en la reserva ecológica Cayambe – Coca y en la Reserva Ecológica Antisana (1990 – 2001). Eco-ciencia, Ecuador 2003. 44pp.

RESULTS FROM STOCHASTIC SIMULATION MODELING

Results from baseline simulation

Although there are limitations on the available data, we assumed for these analyses that our baseline model for each population includes each one of the main threats previously identified: hunting by local human populations, continuous loss of mountain tapir's habitat (carrying capacity) due to agriculture and cattle raising, and natural catastrophes. For this reason, our goal in theses analyses is to identify and to begin quantifying the impacts of these threats, collectively and individually, in all three representative populations. However, first we also want to evaluate the impact of our own measures of uncertainty of the selected demographic parameters on the model. We will achieve it by using demographic sensibility analysis.

Reported results in each model include:

$\underline{r_s}$ (SD): The mean rate of stochastic population growth or decline (SD) demonstrated by the simulated populations, averaged across years and interactions, for all simulated populations that are not extinct. This population growth rate is calculated each year of the simulation, prior to any truncation of the population size due the population exceeding the carrying capacity.

P (E): Probability of population extinction, determined by the proportion of e.g. 500 interactions within that given scenario that have gone extinct in the simulations. "Extinction" is defined in the *VORTEX* model as the absence of either sex.

N_{100} (SD): Mean (standard deviation) population size at the end of the simulation, including those that were extinct during the simulation.

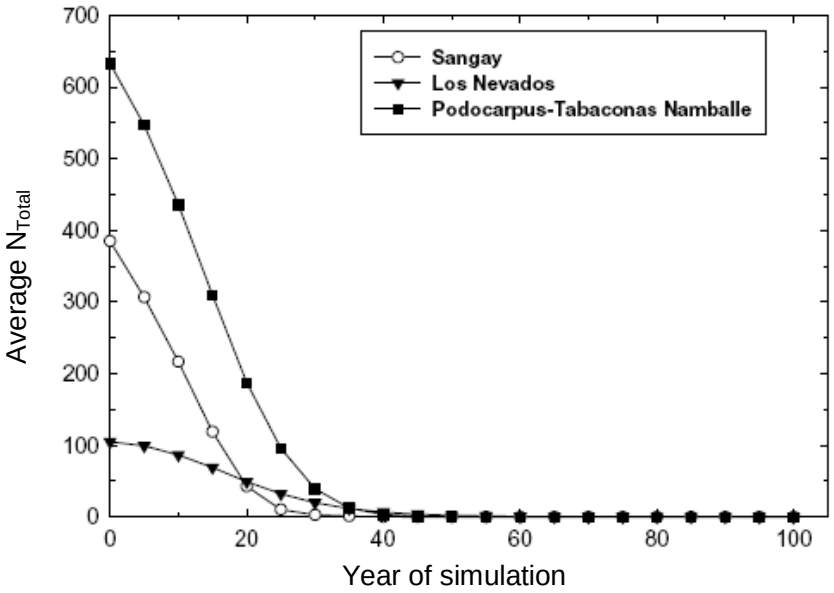


Figure1. Estimates of the average size of the simulated population of all three populations that were considered in this analysis. The scenarios shown here are considered as the base population models, incorporating all the known anthropogenic and natural threats of the local mountain tapir populations: hunting by local inhabitants, reduction of the carrying capacity of the habitat due to development and natural catastrophes. See text for further information.

The results of these baseline simulations are presented in **Figure 1**. With our best estimated demographic parameters of the baseline population, and with our most accurate estimates of natural and anthropogenic threats to the population, it is expected that each one of three focal populations will quickly become extinct in about 50 years. Therefore, due to the kind of threats identified by the group, our populations cannot be considered viable neither in the short nor long term. It would be important to determine which threat or threats are the main ones responsible for this accelerated decline rate, which will be discussed in the section Population Risk Assessment, further below.

Demographic Sensitivity Analysis

During the development of baseline input data, it soon became evident that a significant number of demographic characteristics of the mountain tapir population across its geographic distribution were estimated with variable levels of doubt. This kind of uncertainty measure, which is totally different from the annual rate of demographic deviation due to external environmental stochasticity and other factors, makes it more difficult to generate precise predictions about the population dynamics with a certain level of confidence. Nevertheless, an analysis of the model's sensitivity to these parameters are invaluable in order to identify priorities for detailed research or management projects focused in specified elements of the biology and ecology of mountain tapir populations. To conduct these demographic sensitivity analysis, we have identified a selected group of parameters form **Table 1** whose estimates are considered doubtful. Next, we have developed minimum and maximum figures that are plausible for these parameters (**Table 2**).

Table 2. Input parameters with uncertainty and respective ranges used in the demographic sensitivity analysis for simulated populations of the mountain tapir across its geographic distribution. The values in "bold" are the ones used in the baseline model. See attached text for more information.

	Estimate		
Parameter	***Minimum***	***Mean point***	***Maximum***
Age of first reproduction (AFR)		***3***	*4*
Maximum age	*12*	***15***	*18*
Percentage of Adult Females reproducing	*33.0*	***50.0***	*66.0*
Percentage of Juvenile Mortality (0-1)	*10.0*	***20.0***	*30.0*
Percentage of Adult Mortality	*5.0*	***10.0***	*15.0*
Carrying Capacity	*385*	*578*	***770***

For each of the parameters above, we built multiple simulations, using only one given parameter (pre-establishing its minimum or maximum value), leaving the rest of the parameters at baseline model values. With the 6 parameters identified above, and acknowledging that the aggregated group of baseline values constitute our only baseline model, the table above allowed us to build a total of 11 additional alternative models whose results (defined, e.g., in terms of average rate of population growth) can be compared with our initial baseline model. For the total set of sensitivity models, we considered a population very similar to the one in Sangay, in ECUADOR, i.e. an initial population of 385 individuals and a habitat carrying capacity equal to 770 individuals. These

analyses' results are graphically demonstrated in **Figure 2** and as a table in **Table 3**.

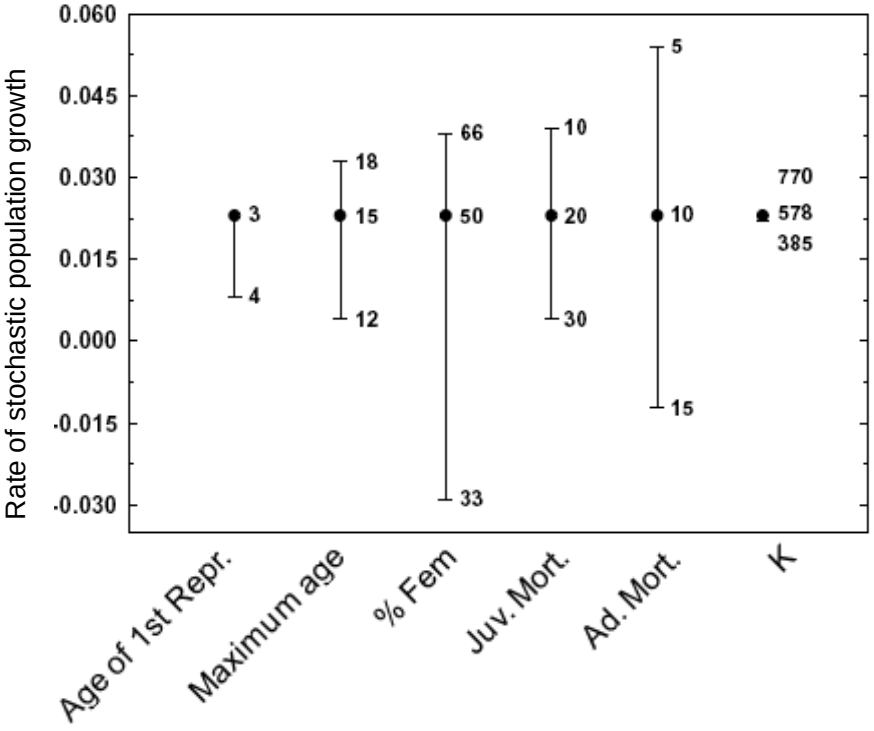


Figure2. Analysis of demographic sensitivity of the simulated mountain tapir population of Sangay (Ecuador). The rate of stochastic population growth for a group of models in which the specific parameter varies through the range of plausible biological values. The baseline model growth rate of 0.023 is set as the central point for each parameter. The general model of the dynamics of the mountain tapir population is more sensitive to the uncertainty in those parameters producing the widest range of simulated population growth rate. See text for further information.

Table 3. Results of demographic sensitivity analysis for the mountain tapir. See the attached text for additional information about how the model was built and parameterized.

Model Conditions		r_s (SD)
Baseline		0.023 (0.065)
Age of first reproduction (AFR)	**4**	0.008 (0.068)
Maximum Age of Reproduction	**12**	0.004 (0.066)
	18	0.033 (0.064)
% of Adult Females reproducing	**33**	-0.029 (0.091)
	66	0.038 (0.055)
% of Juvenile Mortality	**10**	0.039 (0.062)
	30	0.004 (0.065)
% of Adult Mortality	**5**	0.054 (0.060)
	15	-0.012 (0.079)
K	**385**	0.022 (0.066)
	578	0.023 (0.065)

The results of this analysis indicate that our simulated mountain tapir population is more sensitive to changes in the reproductive success of adult females and in adult mortality. This conclusion is basically identical to the one produced by a similar analysis of the Malayan tapir during the PHVA of 2003 in Malaysia (Medici *et al.* 2003). It is important to acknowledge that, under the positive conditions of growth seen here, K variation will have a very low impact on population development, in the way it is measured by the stochastic growth rate. Under conditions of low carrying capacity, these parameter variations may have a considerable effect on our ability of predicting the extinction risk with

certainty, since this risk can be often connected to the carrying capacity, particularly if the growth rate is low.

Population Risk Assessment

Our intention with this general risk assessment was identifying, semi-quantitatively, the relative importance of each one of all main threats for mountain tapir populations – hunting, habitat loss and catastrophes – for the viability of the population in the future. At this rate, biologists and population and landscape managers can prioritize more effectively their research and management actions, which could directly lead to preservation across all classes of mountain tapir.

In order to conduct this analysis, we have produced models with all possible sets of the identified threats – at a simple format or several combinations – and evaluated their impact on each of the 3 populations of mountain tapir by using 3 measures of the population demography performance: mean rate of stochastic growth, probability of population extinction in 100 years, and average size of population after 100 years.

Our comparative analyses results are demonstrated in Table 4 and Figure 3.

Table 4. Measure of population demography development for local populations of mountain tapir in 3 estimates of natural or anthropogenic threats. The numbers inside parenthesis for each population represent the initial size /carrying capacity of the population within all threat models. The scenario that includes all threats is defined as the baseline model of the population. See attached text for a definition of columns and other parameters of the model.

	Population (N_0 / K)								
	Sangay (385 / 770)			**Los Nevados (105 / 130)**			**Podocarpus-Tabaconas Namballe (633 / 750)**		
Scenario	**r_s (SD)**	**P(E)**	**N_{100} (SD)**	**r_s (SD)**	**P(E)**	**N_{100} (SD)**	**r_s (SD)**	**P(E)**	**N_{100} (SD)**
A, B, C	-0.142 (0.174)	1.000	—	-0.070 (0.120)	1.000	—	-0.107 (0.153)	1.000	—
A, B	-0.115 (0.163)	1.000	—	-0.069 (0.123)	1.000	—	-0.080 (0.130)	1.000	—
B, C	0.010 (0.069)	0.000	504 (94)	0.027 (0.080)	0.000	118 (14)	0.012 (0.094)	1.000	—
A, C	-0.142 (0.175)	1.000	—	-0.070 (0.120)	1.000	—	-0.102 (0.151)	1.000	—
A	-0.115 (0.064)	1.000	—	-0.068 (0.120)	1.000	—	-0.070 (0.128)	0.992	2 (28)
B	0.023 (0.065)	0.000	561 (39)	0.027 (0.080)	0.000	118 (13)	0.028 (0.079)	1.000	—
C	0.009 (0.069)	0.000	621 (161)	0.028 (0.080)	0.000	120 (14)	0.014 (0.088)	0.000	628 (133)
None	0.023 (0.065)	0.000	726 (58)	0.027 (0.081)	0.000	121 (13)	0.030 (0.072)	0.000	715 (48)

Definition of scenarios:

A Hunting (harvest) of tapir by local human populations

B Continuous decline of carrying capacity by habitat changes through agriculture and cattle raising.

C Natural catastrophes.

Impacts on population of Sangay, ECUADOR: Our data for our models for Sangay clearly demonstrate that, when hunting is inserted in an estimated density in any of the models, the stochastic growth data is strongly negative and the population goes extinct very fast. For habitat loss and catastrophic conditions, when both are combined or isolated, growth rates are positive and the extinction risk during the 100 simulated years is zero. Comparably, the impacts of catastrophes (volcanic eruption / earthquake and drought / fires) are more severe than the impacts of low habitat loss, but the simulated population retains its ability of positively growing about 1% per year. Without all these threats, our simulated population of Sangay has an average stochastic growth rate of 0.023 and is capable of increasing its size close to the carrying capacity of its habitat.

Impacts on population of Los Nevados, COLOMBIA: The results related to the population of Los Nevados, COLOMBIA, are very similar to the ones of

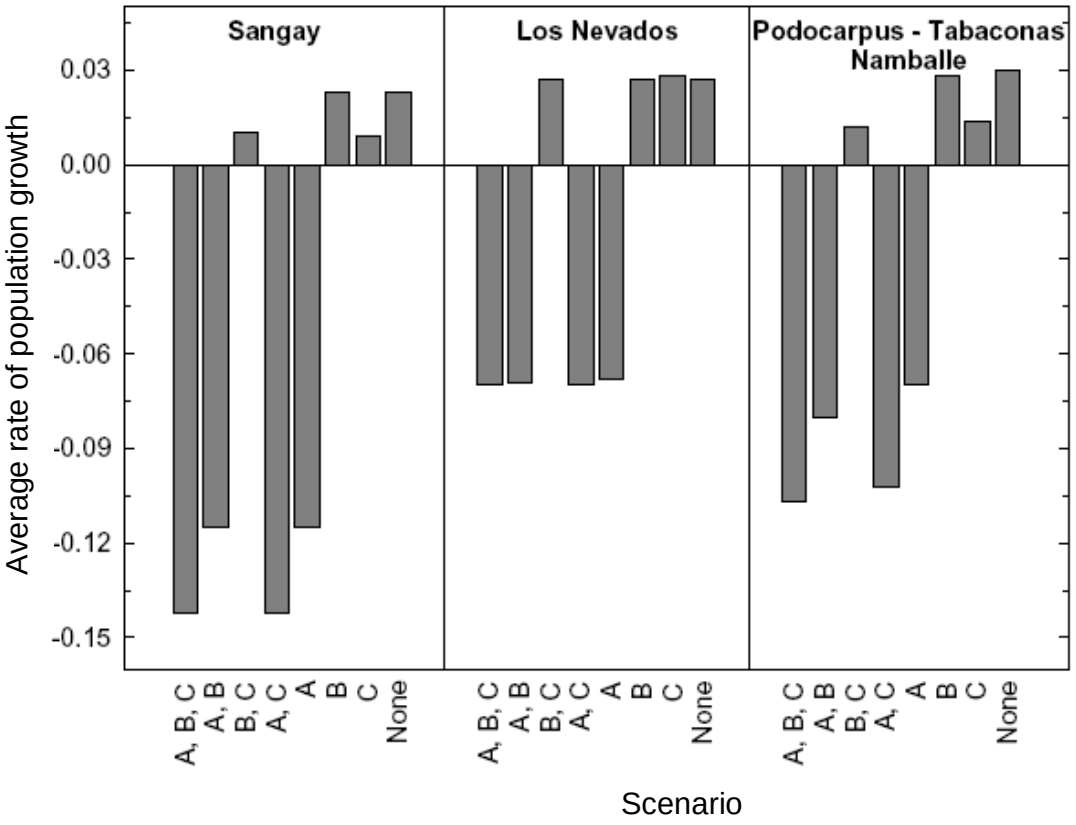
the Sangay (ECUARDOR) population: the input of hunting dramatically destabilizes our simulated population and leads to fast extinction. Habitat loss and catastrophes have few or no impacts on its growth dynamic, as was expected due to the almost insignificant magnitude of the values on parameters presented in Table 1. However, hunting is considered here as the major threat to the future persistence of this specific population in COLOMBIA, according to our best estimates of the nature and magnitude of this particular practice. Since Los Nevados population is the smallest among the three studied populations, we wanted to evaluate the impact that inbreeding depression could have on long term viability. We assumed that, since the Sangay and Podocarpus-Tabaconas Namballe populations are larger, they would not notably suffer the negative effects that affect this process. Therefore, we have not included inbreeding depression models in those analyses. Under the most optimistic scenarios, where threats are removed from the population, we noticed that inbreeding depression has a low impact on the growth dynamic of this comparatively smaller population (**Figure 4**), with no increase in the extinction risk considering the baseline model where inbreeding depression is absent. However, the small effect does not mean that smaller populations are also immune to the harmful effects of inbreeding; a deeper analysis would be necessary in order to define the size of mountain tapir population that, given a particular group of subjacent demographic parameters, would be impacted by this genetic process.

Impacts on the population of Podocarpus-Tabaconas Namballe, PERU: Although this is the largest population of all 3 areas, our analysis suggests that it is the most threatened of them, due to a combination of activities of two different processes: hunting and habitat loss. Our simulated population of Podocarpus-Tabaconas Namballe demonstrates insignificant extinction risk only when both activities are removed from the simulation, leaving only catastrophes as threats that impact the population. By removing catastrophes (disease and drought/fire), the average stochastic growth rate increases more than 100%; therefore, the union of these catastrophes clearly affects the growth rate but does not generate extinction risks to the population.

These results are summarized in **Table 5**. In these analyses, it is clear that tapir hunting by local human populations, at a rate specified by field researchers, dramatically reduces the viability of mountain tapir wild populations across their geographic distribution. Regarding the population of Los Nevados, COLOMBIA, the high rates of habitat loss effectively extinguish this population in 60 years, regardless of hunting rates.

As a result of this analysis, specific recommendations can be developed to guide our variable biological and basic ecological viability estimates for mountain tapir populations, as well as those threats directly related to local human activities. Furthermore, we can begin to conduct detailed recommendations about a decrease or perhaps an elimination of local human threats that may jeopardize the viability of mountain tapir across its geographic distribution range.

Figure 3. Average stochastic growth rate (r_s) for the simulated mountain tapir populations subject to combinations of natural and/or anthropogenic specific regional threats. Scenario definition: A – Hunting (harvest) of tapirs by local communities / B – Continuous reduction of habitat carrying capacity through habitat transformation due to agriculture and cattle ranching / C – Natural catastrophes. See text for further information, model construction and assumptions.



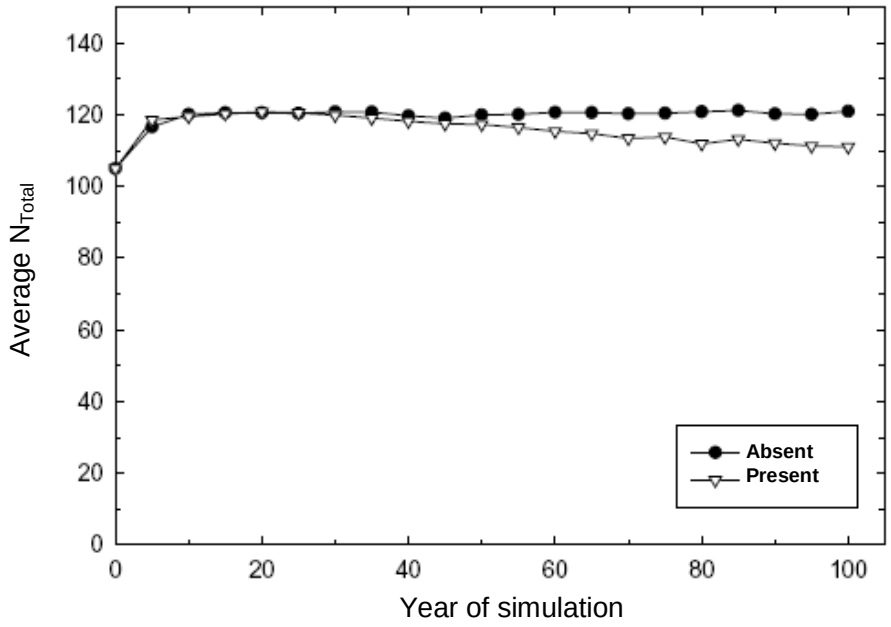


Figure4. Estimates of the population corresponding to the Los Nevados mountain tapir population under assumptions of presence (triangles) or absence (dots) of inbreeding depression. See text for details in the construction of the model and assumptions.

Table 5. Relative intensity of impacts of natural or anthropogenic threats towards simulated populations of mountain tapir across the species geographic distribution. It is determined as the demographic response to the indicated threat. The number of "Xs" indicates the impact intensity. See attached text for details on the definition of threats and model building.

	Population		
Threat	**Sangay**	**Los Nevados**	**Podocarpus-Tabaconas Namballe**
Hunting	XXX	XXX	XXX
Habitat loss	—	—	XXX
Catastrophes	X	—	X

GOALS

PROBLEM 1: Lack of knowledge about the actual extinction risk of local populations.

It will be solved after solving PROBLEMS 2 (Lack of knowledge on estimated demographic and genetic data) and 3 (Lack of information in order to quantify the threats and their impact on population viability).

PROBLEM 2: Lack of knowledge on estimated demographic and genetic data.

Goal 1 To improve estimates of demography, distribution, habitat characterization and genetic composition. In turn, this goal was divided into the following 4 subgoals:

Subgoal 1a: To improve demography estimates, with details of the following aspects: 1.) Population size; 2.) Population structure; 3.) Birth and mortality rates, and survival rates by age and sex classes; 4.) Reproductive behavior: a. Age of first reproduction for males and females; b. Male and female ratio at birth; and c. Probability of one-calf breeding and twins; 5.) Establish the viable population sizes in the long term for each existing population.

Subgoal 1b: To improve geographic distribution estimates, by identifying and mapping the populations and the isolation level among them, in each country.

Subgoal 1c: To improve habitat characterization, specifying the following aspects: 1.) Area size; 2.) Altitudinal range; 3.) Types of ecosystem; and 4.) Habitat quality.

Subgoal 1d: To study the genetic composition of populations, emphasizing the following aspects: 1.) Define the evolution potential (genetic diversity); 2.) Define if there is inbreeding depression; and 3.) Know the level of isolation and the decrease of genetic flow.

PROBLEM 3: Lack of information in order to quantify the threats and their impact on population viability.

Goal 2 To quantify the frequency, magnitude and acceleration of threats and their impact on the mountain tapir populations. These threats can be divided in the following categories:

Natural threats: natural catastrophes and diseases of natural occurrence;
Anthropogenic threats: hunting, habitat and water sources destruction, settlement and development (infra-structure), agriculture, cattle raising, mining, global warming.

PROBLEM 4: It is difficult to preview the impact of management strategies on the extinction risks.

Goal 3 To identify and draw management strategies that can minimize threats to the mountain tapir populations.

Goal 4 To evaluate the possibility of management strategies with local communities.

Goal 5 To evaluate the use and perception of mountain tapir by the communities.

ACTION PLAN

GOAL 1: To improve estimates of demography, distribution, habitat characterization and genetic composition.			
Action description	**Responsibility**	**Deadline**	**Cost US$**
1. To develop research projects to verify the presence of mountain tapir. 1.1 To revise available information about its distribution: - "In press" publications and unpublished information to obtain a record of presence and geographic location. - To produce a database of the collected information. 1.2 To identify and map the available habitat for mountain tapir - By using Geographic Information Systems as a tool for the correspondent spatial analyses. 1.3 To check maps obtained in the field.	TSG members, field researchers, Employees of of the National Natural Parks and Corporaciones Regionales (Colombia)	COLOMBIA - 6 months ECUADOR - 6 months PERU - 2 months	COLOMBIA - US$13,000 ECUADOR - US$13,000 PERU - US$4,000

GOAL 1: To improve estimates of demography, distribution, habitat characterization and genetic composition.			
Action description	**Responsibility**	**Deadline**	**Cost US$**
2. To investigate the population status and tendencies. 2.1 Demographic data: - To estimate population densities. - To estimate population size. - To define sex and age ratios. - To define female and male ratios that reproduce every year. 2.2 Ecological data: - Catastrophes: probability and effect on reproduction and survival rates. - Carrying capacity of the available habitat. 2.3 Genetic data: - Endogamy. - Genetic flow. - Genetic diversity. - Actual population - Detect bottlenecks 2.4 Data about the species biology: - Age of first reproduction for males and females. - Maximum age of reproduction. - Sex ratio at birth. - Maximum litter size. - Proportion of females that have one litter in one year. - Variation in the proportion of females that reproduce across the years. - Average number of offspring by litter. - Survival percentage for females and males in different ages.	Researchers, TSG members , TSG Genetics Committee , field assistants, National Parks, Ministries, Universities, Zoological institutions.	COLOMBIA, ECUADOR and PERU: 2 years.	COLOMBIA US$30,000 ECUADOR US$30,000 PERU US$10,000

GOAL 1: To improve estimates of demography, distribution, habitat characterization and genetic composition.						
Action description	**Responsibility**	**Deadline**	**Cost US$**	**Consequences**	**Consequences of inaction**	**Obstacles**
3. Monitoring at the 6 priority areas to confirm the presence of mountain tapir. 3.1. Gathering of documented reports about the presence of the species in unconfirmed areas. 3.2. Gathering reports from local populations regarding the presence of the species in the area. 3.3. Indirect searches for hair, fecal matter, tracks, bitten plants, bones etc., which must include: - Precise records of the site: date of collecting, precise identification of the site (name, city, department, state, country), geographic coordinates, elevation, time of the year, description of habitat/biome, and a detailed description of the type of track obtained, with photographic record if possible. - In the event of hair and/or fecal matter, a sample must be collected, which will be labeled with previous data. The fecal matter samples must be collected into a hermetic recipient, with 1 part of fecal matter for each 3 parts of absolute ethylic alcohol (96%). - In the event of tracks, it is recommended to measure in mm, according to the method of Cavalier & Lizcano (2000).	Field researchers in the strategic areas. In COLOMBIA: Diego Lizcano, Sergio Sandoval Arenas, Jaime Andrés Suárez Mejía and Javier Sarria. In ECUADOR: Armando Castellanos and Craig Downer. In PERU: Jessica Amanzo.	January 2005 to December 2006. Each research is estimated to last from 6 to 9 months.	Each research will require field teams costing US$3,000, travel expenses of US$2,000 each, and computer material costing US$10,000 (including software for image processing).	There will be much more precise information about the mountain tapir distribution, as well as preliminary demographic and behavioral data.	The presence and the conditions of mountain tapir in the different specified areas will continue to be unknown.	

3.4. Direct collections, by photographing or filming direct discoveries, or photo-captures using photographic traps in strategic sites. - The sight records must include, besides the indirect data, a description as detailed as possible of the watched individual/s, also by taking notes about the observed activities. 3.5. Analysis and interpretation of the obtained data for posterior elaboration and publication of final results.						

GOAL 1: To improve estimates of demography, distribution, habitat characterization and genetic composition.						
Action description	**Responsibility**	**Deadline**	**Cost US$**	**Consequences**	**Consequences of inaction**	**Obstacles**
4. To estimate the genetic diversity of mountain tapir populations in different distribution areas. 4.1 To collect field samples for molecular genetics analysis: - One sample must be collected, which will be labeled with the activity data 3. Fecal matter samples must be collected into a hermetic receptacle, taking 1 part of fecal matter in 3 of absolute ethylic alcohol (96%). Hair samples must have the best quality possible, (presence of bulb and absence of fungus), must be collected with surgical gloves and be wrapped separately and dryly in aluminum foil, being kept in a fresh and dry environment (will silica gel) 4.2. Molecular analysis, in order to estimate the evolution potential of the species, estimate the endogamy level, analyze the genes flow and verify the occurrence of bottlenecks. - Analysis of micro satellites - Mitochondrial and nuclear DNA analysis 4.3. Analysis and interpretation of the obtained data for further elaboration and publication of final results.	Field researchers in the strategic areas will be in charge of samples collected In COLOMBIA: Diego Lizcano, Sergio Sandoval Arenas, Jaime Suárez Mejía and Javier Sarriá. In ECUADOR: Armando Castellanos and Craig Downer. In PERU: Jessica Amanzo) The genetics researchers will be in charge of lab analyses (Carlos Pedraza and Franz Kastón Flores)	January 2005 to December 2007	Lab reagents for US$ 8,000 and computer for US$ 3,000 (including software for data processing)	Knowing the genetic structure of mountain tapir populations in the wild, which will allow us to better evaluate their current situation	Not knowing the genetic aspects of mountain tapir might mean taking the wrong decisions, which could jeopardize species survival.	Absence of financial support. The DNA probes that will be used must be developed, and more labs must be established in these Latin-American countries.

GOAL 2: To quantify the frequency, magnitude and acceleration of threats and their impact on the mountain tapir populations.						
Action description	**Responsibility**	**Deadline**	**Cost US$**	**Consequences**	**Consequences of inaction**	**Obstacles**
1. Developing projects in order to evaluate the impact of human activities on wild mountain tapir populations, particularly agriculture and cattle raising. For this purpose, health monitoring of populations through hematology, serology, parasitology, cytogenetics and molecular tests is suggested. For this, the following steps must be taken: 1.1. Planning and executing expeditions to capture mountain tapir and collect samples in the wild. 1.2. Collecting biological samples for analysis. Blood with and without anticoagulant (EDTA and heparin), skin biopsies, fecal matter of the rectal ampoule, nasal excretion and ectoparasites, among others, must be collected, according to protocols standardized by the TSG Genetics Committee. Each sample must be labeled with data from action 3, plus the type of sample and the identification and sex of the sampled animal.	TSG Veterinary Committee (represented in COLOMBIA by Javier Sarriá), veterinarians with experience in mountain tapir management (Leonardo Arias, Fundación Espíritu del Bosque – Ecuador)	January 2005 to December 2007	Field teams costing US$ 7,000; sampling material for US$ 3,000; lab analyses for US$5,000 and expedition expenses for US$ 2,000 (each).	Knowledge on the current state of health of mountain tapir populations and also the actual impact of cattle raising activities on them. Eventually it will be possible to prove the hypothesis of disease transmission among domestic and wild animals.	Not knowing the actual impact of agricultural and cattle raising activities on the species, and particularly the potential threat of domestic animals diseases for the wild populations of mountain tapir.	Absence of financial support, absence of team for field work.

1.3. Marking the animals in a visible spot for field identification, and placing radio-collars for following them by telemetry. The obtained data will be useful for reinforcing step 5 of action 3. 1.4.Collecting samples of domestic animals from the area for conducting the same analyses of step 2 of this action. 1.5. Analysis and interpretation of the obtained data, comparing the mountain tapir and domestic species data for further elaboration and publication of final results.						

GOAL 3: To identify and draw management strategies that can minimize threats to the mountain tapir populations.						
Action description	**Responsibility**	**Deadline**	**Cost US$**	**Consequences**	**Consequences of inaction**	**Obstacles**
1. To evaluate potential and current corridors - Extension of corridors - Number of areas connected by corridors - Conservation state of corridors. - To confirm the use of corridors by mountain tapirs.						

GOAL 4: To evaluate the possibility of management strategies with local communities.						
Action description	**Responsibility**	**Deadline**	**Cost US$**	**Consequences**	**Consequences of inaction**	**Obstacles**
1. To bring the community near the institutions in charge (NGOs, Regional Corporations, government institutions, foundations and associations). To create and implement a program that allows and strengthens the communication between governmental and non-governmental institutions and the human communities that interact and have influence on the mountain tapir conservation.	ECUADOR - Leonardo Ordóñez Delgado, Fundación ArcoIris	November 2004 to November 2009.	ECUADOR – Due to the extension and organizational level in Ecuador, 1 annual meeting is estimated, with a total cost of US$10,000 for arranging such meetings. COLOMBIA – It is estimated that one meeting is set up each year for 4 regions; therefore, there must be 20 meetings costing US$2,000 each, with a total cost of US$40,000 for all 5 years. Two national meetings in the third and fifth years of work are suggested. PERÚ – The same estimate made for Ecuador: US$10,000. Resources: Required staff and time (5 years); General coordinator for each country and regional coordinators (Colombia). Committee of governmental and non-governmental institutions (4); Community and associations committee (Colombia, 2-4); Research committee (2); Educational committee (2); Volunteers and other participants.	Number of environmental education programs; number of community, regional or local committees, in charge of periodical organization and communication of activities, number of informative pieces about the conservation of mountain tapir, number of Participative Rural Diagnoses (social cartography).		

GOAL 5: To evaluate the use and perception of mountain tapir by the communities.						
Action description	**Responsibility**	**Deadline**	**Cost US$**	**Consequences**	**Consequences of inaction**	**Obstacles**
1. To conduct studies about ancestral traditions and the use of mountain tapir by the local communities (if they hunt it because of mystical beliefs, rituals, nutrition etc.).	ECUADOR – Work Committee; PERU - Jessica Amanzo		US$20,000 (10 people).	Number of lists of use and perception by the communities that affect the mountain tapir conservation. Number of polls conducted within the community.		

Mountain Tapir (*Tapirus pinchaque*) Conservation Workshop Population and Habitat Viability Assessment (PHVA)

Otún-Quimbaya, Pereira, Colombia
12 to 15 October, 2004

Section 4

International and Regional Cooperation Working Group Report

International and Regional Cooperation

PARTICIPANTS: Adolfo Álvarez (Colombia), Carolina Urrea (Colombia), Claudia Rodríguez (Colombia), Joaquin Sánchez (Colombia), José Sinisterra Santana (Colombia), José Vicente Rodríguez (Colombia), Sergio Sandoval Arenas (Colombia), Jaime Camacho (Ecuador), Leonardo Ordóñez Delgado (Ecuador) and Patrícia Medici (Brasil).

PROBLEMS

BRAINSTORMING

- Difficulty to integrate conservation efforts and different conservation actors and stakeholders, even though there are norms and legislations.
- There are advanced scenarios like the ones developed by CAN - Instituto Andino de la Biodiversidad [Andean Biodiversity Institute].
- There are few communication channels among professionals from different organizations.
- José Vicente Rodríguez from Conservation International – Colombia points out that in each country there are quite new conservation initiatives at the governmental level. This is particularly useful when one intends to obtain financial resources for conservation activities.
- It is necessary to establish strategic alliances in the local and regional based on a consensus about the different aspects related to the study of the species.
- Different levels: researchers (fieldwork), government (chancellery and ministries), managers (environmental institutions, NGOs).
- There is a lack of cohesion among politicians, something that happens due to constant changes of job positions and different views and interests in terms of species protection.
- All conservation organizations should contribute to the strengthening of governmental agencies, aiming at working together for a common cause.
- Sergio Sandoval Arenas, Colombia, points out that there are serious problems of integration between researchers, non-governmental-organizations and funding agencies.
- José Vicente Rodríguez from Conservation International – Colombia points out the need to identify the different ways in which one can access the necessary financial and human resources to develop and implement Regional Action Plans.
- Sergio Sandoval Arenas, Colombia, stresses that there are significant difficulties to access all kinds of resources, while Jaime Camacho, Ecuador, remembers that there are resources available.
- José Vicente Rodríguez reminds the group that in order to access financial resources one has to design good research proposals. The most strategic alliances are those that allow for institutional growth and that last into the future.
- In Colombia, the state institutions are the most articulated with regard to the management of mountain tapirs.
- José Vicente Rodríguez from Conservation International – Colombia says that we must be able to access the Metadata, but also points out that the information has to be cleaned, analyzed, and standardized.
- The TSG Country Coordinators must invite all different stakeholders (private, public sectors) to be part of mountain tapir conservation initiatives and to contribute to the implementation of action plans.
- The progress in terms of mountain tapir research in each range country is largely distinct.

- Given what was explained before, it is clear that Action Plans should be designed per range country, which will allow for the differences to be addressed.
- Why hasn't the previous IUCN/SSC Action Plan (1997) worked?
- Claudia Rodríguez, Ministry of the Environment, Colombia, points out that the different conservation groups and Action Plans are not adequately promoted and consequently, are poorly known.
- Action Plans are reflections of all different cultures and governments involved. In general terms, there is not a global vision in terms of conservation.
- Patrícia Medici, IUCN/SSC Tapir Specialist Group (TSG), Brazil, says that Action Plans in general provide compilations of information and diagnostics, but unfortunately do not include concrete actions to be implemented.
- The dissemination of information and communication are quite accentuated difficulties.
- The specialists must have a stronger protagonist role towards the different conservation actors.
- We need to develop and stimulate inter-institutional communication.
- The IUCN/SSC Tapir Specialist Group (TSG) has not developed a strategy to reach the decision-makers in terms of political and economic levels.
- There is a serious lack of cooperation between different institutions.
- The Action Plans are a problem especially when designed with a diagnostic vision.

1. Problem Identification

INADEQUATE COMMUNICATION: There is a deep lack of communication among the specialists and the other actors that have an indirect responsibility on the issue. It is possible to realize that IUCN/SSC Tapir Specialist Group (TSG) members in each one of the range countries have not had enough influence in order to disseminate the recommendations made by the specialists in a strategic way. This leads to the creation of sterile documents, which do not provide practical orientations that all the interested people could take as guidelines.

LACK OF INTEGRATION: Integration should be understood as the articulation among actors and stakeholders from the three range countries (Colombia, Ecuador and Peru) and also inside each country. Although there are political mechanisms to secure the execution of the guidelines for each country, there is a lack of local capacity and training (there are no key elements to reinforce the gears) in order to carry out a real integration.

DEFICIENCY IN ORGANIZING INCLUSIVE PROJECTS THAT WOULD ALLOW ACCESS TO RESOURCES (NOT ONLY FINANCIAL ONES): The proposals are not designed from a broader perspective, one that would approach the species problems at the regional level. Likewise, there are difficulties in translating the specific research projects on mountain tapirs into projects converging in a unified vision. This vision would encompass the different elements which exert pressure on mountain tapirs and bear an interest on the species.

DIFFICULTY TO ESTABLISH PARTNERSHIPS (NATIONAL AND INTERNATIONAL LEVELS): The established partnerships are based on a general framework, but they do not define the responsibilities of its participants in a precise way. The partnerships have not been established based on a structural and participative vision.

IMPLEMENTATION MECHANISMS: In Colombia, implementation of the threatened species issue sets off from the management level that is included in the national development plan of each government. In the environmental section of the current national plan, named "Hacia un estado comunitario" ["Towards a communitarian state"], there is an action line on management and conservation of threatened species and species with potential for human use. This line allows the regional-level State organizations to assign resources to these ends and to implement actions related to them. In ECUADOR, the environmental issue does not exist as a State priority. The Environment Ministry is the weakest one and it is regarded as the lower one in the hierarchy. In PERU, there is no political will to address issues related to the management of the country's biodiversity.

2. Problem Prioritization

Criteria: Urgency and viability

PROBLEM 1: Inadequate communication.
PROBLEM 2: Deficiency in organizing inclusive projects that would allow access to resources (not only financial ones).
PROBLEM 3: Lack of integration.
PROBLEM 4: Restrictions for the implementation of strategies (in some regions).
PROBLEM 5: Difficulties to establish partnerships (national and international levels).

DATA ASSEMBLY AND IDENTIFICATION OF GOALS

PROBLEM 1: Inadequate communication.			
Fact	**Assumption**	**Information Required**	**Goals**
The IUCN/SSC Tapir Specialist Group has an organized structure and different committees addressing specific issues (Patrícia Medici, pers. com.)	The TSG Committees are effective	Lack of dissemination	To make TSG Committees better known in the range countries That the TSG Committees be more active
There are means to maintain an effective communication (IUCN/SSC Tapir Specialist Group WebSite, half-yearly bulletin of the IUCN/SSC Tapir Specialist Group (*Tapir Conservation Newsletter*), Tapir Talk e-list, Colombian Tapir Network WebSite, Colombian Tapir Network e-list). However, they are not used at their full potential (Patrícia Medici and Sergio Sandoval Arenas, pers. com.)	In general, researchers do not have the habit to share information or disseminate their knowledge, activities and interests. There isn't the culture of access to information (stimuli should be proposed to that end)	Lack of identification of the strategic actors for information dissemination Lack of understanding and knowing the users, and their expectations and interests	To create mechanisms for building motivation and capacity. These should be focused on the use of the current diffusion media
The concerns of the users are not arriving through the Colombian Tapir Network Website, since only 10% of its members are active users	The Colombian Tapir Network members have internet access, but do not regard it as a primary information source	Colombian Tapir Network members lack knowledge on each other and on their respective working areas Lack of a printed Colombian Tapir Network bulletin for those people that do not have internet access Lack of identification of the strategic actors for information dissemination Lack of understanding and knowing the users, and their expectations and interests	To get funding for the distribution of the printed version To find other mechanisms than the internet for dissemination of information and that do not incur in high costs To identify the strategic actors for information dissemination To understand and know the users, their expectations and interests

Low proportion of Latin-Americans' participation in the access to the IUCN/SSC Tapir Specialist Group Website. The statistics show the page receives approximately 1,400 hits per day, only 20% of which coming from tapir range countries. The largest proportion of hits comes from the United states and Europe (Patrícia Medici and Gilia Angell, pers. com.) There is a half-yearly Tapir Specialist Group bulletin (*Tapir Conservation Newsletter*). Around 300 people/organizations receive printed copies of this newsletter, but another 40 people request it on a monthly basis (Patrícia Medici, pers. com.)	In Latin America there is a smaller chance to access the internet when compared to the United States and Europe	Lack of identification of the strategic actors for information dissemination	To identify the strategic actors for information dissemination To understand and know the users, their expectations and interests
The researchers from PERU and ECUADOR working with tapirs are not part of a Network (Jessica Amanzo and Jaime Camacho, pers. com.)			To consolidate a Tapir Network in PERU and ECUADOR
Those who lead the initiatives in the sphere of the Colombian Tapir Network are not insistent, and there isn't a good receptivity from the users (Sergio Sandoval Arenas, pers. com.)			To create mechanisms for building motivation and capacity. These should be focused on the use of the current diffusion media
Language issues		Versions of IUCN/SSC TSG and the Colombian Tapir Network publications in several languages	To have the IUCN/SSC Tapir Specialist Group publications (Website, newsletter, leaflets etc.) in English and Spanish

PROBLEM 2: Deficiency in organizing inclusive projects that would allow access to resources (not only financial ones).			
Fact	**Assumption**	**Information Required**	**Goals**
The protocols, criteria and priorities of the funding agencies for the application of resources are not known			To improve the knowledge about the profiles and priorities of the funding agencies
There is an organizational framework (Plans, Programs, Strategies), but these are not used as a guide for project proposals	The framework is not known, nor considered and even less adopted		To get Plans, Programs, Strategies to be widely known and adopted
There is no continuity in the research projects. They are specific and short-term			To convert research projects in research programs, with the incorporation of several disciplines, actors and organizations
Lack of motivating and stimulating the actors (local communities, governmental and educational institutions) for them to participate in the elaboration of inclusive projects (interdisciplinary and inter-institutional) in face of the conservation interests of mountain tapirs			To convert research projects in research programs, with the incorporation of several disciplines, actors and organizations
The local communities have been involved neither in the implementation nor in the socialization of the results of the research projects that were carried out (Sergio Sandoval Arenas, pers. com.)			To actively involve local communities in the elaboration, implementation and monitoring of the research projects
Researchers have little training in writing competitive research proposals (Patrícia Medici, pers. com.)			To build capacity in the different actors for them to develop competitive and inclusive proposals
It is very difficult to access resources in ECUADOR and PERU because the governmental institutions do not have a solid structure			To put forward the issue at the institutional and political levels in ECUADOR and PERU

PROBLEM 3: Lack of integration.			
Fact	**Assumption**	**Information Required**	**Goals**
The organizations have interest and will to develop teamwork, but these do not materialize in joint actions		Plans and programs that were developed Information on funding sources. Database and basic information on the conservation organizations in the range countries (government, NGOs, and university)	To develop joint work proposals
There are no initiatives of regional interchange and also of integration within the three range countries, probably due to scarcity of resources and lack of coordination and communication		Schedule of activities of each research project in the three range countries; Research projects that are in progress in the range countries that allow visits (description, team and responsibilities)	To create mechanisms for regular interchange of researchers at the different levels
There are no opportunities to socialize the research projects and interests about actions on tapirs at the local level (differently from an International Symposium) (Sergio Sandoval Arenas, pers. com.)			
Presence of international institutions with regional missions (CI, WWF, WCS, TNC), which have offices in the three range countries and can cooperate with the conservation strategy	They are willing to cooperate	Which persons are to be contacted in each NGO (name, address) – LIST	To integrate Mountain Tapir Action Plans in the agendas of the international organizations and in the Regional Biodiversity Strategy
Existence of a Regional Biodiversity Strategy for the five Andean countries, supported at the political arena by CAN	Hierarchical differences could bias the management of the regional strategy towards the countries with larger institutional framework, thus hindering integration	To expand dissemination of the strategy and the associated documents	To integrate Mountain Tapir Action Plans in the agendas of the international organizations and in the Regional Biodiversity Strategy
Hierarchy differences in the organizations of different range countries can hinder integration		Analysis of the organizations (their activities, kinds of resources that they manage, partnerships, abilities and know-how etc.)	All actors must understand the dynamics of the hierarchies of all the organizations involved in the mountain tapir conservation strategies both at the regional and international levels

PROBLEM 4: Restrictions for the implementation of strategies (in some regions).			
Fact	**Assumption**	**Information Required**	**Goals**
In ECUADOR there is a National Biodiversity Strategy, but it is inoperative	The environmental issue is not a priority within the State policy. The existing organizations should stimulate and implement the Strategies and Plans (ECUADOR and PERU)		To put forward the issue at the institutional and political levels in COLOMBIA , ECUADOR and PERU To develop the National Action Plan for Tapir Conservation in ECUADOR *(T. pinchaque* and *T.terrestris)* To develop the National Action Plan for Tapir Conservation in PERU (*T. pinchaque* and *T.terrestris)* To implement and monitor the National Program for the Conservation and Recovery of Tapirs in Colombia
In ECUADOR there is will from the organizations to change the situation	The instability from government to government prevent continuity on the issue		
In COLOMBIA there is the National Program for the Conservation and Recovery of Tapirs in Colombia, including the three tapir species (MAVDT - ICN/UNAL Montenegro, 2002)	The state organizations and NGOs have access to the documents produced by MAVDT		
In PERU there is no specific strategy	The instability from government to government prevent continuity on the issue	Adaptation of the National Program for the Conservation and Recovery of Tapirs in Colombia by local organizations	
The Regional Action Plans are very broad (for example IUCN Action Plan 1997)		To identify and disseminate the results and advancements of the Action Plans that have been evaluated.	To develop Action Plans with specific actions and monitoring indicators
The financial scenario is very limited at the regional level both from national and international sources	By assigning resources only to the Action Plans we could preserve the threatened species	Evaluation of the representativeness and viability of species within the Action Plans	To identify and ensure access to funding mechanisms which give sustainability to the conservation strategy To identify small- and medium-scale funding mechanisms To negotiate the inclusion of mountain tapir conservation actions in development projects at the local, regional and national levels.

PROBLEM 5: Difficulties to establish partnerships (national and international levels).			
Fact	**Assumption**	**Information Required**	**Goals**
Lack of knowledge of all the capabilities of the organizations			To characterize all organizations related to mountain tapir conservation issues
Mutual responsibilities are not defined in the majority of the partnerships			To develop guidelines for the establishment of partnerships that include specific responsibilities
The lack of dissemination and acceptance of the existing partnerships and the Action Plans which result from them hinders the formation of effective alliances			To put forward the issue
The organizations have different approaches and not always the mountain tapir is a common objective. In some cases the interests of the organizations are distinct			To create opportunities for arriving at agreements focused on the protection of mountain tapirs

PRIORIZATION OF GOALS

Criteria: urgency and viability

GOAL 1 To have Action Plans for ECUADOR and PERU (106).

GOAL 2 To implement and monitor the National Program for the Conservation and Recovery of Tapirs in Colombia (99).

GOAL 3 To put forward the issue of mountain tapir conservation at the institutional and political levels in COLOMBIA, ECUADOR and PERU (94).

GOAL 4 To develop Action Plans with specific actions and monitoring indicators (92).

GOAL 5 To get Action Plans, Programs and Strategies to be widely known and adopted by those who carry out actions on the issue (90).

GOAL 6 To build capacity in the different actors for developing competitive proposals which get funding (89).

GOAL 7 To actively involve local communities in the formulation, implementation and monitoring of the research projects (83).

GOAL 8 To identify and take in funding mechanisms (82).

GOAL 9 To convert research projects in research programs, with the incorporation of disciplines, actors, organizations etc. (78).

GOAL 10 To negotiate the inclusion of mountain tapir conservation actions in development projects at the local, regional and national levels (77).

GOAL 11 To integrate Mountain Tapir Action Plans in the agendas of the international organizations and in the Regional Biodiversity Strategy (68).

GOAL 12 To create opportunities to arrive at agreements focused on the protection of mountain tapirs (63).

GOAL 13 To improve the knowledge about profiles and priorities of the funding agencies (62).

GOAL 14 To improve communication mechanisms (58).

GOAL 15 To identify the strategic actors for information dissemination (41).

GOAL 16 To create mechanisms for regular interchange of researchers at the different levels (30).

GOAL 17 To understand and know the users, their expectations and interests (20).

GOAL 18 All actors must understand the dynamics of the hierarchies of all the organizations involved in the mountain tapir conservation strategies both at the regional and international levels (15).

GOAL 19 To characterize of all organizations related to mountain tapir issues (14).

The results were presented at the workshop plenary. By audience suggestion, the goal "To develop action plans with specific actions and monitoring indicators" was merged to the goal "To have Action Plans for ECUADOR and PERU". The goal "To actively involve the community in the formulation, implementation and monitoring of the projects" was attached to another group's goal.

ACTION PLAN

GOAL 1: To develop, implement and monitor the Action Plans of ECUADOR and PERU.					
Action Description	**Deadline**	**Responsibility**	**Collaborators**	**Indicators**	**Costs US$**
To establish Regional Action Planning Committees in order to produce the National Action Plans for Tapir Conservation for ECUADOR and PERU	November/2004	ECUADOR: Leonardo Ordoñez Delgado and Fernando Nogales (TSG Country Coordinators) PERU: Jessica Amanzo and Richard Bodmer (TSG Country Coordinators)	ECUADOR: Armando Castellanos and Leonardo Arias (Fundación Espíritu del Bosque); Jaime Camacho, Gioconda Remache and Francisco Cuesta (EcoCiencia); Andrés Tapia (Centro Fátima); Luis Fernando Sandoval (U. Central); and Gabriela Montoya (MINAMBIENTE) PERU: Rosario Acero (INRENA), Vanesa Ingar (INRENA) and Linda Norgrove (WWF-Peru) Patrícia Medici (IUCN/SSC TSG)	Committees created	US$100 Total US$50 ECUADOR US$50 PERU
To organize a database of direct and indirect contacts	December/2004	ECUADOR: Leonardo Ordoñez Delgado and Fernando Nogales (TSG Country Coordinators) PERU: Jessica Amanzo and Richard Bodmer (TSG Country Coordinators)	ECUADOR: Armando Castellanos and Leonardo Arias (Fundación Espíritu del Bosque); Jaime Camacho, Gioconda Remache and Francisco Cuesta (EcoCiencia); Andrés Tapia (Centro Fátima); Luis Fernando Sandoval (U. Central); and Gabriela Montoya (MINAMBIENTE) PERU: Rosario Acero (INRENA), Vanesa Ingar (INRENA) and Linda Norgrove (WWF-Peru) Patrícia Medici (IUCN/SSC TSG)	Database created	US$100
To distribute surveys in order to establish contacts	February/2005	ECUADOR: Leonardo Ordoñez Delgado and Fernando Nogales (TSG Country Coordinators)	ECUADOR: Armando Castellanos and Leonardo Arias (Fundación Espíritu del Bosque); Jaime Camacho, Gioconda Remache and Francisco Cuesta (EcoCiencia); Andrés Tapia (Centro Fátima); Luis Fernando Sandoval (U. Central); and Gabriela Montoya (MINAMBIENTE)	The number of surveys completed and returned	US$200

		PERU: Jessica Amanzo and Richard Bodmer (TSG Country Coordinators)	PERU: Rosario Acero (INRENA), Vanesa Ingar (INRENA) and Linda Norgrove (WWF-Peru) Patrícia Medici (IUCN/SSC TSG)		
To organize the first draft of the National Action Plans for Tapir Conservation for ECUADOR and PERU	May/2005	ECUADOR: Leonardo Ordoñez Delgado and Fernando Nogales (TSG Country Coordinators) PERU: Jessica Amanzo and Richard Bodmer (TSG Country Coordinators)	ECUADOR: Armando Castellanos and Leonardo Arias (Fundación Espíritu del Bosque); Jaime Camacho, Gioconda Remache and Francisco Cuesta (EcoCiencia); Andrés Tapia (Centro Fátima); Luis Fernando Sandoval (U. Central); and Gabriela Montoya (MINAMBIENTE) PERU: Rosario Acero (INRENA), Vanesa Ingar (INRENA) and Linda Norgrove (WWF-Peru) Patrícia Medici (IUCN/SSC TSG)	Draft of the National Action Plans for Tapir Conservation for ECUADOR and PERU	US$100
First National Workshops for both ECUADOR and PERU	June/2005	ECUADOR: Leonardo Ordoñez Delgado and Fernando Nogales (TSG Country Coordinators) PERU: Jessica Amanzo and Richard Bodmer (TSG Country Coordinators)	ECUADOR: Armando Castellanos and Leonardo Arias (Fundación Espíritu del Bosque); Jaime Camacho, Gioconda Remache and Francisco Cuesta (EcoCiencia); Andrés Tapia (Centro Fátima); Luis Fernando Sandoval (U. Central); and Gabriela Montoya (MINAMBIENTE) PERU: Rosario Acero (INRENA), Vanesa Ingar (INRENA) and Linda Norgrove (WWF-Peru) Patrícia Medici (IUCN/SSC TSG)	Preliminary National Action Plans for Tapir Conservation	US$4,000
Final Revision of the National Action Plans for Tapir Conservation for ECUADOR and PERU Note. The final versions of the National Action Plans for Tapir Conservation will be presented at the Third International Tapir Symposium in 2006	August/2005	ECUADOR: Leonardo Ordoñez Delgado and Fernando Nogales (TSG Country Coordinators) PERU: Jessica Amanzo and Richard Bodmer (TSG Country Coordinators)	ECUADOR: Armando Castellanos and Leonardo Arias (Fundación Espíritu del Bosque); Jaime Camacho, Gioconda Remache and Francisco Cuesta (EcoCiencia); Andrés Tapia (Centro Fátima); Luis Fernando Sandoval (U. Central); and Gabriela Montoya (MINAMBIENTE) PERU: Rosario Acero (INRENA), Vanesa Ingar (INRENA) and Linda Norgrove (WWF-Peru) Patrícia Medici (IUCN/SSC TSG)	The final versions of the National Action Plans for Tapir Conservation will be produced, handed out and made available	US$100

GOAL 2: To implement and monitor the National Program for the Conservation and Recovery of Tapirs in Colombia.					
Action Description	**Deadline**	**Responsibility**	**Collaborators**	**Indicators**	**Costs US$**
To distribute the final version of the National Program for the Conservation and Recovery of Tapirs in Colombia to NGOs, CARs [Regional Autonomous Corporations in Colombia], universities, local community organizations, indigenous and peasant organizations, mayoralties and governments of the areas where the mountain tapir occurs	November/2004	TSG members in COLOMBIA: Adriana Sarmiento, Diego Lizcano, Sergio Sandoval Arenas and Olga Lucía Montenegro	CORTOLIMA, Fundación Nativa, UAESPNN, MAVDT, TSG, Colombian Tapir Network and Cali Zoo	- Number of copies that are distributed - Institutions and persons in charge - Number of times the document is downloaded from the Website	$300
To keep a quarterly, direct contact with each one of the persons that are responsible for carrying out the actions related to the mountain tapir listed in the National Program for the Conservation and Recovery of Tapirs in Colombia	Since November/2004 Quarterly	TSG members in COLOMBIA: Adriana Sarmiento, Diego Lizcano, Sergio Sandoval Arenas and Olga Lucía Montenegro	CORTOLIMA, Fundación Nativa, UAESPNN, MAVDT, TSG, Colombian Tapir Network and Cali Zoo	The number of responsible persons that are contacted	$400
Two local meetings a year (Guacharos, Puracé, Huila, Las Hermosas, Tolima and Eje Cafetero) (1 day)	Since November/2004 Twice a year	Joaquín Sánchez (UAESPNN), Sergio Sandoval Arenas (Colombian Tapir Network/TSG) and Adolfo Álvarez (CORTOLIMA)	CORTOLIMA, Fundación Nativa, UAESPNN, MAVDT, TSG, Colombian Tapir Network and Cali Zoo	Meetings carried out (twice a year)	$5,000
Working meeting where the results of the local meetings are shared and the national meeting is organized (three times a year)	From January/2005 on	Joaquín Sánchez (UAESPNN), Sergio Sandoval Arenas (Tapir Network/TSG) and Adolfo Álvarez (CORTOLIMA)	CORTOLIMA, Fundación Nativa, UAESPNN, MAVDT, TSG, Colombian Tapir Network and Cali Zoo	Number of working meetings carried out	$450
National Meeting	June 2006	Claudia Rodríguez (MAVDT), José Sinisterra Santana (UAESNN) and Patrícia Medici (IUCN/SSC TSG)	CORTOLIMA, Fundación Nativa, UAESPNN, MAVDT, TSG, Colombian Tapir Network and Cali Zoo	Number of participants, number of research results shared, reports of the workshops	$3,000

To make publicity material of the Action Plans (posters, banners, leaflets, brochures etc.)	Permanent	TSG Regional Action Planning Committees (TSG Country Coordinators must lead), TSG Education Committee, TSG Marketing Committee, TSG Fundraising Committee and Corporaciones Regionales	Participants of Tapir Workshops, TSG and UAESPNN	Amount and kinds of publicity material that is produced and handed out	Need to evaluate the cost which this activity involves
To take advantage of events for disseminating the Tapir Action Plans	Permanent	TSG Regional Action Planning Committees (TSG Country Coordinators must lead)	Participants of Tapir Workshops, TSG and UAESPNN	Events where the plans are shared	Need to evaluate the cost which this activity involves

GOAL 3: To put forward the issue of mountain tapir conservation at the institutional and political levels in COLOMBIA, ECUADOR and PERU.					
Action Description	**Deadline**	**Responsibility**	**Collaborators**	**Indicators**	**Costs US$**
To include the issue of the conservation of threatened species in at least one project of a non-environmental sector (local, regional or national)	December/2007	TSG Country Coordinators and TSG Regional Action Planning Committees	TSG, CARs [Regional Autonomous Corporations in Colombia], organizations identified on each country and politicians	Projects of non-environmental sectors which take into account conservation actions towards threatened species	Need to evaluate the cost which this activity involves
To design and implement one promotional marketing strategy for the mountain tapir	June/2005	TSG Country Coordinators, TSG Marketing Committee, Joaquín Sánchez (UAESPNN, COLOMBIA, local), Jaime Camacho (Ecociencia/TSG, ECUADOR), Adolfo Álvarez (COLOMBIA, regional) and José Sinisterra Santana (UAESPNN, COLOMBIA)	CARs[Regional Autonomous Corporations in Colombia], TSG Country Working Groups, Cali Zoo, AZA Tapir TAG and EAZA Tapir TAG	Number of promotional materials that are produced and handed out	Need to evaluate the cost which this activity involves
To carry out the first "Market of Experiences" for mountain tapirs and Andean Bears (COLOMBIA)	October/2005	José Sinisterra Santana (UAESPNN, COLOMBIA) and Joaquín Sánchez (UAESPNN, COLOMBIA, local)	TSG Country Coordinators and Patrícia Medici (IUCN/SSC TSG)	Market of experiences carried out	$20,000

GOAL 5: To get Action Plans, Programs and Strategies to be widely known and adopted by those who carry out actions on the issue.					
Action Description	**Deadline**	**Responsibility**	**Collaborators**	**Indicators**	**Costs US$**
To distribute the National Action Plans to key actors, identified by the Regional Action Planning Committees in each mountain tapir range country	PHVA Workshop February/2005 ECUADOR and PERU National Action Plans February/2006	TSG Country Coordinators, TSG Regional Action Planning Committees, and CBSG (United States and Mexico)	Participants of Tapir Workshops and organizations identified on each country	- Number of times the document is downloaded from the WEB - Number of copies of the plans handed out	PHVA Workshop US$ 3,000 (100 copies) ECUADOR and PERU Action Plans US$2,000
To take advantage of events for spreading the Tapir National Action Plans	Continuous	TSG Regional Action Planning Committees	Participants of Tapir Workshops, TSG and UAESPNN (COLOMBIA)	Events where the National Action Plans are shared	Need to evaluate the cost which this activity involves
To make publicity material of the plans (posters, banners, leaflets, brochures etc.)	Permanent	TSG Regional Action Planning Committees (TSG Country Coordinators must lead), TSG Education Committee, TSG Marketing Committee, TSG Fundraising Committee and Corporaciones Regionales	Participants of Tapir Workshops, TSG and UAESPNN (COLOMBIA) and organizations identified on each country	Amount and kinds of publicity material that is produced and handed out	Need to evaluate the cost which this activity involves

GOAL 6: To build capacity in the different actors for developing competitive proposals which get funding.					
Action Description	**Deadline**	**Responsibility**	**Collaborators**	**Indicators**	**Costs US$**
To carry out at least two training course on how to write and submit funding proposals (20 participants per workshop) in ECUADOR and COLOMBIA (The participants must commit themselves to carry out at least three replicates of the workshop in their own countries)	Until December/2005	Patrícia Medici (IUCN/SSC TSG), Jaime Camacho (EcoCiencia/TSG), Sergio Sandoval Arenas (Colombian Tapir Network/TSG) and Carolina Urrea (UAESPNN)	TSG, Fundación ArcoIris, Ecociencia, Idea Wild, CI, TNC, WCS, WWF, UAESPNN, MAVDT and CARs	- At least 40 proposals and lists submitted for funding - 40 persons trained to lead the process on the countries	US$10,000
To indentify at least ten existing training courses on fundraising and financially support the participation of persons involved with the mountain tapir issue	February/2005 Periodic support	Patrícia Medici (IUCN/SSC TSG) and Jaime Camacho (EcoCiencia/TSG)	TSG, Fundación ArcoIris, EcoCiencia and Idea Wild	Ten capacity-building processes identified and persons regularly supported	At least US$5,000 of support
To find information on the topic of writing up proposals and make it available for the members-actors involved with the mountain tapir issue (through the Internet initially)	Revision Date January/2005 Continuous afterwards	Patrícia Medici (IUCN/SSC TSG) and Leonardo Ordoñez Delgado (Fundación ArcoIris/TSG)	Colombian Tapir Network (Sergio Sandoval Arenas) and TSG Webmaster (Gilia Angell)	Information available online on the Websites of the TSG and Colombian Tapir Network	US$500

When the results of the tables of the Action Plan were reviewed, the members of the Working Group realized that some of the proposed goals which had not been prioritized could be accomplished with the actions proposed for the goals that did were prioritized. Nevertheless, the group decided that the funding issue (GOALS 8 and 13) should be accepted as one of great relevance. The reason is that even though some actions intend to prepare professionals for writing and presenting better proposals, the topic is not sufficiently dealt with. The TSG has been identifying funding sources and the priorities of each agency. GOAL 9 ("To convert research projects in research programs, with incorporation of different disciplines, actors, organizations etc.") was addressed by actions proposed by other working groups, since what this group intended with this proposal was to get the research projects to be inter-disciplinary and inter-institutional, and not specific. GOAL 10 ("To negotiate the inclusion of mountain tapir conservation actions in development projects at local, regional and national levels") is satisfactorily addressed by ACTION 1 of GOAL 3. GOAL 11 ("To integrate Mountain Tapir Action Plans in the agendas of the international organizations and in the Regional Biodiversity Strategy) is somewhat addressed by the actions within GOAL 5. Nonetheless, it would still be necessary to do something in order to incorporate the National Plans in the agendas of the international organizations once they know the Action Plans. GOAL 12 has been covered by GOALS 3 and 5. "To improve communication mechanisms" crossed all proposed actions and is part of the actions proposed by the TSG. GOAL 15 is an activity which is necessary for those actions which imply dissemination and publication. GOALS 18 and 19 could be reached at the pace that the actions proposed for the prioritized goals are carried out, given this will offer us the knowledge of the related organizations and to understand their role in the conservation task.

Mountain Tapir (*Tapirus pinchaque*) Conservation Workshop Population and Habitat Viability Assessment (PHVA)

Otún-Quimbaya, Pereira, Colombia
12 to 15 October, 2004

Section 5

Participation of Local Communities Working Group Report

Participation of Local Communities

PARTICIPANTS: Adriana Sarmiento Dueñas (Colombia), Andrés Tapia (Ecuador), Eliceth Mosquera (Colombia), Fernando Sanchez (Colombia), Guido López (Colombia), Jhon Jarold Montilla (Colombia), Luis Alberto Espino (Colombia), Pedro Antonio Quilindo (Colombia), Rodrigo Sarria (Colombia), Sandra Milena Correa (Colombia) y Oscar Ospina (Colombia).

PROBLEMS

This group recognized itself as a crosscut group, since it is embedded in and relates with the other working groups. The problems were identified through a brainstorming process, after which the issues were consolidated and grouped. Afterwards, it was determined which problems matched each issue.

1. Problem Identification

BRAINSTORMING – COMMUNITY AND CULTURAL CONTEXT

- Divergence of interests and priorities between local and outside communities settled in the mountain tapir distribution range.
- Lack of trust from the local communities in the research processes due to exploitation or bad use of the information. The information never goes back to the local communities in an adequate way, one in which the community feels participant and could even be used by them in order to formulate plans for management and use of natural resources alongside the researchers.
- Organizational weakness of some peasant communities in the buffer zones of the Natural National Parks Puracé and Huila.
- Loss of regional and national identity in the local communities.
- Division of local communities caused by external agents (oil companies, logging companies, armed groups etc.)
- Limitations of the local communities in relation to the knowledge about the fauna of the Flora and Fauna Sanctuaries and the Protected Natural Areas.

IDENTIFIED PROBLEMS

1. There is a weakness within local communities in terms of their organization which leads to loss of their cultural identity. Such weakness also makes them not to value their own knowledge (something that is deepened in the outside communities – settlers – established in the area) and opens them to the influence of external agents, such as oil companies, logging companies, armed groups etc.

2. In some occasions, there is a lack of trust from the local communities towards researchers and their projects. This distrust is caused by the way through which projects dealing with community issues have been carried out in relation to the local people. They have participated just as field assistants or data collectors, but not as key actors that could give important contributions to the research based on their daily life experience.

BRAINSTORMING – RESEARCHERS

- Failing to value the local knowledge.
- Lack of continuity in the participative research projects that include the local communities.
- Lack of articulation among social and biological research projects in ECUADOR and COLOMBIA (institutional jealousy)
- The research projects do not answer the needs of the local communities, something that creates indifference towards the projects on their side.
- Lack of knowledge from the researchers of the participative research method.
- Lack of knowledge from the researchers of the regional and cultural contexts in COLOMBIA and ECUADOR.

IDENTIFIED PROBLEMS

1. The researchers do not have knowledge of the regional and cultural contexts at their field sites. Thus, their projects end up not answering the needs of the local communities, and the social processes and biological studies are not integrated. In some cases the researchers do not take the possibility of participative research into account.

BRAINSTORMING – INSTITUTIONS / UNIVERSITIES

- Lack of continuity in the institutional processes.
- Lack of stimulus and support to the local initiatives of research projects.
- Lack of dissemination to the academia and the community as a whole of the participative research methods, from the organizations working with it.
- Patronizing behavior towards the local communities.
- Lack of articulation among organizations, institutions and universities in terms of research projects.
- Deficiency in the dissemination and implementation of didactic materials on environmental issues, in the inclusion of the environmental education issue in the legislation and also in its implementation in the formal sector.
- Lack of translation of the scientific language to the local language.

Identified Problems

1. Inside the institutions, organizations (NGOs) and universities there is a lack of articulation among the different research projects, something that creates neither stimulus nor support for the creation of projects based on local initiatives. The organizations which work with participative research do not give enough publicity of their results to the academic world or to the community as a whole.

2. Deficiency in the production, dissemination and implementation of didactic materials on environmental issues, besides weaknesses in the environmental education legislation and its implementation in the formal sector.

2. Problem Prioritization

Criteria: Viability and impact on mountain tapir conservation

PROBLEM 1: The research projects do not answer the needs and interests of the local communities.
PROBLEM 2: Lack of inter- and intra-institutional articulation.
PROBLEM 3: Distrust of local communities.
PROBLEM 4: Deficiencies in the organization of local communities.
PROBLEM 5: Failure to disseminate the research projects / results.

DATA ASSEMBLY

PROBLEM 1: The research projects do not answer the needs and interests of the local communities.

1. Fact

- The projects are made to satisfy the needs of the institutions or are conceived within offices and they answer more to the interests of the institution than the local community ones.

2. Assumption

- Project of pork ranching in the Ecuadorian Amazon lowlands do not answer the interest of the local community in preserving wildlife.
- Deficiency in the relation of the researchers with the local communities because there is little community participation in the field research projects.

3. Information required

- Recovery, in written form, of the traditional knowledge that the local communities have about mountain tapirs, considering uses and management of this species.
- Participative methodologies that can be applied to the local communities living in areas where the mountain tapir occurs.

PROBLEM 2: Lack of inter- and intra-institutional articulation.

1. Fact

- Duplication of information (theses, projects, diagnoses etc.).
- The organizations do not focus their work towards specific problems, staying at a very broad level. Many actions are done and planned without field checking.

2. Information required

- Working plans of the organizations.

PROBLEM 3: Distrust of local communities.

1. Fact

- Changes in the national and regional politics affect institutional processes, interrupting work that is developed with local communities.
- Private parties assign traditional knowledge to themselves, requiring patents.
- Distrust of the local communities in relation to authorities (NNP Puracé).

2. Information required

- There is enough information on the policies.

PROBLEM 4: Deficiencies in the organization of local communities.

1. Fact

- Leadership weakness: leaders sign permissions for the entrance of oil, logging, mining companies etc., thus allowing the destruction of mountain tapir habitat (*e.g.* Petrolera Sucumbíos Amazonía, ECUADOR).
- Deficiencies in the organization of local communities allow the entrance of people from outside the community, and these exert pressure on the mountain tapir (Santa Rosa de Cabal, Ucumarí, Nevados – Colombia).
- Town councils have an environmental legislation which is not enforced in relation to mountain tapir protection (Nevados de Huila, NNP Puracé - Colombia).
- The peasant communities do not have an organizational entity that groups them with the aim of protecting their resources.
- There are Communal Action Boards and other organizations in which the leaders do not represent the whole community and can bias the decision making process towards private interests, but not the community ones.

2. Information required

- Information on the existing organizations, their priorities and the aims they pursue.
- Characterization of mountain tapir hunting patterns within the local communities.

PROBLEM 5: Failure to disseminate the research projects / results.

1. Fact

- Institutions and NGOs own the intellectual property of consultancies and keep the information to themselves, not allowing public access to the documents.
- The information does not go back to the local communities and, in some occasions, the information that does go back is not adequate.
- The communication media get interested in environmental issues but do not get involved because they answer to private interests (*e.g.* multinational and national companies). There are no direct communication channels.

2. Information required

- Bachelor's theses, studies, evaluations.

GOAL IDENTIFICATION AND PRIORITIZATION

1. Goal identification

PROBLEM 1: The research projects do not answer the needs and interests of the local communities.

Goals

1. To involve local communities' members in research projects as researchers, and not as field assistants.
2. To stimulate research from the local communities (own research).
3. To structure inter-disciplinary groups.

PROBLEM 2: Lack of inter- and intra-institutional articulation.

Goals

1. To stimulate the maintenance or creation of inter-disciplinary research groups within the research topics.
2. To articulate inter-institutional working groups.
3. To plan long-term research projects.

PROBLEM 3: Distrust of local communities.

Goals

1. To keep the commitments made with the local community before, during and after the research, thus creating continuity in the processes.

PROBLEM 4: Deficiencies in the organization of local communities.

Goals

1. To cooperate with the local communities so they can grow stronger without losing their identity.

PROBLEM 5: Failure to disseminate the research projects / results.

Goals

1. To create and strengthen communication media and ensure effective dissemination of research projects / results.
2. To make technical and local vocabulary known at the different educational levels.

Goal Prioritization

Criterion: influence on mountain tapir conservation.

GOAL 1 To structure inter-disciplinary groups.

GOAL 2 To make technical and local vocabulary known at the different educational levels.

GOAL 3 To cooperate with the local communities so they can grow stronger without losing their identity.

GOAL 4 To create and strengthen communication media and ensure effective dissemination of research projects / results.

GOAL 5 To keep the commitments made with the local community before, during and after the research, thus creating continuity in the processes.

GOAL 6 To stimulate the continuation of research projects or create new research lines.

GOAL 7 To stimulate research from the local communities (own research).

GOAL 8 To involve local communities in research projects.

GOAL 9 To articulate inter-institutional working groups.

ACTION PLAN

ACTION 1 To involve local communities in research projects.

ACTION 2 To articulate inter-institutional working groups.

ACTION 3 To stimulate research from the local communities (own research).

ACTION 4 To articulate inter-institutional working groups.

ACTION 5 To plan long-term research projects within the social and biological context.

ACTION 6 To keep the commitments made with the local community before, during and after the research, thus creating continuity in the processes.

ACTION 7 To create and strengthen communication media and ensure effective dissemination of research projects / results.

CLARIFYING NOTES

- For the action plan, it was taken into account that it is critically important that the local communities do get involved. Unfortunately, we had little participation of local communities in this workshop, including the participation of a representative of the Puracé community town council and a leader of the Nasa del Tolima community.

- The deadline for each action was defined as CONTINUOUS, since one can not give a definite deadline when dealing with participative processes. Besides, they are processes which go along with the research projects.
- The most potential people to implement the actions are those who can establish a direct relationship with the persons involved with these issues.
- The necessary resources for carrying out these actions depend directly on the kind of project within the defined topics. On the other hand, the necessary resources to cover the costs of workshops, meetings and educational material depend on the numbers of participants in the processes.
- For the "Responsibility" field, we only considered the PHVA participants, reason why we did not consider some important institutions such as the Education Ministry, the Environmental Ministry and governmental organizations in general in the three countries (COLOMBIA, ECUADOR and PERÚ), that are the actual decision makers.

ACTION 1: To involve local communities in research projects. ACTION 5: To plan long-term research projects within the social and biological context.						
Action Description	**Deadline**	**Responsibility**	**Collaborators**	**Results**	**Indicators**	**Cost US$**
To plan the research projects with the local communities	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA) and Juan Carlos Amézquita (CR) ECUADOR: Andrés Tapia (Fátima Centre)	Researchers Universities Institutions Local communities	-Direct participation of the local communities -To carry out socialization workshops	Number of people from the local communities involved (co-researchers)	Investment within the research project
To create opportunities for interchange of scientific and local knowledge (children, grown-ups, women etc.)	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA) and Juan Carlos Amézquita (CR) ECUADOR: Andrés Tapia (Fátima Centre) PERU: Jessica Amanzo	Researchers Universities Institutions Local communities	To know and appropriate knowledge from both sides	Number of projects in which both kinds of knowledge are included	Investment within the research project
To contact local communities (adults, elders, leaders etc.)	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA) and Juan Carlos Amézquita (CR) ECUADOR: Andrés Tapia (Fátima Centre)	Researchers Universities Institutions Local communities	To have meetings with the local communities for sharing the research projects	Database with the list of local communities located in the areas where mountain tapir occurs	Investment within the research project
To establish working groups with the local communities to help and support the research projects	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA) and Juan Carlos Amézquita (CR) ECUADOR: Andrés Tapia (Fátima Centre)	Researchers Universities Institutions Local communities	To have identified working groups	Number of groups for supporting research	Investment within the research project
Project continuity	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA) and Juan Carlos Amézquita (CR) ECUADOR: Andrés Tapia (Fátima Centre) PERU: Jessica Amanzo	Researchers Universities Institutions Local communities	Projects must have peaked until the socialization phase		Investment within the research project

ACTION 2: To articulate inter-institutional working groups.						
Action Description	**Deadline**	**Responsibility**	**Collaborators**	**Results**	**Indicators**	**Cost US$**
Meetings among the institutions for the formulation and development of research lines on mountain tapirs	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA), Oscar Ospina (CR), Rocío Polanco (IAvH) and Sandra Correa (Matecaña Zoo) ECUADOR: Jaime Camacho (EcoCiencia /TSG), Leonardo Ordoñez Delgado (Fundación ArcoIris/TSG) and Leonardo Arias (Fundación Espíritu del Bosque) PERU: Jessica Amanzo	Researchers Universities Institutions Environmental and Educational Organizations Environment Ministries	Research lines Inter-institutional agreements	Number of research topics unified	
To strengthen the networks or working groups specialized on mountain tapirs	Continuous	Sergio Sandoval Arenas (Colombian Tapir Network)	Colombian Tapir Network	Functionality of networks and groups		
To carry out meetings aiming at evaluating how the research topics and the inter-institutional groups are doing	Half-yearly	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA), Oscar Ospina (CR), Rocío Polanco (IAvH) and Sandra Correa (Matecaña Zoo) ECUADOR: Jaime Camacho (EcoCiencia/TSG), Leonardo Ordoñez Delgado (Fundación ArcoIris/TSG) and Leonardo Arias (Fundación Espíritu del Bosque) PERU: Jessica Amanzo	Researchers Universities Institutions Environmental and Educational Organizations Environment Ministries	Meetings	Number of topics and groups that are working	

ACTION 3: To stimulate research from the local communities (own research).						
Action Description	**Deadline**	**Responsibility**	**Collaborators**	**Results**	**Indicators**	**Cost US$**
To promote meetings in order to stimulate recognition of the importance of local knowledge	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA), and Juan Carlos Amézquita (CR) ECUADOR: Andrés Tapia (Centro FÁTIMA/TSG) PERU: Jessica Amanzo	Researchers Corporaciones Universities Institutions Organizations Local communities	Meetings about local knowledge	Workshops on local knowledge supervised by the own communities	Resources assigned in the research projects. Joint research projects and resources from the own communities
To supervise and support the management of local research initiatives through workshops and meetings	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA), and Juan Carlos Amézquita (CR) ECUADOR: Andrés Tapia (Centro FÁTIMA) PERU: Jessica Amanzo	Researchers Corporaciones Universities Institutions Organizations Local communities	Own research projects from the local communities	Number of own research projects being carried out or already conducted	Resources assigned in the research projects. Joint research projects and resources from the own communities
To work with local schools for the design of research projects	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA), and Juan Carlos Amézquita (CR) ECUADOR: Andrés Tapia (Centro FÁTIMA)	Researchers Corporaciones Universities Institutions Organizations Local communities	Research project	Number of research projects designed in local schools	Resources assigned in the research projects. Joint research projects and resources from the own communities
To support the local teachers in the PRAES, PEI, and educational plans with local projects about the mountain tapir	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA), and Juan Carlos Amézquita (CR) ECUADOR: Andrés Tapia (Centro FÁTIMA)	Researchers Corporaciones Universities Institutions Organizations Local communities	Research projects included in PRAES, PEI and educational plans	Number of institutions which apply the research projects from the school	Resources assigned in the research projects. Joint research projects and resources from the own communities
To retrieve and document the local knowledge on mountain tapirs	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA), and Juan Carlos Amézquita (CR) ECUADOR: Andrés Tapia (Centro FÁTIMA) PERU: Jessica Amanzo	Researchers Corporaciones Universities Institutions Organizations Local communities	Publications	Number of research projects (publications) generated from traditional, scientific and local knowledge	Resources assigned in the research projects. Joint research projects and resources from the own communities

ACTION 6: To keep the commitments made with the local community before, during and after the research, thus creating continuity in the processes.						
Action Description	**Deadline**	**Responsibility**	**Collaborators**	**Results**	**Indicators**	**Cost US$**
To design realistic and feasible projects	Duration of the project	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Karin Osbahr (UDCA), Oscar Ospina (CR), Rocío Polanco (IAvH) and Sandra Correa (Matecaña Zoo) ECUADOR: Jaime Camacho (EcoCiencia/TSG), Leonardo Ordoñez Delgado (Fundación ArcoIris/TSG) and Leonardo Arias (Fundación Espíritu del Bosque) PERU: Jessica Amanzo	Researchers Corporaciones Universities Institutions Organizations Local communities	To build trust from the local communities	Proposal of new initiatives and reproduction of the project in other human groups	Resources assigned in the research projects. Joint research projects and resources from the own communities

ACTION 7: To create and strengthen communication media and ensure effective dissemination of research projects / results.						
Action Description	**Deadline**	**Responsibility**	**Collaborators**	**Results**	**Indicators**	**Cost US$**
To share information about research projects before, during, and after the research processes	Continuous	COLOMBIA: Fernando Sánchez (Cali Zoo), Sandra Correa (Matecaña Zoo), and Sergio Sandoval Arenas (Colombian Tapir Network/TSG)	Zoological institutions, Colombian Tapir Network, TSG, and Education Ministry	Shared projects	Workshops, meetings	
To disseminate the mountain tapir conservation program at the institutional level by the PHVA participants	Continuous	COLOMBIA: José Sinisterra Santana (UAESPNN), Fernando Sánchez (Cali Zoo), Sandra Correa (Matecaña Zoo), and Adriana Sarmiento (Colombian Tapir Network/TSG)	Working Group of Participation of Local Communities	Dissemination of the project in different communication media		Educational materials
To carry out awareness campaigns through local, regional and national media	Continuous	COLOMBIA: Fernando Sánchez (Cali Zoo), Sandra Correa (Matecaña Zoo and Ministry), and Sergio Sandoval Arenas (Colombian Tapir Network/TSG) Patrícia Medici (IUCN/SSC TSG)	Zoological institutions, Colombian Tapir Network, and TSG Marketing Committee	Knowledge of the community about mountain tapirs		
To design educational materials for the mountain tapir conservation program	Continuous	COLOMBIA: Adriana Sarmiento (Colombian Tapir Network/TSG) and Sandra Correa (Matecaña Zoo) ECUADOR: Andrés Tapia (Centro FÁTIMA) Patrícia Medici (IUCN/SSC TSG)	Colombian Tapir Network, TSG Marketing Committee, and Zoological institutions	Better knowledge about mountain tapirs	Number of institutions which use and disseminate the educational materials	Educational materials
To publish the results in scientific and local language/terminology	Continuous	COLOMBIA: Fernando Sánchez (Cali Zoo), Sandra Correa (Matecaña Zoo), and Sergio Sandoval Arenas (Colombian Tapir Network/TSG) Patrícia Medici (IUCN/SSC TSG)	Colombian Tapir Network, TSG Marketing Committee, and zoological institutions			

Mountain Tapir (*Tapirus pinchaque*) Conservation Workshop Population and Habitat Viability Assessment (PHVA)

Otún-Quimbaya, Pereira, Colombia
12 to 15 October, 2004

Section 6

Ex-Situ Conservation Working Group Report

Ex-Situ Conservation

PARTICIPANTS: Alan Shoemaker (United States), Della Garelle (United States), Diana Sarmiento (Colombia), Germán Corredor (Colombia), Juan Carlos Castañeda (Colombia), Leonardo Arias (Ecuador), Liliana Román (Colombia), Michael Dee (United States) and Tamara Vodovoz (Colombia).

PROBLEMS

1. Problem Identification

BRAINSTORMING

- There is no captive population in the range countries.
- Low genetic variability in the captive population of United States and Canada.
    - 1 female in Canada / 4 females and 3 males in the United States
- There is little cooperation / communication among the research projects.
- Lack of experience in the management of the species in captivity (in the range countries).
- There is little or no information about *in-situ* wild populations: for example about nutrition, individuals which could be used in the management of captive populations.
- The lack of captive specimens hinders the educational task of the zoological institutions. A live animal tells you stories. There are few opportunities, and even efforts, for developing education and outreach programs that raise public awareness about the species, especially in the range countries.
- Lack of *in-situ* mountain tapir research, as it happens also with *T. bairdii* and *T. terrestris*.
- The legislation regarding *ex-situ* conservation does not make the management of captive populations an easy task. Such legislation is strict regarding the reproduction and management of mountain tapirs. In some cases special situations are required depending on the species.
    - ECUADOR: Only animals at the third generation in captivity can be put at disposal for interchange, sale, exporting, use at a wildlife breeding center etc.
- The community at large (government, local populations, scientists, students etc.) is unaware of the species existence and does not know the value of the captive population for fostering research, promoting environmental education and raising funding for conservation.
- Lack of dissemination of information in Spanish, *e.g.* the "Tapir Husbandry Guidelines" (Guía de Manejo de Tapires en Cautiverio).
- Mountain tapirs suffer from a "snowball" effect, where the species tend to disappear due to problems related to inbreeding.
- Lack of technical information in Spanish.
- There is no communication among institutions. Latin American zoological institutions have not shown interest in receiving surplus animals from North American holders.
- Lack of funding for programs in captivity in South America.

THE PROBLEMS DEFINED IN THE BRAINSTORMING WERE GROUPED IN 6 PRIORITY TOPICS:

1. Captive population absent (in the distribution range countries) or limited (in North America), which causes low genetic variability.

2. Lack of integration (flow and interchange of information and experiences) among the *ex-situ* and *in-situ* programs about their respective research projects, movement of animals, funding, education etc.

3. Lack of *ex-situ* research in the genus *Tapirus*.

4. The lack of captive animals hinders the implementation of educational and research programs, and also raising funding for mountain tapir conservation.

5. Lack of inter-institutional communication (information on management, interchange of experiences).

6. The legislation related to the management of captive populations does not make the processes related with *ex-situ* conservation easy.

SENTENCES WHICH IDENTIFY THE PROBLEMS:

When we were grouping the problems in topics, we attempted to define sentences that summarized the whole problem. Then, during the group discussion, the number of problems was increased to eight:

1. The low genetic variability of mountain tapir individuals at zoological institutions jeopardizes the medium term viability of the captive population.
2. The captive individuals are found in institutions located in countries outside the distribution range; this creates a lack of connection among *ex-situ* and *in-situ* conservation programs.
3. Lack of knowledge about assisted reproduction, reproductive physiology and reproductive behavior, which are necessary for the management of small isolated populations.
4. The community as a whole is not aware of the issues and threats which the mountain tapir faces. The lack of captive animals makes it difficult to create educational programs that support the conservation of the species.
5. Lack of funding for carrying out research projects on management of reproduction, nutrition, veterinary management, and also for the implementation of educational programs.
6. Lack of information and interchange of knowledge and experiences about *ex-situ* management among the zoological institutions.
7. The legislation of the different countries makes it difficult the interchange of individual tapirs for the management of the *ex-situ* population.
8. The AZA policies for the mountain tapir *ex-situ* conservation are inclined to phase out the captive management of the species, because the organization considers it close to extinction within the zoological institutions.

2. Problem Prioritization

Criterion: The prioritization was made through the paired ranking technique. The criterion was: How much does it affect the conservation of the species?

PROBLEM 1: The community as a whole is not aware of the issues and threats which the mountain tapir faces. The lack of captive animals makes it difficult to create educational programs that support the conservation of the species.

PROBLEM 2: Lack of information and interchange of knowledge and experiences about *ex-situ* management among the zoological institutions.

PROBLEM 3: Lack of funding in the range countries for carrying out research projects on management of reproduction, nutrition, veterinary management, and also for the implementation of educational programs.

PROBLEM 4: The legislation of the different countries makes it difficult the interchange of individual tapirs for the management of the *ex-situ* population.

PROBLEM 5: Lack of knowledge about assisted reproduction, reproductive physiology and reproductive behavior, which are necessary for the management of small isolated populations.

PROBLEM 6: The low genetic variability of mountain tapir individuals at zoological institutions jeopardizes the medium term viability of the captive population.

PROBLEM 7: The AZA policies for the mountain tapir population in captivity determine that the *ex-situ* management of the species must be phased out, since the organization considers that such population is close to extinction within the zoological institutions.

PROBLEM 8: The only individual tapirs held in captivity are found outside the species natural distribution range; this creates a lack of connection among *ex-situ* and *in-situ* conservation programs being developed in the range countries.

The criterion for the prioritization of problems was the degree of influence they have on the conservation of mountain tapirs. When we applied this criterion, it was determined that the lack of knowledge and awareness about the species by the community as a whole was the most important issue. It was also regarded as the one which would determine a priority risk that poses the higher risk of threat to the mountain tapir current status. In second place came the problem of lack of information either for captive management or to support conservation strategies aimed mainly at the reproductive management of the species and the

small isolated populations. In third place we included fundraising, which is necessary mostly for the development of reproduction and education programs. The maintenance of captive individuals is not a main problem, although they would make the development of educational programs easier. The viability of the species in captivity is a major problem; even so it was considered as a non-priority issue according to the degree which it can affect the conservation of mountain tapirs.

DATA ASSEMBLY

PROBLEM 1: The community as a whole is not aware of the issues and threats which the mountain tapir faces. The lack of captive animals makes it difficult to create educational programs that support the conservation of the species.		
Fact	**Assumption**	**Information Required**
□ There are no captive individuals in Colombia, Ecuador or Peru. □ Potential educational material for outreach programs. □ Some human groups have an impact on mountain tapir conservation.	□ The community as a whole does not know the species, which does not make it aware of the problems it faces.	□ Impact of the educational programs of zoological institutions on the community. □ What knowledge do zoo visitors have about the species?

PROBLEM 2: Lack of information and interchange of knowledge and experiences about *ex-situ* management among the zoological institutions.		
Fact	**Assumption**	**Information Required**
□ IUCN/SSC TSG, AZA Tapir TAG, ISIS: contacts with specialists □ There is available information on captive management: Tapir Husbandry Guidelines and Tapir Minimum Standards (AZA Tapir TAG).	□ Sharing the information would help improve *ex-situ* management.	□ Information in English. It is required that the information be translated to Spanish. □ List of all institutions potentially related to mountain tapir conservation, including the contact person (bilingual) □ Database (English – Spanish) of research projects, publications and results about *ex-situ* management, size of exhibits, diet, specifications and experiences of captive management (in the different countries).

PROBLEM 3: Lack of funding in the range countries for carrying out research projects on management of reproduction, nutrition, veterinary management, and also for the implementation of educational programs.		
Fact	**Assumption**	**Information Required**
□ The mountain tapir is a species that has potential for fundraising. □ Funding is required for the development of projects in captivity.	□ There are other funding sources to support mountain tapir conservation projects.	□ What projects do require funding? □ Which institutions do support projects with mountain tapirs?

PROBLEM 4: The legislation of the different countries make it difficult the interchange of individual tapirs for the management of the *ex-situ* population.		
Fact	**Assumption**	**Information Required**
□ The Ecuadorian, Colombian and Peruvian legislation.	□ The legislation can be modified in order to make programs of captive management easier.	□ Consensus among *ex-situ* institutions and governmental organizations to modify the legislation. □ Information about legislation of other countries

PROBLEM 5: Lack of knowledge about assisted reproduction, reproductive physiology and reproductive behavior, which are necessary for the management of small isolated populations.		
Fact	**Assumption**	**Information Required**
□ Hormonal levels □ Gestation length □ Anatomy □ Hematological values □ Estrous cycles □ Endocrinology □ Reproductive behavior □ Age at sex maturity □ Longevity □ Captive management	□ We can use data from other species of tapirs and extrapolate the information and the techniques for the mountain tapir	□ Research about mountain tapir reproductive physiology and assisted reproduction. □ Techniques for semen collection and freezing and for artificial insemination. □ Genetic analysis of the current population.

PROBLEM 6: The low genetic variability of mountain tapir individuals at zoological institutions jeopardizes the medium term viability of the captive population.		
Fact	**Assumption**	**Information Required**
□ Number of ARKS specimens in zoological institutions.	□ Possibility to get new individuals or semen.	□ Techniques for semen collection and freezing and for artificial insemination developed with captive tapirs. □ Where are the animals which are potentially available? □ How many animals are necessary to maintain the genetic variability of the captive population during 50 and 100 years?

PROBLEM 7: The AZA policies for the mountain tapir population in captivity determine that the *ex-situ* management of the species must be phased out, since the organization considers that such population is close to extinction within the zoological institutions.		
Fact	**Assumption**	**Information Required**
□ Regional Collection Plan (RCP) for tapirs in the AZA Zoological institutions: to manage the mountain tapir until extinction in the AZA zoological institutions. □ Some members of AZA and zoological institutions do not agree with this decision of the AZA Regional Collection Plan (RCP).	□ The plan can be revised. □ New animals that would allow increasing the genetic variability of the captive population will be found	□ How many zoological institutions are interested about integrating themselves to the mountain tapir management program?

PROBLEM 8: The only individual tapirs held in captivity are found outside the species natural distribution range; this creates a lack of connection among *ex-situ* and *in-situ* conservation programs being developed in the range countries.		
Fact	**Assumption**	**Information Required**
□ Few efforts in joint *ex-situ* and *in-situ* conservation projects (Cali Zoo, Los Angeles Zoo, Wildlife Conservation Society).	□ The increase in such links and efforts would improve the conservation of the species.	□ Interchange of *ex-situ* and *in-situ* information: research results, project proposals, training needs for the management of species in the wild.

GOAL IDENTIFICATION AND PRIORITIZATION

1. Goal Identification

Based on the required information and the problems stated, we began the process of goal identification. The difficulty which appeared on some occasions was to differentiate between goal and action.

Deadline: ST: Short term, MT: Medium term, LT: Long term.

PROBLEM 1: The community as a whole is not aware of the issues and threats which the mountain tapir faces. The lack of captive animals makes it difficult to create educational programs that support the conservation of the species.

Goals

1. To create educational programs in the zoological institutions with both visitors and communities aiming at getting the mountain tapir known and developing conservation programs, with short-term impacts (Deadline-MT).
2. To raise awareness of the public that visits zoological institutions, both in the United States and Latin America. This comprises information both on threats to the species and on conservation options, including what each one can contribute for the conservation of the mountain tapir (Deadline-LT).

PROBLEM 2: Lack of information and interchange of knowledge and experiences about *ex-situ* management among the zoological institutions.

Goals

1. To strengthen the connections among the different zoological institutions that participate in the conservation of the mountain tapir, making such links effective and functional. The start of the process would be in the short term and the maintenance of the links in the medium term (Deadline-MT).
2. To increase the participation in the TSG meetings and workshops of zoological institutions of all countries involved. The lack of funding can be one of the obstacles to attend the workshops. Thus, the interest of the Latin American zoological institutions must be stimulated, since they do not receive information because they do not hold the species in captivity (Deadline-MT).
3. All the information must be published in Spanish and English (Deadline-ST).

PROBLEM 3: Lack of funding in the range countries for carrying out research projects on management of reproduction, nutrition, veterinary management, and also for the implementation of educational programs.

Goals

1. To create a common fund for *ex-situ* conservation programs led by the zoological institutions. To obtain US$5,000 in one (1) year for conservation programs with links to zoological institutions (Deadline-ST).
2. Bilingual Web List or Websites where the projects can be submitted for sponsoring. The IUCN/SSC Tapir Specialist Group (TSG) is in charge of carrying out a prioritization (Deadline-ST).

PROBLEM 4: The legislation of the different countries makes it difficult to interchange individual tapirs for the management of the *ex-situ* population.

Goals

1. To change the legislation in order to make the inter-institutional (international and national) management processes for threatened species easier (Deadline-MT).
2. To gather different groups (zoological institutions and government) in order to suggest changes in the legislation (Deadline-MT).

PROBLEM 5: Lack of knowledge about assisted reproduction, reproductive physiology and reproductive behavior, which are necessary for the management of small isolated populations.

Goals

1. To carry out assisted reproduction in mountain tapirs (Deadline-LT).
2. To compile the current information on reproductive physiology and techniques and update it periodically. Additionally, it is necessary to assess studies that are being carried out on reproductive issues and data from the captive specimens in the different countries (Deadline-ST).
3. Captive breeding of the mountain tapir in the range countries (Deadline-LT).
4. Hormonal analyses of all captive animals (Deadline-MT).
5. To develop, implement and sharpen the techniques for mountain tapir semen collection, conservation and analysis (Deadline-MT).

PROBLEM 6: The low genetic variability of mountain tapir individuals at zoological institutions jeopardizes the medium term viability of the captive population.

Goals

1. To increase the genetic variability and avoid the loss of mountain tapir captive populations (Deadline-LT).

PROBLEM 7: The AZA policies for the mountain tapir population in captivity determine that the *ex-situ* management of the species must be phased out, since the organization considers that such population is close to extinction within the zoological institutions.

Goals

1. To identify available spaces for the maintenance of individuals both in the zoological institutions affiliated to the AZA and also outside the United States (preferably in zoological institutions of range countries) (Deadline-ST).
2. To keep a captive population in the AZA zoological institutions as part of the DERP program (exhibition, education, research) (Deadline-LT).

PROBLEM 8: The only individual tapirs held in captivity are found outside the species natural distribution range; this creates a lack of connection among *ex-situ* and *in-situ* conservation programs being developed in the range countries.

Goals

1. To hold mountain tapirs in some zoological institutions of the mountain tapir range countries (Deadline-LT).
2. To strengthen the links among *in-situ* and *ex-situ* researchers and programs.
3. To promote interchanges of staff and researchers among *in-situ* and *ex-situ* programs (Deadline-MT).

2. Goal Prioritization

Criterion: Based on the identification of the 20 goals, we made a prioritization employing the paired-ranking technique. The criterion was the contribution of each goal towards mountain tapir conservation.

GOAL 1 To promote interchanges of staff and researchers among *in-situ* and *ex-situ* programs (Deadline-MT) (92).

GOAL 2 To develop, implement and sharpen the techniques for mountain tapir semen collection, conservation and analysis (Deadline-MT) (90).

GOAL 3 To strengthen the links among *in-situ* and *ex-situ* researchers and programs (Deadline-ST) (88).

GOAL 4 To increase the genetic variability and avoid the loss of mountain tapir captive populations (Deadline-LT) (85).

GOAL 5 To hold mountain tapirs in some zoological institutions of the mountain tapir range countries (Deadline-LT) (85).

GOAL 6 To carry out assisted reproduction in mountain tapirs (Deadline-LT) (78).

GOAL 7 To keep a captive population in the AZA zoological institutions as part of the DERP program (exhibition, education, research) (Deadline-LT) (78).

GOAL 8 To compile the current information on reproductive physiology and techniques and update it periodically. Additionally, it is necessary to assess studies that are being carried out on reproductive issues and data from the captive specimens in the different countries (Deadline-ST) (77).

GOAL 9 To raise awareness of the public that visits zoological institutions, both in the United States and Latin America. This comprises information both on threats to the species and on conservation options, including what each one can contribute for the conservation of the mountain tapir (Deadline-LT) (75).

GOAL 10 Hormonal analyses of all captive animals (Deadline-MT) (73).

GOAL 11 Bilingual Web List or Websites where the projects can be submitted for sponsoring. The IUCN/SSC TSG is in charge of carrying out a prioritization (Deadline-ST) (64).

GOAL 12 To create a common fund for *ex-situ* conservation programs led by the zoological institutions. To obtain US$ 5,000 in 1 year for conservation programs with links to zoological institutions (Deadline-ST) (63).

GOAL 13 To identify available spaces for the maintenance of individuals both in the zoological institutions affiliated to the AZA and also outside the United States (preferably in zoological institutions of range countries) (Deadline-ST) (60).

GOAL 14 To strengthen the connections among the different zoological institutions that participate in the conservation of the mountain tapir, making such links effective and functional. The start of the process would be in the short term and the maintenance of the links in the medium term (56).

GOAL 15 Captive breeding of the mountain tapir in the range countries (Deadline-LT) (56).

GOAL 16 To create educational programs in the zoological institutions with both visitors and communities aiming at getting the mountain tapir known and developing conservation programs, with short-term impacts (Deadline-MT) (54).

GOAL 17 To gather different groups (zoological institutions and government) in order to suggest changes in the legislation (Deadline-MT). (49)

GOAL 18 To change the legislation in order to make the inter-institutional (international and national) management processes for threatened species easier (Deadline-MT) (48).

GOAL 19 To increase the participation in the TSG meetings and workshops of zoological institutions of all countries involved. The lack of funding can be one of the obstacles to attend the workshops. Thus, the interest of the Latin American zoological institutions must be stimulated, since they do not receive information because they do not hold the species in captivity (Deadline-MT) (36).

GOAL 20 All the information must be published in Spanish and English (Deadline-ST) (23).

When carrying out the voting by the whole working group, the results of the stated goals by the *Ex-Situ* Conservation Working Group were categorized as follows (the number shows the number of votes):

GOAL 1 To increase the genetic variability and avoid the loss of mountain tapir captive populations (11).

GOAL 2 To strengthen the links among *in-situ* and *ex-situ* researchers and programs (11).

GOAL 3 To hold mountain tapirs in some zoological institutions of the mountain tapir range countries (8).

GOAL 4 To promote interchanges of staff and researchers among *in-situ* and *ex-situ* programs (5).

GOAL 5 To keep a captive population in the AZA zoological institutions as part of the DERP program (exhibition, education, research) (4).

GOAL 6 To carry out assisted reproduction in mountain tapirs (2).

GOAL 7 To develop, implement and sharpen the techniques for mountain tapir semen collection, conservation and analysis (1).

During the session with the other working groups and the joint prioritization, the highest scores were obtained by research and management strategies that included the local community, emphasizing the importance of the development of projects in the habitat and of research itself. The points suggested by the *Ex-Situ* Conservation Working Group were not considered as the most relevant to promote mountain tapir conservation. This is possibly due to the lack of captive animals in Latin American countries and also to the fact that the captive populations in the United States tend to disappear if no new specimens are included to increase the genetic variability. Nonetheless, it is proposed as an alternative for obtaining knowledge on the physiology of the species, and as one of the options to design management tools, mainly directed at the strengthening and linking of *in-situ* and *ex-situ* research projects.

ACTION PLAN

For the suggestion of actions, we initially chose the seven high-priority goals of the previous task. For each one, we proposed actions that we considered would allow fulfilling the proposed objective. At the end, we revised all goals and included actions which have not been considered in previous points, due to the importance of these goals within the conservation program.

GOAL 1: To increase the genetic variability and avoid the loss of mountain tapir captive populations.			
Action Description	**Responsibility**	**Deadline**	**Cost US$**
□ Creation of a Mountain Tapir Studbook	Alan Shoemaker (AZA Tapir TAG and TSG Red List Authority)	November/2004	0
□ In United States: description of microsatellites (sending information: DNA sequences for preparation of primers) from blood samples of captive animals in the United States	Michael Dee and Della Garelle (AZA Tapir TAG and TSG)	October/2005	US$5,000
□ Sending samples from the United States to COLOMBIA after getting the microsatellites results □ To check and compare the application of the technique and the protocols for the analysis of samples of free-living animals with samples from captive individuals (United States samples and Colombia free-living samples)	Michael Dee and Della Garelle (AZA Tapir TAG and TSG) TSG Genetics Committee: Carlos Pedraza, Anders Gonçalves and Javier Sarria	October/2005 October/2006	US$5,000
□ ECUADOR: Sending samples from ECUADOR to COLOMBIA for comparison with the Colombian data □ PERU: consideration about the possibility(CONOPA Genetic Group) of developing studies about the genetics of free-living animals, skins or animals that reach captivity (through confiscations, not captures)	ECUADOR: Leonardo Arias (Fundación Espíritu Del Bosque) PERU: Jessica Amanzo	October/2005 Answer on the possibility: November/2004	US$5,000
□ Comparison of the results about variability with samples from free-living animals through the processing of samples in Colombia	TSG Genetics Committee: Carlos Pedraza, Anders Gonçalves and Javier Sarria	October/2007	US$5,000
□ Results about the genetic variability of the United States captive population (endogamy and loss of variability) and historical samples (if possible)	Della Garelle will look for contacts for the analysis of the results	October/2006	US$5,000-US$8,000
□ Comparison of the data from free-living and captive animals (all countries)	TSG Genetics Committee	October/2008	US$2,000
□ Planning and analysis of pair formation and reproductive events according to the results from the captive specimens	Alan Shoemaker (AZA Tapir TAG and TSG Red List Authority)	November/2006	

□ To revise the legislation so that the interchange of samples and individuals among countries is more effective and useful for the mountain tapir	COLOMBIA: Liliana Román (Fundación Zoológico Santacruz) / ECUADOR: Leonardo Arias (Fundación Espíritu del Bosque)	January/2005	
□ Alan Shoemaker will liaison with the U.S. Fish & Wildlife Service in order to ask about the possibility for them to contact the Environment Ministries of COLOMBIA, ECUADOR and PERU	Alan Shoemaker (AZA Tapir TAG and TSG Red List Authority)	November/2004	

GOAL 2: To strengthen the links among *in-situ* and *ex-situ* researchers and programs and GOAL 4: To promote interchanges of staff and researchers among *in-situ* and *ex-situ* programs.			
Action Description	**Responsibility**	**Deadline**	**Cost US$**
□ To suggest and connect the persons which are working with the mountain tapir in a list of projects and in the Colombian Tapir Network. □ To disseminate the list and the Websites to the persons which are interested, for example potential sponsors, students etc. ○ Volunteers which pay fees to participate in *in-situ* research projects in Latin-American countries	Patrícia Medici (TSG Website) and Sergio Sandoval Arenas (Colombian Tapir Network/TSG) Participants of the Mountain Tapir PHVA Workshop Michael Dee and Della Garelle (AZA Tapir TAG and TSG)	From now From now	
□ Staff interchange and volunteering program among the institutions in the United States and in Latin-America ○ Seek for the possibility of funding sources or institutions which support the project; ○ To make the contacts (Earthwatch from USA to L. A. and Partners of America from L. A. to USA)	Della Garelle (AZA Tapir TAG and TSG)	February/2005 January/2005	
□ List of potential companies for contributing to the program	COLOMBIA: Juan Carlos Castañeda (Matecaña Zoo) / ECUADOR: Leonardo Arias (Fundación Espíritu del Bosque)	March/2005	

GOAL 3: To hold mountain tapirs in some zoological institutions of the mountain tapir range countries.			
Action Description	**Responsibility**	**Deadline**	**Cost US$**
□ To send the protocols for management of captive tapirs to the zoological institutions	Alan Shoemaker (AZA Tapir TAG and TSG Red List Authority)	November/2004	
□ To make a list of: zoological institutions, contact persons and language, interest in holding the mountain tapir in captivity, availability of space for inclusion of mountain tapir in the collection and experience on holding tapirs	Compiling all the information: ZCOG: Della Garelle COLOMBIA: Diana Sarmiento (Piscilago Zoo) ECUADOR: Leonardo Arias (Fundación Espíritu Del Bosque) PERU: Jessica Amanzo	June/2005	
□ Support from zoological institutions in the United States for the re-structuring and adaptation of exhibits according to the parameters for holding mountain tapirs in captivity	Della Garelle, Michael Dee and Alan Shoemaker (AZA Tapir TAG and TSG)	On request	To be defined
□ Definition of criteria for prioritization of zoological institutions intended for holding mountain tapirs in captivity in Latin America. These criteria are defined in order to establish the process of support to the institutions for the repair or construction of exhibits	Della Garelle, Michael Dee and Alan Shoemaker (AZA Tapir TAG and TSG)	February/2005	
□ To send information about the mountain tapir to the Corporations [Corporaciones] (Colombia), Forest Districts - Environment Protection Unit [Distritos Forestales Unidad de Protección del Medio Ambiente] (ECUADOR), Environment Ministry (ECUADOR and COLOMBIA). To stress the importance the species has and explain what to do in case an individual is received and who should be contacted in such situation: LETTER	COLOMBIA: Juan Carlos Castañeda (Matecaña Zoo) / ECUADOR: Leonardo Arias (Fundación Espíritu del Bosque)		
□ Design of an informational signboard about the mountain tapir to be placed in the zoological institutions holding *T. terrestris* . COLOMBIA and ECUADOR: To send the zoological institutions the information which was suggested to be included in the sign	COLOMBIA: Liliana Román (Santacruz Zoo Foundation) / ECUADOR: Leonardo Arias (Fundación Espíritu del Bosque)	January/2005	
□ To repatriate or bring surplus mountain tapir individuals to zoological institutions in COLOMBIA, ECUADOR or PERU (according to the proposed standards and criteria for the selection of interested institutions). The surpluses are found in the Cheyenne Mountain Zoo (1 male) and Los Angeles zoo (1 male and 1 female)	Della Garelle and Michael Dee (AZA Tapir TAG and TSG) and the personnel from the zoological institution which makes the request	On request	Undetermined

GOAL 5: To keep a captive population in the AZA zoological institutions as part of the DERP program (exhibition, education, research).			
Action Description	**Responsibility**	**Deadline**	**Cost US$**
□ To confirm the agreement of the AZA Tapir TAG to keep breeding mountain tapirs for five years. During this period, more spaces to hold other animals in zoological institutions outside AZA will be looked for.	Alan Shoemaker (AZA Tapir TAG and TSG)	November/2004	
□ To check other zoological institutions in the United States, outside the AZA, about their interest to include the mountain tapir in their collections.	Della Garelle, Alan Shoemaker and Michael Dee (AZA Tapir TAG and TSG)	During five years	

GOAL 6 and 7: To develop, implement and sharpen the techniques for mountain tapir semen collection, conservation and analysis.			
Action Description	**Responsibility**	**Deadline**	**Cost US$**
□ Collection and analysis of samples for endocrinological studies (males and females) in order to determine hormonal values for the species in captivity	Michael Dee and Della Garelle (AZA Tapir TAG and TSG)	October/2005	US$1,000-$2,000
□ To identify a researcher (reproduction physiologist) to start the project on collection, management, qualification, and conservation of mountain tapir semen. To announce it in the Website	Della Garelle and TSG Veterinarian Committee	June/2005	
ECUADOR: To start a project on techniques for semen collection through electrical ejaculation (zoological institutions)	Leonardo Arias (Fundación Espíritu del Bosque)	April/2005	US$3,000
COLOMBIA: Project on evaluation of techniques and of collection of tapirs semen in the Colombian zoological institutions	ACOPAZOA - Juan Carlos Castañeda (Matecaña Zoo) and Liliana Román (Santacruz Zoo)	June/2005	US$3,000
□ Literature review and contact with researchers which have worked with tapir reproduction.	Leonardo Arias (Fundación Espíritu del Bosque), Liliana Román (Santacruz Zoo Foundation) and Juan Carlos Castañeda (Matecaña Zoo)	March/2005	

Mountain Tapir (*Tapirus pinchaque*) Conservation Workshop Population and Habitat Viability Assessment (PHVA)

Otún-Quimbaya, Pereira, Colombia
12 to 15 October, 2004

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Mountain Tapir (*Tapirus pinchaque*) Conservation Workshop Population and Habitat Viability Assessment (PHVA)

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Section 8

Glossary

ACOPAZOA: Asociación Colombiana de Parques Zoológicos [Colombian Association of Zoological Parks]

AZA: Association of Zoos and Aquariums

CAMP: Conservation Assessment and Management Plan

CAR: Corporación Autónoma Regional, Colombia [Regional Autonomous Corporation, Colombia]

CATIE: Centro Agronómico Tropical de Investigación y Enseñanza [Tropical Agronomic Center of Research and Teaching]

CBSG: Conservation Breeding Specialist Group

CI: Conservation International

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora

CORTOLIMA: Corporación Autónoma Regional del Tolima, Colombia [Regional Autonomous Corporation of Tolima, Colombia]

CR: Corporaciones Regionales (Colombia) [Regional Corporations (Colombia)]

CRQ: Corporación Autónoma Regional del Quindío, Colombia [Regional Autonomous Corporation of Quindío, Colombia]

EAZA: European Association of Zoos and Aquaria

FUNDEBO: Fundación Espíritu del Bosque [Foundation Spirit of the Woods]

GEF: Global Environmental Facility

IAvH: Instituto de Investigación en Recursos Biológicos "Alexander von Humboldt" ["Alexander von Humboldt" Institute of Research of Biological Resources]

ICN: Instituto de Ciencias Naturales, Universidad Nacional de Colombia [Institute of Natural Sciences, National University of Colombia]

IDEAM: Instituto de Hidrología, Meteorología y Estudios Ambientales, Colombia [Institute of Hidrology, Meteorology and Environmental Studies of Colombia]

INDERENA: Instituto Nacional de Recursos Renovables Naturales (actualmente Ministerio del ambiente y desarrollo territorial de Colombia) [National Institute of Natural Renewable Resources (currently Ministry of Environment, Housing and Land Development of Colombia)]

INRENA: Instituto Nacional de Recursos Naturales, Perú [National Institute of Natural Resources, Peru]

ISIS: Internacional Species Information System, United States

IUCN/UICN: International Union for the Conservation of Nature

MAE: Ministerio del Ambiente del Ecuador [Ministry of Environment of Ecuador]

MAVDT: Ministerio del Ambiente, Vivienda y Desarrollo Territorial de Colombia [Ministry of Environment, Housing and Land Development of Colombia]

MINAMBIENTE: Ministerio del Ambiente de Colombia [Colombian Ministry of Environment]

MUSM: Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Peru [Museum of Natural History, Major National University of Saint Mark, Peru]

PEI: Proyecto Educativo Institucional [Institutional Education Project]

PHVA: Population and Habitat Viability Assessment

PNN: Parque Nacional Natural, Colombia [Natural National Park, Colombia]

PRAES: Proyectos Ambientales Escolares [Environmental Projects of Schools]

RCP: AZA Tapir TAG - Regional Collection Plan. Plan that prioritizes the presence or absence of species included in TAG within zoological institutions afiliated to AZA

SIRAP-EC: Sistema Regional de Áreas Protegidas de la Eco Región del Eje Cafetero, Colombia [Regional System of Protected Areas of the Eje Cafetero Eco Region]

SSC: Species Survival Commission

SSP: AZA Tapir TAG - Species Survival Plan

STUDBOOK: The pedigree book of the species or sub-species being held in captivity. This is the database for SSP decisions

TAG: AZA Taxon Advisory Group. It is the group which is responsible for the management of a mammal order or family (*e.g.* AZA Tapir TAG – the first task of the TAG is to produce the Regional Collection Plan)

TNC: The Nature Conservancy

TSG: Tapir Specialist Group

UAESPNN: Unidad Administrativa Especial de Sistema de Parques Nacionales Naturales, Colombia [Special Administrative Unit of the System of Natural National Parks of Colombia]

UDCA: Universidad de Ciencias Aplicadas y Ambientales (Colombia) [University of Environmental and Applied Sciences (Colombia)]

UNAL: Universidad Nacional de Colombia [National University of Colombia]

UPCH: Universidad Peruana Cayetano Heredia [Peruvian University Cayetano Heredia]

UTP: Universidad Tecnológica de Pereira [Technological University of Pereira]

UTPL: Universidad Técnica Particular de Loja (Ecuador) [Private Technical University of Loja (Ecuador)]

WCS: Wildlife Conservation Society, United States

WRI: World Resources Institute

WWF: World Wildlife Fund

Mountain Tapir (*Tapirus pinchaque*) Conservation Workshop Population and Habitat Viability Assessment (PHVA)

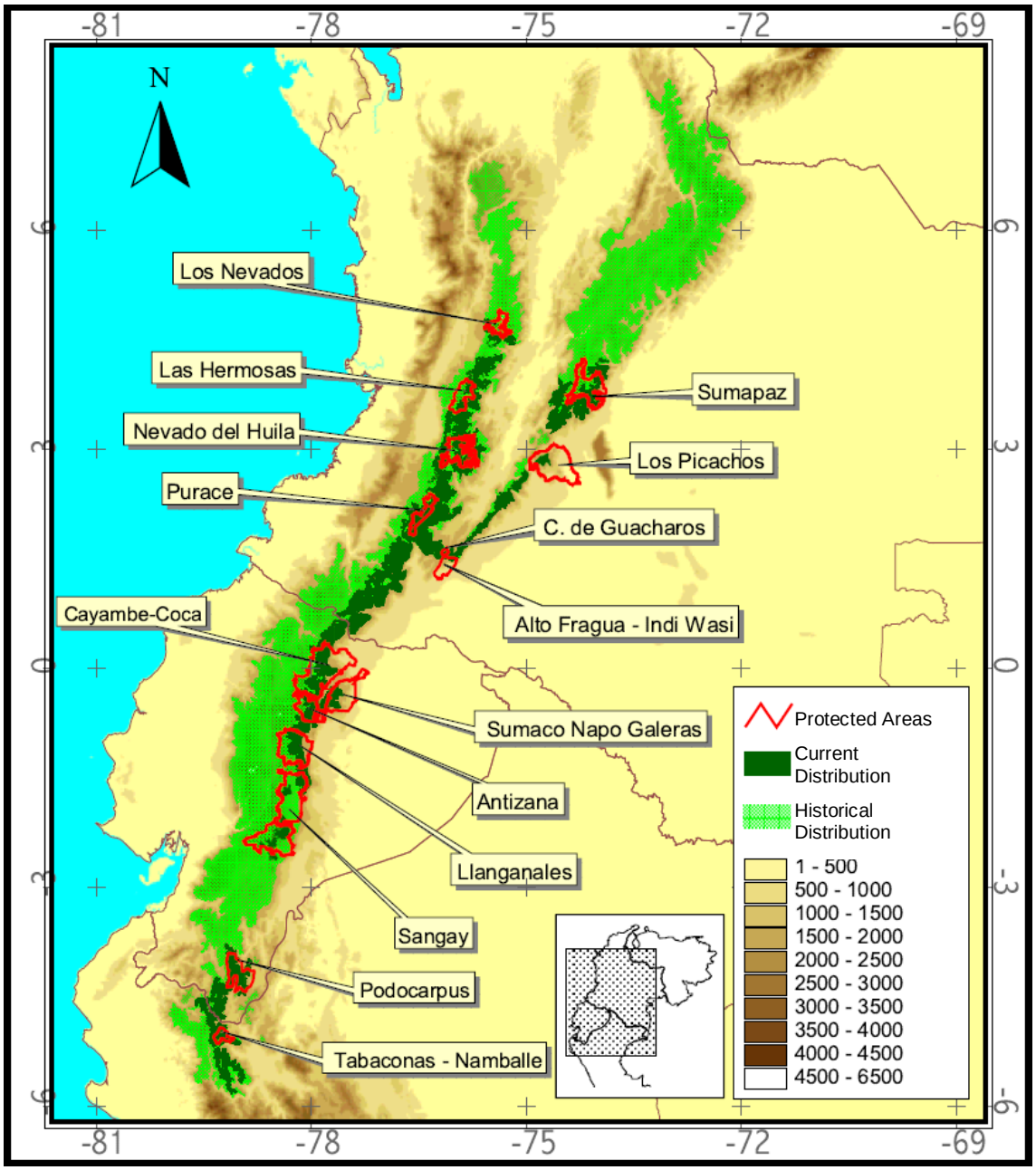
Otún-Quimbaya, Pereira, Colombia 12 to 15 October, 2004





Section 9

Map of Mountain Tapir Distribution



Made by Diego J. Lizcano. Adapted from Cavelier, Lizcano, Downer and Herena 2004. Second international Tapir Symposium, Tropical Montane Cloud Forest, Hawaii 2004.

Appendix I

Simulation Modeling and Population Viability Analysis

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A model is any simplified representation of a real system. We use models in all aspects of our lives, in order to: (1) extract the important trends from complex processes, (2) permit comparison among systems, (3) facilitate analysis of causes of processes acting on the system, and (4) make predictions about the future. A complete description of a natural system, if it were possible, would often decrease our understanding relative to that provided by a good model, because there is "noise" in the system that is extraneous to the processes we wish to understand. For example, the typical representation of the growth of a wildlife population by an annual percent growth rate is a simplified mathematical model of the much more complex changes in population size. Representing population growth as an annual percent change assumes constant exponential growth, ignoring the irregular fluctuations as individuals are born or immigrate, and die or emigrate. For many purposes, such a simplified model of population growth is very useful, because it captures the essential information we might need regarding the average change in population size, and it allows us to make predictions about the future size of the population. A detailed description of the exact changes in numbers of individuals, while a true description of the population, would often be of much less value because the essential pattern would be obscured, and it would be difficult or impossible to make predictions about the future population size.

In considerations of the vulnerability of a population to extinction, as is so often required for conservation planning and management, the simple model of population growth as a constant annual rate of change is inadequate for our needs. The fluctuations in population size that are omitted from the standard ecological models of population change can cause population extinction, and therefore are often the primary focus of concern. In order to understand and predict the vulnerability of a wildlife population to extinction, we need to use a model which incorporates the processes which cause fluctuations in the population, as well as those which control the long-term trends in population size (Shaffer 1981). Many processes can cause fluctuations in population size: variation in the environment (such as weather, food supplies, and predation), genetic changes in the population (such as genetic drift, inbreeding, and response to natural selection), catastrophic effects (such as disease epidemics, floods, and droughts), decimation of the population or its habitats by humans, the chance results of the probabilistic events in the lives of individuals (sex determination, location of mates, breeding success, survival), and interactions among these factors (Gilpin and Soulé 1986).

Models of population dynamics which incorporate causes of fluctuations in population size in order to predict probabilities of extinction, and to help identify the processes which contribute to a population's vulnerability, are used in "Population Viability Analysis" (PVA) (Lacy 1993/4). For the purpose of predicting vulnerability to extinction, any and all population processes that impact population dynamics can be important. Much analysis of conservation issues is conducted by largely intuitive assessments by

biologists with experience with the system. Assessments by experts can be quite valuable, and are often contrasted with "models" used to evaluate population vulnerability to extinction. Such a contrast is not valid, however, as *any* synthesis of facts and understanding of processes constitutes a model, even if it is a mental model within the mind of the expert and perhaps only vaguely specified to others (or even to the expert himself or herself).

A number of properties of the problem of assessing vulnerability of a population to extinction make it difficult to rely on mental or intuitive models. Numerous processes impact population dynamics, and many of the factors interact in complex ways. For example, increased fragmentation of habitat can make it more difficult to locate mates, can lead to greater mortality as individuals disperse greater distances across unsuitable habitat, and can lead to increased inbreeding which in turn can further reduce ability to attract mates and to survive. In addition, many of the processes impacting population dynamics are intrinsically probabilistic, with a random component. Sex determination, disease, predation, mate acquisition -- indeed, almost all events in the life of an individual -- are stochastic events, occurring with certain probabilities rather than with absolute certainty at any given time. The consequences of factors influencing population dynamics are often delayed for years or even generations. With a long-lived species, a population might persist for 20 to 40 years beyond the emergence of factors that ultimately cause extinction. Humans can synthesize mentally only a few factors at a time, most people have difficulty assessing probabilities intuitively, and it is difficult to consider delayed effects. Moreover, the data needed for models of population dynamics are often very uncertain. Optimal decision-making when data are uncertain is difficult, as it involves correct assessment of probabilities that the true values fall within certain ranges, adding yet another probabilistic or chance component to the evaluation of the situation.

The difficulty of incorporating multiple, interacting, probabilistic processes into a model that can utilize uncertain data has prevented (to date) development of analytical models (mathematical equations developed from theory) which encompass more than a small subset of the processes known to affect wildlife population dynamics. It is possible that the mental models of some biologists are sufficiently complex to predict accurately population vulnerabilities to extinction under a range of conditions, but it is not possible to assess objectively the precision of such intuitive assessments, and it is difficult to transfer that knowledge to others who need also to evaluate the situation. Computer simulation models have increasingly been used to assist in PVA. Although rarely as elegant as models framed in analytical equations, computer simulation models can be well suited for the complex task of evaluating risks of extinction. Simulation models can include as many factors that influence population dynamics as the modeler and the user of the model want to assess. Interactions between processes can be modeled, if the nature of those interactions can be specified. Probabilistic events can be easily simulated by computer programs, providing output that gives both the mean expected result and the range or distribution of possible outcomes. In theory, simulation programs can be used to build models of population dynamics that include all the knowledge of the system which is available to experts. In practice, the models will be simpler, because some factors are judged unlikely to be important, and because the persons who developed the model did not have access to the full array of expert knowledge.

Although computer simulation models can be complex and confusing, they are precisely defined and all the assumptions and algorithms can be examined. Therefore, the models are objective, testable, and open to challenge and improvement. PVA models allow use of all available data on the biology of the taxon, facilitate testing of the effects of unknown or uncertain data, and expedite the comparison of the likely results of various possible management options.

PVA models also have weaknesses and limitations. A model of the population dynamics does not define the goals for conservation planning. Goals, in terms of population growth, probability of persistence, number of extant populations, genetic diversity, or other measures of population performance must be defined by the management authorities before the results of population modeling can be used. Because the models incorporate many factors, the number of possibilities to test can seem endless, and it can be difficult to determine which of the factors that were analyzed are most important to the population dynamics. PVA models are necessarily incomplete. We can model only those factors which we understand and for which we can specify the parameters. Therefore, it is important to realize that the models probably underestimate the threats facing the population. Finally, the models are used to predict the long-term effects of the processes presently acting on the population. Many aspects of the situation could change radically within the time span that is modeled. Therefore, it is important to reassess the data and model results periodically, with changes made to the conservation programs as needed (see Lacy and Miller (2002), Nyhus *et al.* (2002) and Westley and Miller (2003) for more details).

The *VORTEX* Population Viability Analysis Model

For the analyses presented here, the *VORTEX* computer software (Lacy 1993a) for population viability analysis was used. *VORTEX* models demographic stochasticity (the randomness of reproduction and deaths among individuals in a population), environmental variation in the annual birth and death rates, the impacts of sporadic catastrophes, and the effects of inbreeding in small populations. *VORTEX* also allows analysis of the effects of losses or gains in habitat, harvest or supplementation of populations, and movement of individuals among local populations.

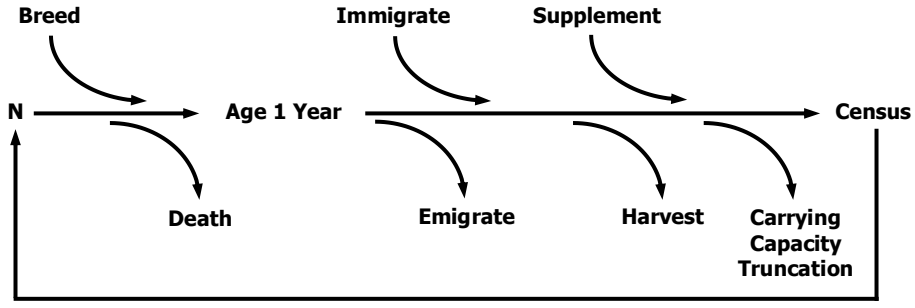
Density dependence in mortality is modeled by specifying a carrying capacity of the habitat. When the population size exceeds the carrying capacity, additional morality is imposed across all age classes to bring the population back down to the carrying capacity. The carrying capacity can be specified to change linearly over time, to model losses or gains in the amount or quality of habitat. Density dependence in reproduction is modeled by specifying the proportion of adult females breeding each year as a function of the population size.

Vortex models loss of genetic variation in populations, by simulating the transmission of alleles from parents to offspring at a hypothetical genetic locus. Each animal at the start of the simulation is assigned two unique alleles at the locus. During the simulation, Vortex monitors how many of the original alleles remain within the population, and the average heterozygosity and gene diversity (or "expected heterozygosity") relative to the starting levels. Vortex also monitors the inbreeding coefficients of each animal, and can reduce the juvenile survival of inbred animals to model the effects of inbreeding depression.

VORTEX is an *individual-based* model. That is, *VORTEX* creates a representation of each animal in its memory and follows the fate of the animal through each year of its lifetime. *VORTEX* keeps track of the sex, age, and parentage of each animal. Demographic events (birth, sex determination, mating, dispersal, and death) are modeled by determining for each animal in each year of the simulation whether any of the events occur. (See figure above.) Events occur according to the specified age and sex-specific probabilities. Demographic stochasticity is therefore a consequence of the uncertainty regarding whether each demographic event occurs for any given animal.

VORTEX requires a lot of population-specific data. For example, the user must specify the amount of annual variation in each demographic rate caused by fluctuations in the environment. In addition, the frequency of each type of catastrophe (drought, flood, epidemic disease) and the effects of the catastrophes on survival and reproduction must be specified. Rates of migration (dispersal) between each pair of local populations must be specified. Because *VORTEX* requires specification of many biological parameters, it is not necessarily a good model for the examination of population dynamics that would result from some generalized life history. It is most usefully applied to the analysis of a specific population in a specific environment.

VORTEX Simulation Model Timeline



Events listed above the timeline increase N, while events listed below the timeline decrease N.

Further information on *VORTEX* is available in Lacy (2000) and Miller and Lacy (2003).

Dealing with Uncertainty

It is important to recognize that uncertainty regarding the biological parameters of a population and its consequent fate occurs at several levels and for independent reasons. Uncertainty can occur because the parameters have never been measured on the population. Uncertainty can occur because limited field data have yielded estimates with potentially large sampling error. Uncertainty can occur because independent studies have generated discordant estimates. Uncertainty can occur because environmental conditions or population status have been changing over time, and field surveys were conducted during periods which may not be representative of long-term averages. Uncertainty can occur because the environment will change in the future, so that measurements made in the past may not accurately predict future conditions.

Sensitivity testing is necessary to determine the extent to which uncertainty in input parameters results in uncertainty regarding the future fate of the pronghorn population. If alternative plausible parameter values result in divergent predictions for the population, then it is important to try to resolve the uncertainty with better data. Sensitivity of population dynamics to certain parameters also indicates that those parameters describe factors that could be critical determinants of population viability. Such factors are therefore good candidates for efficient management actions designed to ensure the persistence of the population.

The above kinds of uncertainty should be distinguished from several more sources of uncertainty about the future of the population. Even if long-term average demographic rates are known with precision, variation over time caused by fluctuating environmental conditions will cause uncertainty in the fate of the population at any given time in the future. Such environmental variation should be incorporated into the model used to assess population dynamics, and will generate a range of possible outcomes (perhaps represented as a mean and standard deviation) from the model. In addition, most biological processes are inherently stochastic, having a random component. The stochastic or probabilistic nature of survival, sex determination, transmission of genes, acquisition of mates, reproduction, and other processes preclude exact determination of the future state of a population. Such demographic stochasticity should also be incorporated into a population model, because such variability both increases our uncertainty about the future and can also change the expected or mean outcome relative to that which would result if there were no such variation. Finally, there is "uncertainty" which represents the alternative actions or interventions which might be pursued as a management strategy. The likely effectiveness of such management options can be explored by testing alternative scenarios in the model of population dynamics, in much the same way that sensitivity testing is used to explore the effects of uncertain biological parameters.

Results

Results reported for each scenario include:

Deterministic r -- The deterministic population growth rate, a projection of the mean rate of growth of the population expected from the average birth and death rates. Impacts of harvest, inbreeding, and density dependence are not considered in the calculation. When r = 0, a population with no growth is expected; r < 0 indicates population decline; r > 0 indicates long-term population growth. The value of r is approximately the rate of growth or decline per year.

The deterministic growth rate is the average population growth expected if the population is so large as to be unaffected by stochastic, random processes. The deterministic growth rate will correctly predict future population growth if: the population is presently at a stable age distribution; birth and death rates remain constant over time and space (i.e., not only do the probabilities remain constant, but the actual number of births and deaths each year match the expected values); there is no inbreeding depression; there is never a limitation of mates preventing some females from breeding; and there is no density dependence in birth or death rates, such as a Allee effects or a habitat "carrying capacity" limiting population growth. Because some or all of these assumptions are usually violated, the average population growth of real populations (and stochastically simulated ones) will usually be less than the deterministic growth rate.

Stochastic r -- The mean rate of stochastic population growth or decline demonstrated by the simulated populations, averaged across years and iterations, for all those simulated populations that are not extinct. This population growth rate is calculated each year of the simulation, prior to any truncation of the population size due to the population exceeding the carrying capacity. Usually, this stochastic r will be less than the deterministic r predicted from birth and death rates. The stochastic r from the simulations will be close to the deterministic r if the population growth is steady and robust. The stochastic r will be notably less than the deterministic r if the population is subjected to large fluctuations due to environmental variation, catastrophes, or the genetic and demographic instabilities inherent in small populations.

P(E) -- the probability of population extinction, determined by the proportion of, for example, 500 iterations within that given scenario that have gone extinct in the simulations. "Extinction" is defined in the VORTEX model as the lack of either sex.

N -- mean population size, averaged across those simulated populations which are not extinct.

SD(N) -- variation across simulated populations (expressed as the standard deviation) in the size of the population at each time interval. SDs greater than about half the size of mean N often indicate highly unstable population sizes, with some simulated populations very near extinction. When SD(N) is large relative to N, and especially when SD(N) increases over the years of the simulation, then the population is vulnerable to large random fluctuations and may go extinct even if the mean population growth rate is positive. SD(N) will be small and often declining relative to N when the population is either growing steadily toward the carrying capacity or declining rapidly (and deterministically) toward extinction. SD(N) will also decline considerably when the population size approaches and is limited by the carrying capacity.

H -- the gene diversity or expected heterozygosity of the extant populations, expressed as a percent of the initial gene diversity of the population. Fitness of individuals usually declines proportionately with gene diversity (Lacy 1993b), with a 10% decline in gene diversity typically causing about 15% decline in survival of captive mammals (Ralls *et al.* 1988). Impacts of inbreeding on wild populations are less well known, but may be more severe than those observed in captive populations (Jiménez *et al.* 1994). Adaptive response to natural selection is also expected to be proportional to gene diversity. Long-term conservation programs often set a goal of retaining 90% of initial gene diversity (Soulé *et al.* 1986). Reduction to 75% of gene diversity would be equivalent to one generation of full-sibling or parent-offspring inbreeding.

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