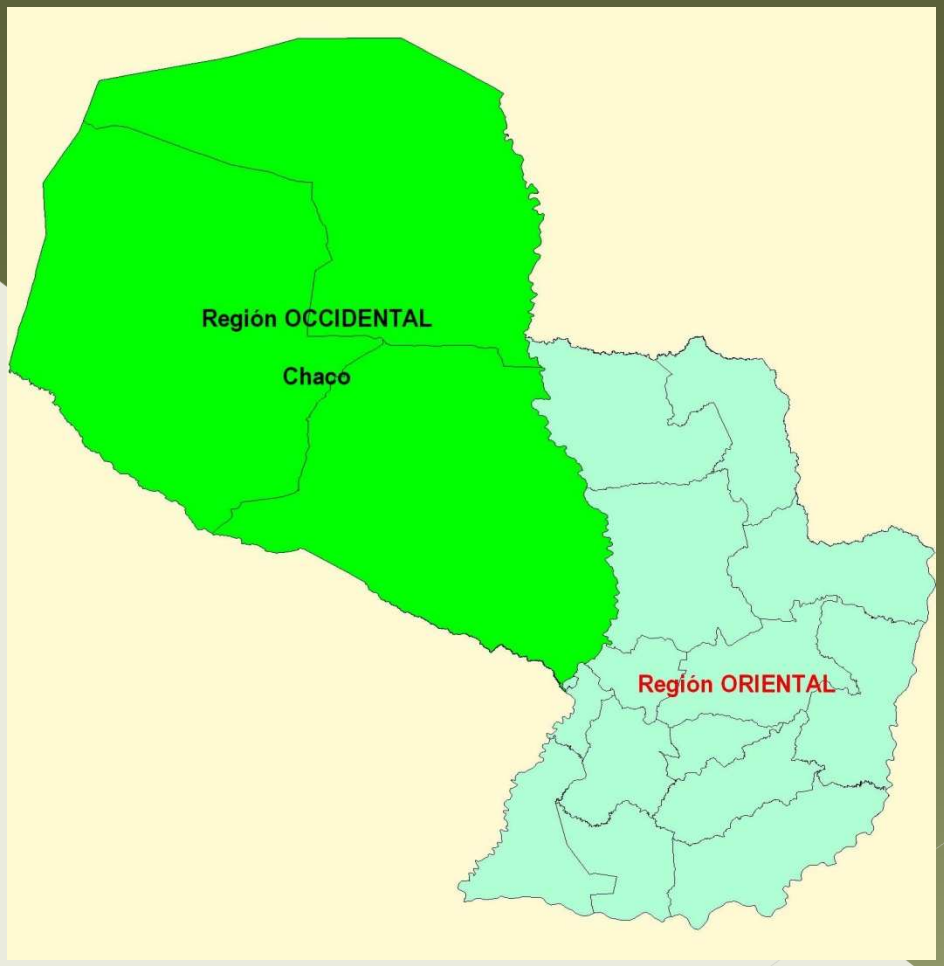
PARAGUAY BUSHMEET

SOUTH AMERICA PARAGUAY

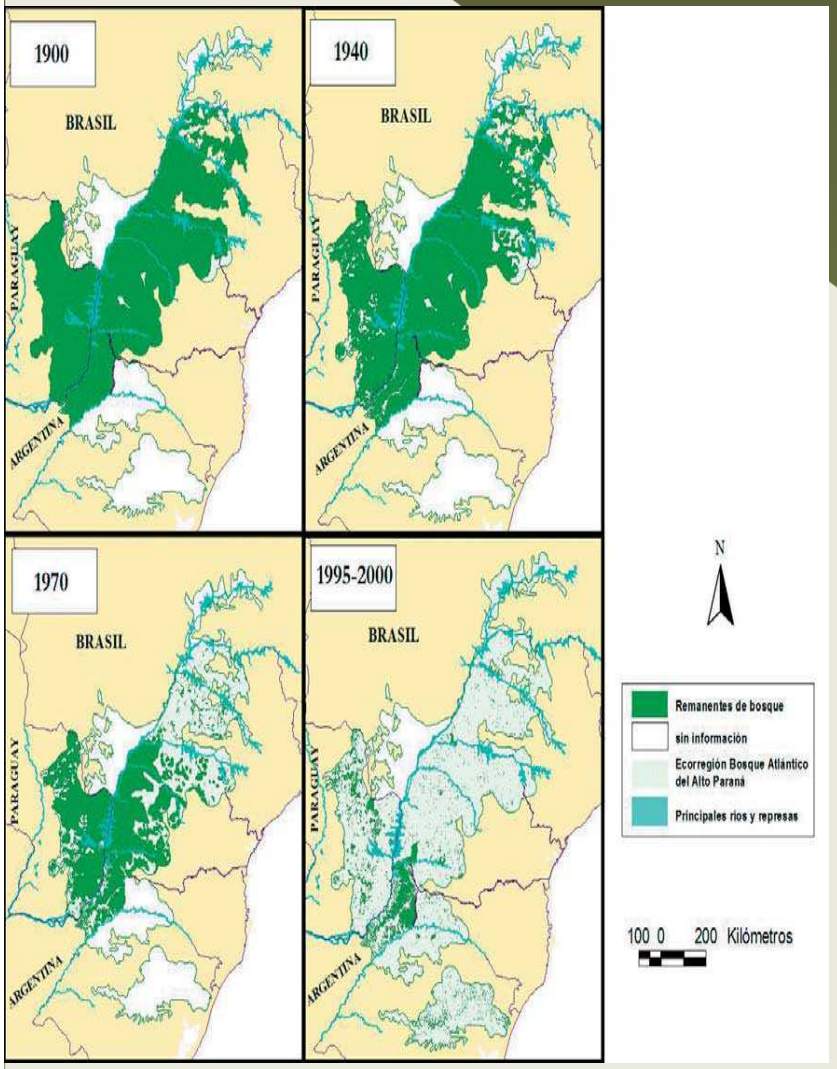
PARAGUAY - 0CCIDENTAL REGION EASTER REGION



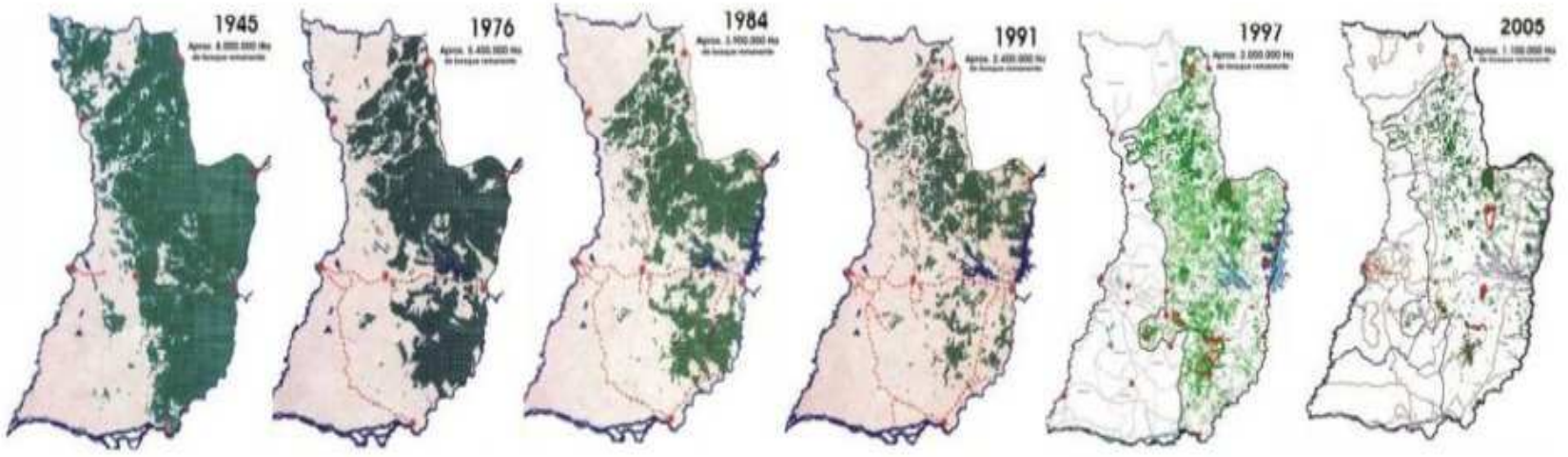
EASTERN REGION

- **EASTERN REGION**
- The Paraguay's eastern region suffered severe deforestation over a few decades. It has been estimated an area of 8,000,000 hectares of rainforest in 1940, diminishing to only about 900,000 ha at present. As a result many wildlife populations are declining and others have disappeared, nevertheless, there is still consumption of wild meat, alternating with mainly beef. Below, one finds a chronological deforestation map of the region.

EASTERN REGION: FOREST AREA



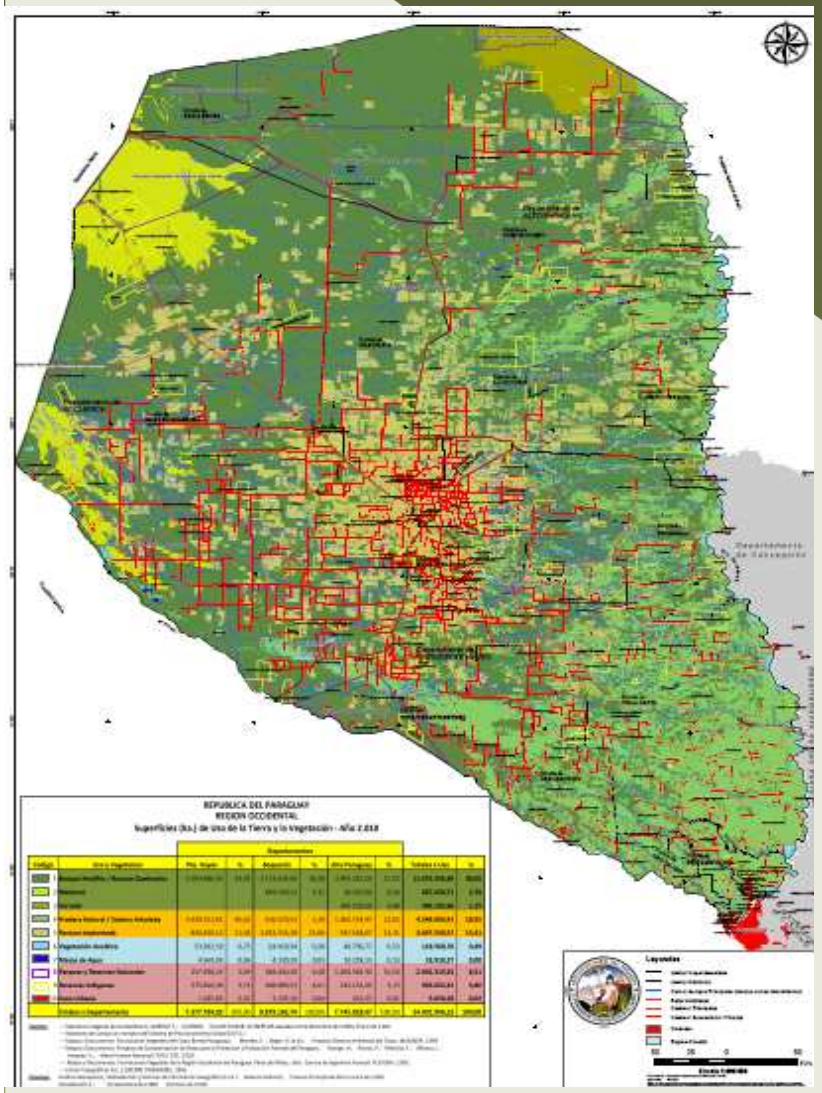
EASTERN REGION DEFORESTATION RATE



OCCIDENTAL REGION

- The Paraguayan Chaco was always seen as an inexhaustible place for hunting wild animals. However, this seemingly inexhaustible abundance is threatened by the abrupt change of land use for agricultural and livestock raising activities. There has also been an expansion of human settlements and construction of national and international highways, thus resulting in increased vehicular traffic and consequently the increase in poaching.
- Currently, the aggressiveness of anthropogenic processes such as intensive agricultural/livestock raising activities and global climate change, adversely affect the protected wild areas, although we still do not have indicators that allow us to quantify that impact.
- According to the region`s land use map (ARP, 2010) there exist is a pasture planted area of 3. 697,530.57, unlike the 1,000,000 ha, estimated area estimated a decade ago (Fracchia (1998). Below it is shown the vegetation and land use map.

OCCIDENTAL REGION; THE VEGETATION AND LAND USE MAP



OCCIDENTAL REGION- VEGETATION

REPUBLICA DEL PARAGUAY
REGION OCCIDENTAL
Superficies (ha.) de Uso de la Tierra y la Vegetación - Año 2.010

		Departamentos							
Codigo	Uso y Vegetacion	Pte. Hayes	%	Boquerón	%	Alto Paraguay	%	Totales x Uso	%
1	**Bosque Xerófito / Bosque Quebracho**	2.509.486,92	34,01	5.174.643,96	58,28	3.992.215,50	51,55	**11.676.346,38**	**48,65**
2	**Matorral**	-	-	649.240,11	7,31	18.210,60	0,24	**667.450,71**	**2,78**
3	**Cerrado**	-	-	-	-	300.192,66	3,88	**300.192,66**	**1,25**
4	**Pradera Natural / Sabana Arbolada**	3.439.511,91	46,62	106.570,53	1,20	1.002.724,47	12,95	**4.548.806,91**	**18,95**
5	**Pastura Implantada**	836.430,12	11,34	1.923.555,78	21,66	937.544,67	12,11	**3.697.530,57**	**15,41**
6	**Vegetación Acuática**	53.392,59	0,72	24.419,34	0,28	40.756,77	0,53	**118.568,70**	**0,49**
7	**Masas de Agua**	4.569,93	0,06	4.130,19	0,05	10.218,15	0,13	**18.918,27**	**0,08**
8	**Parques y Reservas Naturales**	257.296,23	3,49	584.440,20	6,58	1.200.582,90	15,50	**2.042.319,33**	**8,51**
9	**Reservas Indígenas**	275.810,49	3,74	408.889,53	4,61	242.132,40	3,13	**926.832,42**	**3,86**
10	**Area Urbana**	1.285,83	0,02	3.293,10	0,04	451,35	0,01	**5.030,28**	**0,02**
	Totales x Departamento	**7.377.784,02**	100,00	**8.879.182,74**	100,00	**7.745.029,47**	100,00	**24.001.996,23**	**100,00**

Fuentes: --- Mosaicos Imágenes de los Satélites 1) LANDSAT 5 ; 2) MODIS; 3) ALOS PALSAR; 4) CBERS 2B captadas entre Diciembre de 2.008 y Enero de 2.010.
--- Muestreo de campo con receptor del Sistema de Posicionamiento Global (G.P.S.)
--- Mapas y Documentos: Formaciones Vegetales del Chaco Boreal Paraguayo. Mereles, F. ; Degen, R. et all ; Proyecto Sistema Ambiental del Chaco. MAG/BGR. 1.999.
--- Mapas y Documentos: Proyecto de Caracterización de Areas para la Protección y Producción Forestal del Paraguay. Huespe. H.; Alonso, P.; Pekholtz, F. ; Alfonso, L. Vazquez, V.; Mesa Forestal Nacional / FAO / GTZ. 2.003.
--- Mapas y Documentos: Formaciones Vegetales de la Región Occidental del Paraguay. Pérez de Molas, Lidia. Carrera de Ingeniería Forestal. FCA/UNA. 2.003.
--- Cartas Topográficas Esc. 1:100.000. DISERGEMIL. 1996.

Procesos: Análisis Geoespacial, Teletedección y Sistemas de Información Geográfica (S.I.G.) : Federico Pekholtz. Proceso Principal de Abril a Junio de 2.009.
Actualización a : (1) Setiembre de 2.009; (2) Enero de 2.010.

Bosque Xerófito / Bosque Quebracho	2.509.486,92	5.174.643,96	3.992.215,50	11.676.346,38	-
Matorral	-	649.240,11	18.210,60	667.450,71	-

utilization of medium size and big mammals in Paraguay

- In a study about Distribution, population trends and utilization of medium size and big mammals in Paraguay (Neris *et al*, 2002), it was found that 22 species were hunted for food and 20 especies were utilized as medicine. Among these species, those used as food were Azara's agouti (*Dasyprocta* spp) , Plains viscacha (*Lagostomus maximus*), Chacoan pecari (*Catagonus wagneri*) and Pampas deer (*Ozotocerus bezoarticus*), and those only for medicinal use were Pampas fox (*Pseudalopex gymnocercus*) and Manned wolf (Chrysocyon brachyurus). The ratio of food utilization for each species is as follows:
-
- The species with high ratio of food use (over 30 %) are nine-banded armadillo (*Dasypus novemcinctus*), capybara (*Hydrochaeris hydrochaeris*), paca (*Agouti paca*), Gray brocket deer(*Mazama gouazoupira*), White lipped peccary (*Tayassu pecari*) and Collared peccary (Tayassu tajacu). The highest ratio was observed in *Mazama gouazoupira*, followed by *T. pecari* and *T. tajacu*.
-
- The species most utilized were medicinal purposes were-Nine banded armadillo (*Dasypus novemcinctus*), capybara (*H. hydrocharis*), mountain lion (Puma concolor) and lowland tapir (*Tapirus terrestris*).

utilization of medium size and big mammals in Paraguay

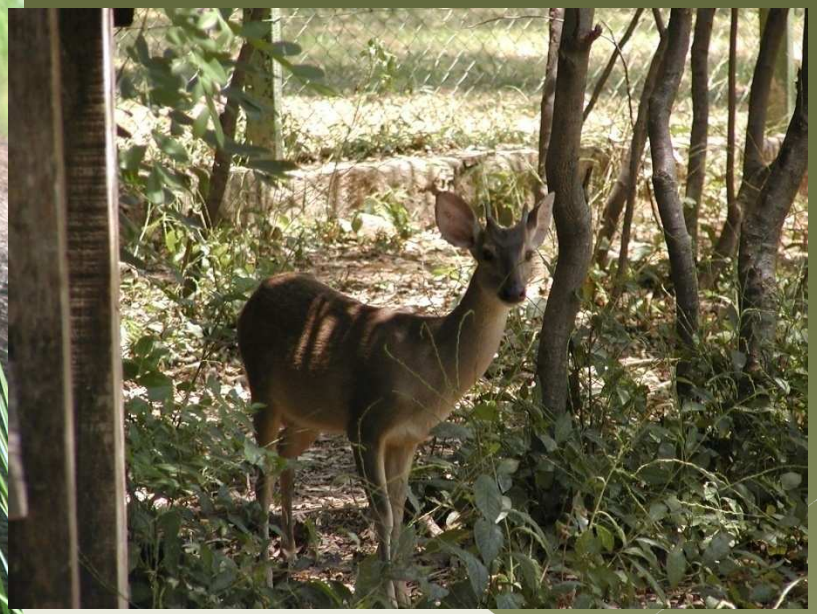
Indicaciones/Indications	Agouti Paca	Agouti Paca + Dasyprocta spp.	Alouatta caraya	Blastocerus dichotomus	Cebus apella	Cerdocyon thous	Chrysocyon brachyurus	Dasipodidae sp.	Dasypus novemcinctus	Euphractus sexcinctus	Hydrochaeris hydrochaeris	Mazama americana	Mazama gouazoupira	Mazama sp.	Myrmecophaga tridactyla	Nasua nasua	Panthera onca	Puma concolor	Sylvilagus brasiliensis	Tapirus terrestris	Tayassu pecari	Pecari tajacu	Tolypeutes matacus	Total
Tos/Cough					1	1		13	23	5	190		4			1	3	4		6	1	1		253
Gripe/Influenza								1	1		5													7
Golpe/Bruise								1			2						2	1						6
Herida/Wound								1	2	5	2				1	4		2						17
Picadura de Víbora/Snake bite								1					11											12
Dolor/Pain					1		1	1	1	3		1	2	1		1	1		1	1				15
Antrax/anthrax					1					1														2
Picadura de mosquito/Mosquito bite											1													1
Caída de Pelo/Alopecia																3								3
Piel/Skin disease					1	1							1											3
Quemadura/Burn	1	1														1								3
Inflamación/Inflammation																2								
Sinusitis											1									1				2
Antiparasitario/Deworming											1		1											2
Hepatitis										1														1
Tuberculosis								1			2													3
Apendicitis								1																1
Meningitis																	1	1						2
Anemia			1														1	1		1				4
Colesterol								1																1
Epilepsia						2																		2
Inteligencia/Intelligence					1																			1
Mal de ojo/Eye disease										1														1
Reuma/Rheumatism			1	2					1							4	5	8		11			1	33
Vàrice/Varix								1								1								2
Anticonceptivo/Contraceptive															1									1
Embarazo/Pregnacy															1									1
Parto/Childbirth																				1				1
Para todo/Panacea											3					1		2						6
Total	1	1	2	2	5	4	1	21	29	16	207	1	19	1	3	18	13	19	1	21	1	1	1	388

HUNTING PRESSURE IN THE CHACO

- A study was conducted in which the objective was to determine the hunting pressure of herbivorous and its impact on the age structure of populations of Chacoan peccary (*Catagonus wagneri*) white lipped peccary (*Tayassu peccary*), collared peccary (*Tayassu tajacu*) and gray brocket deer (*Mazama gouazoupira*) in the buffer zones Teniente Enciso, Medanos del Chaco, Defensores del Chaco of the national parks.
- **Teniente Agripino Enciso National Park has 43,166 hectares**
- **Defensores del Chaco National Park has 780,000 hectares**
- **Medanos del Chaco National Park has 540,000 hectares**

Tayassu tajacu, Catagonus wagneri,Tayassu pecari

Tapirus terrestris Mazama gouazoupira



METHODOLOGY

- **Skulls collection**

- The skull collection was conducted in July, September and November of 2010. The specimens are products of subsistence hunting by the inhabitants of the study area or as a result of poaching. As the hunters kill the animals that are spotted, it was assumed that a random sample was acquired in relation to the species, age and sex. Specimens were collected at military posts and indigenous and peasant communities. Moreover, specimens were collected near the house due to the fact that people are accustomed to put food waste in their yards. Regarding poachers, they kill the animals they observe along the roads, taking the body and leaving the head. Consequently both sides of the roads, at a speed of 30 km / hour, were checked. . Both roads that crossed national parks, as well as those in the buffer zones were covered.

METHODOLOGY

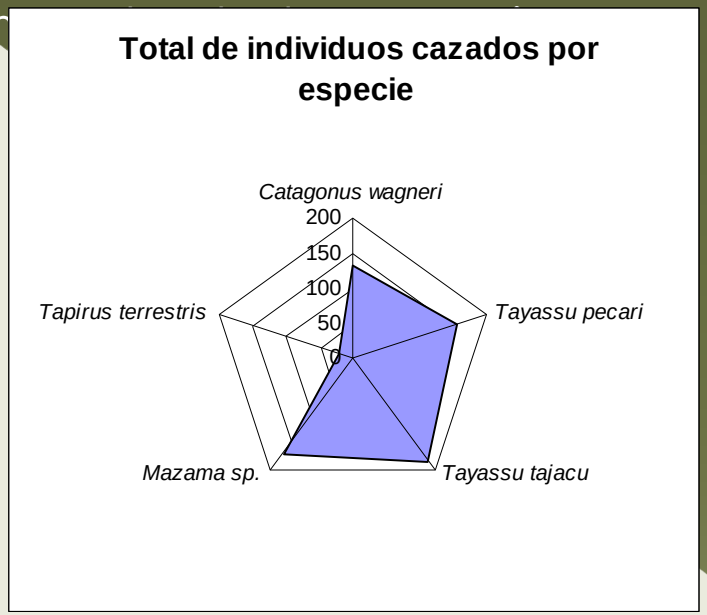
- Skulls were analyzed according to species, sex (where possible) and age. For peccary analysis Sowls' descriptions (1984) and Gasparini nomenclature (2005) were followed. Age classes were determined using the wear on molars and premolars method (Sowls, 1961), with regards to *Mazama* methodologies of Townsend (1996) and Maffei (2001) were follow.

- **Data Analysis**

  The collected skulls in communities were classified as subsistence hunting. While the skulls found along roads were classified as poaching. The data were analyzed by location and by type of activity in each locality. We determined the age distribution of the population of each species in the study area. Data from poaching were analyzed to calculate the rate of incidence of the phenomenon, taking into account the mileage at which individuals were found.

RESULTS

- Amount of specir



Sites, Frequency and Percentage of hunting

Catagonus wagneri (Tagua)	**Frequency**	**Percentage**
Roads	26	19,70
Military posts	47	35,61
Indigenous communities	11	8,33
Nacional Parks	3	2,27
RuralCommunities	45	34,09
TOTAL	**132**	**100,00**

Tayassu tajacu (Kure´i)	**Frequency**	**Percentage**
Roads	13	7,07
Military posts	55	29,89
Indigenous communities	46	25,00
Nacional Parks	15	8,15
RuralCommunities	55	29,89
TOTAL	**184**	**100,00**

Tayassu pecari (Tañi cati)	**Frequency**	**Percentage**
Roads	20	12,58
Military posts	39	24,53
Indigenous communities	48	30,19
Nacional Parks	4	2,52
RuralCommunities	48	30,19
TOTAL	**159**	**100,00**

Tapinus terrestres (tapir)	**Frequency**	**Percentage**
Roads	10	50
Military posts	6	30
Indigenous communities	0	0
Nacional Parks	3	15
RuralCommunities	1	5
TOTAL	**20**	**100**

Mazama sp. (Guasu´i)	**Frequency**	**Percentage**
Roads	8	4,71
Military posts	84	49,41
Indigenous communities	33	19,41
Nacional Parks	15	8,82
RuralCommunities	30	17,65
TOTAL	**170**	**100,00**

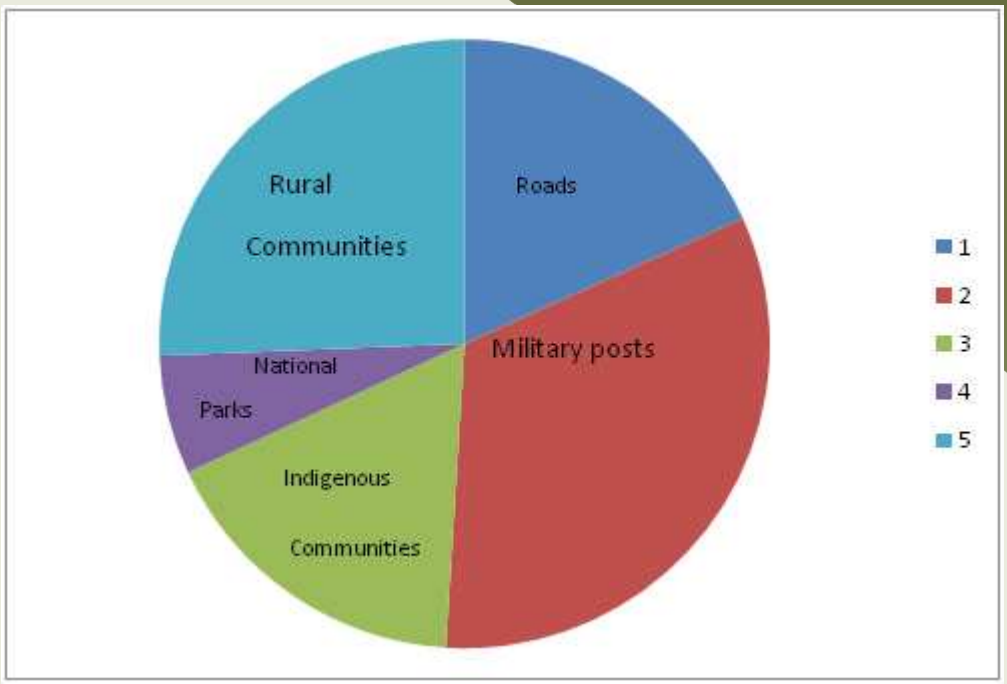
Species Hunting Percentage per Site

species	military posts	rural communities	indigenous communities	Nacional Parks	Roads
Catagonus wagneri	36%	34 %	8%	2"	20 %
Tatassu tajacu	30 %	30 %	25 %	8 %	7 %
Tayassu pecari	25 %	30 %	30 %	2 %	13 %
Mazama gouazoupira	49 %	18 %	19 %	9%	5%
Tapirus terrestris	30 %	5 %	------	15 %	50 %

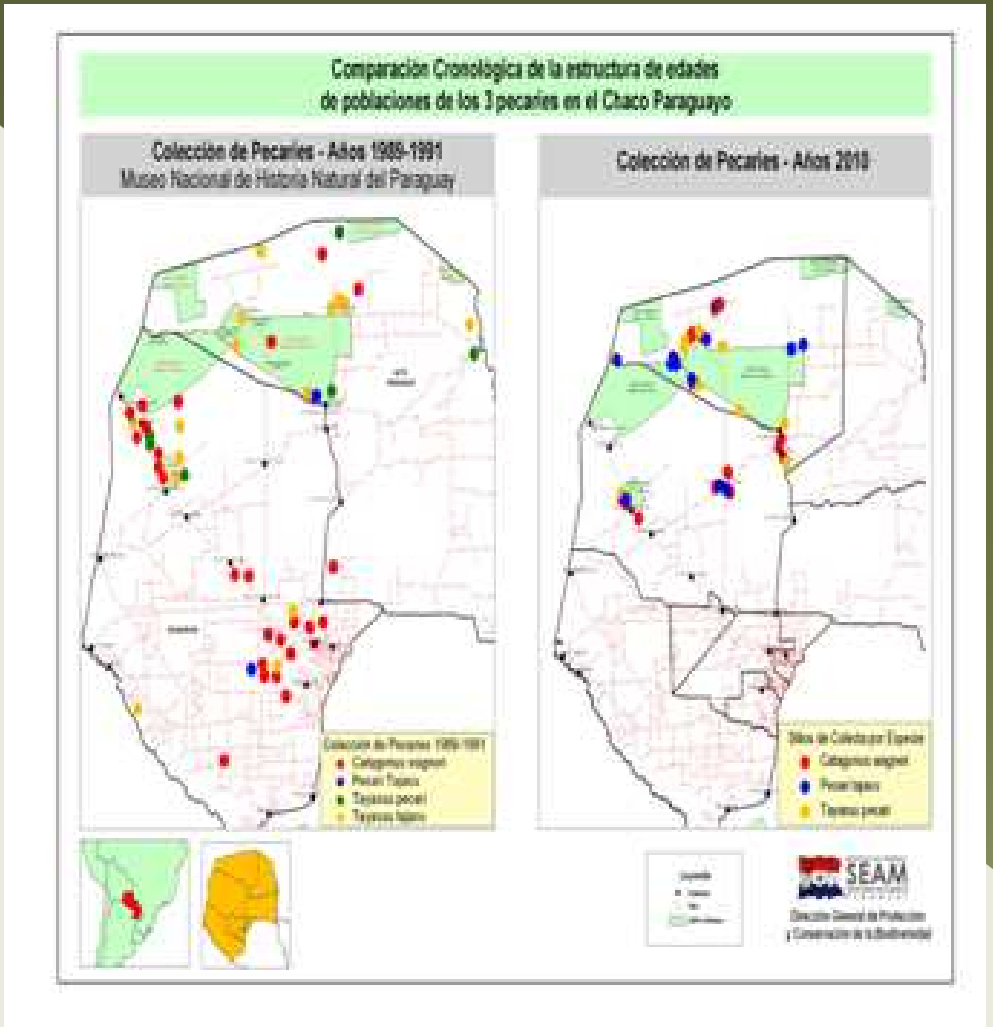
- A total of 506 km traveled in the buffer zones of the three national parks obtaining an index of 1 individual hunted per 9.2 km. With respect to the average estimated kilograms of wild meat in the study area, the total was 19,280 kg. The military posts were the biggest consumers at a rate of 32.72% followed by the rural communities with 25.62% and 17.09% in indigenous communities.

Total Kilograms of wild meet utilized by site and by species

Sites	C. wagneri	T. tajacu	T. pecari	T. terrestris	M. gouazoupira	Total Kg	Porcentage
Roads	1040	260	600	1500	120	3520	18,2572614
Military Posts	1880	1100	1170	900	1260	6310	32,7282158
Indigenous Communities	440	920	1440	0	495	3295	17,090249
National Parks	120	300	120	450	225	1215	6,30186722
Rural Communities	1800	1100	1440	150	450	4940	25,6224066
Total	5280	3680	4770	3000	2550	19280	100



A comparison of the age structures of collections of skulls of the three species of peccary for 1989 and 2010 respectively was done.



Catagonus wagneri

ANOVA de la Sinfisis Parietal de la especie *Catagonus wagneri* entre años 1988 y 2010 con referencia a sexo

Descriptivos

Sinfisis Parietal (mm)

	N	Media	Desviación típica	Error típico	Intervalo de confianza para la media al 95%		Mínimo	Máximo
					Límite inferior	Límite superior		
Hembra	28	19,2982	3,79683	,71753	17,8260	20,7705	10,10	27,06
Macho	28	10,9529	4,62461	,87397	9,1596	12,7461	4,10	19,58
Total	56	15,1255	5,94170	,79399	13,5343	16,7167	4,10	27,06

ANOVA

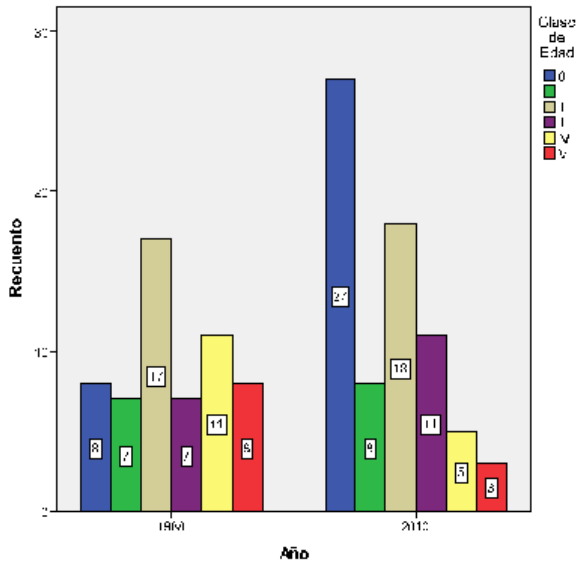
Sinfisis Parietal (mm)

	Suma de cuadrados	gl	Media cuadrática	F	Sig.
Inter-grupos	975,030	1	975,030	54,467	,000
Intra-grupos	966,678	54	17,901		
Total	1941,708	55			

Catagonus wagneri

Clase de Edades de la especie *Catagonus wagneri* entre años 1988 y 2010

		Año	
		1988	2010
		Recuento	Recuento
Clase de Edad	0	8	27
	I	7	8
	II	17	18
	III	7	11
	IV	11	5
	V	8	3



Catagonus wagneri

ANOVA de estructura de Edades

Descriptivos

Cantidad

	N	Media	Desviación típica	Error típico	Intervalo de confianza para la media al 95%		Mínimo	Máximo
					Límite inferior	Límite superior		
1988	6	9,67	3,882	1,585	5,59	13,74	7	17
2010	6	12,00	9,033	3,688	2,52	21,48	3	27
Total	12	10,83	6,740	1,946	6,55	15,12	3	27

ANOVA

Cantidad

	Suma de cuadrados	gl	Media cuadrática	F	Sig.
Inter-grupos	16,333	1	16,333	,338	,574
Intra-grupos	483,333	10	48,333		
Total	499,667	11			

Tayassu pecari

Tayassu pacari

Descriptivos

Sínfisis_Parietal

	N	Media	Desviación típica	Error típico	Intervalo de confianza para la media al 95%		Mínimo	Máximo
					Límite inferior	Límite superior		
1998	8	8,4263	3,18894	1,12746	5,7602	11,0923	5,88	13,76
2010	37	7,8941	2,86381	,47081	6,9392	8,8489	3,49	14,41
Total	45	7,9887	2,89317	,43129	7,1195	8,8579	3,49	14,41

ANOVA

Sínfisis_Parietal

	Suma de cuadrados	gl	Media cuadrática	F	Sig.
Inter-grupos	1,863	1	1,863	,219	,642
Intra-grupos	366,435	43	8,522		
Total	368,298	44			

Tayassu pecari

Descriptivos

Sínfisis_Parietal

	N	Media	Desviación típica	Error típico	Intervalo de confianza para la media al 95%		Mínimo	Máximo
					Límite inferior	Límite superior		
Macho	31	6,3806	1,59422	,28633	5,7959	6,9654	3,49	10,03
Hembra	14	11,5493	1,62675	,43477	10,6100	12,4885	9,34	14,41
Total	45	7,9887	2,89317	,43129	7,1195	8,8579	3,49	14,41

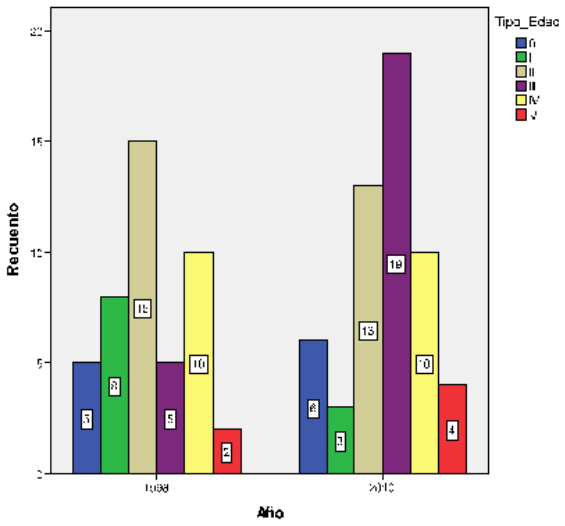
ANOVA

Sínfisis_Parietal

	Suma de cuadrados	gl	Media cuadrática	F	Sig.
Inter-grupos	257,650	1	257,650	100,128	,000
Intra-grupos	110,648	43	2,573		
Total	368,298	44			

Tayassu pecari

		Año	
		1998	2010
		Recuento	Recuento
Tipo _ edad	0	5	6
	I	8	3
	II	15	13
	III	5	19
	IV	10	10
	V	2	4



Tayassu pecari

Descriptivos

Tipo_edad

	N	Media	Desviación típica	Error típico	Intervalo de confianza para la media al 95%		Mínimo	Máximo
					Límite inferior	Límite superior		
1998	45	2,29	1,408	,210	1,87	2,71	0	5
2010	55	2,65	1,350	,182	2,29	3,02	0	5
Total	100	2,49	1,382	,138	2,22	2,76	0	5

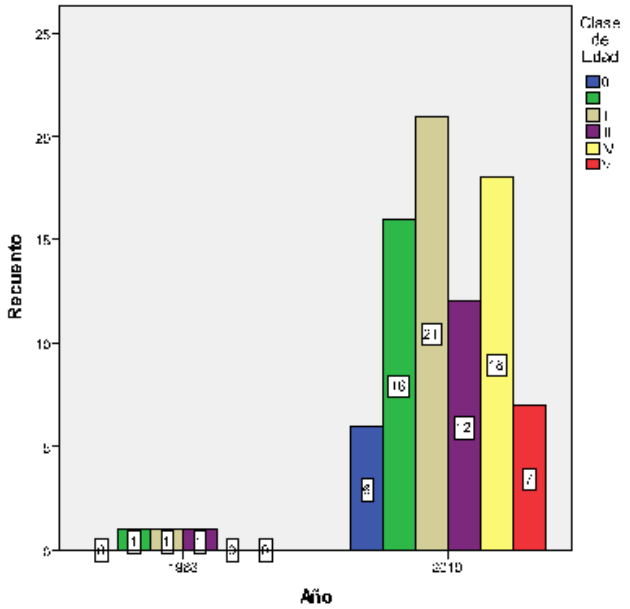
ANOVA

Tipo_Edad

	Suma de cuadrados	gl	Media cuadrática	F	Sig.
Inter-grupos	3,309	1	3,309	1,747	,189
Intra-grupos	185,681	98	1,895		
Total	188,990	99			

Tayassu tajacu

		Año	
		1988	2010
		Recuento	Recuento
Clase de Edad	0	0	6
	I	1	16
	II	1	21
	III	1	12
	IV	0	18
	V	0	7



THREATS

- Chacoan peccary is the most endangered species of the three peccaries, seems to be most vulnerable to human disturbance. Taber (1992) said that it is likely to exist in altered conditions but not in deforested sites. This species frequently uses road and does not flee in the presence of hunters, making it particularly vulnerable to over hunting.

Comparison of age structures of chacoan peccary populations from 1989 and 2010, and according to the ANOVA statistical analysis, it can be inferred that there are significant differences. In the first age group proportions are equivalent, while in 2010 there was a large proportion of first age classes and then decreases proportionately through the following age classes, this would indicate an improvement in the population. However it is important to remember that this analysis comes from specimens from hunting. This Indicates that there is a high hunting pressure on young individuals, that in some cases have not reproduced. Consequently, urgent actions should be taken to manage hunting of this species.

Regarding the age structure he comparison of the white lipped peccary, there was no significant statistical difference; apparently species populations remain stable.From this research can be deduced that the bushmeat resource utilization by means of hunting does not take into account animal size, sex, or numbers of individuals to be hunted making this current use unsustainable.

THREATS

Wildlife poaching and subsistence hunting, especially from Military posts and peasant communities, threaten the population status, causing a population decline of many wild species.. expansion of livestock operations, development projects and exploration and exploitation of hydrocarbons, all cause different levels of impacts and negative environmental effects, such as opening up of roads and access, biomass removal, soil and groundwater pollution, landscape modification, and fragmentation and disturbance species natural habitat. Construction of new access roads (jeep trails and roads) for different projects: hydrocarbon prospecting concessions. Hydrocarbons Exploration and exploitation work. Selective extraction of flora species extraction for commercial purposes and natural resources Pressure by settlements.

CONCLUSIONS

- In Paraguay wildlife is diverse, but the increased activity of the rural population and the unsustainable exploitation of natural resources, exert considerable pressure on wildlife. Habitat alterations, drought and poaching are also threats, land clearing for pasture land is responsible for the loss of about 50,000 hectares of chaco savannas per year. As seen throughout the Chaco region, grazing and agriculture are the two most powerful economic forces and thus result in irreversible ecosystem transformations.
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- The most endangered species in the eastern region are bush dog (*Spheothos venaticus*) and pampas deer (*Ozotoceros besoarticus*), because they have a limited ranges and high reduction of their habitats. Chaco endemic species with high rates of population decrease is the chacoan peccary (*Catagonus wagneri*). Species with large ranges and with declining populations are: giant armadillo (*Priodontes maximus*), giant otter (*Pteronura brasiliensis*), jaguar (Panthera onca), lowland tapir (Tapirus terrestris), marsh deer (*Blastocerus dichotomus*) and anteater (*Myrmecophaga tridactyla*).
- Taking into account the relationship of extinction, wild population decline and rates of use and modification of natural environments and species, it is necessary in the short term, that Paraguay implement an action plan for the management and conservation of wild hunting species. It should include knowledge of population dynamics of game species, habitat quality, hunting pressure, and programs of environmental education, sanctuaries, legislation and control.
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