Ecological impacts in mountain protected areas





International Programme on Research and Training on Sustainable Management of Mountain Areas (IPROMO)
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Background and current activities

- **Universidad Nacional de Cordoba.** Master's thesis *Trampling and camping impacts in vegetation and soil in Horcones Valley, Aconcagua Provincial Park*
- **Mountain Forum Secretariat,** Nepal. *Information Programme Assistant*
- **Natural Resource Division** of Mendoza. *Management Plan of Mountain Protected Areas*

- **Griffith University**, International Centre for Ecotourism Research, School of Environment. PhD. Project: ***Tourism in High Mountain Protected Areas: Use and environmental impacts of tourism in Aconcagua Provincial Park***

Aconcagua Provincial Park

Aconcagua

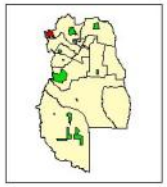
Provincial Park

N

2 0 2 4 km

- *Campsites*
- *Localities*
- *Peaks*
- *Railway*
- *Highway*
- *Rivers*

Natural Protected Area System



Mendoza, Argentina

Fuente: Componente Institucional - PM Aconcagua
Elaboración Catográfica: M. Clara Rubio
Unidad SIG- Dpto. ANP - DRNR. 2009

Conservation values





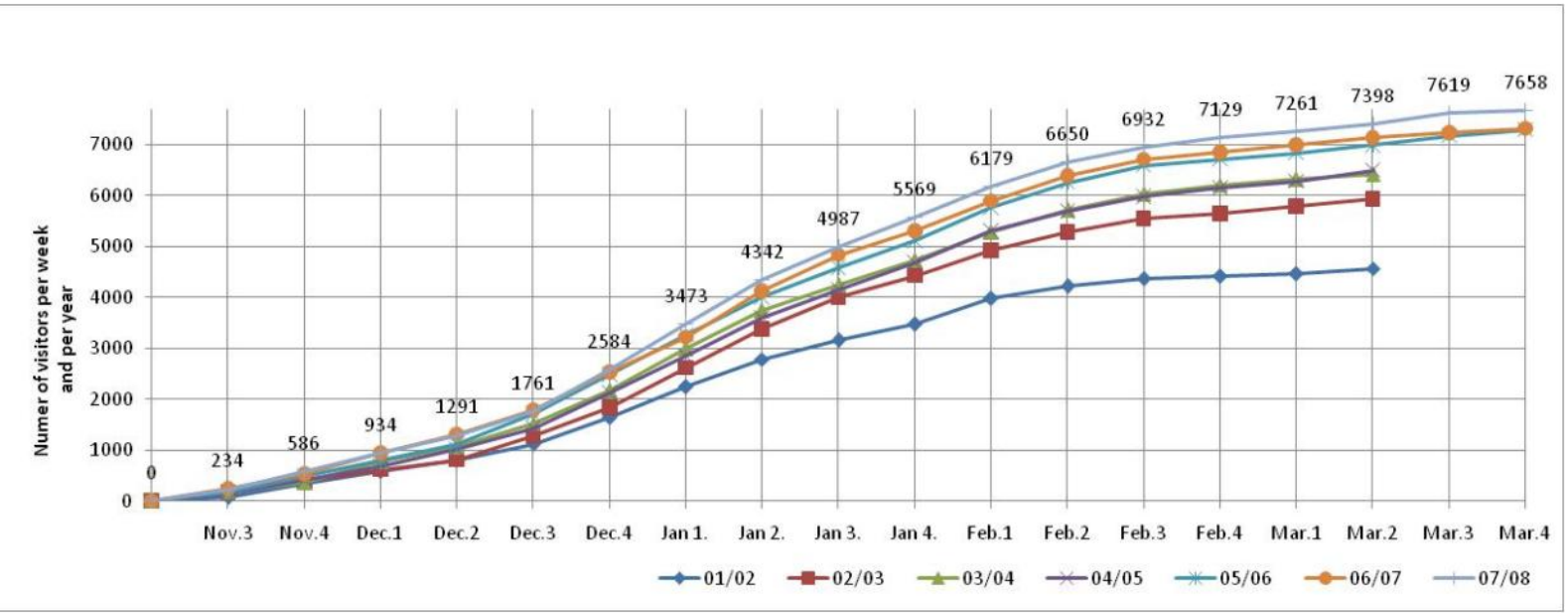


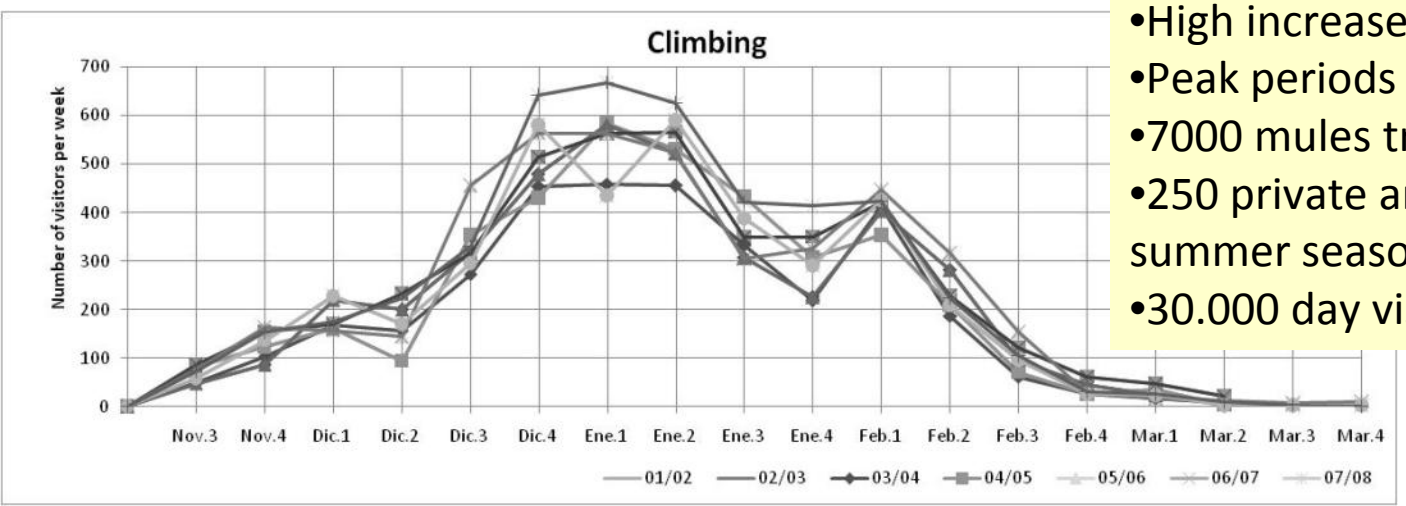







Visitor Use





- High increase
- Peak periods
- 7000 mules trample the area
- 250 private and public people live in summer season
- 30.000 day visitors during summer

Aims and research questions

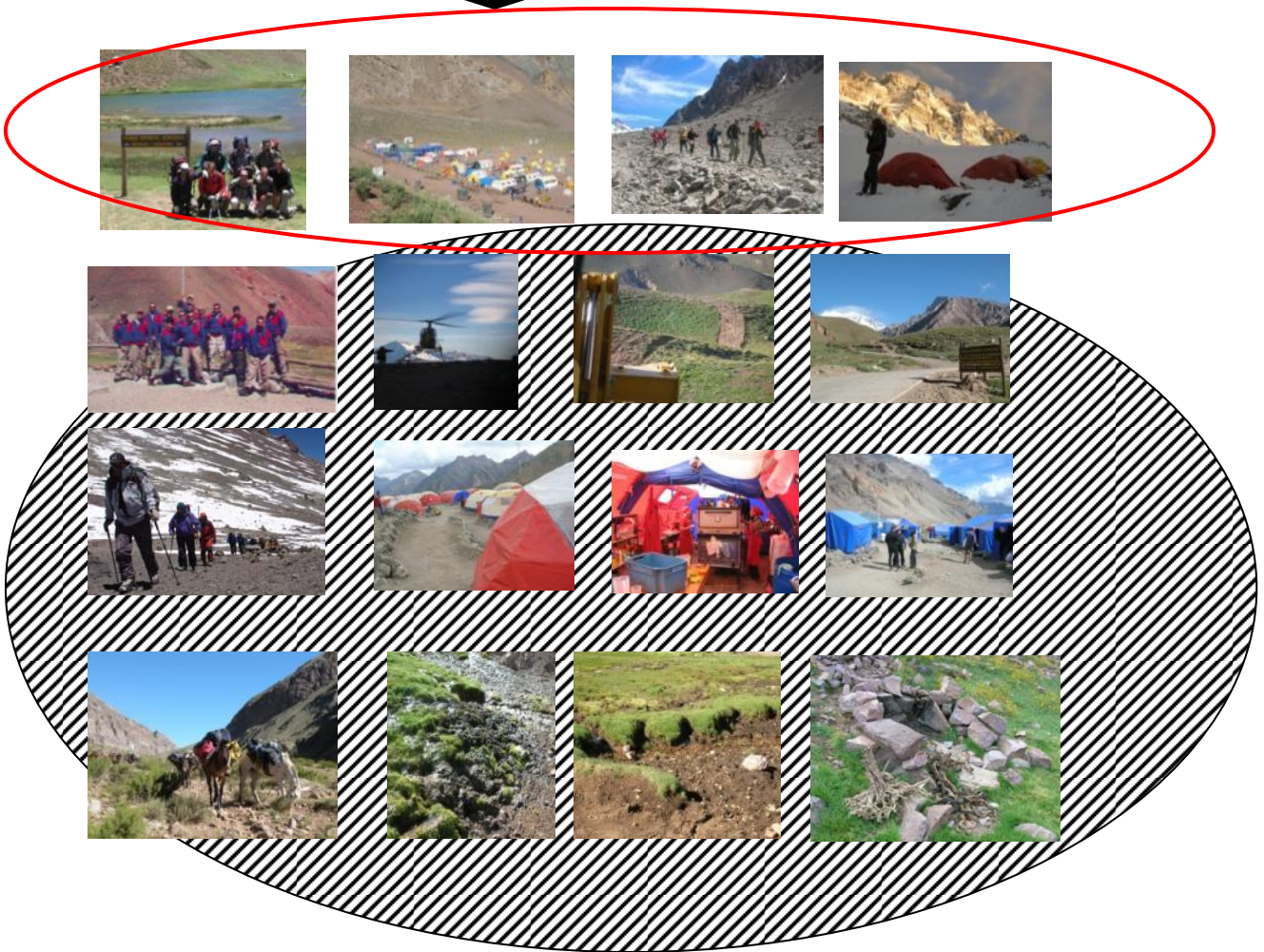
Assess the scale and types of ecological impacts from tourism use and associated activities in Aconcagua Provincial Park at the *landscape level,* including the four main groups

tourists

park rangers and facilities

tour operators

transport providers



Rationale

Park	Peak	Location	Mountain range	IUCN Cat.	Visitors		Commercial transportation								
							Base camps					Summit			
					C	I	P	A	CH	S	AR	P	A	CH	S
Sagarmatha National Park	Mt. Everest	Nepal-Tibet	Himalayas	II	X		X	X				X			
Huascaran National Park	Mt. Huascaran	Peru	Andes	II	X	X		X							
Denali National Park	Mt. McKinley	Alaska	Alaska range	II	X	X					X				X
Kilimanjaro National Park	Mt. Kilimanjaro	Tanzania	Kilimanjaro	II	X		X					X			
Aconcagua Provincial Park	Mt. Aconcagua	Argentina	Andes	II	X	X	X	X			X	X			X
Mt. Cook National Park	Mt. Cook	New Zealand	Southern Alps	II	X	X					X				X
Prielbrusya National Park	Mt. Elbrus	Russia	Caucasus	II	X	X			X	X					
Mt. Vinson	Mt. Vinson	Antarctica	Ellworth		X						X				
Kosciusko National Park	Mt. Kosciusko	Australia	Australian Alps	II	X	X			X						

Mountain protected areas showing type of visitors and means of transportation for mountain expeditions.C=commercial, I=independent, P=porters, A= animals, CH=chairlift, S= snowcat, AR= aircraft.

Groups

Activities

Ecological impacts

common

primary

visitors
park agency
tour operators
transport providers

hiking
camping

vegetation clearance and disturbance
soil erosion
soil compaction
water pollution
wildlife disturbance
weeds dispersal
habitat loss

specific

(+)

park agency

Fixed infrastructure
roads
toilets
buildings

other impacts

tour operators

Temporary infrastructure expedition tents
kitchens
showers
toilets

(+)

track erosion from hooves
trail incision
degradation existing trail network
parasite diseases
zoonotic infections
nutrient enrichment from faecas and urine scalds
plant defoliation through grazing
predation of ground nesting birds by dogs

transport providers

packstock animals

helicopter

Transportation
packstock animals

(+)

Transportation
helicopter flights

noise pollution

Research questions

1. What are the temporal and spatial patterns of use of these 4 groups?
2. What are the ecological impacts of tourism in the Park at the landscape level?

   2.a. How does the severity of threats vary according to different altitudinal zones, ecosystem types and type of activity?

   2.b. How does the severity of threats vary according to the different groups involved in tourism?

3) What are the key factors that affect the management of ecological impacts from tourism use?

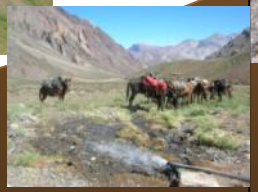
integrated approach: ecological impacts + economic and social aspects

Temporal and spatial patterns of use

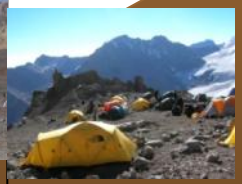
- Type of activities → hiking – camping – mules transportation – helicopter flights
- Location of the activities → concentrated or dispersed - altitudinal zone – ecosystem type
- Use intensity → number of people per day, people nights, peak periods










Front country
2400-3000m

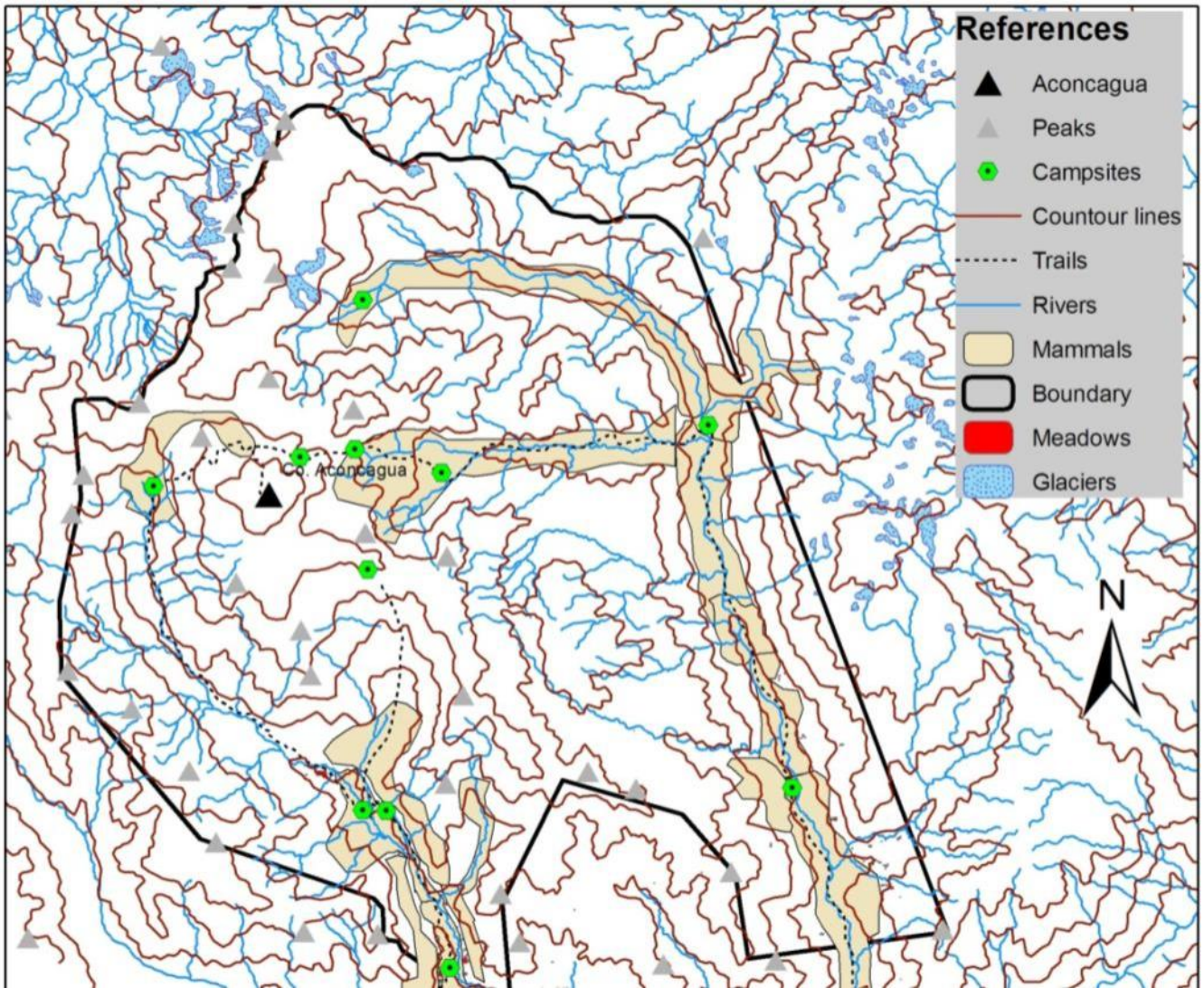
Low altitude areas
3000-3500m

Base camp areas
3500-4500m

High altitude areas
4500m-6962m

Type and extent of ecological impacts

1) Park natural assets and conservation values



GIS spatial information and existing data for flora (meadows), physical (glaciers, wetlands), and fauna components (Lama guanicoe habitat areas)

Type and extent of ecological impacts

2) Likely ecological impacts for each type of activity → literature review and existing data

Node activities	Valley: Horcones				Valley: Vacas					Source
	Horc.	Conf.	Mulas	HAC	Vacas	Lenas	CP	PA	HAC	
Camping	-	-	-	-	-	-	-	-	-	
Vegetation clearance and disturbance		X	NA	NA				NA	NA	Barros (2004)
Soil erosion	X	X								Barros (2004)
Soil compaction										
Wildlife disturbance										
Modified drainage patterns due to water extraction				NA					NA	
Water pollution in rivers due to liquids sewage	X	X	X		X	X	X			EPAS (2008), Martinez
Water pollution in lakes due to liquids sewage										Barros (2004)
Snow pollution due to human waste										
Noise pollution from generators and helicopter										
Weeds dispersal			NA					NA	NA	
Mules transportation	-	-	-		-	-	-	-		
Vegetation clearance and disturbance due to grazing			NA					NA	NA	
Water pollution due to faecal matter disposal and urine										EPAS (2008)
Weeds dispersal										
Infrastructure										
Huts	-	-	-		-	-	-	-		
Modified drainage patterns due to water extraction										
Water pollution due to sewage discharges	X	X	X		X	X	X	X		EPAS (2008)
Vegetation clearance and disturbance from construction			NA					NA	NA	
Weeds dispersal										
Hotel			-							
Modified drainage patterns due to water extraction										
Water pollution due to sewage discharges			X							EPAS (2008)

Type and extent of ecological impacts

3) Sources of disturbance and ecological indicators → temporal and spatial patterns of use + identification of sources of disturbance → ecological indicator

Node activities

Stressor	**Brown indicators** (quantified per summer season)	Data sources
People	number of people nights	published data
Water sewage	litres	survey, published data
Wet toilets	litres	survey, published data
Showers	litres	survey, published data
Kitchen	litres liquid disposed	survey, published data
Waste production		
Litter	kilos	published data
Faecal matter	kilos	published data
Urine	litres	inferred from the literature
Water extraction	litres	survey
Energy consumption		
Generators	level of noise (Dbs) per amount of hours of usage	published data, survey
Mules overnight camping		
Mules	number of animal nights	published data
Faecal matter	kilos of faecal matter	inferred from the literature
Urine	litters of urine	inferred from the literature
Infrastructure		
Hotel		
Water sewage	litres	published data, survey
Water extraction	litres	survey
Visitor centre		
Water sewage	litres	survey
Water extraction	litres	survey

Severity of threats from ecological indicators

Based on

- **source of disturbance**
- **the value** of the indicator
- **the vulnerability** of the natural asset
- **management actions** to minimize the source of disturbance

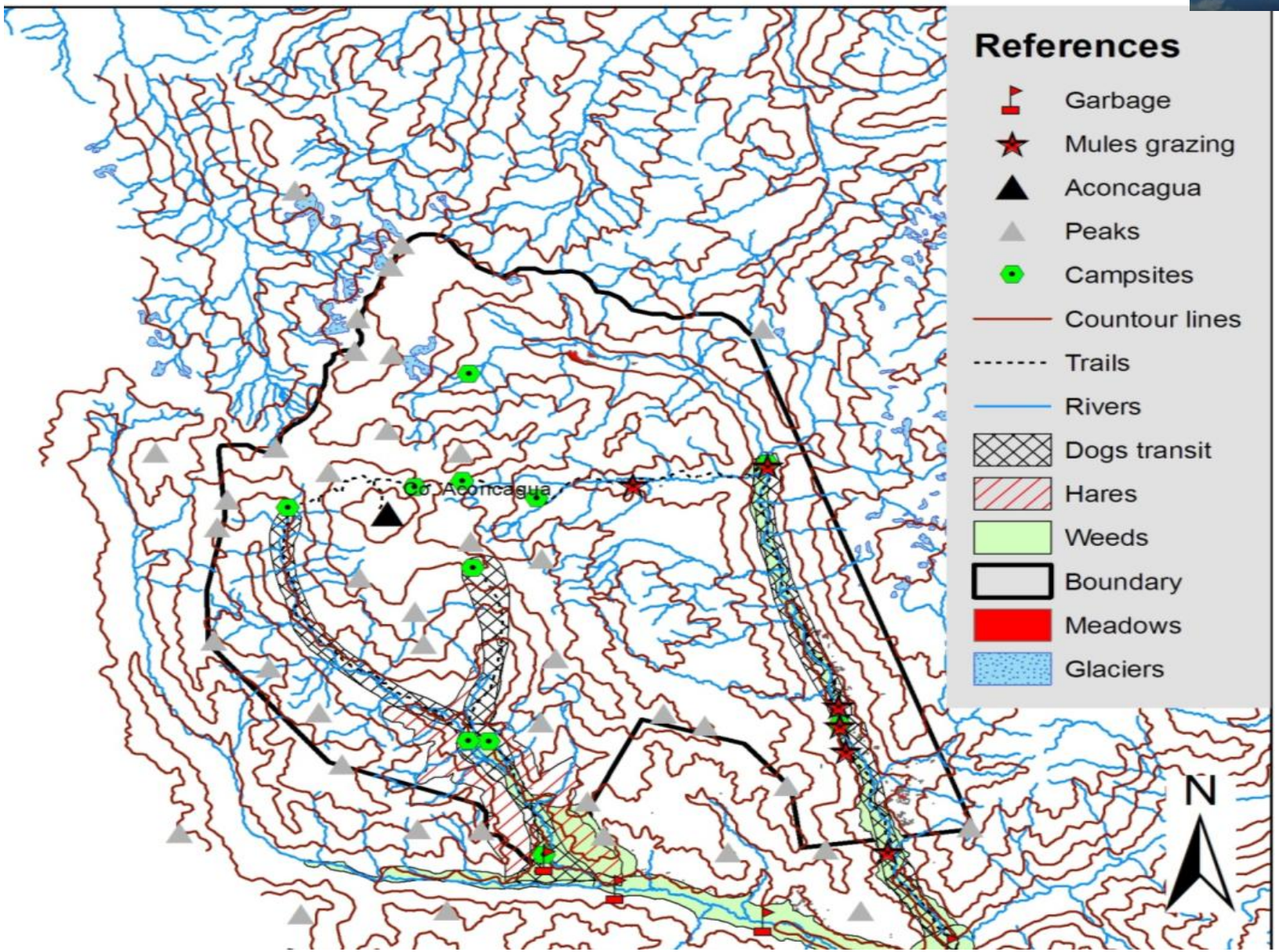
source of disturbance

the intensity

ecosystem type

management action

Severity of threats from ecological indicators



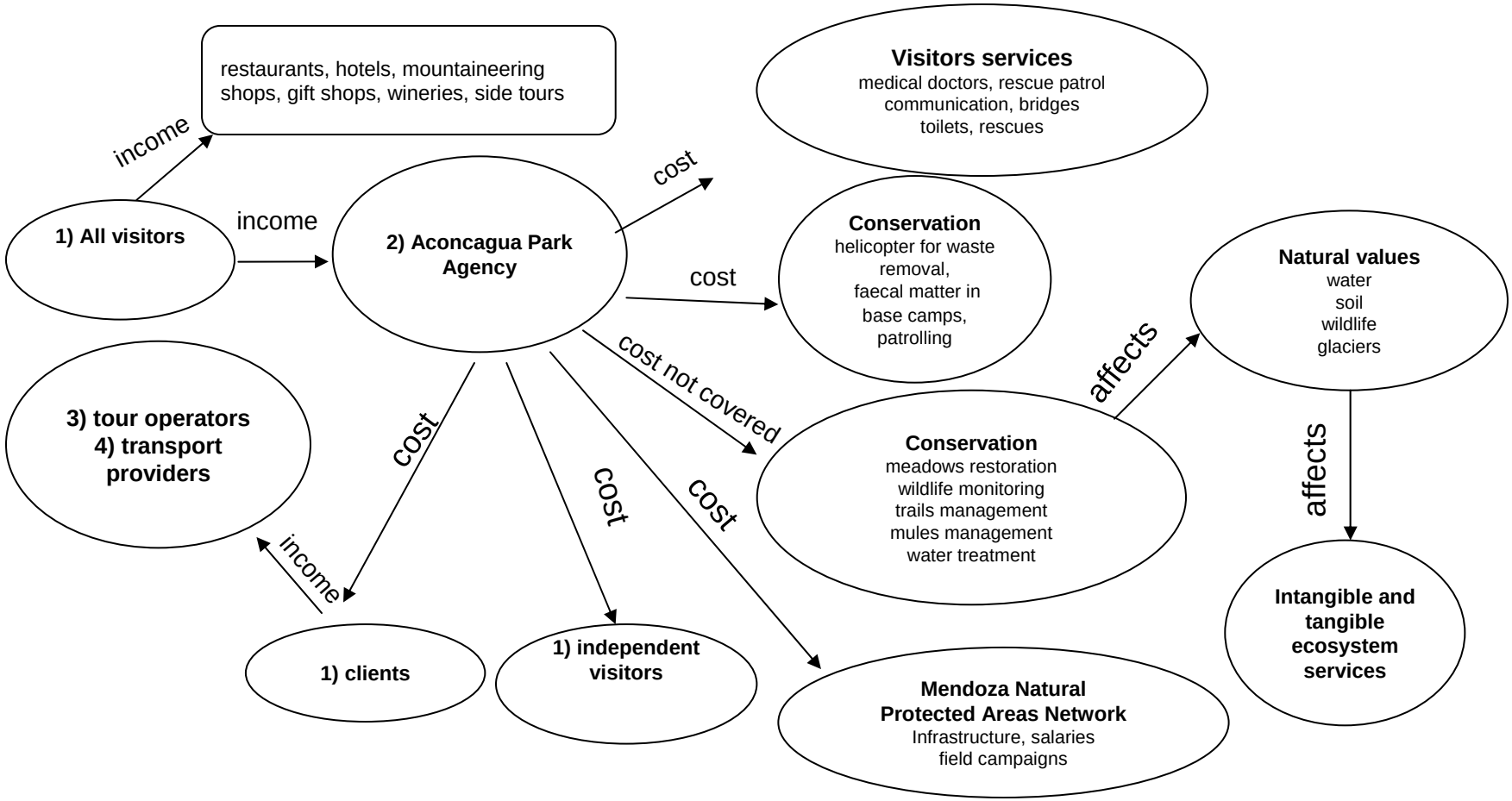
Management of ecological impacts

Indicators →

Legislation
Economics
Capacity to manage

Topic	Indicator	Associated measures
1) Laws and regulations	Legislation relevant to the environmental impacts Law enforcement	number of activities not regulated number of sanctions applied related to tourism impacts
2) Economics	Cost of management	% of park revenues allocated to conservation
3) Capacity to manage (performance)	Human resources allocated to manage visitors impacts	% of management actions dedicated to minimize tourism impacts

Eg. Economics factors affecting management of impacts



Thanks!!

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