Gap Analysis and Identification of Key Biodiversity Areas in Mexico

Multi-institutional Project Coordinated by

CONABIO & CONANP

Introduction

It crucial to carry out an evaluation of the protected areas (PA) capacity to represent Mexico´s vast biodiversity

The first necessary step towards this evaluation is to identify priority sites for conservation.

Previous conservation exercises:

- World-wide Hotspots
- Terrestrial and Hydrological Priority Regions
- Alliance for Zero Extinction

However, the large extension of most of these previously identified priority regions stresses the need of identifying precise priority sites for conservation.

GAP analysis aims COP-7

7th CONFERENCE OF THE PARTIES
CONVENTION ON BIOLOGICAL DIVERSITY
77th meeting, Kuala Lumpur,
8-20 & 27 Februray, 2004

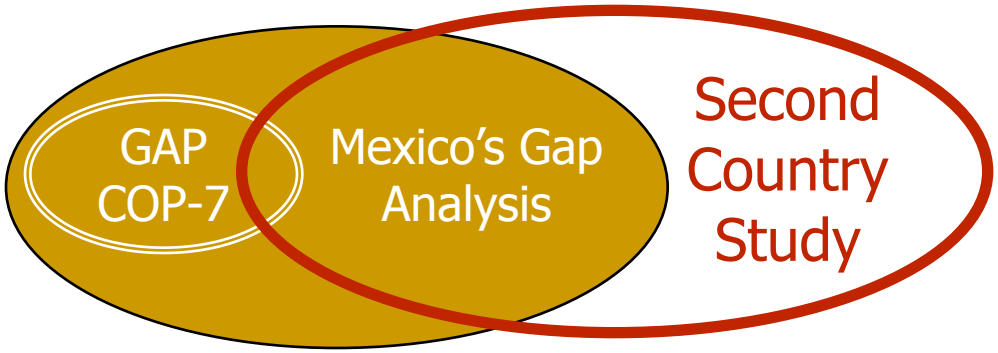
UNEP

Convention on Biological Diversity

Goal 1.1
Create and reinforce national & regional PA systems integrated in a global net

Mexico decided to expand the scope of the national GAP analysis

215 experts participated in the PA GAP analysis



biodiversity's complete assessment

Environmental government sector + International and national NGO's + Scientists

Goals

Conduct several gap analyses to identify *in situ* conservation priorities

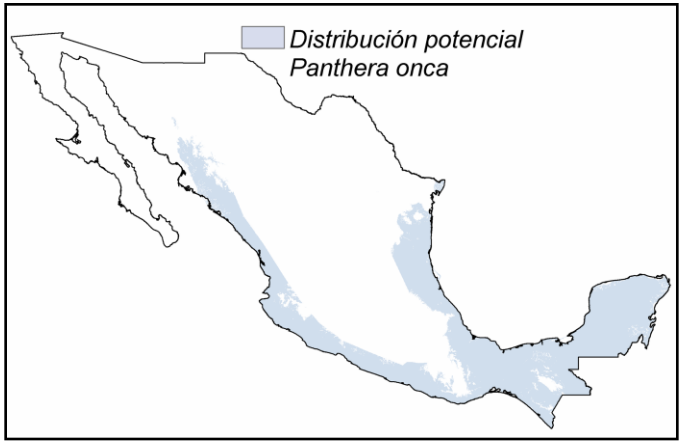
Five-step conceptual model:

1) Determine critical **ecoregions** **for conservation**
2) Identify **terrestrial, fresh water and marine priority sites** for conservation
3) I**ntegrate** results of terrestrial, fresh water and marine environments and generate a **National Agenda** towards the protection of priority sites.
4) Protect the most important **gaps** according to the National Agenda, favoring connectivity and ecological resilience
5) Continue the analyses of other conservation targets at finer scales to identify important areas for **connectivity** and **ecological resilience** (considering climate change)

GIS input material generated for **gap** analyses

Terrestrial ecoregions map
(level 4; 1:1,000,000)

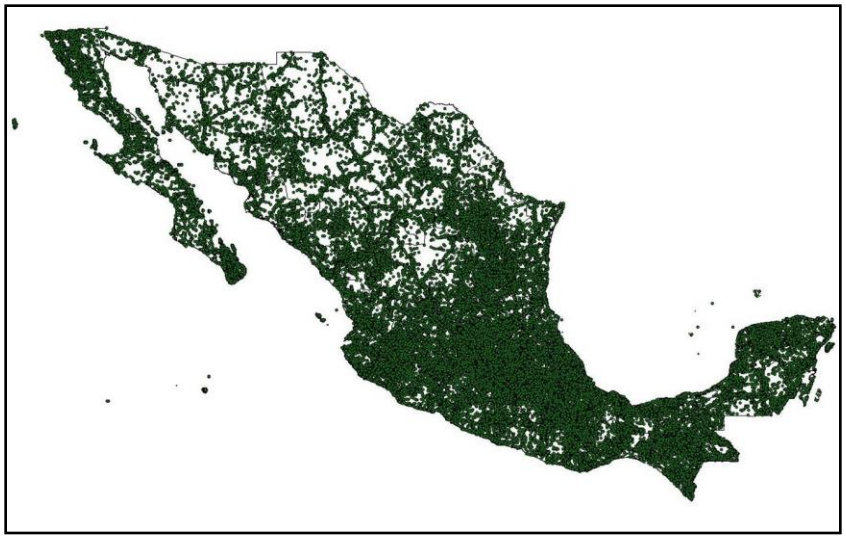
gap
Protected
areas

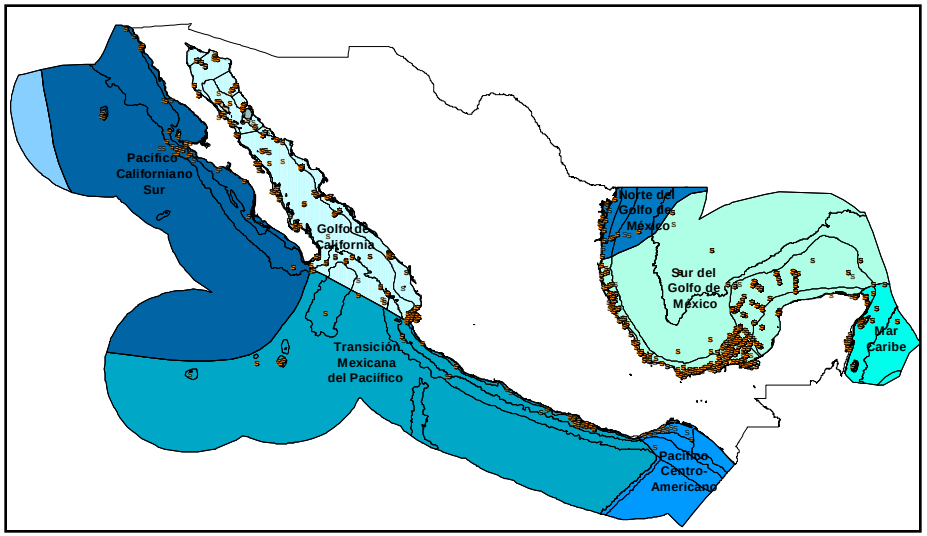


- **Species potential distribution maps:**

Amphibians
Reptiles
Birds
Mammals
Plants (Mexican Red list, NOM-059-2001)

- **SNIB biological database**





Gap analyses of biodiversity areas

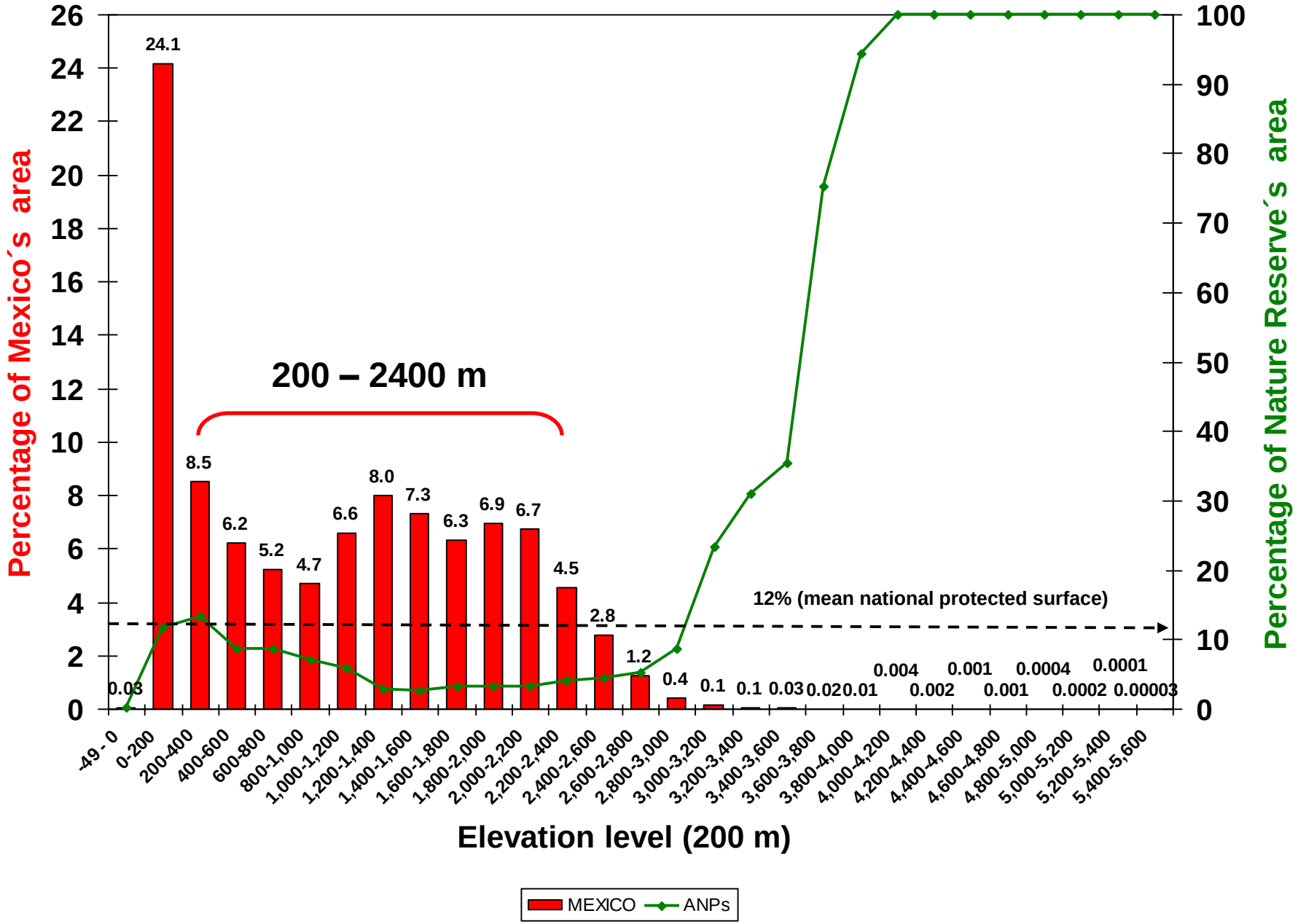
Ecological environments by altitude

Primary vegetation

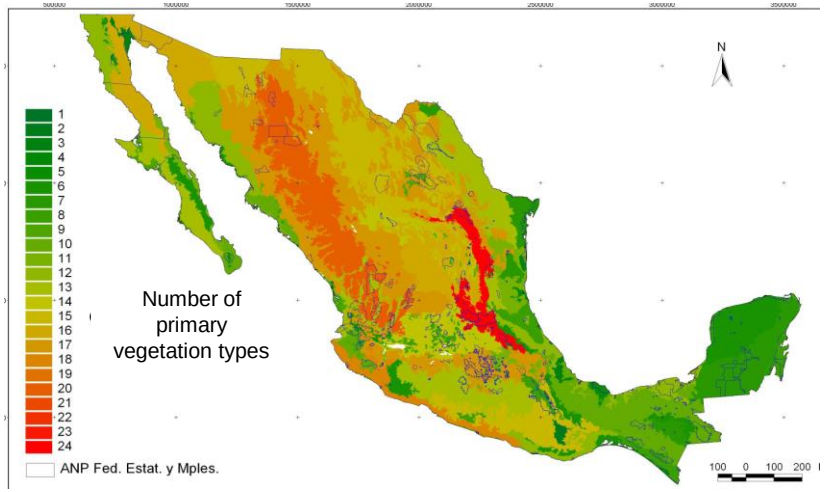
Ecoregions



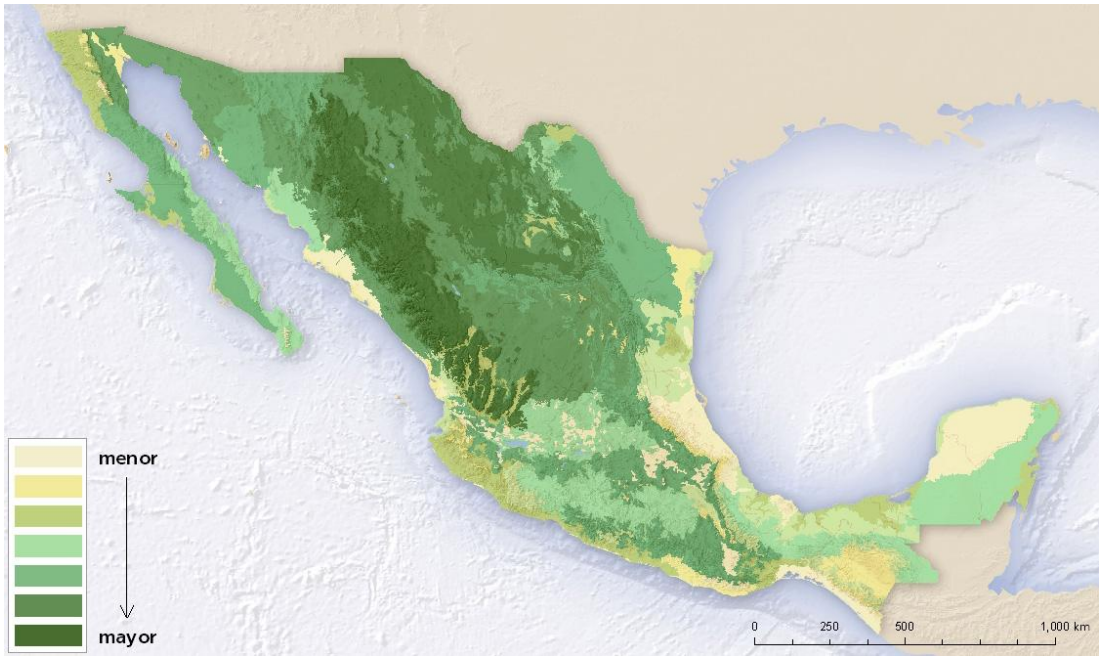

Nature reserves *vs.* elevation levels



Primary vegetation types



Primary vegetation within ecoregions

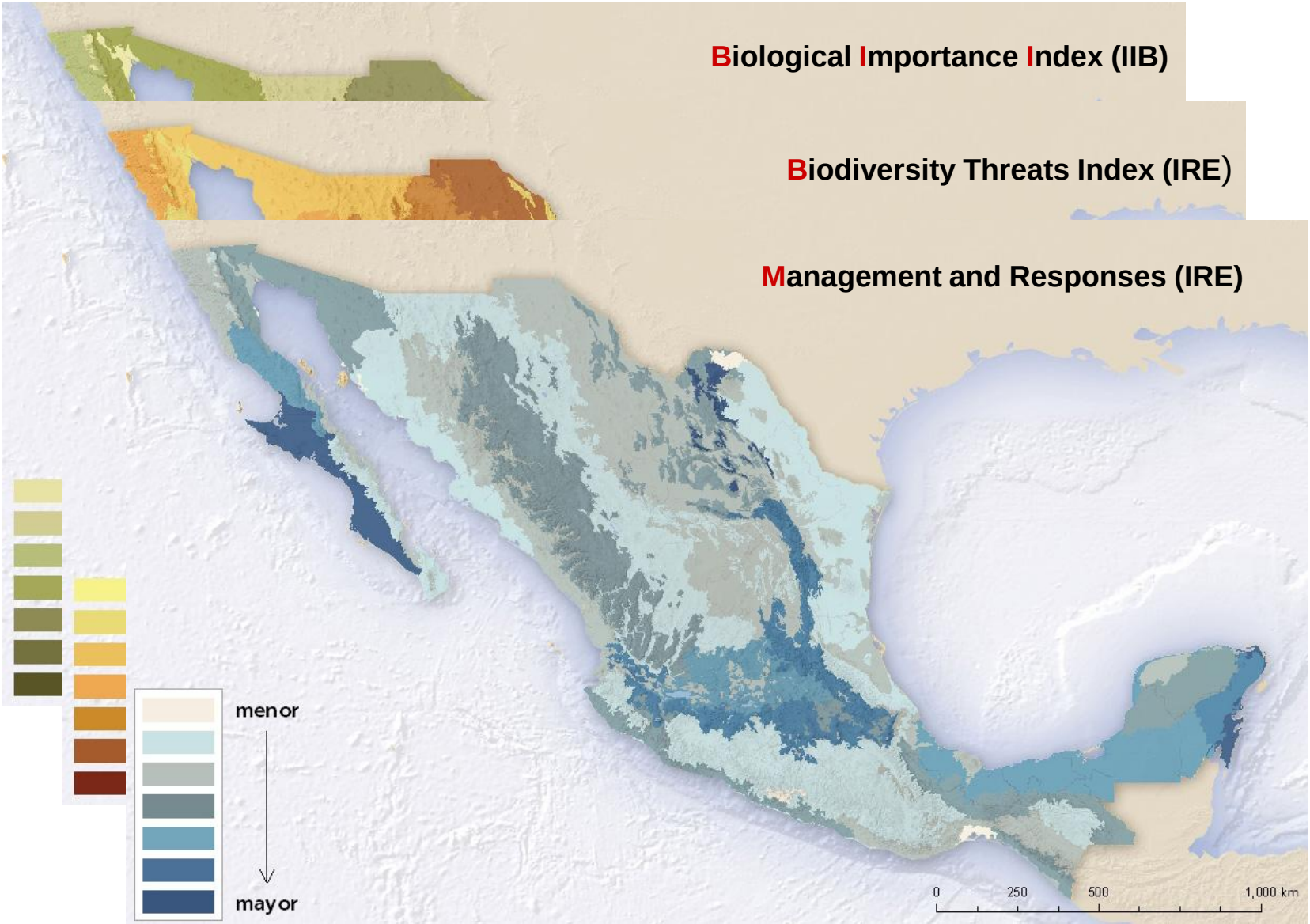


- Deserts and shrublands with higher representation in existing PA system
- Tropical dry forests highly under-represented

Dark green areas are ecoregions with the highest primary vegetation coverage

Three **indexes** were developed at the **ecoregional** level:

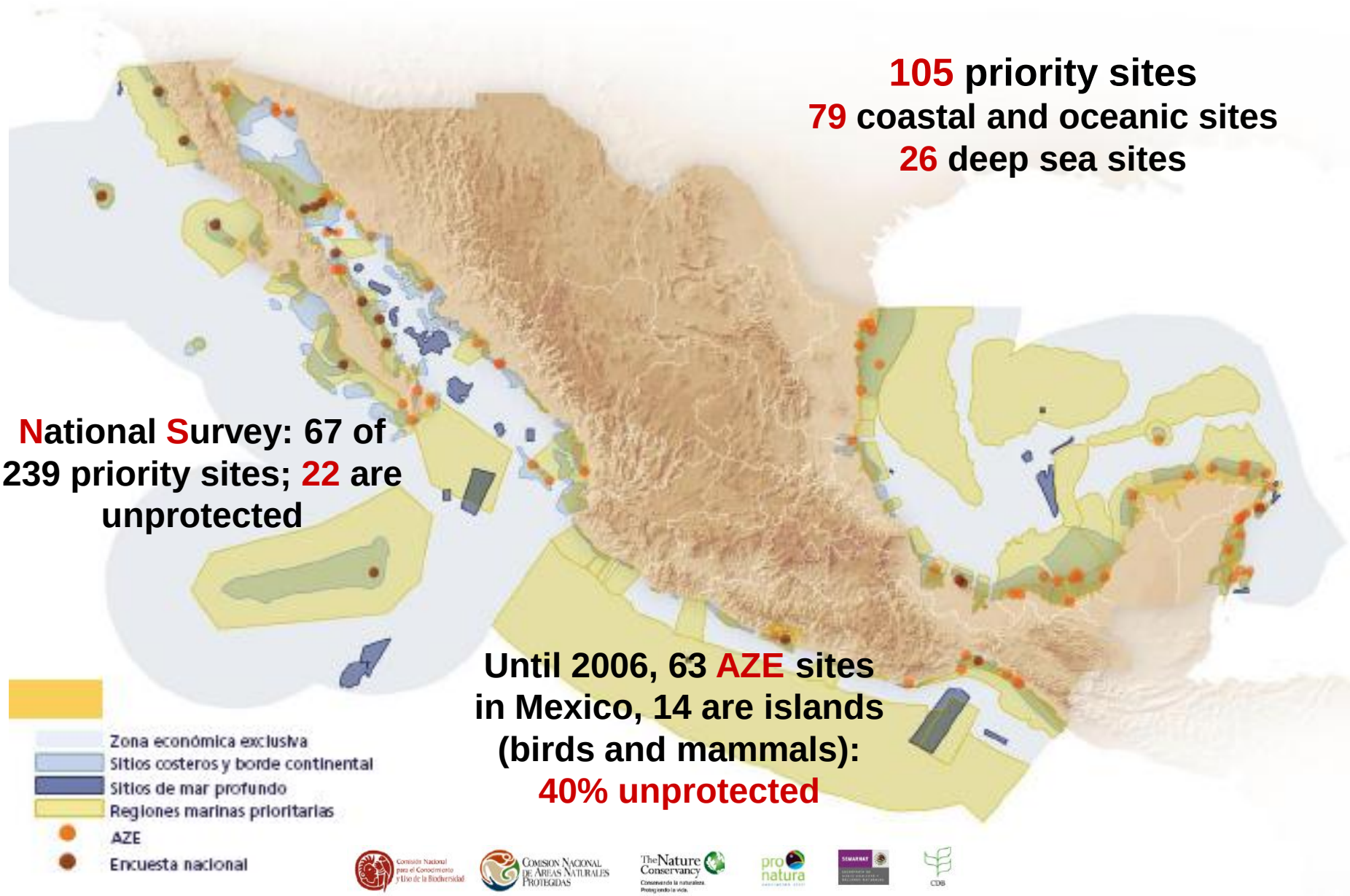
- **Biodiversity Threats Index (IRE**) (47 variables), **Biodiversity Threats Index (IRE**)(18 variables), **Management and Responses** (9 variables).



Ecoregional gap analysis

11 of 96 **Ecoregions** with no formal protection

Marine priority sites for biodiversity conservation



Coincidence of Marine Priority Sites and Marine Priority Regions

Sites	*Total area (ha)*	*No. of sites*	*% Overlapped area*
SCMC + SMP	34 230 504.84	105	70
RMP	137 862 023.82	70	17

SMP =Deep see priority sites
SCMC = Coastal priority sites

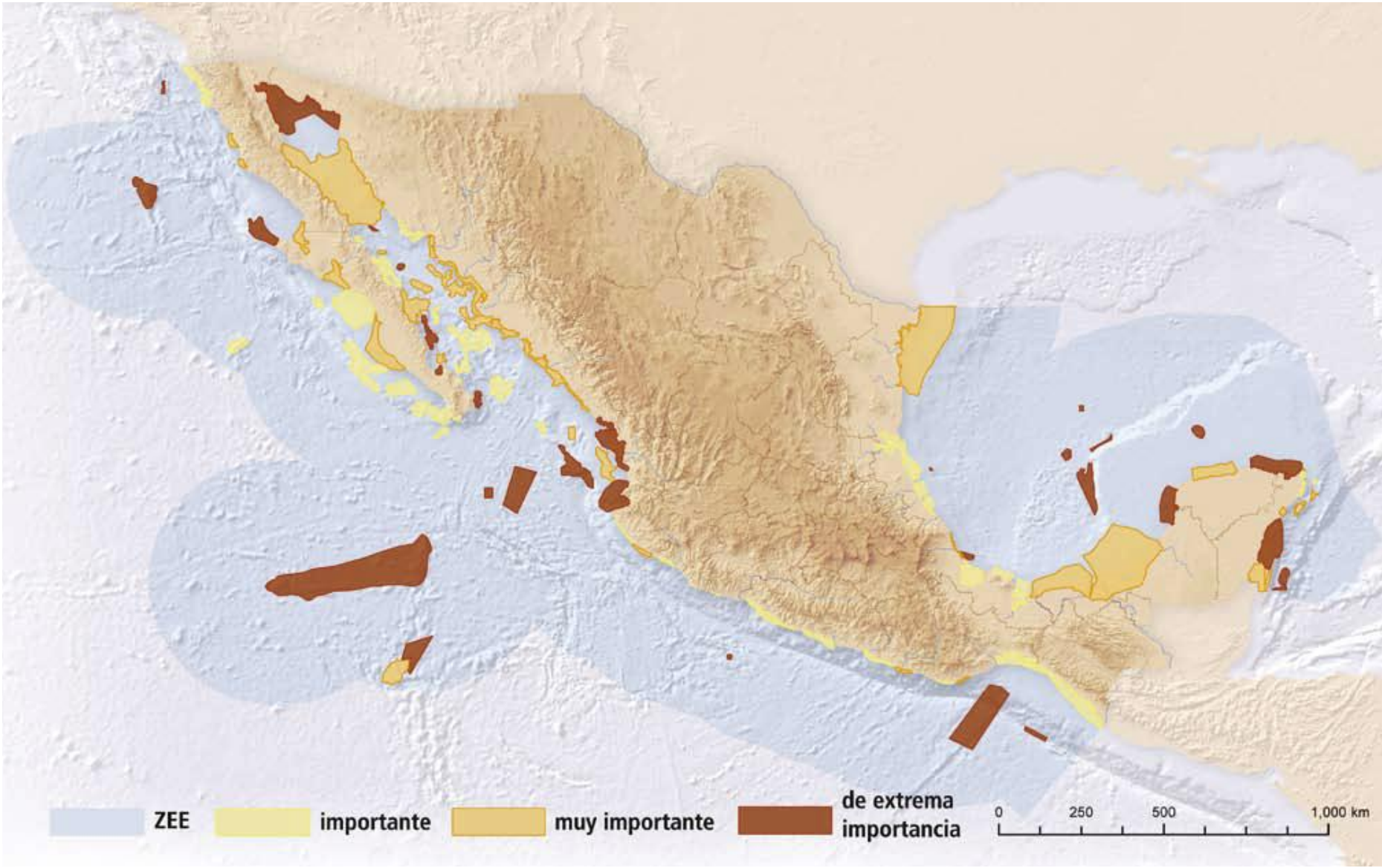
105 priority sites
79 coastal and oceanic sites
26 deep sea sites

Marine priority sites by ecoregion

coasts, islands and oceans

Marine Ecoregions	*no. SCMC+SMP*	*% de no. SCMC+SMP*
Northern Gulf of Mexico	2	1.90
Centroamerican Pacific	5	4.76
Mexican Pacific Transition	19	16.19
Caribbean Sea	15	14.29
Southern Gulf of Mexico	21	20.00
Gulf of California	30	28.57
Total	105	100

Coastal and marine gap analysis



Coastal and marine gap analysis

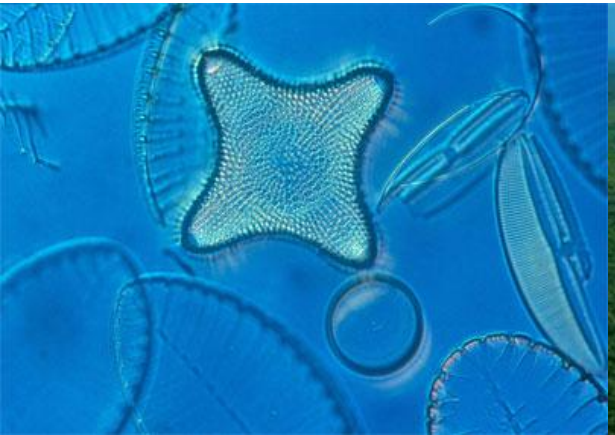
Classification of marine priority sites

Sites	***Important***		***Very important***		***Extremely important***	
	no. of sites	% sites	no. of sites	% sites	no. of sites	% sites
Coastal	36	46	27	34	16	20
Deep Sea	5	19	6	23	15	58
Total	41	39	33	31	31	30

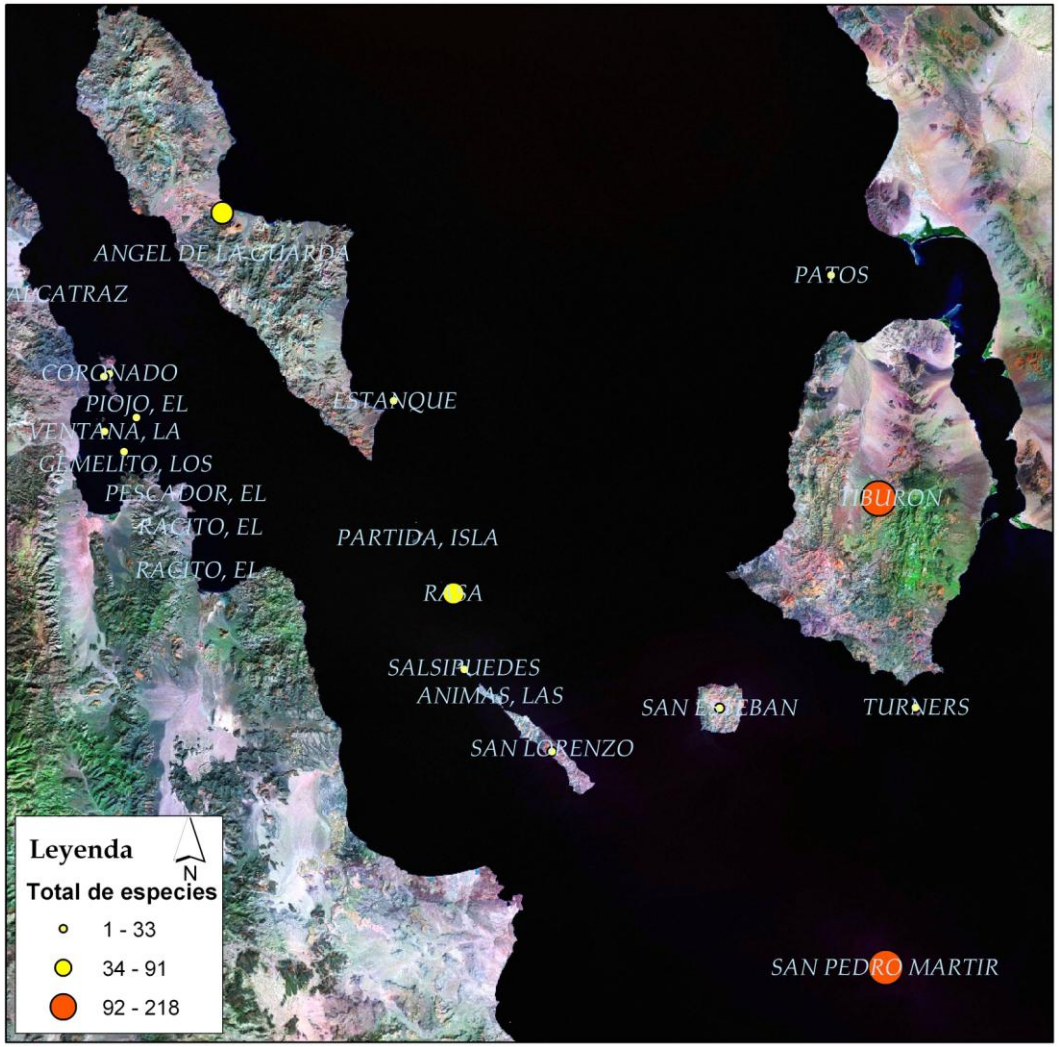
Low representativity levels of priority sites in the protected area system (18.33%)

78 priority sites are represented with less than 20% of their area in the PA system.

All deep marine priority sites are without protection



Mexico's island biodiversity database



- Comprises a unique portion of the country's biodiversity: 1365 insular elements (1218 islands, 75 reefs and shoal, 31 islotes, 17 cays, 12 rocks, 8 bar, 3 morros, 1 bank)
- 2450 marine and 1937 terrestrial species in 151 insular bodies
- Geomorphologic, physical, biological characteristics and human impacts
- Highly vulnerable ecosystems; since 1600, 75% of the extinct species lived in islands

Terrestrial gap

Five expert workshops were carried out to identify and define:

Biodiversity key features and surrogates (used in analyses 1450)

Criteria for biodiversity targets (targets ranged 5-99%)

Major threats to biodiversity (19 layers)

Priorization software (MARXAN)

Size of planning units (**256 km^2 ,** 100 km^2)

Criteria to assign biodiversity targets

Criteria for key species:

Group	Endemism	Restricted distribution (rarity)	Mexican red list	IUCN	CITES	Sum
	Yes/No	IV Quartile divided in 4 (4, 3, 2 y 1)	E, P, A, Pr	Cr/En/Vu	I/II	
	20	20/16/13/10	25/25/15/-	15/10/5	10/5	
Species 1	20	16	25	15	5	**81**
Species 2		10	15	5		**30**

Sum range	Target (% of geographic range size within country)
85 – 64	40
63 – 42	30
41 – 22	10
< 21	5

% Target:

Species 1: 40 %

Species 2: 10 %

Criteria to assign costs

Threat and pressure factors were:

Threat layer	Cost Value
Land use change:	
▪ Rate of primary vegetation loss	10 000
▪ Fragmentation (area-perimeter index)	8300
▪ Secondary vegetation, shrubs	100
▪ Secondary vegetation, herbaceous	200
Heat points from satellite images	7500
Cattle ranching:	
▪ High impact cattle (goats and lambs)	6700
▪ Low impact cattle (bovine and equine)	6100
▪ Non-natural grasslands	6000
Agriculture:	
▪ Irrigation agriculture	5800
▪ Seasonal agriculture	4000
Human infrastructure:	
▪ Road density (paved roads)	3000
▪ Road density (unpaved roads)	2000
Human population centers:	
▪ New localities	1000
▪ Localities <1000 inhabitants	10
▪ Localities 1000- 10,000 inhabitants	20
▪ Localities 10,000- 100,000 inhabitants	30
▪ Localities 100,000- 200, 000 inhabitants	40
▪ Localities > 200, 000	50
▪ Population growth (1990-2005)	900

- compiled
- ranked
- costs assigned based on agreed biodiversity impacts

Example:

Threat and pressure factors	Calculation	Cost value	Example value
Road density (paved roads)	Longitude (m) x cost	3000	6143300
Localities 100,000- 200, 000 inhabitants	N°. Localities x cost	40	4000
Localities > 200, 000	Area x cost	50	567557
Introduced grasslands	Area (ha) x cost	6000	370263
Total			6516623







Summary of actual and potential threats, weighted considering negative effects on biodiversity.

Summary of conservation targets for key species and surrogates

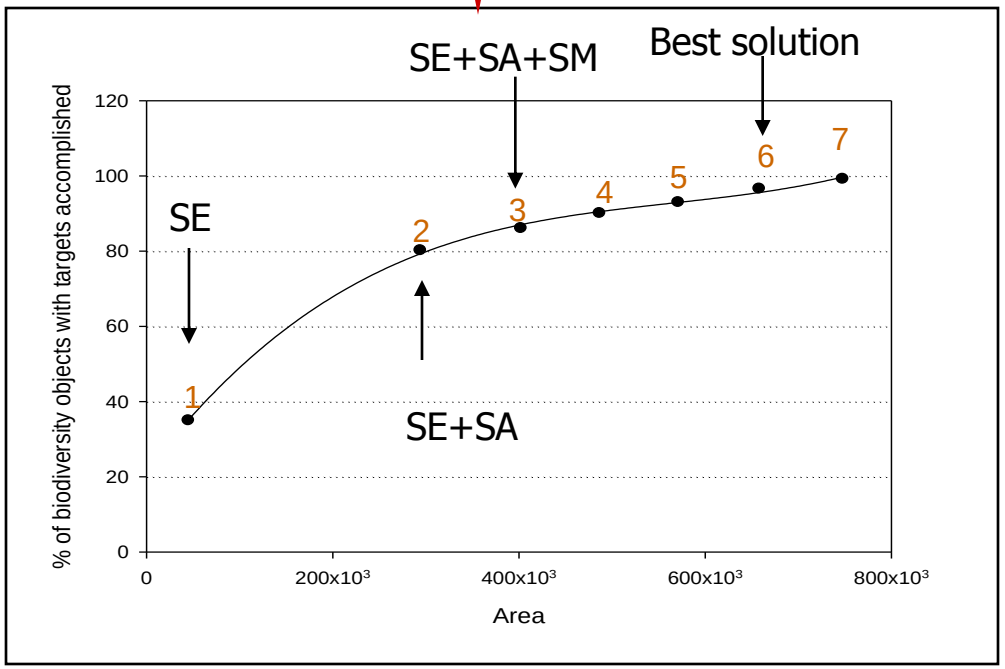
Results


VACÍOS Y OMISIONES EN CONSERVACIÓN DE LA BIODIVERSIDAD TERRESTRE DE MÉXICO
espacios y especies
Océano
Pacífico
Golfo
de
México
Mar
Caribe
Áreas naturales protegidas federales
Áreas naturales protegidas estatales
Áreas naturales protegidas municipales
Sitios de extrema prioridad
Sitios de alta prioridad
Sitios de media prioridad
0
250
500
1000 km

Terrestrial priority sites for conservation and their coincidence with protected areas (PA), terrestrial priority sites (RTP) and areas of importance for bird conservation (IBA)

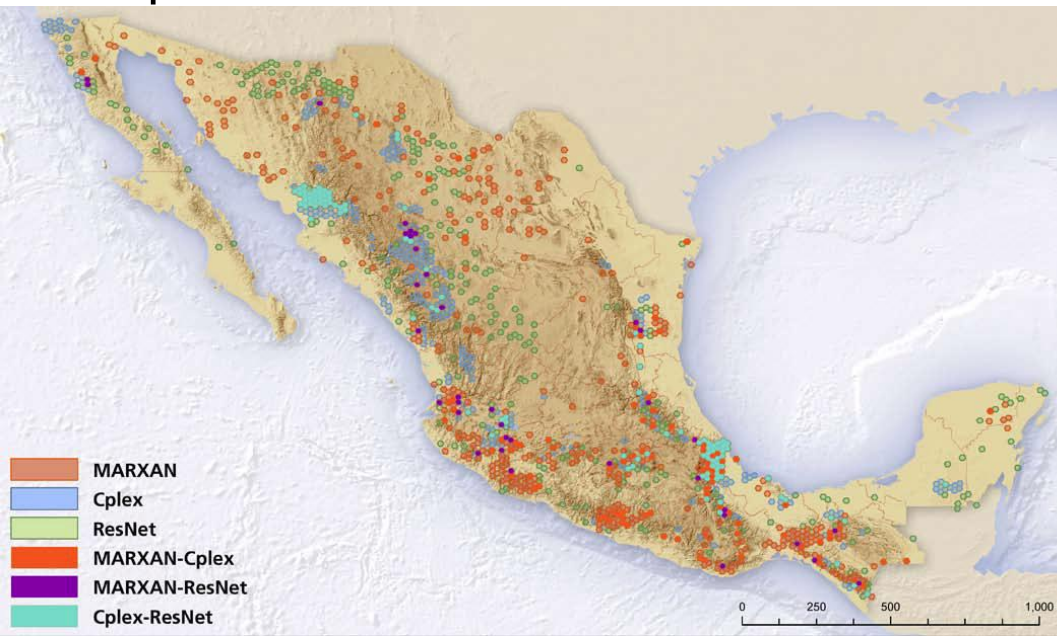
Priority sites	area (km^2)	% of Mexico's continental area	Goals* (%)	PA	RTP	IBA
Extreme priority (SE)	42 725	2.18	34.9	18.19	49.52	30.70
High priority (SA)	283 092	14.45	81.2**	15.59	39.29	24.72
Medium priority (SM)	269 077	13.73	90.5**	9.23	29.80	20.42
SE + SA + SM	594 894	30.36		12.90	35.74	23.21
Best solution***	848 881	43.32	100	12.44	32.98	20.28

*Acumulated value

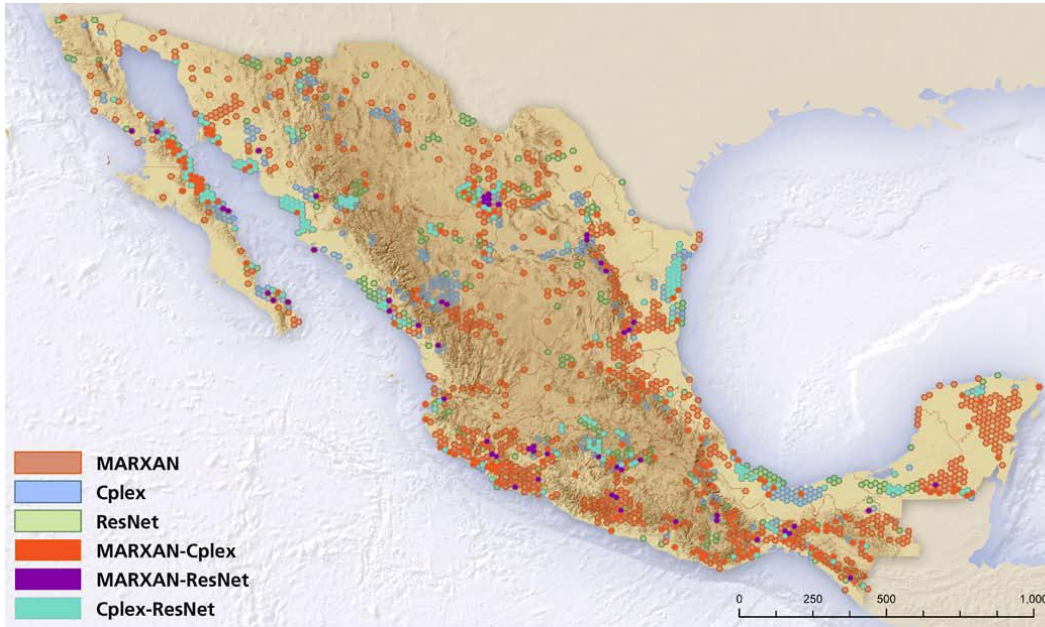


Gap Analyses by taxonomic group

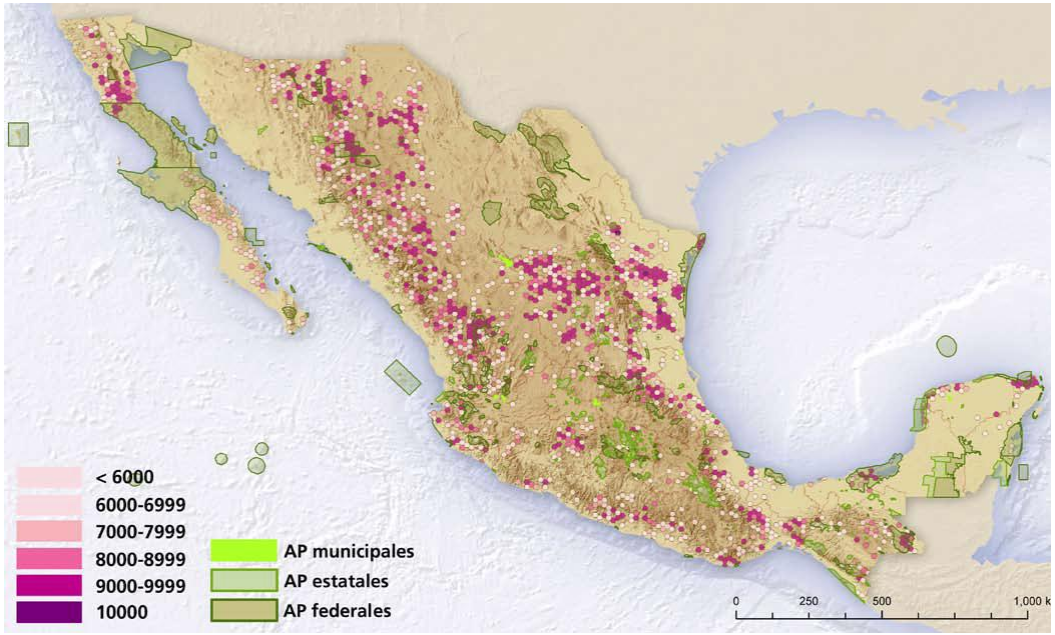
Amphibians



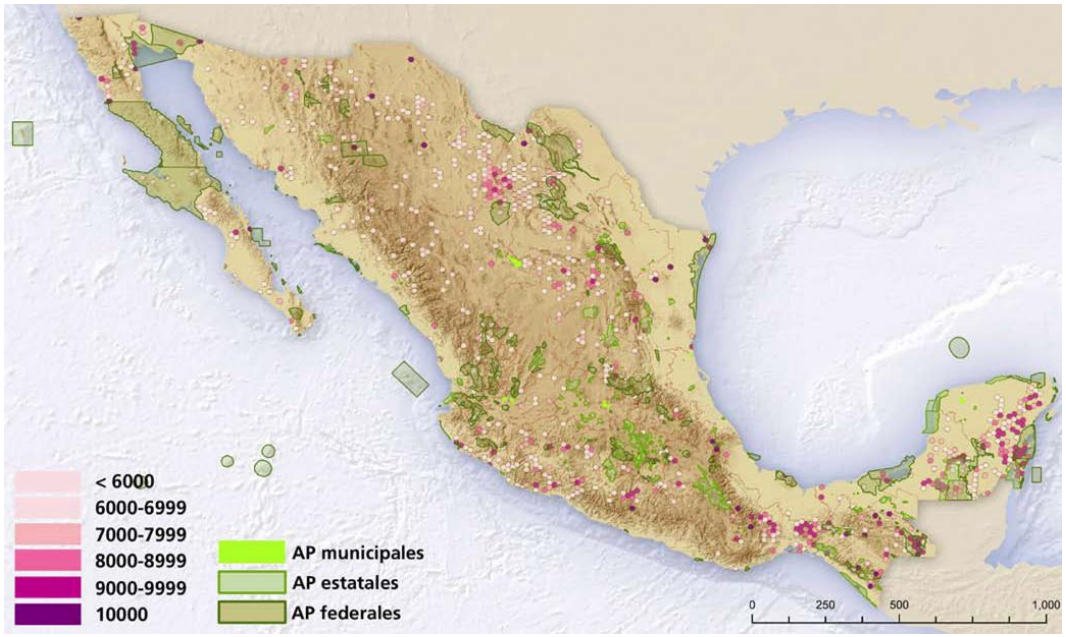
Reptiles



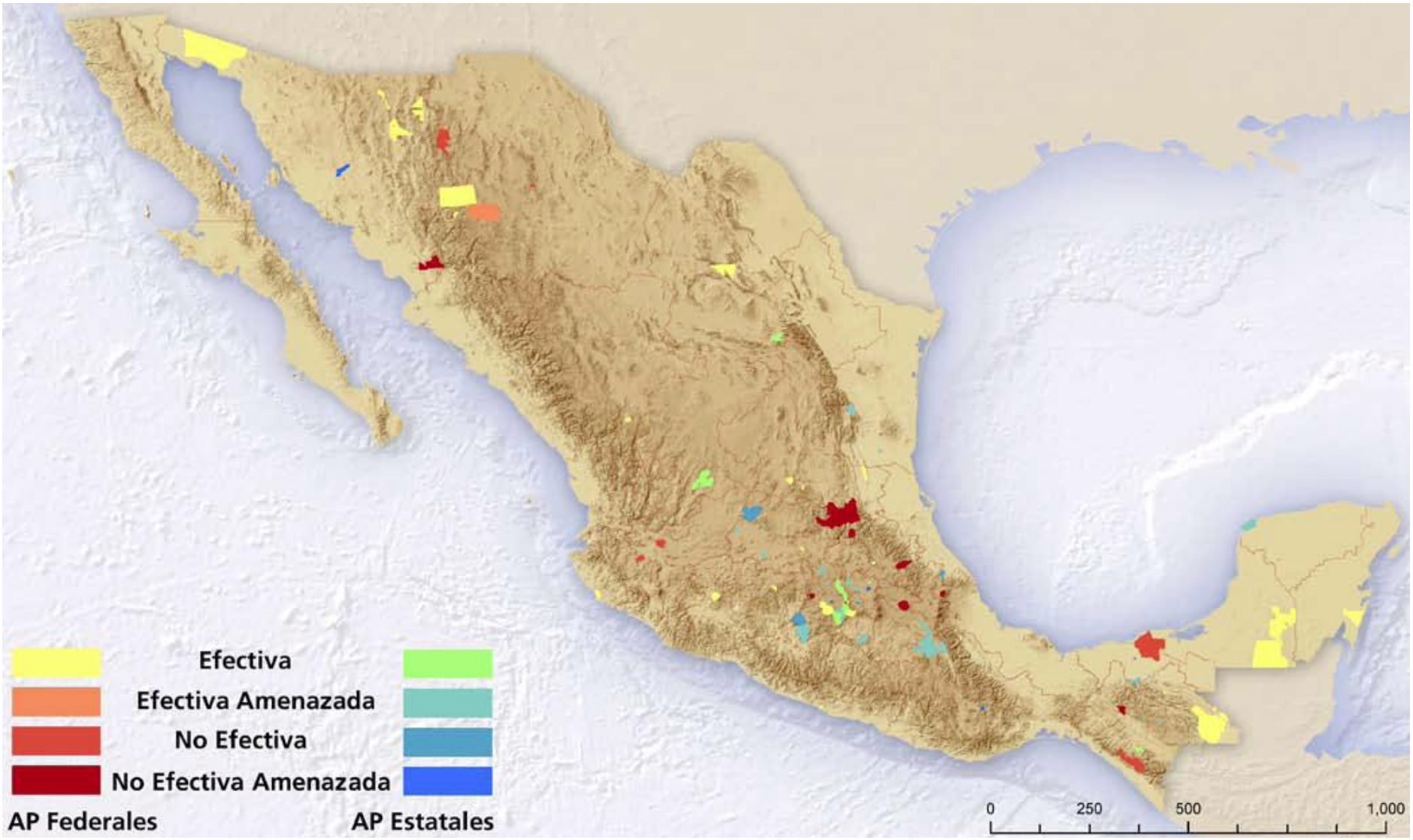
Birds



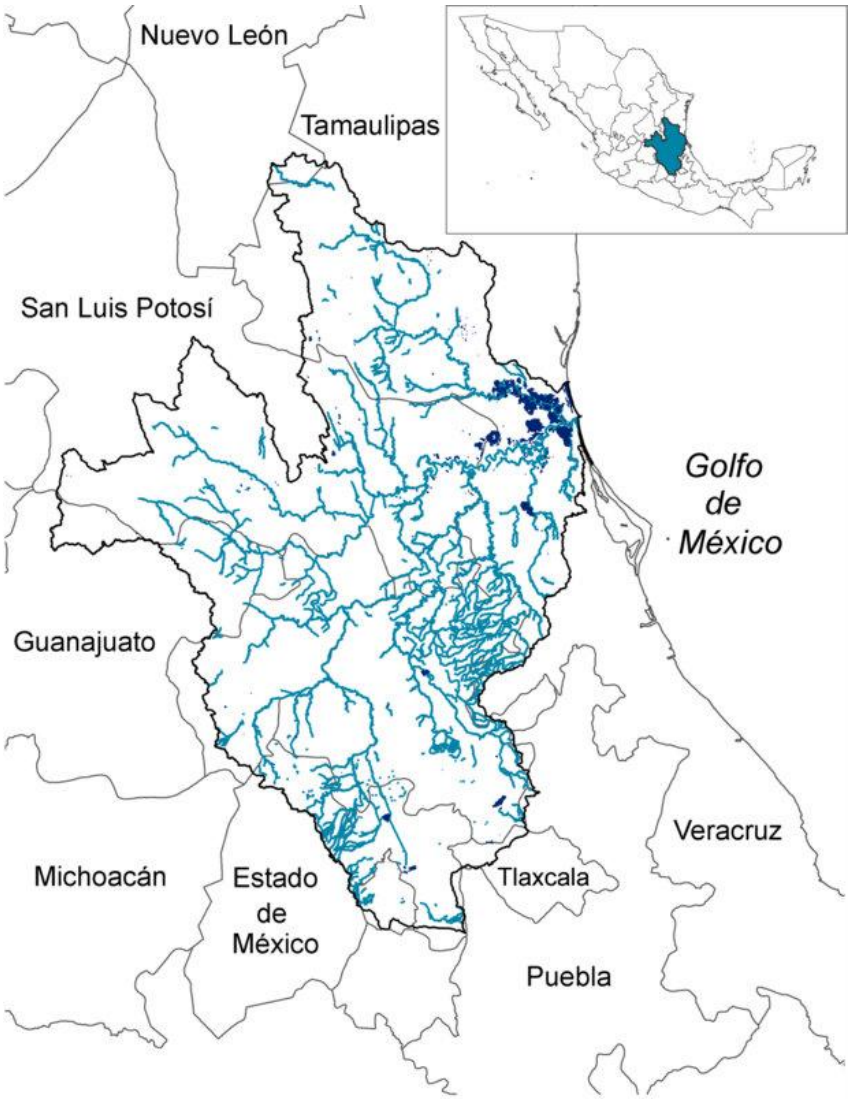
Mammals

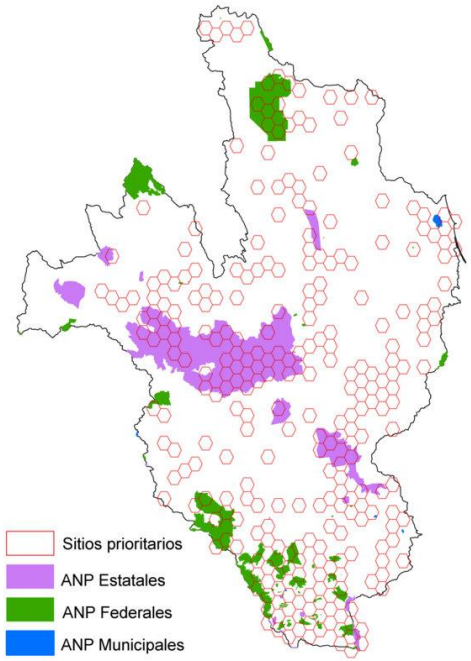


Effectiveness of **protected areas** to conserve **primary vegetation** (1993-2002)



Fresh water gap first approach: the Panuco hydrological region

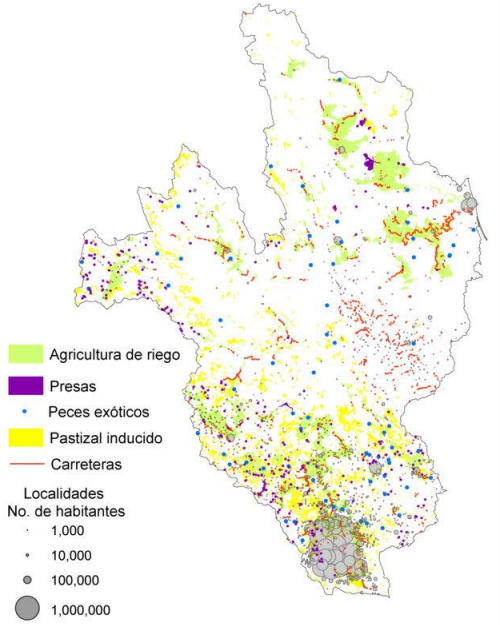




- Organisms with aquatic affinity
- Ecosystem layers
- Major threats

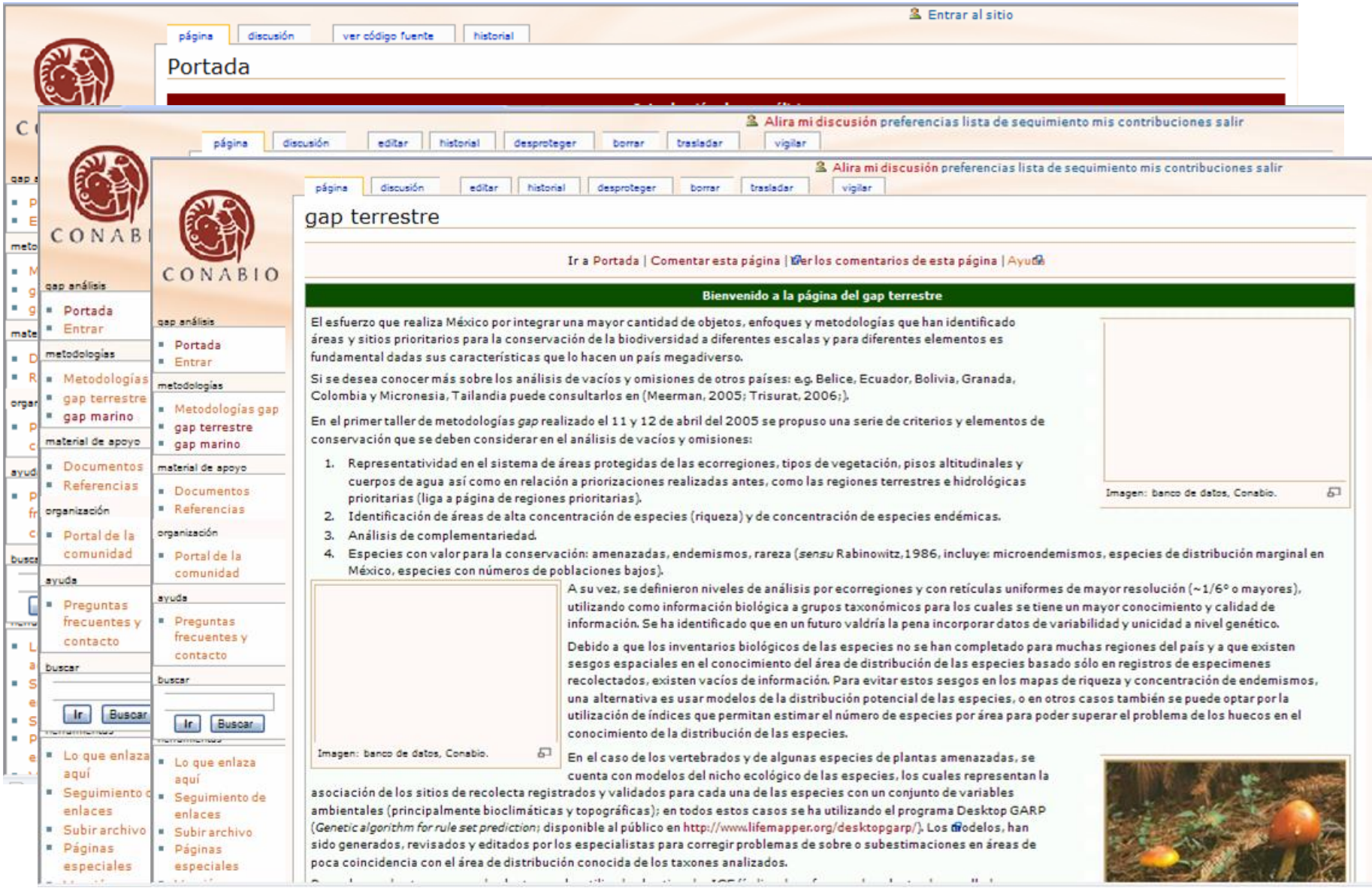
100 km^2 analysis units

Working on **Regional analysis** throughout the **country**




wwwiki gap
www.conabio.gob.mx/gap

Gap website same enginering as the Wikipedia / disussion / peer review



Mexico's gap assessment: next steps

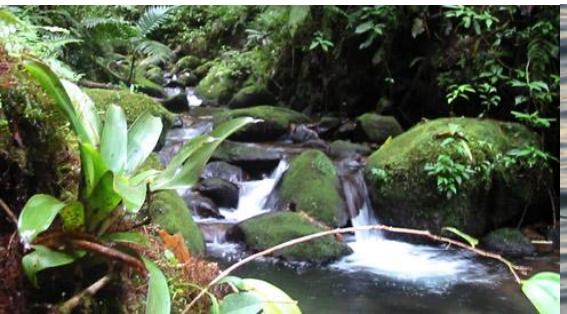
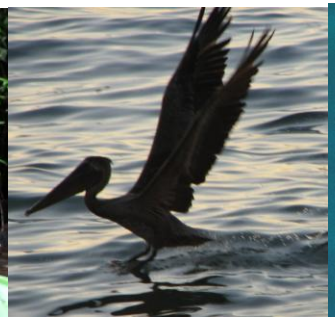
- Analyses at different scales
- Carry out a revision and validation process
- Integration of gap results of different environments and taxonomic groups with a quantitative and qualitative approach
- Inclusion of priority sites for migratory species & areas
  - stopovers, nesting beaches, etc.
- Development of models to estimate viability and to define required redundancy and resilience.
- Define different categories to analyze and represent the gaps (Representativity, management, etc).
- Analyze the tendencies of pressure factors, such as deforestation and climate change.
- Incorporate new elements and knowledge to update Gap analyses in the future

Conservation recomendations

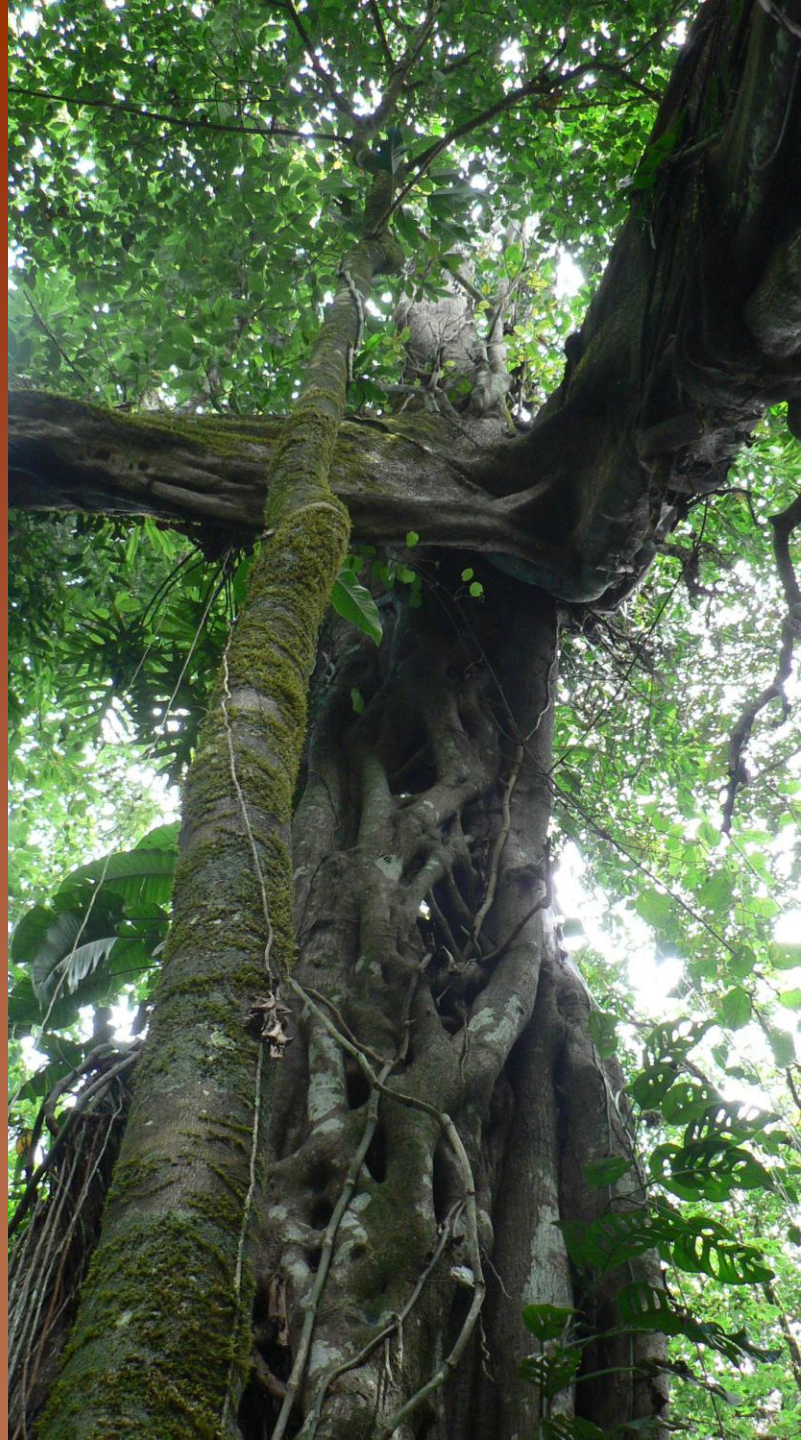
• Given Mexico´s exceptional high biodiversity, it will be necessary to implement diverse strategies, such as the establishment of new protected areas, social and private reserves and integral management programmes.

•The participation of the society as a whole will be a key factor towards the conservation of our natural capital

•It will be crucial to identify the factors of success and failure of different instruments and areas, taking into account socioeconomic aspects

M. Kolb

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The Nature Conservancy
Protecting nature. Preserving life.

pro natura
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