



# 6<sup>th</sup> International **DAAD** Workshop

14 – 18  
November 2016  
SANTIAGO DE CHILE

**The science policy gap regarding  
informed decisions in forest policy  
and forest management:**

what scientific information are policy makers  
really interested in?



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**Use and conservation of biodiversity.  
Inventory and assessment of ecosystems  
with relict tree species as a tool for  
establishing criteria for forest public policy**

**Dr. Eduardo Javier Treviño Garza**



## Forest areas

- They provide raw materials, help conserve biodiversity and water resources, protect land and help mitigate climate change.



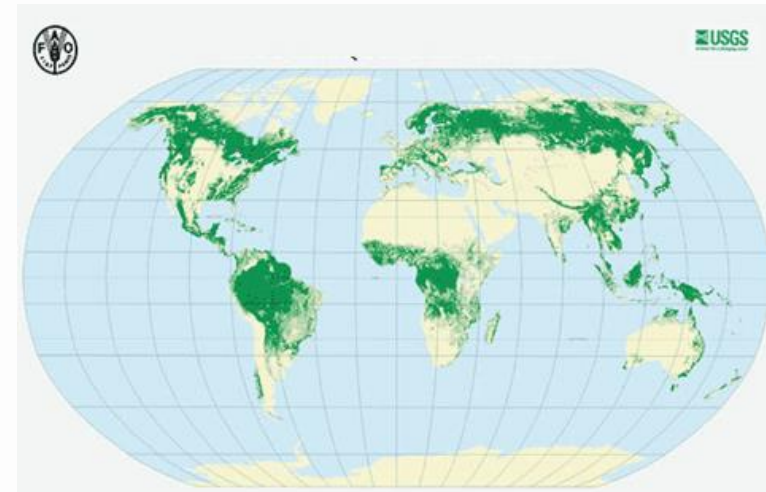
## Forest areas

- Forest: Complex ecosystems .
- Higher environmental requirements.

Weather

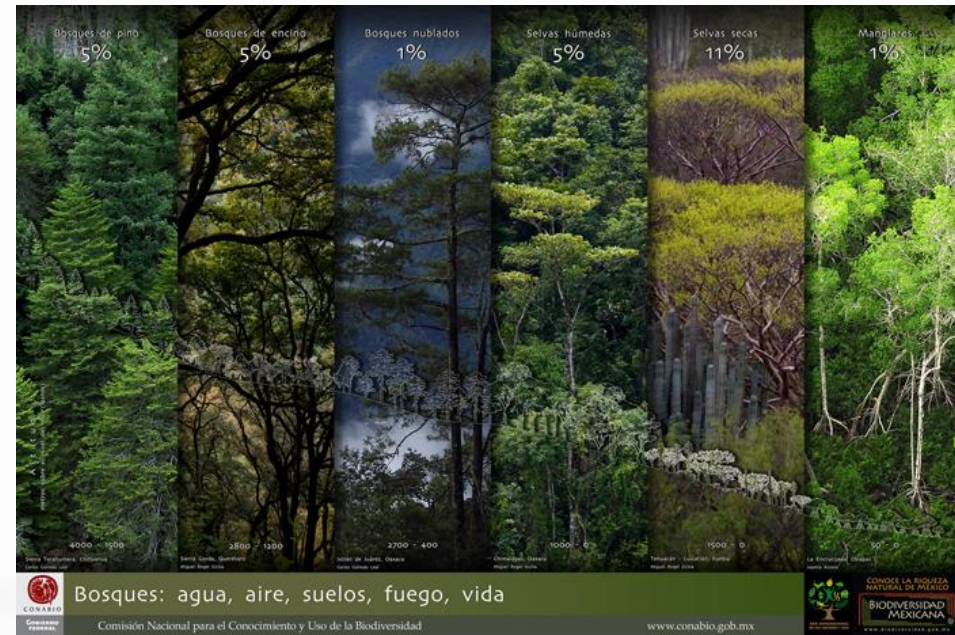
Soil

Topography



## Forest areas

- 80% of the Biodiversity in only the 31% terrestrial surface of the World



Bosques: agua, aire, suelos, fuego, vida

Comisión Nacional para el Conocimiento y Uso de la Biodiversidad

www.conabio.gob.mx



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## Historical Perspective on the use of biological diversity

- Moderate use  
(gathering, nomadic peoples)
- Appropriation of resources, human settlements and land use change ¡Civilization!



## History

- Foris –  
(Forestry, areas  
outside cities,  
Romans)
- Land of no one  
(or all)



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# Forestry areas

- Appreciation of forest areas when resource depletion by deforestation
- Regulation of use = Forestry policies
- Land of Nobody = Public Property (State)



# Forestry policies

## Introduction

- Regulation oriented in the permanence of the forest (medieval age)
- Sustainable production: continuous, non-declining and maximum extraction (industrial revolution)
- Scientific basis, creation of forestry schools (Germany)



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## Changing paradigms

➤ **FROM:** Technical interventions oriented only to wood production



<http://www.cotopaxi.com.ec/en/blogs/la-importancia-de-las-plantaciones-forestales>



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## ➤ TO :

- Conservation of the ecosystems function and their biodiversity
- Ecosystem environmental services
- Restoration / rehabilitation of degraded areas or diminished resources (Jardel et al. 2008, Jardel 2012).



# Biodiversity

- Life forms
- Types of living organisms
- species
- Biotic Communities
- or ecosystems



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# Biodiversity

- Diversity of species
- Diversity of ecosystems.
- Genetic diversity



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## Genetic diversity

- Intrapopulation genetic diversity.
- Genetic variation at same species in different environmental gradients



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# Genetic diversity

- Fundamental for the persistence of a species .
- Reducing genetic diversity increases the vulnerability

# Environmental fluctuations

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# Use of biodiversity

- Provenance studies – to identify the best wild populations
- Tree breeding programmes – to select and breed from the best individuals within the best populations



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# Conservation of biodiversity

- Maintenance

connectivity

landscape heterogeneity

stand structural complexity

aquatic ecosystem integrity



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# Conservation of biodiversity

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aquatic ecosystem integrity



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# Conservation of biodiversity

Holmgren P. and R. Persson 2002

- Maintenance

connectivity

landscape heterogeneity

stand structural complexity

aquatic ecosystem integrity



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# Forest biodiversity conservation

## Approaches

- **Regional scale**

*Large ecological reserves:*

*Natural Protected areas*

*National parks*



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# Natural Protected Areas



Figura 1. Áreas protegidas (AP) federales (Covarr, 2007), estatales y municipales (Bezaury et al., 2007).



# PRIORITY AREAS FOR THE CONSERVATION OF FLORISTIC DIVERSITY

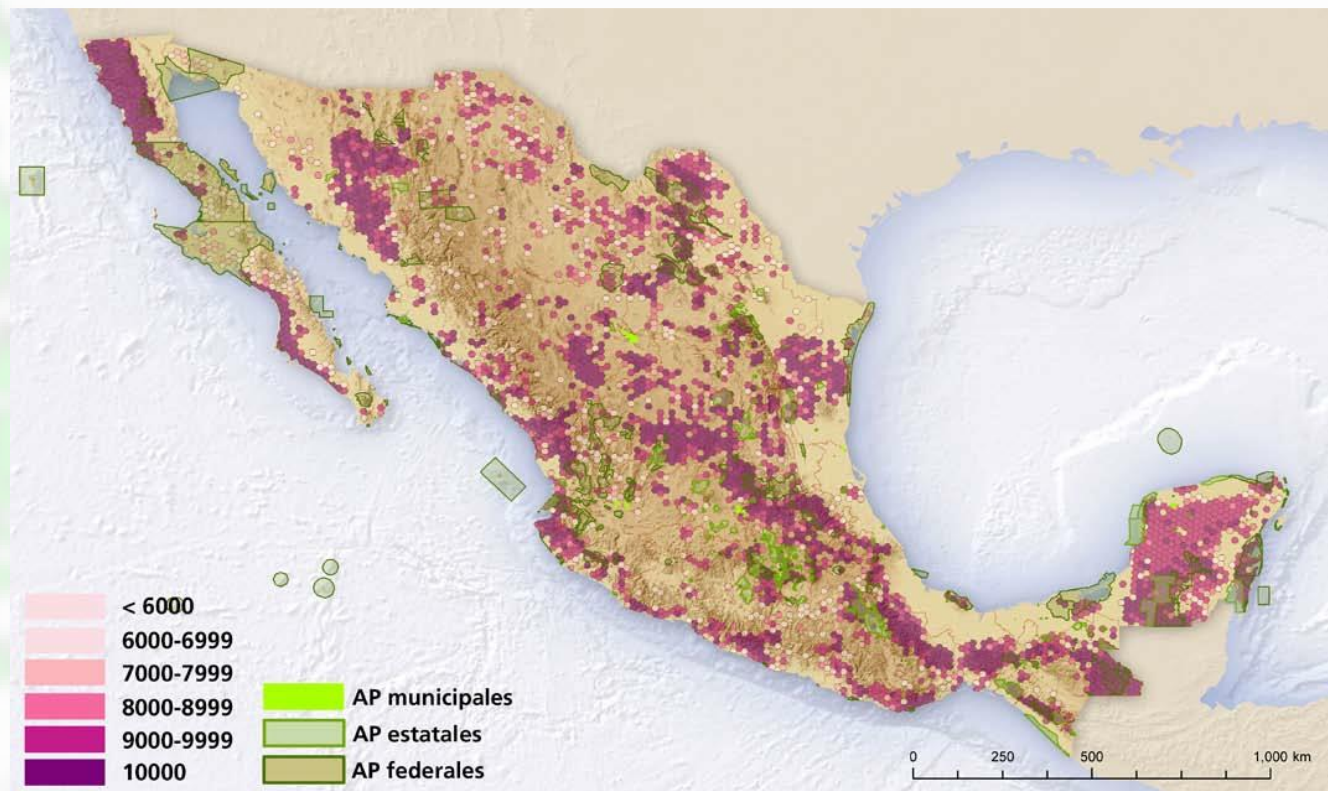


Figura 19. Sitios prioritarios para las plantas en la NOM-059-SEMARNAT-2001 y tipos de vegetación, considerando la 'mejor solución' con metas variables. Las unidades de estudio se muestran de acuerdo a su frecuencia de selección por el programa de priorización.



# Forest biodiversity conservation

## Approaches

- **Landscape scale**

*Protected areas within production forests*

*Buffers for aquatic ecosystems*

*Appropriately designed and located road networks*

*Careful spatial and temporal arrangement of harvest units*

*Appropriate fire management practices*



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# Forest biodiversity conservation

- **Stand level**

stand structural complexity

long rotation times

silvicultural systems

fire management practices

Approaches



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# Mexican regulation for forest management.

## Classification of areas.

- Areas of conservation and restricted use
- Areas of production
- Restoration areas
- Areas of protection
- Areas of other uses.



Noviembre 2004 Eduardo Javier Treviño Garza



# Areas of conservation and Restricted use

- Natural Protected Areas
- Protective strip of riparian;
- Slope greater than 100 % or 45 degrees;
- Mountainous areas over 3,000 meters
- Surfaces with mangrove and Cloud forest
- Habitat of species and subspecies of wild flora and fauna at risk

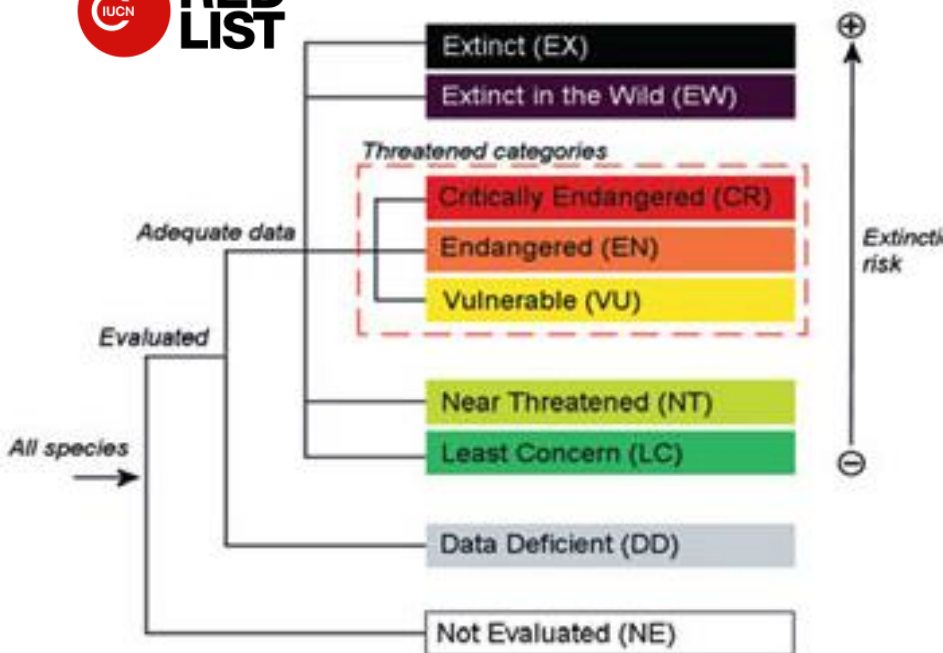


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# Species and subspecies of wild flora and fauna at risk



Jueves 30 de diciembre de 2010

DIARIO OFICIAL

(Segunda Sección) 1

**NORMA Oficial Mexicana NOM-059-SEMARNAT-2010, Protección ambiental-Especies nativas de México de flora y fauna silvestres-Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio-Lista de especies en riesgo.**

Al margen un sello con el Escudo Nacional, que dice: Estados Unidos Mexicanos.- Secretaría de Medio Ambiente y Recursos Naturales.

## 2.2 Categorías de riesgo

### 2.2.1 Probablemente extinta en el medio silvestre (E)

Aquella especie nativa de México cuyos ejemplares en vida libre dentro del Territorio Nacional han desaparecido, hasta donde la documentación y los estudios realizados lo prueban, y de la cual se conoce la existencia de ejemplares vivos, en confinamiento o fuera del Territorio Mexicano.

### 2.2.2 En peligro de extinción (P)

Aquellas cuyas áreas de distribución o tamaño de sus poblaciones en el Territorio Nacional han disminuido drásticamente poniendo en riesgo su viabilidad biológica en todo su hábitat natural, debido a factores tales como la destrucción o modificación drástica del hábitat, aprovechamiento no sustentable, enfermedades o depredación, entre otros.

### 2.2.3 Amenazadas (A)

Aquellas que podrían llegar a encontrarse en peligro de desaparecer a corto o mediano plazo, si siguen operando los factores que inciden negativamente en su viabilidad, al ocasionar el deterioro o modificación de su hábitat o disminuir directamente el tamaño de sus poblaciones.

### 2.2.4 Sujetas a protección especial (Pr)

Aquellas que podrían llegar a encontrarse amenazadas por factores que inciden negativamente en su viabilidad, por lo que se determina la necesidad de propiciar su recuperación y conservación o la recuperación y conservación de poblaciones de especies asociadas.



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# Forest tree species at risk in Mexico

- Martinez's Spruce (*Picea martinezii*)
- Vejar's Fir (*Abies vejarii*)
- Mexican Yew (*Taxus globosa.*)
- Douglas Fir (*Pseudotsuga menziesii*)

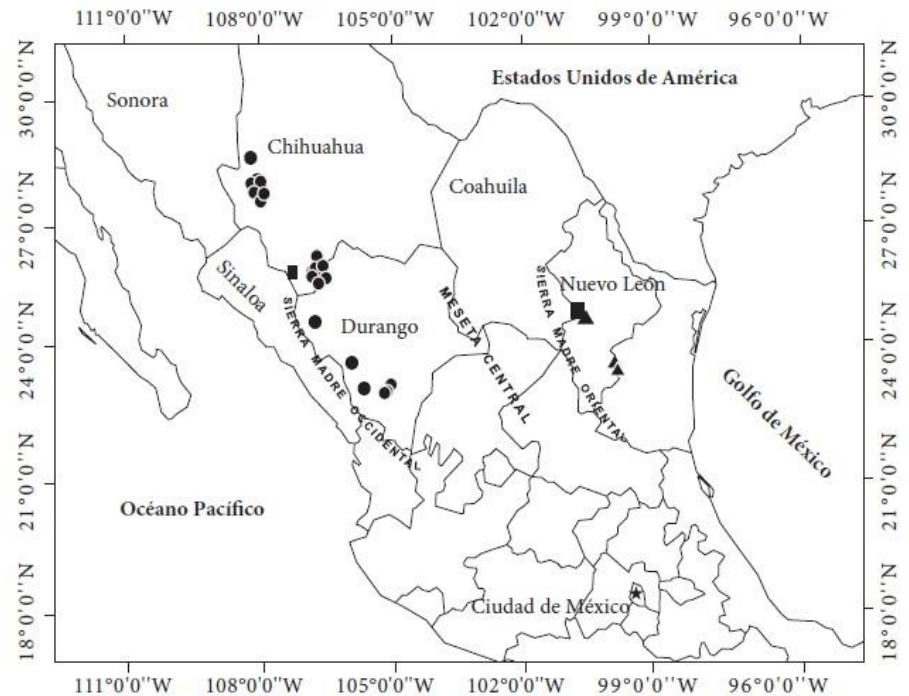


Figura 1. Ubicación de las poblaciones de *Picea mexicana* (■), *P. chihuahuana* (●) y *P. martinezii* (▲) (mapa basado en Ledig et al., 2000b).

Mendoza-Maya, Eduardo, Espino-Espino, Judith, Quiñones-Pérez, Carmen Z., Flores-López, Celestino, Wehenkel, Christian, Vargas-Hernández, J. Jesús, & Sáenz-Romero, Javier Treviño Garza  
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propuesta de conservación de tres especies mexicanas de picea en peligro de extinción. Revista fitotecnica mexicana, 38(3), 235-247.



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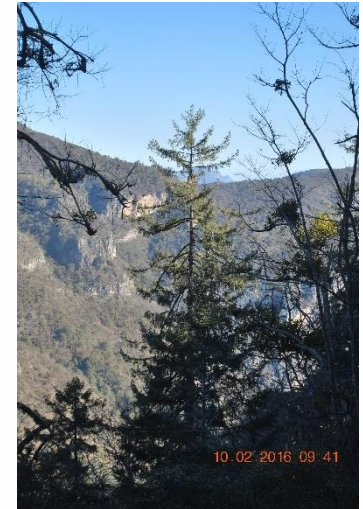


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# Vejar's Fir (*Abies vejarii*)

- **Red List Category** : Near Threatened
- *Elevation limit (metres)*  
1900 to 3300
- *Estimated area of occupancy (AOO) - km2: 144*
- *The population is likely to be decreasing through wildfires and deforestation rather than logging,*
- *severely fragmented*



Abies	vejarii	mexicana	Abies mexicana	oyamel blanco	endémica	A
Abies	vejarii			oyamel cenizo	endémica	A



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# Martinez's Spruce (*Picea martinezii*)

- Red List Category : *Endangered*
- Elevation limit (metres)  
2155 to 2990
- Estimated area of occupancy (AOO) -  
km2: 16 in two locations (4)
- The population is likely to be  
decreasing through wildfires and  
deforestation rather than logging,
- severely fragmented



<i>Picea</i>	<i>martinezii</i>			pinabete de Nuevo León	no endémica	P
<i>Pinus</i>	<i>attenuata</i>		<i>Pinus attenuata</i>		no endémica	P







# Mexican Yew (*Taxus globosa*, Schltdl.)

- **Red List Category** : *Endangered*
- *Elevation limit (metres)*  
1000 to 2990
- *Estimated area of occupancy (AOO) - km<sup>2</sup>: less than 2,000 km<sup>2</sup>*
- *Is sporadically distributed from northern Mexico*
- *populations are usually small and disjunct and severely fragmented*



Taxus	globosa			tejo mexicano, romenillo,	no endémica	Pr
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national  
shop

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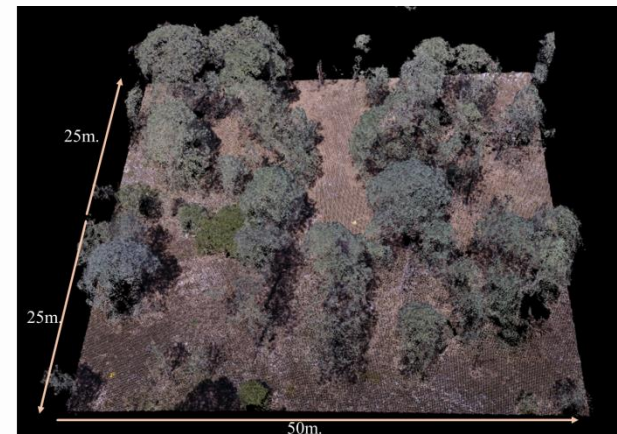
# Douglas Fir (*Pseudotsuga menziesii*, (Mirb.) Franco)

- Red List Category : *Stable*
- *Elevation limit (metres)*  
*1 to 3350*
- Is one of the world's most important timber trees
- Subpopulations in Mexico are often isolated and they have been described as distinct species.
- This variety is present in many protected areas, including some famous national parks.



GENERO	ESPECIE	SUBESPECIE, FORMA O VARIEDAD	SINONIMIA	NOMBRE COMUN	DISTRIBUCION	CATEGORIA
<i>Pseudotsuga</i>	<i>menziesii</i>	<i>glauca</i>	<i>Pseudotsuga flahaulti</i> , <i>Pseudotsuga menziesii flahaulti</i> , <i>Pseudotsuga guinieri</i> , <i>Pseudotsuga macrolepis</i> , <i>Pseudotsuga rehderi</i>	cahuite, hayarín colorado, hayarín, espinoso, payarín tepehuano, pinabete	endémica	Pr

- **Permanent Forest Research Sites (SPIF)**
- **Remote sensing**  
Satellite imagery  
Unmanned Aerial Vehicle



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# Inventory / Field work

- Forest inventory (every 5 years)
- Soil sampling
- Monthly phenology register of 25 trees in each site (two years)
- Samples of leaves to determine their genetics variation
- Sampling of cones



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# Assessment

- Current area of the ecosystem
- Analysis of the horizontal, vertical and floristic structure
- Average annual increases in diameter and volume
- Carbon stocks
- Forest seedlings



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# Assessment

- Determination of dates flowering, fructification, leaf renewal
- Genetic diversity among populations
- Soil: Physical and chemical conditions, quantity and nutrient quality
- Number of seeds in the soil and their viability



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# Ecosystems with relict tree species / relict ecosystems

## Importance of studying relict ecosystems

- Genetic richness
- Assisted plant migration



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# Conclusions

- Biological diversity  
controversial  
confusion
- Importance  
Genetic richness  
Unknown species,  
unidentified uses,  
unlimited possibilities



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# Thanks for your attention!!



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