

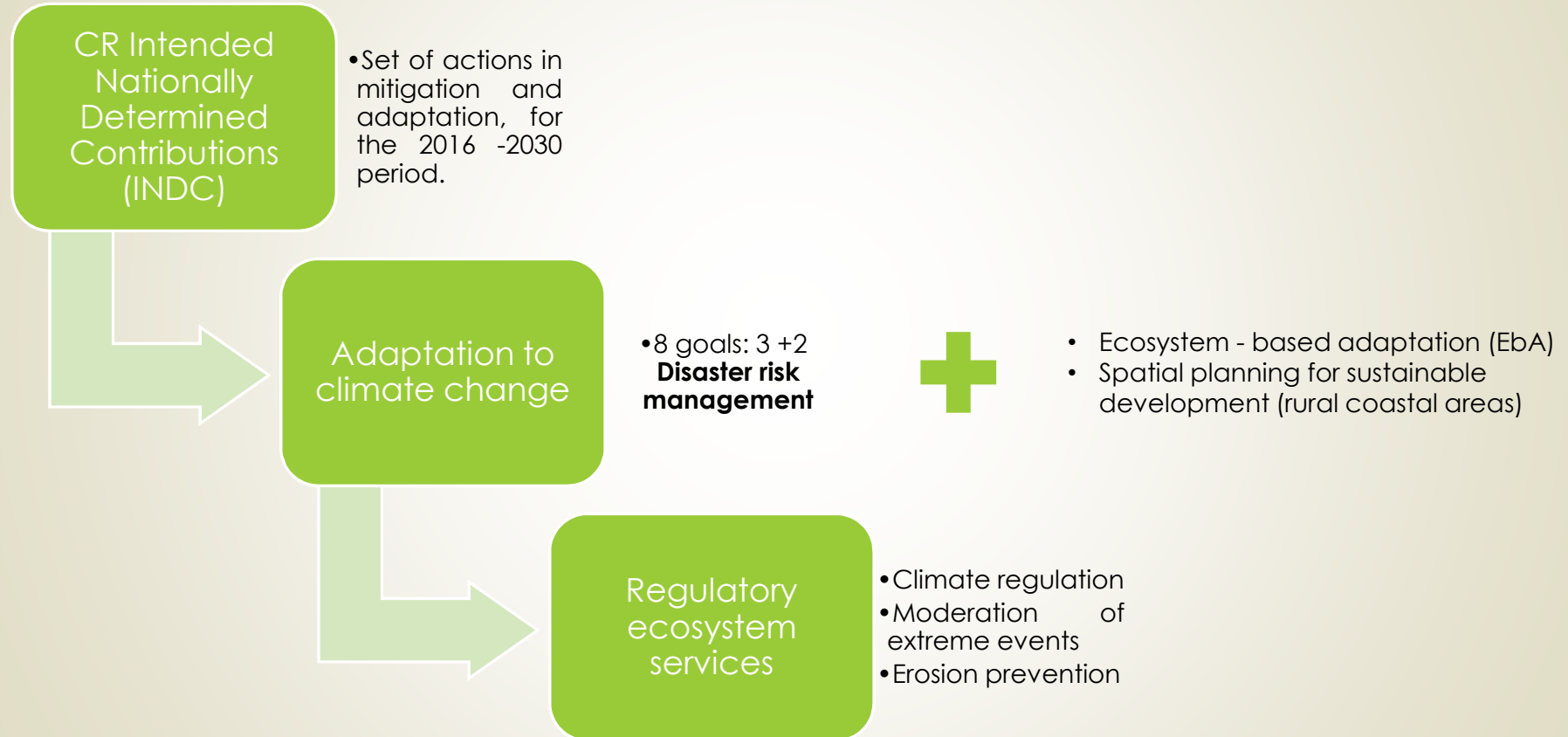
# How to generate spatial scenarios for landcover / land use considering their suitability to favor the provision of regulatory ecosystem services?

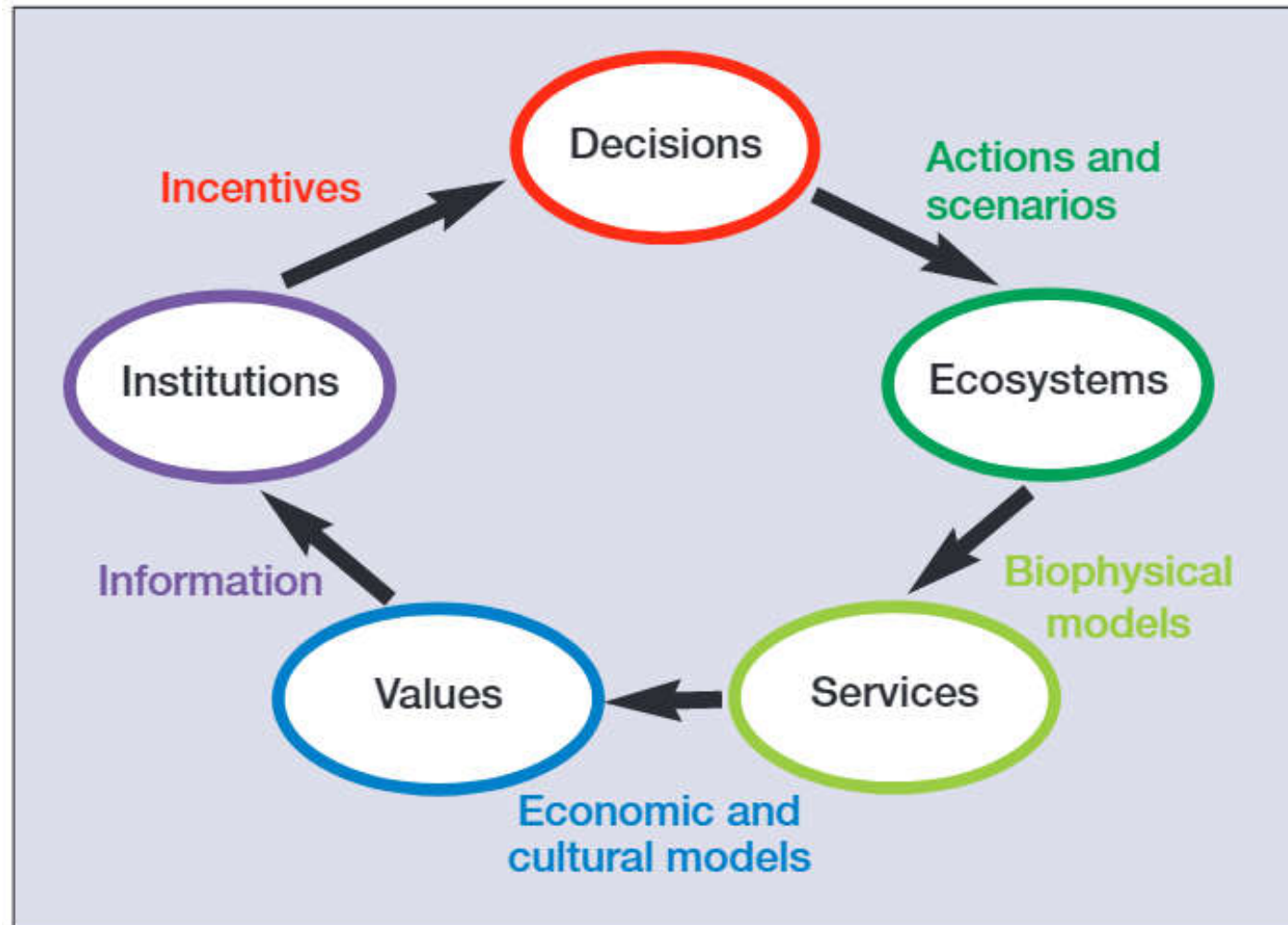
Final presentation

Bepsy Cedeño-Montoya



# Problem Context





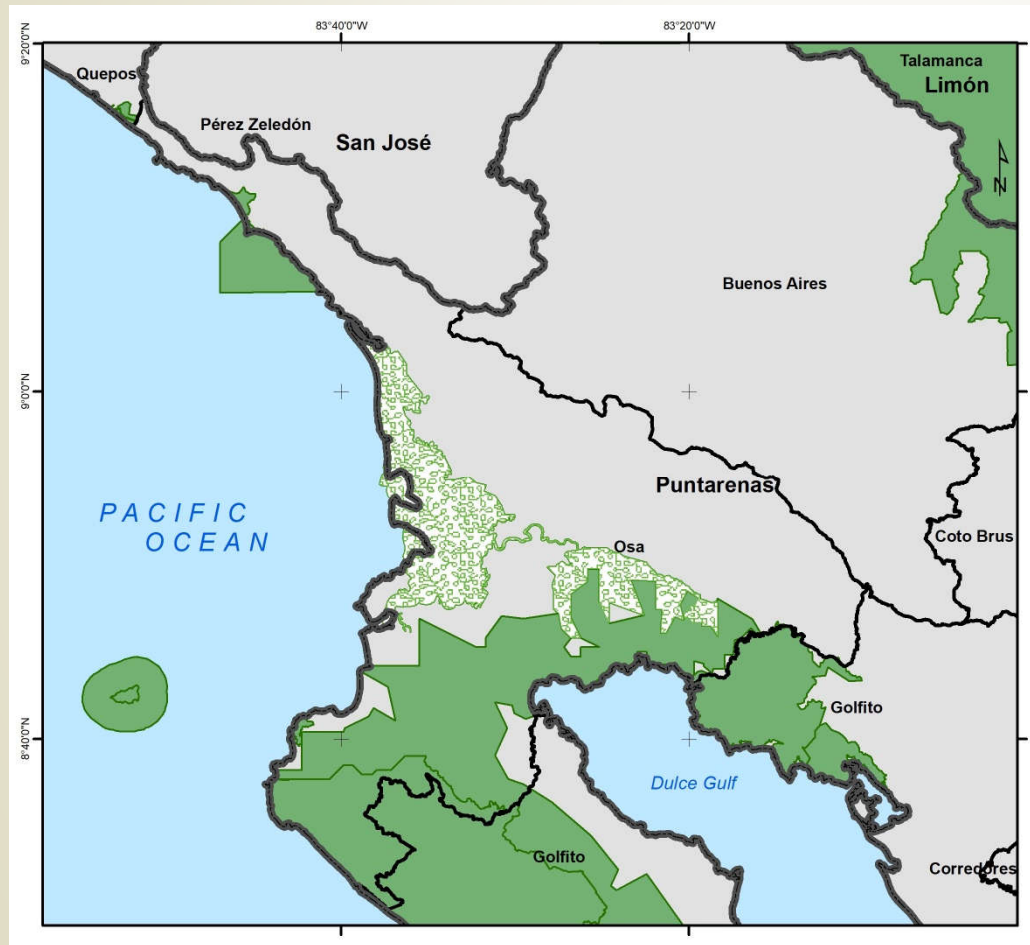
Framework for the integration of ecosystem services into decision making.

Source: Daily et al (2009)



# Térraba-Sierpe Wetland

## Osa, Puntarenas, Costa Rica



► Progress:

- Land units definition
- Land units classification

How to generate spatial scenarios for landcover / land use considering their **suitability** to favor the **provision of regulatory ecosystem services?**

**Wild Protected  
Areas**

**Indigenous  
territories**

**Land use  
capability**

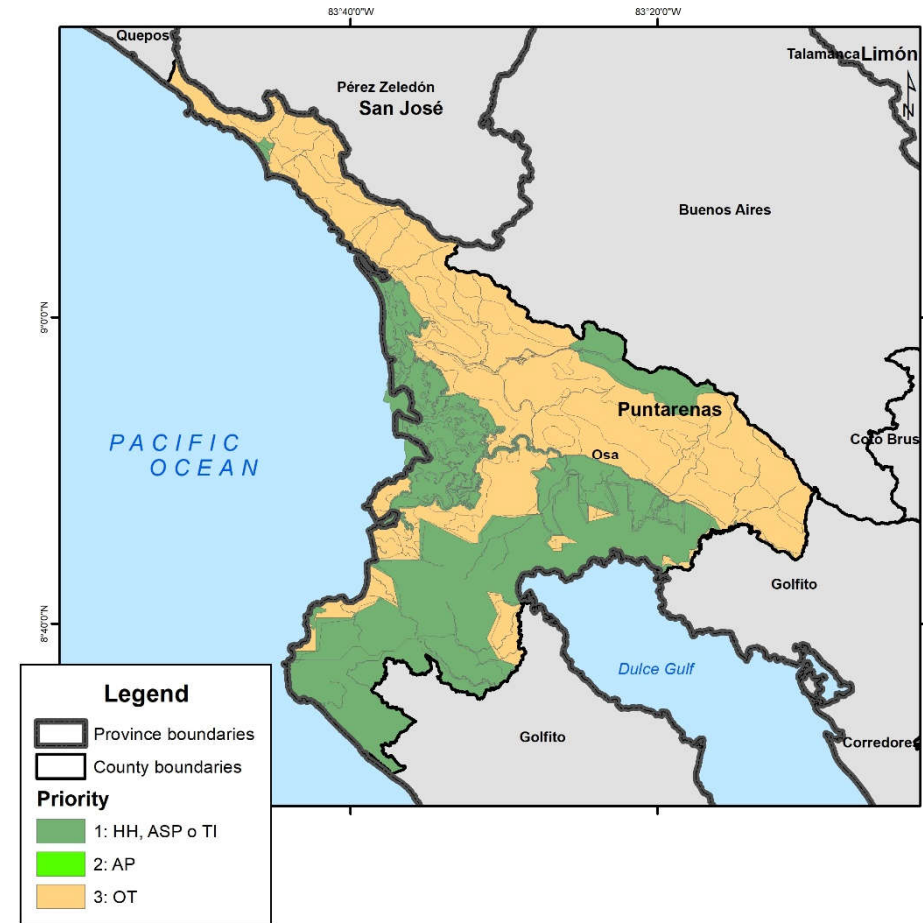
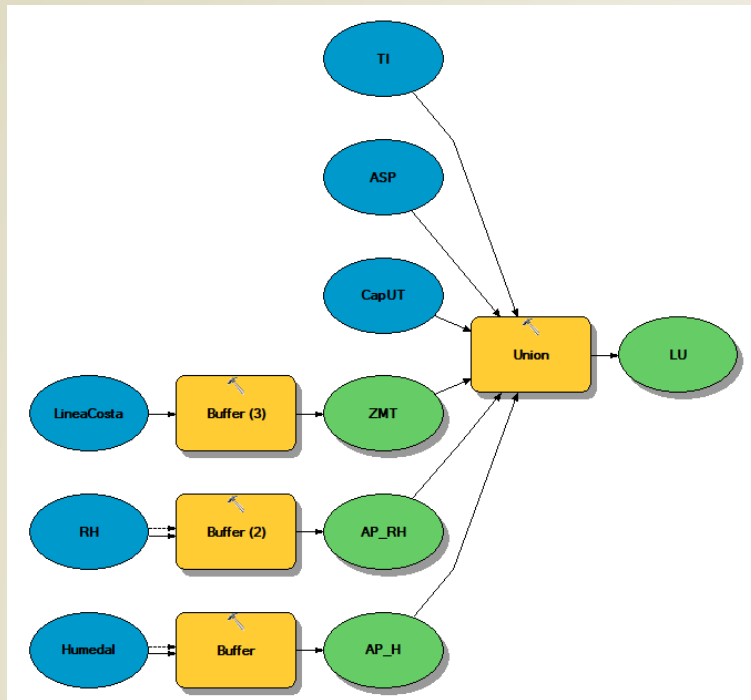
**Distance to  
wetlands**

**Distance to  
rivers, reservoirs  
and lagoons**

**Distance to  
coast**



**Land units definition**



# Land units definition

➤ 570 land units (polygons)

# Land units clasification

| Landscape functions  | Landscape functions definition   | Goods and services provide by land uses according to landscape functions   |
|----------------------|--|--|
| Provisioning         | Provide resources, produce directly from ecosystems with (carrier) or without (production) human intervention. | Land uses related to production of raw material (wood, food, water, medicines, dyes, etc.), agroforestry, aquaculture and livestock activities, energy production (hydro, geothermal or wind generated), mineral extractions and water transportation. |
| Regulation           | Influence, in a positive way, the natural cycles (hydrological, biochemical, climate) in the Earth.            | Land uses that contribute to water and biochemical cycles control, maintenance of soil fertility, waste treatment, water regulation, erosion and flood prevention, storm protection.   |
| Habitat              | Act as shelter for natural species (flora and fauna) allowing them to grow and reproduced naturally.           | Land uses that offers refuge and nursery for wildlife in natural conditions, biological corridors.   |
| Cultural and amenity | Offers benefits to society through recreation, cognitive development, relaxation, and spiritual reflection.    | Protected areas (as reserves, national parks), water bodies, recreation areas (including touristic attractions), indigenous territories.   |

**Landscape functions, definitions and goods and services associated.**

Based on de Groot & Hein (2007) and Brand & Verje (2004).



# Land units clasification

| Class | Goods and services associated with the class (considering the restrictions)   | Landscape function assigned                              |
|-------|---|--|
| I     | Permanent and annual crops, forestry, aquaculture and livestock products, water, medicines, dyes, energy production, mineral extractions and water transportation.  | Provisioning   |
| II    | Permanent and annual crops, forestry, aquaculture and livestock products, water, medicines, dyes, energy production, mineral extractions and water transportation.  | Provisioning   |
| III   | Permanent and annual crops, forestry, aquaculture and livestock products, water, medicines, dyes, energy production, mineral extractions and water transportation.  | Provisioning   |
| IV    | Permanent crops, annual crops (occasionally), forestry, aquaculture and livestock products.   | Provisioning   |
| V     | Forestry, aquaculture and livestock products. Maintenance of soil fertility, waste treatment, water regulation, erosion and flood prevention, storm protection.   | Provisioning, regulation.                                |
| VI    | Permanent crops, forestry, aquaculture and livestock products. Maintenance of soil fertility, waste treatment, water regulation, erosion and flood prevention, storm protection.  | Provisioning, regulation.                                |
| VII   | Forestry products. Refuge and nursery for wildlife, biological corridors. Aesthetics, recreation. Contribute to water and biochemical cycles control, maintenance of soil fertility, waste treatment, water regulation, erosion and flood prevention, storm protection.                         | Provisioning, regulation, habitat, cultural and amenity. |
| VIII  | Refuge and nursery for wildlife in natural conditions, biological corridors. Aesthetics, recreation (tourism attraction). Contribute to water and biochemical cycles control, maintenance of soil fertility, waste treatment, water regulation, erosion and flood prevention, storm protection. | Provisioning, regulation, habitat, cultural and amenity. |



# Land units clasification

| Land cover        | Land use          | Goods and services associated with land cover and land use  | Landscape function assigned                              |
|-------------------|-------------------|---|--|
| Primary forest    | Primary forest    | <p>Refuge and nursery for wildlife.<br/>Aesthetics, recreation.<br/>Contribute to water and biochemical cycles control, maintenance of soil fertility, waste treatment, water regulation, erosion and flood prevention, storm protection.</p> <p>Raw materials: water, medicines, dyes and water transportation</p> | Provisioning, regulation, habitat, cultural and amenity. |
| Permanent crops   | Banana            | Agriculture products (food production)  | Provisioning   |
|                   | Coffee            |   |  |
|                   | Sugar cane        |   |  |
|                   | Oil pam           |   |  |
| Forest plantation | Forest plantation | Forestry products. Biological corridors. Erosion prevention   | Provisioning, regulation, habitat                        |
| Wetland           | Wetland           | <p>Refuge and nursery for wildlife.<br/>Aesthetics, recreation.<br/>Contribute to water and biochemical cycles control, maintenance of soil fertility, waste treatment, water regulation, erosion and flood prevention, storm protection.</p> <p>Raw materials: water, medicines, dyes and water transportation</p> | Provisioning, regulation, habitat, cultural and amenity. |
| Uncovered land    | Uncovered land    | Contribute to water and biochemical cycles control.   | Regulation   |

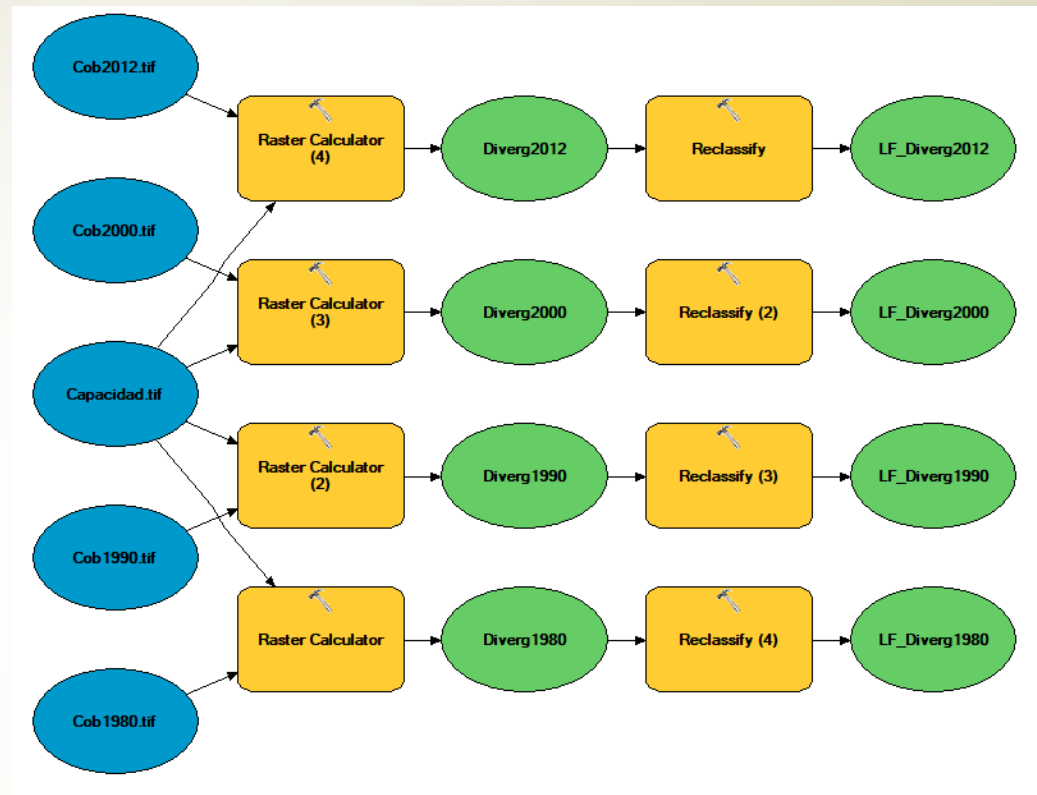
# Land units classification: Divergences and Interactions

| Landscape functions according to land cover / land use |                |   | Landscape functions according to land capability |              |              |              |                          |                          |   |   |
|--|----------------|---|--|--------------|--------------|--------------|--------------------------|--------------------------|---|---|
|  |                |   | I  | II           | III          | IV           | V                        | VI                       | VII   | VIII  |
| Land cover   | Land use       | Landscape function assigned                             | Provisioning                                     | Provisioning | Provisioning | Provisioning | Provisioning, regulation | Provisioning, regulation | Provisioning, regulation, habitat, cultural and amenity | Provisioning, regulation, habitat, cultural and amenity |
| Primary forest   | Primary forest | Provisioning, regulation, habitat, cultural and amenity | S  | S            | S            | S            | S                        | S                        | Cp  | Cp  |
| Annual crops   | Rice           | Provisioning  | Cp   | Cp           | Cp           | Cp           | Cf                       | Cf                       | Cf  | Cf  |
|  | Vegetables     |   | Cp   | Cp           | Cp           | Cp           | Cf                       | Cf                       | Cf  | Cf  |
|  | Greenhouse     |   | Cp   | Cp           | Cp           | Cp           | Cf                       | Cf                       | Cf  | Cf  |
| Wetland  | Wetland        | Provisioning, regulation, habitat, cultural and amenity | S  | S            | S            | S            | S                        | S                        | Cp  | Cp  |
| Pastures   | Pastures       | Provisioning, regulation                                | S  | S            | S            | S            | Cp                       | Cp                       | Cf  | Cf  |

Conflicts (Cf), Synergies (S), Compatibility (Cp)  
Based on Willemen's (2010)

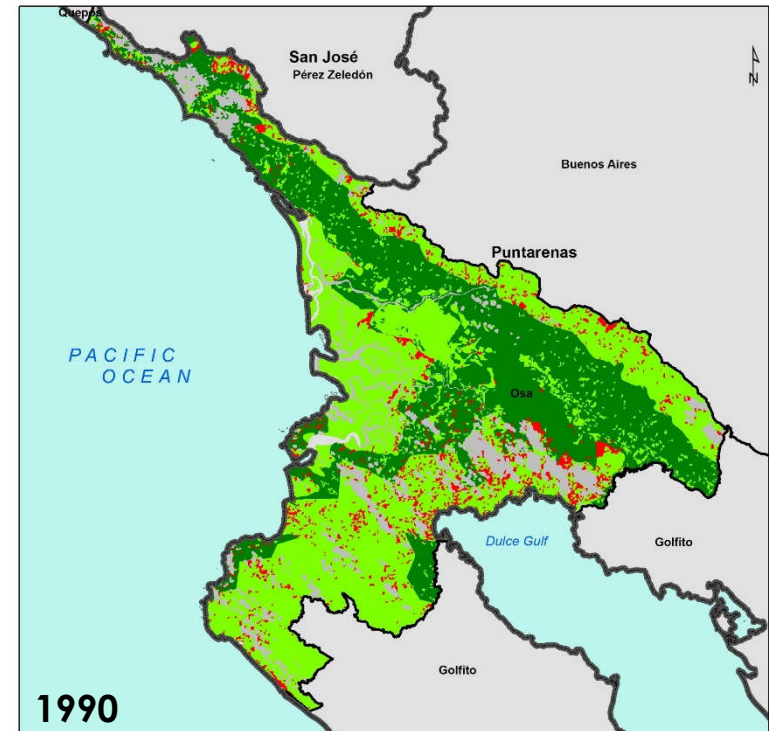
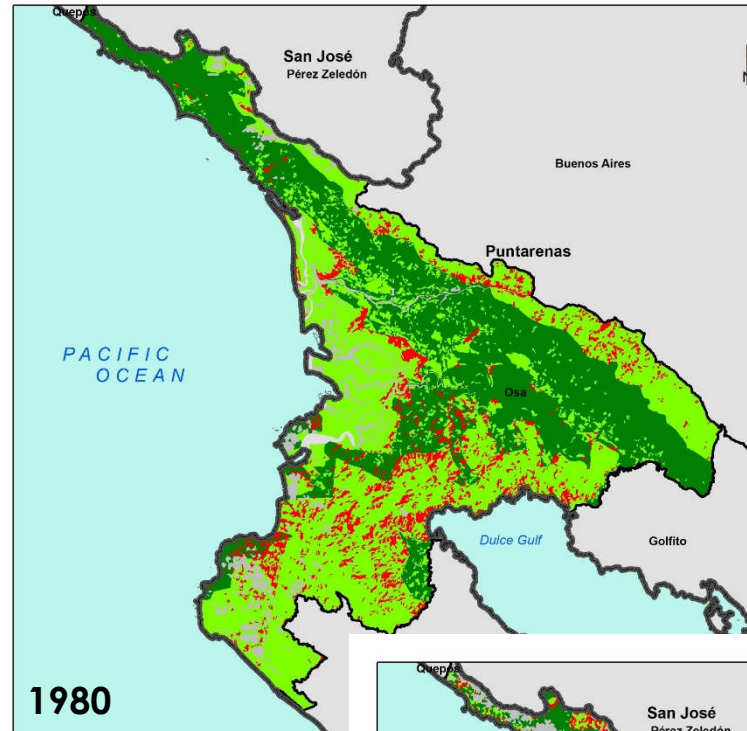


# Land units clasification



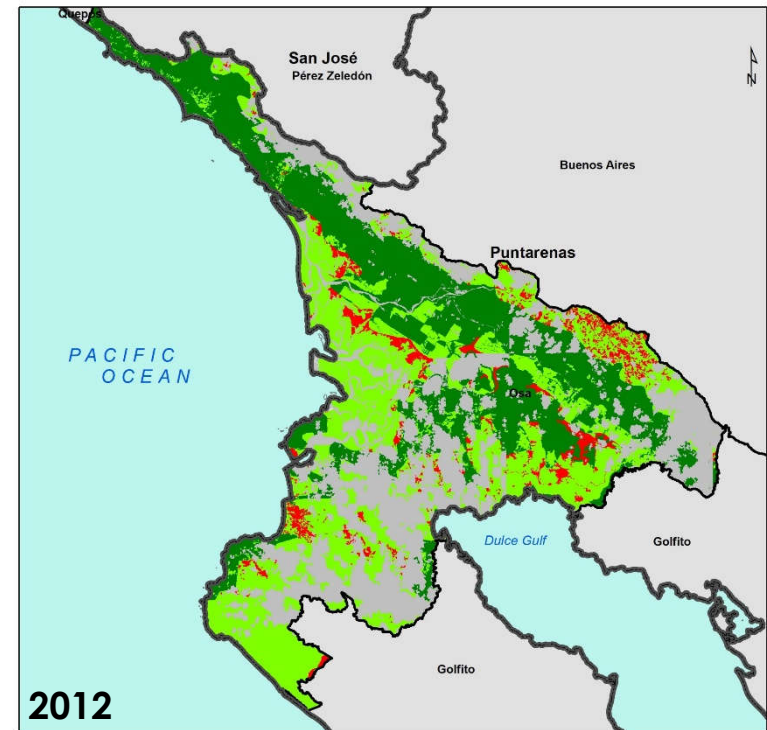
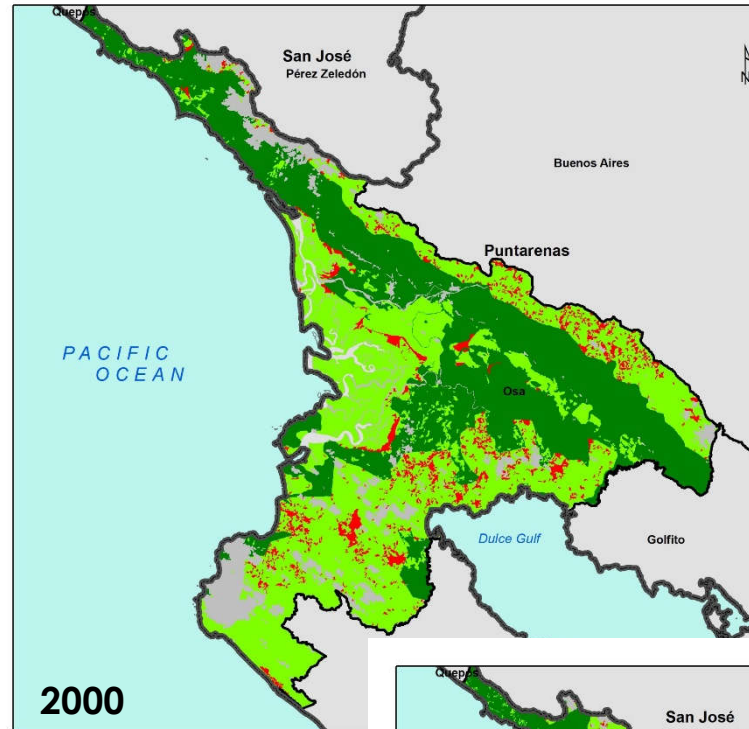


# Land units clasification





# Land units clasificación



## ► Whats next?

### ► Scenarios:

► Formulation

► Selection using GIS –  
based MCDA

**How to  
generate  
spatial  
scenarios for  
landcover /  
land use  
considering their  
suitability to favor the  
provision of  
regulatory ecosystem  
services?**

# ¡Gracias!

Questions and comments will always help