

**6th Annual International ESP Conference, 2012**

**Portland. USA**

# Identifying hotspots or priority areas for multiple ecosystem services to enhance sustainable land management

Miren Onaindia (1), Gloria Rodríguez-Loinaz (1), Beatriz Fernández de Manuel (1), Lorena Peña (1), Igone Palacios-Agundez (1), Izaskun Casado-Arzuaga (1), Xabier Arana (2), Iosu Madariaga (1, 2), Ibone Amezaga (1)

*(1)University of the Basque Country. Spain*

*(2)County Council of Biscay. Spain*

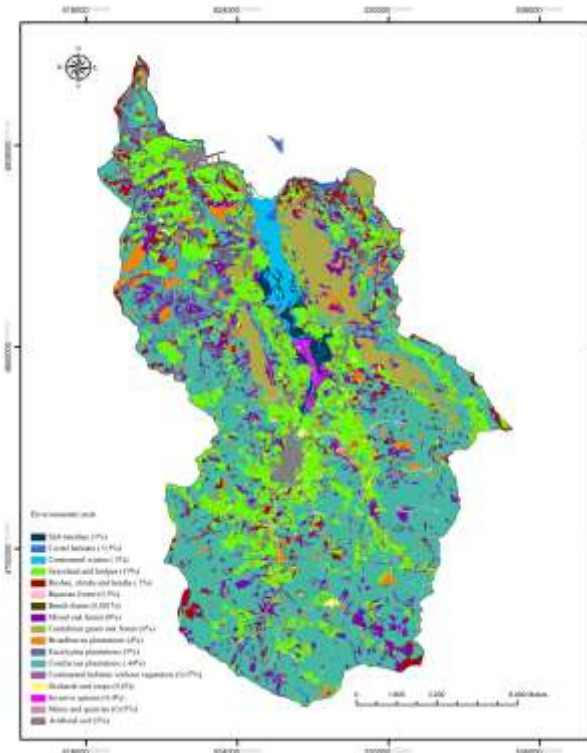


# 1- Aim of the study

- **The paper contributes to the debate about the role of ecosystem services in conservation**
  - **to what extent the conservation of biodiversity will ensure the provision of ecosystem services?.**
- 
- Questions:
    - 1- which ecosystems are the most important producers of biodiversity, carbon storage and water regulation?
    - 2- to what extent do the biodiversity, carbon storage and water regulation hotspots overlap?

# 2- Methodology

- **Study area:** watershed in northern Spain: Urdaibai B.R.
- Costal and mountainous landscapes. 220km<sup>2</sup> ; 44,000 inh.



Coniferous plantations 44%,  
natural forests 15%

**Biodiversity** was calculated and valued as (Onaindia et al. 2004):

$$B = f(r) + f(q) + f(p)$$

richness; habitat quality (succession); degree of legal protection.

**Carbon storage C** (biomass and soil) was valued as (IPCC, 2003):

- Inventory of organic C stored in the soil (Neiker-Ihobe, 2004). CB (biomass)

$$CB = V * BEF * (1 + R) * D * CF$$

the root-to-shoot ratio; wood density; the carbon fraction of dry matter

**Water flow regulation** was based on the TETIS model (Vélez et al., 2009) (WC) was calculated as (mm / year):

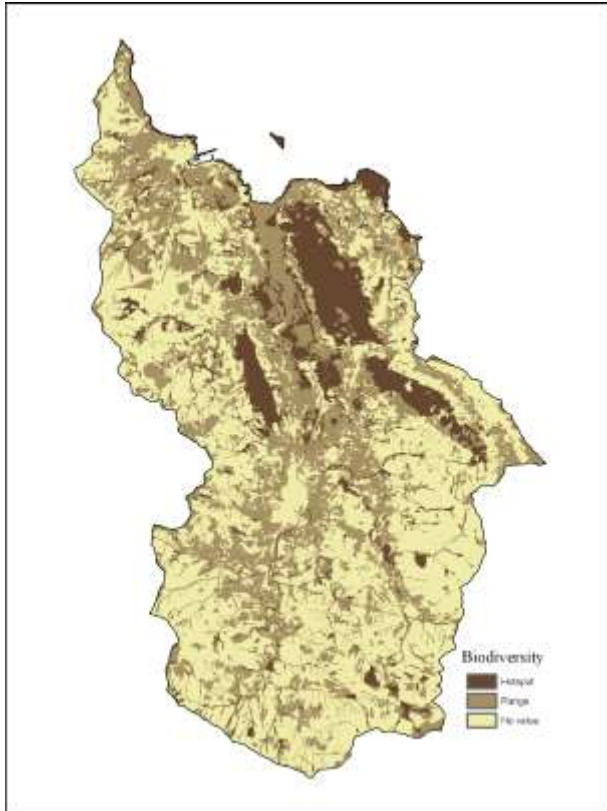
$$WC = Hu / R$$

water stored in the soil; annual rainfall; corrected annual potential evapotranspiration

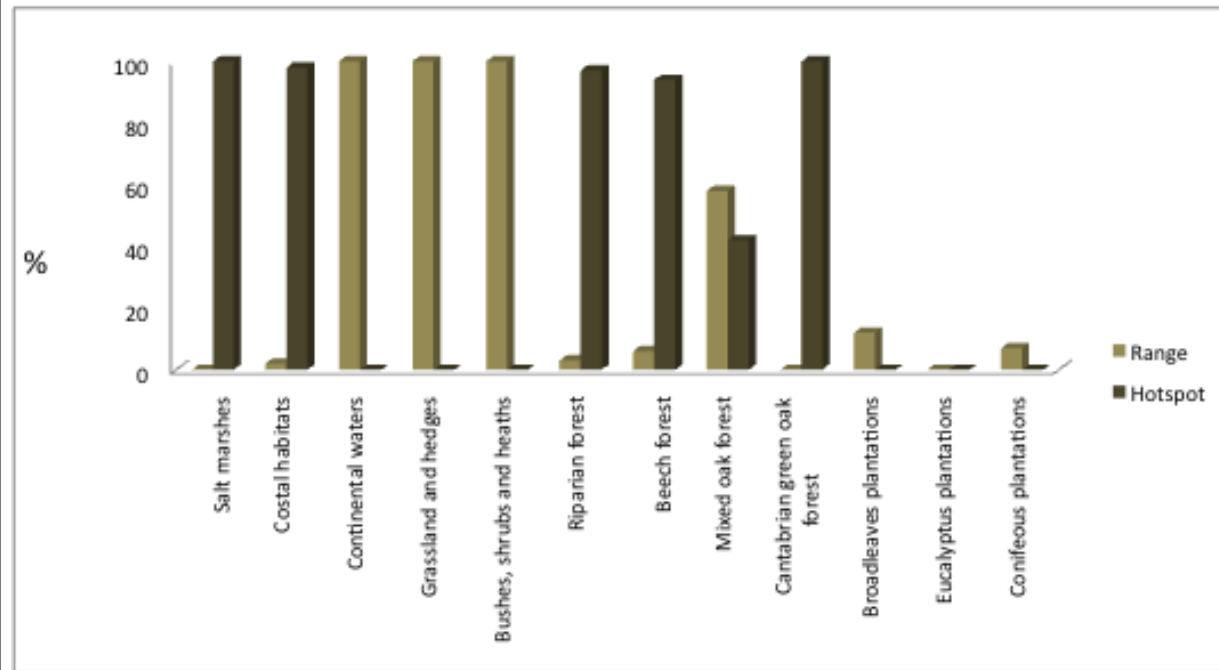
- A Geographic Information System-based approach was designed to estimate spatially the value of the biodiversity and ecosystem services. Spatial units were grid cells with a size of 4 m<sup>2</sup>.

# 3- Results. Biodiversity

## Range and hotspot



Percentage of each ecosystem that is included in the ranges and hotspots



The total area of marshes, coastal habitats and natural forests are included as biodiversity hotspots. The coniferous and eucalyptus plantations did not contribute to the biodiversity.

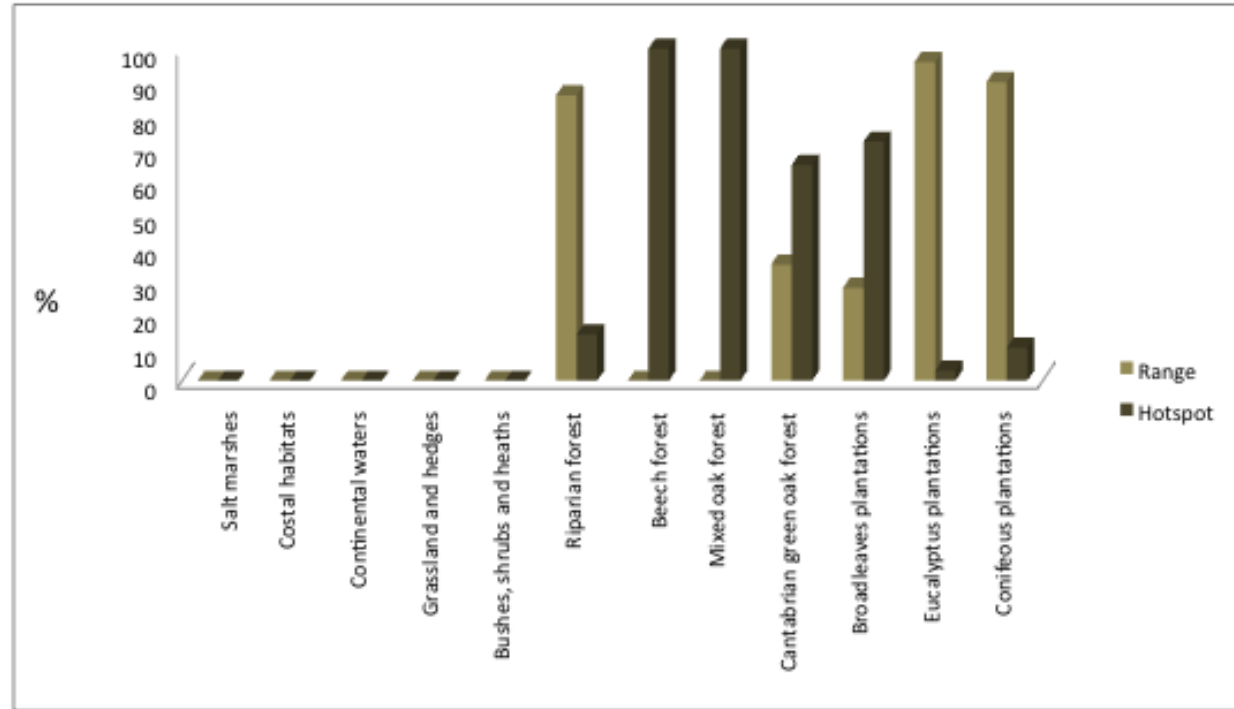
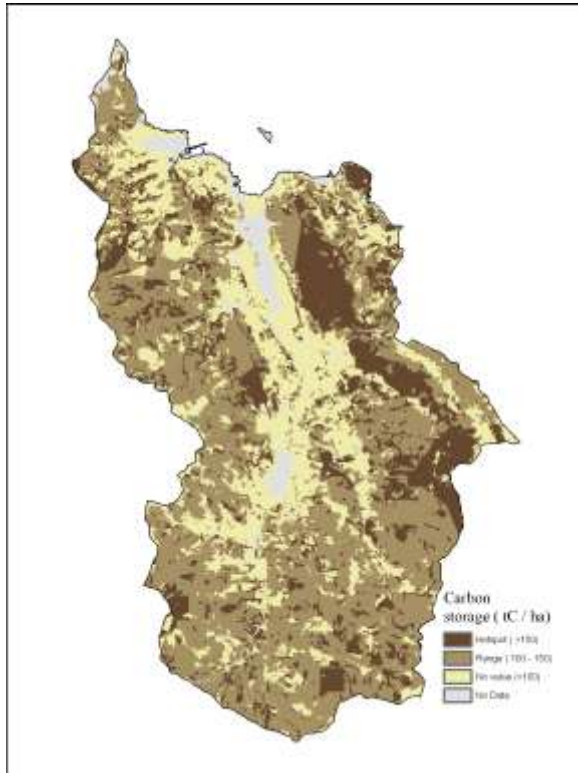


# Carbon storage

Range and hotspot

**68% overlap with Biodiversity**

Percentage of each ecosystem that is included in the ranges and hotspots



Nearly the total area of the natural forests contributes to the carbon storage hotspot. 10% of the coniferous plantations are included in the hotspot and 90% are include in the range.

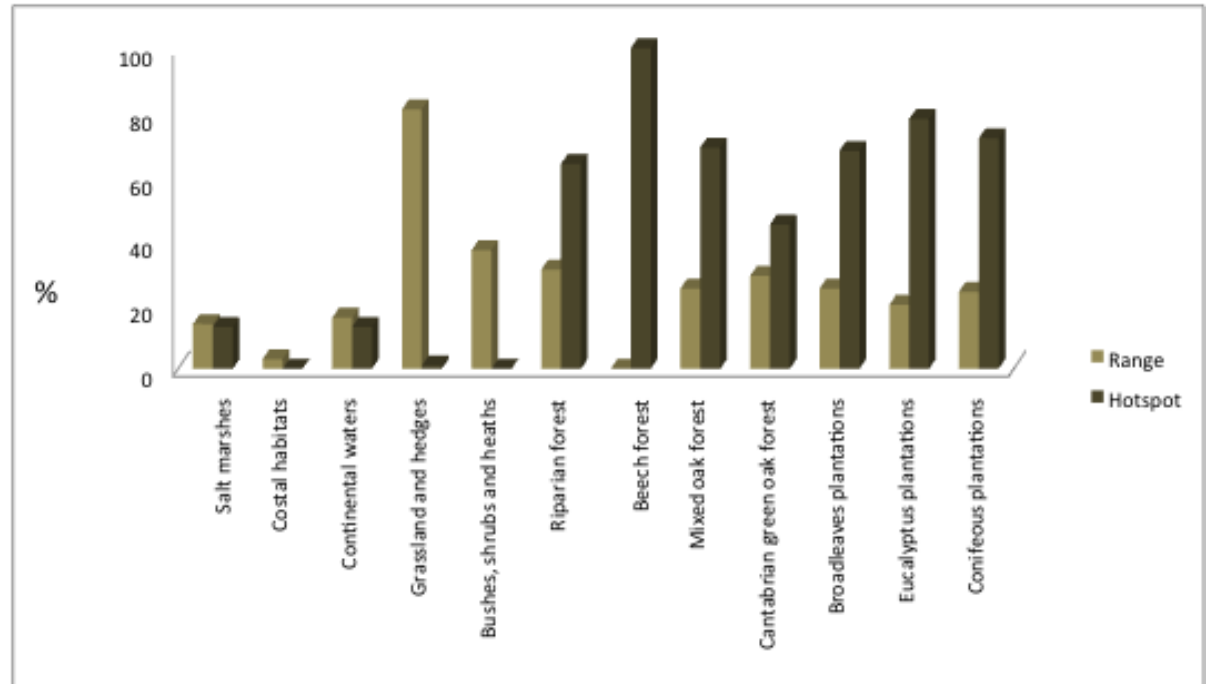
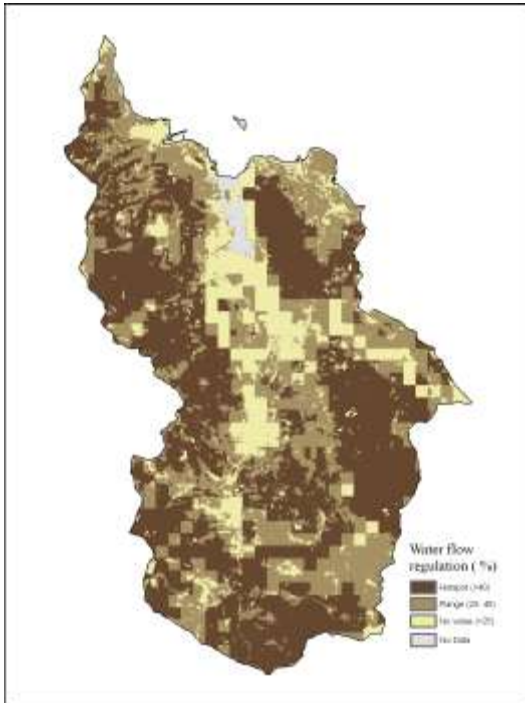


# Water flow regulation

Range and hotspot

**49% overlap with Biodiversity**

Percentage of each ecosystem that is included in the ranges and hotspots



The entire area of natural forests contribute to the hotspot. More than half of the area of forest plantations, are also included in the hotspot.

## 4- Conclusions

- Natural forests are the ecosystems that most contribute to biodiversity, carbon storage and water flow regulation
- Conservation of natural forests should improve biodiversity and ecosystem services
- **Conservation of biodiversity will ensure the provision of ecosystem services**
- Pine and eucalyptus plantations contribute to ecosystem services but have negative effects on the biodiversity
- **Conservation based only on ecosystem services might be detrimental to biodiversity**

Thank you