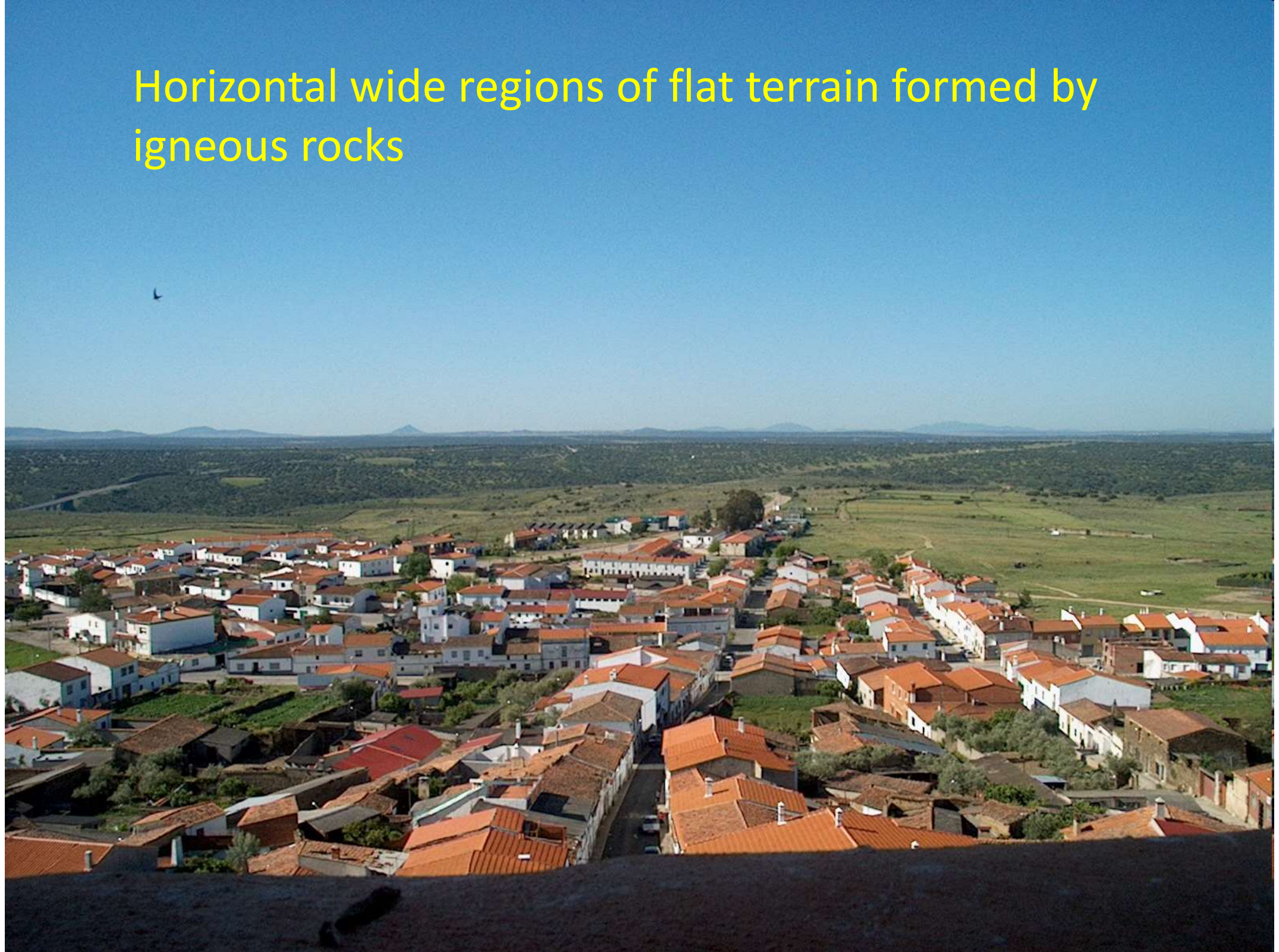


**The western “peneplains”
and
ancient mountains**



Horizontal wide regions of flat terrain formed by igneous rocks

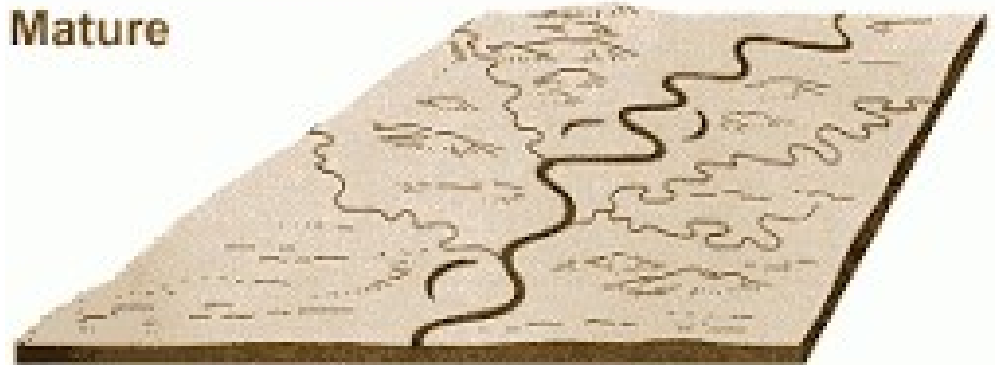


1. Resulting from long geological periods of erosion → final stage of **fluvial erosion** during times of extended **tectonic stability**.
2. Rivers usually show extensive meandering and braiding
3. Lateral erosion is dominant as the higher areas between the streams are eroded.

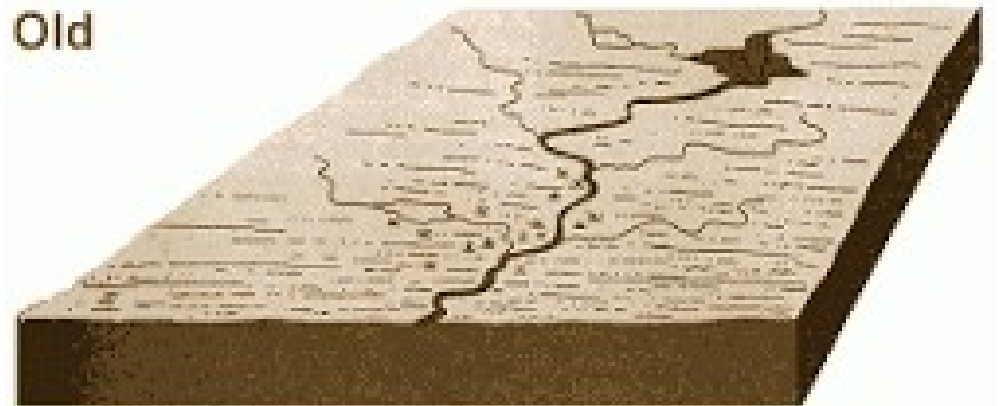
Young



Mature



Old



“Inselbergs” when resistant rocks are present



1. If the area is subsequently uplifted due to any tectonic process, without internal deformation,
2. The streams will again begin downward erosion - creating incised meanders, water gaps ...



An aerial photograph showing a deep, winding river valley. The river is a dark blue color, flowing through a landscape of steep, rocky slopes covered in dense green forest. The slopes are almost vertical in some places, and the river meanders through the center of the valley. The overall scene is one of a rugged, natural landscape.

Arribes (also named arribas or arribanzos)

Banks of the rivers in the SE Zamora and NE Salamanca (Castile and León)

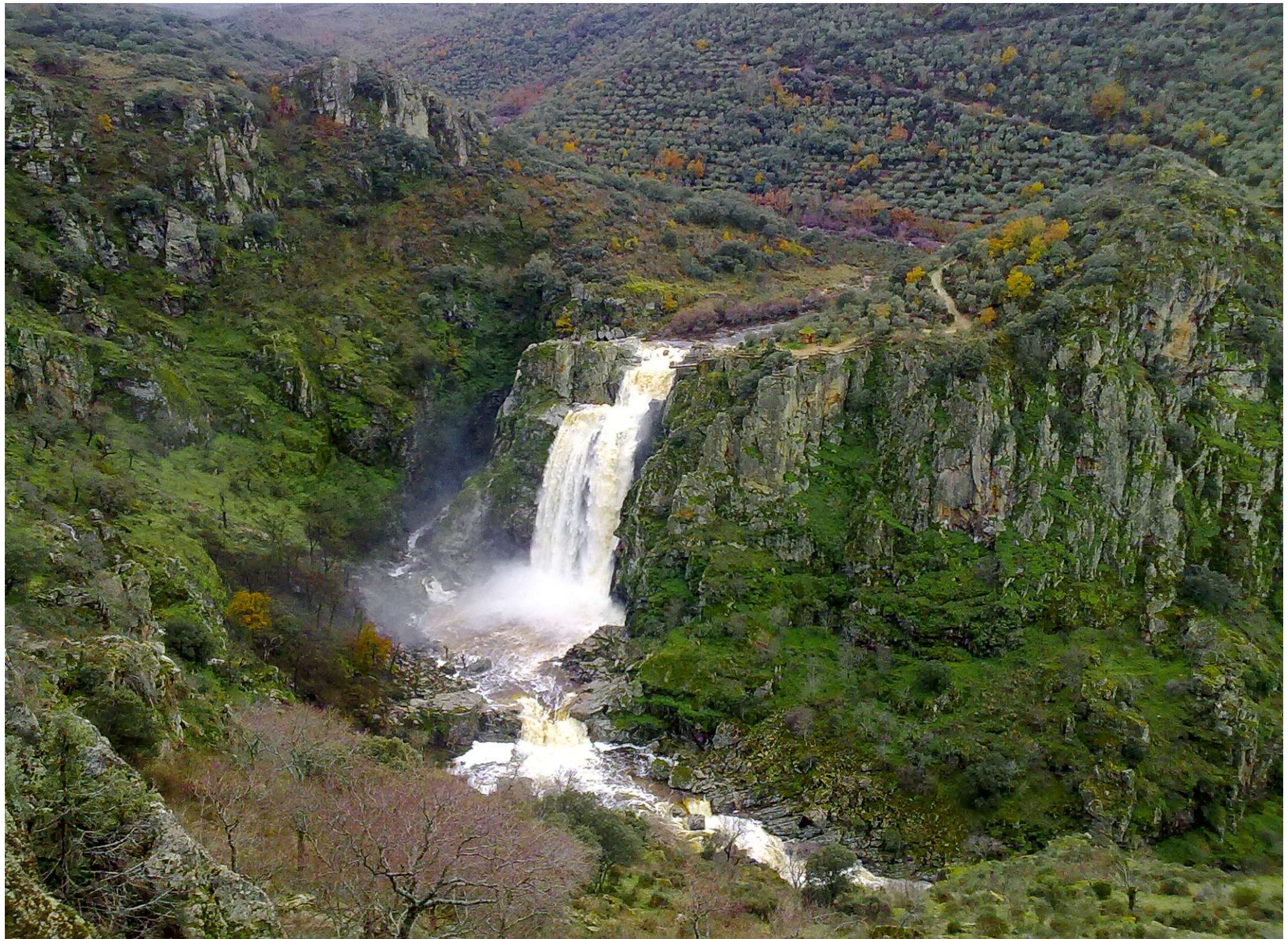
Rivers: Águeda, Douro, Esla, Huebra, Tormes and Uces.

Deep valleys with almost vertical slopes

ARRIBES

1. The most notable characteristics of this natural space are its **biodiversity** and range of **watercourses**.
2. The landscape is characterized by two **areas**:
 - A **low altitude area** (the canyons). Duero canyons are especially deep in the stretch shared with Portugal, as the erosion found better conditions to act than in previous zones.
 - Another at **higher altitude** (the Peneplain where towns are located).
3. Geologically, the most common terrain is composed by low-quality ground and many granite outcrops, with few areas of fertile floor around the streams.







ARRIBES

1. The canyons have been used to build some **reservoirs**, some of them owned by Portugal).
2. They all are for **electricity production**, making Los Arribes one of the most important hydroelectric areas in the Iberian Peninsula.



ARRIBES

1. The river Duero forms the **national boundary between Spain and Portugal**.
2. The high value of this ecosystem has been recognized by two protection figures:
 - **Arribes del Duero Natural Park** (2002) is a protected area in western Spain, covering 106.105 ha in the autonomous community of Castile and León.
 - The Portuguese side is also protected under the **Douro International Natural Park**.
3. This area is the home for many endangered **bird species** such as black stork and is known for a well-preservation of the **native flora** (Holm oak, common oak, juniper, broom or thyme).

Doctor Zhivago

<https://www.youtube.com/watch?v=XBRYXQjo8w8>

The World is Your Workplace

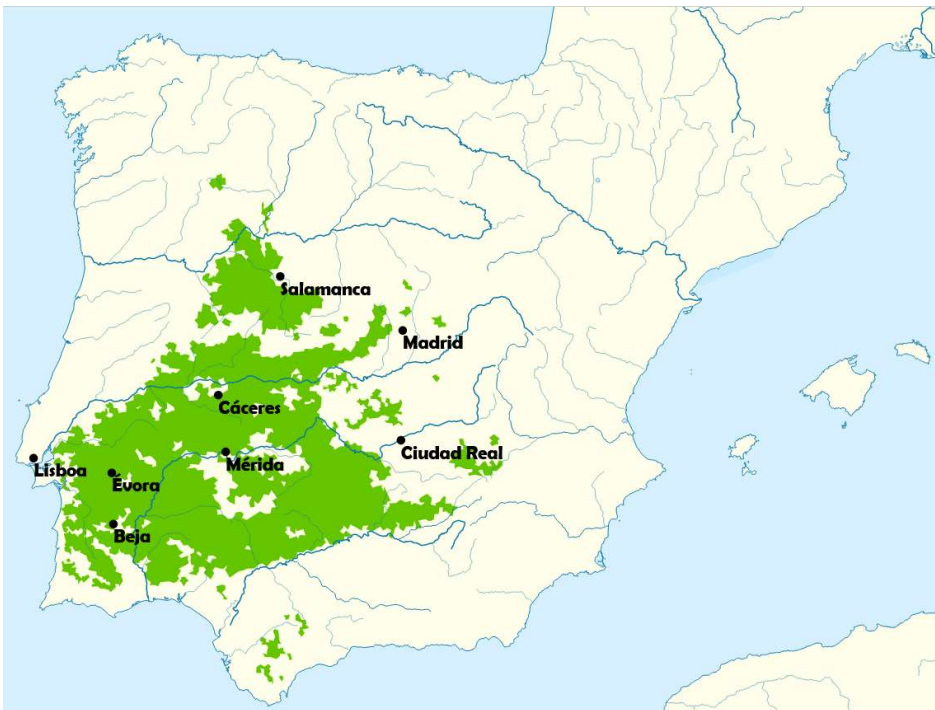
<https://www.youtube.com/watch?v=fffKFw5FqXY>

THE DEHESAS



WHAT IS A DEHESA

1. A multifunctional, **woodland agrosylvopastoral system** (a type of agroforestry).
2. A **ecosystem**: provides not only a variety of foods, but also wildlife habitat for endangered species such as the *Spanish imperial eagle*.



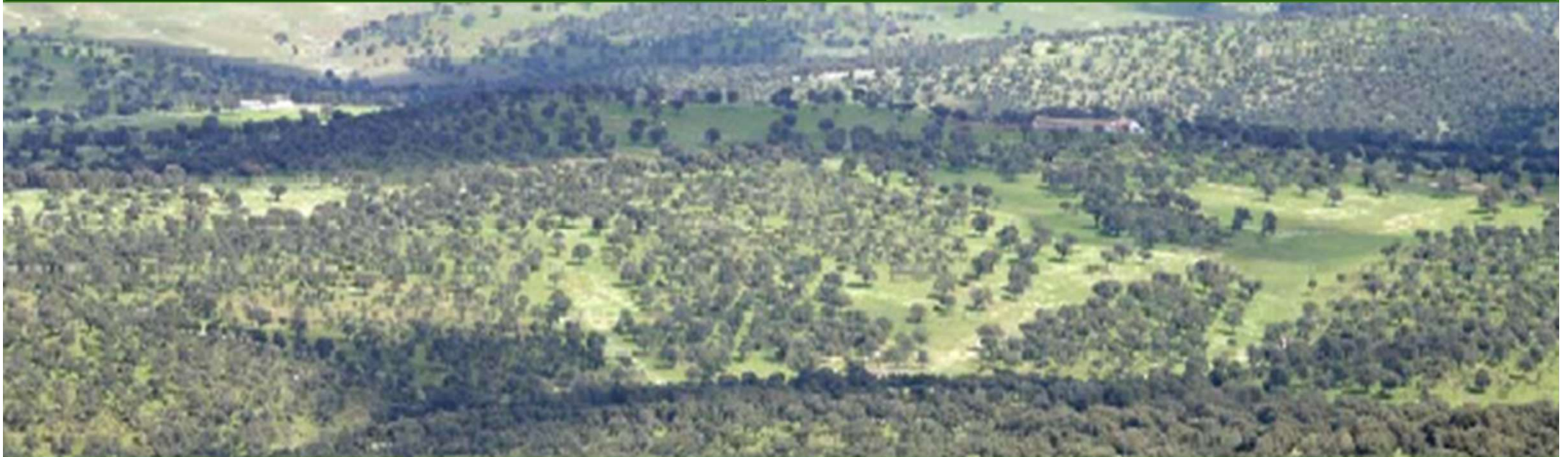
NAME: comes from the Latin 'defensa' (fenced) referring to land that was fenced, and usually destined for pasture.

LEGAL STATUS: may be private or communal property (usually belonging to the municipality).

WHERE: southern and central Spain (2,5-3 mil has) and southern Portugal

Main features:

- Mediterranean climate
- Soils of low fertility
- Flat to undulating topography
- Pastures - main production
- Tree cover 5-75%
- Complex secondary production



A result of a long co-evolution between man and a harsh environment. It uses a strategy of efficiency and diversification of structures and products for taking an advantage of every natural resource with a minimum input of energy and materials (San Miguel, 2007)

A ECOSYSTEM

1. Derived from the Mediterranean forest ecosystem

Trees belonging to the genus
Quercus (oak)

Grassland for grazing cattle,
goats, and sheep

The most usual oaks are

- holm (*Quercus rotundifolia*)
- cork (*Quercus suber*)
- Other oaks: *Quercus pirenaica*, *Quercus faginea*.

Besides, other tree species such as beech and pine trees.

The location of the species depends on geographical location and elevation.



Dehesas provide:

Products

Services and functions



A AGROSYLVOPASTORAL SYSTEM

- Used **primarily for grazing**, they also produce a variety of products, including **non-timber forest products** such as mushrooms, honey, cork, and firewood, and even for **hunting**.
- A **great economic and social importance** because of
 1. The large **amount of land** involved
 2. Its capability in **maintaining rural population levels**. The area of dehesas could be termed "**marginal**" because of
 - Both their **limited agricultural potential** (due to the poor quality of the soil)
 - A lack of local industry, which results in **isolated agro-industries and very low capitalization**.

Products

❑ One of the major sources of income is cork.

❑ Oaks

1. Are managed to live for about **250 years**.
2. Are **spaced** to maximize overall productivity by balancing
 - Light for the grasses in the understory.
 - Water use in the soils
 - Acorn production for pigs and game.



Products

- ❑ The **understory** is usually cleared every 7 to 10 years
- ❑ To prevent the takeover of the woodland by shrubs (Cistaceae), often referred to as "jara", or by oak seedlings.



Products

Tree products:

- Acorns
- **Cork**
- Fuel wood and biomass
- Others



Cork oak → cork stoppers
Collected every 9-10 yrs.
Sustainable and profitable



PRODUCCIÓN DE CORCHO EN 2008 POR PROVINCIA (toneladas)



Products

Tree products:

- **Acorns**
- Cork
- Fuel wood and biomass
- Others



Quercus ilex: Oct-Nov
Quercus suber: Nov-Jan

Acorns are the most nutritionally valuable food resource for a number of mammals, birds and insects, including game and non-game wild species (Greenberg, 2000)

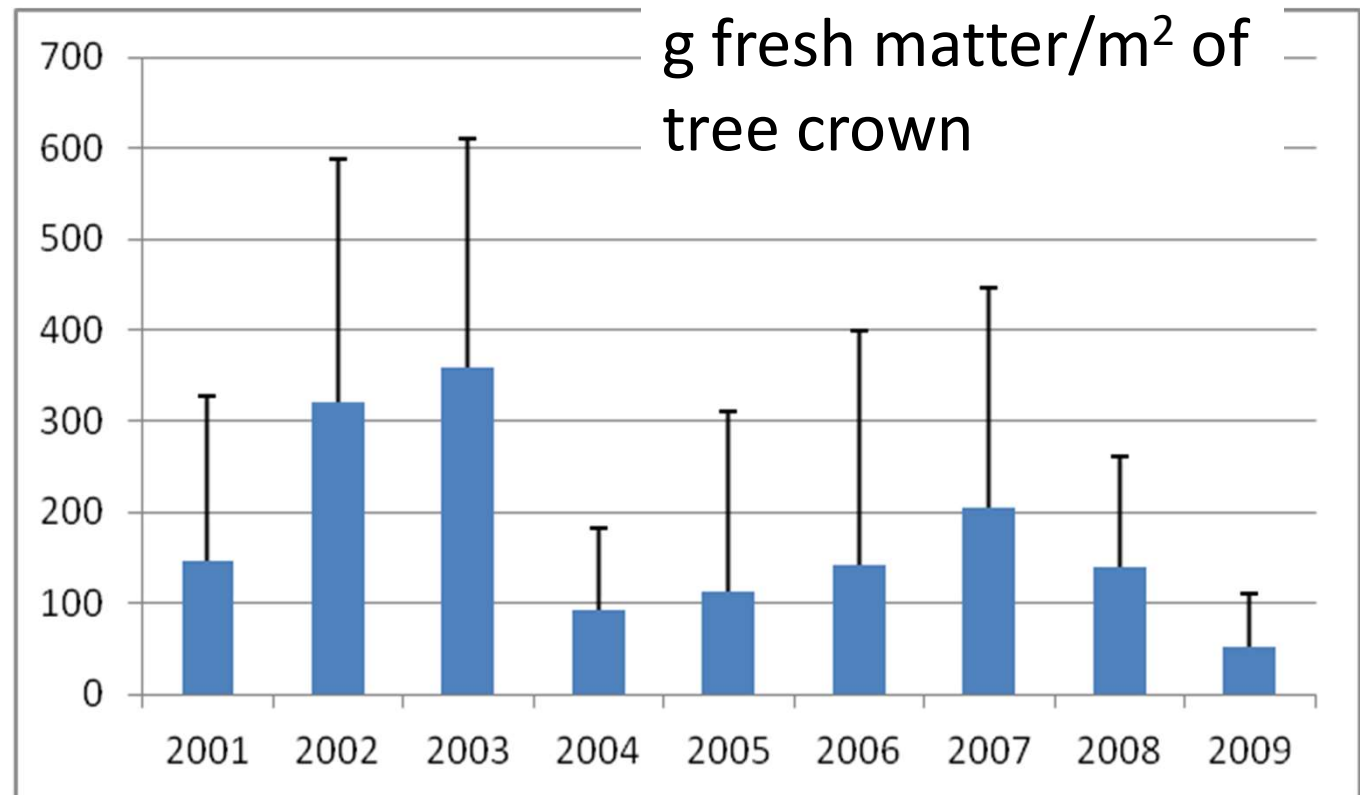
Products

Tree products:

- **Acorns**
- Cork
- Fuel wood and biomass
- Others



Quercus ilex: Oct-Nov
Quercus suber: Nov-Jan



Acorns - high variability over sites, years, individual trees

Products

1. The **different types of oak** are crucial in the continuous production of **acorns**.
 - The bulk of the harvest comes from the holm oak (*Quercus rotundifolia*): from November to February
 - That season would be too short (the acorn-production period extends from September almost to April).
 - Earlier harvests of Pyrenean oak (*Quercus pyrenaica*) and Portuguese or gall oak (*Quercus lusitanica*),
 - Late cork oak (*Quercus suber*)



Products

1. **Montanera**: the last phase of breeding the Iberian pig before slaughter, exclusively by acorn.
2. The **high carbohydrate** content of the acorn will be transformed into the famous fat, and the herbs add the peculiar perfume, of all the Iberian derivatives.
3. The pig graze freely in the dehesa and are constantly moving around, burning calories. This, in turn, produces the fine bones (base of the quality of its meat)
4. Each pig requires approximately 1 ha of pasture



Products

1. Only the most suitable specimens that have completed the previous phases are used for the montanera.
2. The animals enter this stage with about 90 kilograms of weight and can finish it with 160, gaining an average daily weight of about 0.67 kg.



Products

1. The **Iberian pig**: traditional breed.
2. Familiar name **pata negra** ("black hoof"): can be either red or dark in colour... if black ranging from dark to grey, with little or no hair and a lean body
3. Exhibits a good appetite and propensity to obesity, including a great capacity to accumulate intramuscular and epidermal fat.



Products

1. Meat products from Iberian pigs are a good example of a high-quality and highly prized meat product.
2. Ham produced from Iberian pigs fattened with acorns and air-dried at high elevations is known as **Jamón ibérico** ("presunto ibérico", or "pata negra" in Portuguese)
3. Sold for premium prices, especially if only acorns have been used for fattening.



Products

Tree production

- Acorns
- Cork
- **Fuel wood and biomass**
- Others

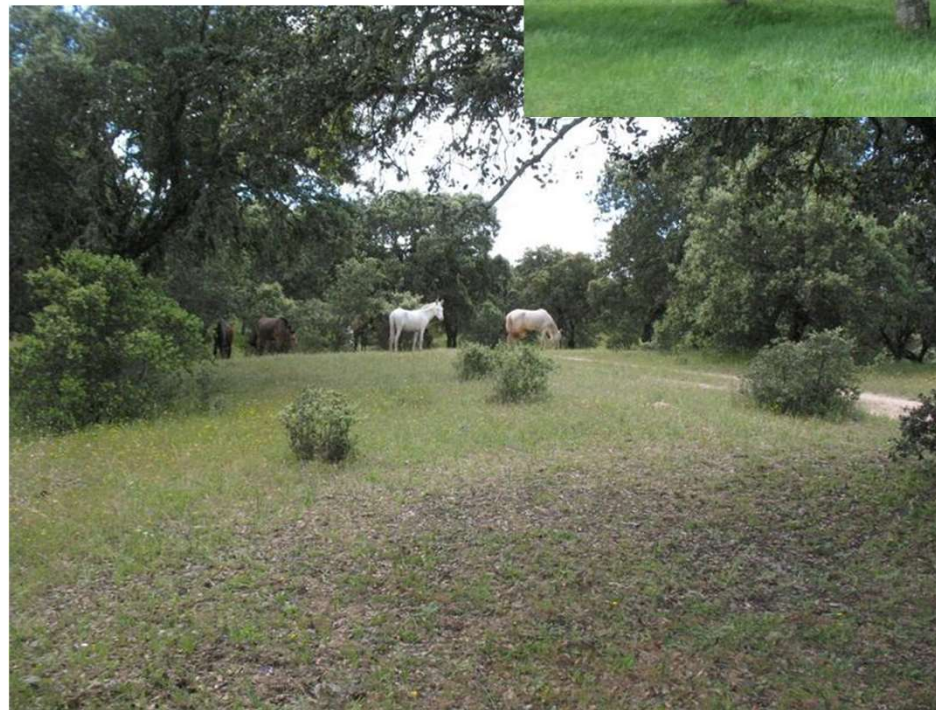
Traditional operation to obtain
fuel wood
Low benefit
Supposed to increase acorn
production



Products

Tree production

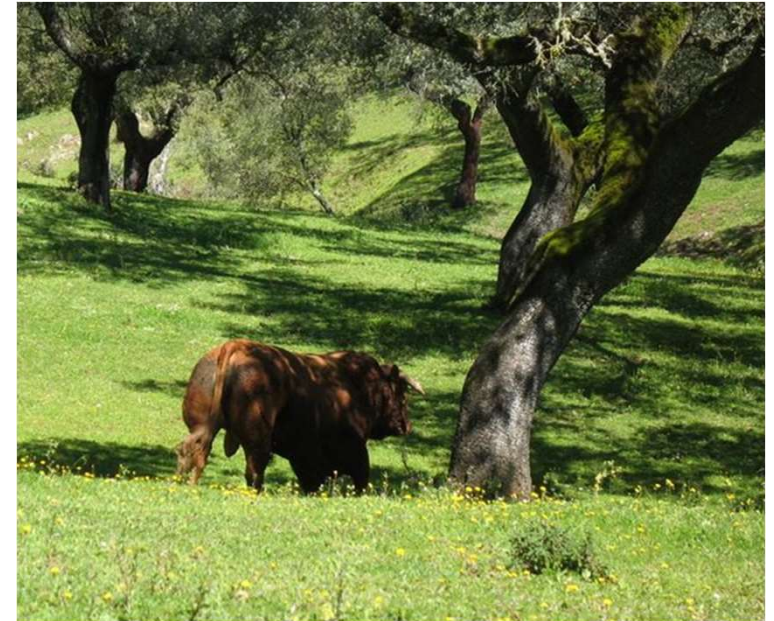
- Acorns
- Cork
- Fuel wood and biomass
- **Other from trees**
 - Leaves
 - Lichen
 - Honey



Products

Production not related to trees:

- **Grass (shrubs) → pasture**
- Mushrooms
- Crops
- Other: livestock, game



Three types of pastures with different composition and productivity



Products

Non-tree production:

- Grass (shrubs) → pasture
- **Mushrooms**
- Crops
- Other: Livestock, Wildlife (incl. game)



Cistus ladanifer



Some shrubs important for
mushroom production



Amanita ponderosa



Products

Non-tree production:

- Grass (shrubs) → pasture
- Mushrooms
- **Crops**
- **Other: Livestock, Game**



Crops (only better soils)
rotation: 1 yr crop & 3 yr fallow

Sale of hunting rights (for wild boar, red deer) is an important income source

Products

1. Sale of hunting rights also represent significant income sources.
2. Periodic hunts in the dehesa are known as the montería.
3. Groups attend a hunt at a private estate and wait at hunting spots for game to be driven to them with dogs. They usually pay well for the privilege, hunting wild boar, red deer and other species.





Mapa 10.1: Capturas totales de caza mayor por provincia en 2019.

Dehesas provide:

Products

Services and functions

Trees & grassland

Man-made traditional elements

- Fences
- Farms - buildings
- Livestock infrastructure

- Shade
- Soil protection
- Landscape quality
- Carbon fixation
- Biodiversity
- Genetic diversity



**High
recreational
value**



Why have dehesas been preserved?

Poor soil quality

- Shallow
- Stony
- Low fertility



-> Unsuitable for
more specialised
and intensive land
use



Why have dehesas been preserved?

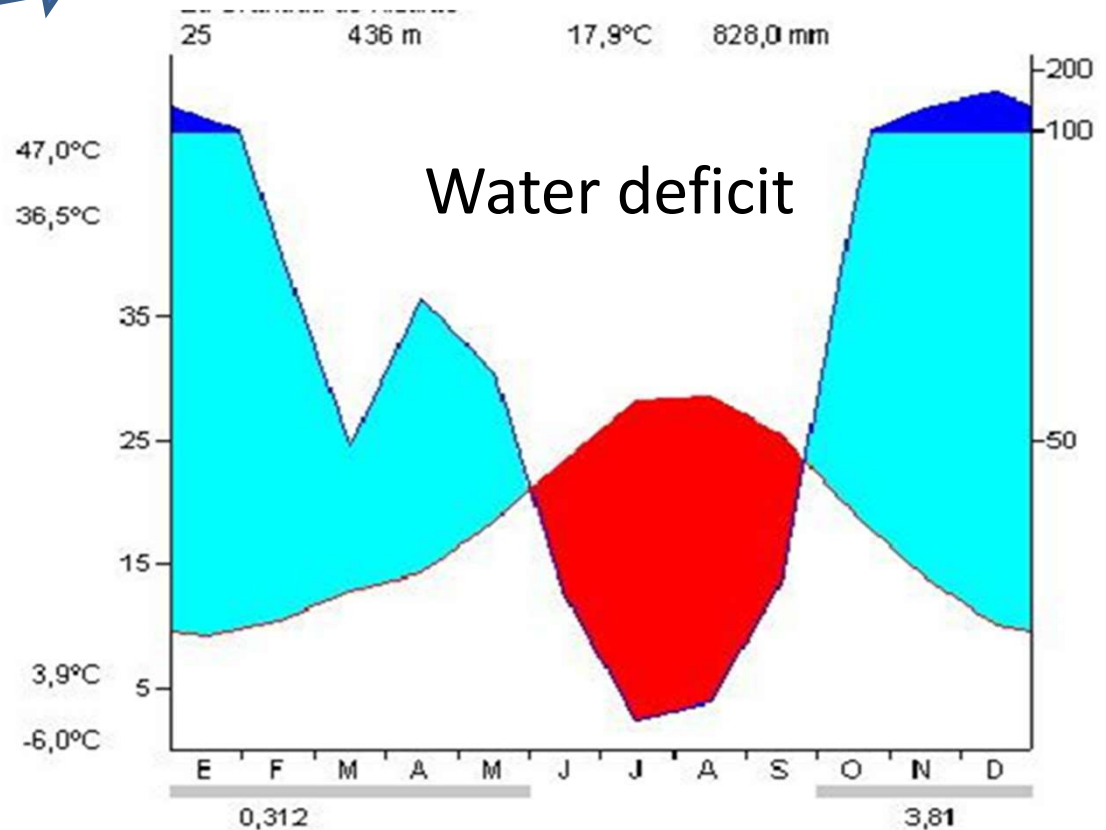
Poor soil quality

Mediterranean climate

- Hot & dry summer
- Mild rainy autumn and spring
- Rainy (not so cold) winter

Most grass species die in summer.
Only tree leaves available as feed

Pasture yield is uneven during wet season



Why have dehesas been preserved?

Poor soil quality

Mediterranean
climate

Adaptations

Medium quality rangeland

- Extensive production of locally adapted breeds of livestock
- Hunting areas
- Transhumance (livestock migration)
 - South ⇔ North
 - Plains ⇔ Mountains



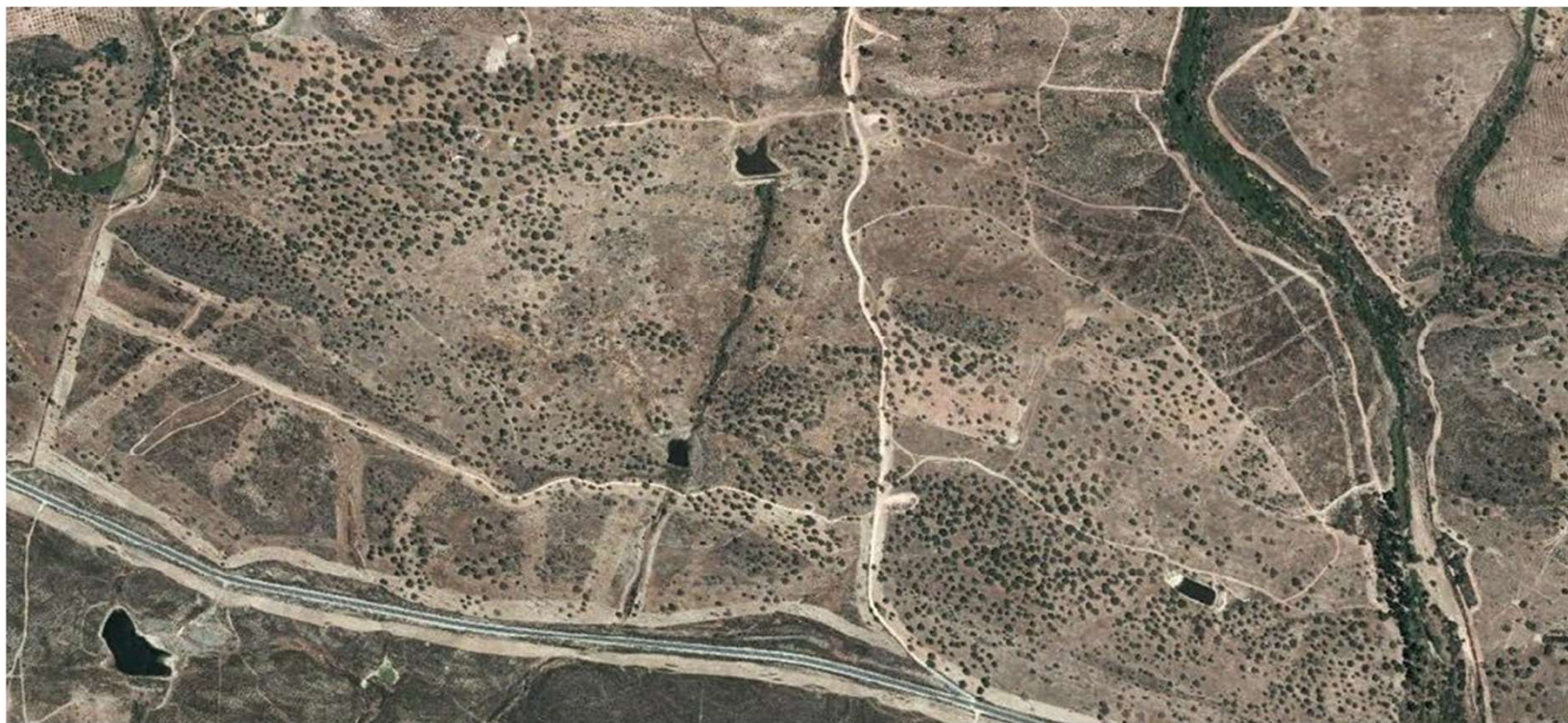
Dehesa = a centuries-old, economic solution adapted for a poor environment



Are dehesas REALLY preserved?



1980



2010

Are dehesas REALLY preserved?

Some dehesas have persisted since the Middle Ages

Many dehesas have been created in the last 150 yrs.

Many dehesas have transformed to:

- Rangeland (no trees)
- Shrubland → eroded stony soil
- Farmland → modern farming (better soil areas)
- Forest restoration or production → those evolving previously to shrubland, protected areas and other low profit areas



Are dehesas REALLY preserved?

Pasture degradation
No tree regeneration
Soil compaction

Main
threats

Overgrazing:

- Livestock stays continuously (even with supplementary feed)
- Too heavy grazing (even with rotations)

Undergrazing → shrubs

Loss of traditional breeds



Are dehesas REALLY preserved?

Pasture degradation
No tree regeneration
Soil compaction

Main
threats



Tree decay:

- Climate change
- Disease *Phytophthora cambivora*
- Pest *Cerambycidae*

Degradation

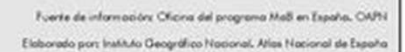
- Soil erosion
- Loss of traditional buildings
- Loss of tree density
- Landscape devaluation

No private
resources to
reverse
situation

Dehesas as protected areas

Habitat Directive
92/43/EEC

Dehesas: man-made ecosystem considered as “Special interest habitat”



Dehesas as protected areas

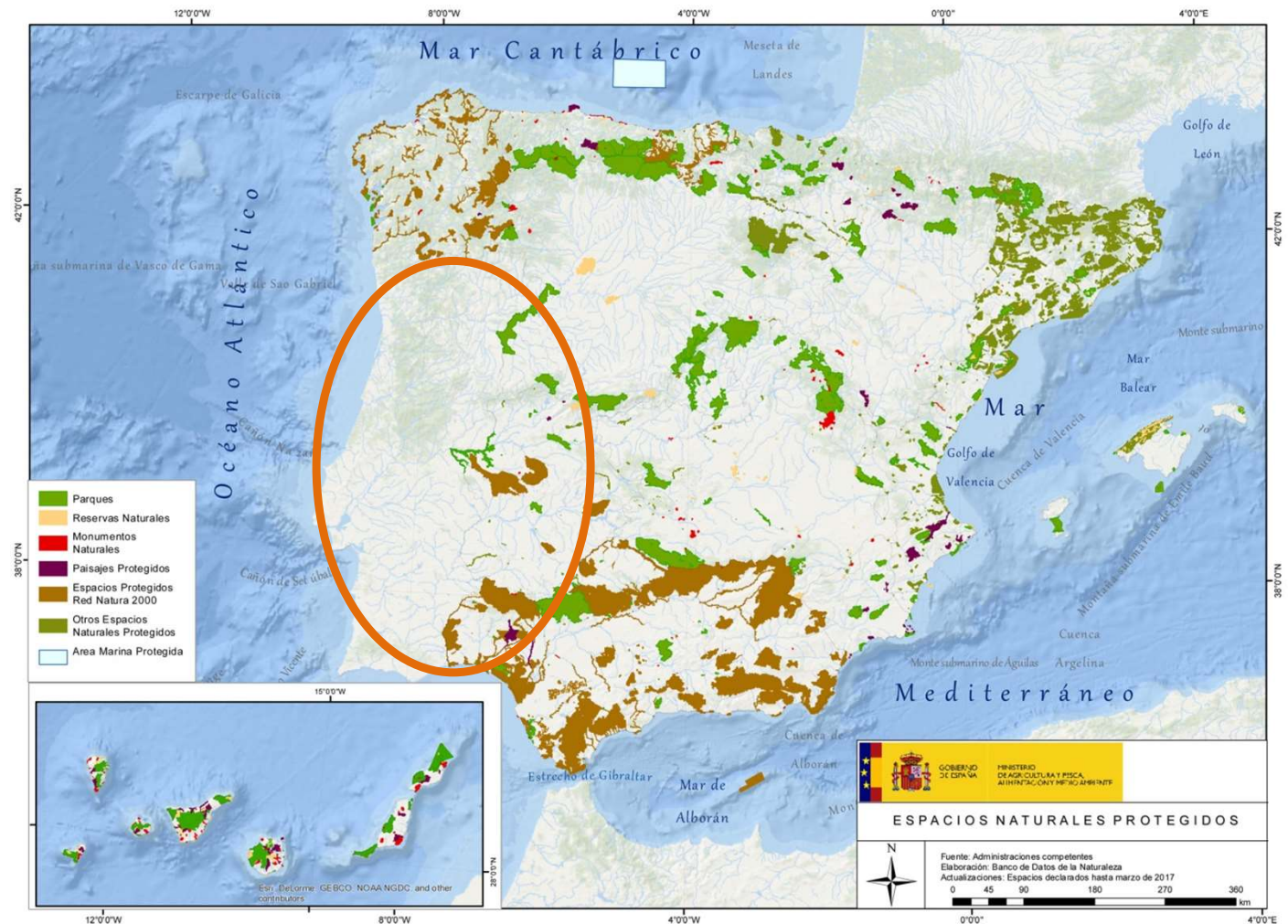
In Spain:

30% of land protected

Many protected areas contain dehesas

Regional governments promote special regulations

BUT the mainstream agricultural policy supports mainly intensive specialised production, not multifunctional systems



Dehesas as protected areas

A great number of plant species: 30% of the vascular plant species of the Iberian peninsula. Rare animals: Iberian lynx, black stork, otter, dormouse. Birds of prey: Cinereous vulture, Spanish imperial eagle, short-toed eagle, sparrowhawk, peregrine falcon.



Management and conservation of dehesas

1. Acknowledge social and ecological services → increase public funding

2. Recover tree densities

- Better livestock control and management
- Natural or artificial regeneration
- Leave natural forested and shrub areas
- Re-establish transhumance of livestock



Management and conservation of dehesas

1. Acknowledge social and ecological services → increase public funding
2. Recover tree densities
3. Research on pest and diseases
 - Plants resisting fungus
 - Knowledge of disease mechanisms
 - Improved management



Management and conservation of dehesas

1. Acknowledge social and ecological services → increase public funding
2. Recover tree densities
3. Research on pest and diseases
4. Increase value of products
5. Protect against fire, erosion
6. Protect landscape
7. Protect biodiversity



Local breeds



Improve
sustainability



FINAL REMARKS

There is debate about the origins and maintenance of the dehesa, and whether or not the oaks can reproduce adequately under the grazing densities now prevailing.

At least a hectare of healthy dehesa is needed to raise a single pig, and since the trees may be several hundred years old, the prospects for reforesting lost dehesa are slim at best.

<https://www.youtube.com/watch?v=7kvCn9lg7o>

<https://www.youtube.com/watch?v=jPqbWk0R5w4>