

Riparian Vegetation of the Iberian Peninsula. Composition and structure.

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1. Introduction

The riparian vegetation can be defined as the vegetation influenced by the existence of the river. In flat areas it can expand kilometres away from the channel while in steeper areas can stick to a few meters from it.

In comparison with the surrounding areas, the riparian environment can be characterised by the following features:

- ✓ Higher water availability
- ✓ Higher environmental humidity
- ✓ Less severe temperature extremes as a result of water and vegetation smoother effect.
- ✓ Soil dependency on fluvial regime (migration or sedimentation of different materials, erosion...)

Ideal vegetal distribution along the river follows two different axes:

1. Longitudinal (following the river line): In response to the altitudinal gradient, species distribute according to their optimum climatic conditions. The slope of the river line and the fluvial regime (frequency of floodings, runoffs and drought periods) varies with the altitude (Fig. 1), conditioning the species distribution.

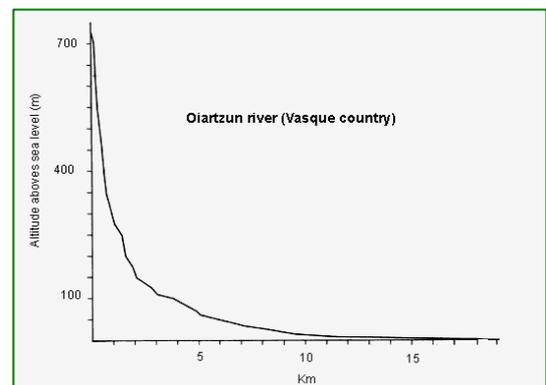


Fig. 1. Longitudinal section of a typical short mountain river.

2. Transverse section: Species distribution depends on the distance of the surface to the phreatic water table, therefore to the distance to the channel (the topography takes here a lot of importance conditioning the extension of the riparian vegetation). Accordingly, the following zones can be distinguished:

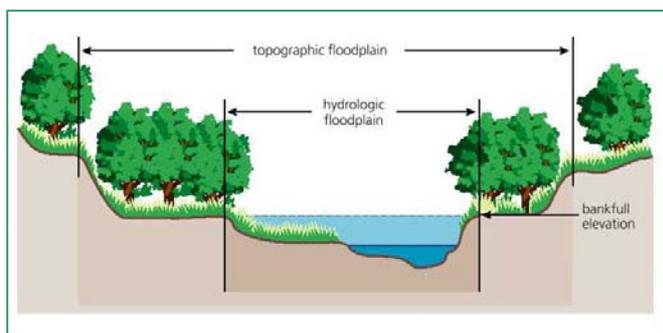


Fig. 2. Transverse section with definition of the river zones.

- ✓ *River line*; where aquatic and first line phreatic plants can be found.
- ✓ *Hydrologic floodplain*; home of the second line of phreatic plants.
- ✓ *Topographic floodplain*; water table available to the species with deeper root system (mainly arboreal species).

Nevertheless these definitions, we have to be aware of the natural complexity of the river environments, topography, species competition..., which makes the former concepts difficult to observe in the field. Instead, mixed patches of the defined transverse bands can be found. This is enhanced by the river ecological function, as it works as natural seed-dispersing corridors. Not only because the water transport but of the existence of a continuous environment conditions.

2. Principal river communities in the Iberian Peninsula.

Two different biogeographic regions existing in the Iberian Peninsula give way to different formations. The Eurosiberian region is characterised by no summer drought period, and a snow to pluvial-snow fluvial regime. On the other hand, the vegetation of the Mediterranean region is conditioned by a summer drought and a rain dependent fluvial regime.

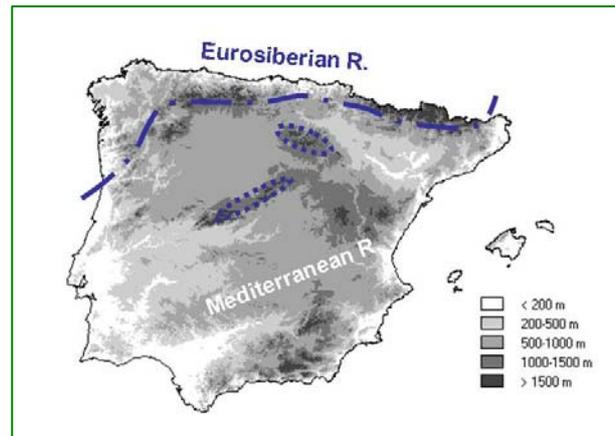


Fig.3. A rough division of the two biogeographic regions existing in the Iberian Peninsula.

A. Riparian vegetation in the Eurosiberian Region

In these areas, the high mountain can be distinguished from the mid and low sections. Here, the erosive processes, the high irradiation, the low temperatures in winter and high temperatures in summer, the snow..., hamper the establishment of the vegetation found in lower areas.

Birch formations:

Patches of vegetation dominated by *Betula alba* or *B. pubescens* can be found in the high mountain with *Corylus avellana*, *Populus tremula*, *Salix caprea*, *Aconitum*, *Lilium martagon*...etc. However these species can be found in the mid river sections.

Willows:

The most important willow species that appear in Eurosiberian region are *Salix atrocinerea*, *Salix caprea*, *Salix triandra*, *Salix eleagnos*, *Salix fragilis* and *Salix cantabrica*. They high vegetative regeneration and helophytic aptitudes allow them to colonise unstabilised river margins or boulder river substrates. However they tend to be replaced by other types of vegetation when these conditions change. They are important in the high mountain areas, although they can be found elsewhere along the river line.

Atlantic alders:

These dominate in mid and low Eurosiberian areas below 1200 m a.s.l., although a few individuals can be found up to 1600 m. Their roots are adapted to be submerged in the water, allowing these species to set in the first line of the river margin and hydrophytic soils. They do not grow on calcified substrates, although it is not a problem in the Eurosiberian region where the water rinses the calcium. They form shadow forests along the river line with few shrubs.

beneath (*Corylus avellana*, *Cornus sanguinea*, *Laurus nobilis*...). *Carex* species are dominant at the herbaceous layer.

Mixed forests:

Between 1200-1600 m a.s.l., alders are replaced by forest rich in deciduous species such as *Fraxinus excelsior*, *Betula* sp., *Populus tremula*, *Acer pseudoplatanus*, *Acer opalus*, *Acer campestre*, *Ulmus glabra*... etc.

Ashes formations:

Although these communities are difficult to find as they have been generally destroyed by the humans, *Fraxinus excelsior* potentially occupy the topographic floodplain in the mid and low river sections. Actually, they are usually found with *Quercus robur* and other deciduous species (*Castanea* sp., *Acer pseudoplatanus*... etc.).

Boulders:

In these substrates difficult to colonise at the base of the mountains, some willow species, *Hippophae rhamnoides* and *Myricaria germanica* are between the most common species.

B. Riparian vegetation in the Mediterranean Region

In the Mediterranean region a river lead to big differences with the surroundings. The smoother temperatures and higher humidity let water dependent species (deciduous Eurosiberian species or even species of subtropical origin as *Rhododendron ponticum*) to establish. As a result, higher biodiversity and higher complexity of the ecosystems structure are found in the Mediterranean riparian habitats.

Here, the river can also be divided in three sections (high, mid and low sections), although more relevant is the length of the drought period. This defines differences the river with a short summer-drought period (where deciduous species dominate -*Salicaceae*, *Oleaceae*, *Ulmaceae*, *Betulaceae*-), to the rivers where most of the year bear no water above the surface (so called *Ramblas*, well distributed along the Mediterranean shore).

Willows:

Formations established on the first line of the river margin from the birth to the mounth of the river. They are well adapted to high water table fluctuations. Their ability to propagate through vegetative reproduction and the flexibility of their branches make them suitable to places with frequent runoffs. *Salix atrocinerea*, *Salix purpurea*, *Salix eleagnos* (on carbonated substrates) and *Salix salviifolia* are the most common species.

Mediterranean alders:

In the Mediterranean region, *Alnus glutinosa* formations appear in places with no summer drought along the mid and low river sections. The lower rain in these areas makes carbonated substrates not to be washed. Therefore, alders are nor found on these substrates. They set on the first line of the river basin, or just after a narrow willow band. A number of lianoid plants and a rich herbaceous layer (Pteridophyta, *Carex* species), accompany the Mediterranean alders.

Poplars:

Populus alba and *P. nigra* develop along the mid and lower river section, generally on the second line after willows and alders. *Populus alba* is more abundant on substrates rich on clay and below 1000 m. *Populus nigra* takes relevance above this altitude on different substrates. Convoing poplars, *Salix alba*, *Salix fragilis*, *Salix triandra*, *Fraxinus excelsior*, and *Rosaceae*, *Rhamnaceae* and *Oleaceae* shrubs are found.

Ashes:

Fraxinus angustifolia grow well on the topographic floodplain along the mid to low river section on sand to clay substrates. Therefore it is more frequent on the western half of the Iberian Peninsula. Ashes grow behind the alder line with other sub-Mediterranean plants like *Frangula alnus*, *Rhamnus catharticus*, *Corylus avellana*, *Prunus spinosa*, *Sambucus nigra*... etc. Their branches are highly appreciated by humans to feed the cattle and make different objects (chairs, baskets...). As a result, after years of branch cutting (3-5 m high), and in combination with pastures often offer a *dehesa*-like landscape.

Elms:

Ulmus minor formations grow on the topographic floodplain along the mid to low river section, generally over the rich calcified substrates of the eastern half of the Iberian Peninsula. However they have been usually cut down to be substituted by all kinds of cultivations (crops, rice, market gardens. Additionally, the Dutch elm disease (caused by *Ceratocystis ulmi* fungus) has recently attacked elm formations reducing seriously its extension.

Tamarix formations

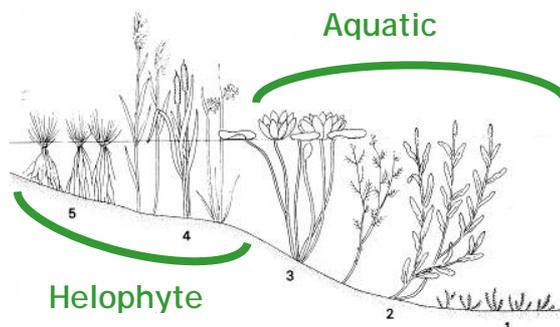
On dry environments, halophytes plants as *Tamarix* grow on salted-marl substrates. They constitute open shrub-like forests, accompanied by *Chenopodiaceae*, *Gramineae* (*Arundo donax*, *Phragmites australis*, *Saccharum ravennae*, *Imperata cylindrica*) and *Nerium oleander*.

Ramblas

This type of rivers are characterised by a strong summer drought, which makes water flow under the surface. The vegetation has deep root to reach the water table, and is adapted to frequent runoffs that during spring and autumn occur. Perennial esclerofilous plants (e.g. *Nerium oleander*), xeromorphic deciduous plants with tiny leaves (e.g. *Tamarix* sp.) or hairy leaves (e.g. *Vitex agnus-castus*), thorny shrubs (e.g. *Flueggea tinctoria*)... etc, are between the plants that compose the opened formations dwelling in the *ramblas*.

C. Lentic habitats

Lakes, deltas and marshes swamps, wetlands... all these habitats are lentic habitats, in which plants are adapted to low flooding occurrence, few oxygen, fine sediments, high concentration of nutrients... the vegetation that lives in these habitats is composed of aquatic (completely under the water) or helophytic elements (only the root system is under the water).



Cyperaceae (5), *-Typhaceae*, *Juncaceae*, and *Gramineae*-(4) are the most commons between the helophytes. *Nymphaeaceae* (3), *Potamogeton* (2) *Ranunculaceae* and several *Algae* (e.g. *Chara* -1) can be found between the aquatic ones.

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