# Natural Zaragoza

## A mosaic of landscapes and biodiversity

Zaragoza life natural

Con la contribución del
Instrumento Financiero LIFE
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Zaragoza
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## INTRODUCTION

Zaragoza is an extensive, exceptional and privileged territory of almost 1000 km$^2$ (the ninth largest municipality in Spain) located in a semiarid environment upon one of the most important gypsum outcrops of the Peninsula.

The city of Zaragoza is located within the confluence of 3 rivers: the Ebro River, natural vertebral of the territory and its river effluents, the Gállego and Huerva rivers. A diverse mosaic of landscapes shaping this territory (rivers, thickets, steppes, gorges and forests…) modelled by a large history of human activity where traditional uses have left an important cultural impression.

In 2012, the Council of Zaragoza decided to take another step towards conservation objectives regarding the value in the importance of the natural capital by presenting a project to the European Commission to create, manage and promote a green infrastructure for Zaragoza. The project is LIFE Zaragoza Natural.

This complex and ambitious project wants to establish a basis for the city of Zaragoza to be able to articulate in a short and long term and efficient, integrative and sustainable way an urban growth and territorial development with the conservation of environmental values. And at the same time offering new job opportunities within the area of green economy.

The project LIFE Zaragoza Natural offers a unique opportunity for citizens to know, enjoy and be closer to the natural patrimony and to have experiences that will enrich and fortify their links with it, as well as an identity and a feeling of belonging to this exceptional territory.

The development of the Green Infrastructure not only maximizes biodiversity but also provides multiple benefits: improving air and water quality, contributing to stop climate change and ultimately to improve the quality of life and people's health.

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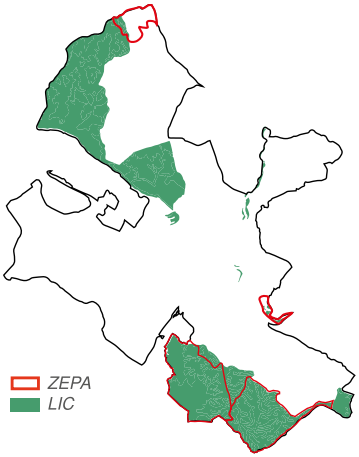
## The web connecting life in the city

The municipality of Zaragoza, of almost 1000 km2 is the ninth more extensive of Spain. A territory of contrasts and varied ecosystems.

The richness of this valuable natural patrimony has received a European acknowledgment so that from 1992 38% of its municipality is under the protection of **Red Natura 2000**: Special Protection Areas **(SPA)** and Sites of Community Importance **(SCI)**.




The Green Infrastructures composes a network of interconnected ecosystems that maximizes the biodiversity, improving the quality of air and water contributing to stop the climate change and ultimately improving the quality of life in cities.

However, like in many cities, the urban expansion processes over the last decades have provoked negative **impacts,** like the fragmentation of ecosystems.

Nowadays, it has been demonstrated that if we want to maximize and maintain biodiversity is not enough just to protect spaces in an isolated manner but it is essential to maintain the connection between themselves, meaning, the potentiation of ecological corridors where the flora and fauna can move around.

*Parque del Agua Luis Buñuel (Water Park of Luis Buñuel)*

In 2013 a project started in Zaragoza called **Green Infrastructure** driven by the European Union and understood as the **ecological network** of natural, rural and green urban spaces giving multiple environmental, social and economic benefits.

According to this information, the Council of Zaragoza compromised with Europe in the development of the **Project Life Natural Zaragoza** whose objective is to improve some of those spaces, wetlands, steppes and natural forests and to **interconnect** them together with parks and urban green spaces.

*Web of the LIFE project*

## A territory of contrasts

The **variety** of landscapes and colours constitutes one of the most flamboyant elements of the **municipality of Zaragoza.** In all of them exists a common protagonist either for its abundance or for its shortage: **water**.

The greens of the river banks and orchards and the ochres, browns and even whites of the steppes and the agriculture on dry land are a testimony of the natural and human history of our territory.

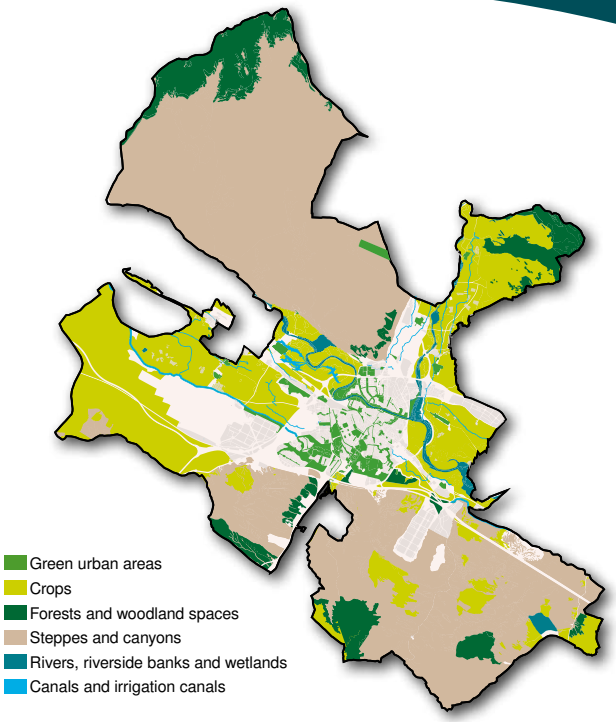
*Sabina in Peñaflor*

The **materials** that constitute this landscape were deposited twenty million years ago where an **interior sea** existed, literally enclosed by three geological barriers: The Pyrenees to the North, the Iberian ridge to the Southwest and the Coastal-Catalan ridge to the East. During periods of greater aridity, the evaporation was very high so salt precipitated as **gypsum** or **gem salt**. During the last stage of this period, a much wetter one, some **limestone** was deposited.

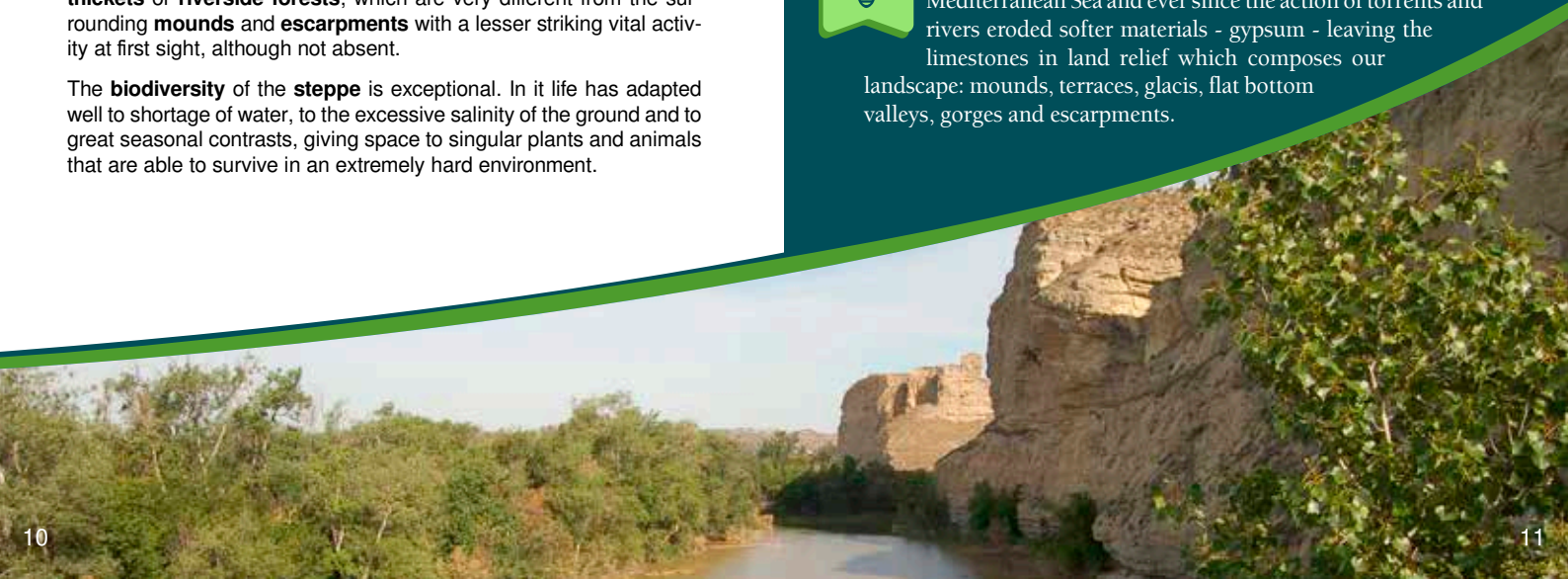
In this landscape, marked by land relief, materials, climate and the presence and absence of water, we can find different ecosystems in which life is created: **rivers and thickets, wetlands, forests and steppes.**

The rivers - great paths of life - provide exuberant environments as **thickets** or **riverside forests**, which are very different from the surrounding **mounds** and **escarpments** with a lesser striking vital activity at first sight, although not absent.

The **biodiversity** of the **steppe** is exceptional. In it life has adapted well to shortage of water, to the excessive salinity of the ground and to great seasonal contrasts, giving space to singular plants and animals that are able to survive in an extremely hard environment.




Five million years ago, the Ebro made its way towards the Mediterranean Sea and ever since the action of torrents and rivers eroded softer materials - gypsum - leaving the limestones in land relief which composes our landscape: mounds, terraces, glacis, flat bottom valleys, gorges and escarpments.



## Green space and life in the city of Zaragoza

The Ebro River crosses the city from the Northwest to the Southwest. Receives water from the Gállego River from the North, and from the Huerva River which runs below the streets of the city, from the South.

*Gállego riverside*

Three rivers with three different origins, with the Ebro River being the backbone, born in Cantabria territory; the Gállego River, with its Pyrenean waters and the river Huerva which starts at the foothills of the Iberian chain.

In this arid territory rivers provide a constant humidity allowing the existence of magnificent riverside forests or thickets that harbour an important rich flora and fauna as well as providing multiple benefits: they slow down the speed of the water streams when floods happen, it enhances the quality of the water and helps to fill up aquifers.

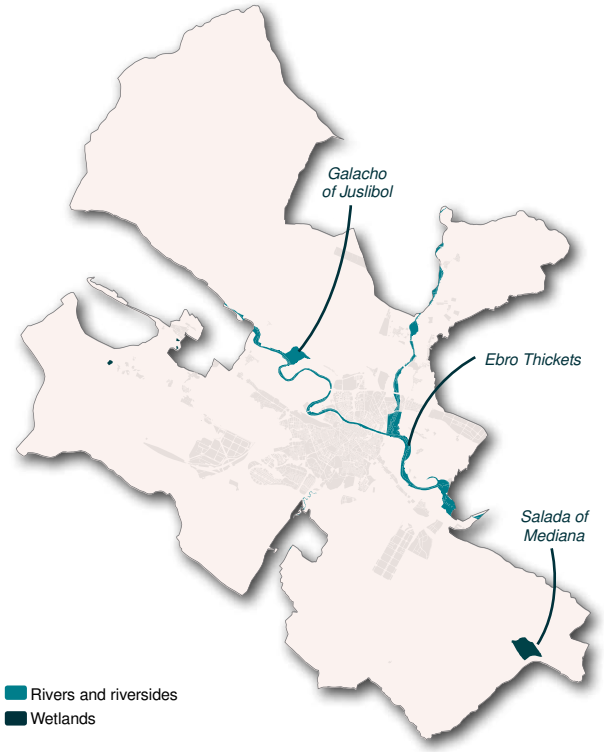
Those thickets have also an important cultural and emotional value. During a long time, they were used as a place for the celebration of parties and for meetings which today we would like to recover for the city to enjoy.

Rivers act like corridors allowing an exchange and a displacement of species that help to maintain and maximize the biodiversity.

Apart from rivers we can also count on wetlands:

• **Endorheic lagoons**: in the steppes, we have seasonal **salt lagoons**. An example of this is **La Salada**, also known as the **Sulfúrica**, which during the rainiest months shows a thin sheet of water.

• **The "eyes" of Zaragoza**: in the right terraces of the river Ebro some **sinkholes** are formed, a sinking of the land more or less rounded which appears when the subsoil materials dissolves (usually **gypsums**). Many of these depressions contain water, mainly coming from the contribution of the surplus of irrigations. They have been named **"eyes"** or **"rafts"** by the locals, with some examples like the **"balsa del Ojo del Cura"** or the **"balsa del Fraile"**. Others could come from the extraction of gravel like those of **Justibol** or **Larralde**, which it is believed to be from the result of an extraction of clays used for waterproofing the Canal Imperial of Aragon.




## The last meander abandoned by the river

The **Ebro River** - in its middle section - crosses the wider floodplain of its basin, creating a sinuous riverbed due to its low slope. These curves or meanders are not static so they evolve in such way that they create the "**galachos"**, word used in Aragon to determine the abandoned meanders by the river.

*Development stages*

The Ebro River at Alfocea, Monzalbarba and Juslibol boroughs' level, showed a meander next to an escarpment of gypsums. But this layout was modified by the natural dynamic of the river.

During 1961 happened the biggest water flooding of the XX century creating a flow of 4130 $m^3$ per second. When the waters receded, the river had taken a shorter path leaving a bank gravel preventing the water flow to run through its old riverbed: then the Galacho of Juslibol was formed.

During the 1970s in the Galacho's environment, gravels were extracted to be used for construction so creating depressions that reached the phreatic level then they filled with water thus creating a set of artificial lagoons that have been becoming natural over the times.

## The silting of the Galacho

The flooding of the river Ebro slowly provides sediments to the old riverbed or galacho reducing the depth and helping with the colonization of plants as **reeds** (*Phragmites australis*) or **reed mace** (*Typha sp.*).


They contribute with vegetal remains and its presence increases the retention of other sediments. When the soaking becomes less some bushes will appear like the Tamarisk (Tamarix sp.) and finally typical trees from a riverside like the Black Poplar (Populus nigra), White Poplar (Populus alba), Willow (Salix alba), Ash Tree (Fraxinus angustifolia) and therefore being a natural process of silting that will create a riverside forest or thickets.

The level of water in the old riverbed and its lagoons depends on the flow of the river since they are connected with the flow by the phreatic level.

## The singularity of the Galacho

The greatest singularity of this space is the fact that it is located in the confluence of different ecosystems: the river, the steppe, the escarpments and the orchards creating a space of diversity of flora and fauna. On the other hand, escarpments act as a viewpoint from where to contemplate the floodplains of the river and human activities in the territory.

The Galacho of Juslibol is managed by the Council of Zaragoza and is a space of great educative value.


*Kingfisher*

## Valuable jungles at our homes doorsteps

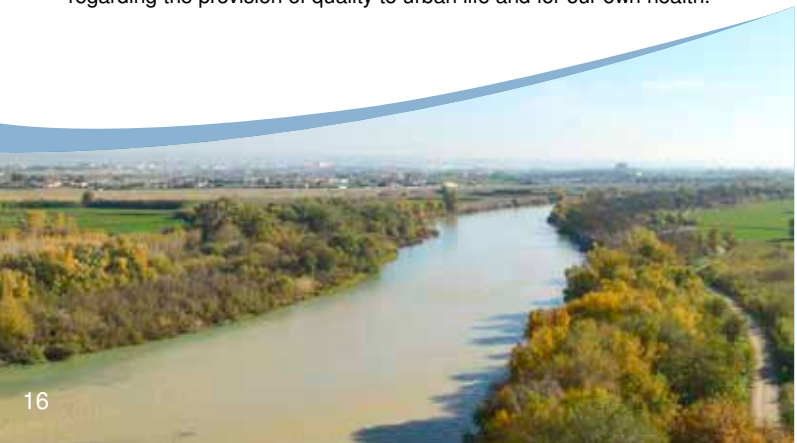
Zaragoza maintains enviable **fluvial** ecosystems, as its **22 thickets** demonstrates and which are distributed along 36 km and which are more than 700 hectares of land.

In a space of great aridity, the presence of permanent fluvial watercourses transform these zones in oasis with abundant riverside vegetation. Places where the **fauna** moves around and uses it as a breeding and feeding area. Moreover, constitutes a fundamental element for some **birds** that use the riverbed and riverside as a refuge where to rest during their long migratory trips.

*White poplar*

Our thickets and riversides provides us with multiple benefits. The shores with well developed riverside forests are able to soften the effects of the water rises slowing down the speed of its waters. Furthermore, absorbing salts and dissolved nutrients through its roots and becoming real natural filters. When the waters are high the phreatic level of the river rises, accumulating water like a sponge, then releasing it during droughts and giving more flow to the river. The annual contribution of silt which is rich in organic materials transforms the river shores into an immensely fertile ground. This is the reason why the grove of Zaragoza has traditionally been rich in nutrients.

However, people not always understands and values the natural wealth of these riverside spaces and the important function they have regarding the provision of quality to urban life and for our own health.






In Zaragoza, some thickets are our urban forests, they are privileged spaces for walking and to enjoy nature. Its aspect changes enormously from one **season** to another. During the hot summer, they appear as green corridors with abundant vegetation thus generating a humid microclimate which becomes a refuge for numerous species. In Autumn, it acquires multiple shades of ochre and yellow becoming the road of life, where some birds start their migration to warmer areas or for the arrival of others that will stay until the spring. During Winter, most part of the riverside vegetation loses its leaves and with the water rises some river banks become flooded, depositing in them some silts and nutrients which fertilize the forests. This substratum will contribute during the spring when the vegetation is resurfacing again and then closing in this way the annual circle of our rivers.

*Distribution of the vegetation in a thicket*

Not all thickets of the river Ebro are the same. They appear in the shape of impenetrable jungles (like the thickets of the **Franc-es** and the **Partinchas**) or with the aspect of extensive prairies scattered with trees and riverbank bushes (as the thickets of **Picatiel** or **La Cartuja**).

This difference is conditioned mainly by **farm animals** since in those thickets where farm animals penetrate to graze and consuming the green shoots generating areas similar to meadows.

*Martinete*

## A seasonal Salt Lake in the middle of the steppe

In the middle of the steppe, on the most south easterly area of the municipality of Zaragoza a **seasonal lake** appears – Sulfurica (Sulphuric) or Salada (Salt lake) of Mediana- of great historical, cultural and ecological interest.

*Salicornia*

In a basin without drainage (endorheic basin) like the Salada, the water from sparse rains is the main reason for the accumulation of salts.

Being a very arid area, during the driest and hottest months of the year, the amount of water evaporating is greater than the one being received then changing the water sheet into a **muddy** terrain covered by a **whitish salt crust** with numerous crystallizations shining under the sun. This crust is mainly made of **magnesium and sodium sulfates** a mineral exploited at the end of the XIX and beginning of the XX centuries but probably already used much earlier as it has been suggested in some texts found and in some maps from those times.

The sodium sulfates extracted from this lake, named "La Sulfúrica" ("The Sulfuric"), were used during its exploitation to create diuretic and purgative mineral water and receiving a gold award during the Universal Exhibition in Paris in 1900. The exploitation of this minerals was maintained-alternatively - until 1952 when it ceased entirely.

The great accumulation of salts will condition the vegetation found in it. You can notice that plants are succulent because they retain salty water inside to balance the great salinity of the ground and to facilitate the ascension of water.




This type of plants are called **halophiles** from the Greek: Halo (Salt) and Philes (Lover of) The salinity varies around the lake with very high levels on the areas closest to the Salada and decreasing the content of salt as we go further away from it. The flora around it, is positioned in **vegetation rings**, with each one of them containing species adapted to the different salinity levels: the more saline areas are notorious for the presence of the **Salicornia** (*Salicornia Patula*) the **sodas** (*Suaeda Vera*) and the **Limonium**. In the areas where the salinity levels are less notorious the typical **espartos** or **albardines** (*Lygeum Spartum*) start to appear and **Tamarisks** (*Tamarix Boveana*).

*Precipitation cycle and dissolution of the Salada*

This space is the habitat for typically steppe like birds like the flamboyant **Gangas** (*Pterocles Orientalis*) and other lacustrine birds like ducks and limicles.

*Ortegas*

In this environment we can let our imagination flow and travel 3,500 millions of years to find, at the bottom of the lagoon, bacterial communities similar to the first forms of life that populated earth.

## A patrimony of great cultural and natural value

The city of Zaragoza at its surroundings own an exceptional **hydraulic patrimony** which is a reflection of its history and of how its **irrigation canals** and **canals** have shaped the city.

The **irrigation canals system** around Zaragoza – although many of them are underground – originate from four rivers: **Ebro**, **Huerva**, **Gállego** and **Jalón**.

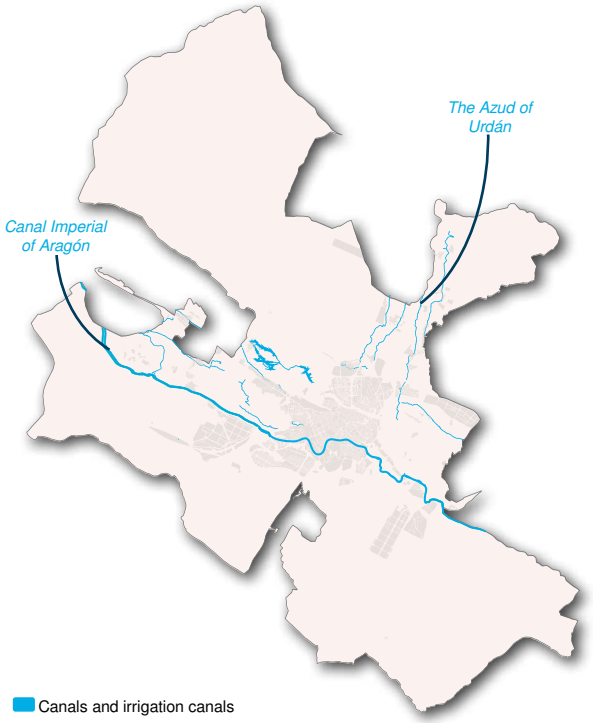
The irrigation canal of **Almozara** should be the one to stand out since it originates before 87 BC taking its waters from the river Jalón. This irrigation canal permitted the irrigation of part of the right margin of the river Ebro until the Canal Imperial of Aragon was constructed which incremented the irrigable surface.

*Irrigation canal of La Almozara*

The development of the **irrigation canals** system in Zaragoza allowed for a varied type of **agriculture** to appear and to be maintained which became an important resource for the city.

Not only as water resources for irrigation but also for the everyday life around them, which, traditionally, will allow to carry out many domestic activities. So the irrigation canals will become a meeting point before running water was created where to wash clothes or for collecting water for consumption.

The arrival of the **Canal Imperial of Aragón** in Zaragoza in the XVIII century sets out a before and after regarding the supply of water by channels, since its construction permitted the important increase for more hectares to be irrigated and to improve the supply of water to the city and its surroundings.




Muslim culture played a big role in Zaragoza regarding care and development of its hydraulic infrastructures. Our vocabulary clearly denotes it, with words like acequia (irrigation canal) which comes from the Arab *al-saqiyah* (irrigator), azud, from the Arab *as sad* (barrier) or azarbe from the Arab *sarab*.

## The fourth river of Zaragoza

The origins of this hydraulic infrastructure comes from before the **XVI** century, during the reign of king Carlos I. This explains the name of "Imperial". The technical difficulties and the deficiencies in the initial planning impeded the arrival of water to Zaragoza until the 30th of November 1786.

In December of the same year the **Fuente de los Incrédulos** (Fountain of the incredulous) was open constructed by order of **Mr. Ramon Pigantelli** the architect for the construction of the Canal and as a reference to all those that did not believe in the success of his venture.

The architecture linked to the **Canal Imperial of Aragon** (locks of Casablanca and Valdegurriana, beacons, aqueducts….) has been maintained like a true open air museum of one of the most ambitious civil engineering within the Spanish illustration.

The conclusion of the Canal Imperial became an authentic agricultural revolution for the city. The surface of cultivated areas became larger, thanks to the new contribution of water which avoided alimentary crisis. Very frequent during those times.

The people from Zaragoza remembers the old uses going on around this water course by doing the traditional Bajada del Canal (navigating down the Canal). A festive journey where improvised boats made by community organizations go down the Canal around the city, claiming back the recovering of its natural and cultural values.

Not only the **agriculture** benefited by the arrival of this canalization of water but also improved the **transport of goods and passengers** becoming a key resource for **leisure** and social activities in Zaragoza.


During the XIX century, the Canal become a key part for the Industrial revolution because around its banks, flour and metallurgic industries appeared which were the ones that boosted the economy of Zaragoza which before was only based in agricultural activities.

The water of the Canal soaks the banks allowing in this way for some areas like around the park of PLAZA the growing of thickets very similar to the natural water channels and functioning as a refuge for wild life.

Along the route of the Canal the most abundant trees are the **Plátano de Sombra** (Bushy Plane tree) (*Platanus hispanica*) a specie massively planted in Europe at the end of the XIX century and beginning of the XX century.

*Anade real*

The Canal Imperial has also become a refuge for one of the most threatened fluvial species the **river clam** *Margaritifera auricularia*. This bivalve – abundant until the XVIII century in all European rivers – has been progressively disappearing until becoming in **danger of extinction**. Its presence has been noted in a few areas of Spain and France being the Canal Imperial of Aragon – with more than 4,000 specimens – the one sheltering the most important population in the word.

*Reproduction of the Margaritifera*

# The Azud of Urdán (Gállego River)

## The source of the Urdana irrigation canal

On its way through Zaragoza from its left river bank the Ebro River receives the Pyrenean waters of the **Gállego River**, one of the most important affluent. Before ending in the river with the largest current in the Iberian Peninsula, this river has travelled almost 200 km going through a dip of 2014 metres.

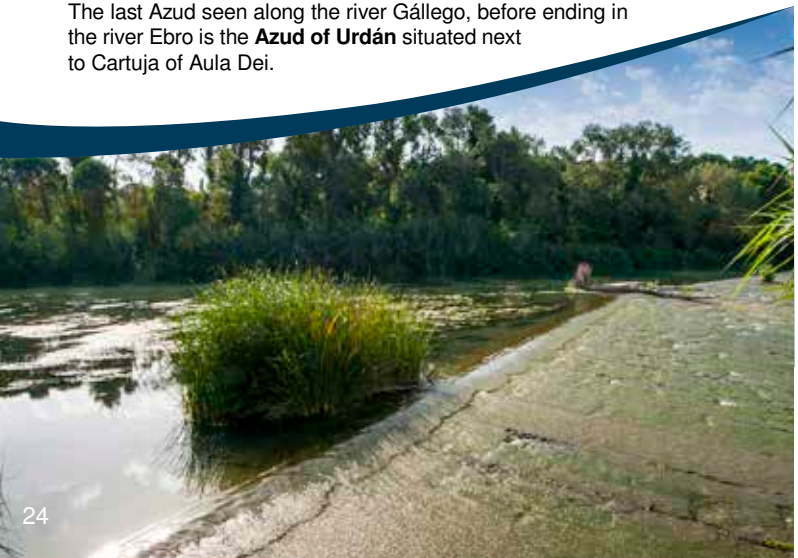
Its current is conditioned and controlled by the irrigation needs, since it feeds with water numerous cultivated lands from its source to its mouth, watering by irrigation system almost the entire left margin of the river Ebro when going through Zaragoza.

*Poplar leaves*

The name of the river Gállego comes from the Latin denomination "*Flumen Gallicum*" referring to its origin from Gaelic lands. Old sources point out that some Gaelic inhabitants emigrated to the Iberian Peninsula, through the Pyrenees, following the course of a river which they will call later Gállego.

The obtaining of the waters from the river has been made since old times through the construction of **Azudes**, usually made with a small wall that makes a dam to raise the water, with part of this water going into the **irrigation canals**.

The last Azud seen along the river Gállego, before ending in the river Ebro is the **Azud of Urdán** situated next to Cartuja of Aula Dei.






From this point the **Urdán or Urdana irrigation canal** waters, along its 30 km, most part of the enclosed areas within the left margins of the rivers Ebro and Gállego.

*Azud of Urdán*

This Azud and the irrigation canal that comes from it are, probably, of Arab origin, since the first references referring to these structures appear in books written during the XII century. Next to the water sheet maintaining the Azud, a well preserved thicket can be seen, making this point an ideal place to rest and to enjoy a peaceful moment.

The Cartuja of Aula Dei was founded in 1563 by Don Hernado of Aragon, archbishop of Zaragoza the grandson of the Catholic King and Queen. Also in its typical gothic architecture, the oil murals painted by Francisco de Goya y Lucientes during 1772 and 1774 stand out. Although some scholars insist that they were not finished until 1781. Of the 11 murals painted, sadly, only 7 were preserved due to time deterioration after the Mendizabal confiscation in 1835.

## Agriculture with much history

During many centuries, the agriculture development in Zaragoza made good use of the resources obtained from the environment and being the presence or lack of water what has conditioned the different kind of crops that could be cultivated.

The fertility of the alluvial land given by the fluvial courses during floods along with a complex irrigation system made in pre Roman times and the work of farmers during millenniums, allowed, nationally, the existence of one of the most important orchards. The chronicles of the XVI century describe the city as the **"Satiated Zaragoza"** alluding to the abundance of crops.

Conversely on those areas most separated from the rivers, lack of water has force the growing of dry farming crops like cereals, almonds, olives and even vines which are predominant around most of the municipality.

The set of the irrigation system network and its complex system to handle water, towers, traditional homes around the traditional irrigation area and the local varieties which have adapted to our climate and land, are part of our history which is important to recover and value.

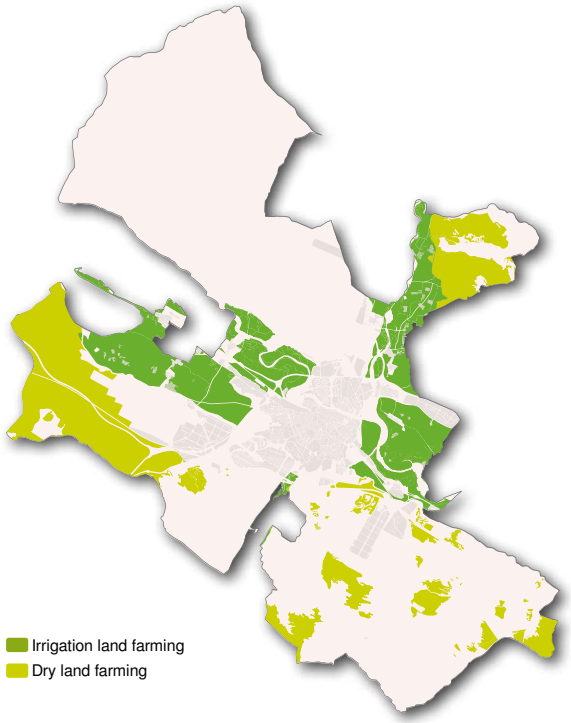
Today, the great majority of consumed food in cities, rarely have been grown in nearby areas. A great amount comes from crops from thousands of kilometres away, when we have fertile land which today is growing alfalfa and corn for exportation.

In Zaragoza, this tendency is being invested upon through a **Farming Project LIFE 0 Km** driven by the **Zaragoza Council** with European, collectives and associations support. To encourage through it, is **"the proximity ecological horticultural production"** to provide the city.

*Zaragoza farming produce*

The recovering of proximity farming could generate **quality produce** new **employment** opportunities and a fight against **climate change** through low energy use, food transportation and production methods.

The agricultural space also constitutes a **biodiverse** space which has been threatened by pesticides. An example of this is the case of the **Cernicalo Primilla** (*Falco Naumanni*) a small falcon that saw its population reduced during the 80s which led to become protected species. Since then and thanks to recuperation programs, the number of reproducing pairs has multiplied moving these species a little bit away from extinction.




## Value and beauty of dry land

Getting further away from the river banks, the predominant blues and greens start to abruptly disappear, giving way to an enormous extension of soft reliefs and big open spaces with ochre, whitish and brown tones. Then a less known profile of our ambience appears known as the **steppe**.

*Steppe*

From the heights of the land known as **Muelas** which are reliefs with a flat roof and very characteristic of this area, a network of drainage appears which starts with small streams of only a few centimetres wide to become big ravines dozen of metres wide that refuge many birds with some of them going later to the open spaces to feed.

The inhabitants of this areas have been able to take advantage of some of the resources like esparto, allowing during centuries the development of trades like the Espartero, who has been falling into oblivion due to the arrival of fabrics and modern materials. This raw material was key for the making of baskets, espadrilles or the "Fencejos" which were ropes for tiding cereal sacks after their harvesting and also made of esparto.

Although for some people the **steppe** is a sterile land and lifeless, for the European Union is possibly one of the spaces more valuable in Europe. From here that the **steppes** of Zaragoza are catalogued as a **Site of Community Importance (SCI)** so they must be protected and cared for.

This landscape that to the naked eye does not show any exuberance like the one from the river banks, is a harsh and demanding territory but not lifeless. The organisms have **adapted** to these conditions by developing **strategies** to survive in extreme conditions.

It is very interesting to observe the beauty of the detail, of the small, of the unnoticed, to change the way to see nature and to allow us to be surprised by it.

In an environment where ochres are predominant, spring waters will unleash the blooming of many plants. A true explosion of colours that will attract insects which will collaborate to the reproduction of different species.

The conservation and protection of the steppe needs their inhabitants, their implication in the defence of a territory that reflects their identity and whose singular beauty not always have been valued.


## Singular and adapted

The **steppe** constitutes one of the typical landscapes around Zaragoza. Paleo botanists situate the origin of the Iberian steppes within the Cenozoic era at around 8.5 million years ago when the changes in the disposition of the European and African Continents and the disappearance of the Strait of Gibraltar gave way to an arid period and permitting the arrival of species from Euro Asiatic and North African steppes. According to some scholars this cores had been expanding due to the over exploitation of arboreal zones like the Sabina or Pine trees forests.

The demands for the lack of water, scorching sun and the presence of salts on the ground, provoked the presence of a kind of flora highly specialized: small leaves, narrow and curved to be able to minimize transpiration and with scales to reflect the sun rays or the accumulation of salt water in the inside of their leaves. These are some of the adopted strategies.

Most of the plants covering the floor of the steppe were well known by its inhabitants due to their medicinal properties. This relation between people and the traditional knowledge of the different properties of the plants and their environment is called ethnobotanics.

The fauna on the steppe has great surprises like for instance the amphibians that in some other environments their number have decreased pushed out by invading species, but in the Zaragoza steppe ecosystem, they are maintaining good health. Species like the **sapo corredor** (running toad) (*Epidalea calamita*) and the **sapo de espuelas** (Spurs toad) (*Pelobates cultripes*) they compose - with their songs- a curious symphony together with many other sounds during the few humid nights on the steppe.

Reptiles are also abundant being the most characteristic the **Lagarto ocelado** (*Ocellated Lizard*) (*Timon lepidus*) known around most of Aragon like **Fardacho**. It feeds of numerous species of invertebrates and also of small mammals and birds.

The open spaces of the steppe difficult the finding of places where to get shelter so many species have adopted a sound efficient strategy: not to be seen thanks to their **camouflage**. The feathers of many of the birds or the skin of many of the mammals contain colorations similar to the environment around them being in this way difficult to detect by predators, including human beings. Proof of this is one of the most characteristic bird of the steppe, like the **Ganga** (*Pterocles alchata*) or the **Ortega** (*Pterocles orientalis*) or the protected bird **Alondra of Dupont** (*Chersophilus duponti*).

Red Patridge

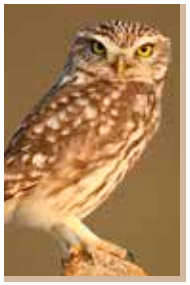
Steppe's fauna

Sapo corredor ( Running toad)

The *Kraschenninnikovia ceratoides* plant is typical in cold deserts of Asia, although also found in isolated points around the planet like some areas around Zaragoza. The first Aragon appointment on this specie was made by a doctor from the Napoleonic army - Leon Dufour – who identified the species and recollected it many years later after the independence war. Proof of this is the example deposited and recollected by himself in the herbarium of Geneva, dating 1841.

## The most important steppe gorge in Zaragoza

One of the most characteristic relieves of Zaragoza is the intricate **network of gorges** that arising from the **planas** or **muelas** of the area, culminate in the **valleys** from the main **river**.



*Mochuelo*

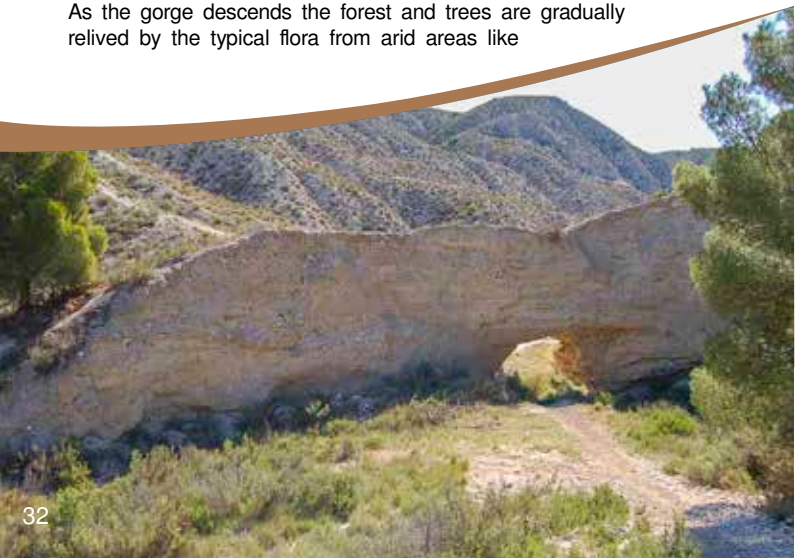
One of the gorges is the **Gorge of the Amunias** one of the better known by hikers and naturalists from Zaragoza and cataloged as a **Sites of Community Importance (SCI) and Special Protection Areas (SPA).**

Initiates its development around the margins of La Plana and continues widening up during more than 10 km draining a surface of 1,002 hectares to end on the fields of the right margin of the river Huerva, between the localities of Cadrete and Santa Fe.

The Gorge of the Almunias, during its course, goes over diverse materials. Beginning in the limestones that form the Plana, augmenting in size when falling upon chalks, clays and marls which they all appear in low lands. All these materials were deposited millions of years ago in lakes which existed before the formation of the river Ebro.

In higher grounds closer to the Plana, a typical **Mediterranean forest** appears, with **Sabina Negral (Phoenicean juniper)** (*Juniperus phoenicia*) and **Coscojas (Kermes oak)** (*Quercus coccifera*)

As the gorge descends the forest and trees are gradually relived by the typical flora from arid areas like




**Rosemary** (*Rosmarinus officinialis*) and **Thyme** (*Thymus vulgaris*) or chalk lovers like the **Asnallo** (*Ononis tridentata*) Iberian North African endemism.

At the bottom of the gorge, where the punishing sun hours are shorter thus keeping humidity and an exuberant vegetation can grow which makes a nice ambience contrast. Also, the narrowing of the gorge in some areas creates sinuous cliffs and curious formations that make its trail an enjoyable experience.

The more prominent fauna of the Almunias gorge are the birds; from a **Buho Real (Eagle Owl)** (*Bubo bubo*) and the **Milano Negro (Black Kite)** (*Milvus migrans*) to one of the insignia birds of the steppe and under the threat of extinction the **Alondra de Dupont (Dupont's Lark)** (*Chersophilus duponti*) the **Collalba Negra (Black Wheatear)** (*Oenanthe leucura*) presenting its biggest population of Aragon in the gorge areas around La Plana. These birds feed of invertebrates, including small ants to others of bigger sizes like the **Escolopendra (Centipede)** (*Scolopendra cingulata*) and of reptiles like the **Lagartija común (Common Lizard)** (*Podarcis hispanicus*).

*Milano negro (Black Kite)*

## The predominance of the Pino Carrasco (Aleppo Pine)

The vegetables formations of the Ebro depression have adapted to the irregular and scarce rainfall and the variability of temperatures and to the singularities of the ground around this territory. Thus, the native species of this ambience are the **Pino Carrasco (Aleppo Pine)** and the **Sabina Albas (Spanish Juniper)** together with an under bush of **Coscoja (Kermes Oak**), **Enebro (Juniper)**, **Sabina Negral (Phoenician Juniper)** and diverse aromatic species.

*Pino carrasco*

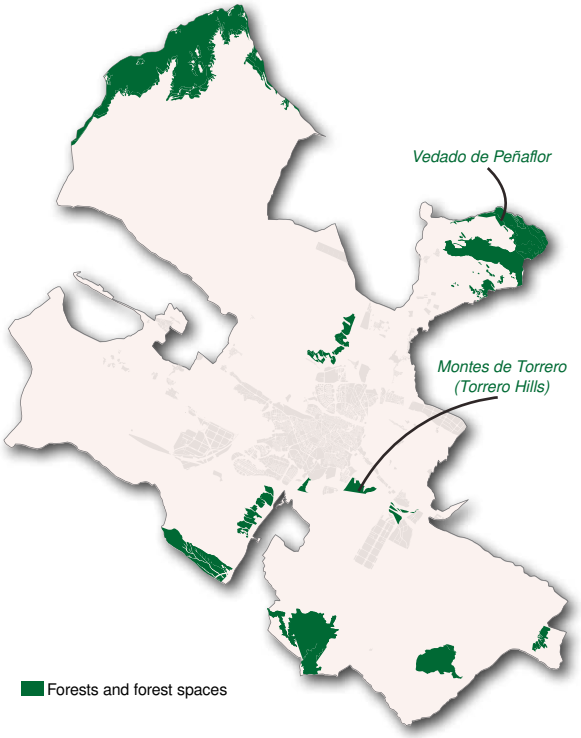
This under bush is the provider of food and shelter for the great majority of fauna inhabiting these ambiences. Also in a healthy under bush mushrooms will grow and other decomposing organisms which will recycle the nutrients allowing the survival of the entire ecosystem.

The Zaragoza environment has been modified along the centuries by human activity. The urban growth, the advance of cultivated areas, the carbon activities and the non sustainable exploitation of wood, has provoked an important regression of forests that today have been reduced to small patches. Zaragoza counts today with 1,000 hectares of autochthonous Mediterranean forest.

The Zaragoza Council has been afforesting from the beginning of the XX century. At the beginning this was only done with Pino Carrasco (Aleppo Pine) (*Pinus Halepensis*) but since around 27 years ago other species have been introduced like the under bush Coscoja (Kermes Oak), Lentisco (Mastic), Sabina, etc.

The forest provides places for breeding and reproduction of numerous species of fauna like birds of prey like the **Milano Negro (Black Kite)** *Milvus migrans*), **Aguila Calzada (Booted Eagle)** (*Hieraaetus pennatus*) or the **Ratonero Común (Common Buzzard)** (*Buteo buteo*) amongst others, present within the municipality of Zaragoza.

A well developed forest is very important for the cycle of water, since in them the great majority of evaporation occurs thus favouring rain precipitations, at the same time than the roots will contribute in improving the structure of the ground and will favour the infiltration of water.




## A woodland island of biodiversity within cultivated fields

The **Mediterranean mixed forest** occupied in the past a big part of what today is the municipality of Zaragoza but having been reduced its surface to the actual **woodland islands**.

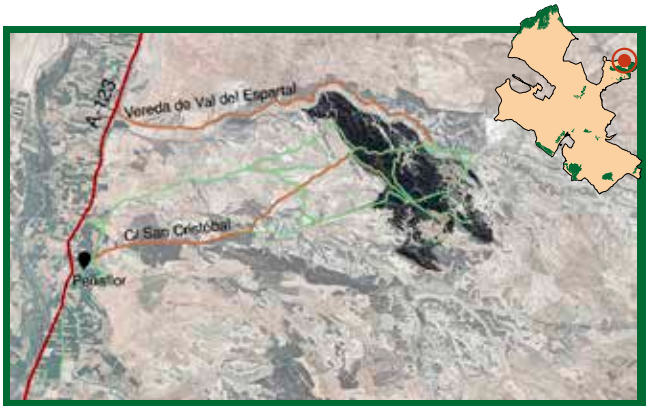
*Kermes Oak's acorn*

One of these woodlands corresponds to the **Vedado of Peñaflor** that with only 20 km from the city centre of Zaragoza raises like an island over the cultivated fields. The predominant specie is the **Pino Carrasco (Aleppo Pine)** typical from the Mediterranean region and resistant to long periods of dry weather and high temperatures, along with the **Sabina Albar (Spanish Juniper)** or the **Carrasca (Hollow)**. Accompanied by a rich under bush with species like **Ephedra**, **Acacia Farnesiana**, **Olivillas**, **Daphne**, **Common Juniper**, **Phoenician Juniper** and many more. In total, well over 250 different species.

In the Vedado of Peñaflor an important population of Cernícalo Primilla (Lesser Kestrel) (*Falco naumanni*) inhabits, which contributes to the recovering of a specie that almost disappeared in Spain during the 1980s decade.

The different micro ambiences generated in this area allows green forests to mix with ochres and yellows at the bottom of valleys and their dry land farming. Furthermore, in some key points the humidity and salinity allows the existence of areas with **Tamarizales** and **carrizales (Spanish broom and reed**






**bed)** that they improve, if permitted, the biodiversity by housing a great variety of **Fauna**.

*Examples of fauna in the Vedado.*

One of the greatest attractions in **Vedado of Peñaflor** is the great variety of **birds** that nest and live in it, in such a manner that they have become a key point for naturalists, especially those very keen in ornithology. The most prominent species are **Kites**, either **Eagle Kites** (*Milvus milvus*) or **Black Kites** (*Milvus migrans*), **Golden eagle** (*Aguila chrysaetos*) or **Booted eagle** (*Hieraaetus pennatus*). Amongst other smaller and less visible birds we can find the **Pico Picapinos (Wood Pecker)** (*Dendrocopos major*) the **Torcecuellos** (*Jynx torquilla*) or the **Curruca cabecinegra (Sardinian warbler)** (*Sylvia melanocephala*).

Within the surroundings of this Natural forest the Council of Zaragoza has been doing reforestation with **Pino Carrasco (Aleppo Pine)** (*Pinus halepensis*) and other **species of plants** along with them. To do this some educational centres from the city and surroundings have been involved allowing the pupils to plant the trees themselves. This way the younger can learn and be aware of the importance of forests for better quality of life and showing them the enormous biodiversity they harbour.

Águila calzada

The defence and management of this spaces by institutions as well as public awareness will help with the conservation and also to make them to appreciate this kind of forests, which are very important in an extreme arid environment like the municipality of Zaragoza.

## A reforested forest of Pine Trees

The Hill of Torrero is situated to the south of the locality of Zaragoza, with about 330 hectares and partially limited by two rivers: the Huerva river to the west and the Canal Imperial of Aragon to the west and north. It is a forest mass almost exclusively made of **Pino Carrasco (Aleppo Pine)** *(Pinus Halepensis)* with the testimonial presence of the **Pino Piñonero (Stone Pine)** *(Pinus pinea)* and anecdotic of the **Pino Canario (Canary Pine)** *(Pinus canariensis)*

Orchid

At some points, you can find some plant species like the **Encina (Ilex)** *(Quercus ilex)* or some types of trees that used to be grown around this hill in the past, and that they managed to survive abandonment like the **Almond tree** *(Prunus dulcis)* or the **Acebuche (Olive tree)** *(Olea europaea)*.

The vegetation surface of this area comes almost in its totality from reforestations done after 1928 – 1929 to this day although in the Cabezo of Buenavista the reforestations started after 1914, taking advantage of the "Day of the Tree" The chronicles from those times said that not one single Zaragozano had never planted a pine tree with their own hands.

In specific areas some herbaceous plants are capable of developing, then appearing floral surprises like the **Orchids** *(Ophrys speculum)* and **Narcissus** *(Narcissus assoanus)* decorating with their beautiful flowers.




Some plants around Torrero will provide food to concrete species of invertebrates like the caterpillar from the **Harlequin Butterfly** *(Zerynthia rumina)*. The lack of a source of forest seeds next to the compaction of the terrain are some of the reasons provoking the non existent regeneration and natural succession of vegetation, lacking in undergrowth which is typical in natural forest spaces. On the other hand, the development of infrastructures like the third and fourth circular roads or new constructions and communication roads of Puerto Venecia have provoked the fragmentation of the pine tree forest causing an important impact in it.

Harlequin Butterfly

Nonetheless Torrero Hill is a deeply arraigned forest to the identity of the city, being a space where the people of Zaragoza have enjoyed, over many decades, walks and the shade it provides. During the hottest months, the microclimate produced by this forest mass has made the locals to come and seek a relief from the heat. The environment beneficiates also from a better air quality which is a resource that is becoming more valuable within cities.

In the Geographical – Historical Dictionary of Pascual Madoz (1845-1850) there is a cite that says that in Monte Torrero was a Pine Tree forest of short heights and with its wood being used for the covering of particular buildings. Posteriorly this wood collection was reduced by introducing the farming of vines. The vines were kept until the XVII when the Canal Imperial of Aragon appeared.

## Essential spaces for better quality of life and for the health of people

The great growth and type of urbanization and expansion of urban areas have propitiated an increment in the occupancy of space, traffic, noise, air pollution, large concentrations of people, stress, etc.

On the other hand, society has become conscious of the importance of maintaining **green areas** to allow the inhabitants of great cities to be able to enjoy spaces where to relax, to relate to others and to take part in leisure activities.

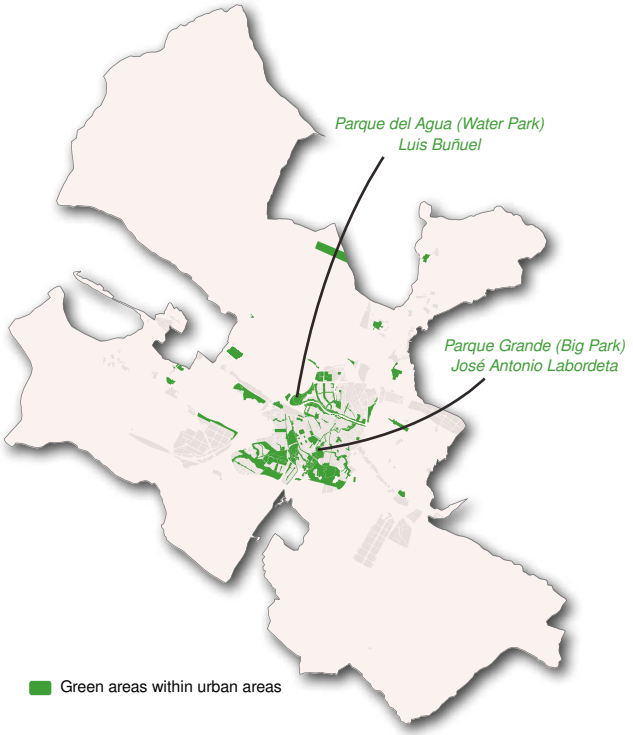
*Parque Grande (Big Park)*

But apart from this kind of functions that contributes to the quality of life in cities, not always we are conscious of the environmental benefits that green spaces give us: generation of microclimates thus reducing temperatures and increasing humidity, decrease of atmospheric pollution and noise which is increasingly more problematic in urban spaces, drainer of carbon and relief from the greenhouse effect, infiltration of rain water, aspect that at the same time affect the health of people.

The existence of public green areas, falls within five obligatory indicators for the sustainability of European cities. 97.44% of people living in Zaragoza have a green area at less than 300 metres from their homes.

On the other hand, flora and fauna not only are found in natural spaces but also within the urban maze of the city. **Parks, tree lined streets and garden areas**, are a refuge for fauna and passages or ecological corridors connecting natural areas with urban environment and where life thrives and travels.

Reason why, that within the frame of **green infrastructure** there is the planning of a new model of **green area** adapted to the modifications that climate changes will create, to reduce the amount of lawn planted which is a great consumer of water, to increase nature and refuge spaces for the fauna and to stablish connexions with the natural environment.




# Parque del Agua Luis Buñuel

## Multiple leisure activities next to the river Ebro

Projected and built for the celebration of the **International exhibition of Zaragoza 2008**, with the main theme being **"Water and sustainable development"** is 122 hectares around the meander of Ranillas and 8 of those hectares correspond to areas with water.

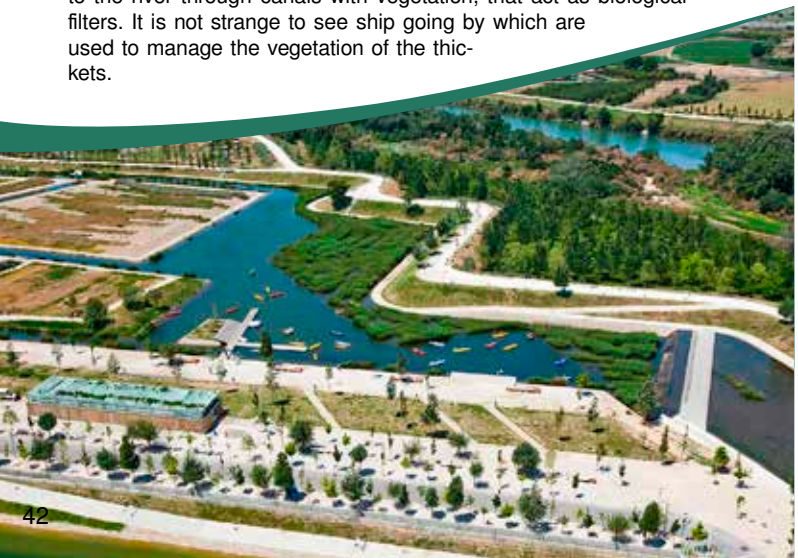
White water course

The old cultivated area, that during many centuries have occupied this space was substituted by a park that offers an ample and varied leisure offer for visitors, from leisure activities for children, to restaurants, horse riding, fluvial parks, multi adventure spaces, golf, allotments or a white water course amongst others.

The park has a **botanical garden** divided in different areas with exotic gardens, grasses, fruit trees or palm trees as well as a vegetable garden.

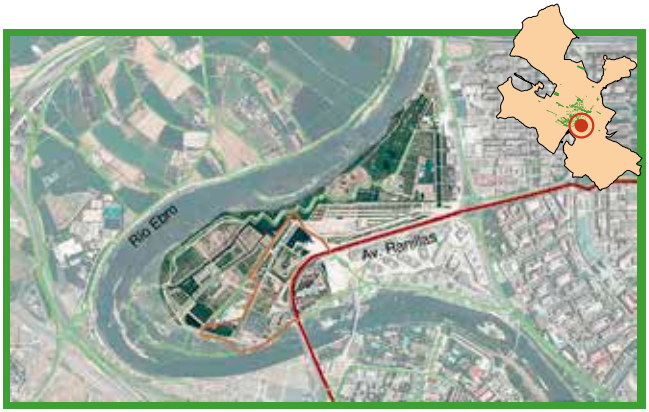
It Is a young park with the vegetation still growing and developing to become a place where nature and leisure become one and where the aquatic plants are growing strong in lagoons and numerous canals where the presence of fauna is every day bigger like the presence of **ducks** *(Anas platyrhnchos)*, **Coot** *(Fulica atra)* **Common Moorhen** *(Gallinula chloropus)* etc.

The maintenance of the park is organized around an **integral hydraulic system** that takes the water from the river Ebro, stores it, depurates it and uses it for many things then sends it back, filtrated, to the river through canals with vegetation, that act as biological filters. It is not strange to see ship going by which are used to manage the vegetation of the thickets.





# Water Park Luis Buñuel




One of the most interesting elements regarding the nature of this park is the **natural thicket** next to the river with the predominant tree being the **Poplar** *(Populus Alba)* tipical specie of river banks.

The Water Park Luis Buñuel is situated within a meander of the river Ebro so is embraced by it and its river banks forests. When constructed the old irrigation canals were adapted to become canals which today distribute the water for its different uses.

The walk down the banks of the river can continue to go along it crossing to the **right margin** by the **pasarela del voluntariado (Volunteers foot bridge)** to arrive in **Soto de la Almozara (Almozara thicket)** From this margin situated in front of the Parque del Agua (Water Park) we can see the thicket and the river from a different angle, with the bird island or mejana and maybe we can discover a **little egret** *(Egretta garcetta)* on the water or standing on a tree branch, a **Heron** *(Ardea cinerea)* or **Cormorants** *(Phalacorcorax carbo)* which during the winter use these trees as a dormant.

Boats in Parque del Agua (Water Park)

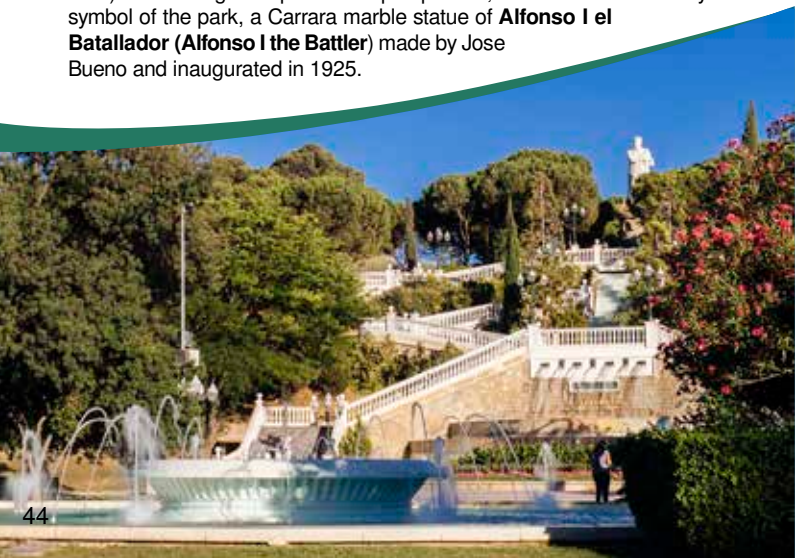
## A park for every *Zaragozano*

This park was opened in 1929 and is one of the most emblematic places of Zaragoza, constituting a true open air museum. Many people have learnt to ride a bicycle under the **Plane trees** in the **Bearneses avenue** or enjoying the pages of a good book in some of the tranquil corners around, like the Rosaleda or the hidden squares. There are many parks in every single borough but the **Parque Grande Jose Antonio Labordeta (Jose Antonio Labordeta Big Park)** to honour this Aragon singer song writer, is the one that the city identifies with and for the memory of the citizens.

The Neptune or Princess fountain (1833) by Tomas Llovet, is today situated in this park. The original place was in the city centre, precisely in the actual Plaza de España (Spain square) where it supplied water to many people in Zaragoza from 1845 to 1902. After its removal it was kept forgotten for many years, until its installation in its actual place in 1946.

The fundamental ideas behind the design of the park are specially because of the Seville painter of Dutch origin Javier Winthuysen, specialist in painting landscapes, parks and gardens. The entrance to the park from **Puente de los Cantautores (Singer songwriters bridge)** over **river Huerva** is one of its most characteristics images.

The **Avenida de San Sebastian (San Sebastian avenue)**, the main path, with its bushes, rose bushes and ornamental fountains, reflects a classic order. Perpetually vigilant over on the stub of Buenavista (Good view) and closing this spectacular perspective, we can see the identity symbol of the park, a Carrara marble statue of **Alfonso I el Batallador (Alfonso I the Battler**) made by Jose Bueno and inaugurated in 1925.








This area has nooks that enclose small fragments of recent history of the city. An example of modernism in Zaragoza is the **Quiosco de la música (Bandstand**) built for the Franco Hispanic exhibition of 1908 which was the commemoration of the centenary of the siege of Zaragoza. It was restored and put in the park by the Zaragoza council many decades ago.


*Alfonso I El Batallador*

Other emblematic area of Parque Grande is the **Rincón de Goya (Goya's nook)** finalized in 1928. A work by Fernando García Mercadal. This is the first example of nationalist architecture in Spain. It commemorated the first centenary of the death of Francisco de Goya and pretended to become a museum with the works by this painter from Aragon.

In Parque Grande it is also possible to observe great variety of **birds** some of which can be seen all over the city, like the **Eurasian tree sparrow** (*Passer montanus*) or the **Magpie** (*Pica pica*) Other less frequent species that can be seen and heard are the **Pito Real (European Green Woodpecker)** (*Picus viridis*) or the **Zorzal Charlo (Mistle thrush)** *(Turdus viridis)*.

Between the months of November and March and around dusk, big flocks of common starling *(Sturnus Vulgaris)* perform authentic dances when they come back to the trees of Parque Grande, which they use as dormant. The presence of thousands of these birds flying together and "Dancing" in the last moments of the day is an incredible image to see and every year surprises and fascinates a great crowd of people.

## Life around rivers

The network of water courses that go across Zaragoza, allows multiple animal species, linked to water, to travel on them and inhabit them. Rivers and their banks are the main shelter for these species, but also some artificial courses like the Canal Imperial de Aragon shelters a great variety of fauna that can travel and feed on the vegetation of the edges.

European hedgehog *Erinaceus europaeus*

*Spanish Pond Turtle* *Mauremys leprosa*

Night Heron *Nycticorax nycticorax*

Eurasian Penduline Tit *Remiz pendulinus*

Green Sandpiper *Tringa ochropus*

White Wagtail *Motacilla alba*

Common Moorhen *Gallinula chloropus*

European Robin *Erithacus rubecula*

*Grey Heron* *Ardea cinerea*

*Little Bittern* *Ixobrychus minutus*

King fisher *Alcedo atthis*

## The jungle on the river banks

The abundance of water in water courses, whether natural or artificial allows the vegetation to grow in abundance and in many occasions standing out in arid environments where vegetation is mainly austere. The river banks and canals shelter many times a similar vegetation adapted to the abundance of water and to periodical flooding.

Rose Bush *Rosa sp.*

Rose Flower *Rosa sp. - Flor*

Old man's beard *Clematis vitalba*

Elm *Ulmus minor*

Ash Tree *Fraxinus*

Blackthorn *Prunus spinosa*

Poplar – leave *Populus nigra*

Poplar *Populus nigra*

White Poplar *Populus alba*

Tamarisk – flower *Tamarix gallica*

Tamarisk *Tamarix gallica*

White Willow *Salix alba*

Cornel *Cornus sanguinea*

Common hawthorn *Crataegus monogyna*

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