



lynxconnect



IBERIAN LYNX

Training for trainers

Driving School instructors and Managers


Coordinator beneficiary:



Junta de Andalucía

Associated beneficiaries:





This document has been produced by the Project Team of the LIFE NATURE AND BIODIVERSITY 19NAT/ES001055 LINXCONNECT: “CREATING A GENETICALLY AND DEMOGRAPHICALLY FUNCTIONAL METAPOPULATION OF IBERIAN LINX (*Lynx pardinus*)”.

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GENERAL SECTION



INTRODUCTION

The LIFE 19NAT/ES001055 LYNXCONNECT project, ‘Creation of a genetically and demographically functional metapopulation of Iberian lynx (*Lynx pardinus*) (2020-2025)’, is the fourth LIFE project approved by the European Commission for the conservation of the Iberian lynx. Connecting all existing lynx population groups requires not only measures related to population management, but also the implementation of land stewardship and social participation tools.

The project promotes the design and implementation of a Training for Trainers Plan, whose main objective is to train those responsible for training the target audience (primary and secondary school teachers, driving instructors and law enforcement agencies).

This handbook has been produced as a resource to support this training and is divided into two sections. The first, common to all target groups of the Training Plan, covers the main aspects related to the biology, habitat and distribution of the Iberian lynx. The second has been developed specifically for each of the target groups, including tools and methodologies to improve and facilitate the transfer of knowledge to students in the case of teaching staff, and a compilation of the regulations and protocols used by law enforcement agencies.

These materials are intended to facilitate the work carried out by the groups targeted by the Training Plan for Trainers within the framework of their competences, raising awareness in settings other than the traditional school context.

The species reached its maximum distribution in the Upper Pleistocene, occupying the entire Iberian Peninsula, southern France, and part of central Europe. There are three moments in which a decline in its genetic variability has been detected. The first coincides with the last glaciation and the arrival of *Homo sapiens* in Europe (approximately 47,000 years ago); the second occurred about 300 years ago; the last, the best known and most recent, took place during the 20th century. During the first half of this period, populations disappeared from the north of the Central System, the Iberian System, the Mediterranean arc and the Subbetic mountain ranges. Between 1950 and 1990, the area occupied by the lynx decreased by 80%, entering into a continuous decline. The lowest known population was in 2002, when the first census-diagnosis carried out on a peninsular scale reduced the number of lynx to approximately 100 specimens distributed in two isolated areas, Doñana and Sierra Morena Oriental (Andújar-Cardeña).



Fig. 2. Evolution of the geographical distribution of the Iberian lynx.
A) Distribution area approximately 40,000 years ago (Late Pleistocene).
B) Distribution area in 2002.

The main causes of the decline of the Iberian lynx are anthropogenic, with roadkill and illegal hunting having the greatest impact. Apart from these, the main threats hindering the recovery of the species are the decline in rabbit abundance and the alteration, fragmentation and loss of quality of its habitat resulting from agroforestry intensification, changes in hunting management, large infrastructure projects, etc. The loss of genetic variability and increased inbreeding have also led to a reduction in biological efficiency and high mortality from disease.

Among pathogens affecting the Iberian lynx, the three main agents that have been shown to cause mortality in the species, due to their potential as population regulators, are feline leukaemia virus (FeLV), tuberculosis (TB) and canine distemper virus (CDV). FeLV affects and is transmitted from domestic and wild cat populations (*Felis catus* and *Felis sylvestris*), CDV to carnivores, and TB can be transmitted from wild ungulates.

As far as the social perception of the species is concerned, it is very favourable to its presence, recovery and reintroduction. There are very sporadic situations of social rejection that slow down or limit the settlement of the species in some areas. This rejection is partly motivated by the interference that can be generated between lynx and domestic animals, whose commercial or non-commercial farms (sheep and goat herds, poultry farms or chicken coops) may suffer occasional attacks by the feline.

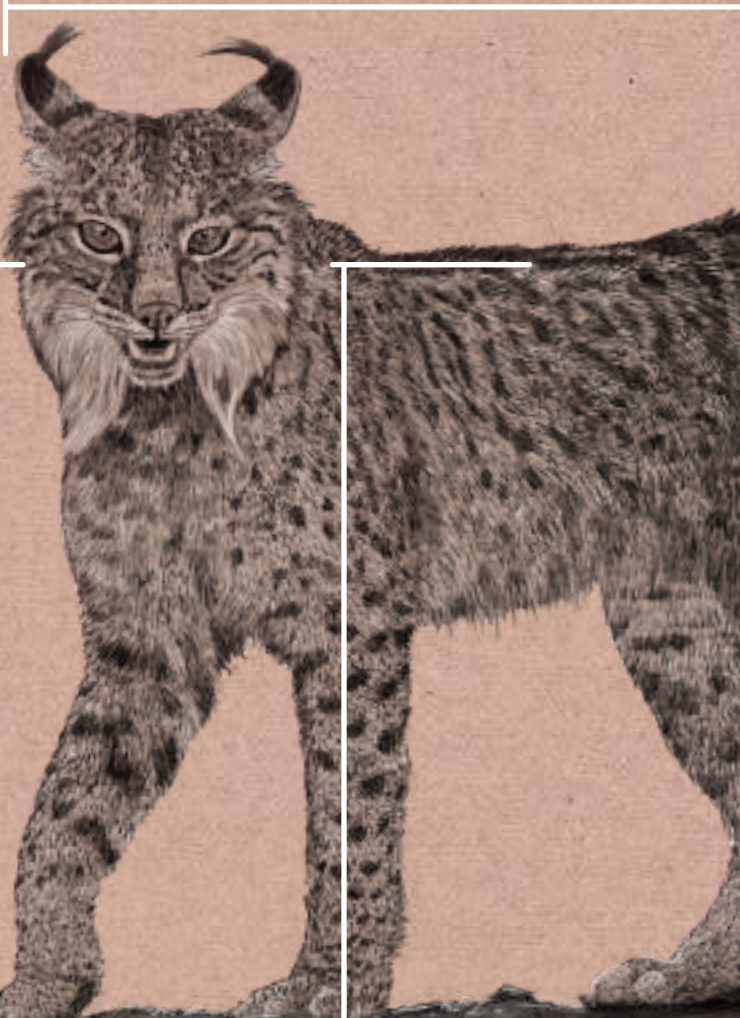
2. CHARACTERISTICS

- Medium-sized feline.
- Slender body, long legs and short tail. Adapted to hunting wild rabbits and the Mediterranean climate.
- Habits: mainly nocturnal and crepuscular.

Body length

Adult males: **85-100 cm** Adult females: **84-88 cm**

45-55cm

A detailed illustration of a lynx standing on a dark ground against a light brown background. The lynx has a thick, spotted coat and prominent, curved ears. White whiskers are visible on its face. A vertical dashed line on the left side of the lynx's body indicates a height measurement of 45-55 cm. A horizontal solid line above the lynx's back indicates a body length measurement. The text '45-55cm' is written vertically next to the dashed line. Above the horizontal line, the text 'Body length' is written, followed by 'Adult males: 85-100 cm' and 'Adult females: 84-88 cm'.

Spotted coat that allows it to camouflage itself and go unnoticed among the grass and Mediterranean scrub. The spots and patterns are specific to each individual and allow for the identification and census of specimens. There are three types of spots: small, medium and large spots.



14 cm

10-15
years

8-10
KG

Adult females

10-15
KG

Adult males

Long, muscular hind legs, adapted for jumping and short, powerful runs.

Digitigrade gait: they walk on their toes, keeping their heels permanently raised. They are faster than animals with a plantigrade gait (e.g. bears, badgers) or unguligrade gait (e.g. deer, wild boar). Some examples are foxes, wolves, lynx and wild rabbits.

Retractable claws to catch their prey.







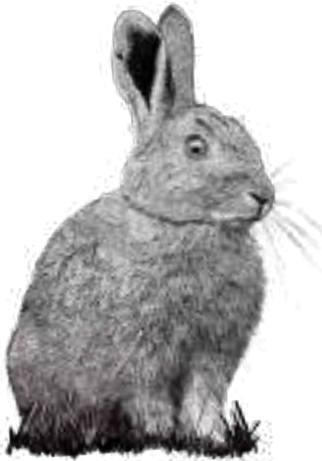
Eyes positioned at the front, large round pupils. This allows for three-dimensional vision and the ability to see in dark conditions.

Ear tufts (brushes) and long whiskers that, in addition to blurring the contours of the face, send visual signals about the individual's mood.

The dentition is that of a strict carnivore, with large canines to deliver the fatal blow, carnassial teeth to tear large pieces of flesh, and small incisors.

3. FEEDING

The lynx is a predator that specialises in hunting wild rabbits (*Oryctolagus cuniculus*), which make up between 85 and 100 per cent of its diet — a figure that can vary between different populations. The smaller size and lower energy requirements of Iberian lynx compared to European lynx are most likely due to parallel evolution between lynx and rabbits. The lynx's diet may also include small mammals (rodents), birds, reptiles and even ungulates.



85-100%

To meet its trophic needs, an adult male weighing 15 kg needs approximately 912 kcal/day, and an adult female weighing 10 kg needs approximately 673 kcal/day, which is equivalent to the consumption of one adult rabbit per day. These energy requirements undergo seasonal changes, being higher during winter, for example, and also depending on the breeding season, especially in the case of females. A breeding female with two young needs approximately three rabbits per day. The joint evolution of prey and predator can also be seen in the fact that the lynx's breeding season coincides with the peak rabbit population in early summer.

The specialisation is such that, despite the general decline in rabbit populations, the Iberian lynx does not change its diet, nor does it substitute other alternative prey.

The lynx hunts by stalking its prey, attacking with a leap or a short run and without pursuing it if it misses. It prefers to try again with new prey, which it will kill quickly with a bite to the back of the neck.



In the case of larger prey such as ungulates, it will suffocate them by biting the front of the throat, and if the prey is birds, it will bite the upper back, between the wings. The size of the prey also determines how and where it is consumed, so that smaller prey (rabbits and birds) are carried to a quiet, sheltered place to be devoured, starting with the head and leaving behind skin, paws or feathers. When the prey is larger, it is consumed on the spot, and the remains may be partially buried with earth or branches to be eaten again over several days. It does not often consume animals that it has not killed itself.

The abundance of wild rabbits plays a fundamental role in the population dynamics of the lynx, determining such important aspects as its reproductive capacity and survival rate.

An essential part of the conservation measures implemented since 2002 have been aimed at managing wild rabbit populations, primarily focused on improving habitat, creating refuges and strengthening populations, with the aim of improving the area with prey presence and increasing the density of specimens.

4. HABITAT

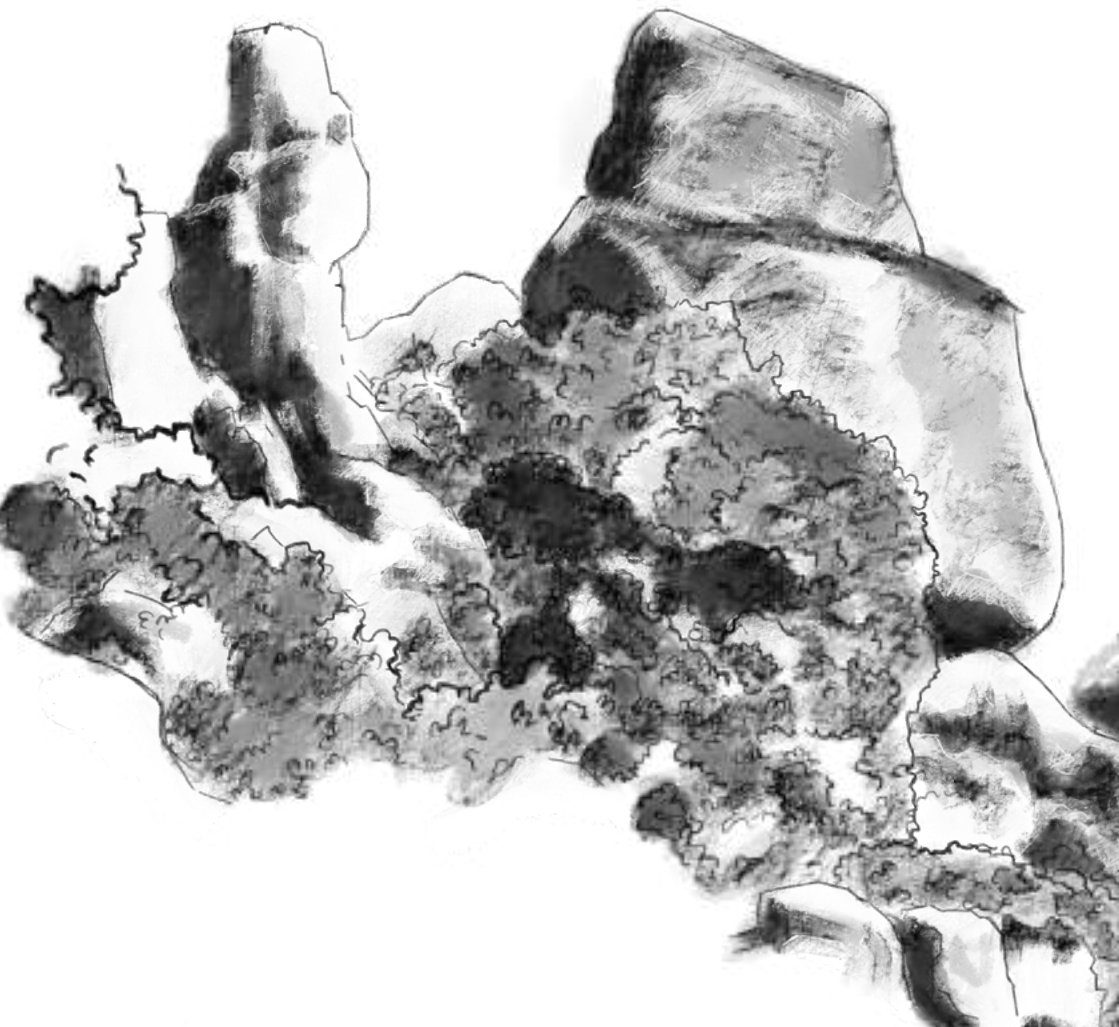
The optimal habitat for the Iberian lynx is Mediterranean scrubland and woodland, on which it is strictly dependent: the decline in the population in the second half of the 20th century is closely linked to the loss of this habitat.

The species' use of its habitat varies, preferring dense areas with rocks and dense vegetation cover for resting and edge areas for hunting rabbits. It can also inhabit scattered wooded formations (olive groves or pastures) with patches of scrub and riparian vegetation. Breeding dens are located in rocky areas or even in hollow trees.

Studies indicate that the average scrub cover in territorial lynx territories is 55%, with scrub cover of between 20 and 80% considered adequate. The ideal situation is the presence of abundant shrub cover interspersed with grassland areas, with large ecotone zones between the two, as this heterogeneous vegetation structure offers the best options for shelter and food availability for rabbits.

The home ranges of adult lynx remain defined throughout their lives, with males having larger ranges. The size of these ranges varies between 4 and 20 km², depending on sex and rabbit abundance. The average size of the territory of a potentially reproductive female is around 600 ha.

Habitat is one of the most limiting factors in terms of the species' distribution. Habitat loss and degradation is the main long-term threat, but losses due to urban development, connectivity and climate change are also significant. These can cause major changes in the survival of the lynx itself, as it is a specialist of the Mediterranean scrubland, and in the status of rabbit populations.



Some of the habitat improvement measures being implemented for the recovery of the Iberian lynx are:

- » Improving shelter and food for wild rabbits
 - Heterogenisation of the plant structure, promoting the development of native Mediterranean vegetation
 - Protection of existing rabbit warrens
 - Improving food availability through clearing, sowing or providing seeds in feeders
 - Creating water points
- » Reintroducing wild rabbits
 - Reinforcement population through rabbit enclosures, consisting of large areas (approx. 4 ha), which allow the population to develop while excluding potential predators
 - Free reinforcement of rabbits with mesh, in which reintroduction is carried out in groups of warrens that are protected with mesh for at least 24 hours
 - Free reinforcement of rabbits without mesh, as above, but without fencing the warren
- » Management of rabbits used for reintroduction. A number of aspects will be taken into account for the selection and management of the specimens used, such as their origin, giving priority to populations close to the recipient and of the same subspecies, and the date of release, so that they occur sufficiently in advance of the breeding and rearing season
- » Involvement of local owners and managers



5. INTERACTION WITH OTHER SPECIES

The presence of lynx can 'shape' the trophic structure of an area. As a superpredator, it can regulate the abundance of other opportunistic mesocarnivores such as foxes, mongooses, genets, etc., so that these are less abundant in the feline's domain, having a positive impact on small prey populations such as rabbits and partridges.

6. TERRITORIAL BEHAVIOUR

The lynx is a territorial animal. This means that, while resources are optimal, it frequents a territory that it defends from other intruders of the same or competing species (e.g. foxes, mongooses and feral cats). The size of its territory and how well it defends it depends on the availability of food and sex. Males have larger territories. A male's territory may overlap with those of several adult females, but generally does not overlap with those of other males. The lynx marks its territory with urine and excrement at key points on paths, trails and obligatory wildlife crossings, and sometimes next to the remains of consumed prey, in order to exclude other members of the same species.

These scent marks are used to delimit the territory and mark important resources, such as water points, as their own. These deposits are often made in groups (latrines or dung piles). These marks also serve as an effective communication system, enabling females and males to be aware of each other's presence and degree of receptivity as the breeding season approaches.



Fig. 3. Lynx droppings.

7. REPRODUCTIVE CYCLE

Between approximately eight months and one year of age (the latter being less common), young lynx begin to become independent and seek their own territory. Until this point, the sexual dimorphism easily seen in adult specimens does not exist. This is the most delicate and critical time for their survival, as it is a stage with high mortality rates, mainly due to factors related to human impact on the environment: roadkill, persecution, etc., as well as malnutrition and disease.

During this period, they can sometimes travel long distances, crossing areas such as roads or urban areas, demonstrating their ability to “avoid” unsuitable habitats, provided there are riverbanks, crops or tracks that serve as corridors. The dispersal period varies in length, from a few weeks to almost two years, after which the habitats used are usually of lower quality than those used by resident animals or those occupied prior to dispersal.

This dispersal of young individuals is usually related to times when rabbits are more abundant, with higher dispersal rates in years of scarcity. There are no differences between the sexes in terms of age, time of year or distance, although it does seem to be related to the return to high reproductive activity of the parents.

Sexual maturity is normally reached around one year of age and the mating season takes place between December and February, with females that do not become pregnant mating somewhat later. Urine markings that indicate reproductive status, as well as confrontations between territorial males and suitors, take place increasingly closer to the female, both during the day and at night.

As with other felines, mating is accompanied by a whole ritual of growling, head-butting... these are patterns of behaviour that will culminate in a period of just three days where both partners copulate, play and hunt together. It is very important that, as this mating period is so short, peace and quiet are ensured and disturbances are avoided so as not to interfere with the behaviour of the species.

Generally, the female will continue the gestation and rearing of the cubs alone. However, the male usually fulfils the role of protector, marking the territory and preventing other intruding males from entering and even killing the cubs, as occurs in other felines. There is also evidence of males providing food for the cubs. The birthing period usually ranges from March to April, although there may be fluctuations depending on the abundance of rabbits.

Gestation lasts about 65 days, after which the female will give birth to 2 to 4 cubs. The birthing dens are located in rocky burrows, brambles, thick scrub and even tree stumps or underground burrows abandoned by other species. It is common for the female to move the cubs to a new location to prevent disease, parasitism or to make it more difficult for potential predators or other males to find them. Early mortality is high in this species, with only two cubs surviving weaning in 90% of cases, and it is usually the smallest cubs that have the lowest survival rate.

The young remain with their mother for months, usually until she comes into heat again. Trophic independence is achieved gradually, with weaning beginning at three months. By seven months, the young spend only 60% of their time with their mother, decreasing to 2% at eleven months.

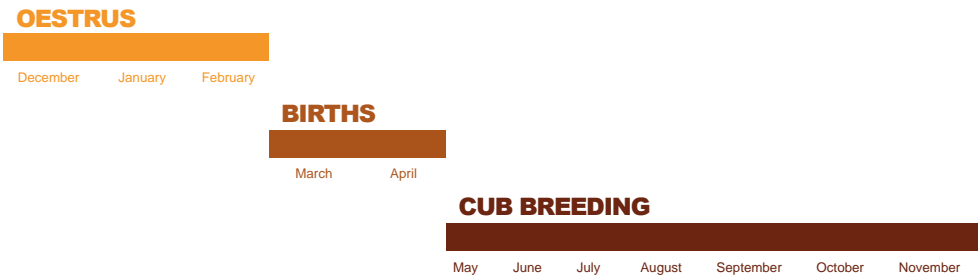


Fig. 4. Reproductive cycle diagram.

SPECIES REGRESSION AND RECOVERY

1. ON THE BRINK OF EXTINCTION

At the end of the 20th century, alarm bells were ringing: the emblem of Iberian wildlife was suffering a dramatic decline that was leading to its disappearance.

Half a century earlier, the lynx was considered vermin and its fur was highly prized. It was therefore hunted and persecuted in every possible way, which was the main cause of its disappearance from large areas of favourable habitat. Combined with the emergence of new diseases in its main prey, wild rabbits, and the fragmentation of its habitat, which resulted in inbreeding, this brought the species to the brink of extinction in 2002. Only two isolated populations of fewer than 50 adult individuals remained: Doñana and Andújar-Cardeña. The time had come to save the world's most endangered feline.

2. RECOVERY OF THE SPECIES

Given the delicate situation of the species, in February 1999 the first Strategy for the Conservation of the Iberian Lynx in Spain was approved. Since then, conservation measures have been implemented that have significantly reduced the risk of extinction for the species. To this end, the population has been increased by promoting the abundance of rabbits and reducing threats, optimising genetic variability and establishing new self-sustaining nuclei in Portugal, Andalusia, Castile-La Mancha and Extremadura. In relation to the latter, areas suitable in terms of size, quality, rabbit density, low risk of death and adequate social support have been selected, where genetically selected specimens have been released and subsequently monitored.

The Andalusian and national administrations' recovery efforts, as well as the concern of society, were joined by those of the European Union. Through various LIFE projects, the EU financed a significant part of the work to save the Iberian lynx.

The LIFE programmes co-financed by the European Commission have contributed to the implementation of the priorities established in the regulations for the protection of the lynx, as well as in its recovery and action plans. Several approved projects have benefited the Iberian lynx from 1994 to the present day and have been and continue to be of essential importance in providing the necessary financial support for the conservation actions proposed and undertaken by public and private entities. The recovery of the species has been supported by three consecutive LIFE projects, which between 2002 and 2010 achieved the consolidation of the isolated populations of Doñana and Andújar-Cardena. The next step was to recover areas of distribution prior to the decline of its populations through the reintroduction of specimens, as well as connecting the existing populations in the province of Jaén, tasks that were carried out between 2011 and 2018. In 2010 and 2011, the creation of populations in the Guadalquivir Valley (Córdoba) and the Guarrizas Valley (Jaén) began through the reintroduction of individuals. From 2014 onwards, part of the work focused on creating population centres outside Andalusia, with reintroductions in Montes de Toledo (Toledo), southern Ciudad Real (Campo de Calatrava and Campo de Montiel), Valle del Matalcán (Badajoz) and Vale do Guadiana (Bajo Alentejo, Portugal).

Increasing numbers through the reintroduction of specimens is the main action for the long-term recovery and maintenance of the species. The LIFE Lynxconnect project establishes a protocol for identifying potential areas that could support viable long-term lynx populations. Some of the characteristics of these areas are that they have a minimum continuous area of 10,000 ha of suitable habitat, i.e. they have an adequate structure and density of rabbits.

Regarding the released specimens, the lynx has demonstrated its ability to adapt well to the release areas. This applies to both wild specimens and those from captive breeding, with an average survival rate of 71%. Wild specimens from other areas have better survival rates (up to 81%) than those bred in captivity (60%). Both groups undergo health checks before release, and the latter undergo a programme of adaptation to freedom beforehand.

3. AN UNCERTAIN BUT PROMISING FUTURE

Despite all the work carried out, the viability and future of Iberian lynx populations remains uncertain. Connecting existing population centres is essential to achieve metapopulation integration, which will produce a genetic flow that ensures the long-term sustainability of the species.

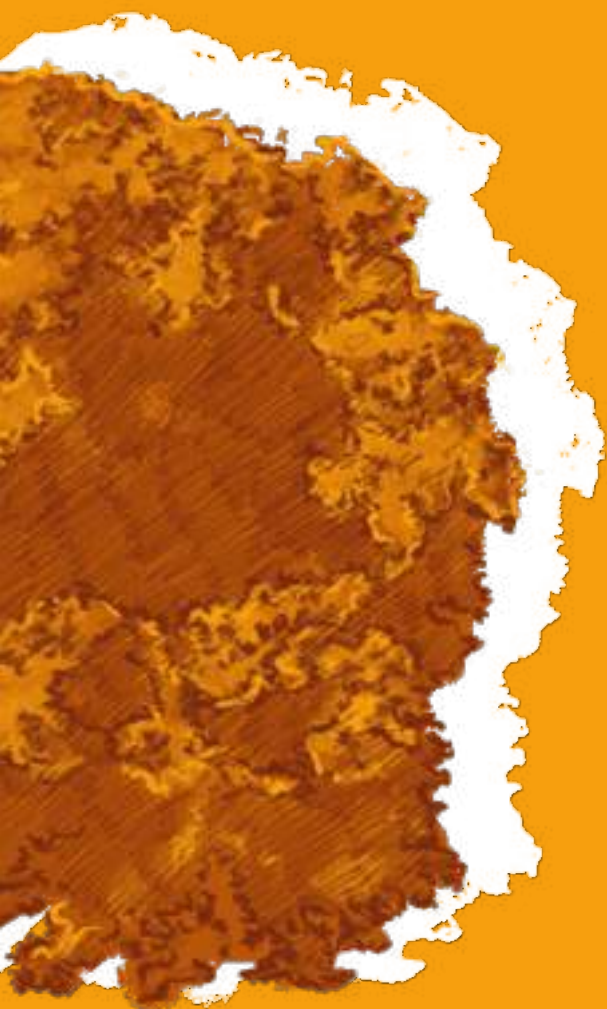
This is why a fourth LIFE project, called LYNXCONNECT (LIFE 19NAT/ES001055 LYNXCONNECT 'Creation of a genetically and demographically functional metapopulation of Iberian lynx (*Lynx pardinus*) (2020-2025)', has been created and developed. The project aims to continue the conservation plans from previous stages and implement 33 new strategic conservation actions. These actions are intended to consolidate and connect emerging populations and ensure demographic and genetic viability, as these are considered the most pressing threats to the species. A key aspect is the project's transnational nature, necessitating effective collaboration between Spain and Portugal. Work plans must transcend political and administrative boundaries so that the species recovery process is a joint effort involving the countries and autonomous communities concerned.

The achievement of a large Iberian metapopulation of the species and, therefore, its long-term conservation, requires the promotion of demographic and genetic exchange between the different lynx populations, thus ensuring that these populations and the species as a whole remain self-sufficient. Connectivity between already stable populations and reintroduction areas plays a very important role in this regard. This requires ensuring an adequate distribution of reintroduction areas (in relation to each other and also in relation to already stable population areas) and adequate management of the territorial matrix, ensuring functional connectivity between populations, either through the conservation or restoration of corridors or through actions that reduce the barrier effect of linear infrastructure and other landscape elements.

As a result of the efforts made by the various administrations to conserve the species, in June 2024 it was finally removed from the 'Endangered' category of the Red List of Threatened Species, thanks to a 'spectacular recovery process'. Since then, it has been considered 'vulnerable', according to the latest update of the list.







SPECIFIC SECTION



INFRASTRUCTURES AND HABITAT FRAGMENTATION

We have probably all heard the expression “an animal crossing a road”, when in reality it is the road that cuts across the animal’s habitat. Since such human infrastructure is necessary, our aim should be, on the one hand, to understand the real effects these elements have and, on the other, to consider how to mitigate them and provide solutions that minimise their negative impacts on wildlife.

A habitat is, by definition, the place or territory where the optimal and appropriate conditions exist for a species to live. The Iberian lynx is an animal with a very specific habitat which, combined with its territorial nature, requires a range of movements.

Human infrastructures such as roads, railway lines, water channels, reservoirs, and fencing sometimes constitute insurmountable barriers or dangers for species and, consequently, for biodiversity. When ecosystems and habitats are divided into smaller units, functionality is lost, which in turn affects other species, both plant and animal.

The presence of infrastructure not only affects natural ecosystems, but can also have serious consequences for road safety, owing to accidents caused by collisions or by evasive manoeuvres to avoid running over animals in the case of linear transport infrastructures (roads and railway lines).

The effects that infrastructures have on habitats are as follows:

- Destruction of habitats.
- Reduction in habitat size.
- Edge effects: diffusion of pollutants, noise, light pollution, human disturbance, and other processes that result in loss of habitat quality.
- Edge processes: creation of new habitats, channelling of organism movements, proliferation and dispersal of exotic species, etc.
- Filter and barrier effects.
- Wildlife mortality due to collisions or other causes related to infrastructure.
- Induced urban development.

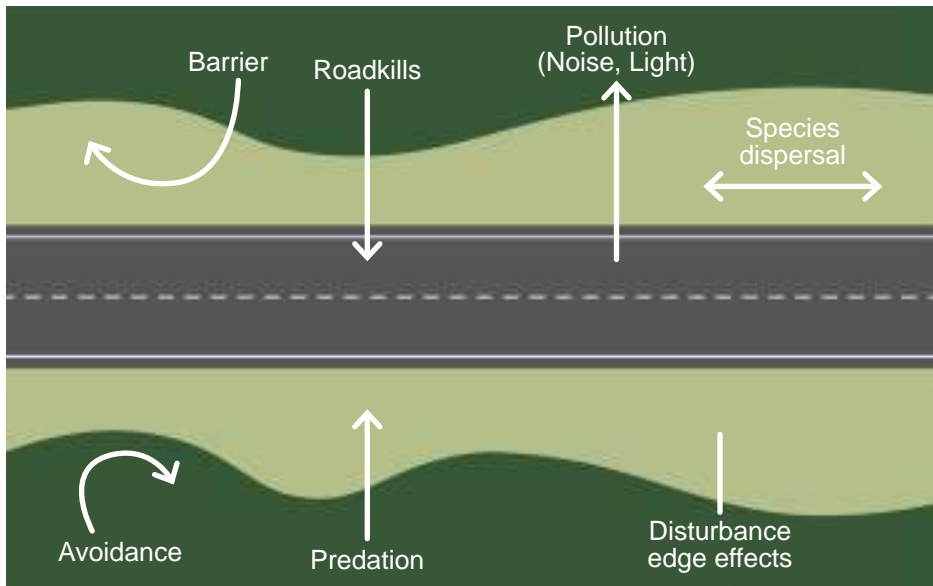


Fig. 6. Effects of infrastructure on wildlife.

1. HABITAT FRAGMENTATION

The presence of the Iberian lynx in a territory creates the need for mutual coexistence with human activities. In areas where this jewel of Iberian wildlife lives, a variety of recreational nature tourism activities take place: wildlife observation, photography, and trails in the lynx's roaming areas. These activities require regulation to avoid causing negative impacts on the species and on other species sharing its habitat.

Ecotourism activities, wildlife observation and photography, hides, and similar initiatives have become a growing tourism resource in recent decades. Such initiatives represent an important economic driver in regions or localities where the lynx is present and simultaneously promote the appreciation of the conservation status of these areas as an added value to their biodiversity and natural resources.

Habitat fragmentation is one of the main causes of biodiversity loss worldwide. This term refers to the division of more or less extensive continuous habitats into smaller, isolated fragments. This division is a consequence of land-use change, particularly due to the development of urban areas and linear infrastructures.

Linear infrastructures restrict the movement of living organisms through the habitats they cross, thereby amplifying the isolation effect. These movement limitations occur due to physical barriers that impede crossing, mortality associated with collisions, and/or disturbances such as noise, light, or pollution. Indirectly, they are also affected by changes in runoff processes resulting from infrastructure construction, which can trigger erosion and soil loss.

2. HABITAT DEFRAGMENTATION AND ACCIDENT PREVENTION

Defragmentation is defined as the set of actions aimed at restoring or enhancing ecological connectivity in areas affected by operational transport infrastructures. In this way, the movement of wildlife is facilitated, the risk of accidents is reduced, and our green infrastructure is strengthened.

The Strategy for the Defragmentation of Habitats Affected by Linear Transport Infrastructures, approved by the Sectorial Conference on the Environment on 24 July 2024, is the result of a joint and collaborative effort, in compliance with the mandate established in the State Strategic Plan for Natural Heritage and Biodiversity to 2030. Its ultimate objective is to advance the improvement of territorial connectivity and achieve a more effective integration of biodiversity into the development of our transport infrastructures. This not only involves the adoption of specific measures but also the implementation of strategic actions that translate into tangible and sustainable long-term results.



ROAD SAFETY AND THE CONSERVATION OF THREATENED SPECIES

Wildlife-vehicle collisions are an increasing concern on the Iberian Peninsula. Some of the causes of this rise include the abandonment of rural areas, the scarcity of predators in certain regions leading to herbivore overpopulation, and, above all, the reduction of natural habitats, which causes wildlife roaming areas to come increasingly close to urban zones. On the positive side, this increase is also partly due to the growing populations of certain species, such as the Iberian lynx.

In this context, concerns about road safety are reinforced by the protection of threatened species and habitat defragmentation. These three factors form a balanced triangle, where measures in support of any one of them have a positive impact on the other two.

1. SIGNAGE

Sections with a particularly high frequency of wildlife-vehicle incidents have been defined by the Directorate-General for Roads as TEFIVA sections (Tramos de Especial Frecuencia de Accidentes Viales con Animales – Sections of Special Frequency of Road Accidents Involving Animals). These are sections with a minimum length of 1 kilometre, in which at least 10 wildlife-related accidents have been recorded over the past five years, including at least one accident involving human casualties.

Once a section with these characteristics is identified, it is marked with the specific regulatory warning sign P-24, indicating the hazard of free-ranging animals, complemented by a panel specifying the length of the affected section. This allows road users to clearly recognise that they are travelling through such a section and to take the necessary precautions. At the vertices of the P-24 sign at the start of the section, flashing lights are installed to operate during nighttime and twilight hours to attract greater attention. When the length of the section to be signed is equal to or greater than 2 km, intermediate signs (without lights) should be installed as reminders.

In addition to signage, other complementary measures may be implemented in these sections.

The identification and marking of such sections will be carried out periodically, at least every five years.



**P-24
WILDLIFE CROSSING**

Danger due to the proximity of an area where the road is frequently crossed by wildlife.

In 2023, the P-24a Wildlife Crossing (Wild Boar) sign was introduced. It indicates the danger due to the proximity of an area where the road is frequently crossed by wildlife, with a very significant proportion being wild boar. In other words, it conveys the same message as the P-24 – wildlife crossing – but specifically warns of the possibility that the animals may be wild boar.

Although such signs are not standardised nor included in Article 134 of the Highway Code, which establishes the official catalogue of traffic signs, it is possible to find signs explicitly indicating the presence of lynx near the road. In this regard, a 2020 Supreme Court ruling concerning the signage of the Regulated Parking Service in Madrid confirmed that municipalities may establish and install newly created traffic signs not reflected in the General Traffic Regulations.



Fig. 7. Some sign models warning of the presence of lynx in the vicinity.

2. SPECIFIC MEASURES TO PREVENT LYNX-VEHICLE COLLISIONS

In addition to signage, there are other tools that help prevent lynx-vehicle collisions:

- Overpasses

These structures provide a crossing point for wildlife, with the surface fully restored or naturalised. They are located in areas of habitual wildlife movement and zones with low human disturbance. To minimise the impact of vehicle lights and noise, opaque screens at least 2 m high are installed along the sides, which can be complemented by dense shrub plantings. The entrances to the overpass are wider than the central section, increasing the likelihood that animals will locate them.

- Fencing

Continuous, buried single-twist mesh fences, 2.5 metres high with an overhang, are used to prevent animals from accessing the road.

- Collar-based detection

Using high-frequency (VHF) receivers, the lynx's collar is detected, triggering variable LED signage and cameras to locate the animal. The system remains active for 15 minutes after detection, then scans the area to see if the animal is still nearby; if not, it switches off one minute later. Drivers are warned with a "Lynx on the road" message, accompanied by a variable speed limit of 40 km/h. This limit overrides the standard road limit and exceeding it may result in a fine if speed is monitored at that point. This system is already implemented at several points on the road network in Extremadura.

- Underpasses

These structures allow wildlife to pass beneath the infrastructure, restoring connectivity on both sides of the road. They are especially suitable where the road runs on an embankment.

- Dry banks

Concrete block structures allow underpasses to be used even when flooded. They consist of one or two raised passages along the tunnel sides, enabling water to continue flowing below.

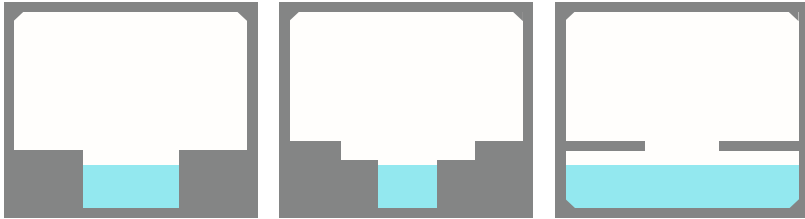


Fig. 8. Different types of dry banks.

- Clearing and trimming of margins

Work is carried out to prevent these areas from serving as refuges or habitats for rabbits, or attracting mammals that use them as hiding places, and to increase visibility for both drivers and animals.

- Escape ramps

In areas with a particularly high risk of animals entering the road and becoming trapped between fences, escape ramps allow animals to return to the exterior of the road.

- Optical deterrents

Reflective materials, usually installed on roadside markers, reflect vehicle lights towards the surrounding areas, ditches, and margins. These are intended to alert animals near the road edges and prevent them from approaching.

- Vehicle-mounted warning whistles

These low-cost devices (under €10) work with airflow like a whistle and help warn animals, reducing collisions—particularly from hybrid or electric vehicles, which are quieter.



- Virtual fence

This system consists of sensors placed every 50 metres on both sides of the road. They activate automatically when an animal is near the road and a vehicle approaches at high speed. This triggers an optical/acoustic alert sequence that deters the animal from crossing and warns the driver of the animal's presence. Once the vehicle passes, the signal ceases, allowing animals to move freely again. This system was first implemented on roads in Andalusia.

- AVC-PS

This system uses a combination of infrared sensors and a thermal camera to detect the animal. When an animal approaches, an alert is triggered to slow down drivers. Simultaneously, a radar sensor checks whether the vehicle reduces speed; if not, the radar sends a signal to the control unit, activating an acoustic device to deter the animal. Like virtual fencing, this system only operates in high-risk situations, i.e., when an animal is near the road and a vehicle approaches at excessive speed. AVC-PS has been installed on roads in the provinces of Córdoba, Jaén, Seville, and Huelva.



GOOD PRACTICES AND RESPONSIBLE DRIVING

The impacts of linear transport infrastructures are numerous and complex. Collisions with wildlife are the most visible and pressing impact, whether due to the mortality of protected species such as the Iberian lynx, or collisions with large wild ungulates such as deer, wild boar, or roe deer, and the accidents they may cause. At times, the remains of animals killed on the road or in the verges attract other types of wildlife, mostly scavengers, which can exacerbate the problem when they come to feed.

More than half of drivers have experienced a risky situation at the wheel due to the presence of an animal on the road. These situations include sudden braking, swerving, the need to enter the opposite lane, or even leaving the roadway.

1. MINIMISING THE CONSEQUENCES OF WILDLIFE COLLISIONS

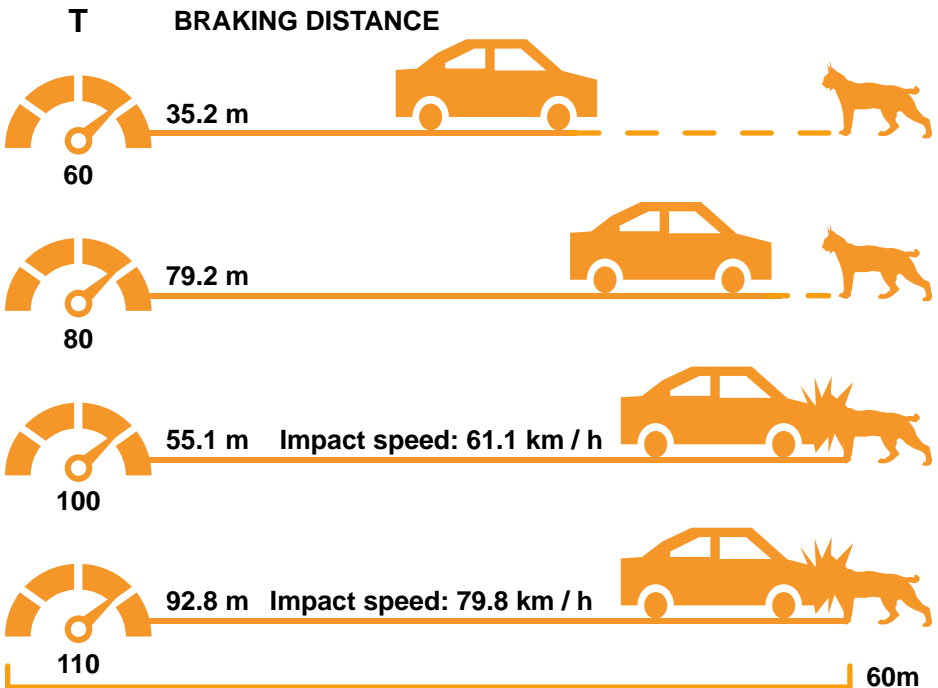
The best way to prevent harm is to avoid a collision in the first place. From a driving perspective, two of the main allies are increasing the following distance and reducing speed. At 80 km/h, there is sufficient time to stop if a wild animal enters the road 60 metres ahead. At 100 km/h, there is no longer enough distance to stop without hitting the animal, reaching an impact speed of 61.1 km/h.

Technological aids in vehicles can also be vital allies. This includes emergency braking systems, driver assistance systems, and night vision systems with infrared technology.

Maximising attention, especially during dawn and dusk—periods of greatest wildlife activity—can help detect the presence of animals and prevent collisions. At night, two bright points on the road may be the eyes of animals illuminated by headlights, revealing the presence of individuals near the road. The most frequent entry points for animals onto roads are the verges, which require particular vigilance. Nevertheless, it is important to remember that an animal can cross the road anywhere and at any time.

Proper maintenance of vehicle lights can also help minimise the likelihood of wildlife collisions.

Warning signs indicating the presence of animals mark sections of road with a higher risk of collisions. Observing speed limits, increasing following distance, and maintaining heightened attention in these areas is particularly necessary.



2. HOW TO ACT WHEN AN ANIMAL IS ON THE ROAD

In the presence of an animal on the road:

- Reduce speed, stop if necessary, and use hazard lights.
- At night, switch from high beam to dipped headlights to avoid dazzling the animal and causing it to freeze in the middle of the road.
- Avoid honking loudly, so the animal is not startled and does not react unpredictably; brief taps on the horn are preferable.
- If it is necessary to drive alongside the animal, proceed very slowly. Its reactions are difficult to predict, as it may be frightened or disoriented.
- Consider that the presence of an animal on or near the road may indicate that there are more nearby (for example, young accompanying their mothers).

If a collision is unavoidable:

- Remain calm and keep your vehicle in its lane.
- Brake to reduce impact speed as much as possible and maintain your lane without sudden movements to minimise human injuries.
- Lift your foot off the brake at the last moment to prevent the front of the vehicle from dipping, which reduces the likelihood of the animal being thrown onto the windshield after impact.
- Swerving to avoid the animal can have far worse consequences, as it may cause you to enter the opposite lane and collide head-on with another vehicle, or veer off the road and hit rigid objects such as trees.



After a collision:

- Stop the vehicle safely, if possible off the road, with appropriate signalling (hazard lights), always following traffic regulations to avoid endangering other road users. Your own safety and that of others is the top priority.
- If the vehicle obstructs traffic, signal the accident with hazard lights, wear a reflective vest when exiting the vehicle, mark the site with emergency triangles or a V-16 signal, and notify emergency services.
- Bear in mind that the animal may be injured and dangerous; ensure you observe its surroundings and do not approach it if it is lying still.
- Regardless of the species, but especially in the case of protected or large animals, contact the emergency number (112) and follow the operator's instructions. Emergency services will coordinate with environmental officers or the Civil Guard to remove the animal, record the incident if it involves a protected species, and transport the carcass for necropsy and analysis as required.
- Do not pursue an injured animal; simply indicate its direction of escape to the authorities or in the accident report to facilitate its location and subsequent care.
- Do not handle or move the animal; competent authorities will do so to prevent further accidents or damage to the carcass.

... GOOD PRACTICES ... AND RESPONSIBLE DRIVING

DANGERS OF WILDLIFE COLLISIONS

Greater impact on protected species

50% of drivers have encountered hazardous situations due to animals on the road

HOW TO REDUCE THE RISK OF AN ACCIDENT



Reduce speed and maintain a safe following distance

80 km/h = Able to stop within 60m

Pay maximum attention when driving through wildlife areas

WHAT TO DO IN THE EVENT OF A COLLISION

IF THERE IS A LYNX ON THE ROAD...

Reduce speed

Use dipped headlights

Stop smoothly and signal the location if necessary

Do not attempt to capture the animal or remove it from the road



DO NOT swerve
It can cause serious accidents

Brake hard, but release the brake just before impact to prevent the animal from striking the windscreen

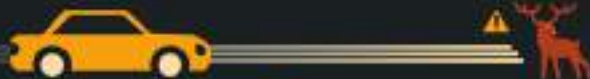
Stop in a controlled manner and secure the accident site: reflective vest, warning triangles, or V16 beacon

Do not approach an injured animal; it may be dangerous

Call 112 and follow instructions

Indicate the direction in which the animal fled if it is still alive

Do not handle or move the animal. Authorities will remove it and assess the situation





Coordinator beneficiary:



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