PARCDEL'ALBA
BARCELONA SYNCHROTRON PARK

B·S·P - PARC DE L'ALBA
ENHANCING GREEN INFRASTRUCTURE AND SUPPORTING BIODIVERSITY

B·S·P - Parc de l'Alba is a full member of the European Union platform Business@Biodiversity

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Credits

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Photographs: Parc de l'Alba, except when otherwise indicated in the photo caption.

Recommended reference work:

BSP-*Parc de l'Alba, Enhancing Green Infrastructure and Supporting Biodiversity 2016.* 61 pp

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1. PRESENTATION

Parc de l'Alba, which includes its business area promoted as BARCELONA SYNCHROTRON PARK (hereinafter BSP-Parc de l'Alba) is a 340 ha sector undergoing urban development, located between the municipalities of Cerdanyola del Vallès and Sant Cugat del Vallès. The purpose of this strategic project for Catalonia is to become a **powerful engine for scientific, technological and business competitiveness in southern Europe**. The land is located in an international knowledge hub at the centre of the Barcelona Metropolitan Region, in a strategic area that brings together scientific equipment that is a benchmark in Europe (the Alba synchrotron that is on BSP lands), a university campus (the Autonomous University of Barcelona, a Parc partner), an exceptional concentration of research and development and business park infrastructures, and a dense industrial fabric of some 10,000 companies within a radius of a few kilometres surrounding the synchrotron. The space is managed by a public consortium owned by the Catalan government via the Catalan Land Institute (Institut Català del Sòl) and the Cerdanyola del Vallès Town Council. It was established in 2001 to drive forward development in the sector.

Mixed uses were forecast in the planning of the BSP-Parc de l'Alba, integrating a **business park (the BSP), a residential land sector and extensive green spaces for the conservation of biodiversity** (Figure 1). One of the most iconic features is the green corridor, a large area of some 140 ha that plays a key role in re-establishing the ecological connectivity between the Collserola Natural Park and the Sant Llorenç del Munt i l'Obac Natural Park, members of the Natura 2000 network. Actions that favour biodiversity also consider other initiatives aimed at ecological restoration and soil recycling, at defragmentation of the region and at creating networks of green spaces and routes. As a whole it establishes an environment with great landscape quality, where people can work while enjoying the benefits of contact with nature.

With this series of actions, the Parc adds its efforts to that of many organisations around the world that are committed to investing in **green infrastructure**, which the European Commission defines as a network that integrates a framework of areas and elements with natural values that are planned and managed as a multifunctional resource, able to offer a **broad diversity of benefits both for the conservation of biodiversity and of services that the ecosystems provide to society**. The green infrastructure leads to an increase in the resilience of ecosystems, contributes to air and water quality, favours adaptation to climate change and makes us less vulnerable to natural disasters. However, it also contributes to economic and

social development that is in harmony with the conservation of healthy green spaces that coexist with spaces transformed by the development of the city and infrastructures.

After years of works, the BSP-Parc de l'Alba is now publicising the series of actions to provide support to the green infrastructure it is implementing, as well as inviting companies located in the Parc and other organisations involved in sector development to join forces with the same spirit.

Figure 1. Extensive spaces are maintained at BSP-Parc de l'Alba that are allocated to the conservation of biodiversity and ecological restoration, which coexist with the sectors allocated to business and residential uses.

GREEN SPACES: 180ha
Green corridor 140ha
Urbans parks 40ha

BUSINESS AREA:
100 plots—640.000m2
Companies established: IBM, SENER, Natura Bissé, Silc Immobles, Synchrotron Alba, Stradivarius, T-Systems.

Some 4.000 housing units

2. CONTRIBUTING TO STOPPING THE LOSS OF BIODIVERSITY: GLOBAL CONTEXT

Biodiversity integrates the complete variety of life forms on the planet (genetic diversity, diversity of species, habitats and ecosystems) and represents the base on which social and economic development is sustained, as well as people's wellbeing. Ecosystems provide essential services for human societies for:

- Supplies, facilitating products such as foods, timber, water and renewable energies
- Regulation, contributing to an improvement in air and water quality, control of erosion and pollination and a reduction of the effects of natural phenomena like heavy rainfall and floods
- Cultural, offering opportunities for leisure, sport and enjoying the landscape and nature, as well as for environmental education.

Biodiversity and the series of services that ecosystems provide us are also called **Natural Capital**, recognising this as an essential asset that must be conserved and shored up, and as an indispensable basic resource on which sustainable social and economic development sustained (see Figure 2).

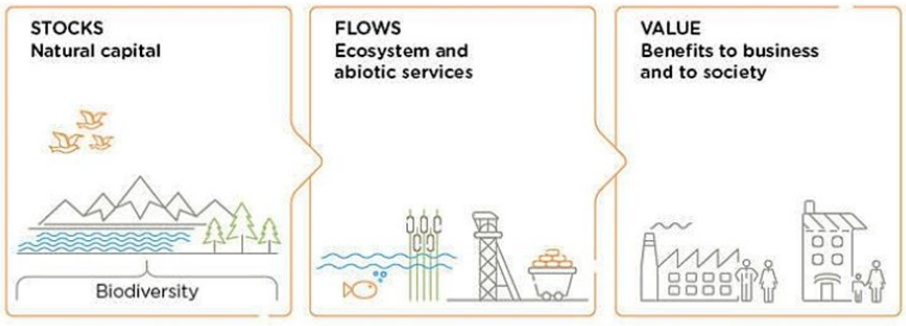


Figure 2. Biological diversity and the services provided by ecosystems are essential for people's wellbeing and fundamental for maintaining sustainable development. Image: Natural Capital Coalition

Despite the enormous benefits provided by ecosystems, which are essential for maintaining life on the planet, an accelerated loss of biodiversity is taking place that no-one has managed to stop. In Europe, the reports written by the European Environmental Agency establish that 83% of habitats and 60% of species in Europe are in a poor state of conservation. River and wetland ecosystems - as welluch as prairies and pastures - are those that reveal the most unfa-

vourable state of conservation. The species in decline even include common birds, whose populations have dropped by some 50% in recent decades. The report entitled 'The Economics of Ecosystems and Biodiversity – TEEB' estimates that the economic value of the loss of biodiversity and ecosystem services will lead to an approximate reduction in the global GDP of 6% by 2050. To give just one example, pollination by insects in the world (an ecosystem service) has been estimated at some 150 billion euros per year, nearly 10% of the total value of agricultural production for human consumption. A recent report, the 'World Economic Forum Global Risks Report 2016' ranks the loss of biodiversity as one of the greatest risks that world must deal with.

These numbers cause great concern and have moved governments and organisations around the world to take action to reverse the pressures affecting ecosystems. The main global instrument driving this process is the **Convention on Biological Diversity** (see Figure 3), established by the United Nations Conference on Environment and Development, which 193 countries have signed. In 2010, at the tenth COP (Conference of the Parties) the 'Strategic Plan for Diversity 2011-2020' was approved. The plan establishes the **Aichi Targets**, with the strategic objective of incorporating a consideration of biodiversity into all actions taken by governments and societies, in order to reverse the pressures and factors that entail a loss of biological diversity.

Figure 3. The Convention on Biological Diversity is the main international instrument for promoting the conservation of biological diversity and the sustainable use of its components.

In 2011 in Europe, the **EU Biodiversity Strategy** was agreed upon, with objectives in line with the Aichi Targets. These include the maintenance and improvement of ecosystems and the services they provide, via the **development of the green infrastructure and restoration of 15% of damaged ecosystems by 2020**.

At the COP21 of the **United Nations Framework Convention on Climate Change**, held in 2015, the mandate also arose to undertake actions to strengthen the resilience of ecosystems, with the aim of contributing to sustainable development and protecting people and their livelihoods.

However, as we approach 2020, it is becoming clearer that greater efforts are required to attain the target of stopping the world's loss of biodiversity and that the actions of both governments and all types of organisations—including the economic world—must be intensified. Committed companies throughout the world are coming together on platforms and at organisations. At the last COP for the Convention on Biological Diversity held in 2016 in Mexico, a call was sent out to companies to join the **European Business and Biodiversity Campaign**. The transition process toward sustainable development and strengthening green infrastructure must be accelerated. It is not only a big step forward in halting the loss of biodiversity, but it also entails opportunities for job creation and economic growth.

The BSP-Parc de l'Alba has joined forces with this cooperation and is a member of the Business & Biodiversity platform of the European Union, which brings together organisations from all of Europe that show their commitment to contributing to favouring biodiversity and strengthening the green infrastructure, at which they can exchange knowledge and innovate along with companies throughout Europe.

Some publications of interest:

Document	Organisation (year)	link
Living planet report	WWF (2016)	http://awsassets.panda.org/downloads/lpr_living_planet_report_2016_summary.pdf
The European Environment. State and Outlook 2015	European environmental agency (2015)	http://www.eea.europa.eu/soer
Global Biodiversity Outloock	CDB (2014)	https://www.cbd.int/gbo/gbo4/publication/gbo4-es-hr.pd
A Quick Guide: the Economics of Ecosystem Services	TEEB (2010)	http://www.teebweb.org/media/2010/09/TEEB-D2-Local-and-Regional-quick-guide_English.pdf
TEEB for business: Chapter 1: business, biodiversity and ecosystem services	TEEB (2010)	http://www.teebweb.org/media/2012/01/TEEB-For-Business.pdf
Manual conservació d'hàbitats agraris	CATALAN DEPARTAMENT OF ENVIRONMENT AND HOUSING (2009)	http://www.gencat.cat/mediamb/publicacions/monografies/ME27_manual_conservacio_habitats_agraris.pdf
Exploring nature-based solutions	EUROPEAN COMMISSION (2015)	http://www.eea.europa.eu/publications/exploring-nature-based-solutions-2014/at_download/file
Ecosystem goods and services	EUROPEAN COMMISSION (2009)	http://ec.europa.eu/environment/pubs/pdf/factsheets/Ecosystems%20goods%20and%20Services/Ecosystem_ES.pdf
EU Strategy on Biodiversity until 2020	EUROPEAN COMMISSION (2011)	http://ec.europa.eu/environment/nature/info/pubs/docs/brochures/2020%20Biod%20brochure_es.pdf
Building a Green Infraestructure for Europe	EUROPEAN COMMISSION (2014)	http://ec.europa.eu/environment/nature/ecosystems/docs/GI-Brochure-210x210-ES-web.pdf

3. A STRATEGIC SPACE FOR THE CONSERVATION OF BIODIVERSITY IN THE BARCELONA METROPOLITAN AREA

The BSP-Parc de l'Alba is located on the Vallès plain, in a setting that has been intensely transformed by urbanisation and large infrastructures that have led to a significant fragmentation of habitats and strong pressures on nature. Nonetheless, the space still enjoys notable biological diversity, with ecosystems and species of great interest. Further, it has a **strategic location** with regard to the **areas of the Natura 2000 network** and it is adjacent to the **Serra de Collserola Natural Park**, a fact that gives it a key role in the context of green infrastructure (see Figure 4).

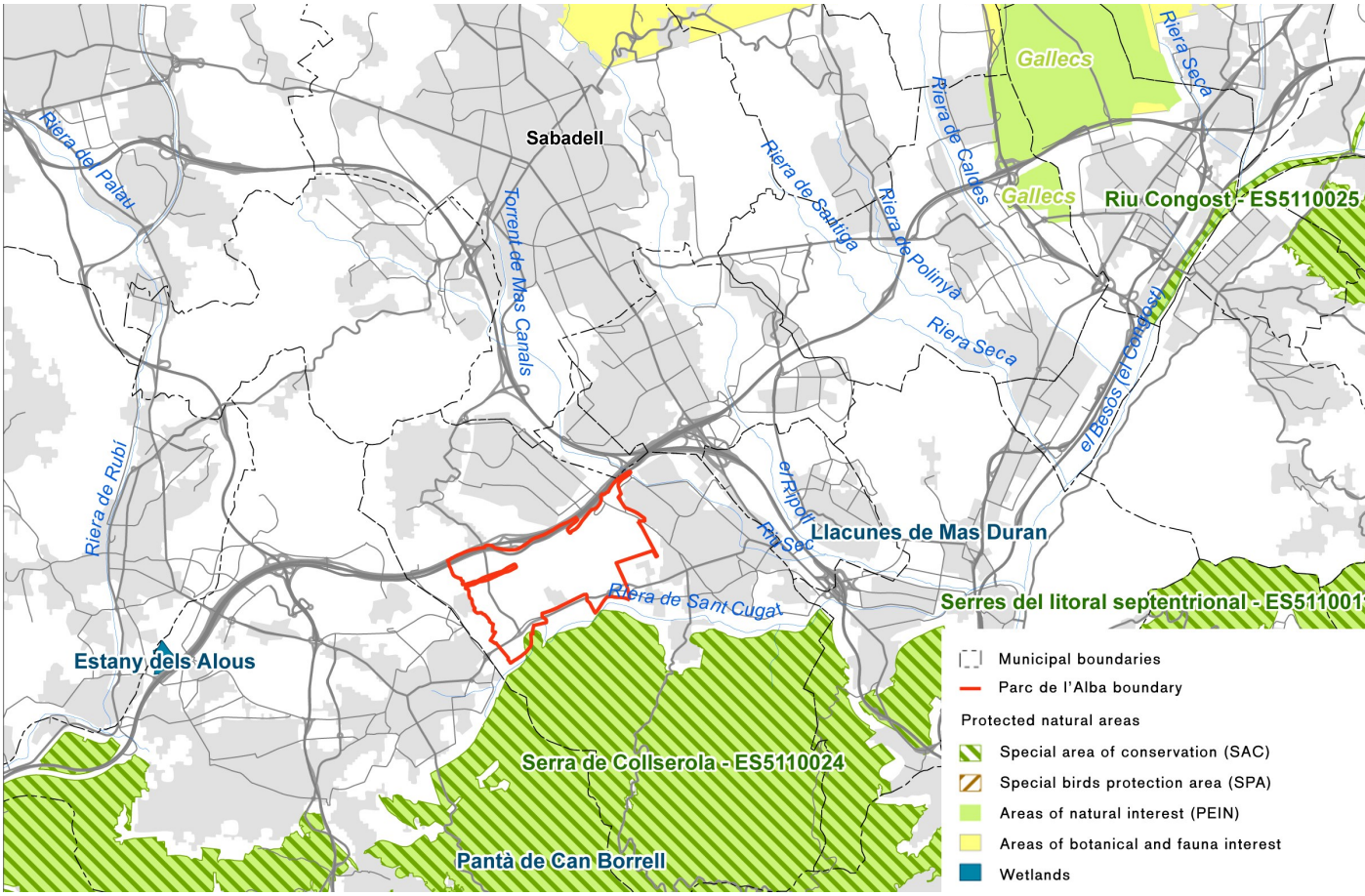


Figure 4. Location of the BSP-Parc de l'Alba (red) with regard to the natural spaces that are part of the Natura 2000 network.

The sector is primarily occupied by extensive herbaceous crops, urbanised areas and infrastructures. There are still also areas undergoing transformation, such as former rubbish tips, old backfilled landfills and vacant plots of land. This space conserves habitats and species of significant

interest. Along the different river courses in the area, such as the Riera de Sant Cugat (Sant Cugat stream) and the Torrents de Can Fatjó, Sant Marçal and Can Magrans (or intermittent streams or torrents), there are gallery forests, such as those that populate most of the top sections of the Torrents de Can Fatjó and Can Magrans. Trees include downy oaks, poplars, cottonwoods, field elms, narrow-leaved ashes and planes, and there is dense undergrowth filled with brambles, sarsaparilla, ivy, old man's beard, fragrant virgin's bower, butcher's-broom and hawthorn, among others. You may even spot plants more typical of Central Europe, such as the oak tree (*Quercus cerrioides),* the beam tree, hawthorn and dogwood. Holm oaks are also frequent inhabitants. In the rest of the sections of these streams and riverbanks of the Torrents de Bosc and Sant Marçal and the Riera de Sant Cugat, there is less abundant plant cover, including shore scrubs and reeds. The latter still conserves, in places, characteristic riverbank formations such as gulfweed and other scrub associated with the riverbanks and beds most affected by growth, where we can see species like rosemary willow, purple willow, reeds and isolated patches of white willow. There are also thicket shrubs in the area, patches of holm oak and white pine groves and stone pines bordering crops, as well as brush and secondary shrub formations, and dry meadows such as Mediterranean false brome thickets and perennial false brome thickets.

The crops are dryland, with corn and barley, remains of olive groves and abandoned almond trees, and alfalfa is planted in some fields closest to the streams. There are also crops of decorative plants and vegetables.

There are three **Habitats of Community Interest** (see Figure 5) surrounding the Parc, which are especially considered in the recovery of lands in the space, and they will be detailed in the next chapter:

- Holm oak and oak woods
- Mediterranean pine groves
- Poplar stands, willows and other riverbank forests

The **biological wealth** of the space is also made clear through the thriving community of mammals, which include rabbits, several carnivores (weasel, marten, badger, genet and fox) and wild boars. Some amphibian species can also be found, connected to the streams and reservoirs, where the most populous include the common toad, green frog and natterjack toad. The Catalonian wall lizard and Montpellier snake are the most abundant reptiles.

The area is interesting with respect to birds, both those that breed and winter there, and those for whom it is a migratory stopover site. The latter include birds of prey and large wading birds like storks and cranes. Many birds of prey, which nest nearby near the border with Collserola, come to the open spaces in the Parc de l'Alba to capture their prey, including the buzzard, goshawk, sparrow-hawk, kestrel and the Eurasian hobby, which can be spotted hunting in the forests of Canaletes and Can Castelló, the fields of Can Fatjó and surrounding Sant Marçal Castle. There are also nocturnal birds of prey such as the barn owl, little owl, scops owl and tawny owl.

Water birds are rare in the area, although the mallard duck and moorhen do breed along some dammed sections of the Riera de Sant Cugat.

The small birds that feed on seeds, such as chaffinches, goldfinches, greenfinches and serins, or insects,

like the robin redbreast, warbler and tit, are abundant in the farmlands and in the shrubs and patches of trees along riverbanks. Birds that inhabit open spaces also breed in the fields, including bee-eaters and hoopoes. The overall populations of red-legged partridge and quail have decreased in Catalonia, partly due to the transformation of croplands and the overuse of pesticides and chemical fertilisers. The application of integrated and ecological agricultural practices will entail an important improvement for these species.

Management of the space will place special emphasis on conserving croplands. Dryland farming areas make farming operations compatible with the conservation of biodiversity, as they house many communities of birds associated with open settings, some of which are in regression. Rich communities of invertebrates can also be found in these open spaces, including pollinators such as butterflies and different bee and beetle species that are in decline. The signing of agreements with farmers has let agricultural work favourable to biodiversity be maintained, not only in extensive areas of the green corridor, but also on some of the vacant plots of land. This means that these plots also house wild fauna and flora associated with crops, making it difficult for them to be colonised by exotic invasive species.

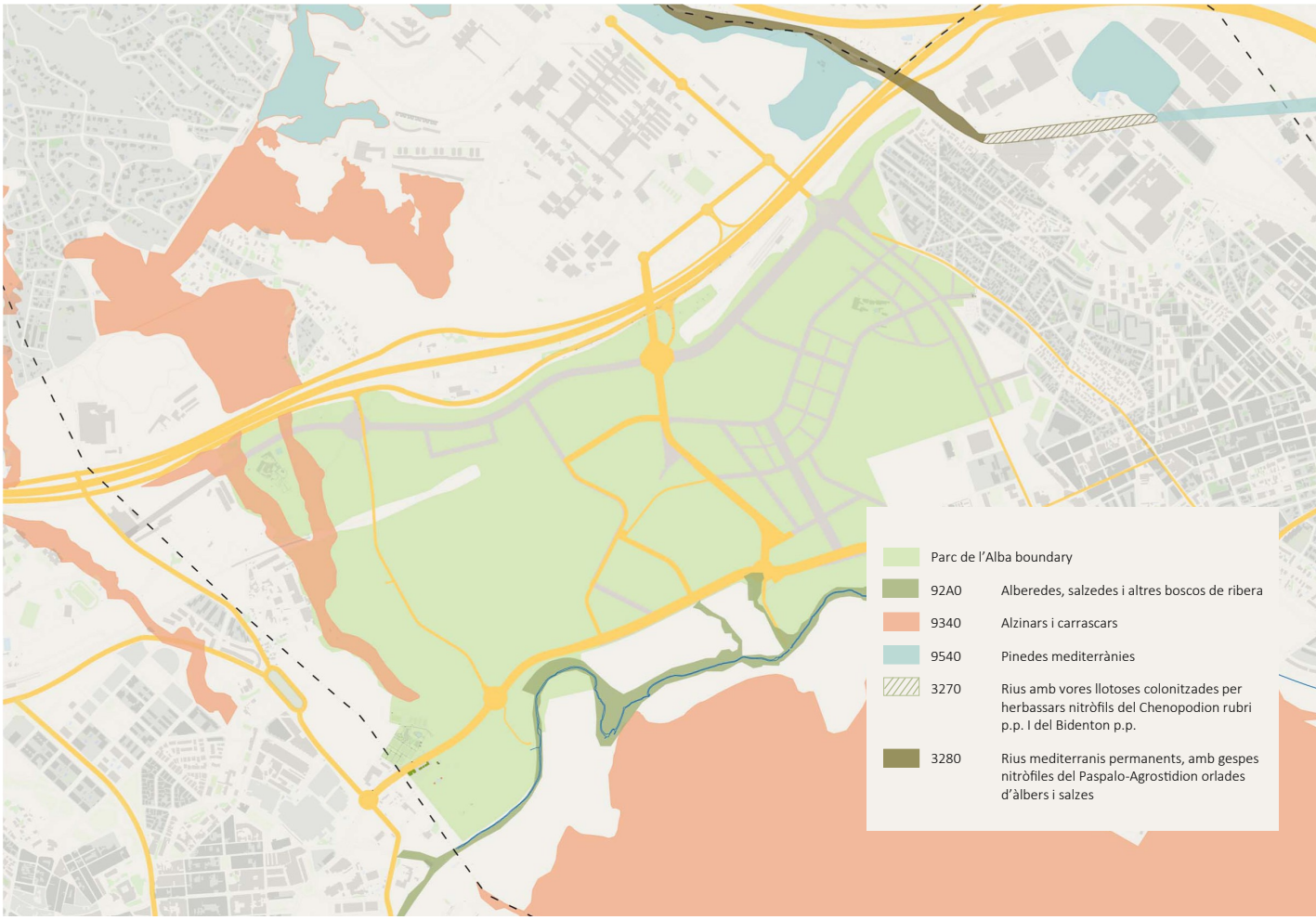


Figure 5: Location of the Habitats of Community Interest in the Parc de l'Alba and its sorroundings



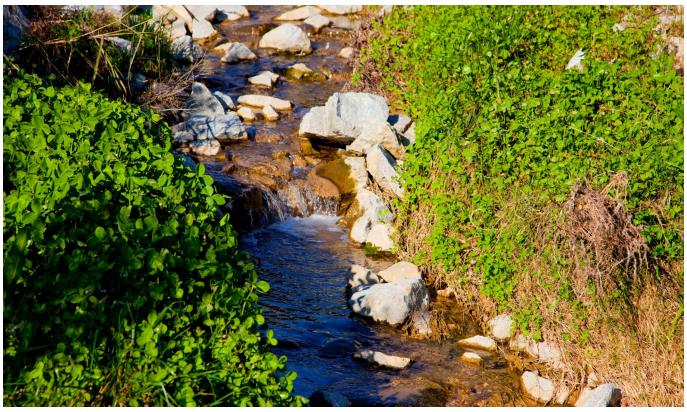



Figure 6. Dryland crops, and their rich associated biological diversity, are conserved in extensive sectors of the Parc de l'Alba, due to agreements with farmers. There are also stands of holm oak, classified as a habitat of community interest. Photos: Minuartia and Parc de l'Alba




Figure 7. Badger, fox and genet, carnivores found in the forests and other areas of Collserola Natural Park, and are also associated with different habitats in the Parc de l'Alba. Photos: Pepo Navarro and Minuartia

4. ACTION PROGRAMME TO ENHANCE THE GREEN INFRASTRUCTURE AT THE B·S·P - PARC DE L'ALBA

4.1 Actions

The actions that the BSP-Parc de l'Alba are carrying out to favour biodiversity and green infrastructure can be broken down into five core areas . The 13 actions and the benefits for biodiversity and the ecosystem services they entail are summarised below. Then a series of charts are set out that provide detailed information on each of the actions.

COREA AREA 1. Ecological restoration

Actions aimed at recycling degraded lands, or those formerly occupied by operations not compatible with conserving biodiversity, recovering forest habitats and riverbank communities, maintaining dryland farming and contributing to using the restored sectors for leisure activities. As a whole, these actions will also contribute to strengthening ecological connectivity between spaces in the Natura 2000 network.

- Conservation of the green corridor
- Restoration of water courses
- Restoration of forests
- Permeability of road infrastructures
- Restoration of soils degraded by past activity

CORE AREA 2. Application of 'nature-based solutions'

Application of systems based on the use of natural solutions as an alternative to infrastructures created from concrete or other artificial materials. These also include the addition of green roofs and walls, and other systems to maintain natural communities in the Parc's buildings.

- Naturalised drainage systems (green ditches)
- Project to construct a naturalized water retention pond
- Promoting green infrastructure in buildings

CORE AREA 3. Ecological management of green spaces and pending building areas

Management practices that let natural communities and dryland fields be maintained temporarily in the spaces planned for building. Ecological management is also applied to the green spaces,

whose purpose is to reduce the use of chemical fertilisers, pesticides and other toxic products, as well as favouring ecosystem services like the populations of pollinating insects.

- Natural communities and dry cropland conservation in pending building areas
- Ecological gardening practises and creation of shelters to promote birds and other fauna to control pests
- Recovery of unique trees

CORE AREA 4. Supporting agriculture

Actions in cooperation with farmers to conserve farming operations on dryland fields. Production will be developed in these spaces that is compatible with biodiversity, since they are home to a rich diversity of fauna, with species associated with open spaces that are in decline around Europe.

- Agreements with farmers to promote biodiversity-suited dry croplands in the green corridor and on undeveloped plots

CORE AREA 5. Healthy and educational network of paths

Creation of an infrastructure of paths for use by people in the restored areas. They provide healthy spaces for doing sports or taking walks that, in parallel, facilitate people getting out into nature and enjoying quality landscapes.

- Setting-up of a network of paths to impart knowledge on make the Parc de l' Alba's green infrastructure

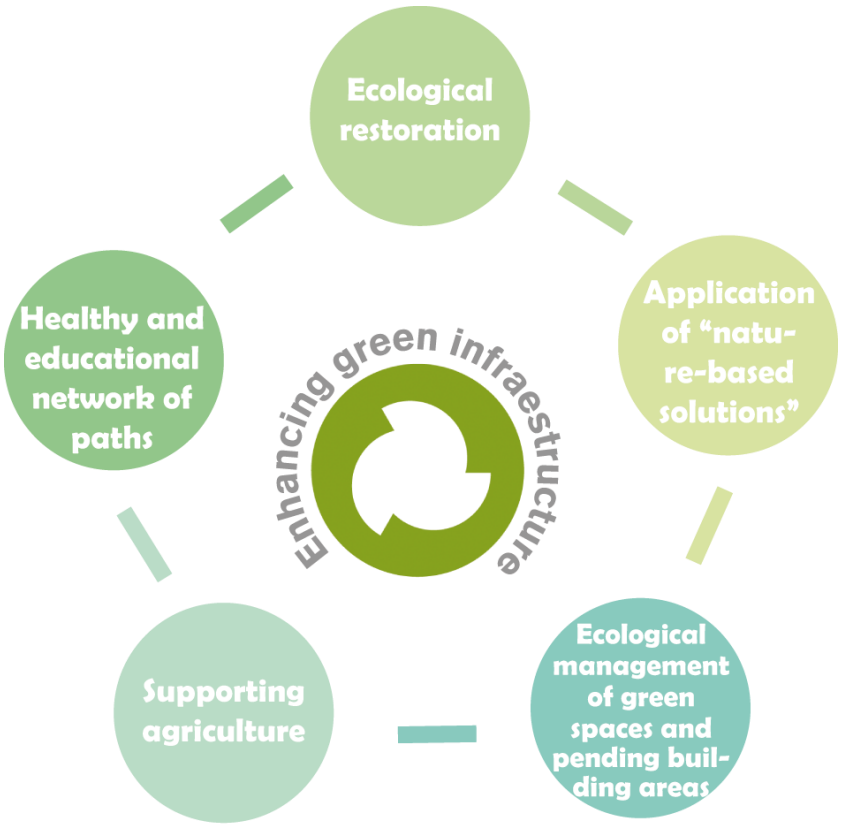


Figure 8. The programme to support the green infrastructure of the BSP-Parc de l'Alba is broken down into five core areas, with different objectives, which promote the conservation of biodiversity and also contribute to people enjoying the space and the development of production activities.

4.2 Benefits for biodiversity and ecosystem services

Ecosystem services

Benefits provided by ecosystems

Supply services

Food
Raw materials
(wood, cellulose, salt, etc.)
Quality water
Medicinal resources
Renewable energies
Other products

Regulatory services

Water and air quality
Control of erosion
Regulation of rainwater flows
Pollination
Biological pest control
Reduction of natural disasters
Mitigation of and adaptation to the effects of climate change

Cultural services

Aesthetic enjoyment
Cultural and spiritual values
Leisure, sport and tourism activities
Scientific knowledge
Environmental education

Support services

Include the formation of fertile lands, primary production, the nutrient cycle, the creation of habitats and ecological connectivity, among other processes

Figure 9. Services provided by ecosystems. Source: Adapted from Ecosystems and Human Well-being: Synthesis (Millennium Ecosystem Assessment, 2005).

The benefits for biodiversity provided by the BSP-Parc de l'Alba are:

Action 1. Conservation of the green corridor

Restitution of riverbank vegetation and mixed forests, and maintenance of dryland crops that house great biological diversity, especially pollinating insects and birds associated with open spaces that are in decline throughout Europe.

Action 2. Restoration of watercourses

Restoration of holm oak and poplar groves (habitats of community interest) on the sections of the waterways restored along the Torrents de Can Fatjó and Bosc.

Action 3. Restoration of forests

Restoration of habitats of community interest, concretely holm oak and other oak woods along the Torrent de Can Fatjó, and other forests of interest, such as riverbank forests and mixed holm oak and oak woods, and holm oak and pine woods along the Bosc stream.

Action 4. Permeability of road infrastructures

Crossings for fauna and, in general, all adapted cross-cutting structures, favour ecological connectivity and therefore increase the capacity for endurance and enable a good state of conservation for many species of animal populations.

Action 5. Restoration of soils degraded by past activities

Permits the recovery of the land and all associated organisms, and represents the base for the restoration of habitats of interest.

Action 6. Naturalised drainage systems

Recovery of herbaceous communities in green ditches. Tests were conducted for implementing helophyte plants, which was not successful due to the lack of enough permanent water.

Action 8. Promoting green infrastructure in buildings

Favours autochthonous plant species and—with a reduction in using toxic products—also benefits animal species, including pollinating insects.

Action 9. Natural communities and dry croplands conservation in pending building areas

Favours the temporary conservation of autochthonous herbaceous and shrub communities and the rich fauna of invertebrates and other species associated with these lands. Prevents uninhabited plots from being colonised by exotic invasive species.

Action 10. Ecological gardening practices and creation of shelters to promote birds and other fauna to control pests

Favours populations of insectivore birds, all protected, and bats, a group of which all species are endangered. Moreover, the reduction in using toxic products benefits all species of flora and fauna and particularly pollinating insects.

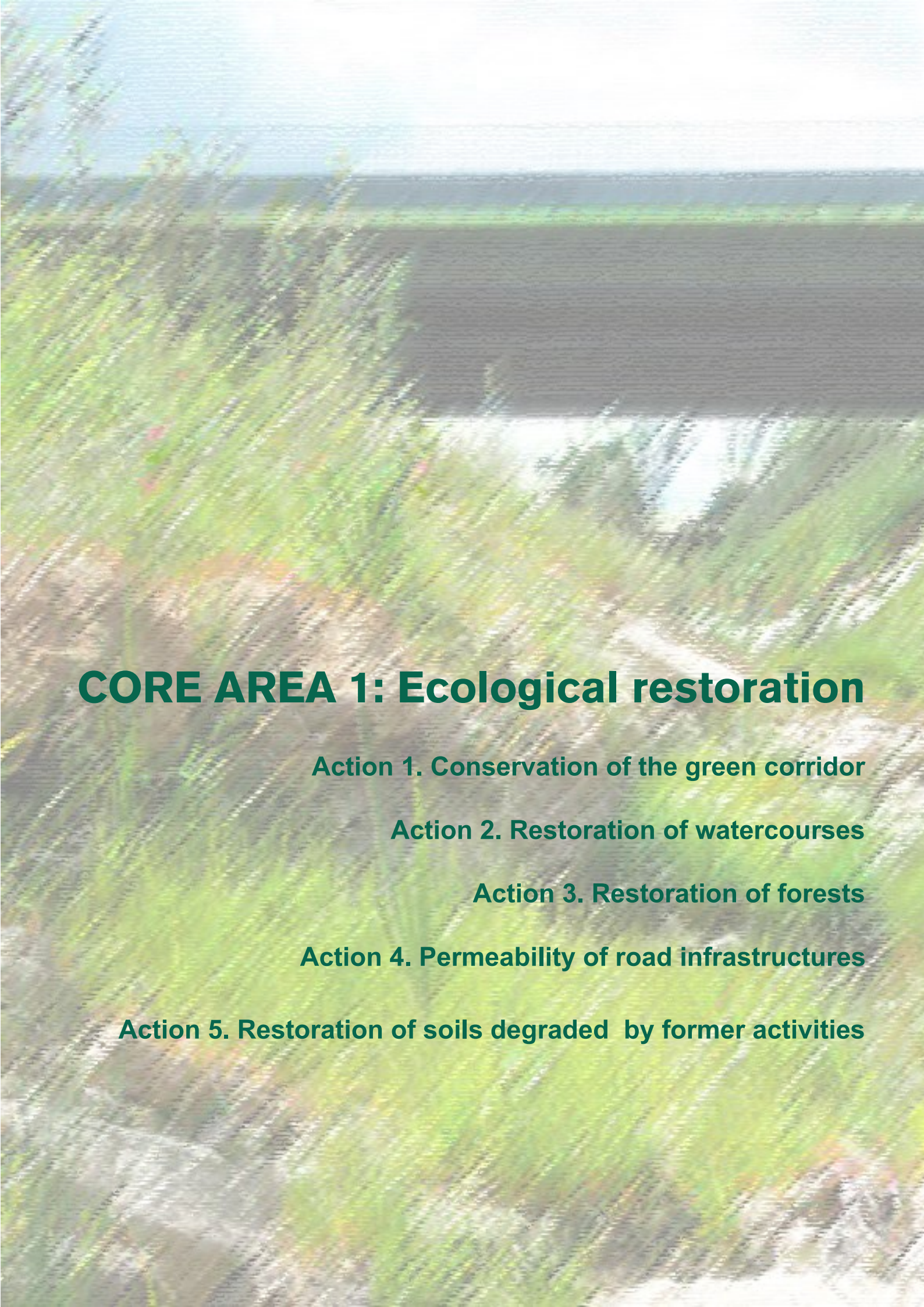
Action 11. Recovery of unique trees

Preservation of unique species of native trees of interest due to their size and landscape value. Some of them are remains of potential natural forests in the region.

Action 12. Agreements with farmers to promote biodiversity-suited dryland cropslands in the green corridor and undeveloped plots

Favour dryland farming of cereals and other associated communities, as well as benefiting rich fauna of birds associated with open spaces (many of them in decline), birds of prey, insects, including pollinators, etc.

		Ecosystem services												
		Supply			Regulatory							Cultural		
		Water	Food	Raw materials	Medicinal resources	Regulation of local climate and air quality	Carbon sequestration	Moderation of effects of catastrophes	Water purification	Erosion control	Pollination	Control of invasive species	Recreation, leisure and	Environmental education	Aesthetic and cultural	Spiritual experiences
CORE AREA 1	Action 1 Conservation of the green corridor	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	
	Action 2 Restoration of watercourses	✓				✓	✓	✓	✓	✓	✓	✓			✓	
	Action 3 Restoration of forests					✓	✓	✓		✓	✓	✓			✓	
	Action 4 Permeability of road infrastructures												✓	✓	✓	
	Action 5 Restoration of soils degraded by former activities							✓	✓	✓	✓		✓		✓	
CORE AREA 2	Action 6 Naturalised drainage systems							✓	✓	✓				✓		
	Action 7 Project to construct a naturalised water retention pond							✓		✓						
	Action 8 Promoting green infrastructure in buildings					✓					✓	✓			✓	
CORE AREA 3	Action 9 Natural communities and dryland crop conservation in undeveloped plots		✓					✓		✓	✓	✓			✓	
	Action 10 Ecological gardening practices and fostering of associated fauna	✓									✓	✓			✓	
	Action 11 Recovery of unique trees					✓	✓								✓	
CORE AREA 4	Action 12 Agreements with farmers to promote biodiversity-suited dryland crops		✓			✓		✓		✓	✓	✓			✓	
CORE AREA 5	Action 13 Creation of a network of routes to educate on green infrastructure												✓	✓		



CORE AREA 1: Ecological restoration

Action 1. Conservation of the green corridor

Action 2. Restoration of watercourses

Action 3. Restoration of forests

Action 4. Permeability of road infrastructures

Action 5. Restoration of soils degraded by former activities

Action 1.

CONSERVATION OF THE GREEN CORRIDOR

The Parc de l'Alba is carrying out numerous actions to contribute to the green infrastructure in its territorial area of development. These actions have been gradually implemented since the earliest planning stages, as the Urban Development Master Plan (PDU per its initials in Catalan) for the Parc allocates approximately half of its area to the restoration of an ecological connector: the 'green corridor' that will favour continuity of the system of natural spaces in the metropolitan region. In successive phases of writing projects and executing urbanisation works, the permeability measures planned for fauna during the construction of roads (until now have been constructed four viaducts adapted as a mixed passage for people and fauna), deconstruction of two old brickworks that have not been used for several years, removal of activities incompatible with the use of the green corridor (old landfills), restoration of forests and other plant communities, management of habitats of interest, etc.

The works executed have consisted of topographical remodelling and suitable re-planting with native species of 11.5 ha of lands located near road BP-1413, the Torrents de Bosc and Can Fatjó (see Action 2) and restoration of forests (see Action 3). The proper development of planting trees and shrubs (3,023 trees and 43,509 shrubs have been planted) contributes to ensuring the connectivity of the habitats and animal populations in Parc de l'Alba and in Collserola. The active maintenance of these restored spaces and dryland farming fields that shape the natural mosaic of habitats in the green corridor is another key piece in the functionality of the ecological connector. The action is complemented by the creation of a network of paths for the leisure use of the region, and the creation of walking routes in order to enjoy and learn about the actions done to present (see Action 13).

To date, the first and second phases of restoration of the green corridor have been executed. Phase one was executed in 2011, at a cost of € 1.5 M, and phase two in 2012, at a cost of € 205,000. The conservation of this space has created approximately four direct jobs and 60 indirect jobs.

Planting works in the green corridor in the riverbed of Torrent del Bosc

View of the green corridor that shows the restored areas and the new Torrent de Can Fatjó viaduct, a connectivity structure that defragments habitats.

Mosaic of grain fields with mixed Mediterranean holm oak woods that are preserved in the green corridor and are associated with a large diversity of flora and fauna that inhabit open spaces.

Birds of prey, like this goshawk, can be found in the open spaces of the green corridor, excellent hunting grounds. Photo: Pepo Navarro

Complementary references and information

The Pla Director Urbanístic of the Directional Centre of Cerdanyola del Vallès

Action 2.

RESTORATION OF WATERCOURSES

The Urban Development Master Plan for the Parc allocates 15.5 ha (nearly 14% of the PDU's total area) to the water system in order to preserve the riverbeds of the Riera de Sant Cugat and the Torrents de Can Fatjó, Bosc, Sant Marçal and Can Domènech and, in parallel, with hydraulic criteria to limit overflows risks.

The green corridor restoration projects and works incorporate, as one of the basic premises, the improvement and preservation of the riverbeds of existing waterways, both for hydraulic and ecological purposes. These riverbeds also represent the structural mainstays for the green spaces in Parc de l'Alba.

Execution of the riverbed restoration works at the Torrent del Bosc and restored riverbed that flows under the BP-1413: restitution of the natural section of the riverbed and re-planting with riverbank woods. Helophyte plants in foreground.

Torrent de Sant Marçal and its passage under the BP-1413. In the foreground, ford over the riverbed for amphibians.

Passage of the Torrent de Bosc under road BP-1413. Mixed path for pedestrians, bicycles and fauna.

Complementary references and information

Importance of environmental recovery of the friver courses in ecological connectivity. The case study of Parc de l'Alba.
Article I Congrés de l'Aigua a Catalunya. March 2015

Action 3.

RESTORATION OF FORESTS

In the scope of the green corridor, existing forests have been maximised through re-plantings and planting autochthonous plants. These actions are encompassed in phases 1 and 2 of restoration of the connector. During phase one of green corridor restoration, actions consisted of re-establishing bank forests in the new riverbeds of the restored streams in the southernmost area of the corridor. These tree masses were transformed into a mixed pine and holm oak forest at some distance from the riverbeds and water level. In phase two, the actions consisted of reinforcing the existing mixed forest of holm oaks and pines in the northernmost section of the riverbed of the Torrent de Can Fatjó.

The action starts up succession processes for the potential natural plant communities in the area through planting specimens of different ages to favour their adaptation and heterogeneity, and to decrease fragility in the initial stages of establishing their plant communities. A total of 1800 trees were planted in phase one and 1270 in phase two, of which some 2000 are autochthonous trees recovered from old nurseries in the region: stone pines, white pines, holm oaks and olive trees, among others. Some 43,000 units of shrub species were also planted and a pilot test was conducted to strengthen the riverbank forest in urban parks, transplanting trees affected by city development works.

Restoration of the riparian forest in the riverbed of the Torrent del Bosc, and successions of mixed forests of oak, holm oak and pine as we draw back from the riverbed.


Phase one of establishing the mixed pine and holm oak woods in the green corridor.


Reinforcement of the holm oak and oak groves existing at the Torrent de Can Fatjó during phase two of restoring the green corridor.

Strengthening the riparian forest in the urban park of Torrent de Sant Marçal. The synchrotron building—under construction—in the background. The trees were reused from forest masses affected by urbanisation works.

Complementary references and information

La connectivitat als espais verds. El corredor verd del Centre Direccional de Cerdanyola del Vallès. 17è APEVEC Congres. "Green spaces in transformation" Nov. 2014

Action 4.

PERMEABILITY OF ROAD INFRASTRUCTURES

The PDU plans for the construction of 14 cross-cutting structures to make the existing and future road infrastructures permeable at Parc de l'Alba. Of these, eight structures will be executed by the manager of this area, while the remaining four must be executed by other infrastructure operators in the sector or in neighbouring areas (ADIF, AP7).

During the first phase of executing urbanisation works at Parc de l'Alba, six structures were built (multifunctional animal crossings that will also be used by people, and drainage works adapted to animals), at a total cost of seven million euros. These structures have contributed to defragmenting the territory, re-establishing connectivity for fauna and, in many cases, maintaining the continuity of natural habitats via the roads. They are located at the intersections of roads with the Torrents de Can Fatjó, Bosc and Sant Marçal, which are natural passage corridors for many animal species in this area. Their effectiveness has been proven during follow-through studies (Minuartia, 2012), making the high frequency of animal crossings clear, as well as the wealth of species that use the structures adapted to fauna, much higher than structures that are not adapted. The species in the reference animal groups (lagomorphs, carnivores and ungulates) that use the green corridor animal crossings are: the wild boar, fox, genet, badger and rabbit. Some structures also have sanctuaries to facilitate their use by invertebrates and to attract and facilitate the crossing of chiropters, or bats.

The construction of these structures led to the creation of some 35 indirect jobs and four direct jobs.

Aerial photo taken in 2008 during the construction of road BP-1413, where the defragmentation achieved with the two transverse structures built in the green corridor can be seen in the foreground. To the left of the Can Fatjó viaduct, 120 m wide, and to the right of the Torrent del Bosc viaduct, 30 m wide.


Old drainage facilities existing on road BP-1413 in sectors that have undergone defragmentation works. Torrent de Can Fatjó on the left and Torrent del Bosc on the right, where both streams are axes that structure the green corridor.


Close-up of the adaptations executed at the mixed structure built on road BP-1413 where it crosses the Torrent del Bosc and includes pedestrian crossings.


Close-ups of the adaptations made to the Torrent de Can Fatjó viaduct to favour the crossing of fauna, which integrate sanctuaries for small fauna like insects, invertebrates and micromammals.

Complementary references and information

La dispersió de la fauna al Corredor Verd del Parc de l'Alba. Avaluació de la situació actual i propostes alternatives per al restabliment de la connectivitat ecològica. *Minutaria, June 2012*

Action 5.

RESTORATION OF SOILS DEGRADED BY FORMER ACTIVITIES .

The PDU plans for the restoration of 39 ha of land occupied by old operations that are incompatible with the use of vacant spaces. The first action, executed in 2008, was the deconstruction of three old unused factories that were located in the middle of the green corridor. These actions led to the liberation of some 10 ha of lands that were occupied by incompatible activities, in which natural habitats and the ecological flows in the green corridor could then be re-established. Next, diagnostic studies were conducted, and different lands in the area affected by these industrial activities were characterised, and others that had been backfilled with soil and waste not controlled in the past. To date, the old backfills in the area called Àrids Catalunya have been restored, and the soil has been decontaminated in the area called PAVIBAR. The restoration of another backfill called Montserrat 2 is planned for the near future. All works have been executed under the supervision of the competent administrations on waste and water. Àrids Catalunya is now a recreational area that is part of the green corridor.

All actions carried out to date have cost € 3.3 M and created approximately 80 indirect jobs and 15 direct jobs.

There are still several areas pending restoration, where the former Can Planas rubbish tip, which was closed in 1995, merits mention. A restoration estimated at € 10 M is planned in order to construct an urban park after the lands have been regenerated, which will let the soil be recycled and add value to this space of some 18 ha, currently in a degraded state.

Another significant work is the Elena controlled landfill, filled with the selection of packed municipal waste, still being shut downclosed. Verification of its compatibility for future use as a recreational area will need to be done.

Deconstruction of Bòvila Capmany, a former abandoned brick factory located in the middle of the Torrent de Can Fatjó corridor. During deconstruction, specific works were executed to remove the fibre cement cladding from the roofs of the warehouses.

Current condition of the space once occupied by Bòvila de Capmany, now naturalised.

Now restored area of Àrids Catalunya: replanted, with paths and signposting for its public use.

Virtual image of the future Parc del Castell (Castle Park), which will be located over the former Can Planas deposit, after it has been restored.

Complementary references and information

Restoration state of the Can Planas rubbish tip
State of the Elena landfill

CORE AREA 2. Application of ‘nature-based solutions’

Action 6. Naturalised drainage systems

Action 7. Project to construct a naturalised water retention pond (being prepared)

Action 8. Promote green infrastructure in buildings

Action 6.

NATURALISED DRAINAGE SYSTEMS

The Parc de l'Alba has a network to separate rainwater and wastewater. There are different pre-treatment systems planned for rainwaters before they flow into the riverbeds, in order to remove the main pollutants that enter rainwater as it flows over roads. One of the systems planned for the PDU, the most suitable from environmental and economic viewpoints, are what are known as green ditches. These ditches are green filters that—via the soil system and plant roots—reduce the pollution generated during rainy periods by the first runoff waters (which have the highest degree of contamination).

The construction is also planned of 16 green ditches that will be located in public green spaces. The first three ditches are located in the green corridor and have been operational since May 2012.

The results are also being monitored that are being obtained from the pre-treatment of rainwaters via the green ditches already operating in the green corridor, with the aim of verifying their efficiency and finding out their service life, with an eye toward their maintenance. Monitoring consists of sampling the waters flowing into and out of the ditches, and analysing the soils throughout the ditches. The results and conclusions of this monitoring will be implemented in complementary urbanisation projects that are pending construction.

Green ditch of Torrent de Can Fatjó

Collection box prepared for sampling waters.

Trail left by rainwaters that flowed through the CV2 ditch that collects the treated waters from the Riera de Sant Cugat.

Taking soil samples in the CV2 ditch.

Complementary references and information

Currently underway.

Action 7.

PROJECT FOR A NATURALISED STRATIFIED POND

n preparation

Sample of the stratified pond of the Maria Cristina Canal that collects rainwaters from Albacete.

Action 8.

PROMOTE GREEN INFRAESTRUCTURE IN BUILDINGS

The Parc is working on preparing materials to provide to companies already established in the park and new companies that want to set up here, with the aim of notifying them on the actions executed at the park to support the green infrastructure and favour biodiversity.

In parallel, they are encouraged to add initiatives along this line when drafting their projects, managing their gardens, etc. They are also asked to adopt nature-based solutions into their projects, such as green roofs, or the ecological design and management of gardens.

These materials will be publicised in the near future, and a survey will be posted on the Parc website to any companies that are interested.

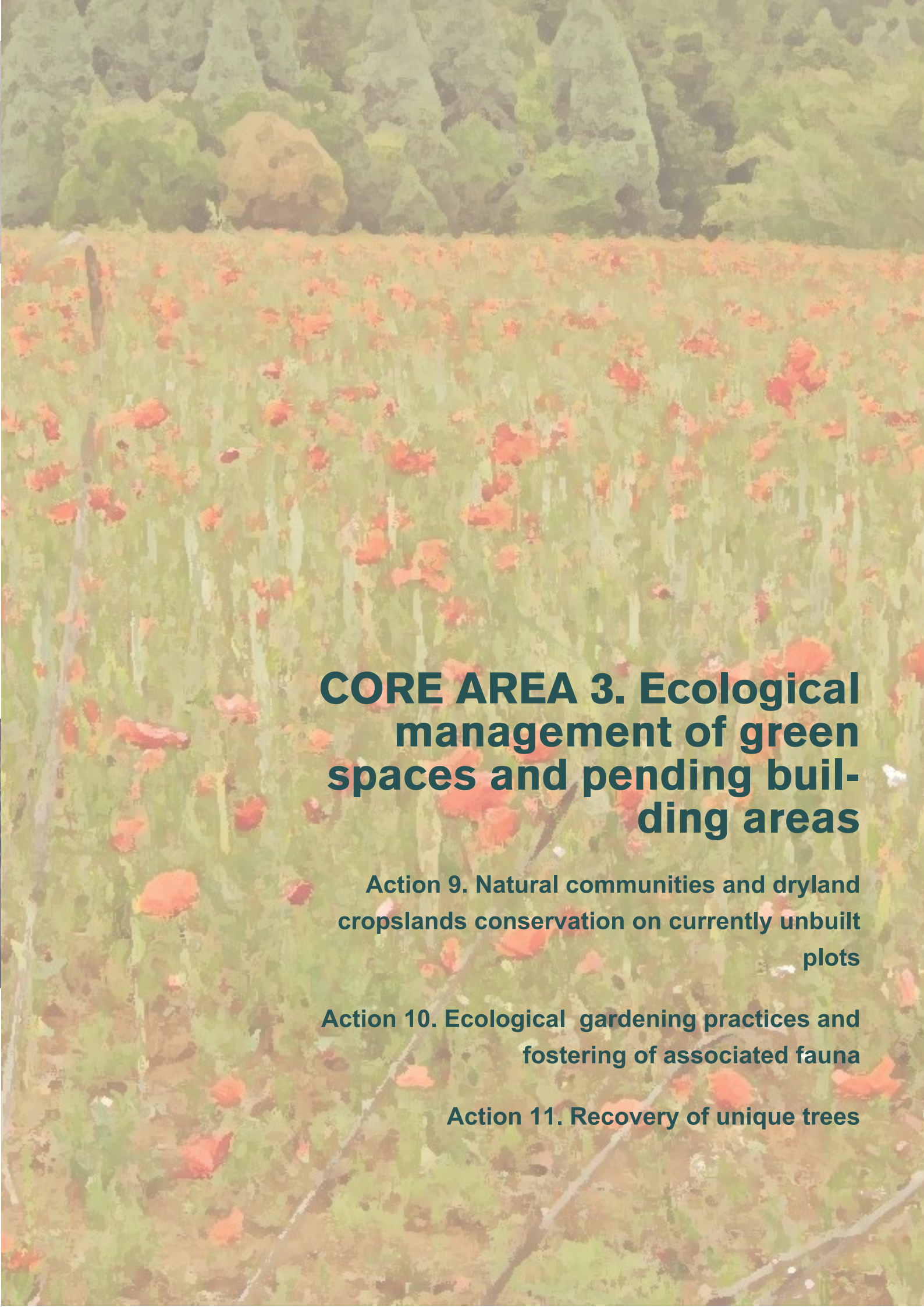
The engineering company SENER, present in the Parc since 2013, included these concerns when designing its gardens.

Garden inside the building of the SENER central offices in Parc de l'Alba.

Green roof on the SENER corporate building in Parc de l'Alba.

Complementary references and information

Currently underway.



CORE AREA 3. Ecological management of green spaces and pending building areas

Action 9. Natural communities and dryland cropslands conservation on currently unbuilt plots

Action 10. Ecological gardening practices and fostering of associated fauna

Action 11. Recovery of unique trees

Action 9.

NATURAL COMMUNITIES AND DRYLAND CROPLANDS CONSERVATION ON CURRENTLY UNBUILT PLOTS

The Parc de l'Alba still has many sectors in which building is pending (plots in the business park and the residential neighbourhood) and other sectors that have still not been urbanised (plots pending restoration, urban green spaces awaiting construction, etc.). These sectors are maintained so that herbaceous plant or shrub communities typical of the area can be implemented, or dryland crops can be planted there.

The management of these sectors consists of the conservation of spontaneous natural habitats, with one-off and periodic clearing of brush in some specific spaces to minimise the risk of fires, although works are not executed during nesting and breeding seasons of the main species there. The planting of ruderal (or shrub) autochthonous plants makes it difficult for exotic invasive species to expand and, further, one-off actions are done to prevent their proliferation, when necessary.

Moreover, on all lands where it is possible, keeping dryland crops active is promoted, as they house interesting biological diversity, including a large diversity of insects, many birds associated with open spaces that are currently in decline throughout Europe, as well as birds of prey, whose populations are shrinking in the areas surrounding Collserola Natural Park. With this objective, agreements are signed with local formers who primarily cultivate grains and legumes for livestock feed. These same farmers have a primordial function in protecting the region, controlling access roads, maintaining vegetation along the borders that can then be used as areas of refuge or shelter for fauna, or clearing out brush in other areas to assist in lessening the risk of forest fires.

Plots pending urbanisation in the area surrounding the synchrotron. Grain crops are maintained on some of them, while others have ruderal plants or other natural habitats.

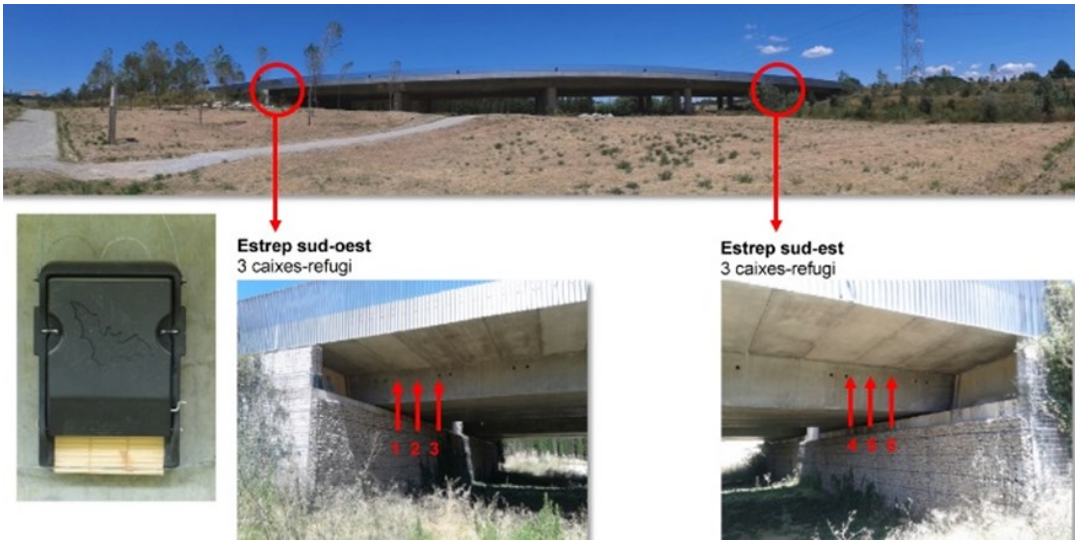
Dryland crops in areas pending construction in the residential neighbourhood (top image) and in the business park sector (bottom image).

Action 10.

ECOLOGICAL GARDENING PRACTICES AND FOSTERING OF ASSOCIATED FAUNA

Gardening and landscape maintenance in the public spaces at Parc de l'Alba incorporates—as one of its basic criteria—the sustainable use of phytosanitary products, adopting suitable management measures for the risk entailed in these products to people's and environmental health. For this reason, strict and comprehensive pest control has been established for the maintenance of plants at the Parc, minimising the use of non-ecological herbicides and pesticides whenever possible.

Moreover, this contributes to autochthonous auxiliary fauna, such as insectivore birds and bats that are predators of insects and other animals considered pests. These measures are especially useful in agriculture and landscaping, as they reduce damages to crops and other plants, and lead to a reduction in pesticide use. They are also useful in forest settings to control the increasingly more frequent pests in Catalonia, including the pine processionary moth, Thaumetopoea pityocampa; the gypsy moth, Lymantria dispar; and the scale insect that feeds on evergreen oaks, Kermes vermilio. To favour these species, an initiative is being carried out consisting of installing nest-boxes for the nesting of tits and other birds that consume large quantities of caterpillars and other insects that cause plagues, and sanctuary-boxes were also installed for bats. The monitoring done reveals good occupation of the nest-boxes, and the sanctuaries for bats are still being assessed.



Bat shelter boxes under the viaduct of the Torrent de Can Fatjó in the green corridor.

Introduction of ladybirds to reduce aphid populations on oleanders.

Nesting boxes that provide nesting spots for insectivore birds that contribute to pest control on the green corridor.

Complementary references and information

Measures to favour native auxiliary fauna in the green corridor of Parc de l'Alba, June 2015

Action 11.

RECOVERY OF UNIQUE TREES

The action consists of preserving and transplanting singular trees at the Parc de l'Alba that could be affected by urbanisation and building works. This criterion has been applied since the start of urbanisation works, and some 30 trees have been transplanted (holm oaks, oaks, elms) that were affected. These have been moved to urban parks in the sector, with a success rate of nearly 95%.

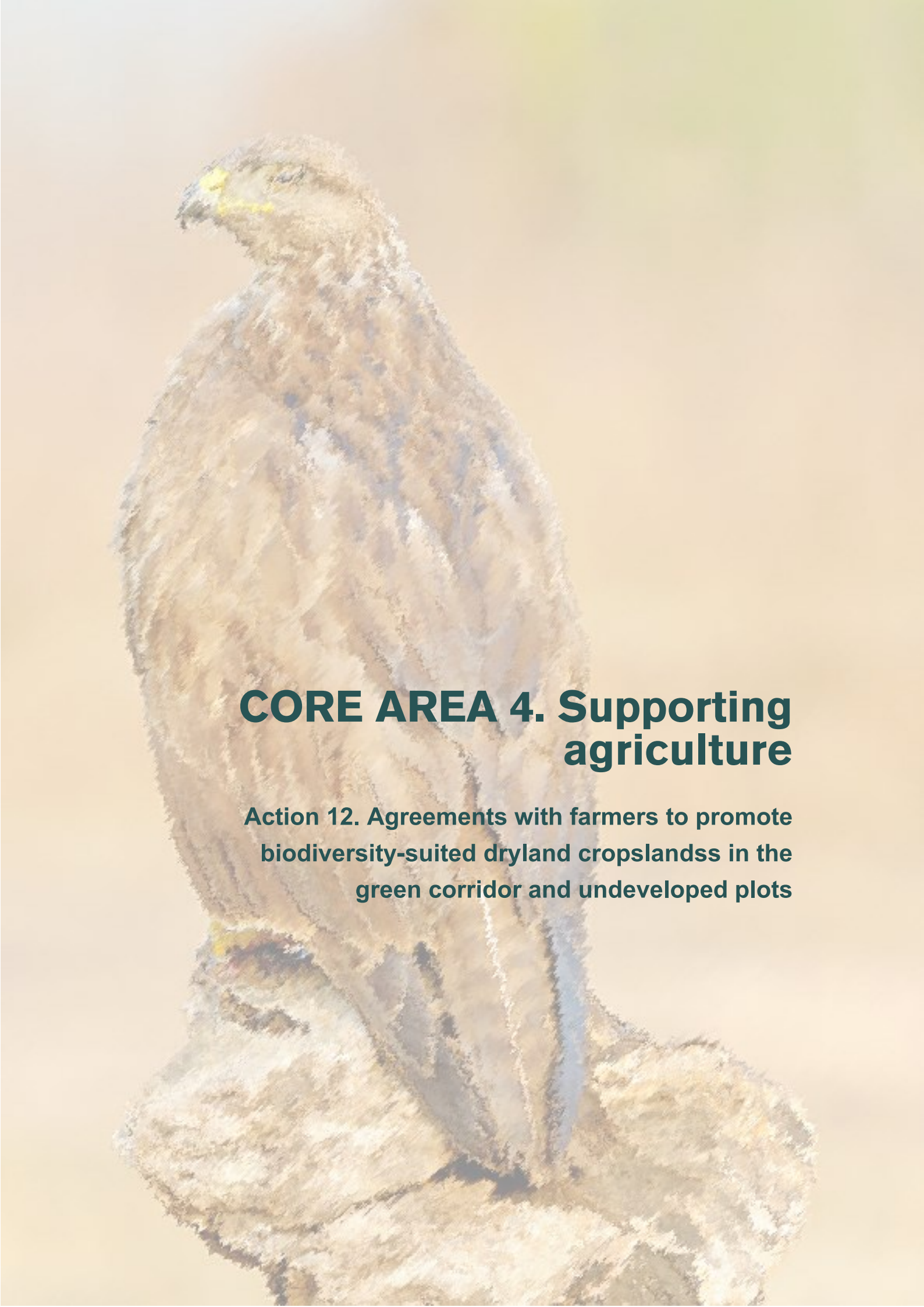
The transplanting of some 100 specimens of different tree species is planned for the future (primarily oaks and holm oaks) that are affected by urbanisation works, which will be moved to different sectors of urban parks in the Parc.

The forecast investment is some € 50,000 and will entail the creation of around six indirect jobs.

Transplanting trees affected by urbanisation works. They were relocated to areas that will house urban parks in the future. On left, the transplanting. On right, current condition.

Transplanting of unique European fan palms that were affected, and planted in a public square in the Parc.

Mossy oak with perimeters of 54/47/63 planned for transplant.



CORE AREA 4. Supporting agriculture

Action 12. Agreements with farmers to promote biodiversity-suited dryland cropslandss in the green corridor and undeveloped plots

Action 12.

AGREEMENTS WITH FARMERS TO PROMOTE BIODIVERSITY-SUITED DRYLAND CROPS IN THE GREEN CORRIDOR AND ON UNDEVELOPED PLOTS

The Parc de l'Alba contributes to the active maintenance of agricultural operations on the lands of the green corridor by making agreements with local farmers: the large majority are dryland grain crops, with a small portion of kitchen gardens. This has several benefits: on the one hand, there is a better and direct protection of the lands by farmers (maintenance of roads, cutting down of bordering vegetation that helps reduce the risk of fires, access controls, etc.) and, on the other, a habitat is maintained (in the case of cereal crops) that is important for many species of birds, insects and other animals.

Moreover, the plots of land that are still undeveloped will continue to temporarily have crops, due to the benefits they represent for the territory.

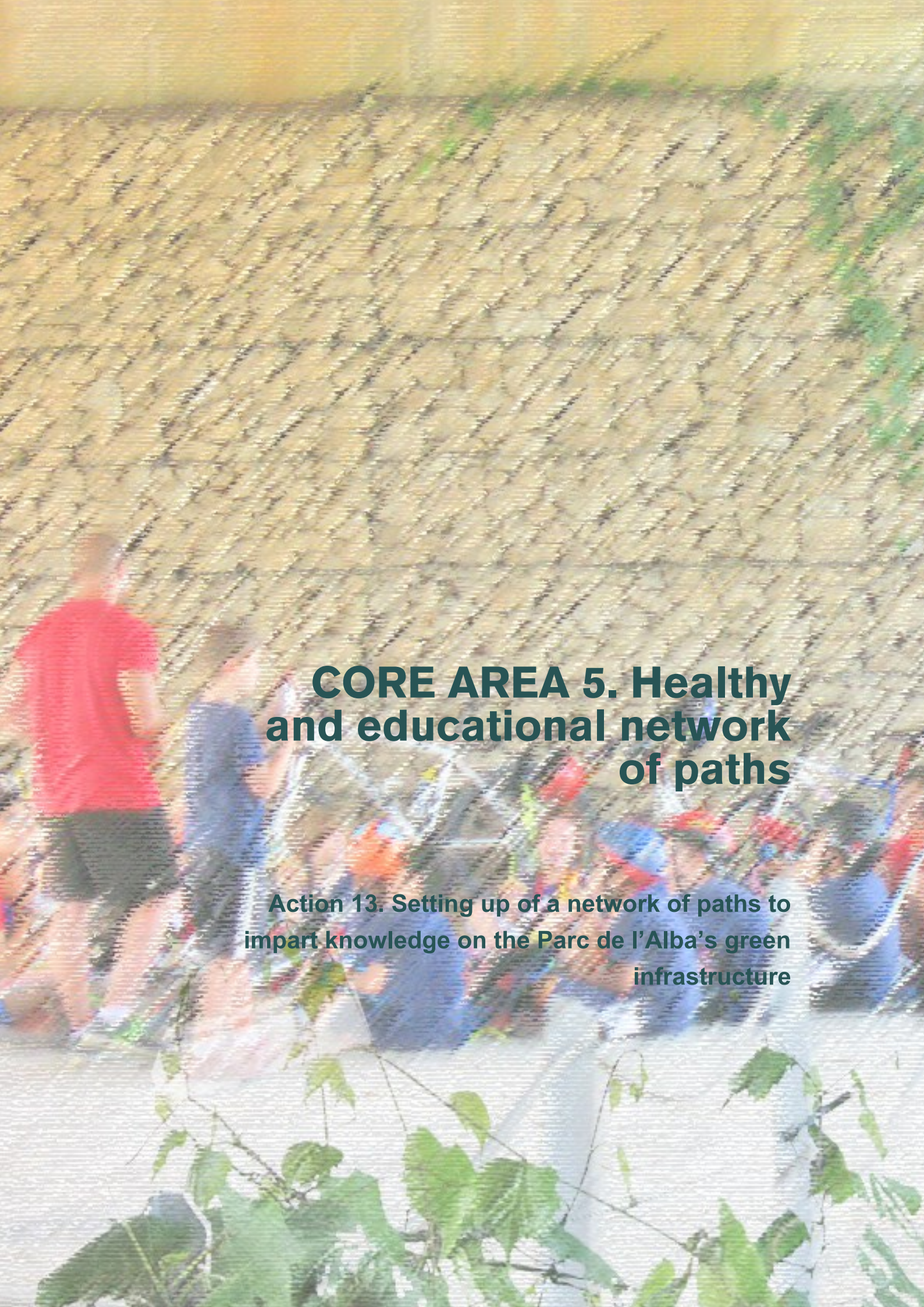
The future outlook for the crops located in the green corridor will be to make longer term agreements that could lead to introducing management under ecological criteria. The objective would be to recover the functional biodiversity of the farmlands, increasing the wealth of species of birds, pollinators and other invertebrates.

These agreements will contribute to creating direct jobs: four for dryland crops and one whole family for kitchen gardens.

The spaces occupied by crops provide great beauty and an ever-changing landscape, with stunning contrasts throughout the year.

Mosaic of grain crops with borders and stands of pines and holm oaks, spaces that are home to great biological diversity. Work on prairies contributes to producing cereals allocated primarily to livestock feed.

Vegetable crops established on the alluvial plain of the Riera de Sant Cugat, at the southernmost end of the green corridor.



CORE AREA 5. Healthy and educational network of paths

Action 13. Setting up of a network of paths to impart knowledge on the Parc de l'Alba's green infrastructure

Acció 13.

SETTINGUP OF A NETWORK OF PATHS TO IMPART KNOWLEDGE ON THE PARC DE L'ALBA'S GREEN INFRASTRUCTURE

The Parc, in cooperation with the Cerdanyola Town Council, is preparing two routes for phase one of the green corridor that has already been restored and is open for public use. These routes have been named: Torrent de Can Fatjó Route and Torrent del Bosc Route.

The purpose of these routes is to publicise, especially to local populations, and also at a more widespread level, all actions done in the territory since it was acquired by the Consortium and through the present-day situation: demolition, earth moving, defragmentation of the territory affected by road barriers due to construction, and adaptation of structures so that fauna and people can cross roads safely, ecological restoration, maintenance and protection of the territory, etc. In short, the aim is to teach the local community about everything involved in the transformation of the territory to contribute to strengthening the green infrastructure. Moreover, this initiative may also help to decongest spaces in Collserola Park that currently receive great pressure due to the high number of visitors.

The forecast is to provide information on the routes in documents that will be available on the Parc website, with a complete informational video on all actions executed, and to distribute brochures at public centres in Cerdanyola to promote visiting these spaces.

A route through the business park is also being prepared, to publicise the technological buildings housed there.

Complementary references and information

In preparation

www.barcelonasynchrotronpark.com