

NATURE



2.4

Environmental profile of Spain 2012

Spain is one of the European Union countries with the highest biological diversity due, among other reasons, to its geographical position, its geological diversity, the wide climatic, orographic and soil variability, and the existence of island territories. Biodiversity conservation and the maintenance and restoration of ecosystems are some of the main environmental challenges Spain, along with the other European countries, face.

The conservation and sustainable use of biodiversity are key elements of the move to a green economy, together with sustainable development that minimises the impact of human activities and recognises the value and relevance that ecosystem services have for development and well-being.

The EU is firmly committed to biodiversity protection. This is evidenced by the establishment, over the last 25 years of an extensive network, spanning all member states, of 26,000 protected areas. The Natura 2000 Network is the largest network of protected areas in the world.

In Spain, protected areas are defined and regulated by Law 42/2007, of 13 December, on Natural Heritage and Biodiversity, including Protected Natural Areas, areas of the Natura 2000 Network or protected areas by international instruments.



The recent law 7/2013, of 25 June, establishing the Guadarrama National Park, establishes the fifteenth park and fifth largest of the National Parks Network. This natural area will protect 33,664 ha of great environmental value, located within the autonomous communities of Madrid and Castile-Leon.

The law identifies nine natural systems, included in the Annex to Law 5/2007 on the National Parks Network, including unique natural systems of glacial and periglacial origin, as well as pine forests, juniper groves, scrubland above the tree line and high mountain pastures, among others, where ecosystems with an enormous wealth of flora and fauna have developed, and where emblematic species such as the imperial eagle and the black stork, both in danger of extinction, can be found.

KEY MESSAGES

- Protected areas occupy 28% of total Spanish land surface. Of this, 12.4% was classified as Natural Protected Areas, while 27.2% is part of the Natura 2000 Network.
- In 2012, the general status of the wooded areas can be described as healthy in more than the 80% of the species analysed, with conifers faring somewhat better than broad-leafed trees.
- Forest land in Spain in 2012 occupied more than 27.5 million ha (55% of the total area of the country). The total wooded area is over 18 million ha, representing 0.39 ha/inhabitant.
- Bird population trends have shown a positive trend in the forests, with more conservation difficulties present in agricultural and urban environments.
- The number of basic materials that be used to obtain reproductive material increased in 2012 by 10 units, with there now being more than 7,700 units.
- In 2012 SEPRONA registered a decrease in the number of criminal offences and in the number of arrests made; nevertheless, an increase in administrative infringements was registered.
- Most parts of the country present a low level of landscape fragmentation, with between one and five meshes per 1,000 km². The provinces with the highest level of fragmentation are Pontevedra and La Coruña with 28.7 and 25.1 meshes per 1,000 km².

INDICATORS

- Protected areas
- Forest defoliation
- Wooded areas and other forest formations
- Trends in common bird populations
- Forest reproductive material
- Environmental Monitoring
- Landscape fragmentation

Protected areas

In 2012 protected areas accounted for 27.9% of the total terrestrial area Spain, including Natural Protected Areas and those that are part of the Natura 2000 Network.

Protected areas by protection category, 2012

Protected area	PA and Natura 2000 Network	PA	Natura 2000 Network
Terrestrial (ha)	14,099,994.56	6,265,285.75	13,762,850.56
Marine (ha)	1,077,829.37	495,236.92	1,035,280.04
Total (ha)	15,177,823.92	6,760,522.67	14,798,130.60
Terrestrial area protected %	27.85	12.38	27.19

Source: MAGRAMA

Almost 28% of Spanish territory is protected; this percentage is made up of the areas declared as being Protected Areas (PA) under Spanish legislation and those areas belonging to the Natura 2000 Network. It should be noted that part of the area designated as PA also forms part of the Natura 2000 Network. Consequently, adding the two totals together does not sum to the total area protected.

The total area (terrestrial and marine) occupied by Natural Areas was 6,670,523 ha. In 2012 there were 1,551 areas registered, representing 12.38% of the total terrestrial area of Spain. The differences in the figures with respect to the previous year are due to amendments made concerning the geographical delimitation of several of these areas.

The Natura 2000 Network, consisting of Sites of Community Importance (SCI) and Special Protection Areas (SPAs) for wild birds, in 2012, covered 27.19% of Spain's total land area. It is important to stress that the figures for the Natura 2000 Network areas do not equal the sum of the SCI and SPA areas, because the two overlap and are not double counted.

At 31 December 2012, there were 1,446 SCIs in Spain, according to the official list. Additionally, a proposal for two new SCIs was made to the European Commission, pending approval on the relevant official list. The total SCI area in Spain is 12,740,667 ha, of which 11,722,040 ha is terrestrial and 1,018,626 ha marine. In total 23.16% of Spanish land area is protected by SCIs.

According to data given to the Ministry of Agriculture, Food and Environment by the competent administrations of the autonomous communities in their declarations and management, 273 Special Areas of Conservation (SAC) were designated in 2012 in Spain from the SCI.

The 598 SPAs in existence in 2012 occupy a total of 10,380,300 ha, being 10,107,051 ha of terrestrial area and 273,249 ha of marine area. The terrestrial area in Spain covered by these spaces amounts to 19.97% of the total.

Nature 2000 network as proportion of total area. 2012 (%)



Source: MAGRAMA

Due to their size, the autonomous communities that contribute the most area to the Spanish Natura 2000 Network are Andalusia, Castile-Leon and Castile-La Mancha. With respect to the relative area included in each region, the contributions of the Canary Islands (46.75% of its surface), Madrid (39.82%) and Valencia (37.48%) should be underlined. The autonomous communities with the lowest percentages are Galicia (11.86% of its area), Basque Country (20.15%) and Balearic Islands (22.60%).

NOTES

- Spanish legislation, (Natural Heritage and Biodiversity Law 42/2007, of 13 December 2007, defines protected areas as “...areas within Spain’s national territory, including the inland and marine waters (...) that meet at least requirements and are declared as such:
 - a) Contain natural elements or systems that are representative, unique, fragile, endangered or of special ecological scientific, scenic, geological or educational interest.
 - b) Are specifically intended to protect and preserve biological diversity, geodiversity and associated natural and cultural resources.”
- The Natura 2000 Network is a European ecological network that consists of Sites of Community Importance (SCI) and Special Areas of Conservation (SAC) designated in accordance with the Habitat Directive (Directive 92/43/CEE), as well as by Special Protection Areas (SPAs) for wild birds established under the terms of the Birds Directive 2009/147/CE. Its purpose is to ensure the long-term survival of the species and types of habitat most under threat in Europe and it is the most important tool for the conservation of biodiversity in the European Union. In order to be designated a SAC, Member States must put forward to the European Commission the areas that noticeably contribute to maintaining or, where applicable, recovering the favourable state of conservation of natural habitats and the habitats of species of community interest, and where the necessary tools are used to manage those areas, for approval as SIC.

SOURCES

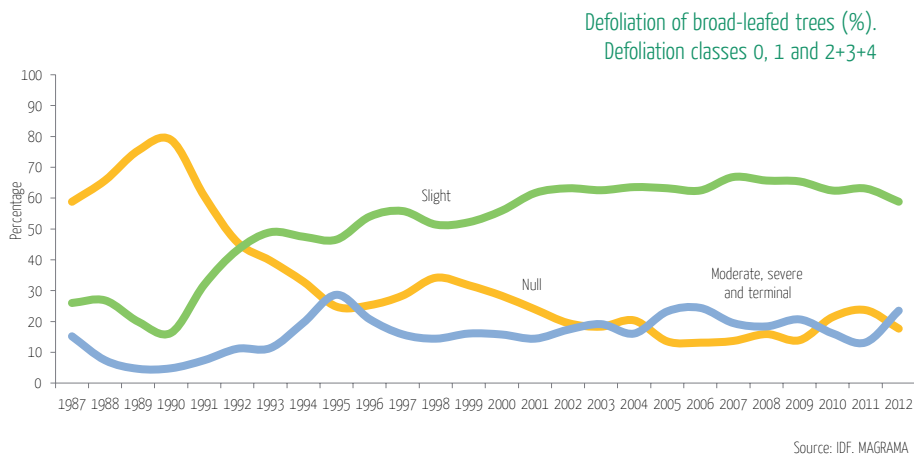
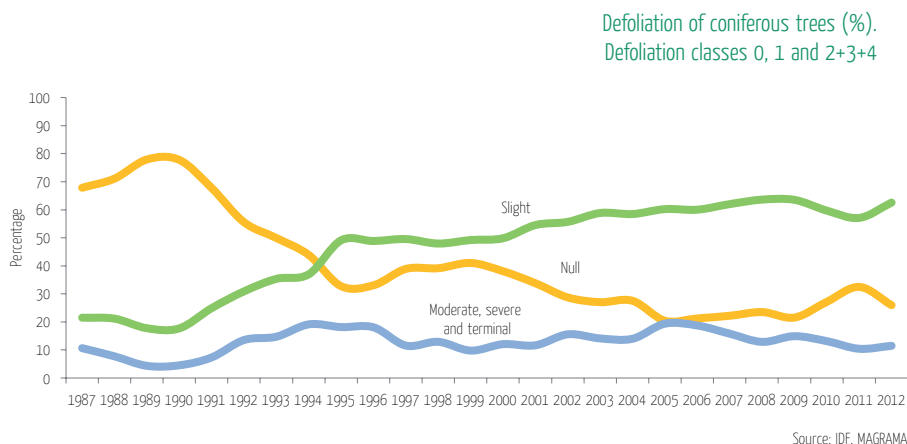
- General-Directorate for Environmental Quality and Assessment and Natural Environment. Ministry of Agriculture, Food and Environment.
- The calculations of surface area were carried out using the regional boundaries agreed in the Spanish Inventory of Natural Heritage and Biodiversity Committee, in December 2012. The projection used for the Peninsula and Balearic Islands: EPSG 25830 and for the Canary Islands: EPSG 32628.

FURTHER INFORMATION

- <http://www.magrama.gob.es/es/biodiversidad/temas/espacios-prottegidos/>
- <http://www.magrama.gob.es/es/parques-nacionales-oapn/>

Forest defoliation

In 2012, the overall forest status showed that 82.5% of tree species studied had a healthy appearance.



In 2012, 82.5% of the tree species studied presented a healthy appearance, compared to 88.2% the previous year, and similar to 2007 levels (82.4%).

Overall 15.9% showed defoliation in excess of 25%, while in 2011 the percentage was 10.2%. The number of damaged trees has clearly increased, while the number of dead trees is at the same level as the previous year, at 1.6%; this is lower in the case of broad-leaved trees at 1.1% and higher in the case of conifers at 2.1%. The overall deterioration affects broad-leaved trees to a greater extent, with 76.5% trees being healthy (86.8% the previous year), than for conifers (88.5% this year and 89.6 % in 2011).

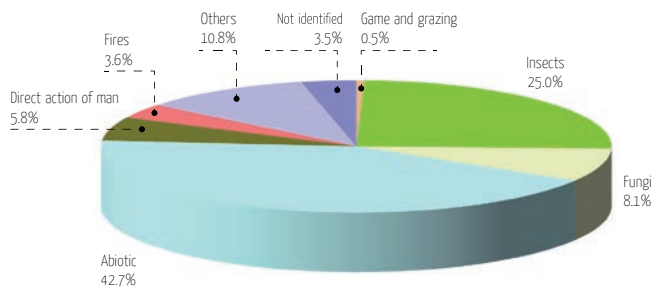
Most of the dead woodland is due to preventative felling, the result of forestry and deterioration owing to isolated water shortages.

As regards other possible causes of tree damage, there has been an increase in abiotic damage (mainly water shortage), while damage directly associated with biotic agents has had less impact.

Fieldwork notes have detected variable behaviour in insects, with a reduction in phytophagous insects affecting broad-leaved trees, with the exception of the alder; differing trends in pine processionary caterpillars (increases in the south and east, decreases in the west and the northern meseta), a slightly rising trend in relation to coniferous tree perforators and a clear increase of broad-leaved tree perforators.

Fungi have shown an overall decrease in their impact, with the only exception being Dutch elm disease (*Ceratocystis ulmi*). Drought however is the damage causing agent that has been most seen, with a considerable impact in the middle and south of the peninsula, with the exception of Catalonia. The recurrence of damage caused by oak branch dieback is concentrated in already established areas, with no appreciable increase.

Type of damages detected in the forested areas. IDF Spain 2012
(Only trees with more than 25% of defoliation)



Source: MAGRAMA



NOTES

- Forest defoliation is the process by which a plant species loses its leaves as a result of pathological or climatic stress that provokes premature or abnormal leaf fall. The degree of forest defoliation indicates the forests' state of health. It is analysed in terms of foliage loss from the tree crown at a series of sampling points, classifying into the following categories:

Loss of needles/leaves	Decree of defoliation
0 - 10%	None
>10-25%	Slight
>25%	Moderate, severe and terminal

- Under the International Cooperation Program on the Assessment and Monitoring of Atmospheric Pollution Effects on Forests, the Level-I European Network on Forest Damage is an international large scale systematic network consisting of more than 5,700 monitoring points spread across a 16 x 16 km grid covering all Europe. It was set up in 1986 from a random starting point. This network annually analyses forest health and assesses the main factors that have a negative impact on it. The Spanish Network currently has 620 sampling points; its design allows for the monitoring of other aspects such as the effects of climate change on forests, sustainable management and the preservation of forest biodiversity.

SOURCES

- Service for Forest Health and Biological Balances. Directorate General for Rural Development and Forest Policy. Ministry of Agriculture, Food and Environment.

FURTHER INFORMATION

- <http://www.magrama.es>
- <http://www.icp-forests.org>

Wooded areas and other forest formations

Spain has more than 27.7 million ha of forested land, with woodland occupying more than 18 million ha

Evolution of forest land in the last 15 years



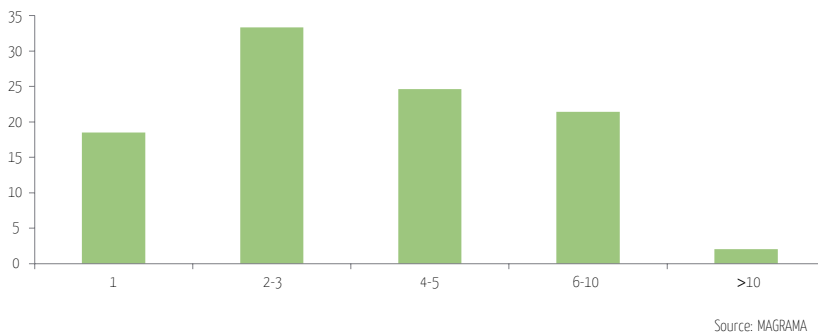
The particular geographical situation of Spain and its broad climatic range, allow for the existence of a wide diversity of forest ecosystems. According to the National Forest Inventory, updated with information from the autonomous communities which have begun the fourth phase of the inventory (started in 2008), Spain's forest area covers 27.7 million ha, equivalent to 55% of Spain's total land area, although a substantial amount of this area is treeless or barely covered by sparse trees (9.3 million ha). The forested area that can be considered woodland comes to 18.3 million ha (representing 0.398 ha/inhabitant).

The Basque Country (55.0%), Catalonia (49.9%) and Galicia (49.0%) are the autonomous communities with the highest percentage of forested areas in relation to their overall areas. At the same time, the autonomous communities with the lowest percentage of forests in relation to their total area are the Canary Islands (17.7%), Murcia (27.2%) and Castile-Leon (31.3%).



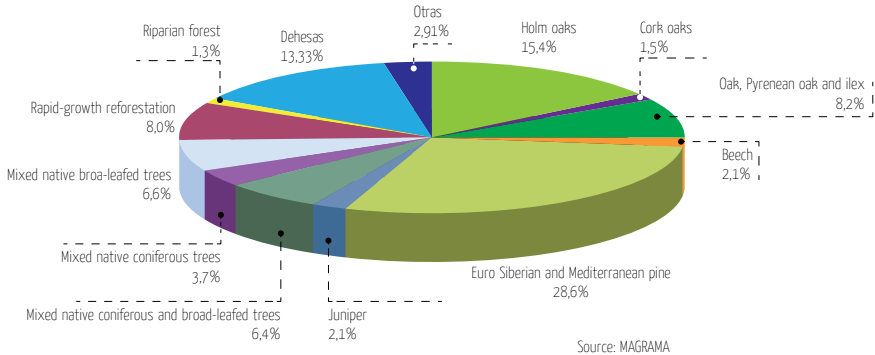
Spanish forests are characterised by their diversity. According to the data of the National Forestry Inventory, 18.6% of forests are made up of only one species, while more than 80% are made up of two or more tree species; 33.3% with two or three; 24.6% with four and five; 21.4% with between six and 10 species; and 2.1% with more than ten species. Even in the forests dominated by one species there is a high presence of non-target species.

Breakdown of forest area by number of present tree species (%).
FN3 (1997-2007)



The most common species is the holm-oak (*Quercus ilex*), occupying 2.8 million ha (15.4% of the total forest area), without taking into account the meadows. Regarding the conifers, the *Pinus halepensis*, with 2 million ha (11% of the forest area), together with *P. pinaster* and *P. sylvestris* represent the majority of pure conifer mountain area. In conjunction, the pine forests occupy 28.6% of the forest land.

Breakdown of wooded formations (%)



NOTES

- According to international criteria, forest is considered wooded area in which the canopy cover fraction is greater than or equal to 10%.

SOURCES

- Spanish Forestry Inventory (SFI) and its base cartography Forest Map of Spain (FMS), both produced on a provincial scale and on a 10 yearly-basis. IFN2 (1986-1996); IFN3 (1997-2007); IFN4 (commenced in 2008); MFE50 (1997-2007); MFE25 (commenced in 2007).
- National data: Navarre, Galicia, Asturias, Cantabria, Balearic Islands and Murcia: IFN4 and MFE25; Rest of Autonomous Communities IFN3 and MFE50.
- Sub-Directorate-General for Forestry and Woodlands. Directorate General for Rural Development and Forestry Policy. MAGRAMA

FURTHER INFORMATION

- <http://www.magrama.gob.es/es/biodiversidad/temas/>

Trends in common bird populations

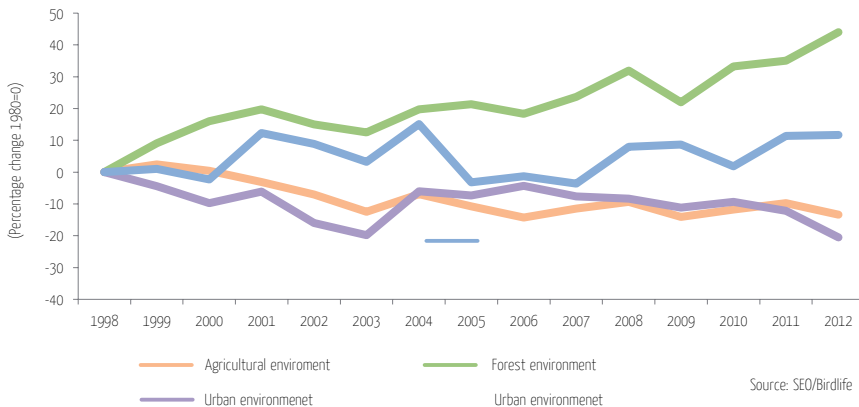
Bird populations have tended to increase in forest areas

Birds, being excellent biomarkers, are used by the European Statistical System working group (Eurostat) as one of the indicators of our quality of life. The working group calls this the 'Common Bird Index', and it is categorised under 'protection of natural resources'.

The working group is made up of volunteers from all the countries of the EU. In Spain, it is coordinated by SEO/Birdlife, and the data are compiled and analysed at European level by the European *Bird Census Council* (EBCC) to produce the *Pan-European Common Bird Monitoring Scheme* (PECBM).

The analysis of this information provides valuable information with which to assess trends in Spain's important ecosystems and, by extension, to assess the country's biodiversity. SEO/BirdLife has carried out this work in Spain since 1996 with the results being representative during the period 1998-2012.

Trend of the common bird populations



The main results observed over the period 1998-2012 are summarised in the following table, which breaks down some of the environments considered to provide greater detail:

Trends of common birds populations: percentage of change between 1998 and 2012

Environments	Trend (% of change) 1998-2012
Agricultural environment	-13.4
Tree plantations	-4.8
Cereal plantations	-25.0
Northern agricultural environments (grasslands)	-22.6
Forest environments	44.0
Euro-siberian forests	10.3
Mediterranean forests	45.4
Birds linked to urban environments	-20.5

Source: SEO/Birdlife

Of all the areas agricultural environments show the most conservation problems. This situation is common across Europe and in Spain there was significant loss during the period 1998-2012, with a fall of 13%. The excessive use in the agricultural environment of herbicides and chemical products to eliminate insects, fungi and other threats, and also to improve yields, negatively impacts bird life. This occurs at the expense of the biodiversity that has always existed in these environments and which is reduced day by day, as the data shows. The agricultural environment in Spain is very diverse, from the Euro-Siberian region to the Mediterranean, but in both regions the decrease is notable, being more pronounced in the dry cereal-cultivation areas than in the grasslands of northern Spain.

Equally, negative trends have been noted in urban environments, where the decrease registered during the period under analysis reached 20%. Urban bird communities have important inter-annual fluctuations, but fell between 1998-2003 and 2005-2012, with marked recovery only being registered during the period 2003-2004. It is necessary to pay more attention to the environment in which these bird communities live, the same environment in which most of the human population in Spain resides.

A notable increase of Passeriformes birds has been registered in shrubland environments. There is no doubt that the disappearance of extensive pastureland in many municipalities gives rise to an increase in the amount of area with this type of vegetation that facilitates an increase in their bird populations.

At the same time, forest bird communities have maintained the moderate increase already observed in previous years, both in Mediterranean forests (Sclerophyllous) and Euro Siberian (deciduous), in line with the recovery of these environments seen in Spain in recent years.

NOTES

- The trend indicators employed are used internationally within the framework of the Convention on Biological Diversity and have been adopted by the EU to assess fulfilment of its goals and strategic plans in the area of biodiversity. To carry out the monitoring of bird populations, annual samples are taken in the peninsula, the Balearic and the Canary Islands in 10 x 10 km UTM grid, with a standardised methodology (20 stations, with 5 minute listening repeated twice every spring). There were over 1,000 participants in 2012 (more than 1,000 sample grids, meaning approximately 20% Spain's territory) and its distribution is reflected in the information below.
- Population data are obtained by a standardised census for more than one hundred bird species during breeding season throughout Spain. Additionally, those species that share common characteristics, such as being present in certain environment, are grouped together, obtaining grouped trend indicators.
- The bird populations monitored by this indicator are grouped as follows:

By environment inhabited	Urban environments	
	Forest environments	Euro-Siberian Mediterranean
	Agricultural environments	Cereals
		Northern Wooded
Aquatic environments		
By migratory behaviour	Sedentary birds	
	Migratory birds	Sub-Saharan Trans-Saharan
By diet	Granivorous birds	
	Insectivorous birds	
Non-native	Exotic birds	

SOURCES

- SEO/Birdlife.

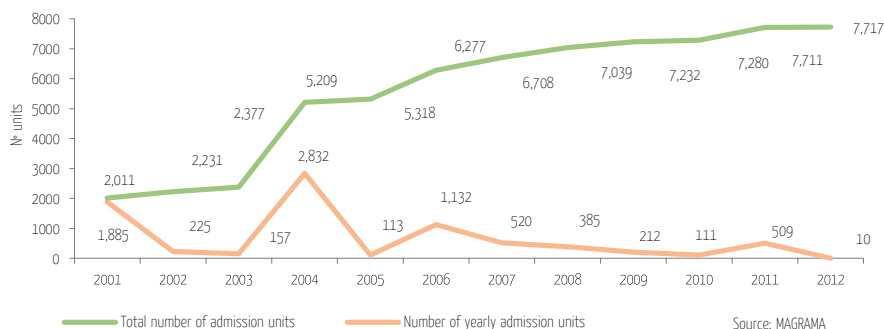
FURTHER INFORMATION

- <http://www.seo.org>
- <http://www.magrama.es>

Forest reproductive material

The number of basic materials increased by 10 units in 2012

Number of admission units of the national catalogue of basic materials



The National Catalogue of Basic Material (NCBM) is a core element of the system that regulates the production and marketing of reproductive materials in Spain, as it includes the basic materials, or units of approval, from which certified forest reproductive material in its origin and genetic quality (seeds and plants) can be obtained.

Basic materials are natural populations, plantations and clones from which reproductive material is obtained for reforestation. The types of basic material currently approved are: seed sources, selected stands, seed orchards, parents of families and clones. The information on these basic materials is compiled in the NCBM and is organised according to the different categories of forest reproductive material that can be obtained with them (identified, selected, qualified and monitored).

The National Catalogue's main objective is to provide the final user with a guarantee as to the origin and quality of the forest reproductive material. In turn, it is intended to provide sufficient knowledge to responsible technicians to facilitate the selection of the type of material and the most appropriate origins for each action.

In 2012 the National Catalogue of Basic Materials increased by 10 new units compared to the 509 new units of 2011. This year, after deducting losses, the total units of approval stands at 7,717 units.

The distribution of the units of approval by type and category is shown in the following table:

Existing units of approval in the national catalogue of basic materials. Year 2012

Type of basic material	Category	Number units of approval (2012)	Land area* (ha) of the units of approval
Seed sources and stands	Identified	7,222	5,570,262.19
Selected stands	Selected	337	17,921.75
Seed orchards	Qualified	25	98.84
	Monitored	2	
Parents of families	Qualified	31	No cuantificable en área
	Monitored	4	
Clones	Qualified	55	No cuantificable en área
	Monitored	41	
TOTAL		7,717	5,588,282.78

* It should be noted that the areas included in the calculations sometimes overlap with other areas containing different species. Also, for practical reasons, sometimes entire municipal districts or hill areas are registered, whose land area may be greater than that actually occupied by the forest.

Source: MAGRAMA

Regarding the total units of approval, 7,222 out of the 7,717 are in the identified category (seed sources and stands), 337 units in the selected category (selected stands), 111 in the qualified category and 47 units in the monitored category. In terms of area, the units of approval occupy approximately 5.6 million of hectares.

NOTES

- Basic Material comprises populations, plantations and clones from which are obtained forest reproductive material (seeds and plants) used in reforestation. The approved types of basic material, currently approved by Royal Decree 289/2003, of 7 March, on the sale of forest reproductive material, are:
 - Seed source: Trees within an area from which fruit and seed is collected;
 - Stands: Delineated population of trees possessing sufficient uniformity in composition;
 - Seed orchard: Plantation of selected clones or families, which is isolated or managed so as to avoid or reduce pollination from outside sources, and managed to produce frequent, abundant and easily harvested crops of seed;
 - Parents of family: Trees used to obtain progeny by controlled or open pollination of one identified parent used as a female, with the pollen of one parent (full-sibling) or a number of identified or unidentified parents (half sibling);
 - Clone: Groups of individuals (ramets) derived originally from a single individual (ortet) by vegetative propagation, for example by cuttings, micropropagation, grafts, layers or divisions.
 - Clonal mixture: A mixture of identified clones in defined proportions.
- Management of the Catalogue implies ecological and phenotypic characterisation of each of the approved materials. This task is carried out by the Directorate-General for Rural Development and Forestry Policy (MAGRAMA) in collaboration with regional governments. New basic materials are published in the Official Gazette (BOE) and form part of the European common catalogue.

SOURCES

- Genetic Material Service. Planning and Forestry Policy Department. Sub-Directorate-General for Forestry and Woodland. General Directorate for Rural Development and Forestry Policy. MAGRAMA.

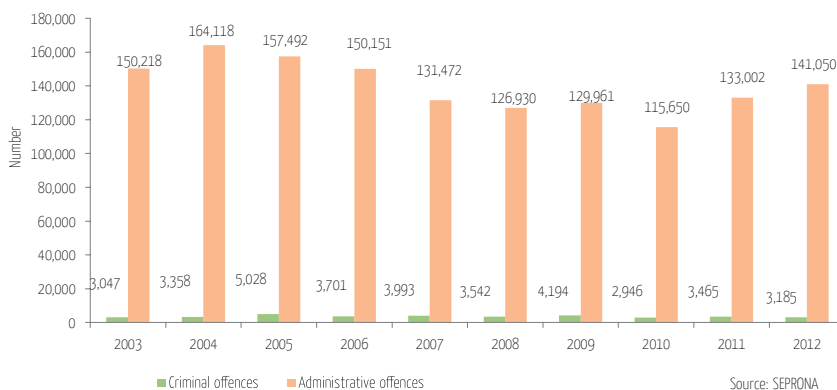
FURTHER INFORMATION

- <http://www.magrama.gob.es/es/biodiversidad/temas/montes-y-politica-forestal/recursos-geneticos-forestales/default.aspx>

Environmental monitoring

The number of administrative infringements increased in 2012, while criminal offences and arrests decreased

Interventions carried out by the Civil Guard concerning environmental matters



Organic Law 2/1986 on State Security Forces and Law Enforcement Bodies entrusts the Civil Guard with the responsibility of ensuring the conservation of nature and the environment. The mission of the Nature Protection Service (SEPRONA) is to enforce compliance with the legislation to conserve nature and the environment, water resources, as well as game, fish, forests and all other natural and related resources.

The trend over the period 2003-2012 in the number cases involving environmental matters dealt with by SEPRONA can be seen in the graph below, which shows that, for administrative infringements, there is a generally reducing trend in the number of cases, up to 2010 and an increase during the next two years. The trend is less consistent with regard to the number of criminal cases, with the average of the last five years standing at around 3,500 offences.

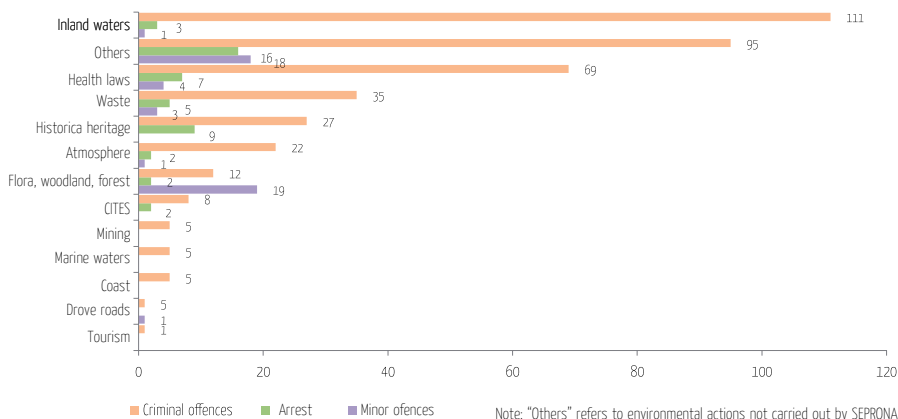
In 2012, in total SEPRONA intervened in 5.7% more cases than in 2011, from 136,467 to 144,235. Of this total number of offences, 97.80% were for administrative infringements that, inter-annually in 2012, increased by 6.05%; 2.05% of the total were criminal offences, with this figure having decreased by 7.3% in the last year; the remainder, 0.15%, were misdemeanours (with an inter-annual decrease of 17.7%).

Environmental cases dealt by the Civil Guard

		2008	2009	2010	2011	2012
Offences	Criminal	3,542	4,194	2,946	3,465	3,185
	Administrative	126,930	129,961	115,650	133,002	141,050
Arrests		330	399	274	313	298

Note: only includes SEPRONA interventions on environmental offences
Source: compiled in-house using SEPRONA data

Number of criminal offences and arrests concerning environment (2012)



By type of criminal offence, and taking into account that inspection campaigns carried out in a specific area at a certain time may increase the number of offences reported in that area, forest fires account for the largest number of offences in 2012, making up 55.3% of the total (1,639 interventions). These are followed by crimes against domestic animals



with 393 cases, representing 13.3% of the total, and crimes against wild fauna (9.1%) and land-use planning offences (8.8%).

In 2012, SEPRONA arrested 298 persons for environmental offences, 8.7% more than the previous year, in which 274 arrests were made. Of those arrested, 42.6% were arrested in relation to forest fires, 24.5% for offences against wild fauna, 8.7% for domestic animals offences, 8.7% in relation to land-use planning offences with the rest, 15.5%, attributable to a variety of other causes.

NOTES

- When calculating the indicator, this edition only takes into account environment-related cases dealt with by the Civil Guard.

SOURCES

- Civil Guard Public Information Office. Directorate-General for the Police and Civil Guard. Minister of Interior.
- SEPRONA. Directorate-General for the Police and Civil Guard. Ministry of Interior.

FURTHER INFORMATION

- <http://www.guardiacivil.org>

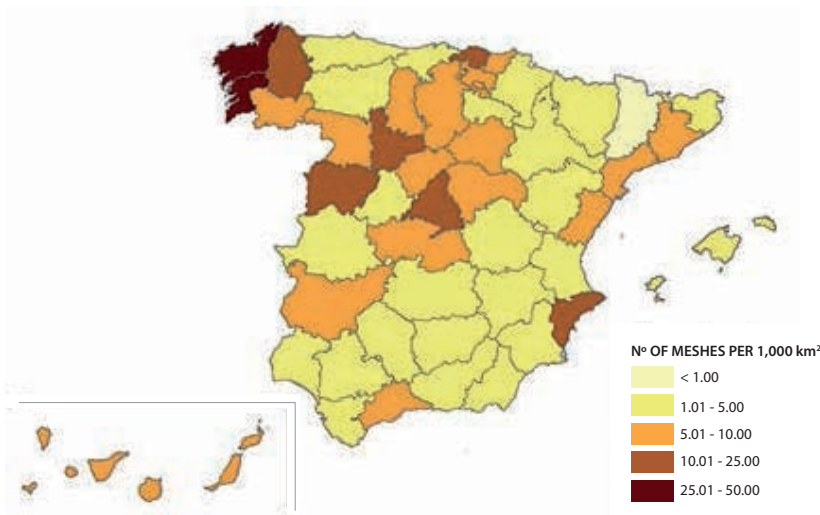


Landscape fragmentation

The majority of the country shows low fragmentation with between 1 and 5 meshes per 1,000 km². The provinces with most fragmentation are Pontevedra and La Coruña, with 28.7 and 25.1 meshes per 1,000 km² respectively

This indicator quantifies the extent to which the movement of wild fauna is interrupted by transport infrastructure and built-up areas. The higher mesh values indicate greater fragmentation of the landscape (see notes at the end of the indicator).

Landscape fragmentation in Spain



Source: MAGRAMA

Spain is among the countries with the least fragmentation in Europe (see Environmental Profile of Spain 2011). Most of Spain presents a low fragmentation, with between 1 and 5 meshes per 1,000 km². Galicia is the autonomous community with the highest fragmentation, followed by Castile-Leon and the Basque Country. In some provinces, the fragmentation occurs as a consequence of urban development or even the presence of large dams.

The provinces with the highest fragmentation levels are Pontevedra and Coruña with 28.69 and 25.11 meshes per 1,000 km² respectively. These are followed by Valladolid (15.19),

Bizkaia (13.98), Lugo (13.78), Alicante (13.37), Madrid (12.95) and Salamanca (11.80), in a range of between 10 and 25 meshes per 1,000 km².

Thirdly, with densities between 7.5 and 10 meshes per 1,000 km², are Segovia (9.55), Las Palmas (8.90), Alava (8.89), Burgos (8.89), Zamora (8.10), Soria (7.92) and Tarragona (7.74).

Next, there are a large number of provinces have between 2.5 and 7.5 meshes per 1,000 km²: Santa Cruz de Tenerife (7.39), Palencia (7.35), Ourense (6.71), Castellon (6.70), Toledo (6.66), Guipúzcoa (6.17), Barcelona (6.06), Guadalajara (5.84), Badajoz (5.23), Malaga (5.14), Caceres (4.82), Cuenca (4.61), Navarre (4.57), Cordoba (4.52), Teruel (4.52), Valencia (4.36), Zaragoza (3.95), Murcia (3.94), Avila (3.91), Cantabria (3.77), Balearic Islands (3.70), La Rioja (3.61), Leon (3.49), Albacete (3.40), Ciudad Real (3.09), Almería, (2.89), Girona (2.85), Cadiz (2.81), Asturias (2.81) and Huelva (2.60).

Finally, with a density below 2.5 meshes per 1,000 km², are Sevilla (2.31), Granada (1.82), Jaen (1.64), Huesca (1.34) and Lleida (0.87).

NOTES

- The effective mesh density (Seff) has been obtained from the calculation of the effective mesh size (Meff) by means of the cross-boundary connections method, which eliminates the bias related to the borders and is applied in 1x1 UTM grids. Unlike the method applied in EEA 2011, we have not considered mountains as barriers when calculating the given values in Spain (MAGRAMA, in preparation). The effective mesh density (Seff) represents the number of meshes per 1,000 km² or the density of meshes, i.e. how many times the effective mesh fits into an area of 1,000 km². Thus, the more barriers fragmenting the landscape, the higher the effective mesh density.
- The effective mesh size (Meff), measured in surface units, is an indicator that serves to measure landscape connectivity, that is, the degree to which the movement of organisms is possible within different parts of the landscape. It expresses the probability that any two points chosen at random in a region are connected, that is, not separated by barriers such as transport routes or built-up areas.

SOURCES

- MAGRAMA. In preparation. Identification of areas to defragment in order to reduce the impact of transport routes on biodiversity. Documents relating to the reduction of habitat fragmentation caused by transport routes, number 6 O.A. National Parks. Ministry of Agriculture, Food and Environment.
- EEA, 2011. Landscape fragmentation in Europe. Joint EEA-FOEN report. EEA report No 2/2000. European Environment Agency (EEA). Federal Office for the Environment (FOEN).

FURTHER INFORMATION

- Working group on habitat fragmentation due to transport infrastructure:
http://www.magrama.gob.es/es/biodiversidad/temas/ecosistemas-y-conectividad/conectividad-fragmentacion-de-habitats-y-restauracion/fragmentacion_habitats.aspx