

habitat fragmentation due to transportation infrastructure



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EDITORIAL

Maintenance of transport routes and biodiversity: common objectives

Between 2000 and 2012, around 6,200 km of new transport routes were built in Spain. Most of these were dual carriageways and high speed railways constructed with a notable set of measures to reduce their impact on biodiversity. However, the construction of new transport infrastructure has now decreased dramatically and even the maintenance of existing routes is affected by budget cuts. More than ever, it is time to invest in good management practices, in developing new practices, in training, and in increasing the cooperation between agents to achieve a common goal: comfortable, safe



transport routes, along which the landscapes and natural habitats are conserved. If the measures also lead to a reduction in collisions with wildlife, this may considerably reduce the costs associated with accidents caused by animals.

Regarding wildlife, road and railway maintenance programmes include many activities that can reduce animal mortality. Suitable maintenance of fences that have been erected along routes is essential to stop animals from getting onto tracks or road surfaces, and to guide them towards structures where they can safely cross. Techniques have also been developed to strengthen particularly weak points.

The management of verges is another important aspect. A suitable programme of cutting and clearing can help to reduce the risk of collisions with animals. Monitoring can be carried out to detect and prevent the dispersal of exotic species that could affect plant communities at the side of roads. Alternatives to the use of pesticides and herbicides should be sought, as the application of these substances has serious direct and secondary risks for human health and environmental conservation. Consequently, their use is closely regulated by current legislation.

Other measures require a greater degree of cooperation. For example, livestock farmers could help by grazing their animals on large overpasses and ecoducts that are covered with herbaceous vegetation, which would help to conserve open spaces. As revegetation around wildlife passages is a key factor in the establishment of adequate connections between surrounding habitats, and it encourages the use of the structures, agreements could be made with the owners of adjacent land. Multifunctionality is perfectly viable; all that is needed is to clearly define certain aspects of the restoration of wildlife passages and their access points.

Road and railway maintenance tasks can also become a considerable source of data, which can then be used to overcome shortcomings and resolve conflicts. The location of problems can be facilitated simply by training maintenance teams and keeping adequate records of incidents such as the presence of animals trapped in ditches or wells, or the mortality of birds due to collisions with acoustic barriers. There are many options to solve such problems.

We now have a lower budget, but must continue to maintain the effectiveness of measures that have already been implemented. Cooperation and training will enable us to make great progress and apply the best management practices.



WORKING GROUP

In recent months, the activity of the Working Group on Habitat Fragmentation due to Transportation Infrastructure (part of the Spanish National Commission on Natural Heritage and Biodiversity) has focused mainly on three areas: the 15th meeting, which was held last April in Madrid; the completion of number 6 in the series *Documents for the reduction of habitat fragmentation due to transportation infrastructure*; and the Working Group's technical symposium, held in Cáceres last November.



Ministry of Agriculture, Food and the Environment

At the 15th meeting, environmental and transport representatives from the Spanish and regional governments described their main activities and news of interest in their respective fields of activity, as is customary. One of the items that sparked the most discussion referred to databases containing records of wildlife collisions and accidents caused by animals. Although there is clear interest in integrating and analysing this information to identify the most conflictive stretches of road and devise solutions, it was found that the databases of the different regional governments are rarely combined, despite the fact that there has been a considerable increase in the number of accidents involving wild animals in many areas. Consequently, participants discussed the utility of gathering more information on existing databases and of promoting their evaluation to identify accident hotspots.

Volume number 5 of the series of documents drawn up in the heart of the Working Group was published in September under the title: *Desfragmentación de hábitats. Orientaciones para reducir los efectos de las carreteras y ferrocarriles en funcionamiento* (see the [Publications](#) section). In addition, the final draft of volume number 6, *Identificación de áreas a desfragmentar para reducir los impactos de las infraestructuras lineales de transporte en la biodiversidad* (Identification of areas to defragmentate to reduce the impacts of linear transport infrastructure on biodiversity), was revised at the Working Group's meeting. Like the rest of the documents in the series, volume 6 was drawn up with the support of a Technical Committee. Participants at the meeting commented on and made suggestions for improvements to final version of the volume, whose proofs are currently being corrected before printing. The Group also discussed the contents of the next document, which will be on reducing the edge effects of transport routes, and agreed to revise and update the first document in the series, which was published in 2006 on wildlife passages and perimeter fences.

The 5th edition of the Working Group's technical symposium took place in Cáceres on 13 and 14 November 2013. The focus of the event was the topic *Conectividad ecológica y vías de transporte* (Ecological connectivity and transport routes) (see the [Events](#) section). The symposium is organized by the Ministry of Agriculture, Food and the Environment and the Regional Government of Extremadura, with the collaboration of the LIFE + IBERLINCE project and Cáceres Provincial Council. The Infra Eco Network Europe (IENE) also provided support, which led to the inclusion of presentations by experts from Sweden, Germany, Austria and France (the latter in panel format). The symposium was attended by a hundred professionals from environment and transport administrations, NGOs, private companies, universities and research centres.



NEWS

Change in legislation on responsibility for accidents caused by wildlife

The Spanish Parliament has recently approved the Bill that amend the current Law on Traffic, Motor Vehicle Traffic and Road Safety. The main changes in this Bill include an amendment to the ninth additional provision on liability for accidents caused by game animals. The amendment establishes that, in general, liability will fall to the driver of the vehicle.



Alfred Encuentra

The amendment stipulates that hunters can only be held liable when the accident is a direct consequence of a group hunting activity. Road owners are only liable if the accident was due to a fence that had not been repaired or a lack of signposting along stretches with a high rate of animal-vehicle collisions.

The current legislation is a source of considerable debate and controversy. The rather ambiguous text has meant that complex procedures are required to gather evidence, and contradictory case law has arisen. Frequently, liability falls to the owners of the

hunting land, even when the accident cannot be linked to a direct hunting event. This has led to a long history of claims by groups of hunters.

The text of the new ninth additional provision proposed in the Bill is as follows:

In traffic accidents caused by collisions with game animals on public roads, the driver of the vehicle shall be liable for damage to persons or property. The value of the animals involved that appeared on the road cannot be claimed.

However, the owner of the hunting grounds, or in their absence, the owner of the land, shall be liable for damage to persons or property when the traffic accident is the direct result of a group hunting action of a large game species carried out on the same day as the accident or that ended twenty-four hours before it.

The owner of the public road on which the accident occurred could also be liable if the accident is due to failure to repair a fence along the road or failure to install specific animal warning signs on stretches of road with a high accident rate due to collisions with wildlife.

In this new legal framework, it will be of greater interest to identify stretches of road that are hotspots for collisions involving animals, some of which have already been located in certain areas (see [the news article](#) in the previous Newsletter). In many cases, the new text transfers the liability to the drivers and the insurance company. This could lead to drivers taking more care and respecting the signs that warn of the presence of wild animals. The Law still has to be approved by Congress, although it appears that the new text will probably not cause much controversy.

Source of information: Editorial Team



Effectiveness of measures introduced along dual carriageways in Extremadura to reduce habitat fragmentation

Along the 345 km of the A-66 dual carriageway (the Ruta de la Plata road as it passes through Extremadura) and the A-58 (Trujillo-Cáceres), which were opened in 2006 and 2009 respectively, a considerable number of measures have been implemented to reduce habitat fragmentation and accidents caused by wildlife collisions.



Ministry of Public Works

The Extremadura State Road District has monitored the measures that have been implemented (wildlife passages, fences and escape systems) to assess their effectiveness and identify areas for improvement.

There are two main reasons for implementing the measures under study: to ensure that a road is permeable to wildlife; and to reduce the number of collisions. The A-66 and A-58 incorporate specific specific wildlife passages, as well as other transverse structures built for paths to cross the road or as drains that have been adapted as wildlife passages. These multifunctional passages have a good cost/effectiveness ratio. In addition, escape systems have been installed in the perimeter fence. The monitoring was carried out between 2007 and 2013 mainly by recording animal tracks, although camera trapping was also used.

The main conclusions of the studies show that the specific and adapted structures were used by different groups of vertebrates (amphibians, small mammals, mustelids and foxes, among others). An average of two to four trails/day of different species was detected, depending on the geographic zone. However, no traces of wild boar or other ungulates were found. The monitoring indicated that the high use of the structures was due to the fact that they were well-positioned and the surrounding conditions were good.

However, the studies also showed that the ramps and escape gates were not highly effective. Nevertheless, their installation was considered justified, as their costs are low and they make it easier to defend against potential claims regarding accidents caused by animals.

The results of this monitoring were presented in panel format at the Working Group's technical symposium in November 2013 (see the [Events](#) section).

Source of information: José Ignacio Sellers, Extremadura State Road District



Transport infrastructure in the draft *Master Plan for Improving Ecological Connectivity in Andalusia*

Over the last two years, the Regional Government of Andalusia has been working on a *Master Plan for Ecological Connectivity in Andalusia*, whose draft is now a first working document.

The Plan was written using a considerable amount of georeferenced information, analysed using geographic information systems. It includes a series of proposals to improve connectivity, to be applied within areas of the Natura 2000 Network and other areas defined in the document itself as: Priority Action Areas, Landscapes of Interest for Connectivity, Reinforcement Areas and Pilot Areas.



Junta de Andalucía

The Plan identifies a total of 9 large units within the Natura 2000 Network, 9 types of Landscapes of Interest for Connectivity, 13 Priority Action Areas, 4 types of Reinforcement Areas and 3 Pilot Areas. It describes measures or guidelines to be applied in each of these areas. In terms of road infrastructure, stretches that cause fragmentation are identified (in particular depth for the Priority Action Areas, as these have the greatest connectivity problems), and then measures and guidelines are provided, including activities to increase the permeability of the roads by adapting or improving wildlife passages, the identification of conflictive stretches of roads due to the high number of wildlife collisions, the improvement of habitats in the surrounding areas, and the restoration of riparian habitats along river courses that cross the road, among others.

The Plan includes a programme of measures with strategic lines and operational objectives specifically for road networks. In addition, it sets out a monitoring programme that includes indicators for road networks, drawn from the document *Indicadores de fragmentación de hábitats causada por infraestructuras lineales de transporte* (number 4 in the series published as part of this project; see the [Documents](#) section).

As a Master Plan, the document is cross-cutting and cross-sector in nature. It involves different departments of the Regional Government of Andalusia and envisages coordination with other competent administrations. In addition, the programme of measures requires the involvement and participation of civil society and the technical and scientific community.

The presentation of the Plan at the Working Group's symposium in November 2013 (see the [Events](#) section) can be consulted [here](#).

Source of information: Fernando Ortega and Antonio Castellano, Directorate General for Management of the Natural Environment, Regional Government of Andalusia



Completion of an inventory of connectivity structures for the Catalan road network

The Department of Territory and Sustainability, Regional Government of Catalonia, has drawn up an inventory of wildlife passages and other structures built in recent decades to increase the permeability of the road network and reduce its effects on ecological connectivity.

Each one of the structures has been described and photographed. In addition to the database, an application has been designed for Google Earth, which makes it much easier to access the information. This should help to ensure that the information is taken into account in urban planning, in new infrastructures, and in the scheduling of maintenance tasks for wildlife passages. It may also be useful for the design of solutions for conflicts due to collisions with animals.



Department of Territory and Sustainability

To date, over 600 structures in the regional government's road network have been included in the database, and the Catalonia State Road District has been contacted to incorporate the wildlife passages in the region's state roads. Of particular note in the inventory are the 11 ecoducts that have been built, although most of the passages are multifunctional (drains or underpasses adapted for wildlife). The structures have been classified into eight categories according to the types of wildlife passages described in the document: *Prescripciones técnicas para el diseño de pasos de fauna y vallados perimetrales* (number 1 in the series published as part of this project; see the [Documents](#) section).

The tool provides a comprehensive list of the number, location, characteristics and type of connectivity structures in the roads of Catalonia. The tool is also designed for use in management and decision-making, to aid government technicians and professionals from organizations involved in environmental impact assessments, infrastructure management and maintenance, planning of defragmentation activities, and management of green infrastructure.

The presentation of the inventory at the Working Group's technical symposium in November 2013 (see the [Events](#) section) can be consulted [here](#).

Source of information: Antoni Sorolla, Department of Territory and Sustainability, Regional Government of Catalonia



The use of electrified mats in the USA is extended to stop large mammals from accessing roads

A common problem in roads with perimeter fences is that livestock or wild animals may access them through entrance and exit ramps. Cattle grids are the most suitable solution to this problem, but cannot always be introduced because of the density and nature of traffic on some roads.



Minuartia

In recent years, the use of electrified mats has spread in the USA as an alternative to cattle grids. These mats, such as the one on Arizona State Route 260 that is pictured here, have been shown to be effective. However, further evaluation is required to ensure that they do not represent a risk for smaller species.

The preliminary results of research carried out in Banff National Park, Canada, where as many as 13 grizzly bears have died in recent years in collisions with trains, have shown the effectiveness of electrified mats (see the article [here](#)).

In the study, it was observed that bears that had received an electric shock did not set their paws on the mat again, even though they continued to be present in the area. Consequently, the researchers consider that the final research results will be positive, and the mats will contribute to reducing the mortality of the species.

Electrified mats were first used in the United States just over ten years ago to stop white-tailed deer from accessing roads, as in 1993 this species was estimated to have caused around 30,000 road deaths.

The mats are comprised of an electrified metal mesh and are solar-powered. When an animal steps on the conductors, it receives an electric shock that forces it to turn back. Research shows that these devices reduce animals' attempts to cross the area by 95%. However, the lack of information about the effects of the shocks on smaller animals means that they should be used with care in natural environments in which they could cause the mortality of particularly vulnerable or threatened species.

Source of information: Carme Rosell, Infra Eco Network Europe (IENE), Minuartia

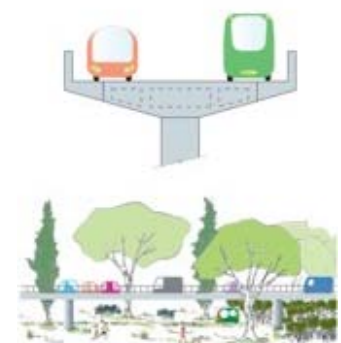


Harvard University holds a symposium in honour of Dr. Richard Forman on the occasion of his retirement

Internationally, Dr. Richard Forman is considered one of the pioneers of road ecology. He is the author of numerous articles and books on the subject, including his two best-known works: Landscape Ecology and Road Ecology.

In September 2013, on the occasion of his retirement, Harvard University's Graduate School of Design organized the symposium Ecology for Land & City: Exploring the Confluences of Landscape, Road, and Urban Ecology in recognition of his long and productive career.

[Symposium](#) participants included numerous experts on landscape, road and urban ecology who focused on the challenge of exploring and highlighting the links between the three disciplines.



Taco Iwashima Matthews
(In Forman & Sperling 2011;
<http://www.thesolutionsjournal.com/node/975>)

Dr. Forman excelled in ecology for his studies on landscape ecology, on which he published numerous papers and proposed the patch-corridor-matrix model. Later, he focused on transport infrastructures as elements that are present in many landscapes,

and he established the principles of road ecology.

He also devoted much of his work to the ecology of urban spaces and their planning. In this area, he carried out various studies in Spain, the first of which was described in *Mosaico territorial para la región metropolitana de Barcelona* (Forman 2004). In 2012, Dr. Forman gave several talks in Madrid and Barcelona and took part in the meeting of the Working Group on Habitat Fragmentation due to Transportation Infrastructure, at which he presented his vision for future transport networks (the Netway System for Transportation) that are safer and have considerably less impact on the natural environment.

Source of information: Editorial Team



PUBLICATIONS

Desfragmentación de hábitats. orientaciones para reducir los efectos de las carreteras y ferrocarriles en funcionamiento (Habitat defragmentation. Guidelines to reduce the effects of operating road and railway networks) is number 5 in the series *Documents for the reduction of habitat fragmentation due to transportation infrastructure*, which are drawn up as part of this project. The fifth volume focuses guidelines and directives to facilitate the implementation of actions designed to increase ecological connectivity in regions with operating transport infrastructures and, in general, to mitigate any of the habitat fragmentation effects caused by roads. It is based on analyses of experiences. The different regional scales on which the actions can be implemented are considered, and legislation as well as planning and management instruments that could facilitate the implementation of actions are reviewed. Guidelines are provided on the identification of areas that are critically affected by the impact of roads and on the selection of the most appropriate defragmentation measures in each situation.



Reference:

MAGRAMA. 2013. *Desfragmentación de hábitats. Orientaciones para reducir los efectos de las carreteras y ferrocarriles en funcionamiento*. Organismo Autónomo Parques Nacionales, Ministerio de Agricultura, Alimentación y Medio Ambiente. Madrid, 159 pp.



EVENTS

IAIA14 Impact Assessment for Social and Economic Development. Viña del Mar (Chile), 8 to 11 April 2014. Organized by: International Association for Impact Assessment (IAIA) and Servicio de Evaluación Ambiental del Gobierno de Chile.

International Seminar "Road Sustainability and Green Technology". Bali (Indonesia), 23 to 26 April 2014. Organized by: World Road Association (PIARC), Road Engineering Association of Asia and Australasia (REAAA) and Indonesian Road Development Association (IRDA).

ANET Conference 2014. Coffs harbour (Australia), 20 to 23 July 2014. Organized by: Australasian Network for Ecology & Transportation.

SER2014: 9th European Conference on Ecological Restoration. Oulu (Finland), 3 to 8 August 2014. Organized by: SER Europe (Society for Ecological Restoration).

IENE 2014 International Conference Life for a greener transport infrastructure. Malmö (Sweden), 16 to 19 September 2014. Organized by: Infra Eco Network Europe (IENE), Swedish Transport Administration, Swedish University of Agricultural Services.



Events that have already been held

Jornadas técnicas Conectividad ecológica y vías de transporte. Cáceres (Complejo Cultural San Francisco), 13 and 14 November 2013. Organized by: Ministerio de Agricultura, Alimentación y Medio Ambiente and Gobierno de Extremadura. Further information is available [here](#).

Transportation Infrastructure and Wildlife Corridors – learning from experience. Luhacovice (Czech Republic), 16 to 18 October 2013. Organized by: Infra Eco Network Europe (IENE), Transport Research Centre, Czech Republic (TRC CR), Nature Conservation Agency of the Czech Republic (NCA CR). Further information is available [here](#).

SER2013 World Conference on Ecological Restoration: Reflections on the Past, Directions for the Future. Madison (Wisconsin, USA), 6 to 11 October 2013. Organized by: Society for Ecological Restoration. Further information is available [here](#).

Changing European Landscapes. Landscape ecology, local to global. IALE 2013 european congress. Manchester (United Kingdom), 9 to 12 September 2013. Organized by: International Association for Landscape Ecology – UK Region. Further information is available [here](#).

International Conference on Engineering and Ecohydrology for Fish Passage. Corvallis (Oregon, USA), 25 to 27 June 2013. Organized by: Oregon State University. Further information is available [here](#).

ICOET 2013. International Conference on Ecology & Transportation. Scottsdale (Arizona, USA), 23 to 27 June 2013. Organized by: ICOET and Arizona Department of Transportation. Further information is available [here](#).

IENE 2013 Scientific & Technical Workshop: Effective motorway planning and securing conservation interests during the planning, construction and operational phases of development. Arad (Romania), 21 to 23 May 2013. Organized by: Infra Eco Network Europe (IENE), University of Arad "Vasile Goldis", WWF-DCP, FFI and Asociatia Zarand. Further information is available [here](#).








Fabos Conference on Landscape and Greenway Planning: Pathways to Sustainability. Amherst (Massachusetts, USA), 12 to 13 April 2013. Organized by: American Society of Landscape Architects (ASLA) and University of Massachusetts. Further information is available [here](#).



DOCUMENTS OF WORKING GROUP AND ACTION COST 341

As part of the European project COST 341 on Habitat fragmentation due to transportation infrastructure and the Working Group that has led to the project's continuity, various resources have been created to contribute to increasing knowledge and mitigation of impacts of habitat fragmentation caused by transport infrastructures.

The following documents have been published:

- **COST 341. La fragmentación del hábitat en relación con las infraestructuras de transporte en España.** (Habitat fragmentation due to transport infrastructure in Spain). Review of the state of the art, published in 2003.
- **COST 341. Wildlife and traffic. A European Handbook for Identifying Conflicts and Designing Solutions**  (40 MB). Published in 2003 as a coda to Action 341, drawn up by experts from various European countries.
- **COST 341. Fauna y Tráfico. Manual europeo para la identificación de conflictos y el diseño de soluciones**  (33 MB). Published in 2005; a translation of *Wildlife and Traffic*.
- Series **Documentos para la reducción de la fragmentación de hábitats causada por infraestructuras de transporte** (Documents for the reduction of habitat fragmentation caused by transport infrastructure).
 - **Nº 1. Prescripciones técnicas para el diseño de pasos de fauna y vallados perimetrales**  (1,8 MB) (Technical prescriptions for the design of wildlife passages and perimeter fences). In 2008 the Catalan version was published **Prescripcions tècniques per al disseny de passos de fauna i tancaments perimetrals** by the Department of the Environment and Housing, Regional Government of Catalonia.
 - **Nº 2. Prescripciones técnicas para el seguimiento y evaluación de la efectividad de las medidas correctoras del efecto barrera de las infraestructuras de transporte**  (2 MB) (Technical prescriptions for monitoring and evaluating the effectiveness of measures to correct the barrier effect of transport infrastructure). Published in 2008.
 - **Nº 3. Prescripciones técnicas para la reducción de la fragmentación de hábitats en las fases de planificación y trazado**  (45 MB) (Technical prescriptions for the reduction of habitat fragmentation in planning and alignment phases). Published in 2010.
 - **Nº 4. Indicadores de fragmentación de hábitats causada por infraestructuras lineales de transporte**  (31 MB) (Indicators of habitat fragmentation due to linear transport infrastructures). Published in 2010.
 - **Nº5. Desfragmentación de hábitats. Orientaciones para reducir los efectos de las carreteras y ferrocarriles en funcionamiento**  (53 MB) (Habitat defragmentation. Guidelines to reduce the effects of operating road and railway networks). Published in 2013.
 - **Nº 6. Identificación de áreas a desfragmentar para reducir los impactos de las infraestructuras lineales de transporte en la biodiversidad** (Identification of areas to defragmentate to reduce the impacts of linear transport infrastructure on biodiversity). In press.

For further information, see the [MAGRAMA](#) and [IENE](#) sites.



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