

habitat fragmentation due to transportation infrastructure



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Dirección General para la Biodiversidad. Ministerio de Medio Ambiente.

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habitats.transporte@mma.es

EDITORIAL

Iberian Lynx road casualties: a grave threat to the survival of this species

The population of this magnificent feline, the most threatened in the world according to the IUCN, does not exceed 200 individuals and is located wholly in the Iberian Peninsula, mainly in Andalucia but also in Castilla-La Mancha. Recently, excrement belonging to this species has been identified in the Madrid Region, specifically in the ZEPA and LIC of the Cofio and Alberche rivers.

Not only is the lynx one of the most emblematic species of Iberian wildlife but also one of the principal priorities for the conservation of biological diversity in Spain; it is included in the National Catalogue of Threatened Species under the category of "endangered" and it relies on a Conservation Strategy which was passed in 1999. This was elaborated by the Ministerio de Medio Ambiente and competent organisations from the autonomous communities, some of which have written up recovery plans. Huge efforts have been applied in order to avoid the lynx's extinction and a large number of people are working in different projects promoted by the autonomous communities of Andalucia and Castilla-La Mancha, the Biological Station at Doñana and the Ministerio de Medio Ambiente. Others who participate in the projects are non governmental organisations and social figures such as landowners, hunters etc. The projects, which also rely on financing from European funding (Life Programme) include work which stabilises and increases the existing populations: habitat improvement through

programmes which favour lynx favourite prey (the rabbit) the bringing in of live prey to enclosures, the installation of structures which can be used as dens, drinking troughs, etc. Alongside these activities for conserving the species in its own habitat is a captive breeding project in the Acebuché Breeding Centre. Last year, the first cubs were born here and this year the successful event was repeated.



Ministerio de Medio Ambiente

On some fronts, the success is evident, and this encourages efforts to maintain or indeed intensify the work being carried out. However, this gigantic investment of economic efforts and enthusiasm poured in by all those involved in the species' recuperation runs into an obstacle which has to be seriously confronted: the mortality of lynx on the roads. Studies carried out in the 1980's on lynx road mortality estimated that this cause was responsible for a little more than 20% of mortality, but more recent data indicates that currently around 80% of known deaths are caused by road accidents. The press continues to periodically report new cases of lynx, many of them young individuals in dispersion which perish when trying to cross the roads.

Organisations responsible for road management have contributed to the conservation of the lynx by constructing wildlife passages and perimetral fencing at the most critical points although in doing so they have not succeeded in avoiding more deaths. It is not an easy task. The lynx is a species which presents great difficulties in the designing of effective measures for the permeabilisation of road routes due to their ability to climb fences. This explains the fact that on some occasions, road casualties continue to occur on stretches with perimetral closures and inferior passages constructed in order to facilitate crossing. Although the lynx are capable of using these structures they often opt for climbing and jumping the fence instead of entering small wildlife passages.

Without doubt it is possible to improve the designs of the corrective measures and it is necessary to carry out an urgent evaluation of all the conflictive stretches of currently functioning roads, with the aim of incorporating new, more effective measures. But besides this priority action, another key aspect for guaranteeing the survival of the lynx is the prevention of the impacts of new routes which contribute even more to the difficulties the lynx has for movement and the exchange of individuals between different population nuclei. As a result, the planning and design phase of new road routes plays a crucial part since this permits a choice of alternative corridors when it is considered essential to preserve a determined area, or, with the incorporation of stretches that merge into tunnels, false tunnels, viaducts or large ecoducts specifically designed for this species. On a parallel, they orientate the lynx towards places where it is safe to cross the roads and railways that segment their area of distribution.

The setting up of a board which would integrate not only the environmental organisations implicated in the conservation of the species, but also transport administrations, from both the State and all those autonomous communities included in the lynx's potential distribution area (areas of certain or probable presence and also those that could be recolonised in the near future, and principal corridor connections between different population nuclei) would be, without doubt, a fundamental element in favouring the sum of efforts and would give new impulse to the endeavours of the conservation of the Iberian lynx.

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WORKING GROUP

The last meeting of the Working Group on Habitat Fragmentation Caused by Transport Infrastructures, (created in 1999 and, which the Dirección General para la Biodiversidad (Ministerio de Medio Ambiente) holds the secretariat) took place in June 2005, and was attended by 30 representatives of transport administrations and environment of the autonomous communities and the State. The next meeting is expected to take place in the final trimester of 2006.

The activities of the Group in the last months have centred on the revision and publication of the first of the series of Technical Prescriptions for the reduction of impacts of network infrastructures on wildlife. It is destined for Design of wildlife passages and perimetral fences, which is in the final publishing stages. In the coming years, two new documents are expected to complete the series: the first will include prescriptions for the monitoring and evaluation of the effectiveness of the measures and the other will deal with the prevention of habitat fragmentation in the infrastructure planning phase.

One aspect which stands out is the notable activity of consultations carried out via the e-mail address habitats.transporte@mma.es. Of all the consultations that were answered, the majority (46%) come from environmental and transport administrations technicians, (many of whom are already members of the mentioned Working Group), followed by 20% of technicians from consultant businesses and 10% from universities and investigation centers, amongst others.

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NEWS

Drainage works compatible with fish migration

It is becoming more and more frequent to find in our communication networks tubes, or pontoons with tubes used to cross watercourses. However, according to experience gathered from other countries, these transversal drainage structures can generate serious environmental problems in watercourses with fish populations, by impeding or limiting their natural movement.



Jorge García Molinos and
Andrés Martínez de Azagra

The most frequent problems which are derived from poor design or bad installation of this type of passage are excessive falls of water at the exit of the tube, insufficient depth inside, high velocity of water and excessive turbulence and the accumulation of sediment and waste dragged by the water to the entrance of the tube. In general, there will always be a problem when the hydraulic conditions of the structure are out of the natural range which can support the fish.

It is therefore an important environmental aspect to be kept in mind when designing this type of drainage. The *Escuela Técnica Superior de Ingenierías Agrarias* of the University of Valladolid has elaborated an informative brochure which seeks to inform those professionals who have a connection with the construction and conservation of communication networks. This brochure offers general information about these problems and their possible solutions, indicating some basic design criteria for our salmonids.

The brochure can be downloaded directly from the Web at <http://www.stream.fs.fed.us/fishxing/espanol.html>. Here you can also find much more additional information in English.

*Jorge García Molinos y Andrés Martínez de Azagra Paredes.
Escuela Técnica Superior de Ingenierías Agrarias. Universidad de Valladolid.*

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False tunnels for wildlife on the A-381 dual carriageway Jerez de la Frontera-Los Barrios

The recently completed A-381 dual carriageway is the main axis of connection of the Bay of Algeciras with the Bay of Cádiz-Jerez and the Bajo Guadalquivir. It passes transversally through the Los Alcornocales Natural Park, one of Andalucía's richest natural areas, both in ecology and landscape, and which is also included in the European Union's Nature 2000 Network.



Luis Ramajo

During construction, strict preventative and corrective measures have been applied, which have taken up 30% of the total cost of the project. In accordance with the Declaration of Environmental Impact,

embankments higher than 10m have been substituted by viaducts and excavations of more than 15m deep by false tunnels. Through these measures, the previous impact on the landscape has been corrected (since the dual carriageway has been constructed on top of the original road) and wildlife transit is guaranteed, decreasing the barrier effect.

The building of the false tunnels is solved by using a double cement vault constructed with prefabricated pieces. They are assembled *in situ* after carrying out the excavation of the ditch and completion of the foundations. Finally they are filled in with earth to restore the natural orography, and finally covered with compost, seed and plantations. Along the entirety of the dual carriageway's route, 6 false tunnels have finally been included, 5 of which are situated inside the natural park and measuring a total of 1,393m (the length of the section situated within the park is 35km). This substantially increases wildlife permeability, facilitates the integration of the dual carriageway into the surroundings and decreases the size of the area which is finally affected.

Each vault is 14m wide, including tarmac and pavements, and is covered with piles of soil with a variable height of up to 25m, until the natural area of ground has been restored.

Luis Ramajo Rodríguez. GIASA. Junta de Andalucía.

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Innovation in the construction of wildlife passages by means of wide vaults, in the construction of the High Speed Railway Line between Barcelona and Girona

The work on the high speed railway on the stretch at Sant Celoni-Riells has permitted the innovation of constructive solutions for improving the permeability of the design. The interests of both those who want to optimise the structure for wildlife use and those who want facility of construction have both been honoured, with the resulting construction of wide vaults exempt of obstacles.



Carme Rosell

In the said stretch of the new high speed line, the project included the construction of wildlife passage of widths between 15 and 20m and in some cases, reaching 100 metres in length. The possibility to include improvements in order to increase the functional character of the passages concluded in a change in the initial project proposed, of rectangular sections with central pillars. These structures were also justified by the existence of the roe deer (*Capreolus capreolus*) in the area which requires an increase in the wildlife passage and at the same time considering the sensitivity of the area (point of key contact between the two large, natural areas of Montseny and the Montnegre-Corredor, separated in this area by the river Tordera).

Improvement of this solution, although considering that in the initial project an answer was given to the strategic importance of the passages with specific criteria of the ecological criteria, generated the interest of the ADIF. After evaluating the different alternatives, a variation was proposed consisting of the construction of the wildlife passages with prefabricated vault sections. Given the desired measurements, the vaults needed to be constructed *in situ*. This solution permitted the elimination of the central pillars whilst maintaining the measurements of the project. It also meant that there was a decrease in the actual length of the passage, given the greater height at the central point, and a significant increase in the

penetration of natural light inside, providing a much more attractive solution.

The ecological functional character of the construction, although it should be verified through its monitoring during the exploitation of the new line, is presumed to be much more effective than initially thought. Therefore the experience has been positive, with the ecological, functional and constructive conditions having been resolved in the new proposition.

Ferran González Prat and Ignasi Grau Roca (IGRemap, S.L.)

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Temporary barriers to prevent toad mortality in the Vigo University campus

In the Vigo University campus, near the Faculty of Philology and Translation, every year hundreds of common toads of the subspecies *Bufo bufo spinosus* turn up at the nearby lake. During February and March, a time which coincides with the migration of reproducing adult toads, a massive number of individuals were found run over on the campus ring road. In 2002, at least 634 were found dead in this manner.



Environment Office,
University of Vigo

From 2003, as a corrective measure to decrease the impact of the ring road on the toads, the University's Environmental Office opted for the installation of temporary traps for collecting the animals which were headed towards the lake to lay their eggs. The traps consist of a light, plastic fencing some dozen metres long which run parallel to the road, and which intercept the routes used in the toads' migration. The fencing is around 30cm high, fixed to the ground with soil and maintained upright with stainless steel poles which are fixed each 1.5m. Along this fencing, at each 6 or 8m, buckets are buried level with the ground and the bottom of each is covered in stones in order to give cover to the toads that fall in.

When the toads bump into the fencing barrier, they tend to travel alongside it and in this way, they fall into the buckets. Whilst the traps are in place they are checked first thing in the morning each day, since this species' reproductive migration is fundamentally nocturnal. Finally, the collected toads are moved by biologists from the Environmental Office to the lake, safe and sound, and are left to carry out their egg laying.

In 2006, 3 traps have been installed with a total of 16 buckets and 190m of fencing resulting in the collection of a total of 790 individuals.

Environment Office, University of Vigo

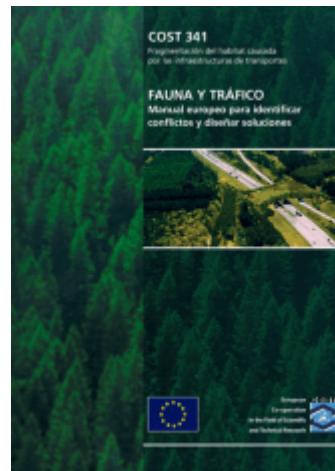
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PUBLICATIONS

COST 341. Fauna y tráfico. Manual europeo para la identificación de conflictos y el diseño de soluciones.

Last December, the Ministerio de Medio Ambiente published the Spanish translation of the manual in English, written up by experts from different

European countries participating in the ACTION COST 341 on Habitat Fragmentation caused by Transport Infrastructures. This manual contributes practical recommendations directed at all professionals implicated in the different phases of planning, project, construction and maintenance of transport infrastructures, in order to reduce to a minimum the barriers which they bring to



bear on the movements of wildlife and also their effects of fragmentation. In the translation, the original texts in English have been respected, with only slight adaptations. In parallel, the publication of a series of documents on Technical Prescriptions has been started, based on the guidelines of this manual but adapted to the context of the Spanish state.

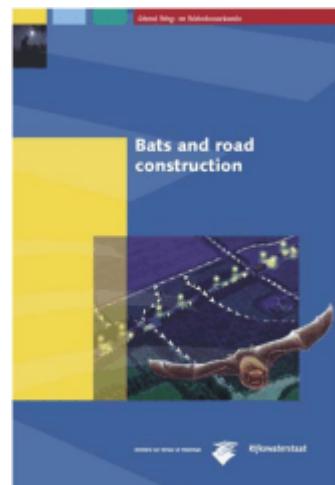
Reference:

Iuell, B., Bekker, HGJ., Cuperus, R., Dufek, J., Hlavac, V., Keller, V., Rosell C., Sangwine, T., Torslow, N & Wandall, B. (2005). *COST 341. Fauna y Tráfico. Manual europeo para la identificación de conflictos y el diseño de soluciones*. Servicio de Publicaciones. Organismo Autónomo Parques Nacionales, Ministerio de Medio Ambiente. 166 pp.

You can obtain this document from: Servicio de Publicaciones del Organismo Autónomo de Parques Nacionales (Tel. 91 596 49 43) or from the website: <http://www.educacionambiental.net>.

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Bats and road construction. Bats constitute a group of high conservation interest that integrates numerous species included in international treaties or European guidelines (Bern Convention, Habitat Directive) and are qualified as *of Special Interest* in the National Catalogue of Threatened Species. This publication, edited by the Dutch Department of Transport, Public Works and Water Management, together with the Society for the Study and Conservation of Mammals in this country, summarises the information on the effects that transport infrastructures cause the communities of this group of mammals.



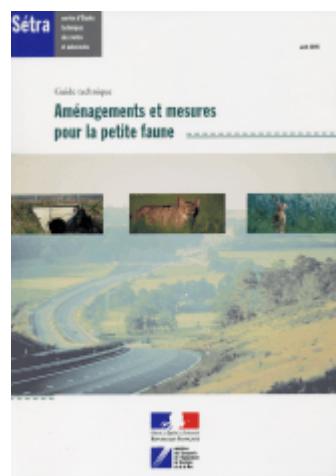
It also presents, briefly, and with magnificent illustrations, the habitat requirements and the patterns of movement through the landscape of different species, and supplies instructions for the application of measures to reduce mortality caused by collision with vehicles and to favour the orientation of the bats' flight towards points where they can safely cross roads. The publication puts a special emphasis on how to facilitate the passage of bats across transversal structures such as superior or inferior passages or viaducts and in particular, on how to replant the entrances to the structures and their integration in the surrounding landscape.

Reference:

Limpens, H.J.G.A., Twisk, P. & Veenbaas G. (2005). *Bats and road construction*. Dutch Ministry of Transport, Public Works and Water Management, Road and Hydraulic Engineering Institute. Society for the Study and Conservation of Mammals.

Aménagements et mesures pour la petite faune – Guide technique.

This guide, which was presented last September, sets out a current synthesis of French and European knowledge and experiences, referring to the actions and measures applied for the prevention of the impacts of transport network on small vertebrates. The book is organised into 5 chapters with general information about the subject (chapter 1), the steps to be taken in order to carry out the previous studies on the implementation of the actions of improvement and corrective measures in the construction of infrastructures (chapter 2), the description of impacts caused by



infrastructures on small vertebrates (chapter 3), the description of the measures and their execution (chapter 4) and finally other elements necessary for the management of these actions (chapter 5). The technical sheets of these actions, sheets on species of small vertebrates, bibliography and glossary complete the book.

Reference:

SETRA. 2005. *Aménagements et mesures pour la petite faune – Guide technique*. Service d'Etudes Techniques des Routes et Autoroutes, Ministère des Transports, de l'Equipement, du Tourisme et de la Mer. 264 pp.

You can obtain this document through the website:

<http://cataloguesetra.documentation.equipement.gouv.fr> (Ref. num. 0527).

EVENTS

I Congress of Environment on Roads. Integration of roads in the natural surroundings. Santander, 25th to the 28th of April 2006. Organised by: Asociación Española de la Carretera. More information at: <http://www.aecarretera.com>

International Seminar of Roads. Monterrey (Mexico), 8th to the 12th of May 2006. Organised by: Asociación Mundial de la Carretera (PIARC). Amongst the topics to be discussed at this seminar is the mitigation of the environmental impact on road transport. More information at: <http://www.piarc.org>

Integrated Assessment of Environmental Impact of Traffic and Transport Infrastructure. Warsaw (Poland), 30th of June 2006. Organised by: COST 350 Integrated Assessment of Environmental Impact of Traffic and Transport Infrastructure, Road and Bridge Research Institute (Poland). More information at: <http://www.ibdim.edu.pl/english/konferencje/cost/index.htm>

1st European Congress of Conservation Biology. Eger (Hungary), 22nd to the 26th of August 2006. Organised by: Society for Conservation Biology. In different symposiums, themes on the loss of biodiversity caused by habitat fragmentation will be discussed. More information at: <http://www.eccb2006.org>

Scientific-technical International Conference. Influence of transport infrastructure on nature. Poznan (Poland), 13th to the

17th of September 2006. Organised by: General Directorate for National Roads and Motorways (GDDKIA), PKP, Polskie Linie Kolejowe SA, Adam Mickiewicz University of Poznan and Agricultural University of Cracow. For more information go to: jbyrka@gddkia.gov.pl

1st Congress of Landscape and Infrastructures. Sevilla, 4th to the 7th of October 2006. Organised by: Department of Public Works and Transport, Andalucian government. Two blocks of presentations will deal with the *Incidence and Integration of infrastructures in the landscape*. More information at: <http://www.aecarretera.com>

III Congress of civil engineering, territory and environment "Water, biodiversity and engineering". Zaragoza, 25th to the 27th of October 2006. Organised by: College of Road, Canal and Port Engineers and the Association of Road, Canal and Port Engineers. More information at: <http://www.ciccp.es>

CONAMA 8. Sustainable Development Summit. Madrid, 27th November to 1st of December 2006. Organised by: CONAMA Foundation. This will include discussions, round tables and working groups based on sustainability and the environmental problem in the development of infrastructures. Also, a technical workshop on the experiences in the Environmental Strategic Evaluation. More information at: <http://www.conama.org>

II International Symposium on Ecological Restoration. Ciudad de Santa Clara, Villa Clara (Cuba), from the 16th to the 22 April 2007. Organised by: Grupo Cubano de Restauración Ecológica y Empresa Nacional para la Protección de la Flora y la Fauna. For more information go to: sisre@ccb.vcl.cu

The International Conference on Ecology & Transportation (ICOET). Little Rock, Arkansas (United States) from the 20th to 25th May 2007. Organised by: Arkansas State Highway and Transportation Department. More information at: <http://www.icoet.net> or at: kpm@ncsu.edu.

Previously held Workshops of which the proceedings can be obtained

The International Conference on Ecology & Transportation (ICOET). San Diego, California (USA). 2005. Proceedings available at: http://www.icoet.net/ICOET_2005/05proceedings_directory.asp

Sustainable Planning 2005. Second International Conference on Sustainable Planning & Development. Bologna (Italy). 2005. Proceedings available at: <http://www.witpress.com/acatalog/025X.html>

Workshops on Optimisation in the planning and management of roads. Barcelona 2006. You can acquire the proceedings (in Spanish) at the Asociación Española de la Carretera, by fax: 915 766 522.

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ACTION PRODUCTS COST 341

The European technologic exchange project COST 341. *Fragmentation of habitats caused by transport infrastructures* (1999-2003) generated the following materials:

COST 341. Fauna y tráfico. Manual europeo para la identificación de conflictos y el diseño de soluciones. Translation into Spanish of the original document in English.

COST 341. Habitat Fragmentation in relation to the transport infrastructures in Spain.

Both documents can be obtained at the Ministry of the Environment's Publications Service (Tel. 91 596 49 43), or through the Web at www.educacionambiental.net. English Manual can be acquired [here](#).

CD-ROM integrating all those documents elaborated during the ACTION COST 341.

CD-ROM with the proceedings of the closing workshop of the ACTION COST 341.

Both CD-ROM can be obtained through the [IENE](#) website

Database which contains bibliography registers on habitat fragmentation and applied measures for its reduction in those countries participating in the Action, amongst them, 298 references corresponding to studies carried out in Spain. You can consult it on the [IENE](#) website. If you would like to send information to be incorporated into the database, you can fill in the [bibliography](#) and [preventive and corrective measures](#) forms (both in Spanish) and send them to habitats.transporte@mma.es.

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- This publication comes out every six months within the framework of the Fragmentation Habitat Due to Transportation Infrastructure Project. It is promoted by the Dirección General para la Biodiversidad, Ministerio de Medio Ambiente. **MINUARTIA, Estudis Ambientals** is undertaking the technical administration of the project.
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