

**Dr Sabina Nowak
&
Robert W. Mysłajek, MSc.**

*The Association for Nature „WOLF”
ul. Górska 69, 43 376 Godziszka, Poland
Tel/fax: +48 33 817 60 90
e-mail: sabina@wolf.most.org.pl
<http://www.most.org.pl/wolf>*

**Problems affecting migration corridors for large terrestrial mammals
caused by the network of fenced motorways and express roads within the
TEN-T program: the situation in Poland.**

Introduction

The natural continuous range of forest in Europe has been broken up into many parts due to agriculture, urbanisation, increasing road traffic and development of transport infrastructure, as well as other human activities. This situation creates many problems for various organisms living in forests. Genetic isolation, limitation of dispersal and migration, and the decline of populations of animals requiring large territories are the most common problems connected with fragmentation of forests and other components of the environment. Dependent on economic development, such fragmentation is most advanced in Western Europe (Bernard J. M. *et al.* 1989, Canters *et al.* 1997, Spellerberg 1998). In Eastern Europe (Estonia, Latvia, Lithuania, Russia, Belarus, Ukraine, up to eastern Poland) large continuous forest tracts still remain. These areas have preserved viable populations of large, rare mammals, such as lynx, wolf, brown bear, European bison and moose. Another such important region are the Carpathian Mountains, which constitute a valuable habitat and important migration corridor for a number of protected species. Thus Poland and other new EU member states could play an important role in the restoration of the connectivity of European forests, and in the recovery of large mammal populations in Western Europe. To enhance forest integrity and animal dispersal a network of migration (ecological) corridors linking the most important forest habitats (e.g. Natura 2000 sites) should be established throughout the whole of Europe.

Migration corridors in Poland

In Poland such ecological corridor networks have recently been identified (Jędrzejewski *et al.* 2002a, 2004a). As target species we used lynx and wolf, due to their great abilities for long distance migrations and dispersal (Jędrzejewski *et al.* 2001, 2002b, Schmidt 1998). Both these species of European importance are protected in our country. Based on detailed analyses of their range changes in Poland in the 20th century and their current distribution (Bieniek *et al.* 1998, Jędrzejewski *et al.* 2002a, Okarma *et al.* 1998, Wolsan *et al.* 1992), results of a genetic study (Jędrzejewski *et al.* unpubl.), analyses of the land-cover in Poland and factors promoting or preventing wolves settling (Jędrzejewski *et al.* 2004b), we have delimited and proposed for their protection a network of forest migration (ecological) corridors, which are suitable for all large terrestrial mammals as well as a number of plant and smaller animal species (Jędrzejewski *et al.* 2004a, 2005). They connect the large forest complexes of Eastern Europe with forests in Germany, Slovakia and the Czech Republic through our country (Map 1). We have distinguished two types of corridors: seven main corridors passing through the whole country, and a network of supporting corridors connecting all the bigger forests in Poland, most of them designated as Natura 2000 sites (Map 2). These corridors require a legal protection framework (on an international, national and local level), which will secure their connectivity, prevent threats from urbanisation and transport infrastructure development, and allow direction of afforestation programs to fill the biggest gaps in their course.

Conflict of migration corridors with TEN-T program

Currently this network of migration corridors in Poland is seriously threatened with disruption by plans to build several new motorways and express roads (which will be fenced all along), and by the upgrading of existing roads to axle load 11.5 ton (Jędrzejewski *et al.* 2004) (Map 3). The purpose of these road developments is to ensure the effective connection of Poland with other EU countries through the Trans-European Transportation Network (TEN-T). Overall 1,510 km of motorways, 1,631 km of expressways and 1,674 km of upgraded roads will be completed by 2013. Most of them are situated along Pan-European corridors, for example: the A-2 motorway (within Pan-European Corridor II) will connect Germany with Belarus, through Poznań and Warsaw; the A-4 and A-18 motorways (within Pan-European Corridor III) will connect Germany with the Ukraine through Wrocław, Katowice and Kraków; and the express road “Via Baltica” (within the I Pan European Corridor) will

connect the Czech Republic with Lithuania through Wrocław, Warsaw and Augustów. The planned road network in Poland for 2003-2013 and beyond is presented on Map 4. The main investor in these roads is the **General Directorate for Public Roads and Motorways**, a branch of the Ministry of Infrastructure.

Since the beginning of 2004 we have observed a significant increase in road investments in Poland. By the end of 2004 about 1,520 million Euros have been spent on road construction and upgrading, and 209 km of motorway, 79 km of express road and 3,484 km of upgraded road were completed. The next 273 km of motorway and 168 km of express road will be under construction, and will be finished by the end of 2005, by which time the total cost will be approximately 2,019 million Euros. Some sections of the infrastructure are, or will be, co-financed by EU sources like ISPA, Phare, European Regional Development Fund, Cohesion Fund, European Investment Bank and the European Bank of Reconstructure and Development. The World Bank provides loans for upgrading old roads.

Currently two highways (A2 and A4 with A18 branch) and the S3 express road near the German border (W Poland) are in a very advanced state of preparation and construction (Map 5), as is the upgrading of some existing roads, for example sections of national road No. 8 located along the route promoted by the Polish government for the Via Baltica express road.

The planned dense road network will disrupt the migration process and cause the isolation of most large forest complexes which provide important habitats for large terrestrial mammal populations, species that are listed as threatened or endangered in the EU (Map 6). We expect similar problems with the development of road infrastructures in all new EU member countries of Eastern Europe. A significant threat of fragmentation is posed by roads that will cross the Carpathian Mountains from Slovakia to Poland, or motorways that will isolate wildlife areas inhabited by vital populations of big predators and ungulates in Lithuania, Latvia and Estonia.

Given this situation it is extremely important to mitigate the negative impact of the new road infrastructure by re-location of some sections of planned roads away from the most valuable areas (e.g. Via Baltica section from Ostrów Mazowiecka to Augustów, NE Poland), and by planning, designing and building wildlife crossings suitable for large mammals on existing migration routes and within wildlife habitats crossed by roads (Clevenger *et al.* 2000, 2002; Iuell *et al.* 2003; Jędrzejewski *et al.* 2004a; Müller *et al.* 1994; Pfister *et al.* 1997).

Unfortunately, because funds for transport infrastructure development in all new EU countries are very restricted (loans and donations of external funds need to be involved), governments

and investors have tried to avoid all expenses not directly connected with road investment and to shorten the decision making process as much as possible.

Since April 2003 Poland has had an Act on Special Procedure for Construction of National Roads, which simplifies previous procedures of obtaining the decisions for road siting and construction. Those special rules affect issues related to: environmental protection (changed scheme of the Environmental Impact Assessment, lack of obligation to agree the road siting and construction conditions with the Minister of Environment, only an opinion is required); public participation (insufficient public participation provision); and compulsory land acquisition.

In Poland wildlife crossing structures on roads are commonly considered as very expensive but doubtful measures, and their number and size are mostly very limited, or integrated with other functions like local road or pedestrian crossings. Though we have regulations which make demands on investors to build wildlife passages on new planned motorways and express roads, their recommended dimensions do not meet the requirements of our biggest mammals like moose *Alces alces*, bison *Bison bonansus*, bear *Ursus arctos*, lynx *Lynx lynx* or wolf *Canis lupus*. At present we only have a few examples of well built passages for large mammals in Poland. The regulations should be urgently adjusted to account for current knowledge on the requirements of different species.

According to the regulations mentioned above, construction of wildlife passages is not required during the improvement and upgrading of existing roads in Poland. We can expect that with the renovation of these roads it will allow a significant increase in overall traffic, caused mostly by heavy trucks. As a result these roads, similarly to motorways, will probably cause a serious barrier for the migration of animals in the near future. Some of the upgraded sections of roads, supported by a loan from the World Bank, will cross very important wildlife areas or will cut ecological corridors. Their improvement should obligatorily be connected with the application of proper mitigation measures.

Conclusions:

In the last few years we have been faced with a serious threat to European wildlife resulting from the dynamic development of a transportation infrastructure network within the TEN-T program. This transportation network disrupts migration corridors of large terrestrial mammals and causes a fragmentation of their environment on a scale not previously recorded. To preserve and improve migration corridors in Europe, it is extremely important to undertake

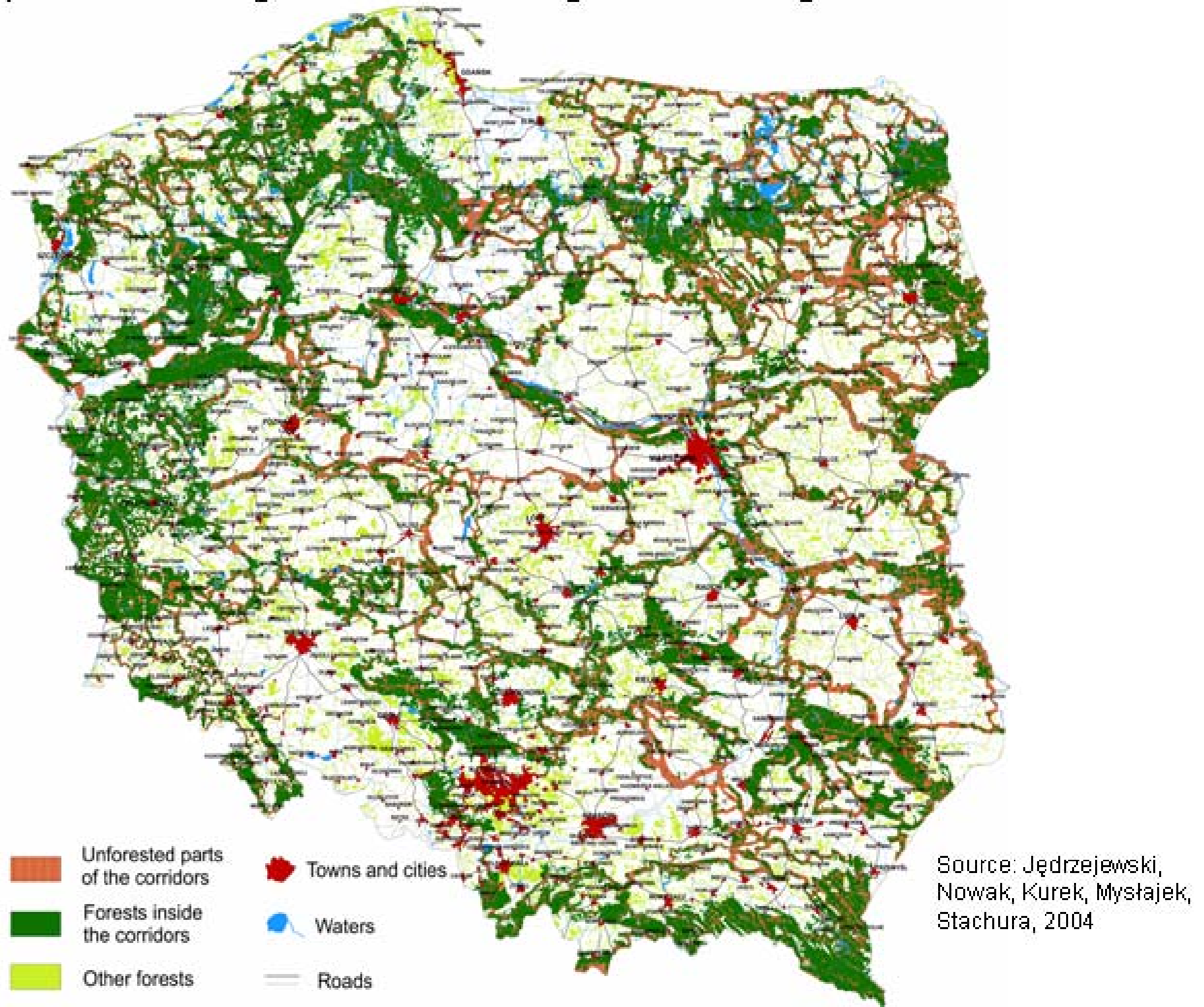
the following activities: (a) define still-functioning and potential migration (ecological) corridors within Europe and establish a Pan-European network of migration corridors; (b) develop a European and national legal framework for the protection and proper management of migration corridors against disruption caused by transportation development, urbanisation and other linear investments; (c) introduce regulations into the European transport policy, which will prevent environment fragmentation, and ensure the protection of ecological corridor connectivity (e.g. relocation of the most harmful sections of roads, building “green passages” for animals on motorways and other roads); (d) implement the corridor network into regional and local management plans; (e) increase forest cover inside corridors by directing afforestation programs supported by EU funds; (f) implement international programs of monitoring vulnerable species like lynx, wolf, bear and moose, and large scale genetic programs on these animals.

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Map 1. Forest ecological corridors for large mammals migrations in Poland



Map 2. Migration corridors linking designated Natura 2000 sites in Poland