

## **BUILDING A REGIONAL ECOLOGICAL NETWORK IN THE CARPATHIANS, BASED ON KEY HABITATS FOR LARGE CARNIVORE (WOLVES, BEARS AND LYNX)**

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### **ABSTRACT**

The project, financed by the PIN MATRA program, is a Romanian-Dutch cooperation aiming to design a GIS map and a management plan that support the implementation of an Ecological Network in the Romanian Carpathians, as a first step for the Natura 2000 Network implementation in Romania. In this respect, based on the existing Romanian situation and on our experience in wildlife research, we will use for the network design the key habitats for large carnivore (wolves, bears and lynx). As a continuation of the project we consider that this network could be extended to a diverse list of Romanian wildlife species.

**Keywords:** ecological network, wolves, bears, lynx, habitats.

### **THE IMPORTANCE OF AN ECOLOGICAL NETWORK IN ROMANIA**

Romania still has a great regional ecological network that covers a large part of the country. This is the Carpathian mountain range containing special and unique biodiversity, landscape and cultural values, and is in connection with the equally important Danube Delta. Important for Europe for instance are the large populations of large carnivores and herbivores. Of the total European large carnivore populations Romania holds 30 % for the wolf (ca. 3 000 individuals), 35% for the Brown bear (ca. 5 000 individuals) and 25% for the Eurasian lynx (ca. 1800 individuals). To the rest of Europe Romania is a very important source area for these animals and other special biodiversity. Large carnivores and herbivores play key regulatory roles in nature and have recent-

ly been shown in the United States to be very important for ecosystem maintenance and diversification. An important responsibility for Romania therefore is to preserve this great natural asset and foster it based on wise-use principles. In the lowland areas of Romania many special landscapes have unfortunately become greatly fragmented and urgency is required to preserve the remaining areas, in order to restore, enlarge and interlink them in the future when the economic situation becomes better.

### **THE COMPONENTS OF AN ECOLOGICAL NETWORK**

An ecological network is made up of a close configuration of:

1. Protected core areas (or biocenters)
2. Buffer zones around the core areas
3. Corridors and ‘stepping stones’

The core areas are natural areas where viable populations of a certain species are fully protected and allowed to play their ecological role to the fullest. As a rule, and ideally, we want to preserve as large an area as possible. When we speak of a ‘minimum required area’ we want to preserve an area that ensures the survival of a robust population with more than adequate refuge and not prone to extinction, which might be caused by natural (chance) events such as disease or fire. How big this minimum required area should be depends on the species population involved. Viable large carnivore populations require large interconnected wilderness areas (home ranges) to roam and exchange. With increasing habitat fragmentation there is an increasing likelihood of conflict with human interests. The end result can be extinction. Buffer zones are required around core areas, allowing certain non-disturbing and well-controlled human activities to take place, such as extensive agriculture (farming with nature) and ecotourism.

Corridors are areas that link core areas together. These can be mountain ridges, streams and rivers with natural riparian zones, abandoned lands, or linear forested zones in the lowland. They provide space for animals to exchange safely and undisturbed under cover of vegetation or darkness between core areas in a landscape dominated by man or otherwise unsuitable (called the matrix).

Stepping stones are isolated natural patches in-between corridors, where animals can find temporary refuge when crossing the divide of the matrix. These can be wetlands (ponds or lakes) or forest patches. They need to be in close proximity of each other and of relatively high natural quality in order to be traversed and occupied by animals, particularly those that have to walk or can only fly small distances such as butterflies. Landscape elements such as ponds, hedgerows, lowland forests and streams are very important in providing connectivity in the human-modified landscape. They are still quite abundant in the Romanian countryside but in danger of being removed in the face of agricultural modernisation and expansion, as has regrettably happened in many Western European countries.

## **THREATS TO THE ECOLOGICAL NETWORK IN ROMANIA**

Romania is undergoing fast socio-economic development running up to the accession to the European Union. The impacts of this development is already taking its toll on the landscape. Profound are the effects of unplanned housing development, such as the haphazard building of holiday houses for instance in the foothills and in fragile stream valleys with special grassland ecosystems. The modernisation of transport infrastructure and tourism facilities has already started. Roads, particularly highways with intensive traffic are effective barriers to wildlife of all trades and sizes, beside all the other environmental effects they exert (pollution, etc.). Recent studies have shown that more wildlife is killed by traffic than can be perceived. Forest quality could change when the forests become privatised and undergo different management systems. When unwisely planned and uncontrolled, these developments are expected to cause great habitat fragmentation and loss of habitat quality. The Carpathians are particularly prone due to mountain ridges (core areas) that are separated by valleys where most human activity takes place, but which also function in places as wildlife corridor. The following human modifiers contribute greatly to landscape resistance, hampering the safe and undisturbed movement of animals and reducing the qualities of their habitat:

- Transport infrastructure (highways, railways, ports, power lines)
- Settlements (urbanisation) and recreational facilities such as ski resorts
- Crop monocultures and large forest clearings
- Industrial plants
- Normalised waterways

This is not to say that these modifiers are always absolutely detrimental to wildlife. In several places with sensitive species and habitats they are, and this is why it so important to wisely, carefully, integratively and intersectorally plan economic endeavours, taking strongly into account the landscape ecological properties (such distribution and movements of animals) in order to maintain important landscape functions and biodiversity requirements. In addition mitigation measures can be taking to reduce environmental costs.

## **MITIGATION MEASURES**

In cases where it is inevitable that busy roads or railways dissect important areas with important animal populations, engineering measures can be taken to mitigate the environmental cost. Special tunnels can be designed and placed under the roads to allow safe passage of small to mid-sized animals such as amphibians, reptiles, hedgehogs, mice and carnivores up to the size of a Badger. For large animals like wolf, bear or deer large ecologically designed passages are required in the form of so-called wildlife bridges (ecoducts) or underpasses. The movement of large animals on roads can be a

severe traffic hazard, so sturdy fences are placed along-side the road to prevent it. Currently in Western Europe many costly mitigation measures for wildlife are taken in highway systems, a process that requires the interdisciplinary collaboration between road engineers, landscape architects and ecologists. It is promoted through the European Co-operation in the Field of Scientific and Technical Research (COST Action 341). Costs can be considerably reduced by taking mitigation measures early into the road construction process, and this is particularly relevant for Romania, also in compliance with EU transport infrastructure regulations and funding. It is currently apparent that the relevant Romanian ministries have not collaborated effectively on this issue.

### **ECOLOGICAL NETWORKING IN THE EUROPEAN CONTEXT**

Romania has endorsed the Pan-European Biological and Landscape Diversity Strategy (1995), the policy framework that provided impetus to the design and effectuation of the Pan-European Ecological Network (PEEN). This process is promoted and coordinated through the ECNC - European Centre for Nature Conservation in Tilburg, The Netherlands. Many European countries have taken up this process, per country currently in various stages of realisation, from partly still on paper and partly as safeguarded core areas and corridors consisting of traditionally protected areas or purchased and newly developed nature areas. In the Netherlands considerable effort and finance is spent on realizing an ecological network, a country that has lost a lot of nature assets after the Second World War to fast economic development. Central and Eastern European countries such as Poland and Slovakia have also made considerable effort to date. Romania is running far behind in this process, having not yet provided plans on safeguarding and constructing a national ecological network. In the United States ecological networks of large wilderness areas are researched and advocated by the Wildlands Project, with conservation biologist Prof. dr. Michael Soulé as one of the key advisors.

### **EU NATURA 2000 AND ECOLOGICAL NETWORKS**

Besides PEEN the European Union is endeavouring to safeguard protected areas with important species and habitat types for conservation through the NATURA 2000 network. EU members are required through the Habitats and Birds Directives to protect certain species in high need of conservation and/or of ecological importance to Europe. Mammals like the Brown bear, Wild cat, Eurasian lynx and Otter are listed on the important Annex IV of the Habitat's Directive, of which Romania holds important populations. Romania therefore has a great responsibility for the conservation of such high-regarded target species for Europe. However, the allocation of the current NATURA 2000 protected areas network running up to the EU accession is expected to fall



**Figure 1.** The Pan European Ecological Network

short in adequately protecting these species. The allocation is based on the traditional appreciation of protected areas, incorporating mainly botanical and geological values. Only ecological networking based on sound landscape ecological and conservation biological principles can provide adequate protection. This is why ecological networking should be at the basis for the allocation of NATURA 2000 sites.

#### **CHALLENGES FOR THE REALISATION OF AN ECOLOGICAL NETWORK IN ROMANIA**

Realizing an ecological network in Romania seems a daunting task in the face of the current socio-ecological and political developments. However the necessity becomes apparent when one realises the enormous ecological, scientific, educational, cultural and economic importance of Romania's relatively pristine wilderness areas that are still in harmony with traditional practices and cultural values. This natural asset, when holistically understood, can be put to wise-use. There are for instance great opportunities for eco-tourism and the educational values are tremendous. The project implement a strategy based on the following actions that can strongly contribute to the realization of an ecological network in Romania:

Effectuate intersectoral collaboration between responsible relevant ministries.

Effectuate concerted effort between nature conservation NGO's and responsible government agencies; top-down and bottom-up.

Effectuate sound environmental and landscape or land-use planning.

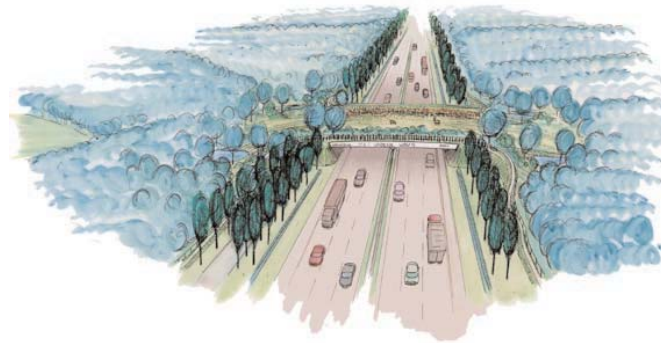
Make an inspiring ecological network vision plan with scientific motivations for the design and effectuation of an ecological network, for instance from landscape ecology and conservation ecology.

Incorporate the study of landscape ecology and conservation ecology into the environmental, engineering, forestry and agricultural science curriculae of universities and colleges.

Provide eco-education on the importance and benefits of ecological networks to all relevant and interested stake-holders, including foresters, hunters, farmers, shepherds and local administrators.

#### **CURRENT EFFORTS AND PIN-MATRA SUPPORT**

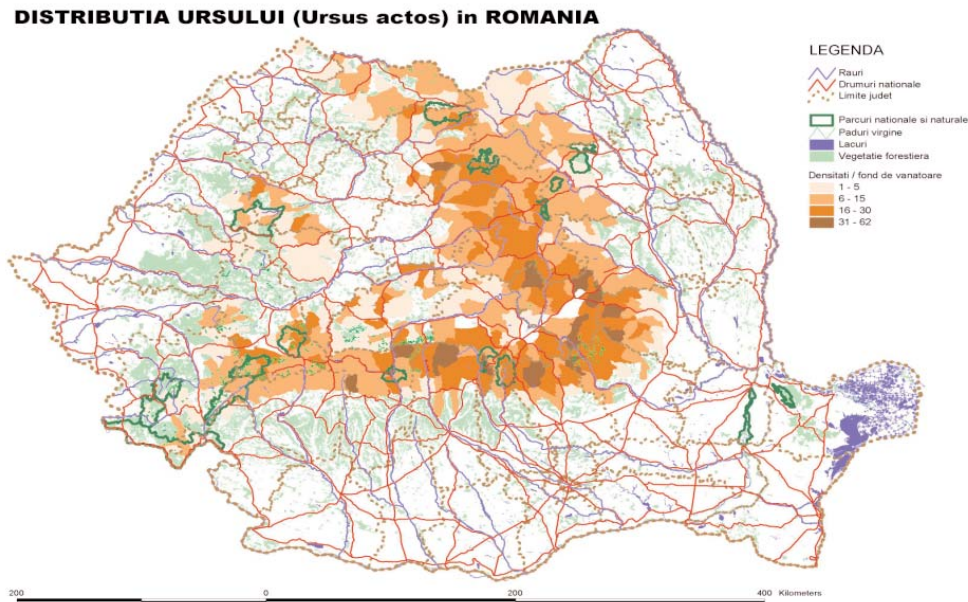
In a collaborative effort between the Romanian Ministry of Environment, ICAS Wildlife Unit, Carpathian Wildlife Foundation, The Wildlands Project (Prof. dr. Michael Soulé) and A&W Ecological consultants, a start has been made in writing a vision plan for safeguarding an ecological network in the Carpathians. With this plan we aim to provide inspiration and a clear objective basis for the design and allocation of a regional ecological network and its components (core areas and corridors). The



**Figure 2.** Ecoduct as a wildlife passage ensuring connectivity

project is a pilot for a national ecological network, investigating the capacity and knowledge needed in Romania to achieve this and promoting synergy among important advocates. Support for this project is provided through the Dutch governmental PIN-MATRA Programme (support to international nature conservation). With the project we endeavour to provide a well-motivated basis for the ecologically sound allocation of

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**Figure 3.** Brown bear distribution in Romania - GIS mapping

NATURA 2000 sites and connectivity between them, safeguarding the perpetual survival of large carnivores and herbivores and species of European importance.

Research by the team is focussed on gathering wildlife distribution and landscape ecological data, setting up data management in a Geographic Information Systems, perform ecological network design modelling and fieldwork for the allocation of important core areas and wildlife corridors. Romanian biodiversity experts for different taxa are consulted in this process.

### **LANDSCAPE CONNECTIVITY AND BEAR POPULATION EXCHANGE IN ITALY AND IN ROMANIA**

In Italy considerable effort has recently been made to ensure the survival of the Wolf and Brown bear. Populations of these species are much smaller than in Romania and have undergone the impacts of habitat fragmentation and persecution by humans to a high extent. Through a regional approach the landscape needs of Wolf and Brown bear have been investigated using computer modelling techniques. One area of focus occurs in the Abruzzo region, a mountainous area east of Rome. Through renewed landscape planning and tailored land-use management connectivity is being brought back between two separated National Parks. The parks, Parco Nazionale Gran Sasso-Monti della Laga

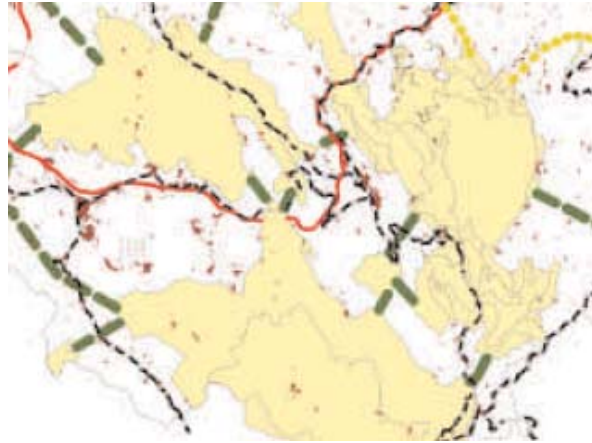


Figure 4. Brown bear habitat connectivity in Abruzzo region, Italy

Large carnivores corridors map with landuse and animal tracks

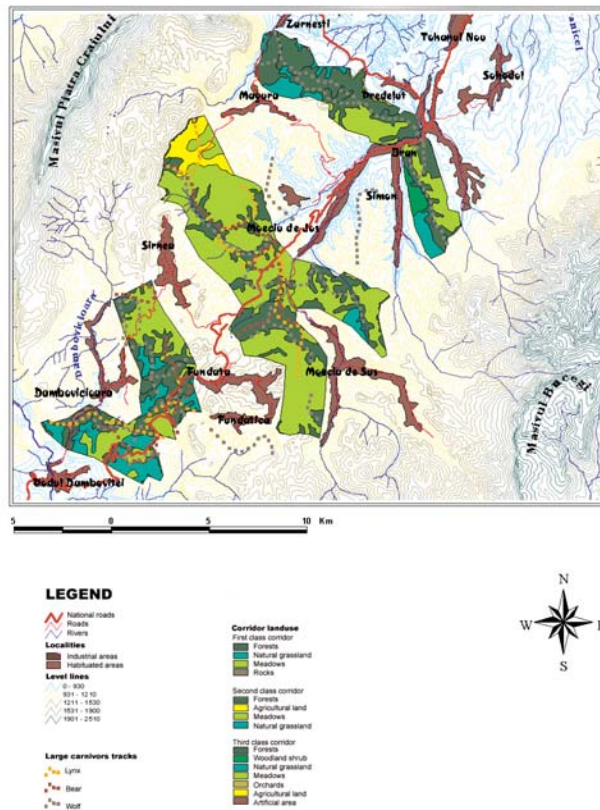


Figure 5. Green corridors between Piatra Craiului and Bucegi, Romania



and Parco Nazionale D'Abruzzo & Majella, are core areas for two remaining small populations of Brown bear. It was important to allocate ecological gateways between the parks in order to provide safe passage and allowing the bears to interchange, which is important for population maintenance (genetic composition).

A similar study is performed in Romania for the safeguarding of a corridor area between Piatra Craiului National Park and Bucegi National Park, an area currently under influence of fast tourism development. The preliminary results have shown that in the area there are three corridors that are used by wildlife species, two of these corridors being affected by local developments.

#### **FUTURE STEPS FOR THE PROJECT**

In the next period the project will perform GIS analysis and modeling regarding ecological networking based on key habitats for large carnivore and will elaborate a draft regarding the management plan of a Regional Ecological Network in the Romanian Carpathians. This plan will be discussed with Romanian stakeholders and will be provided to the Romanian Ministry of Environment, as a working document for the future implementation of NATURA 2000 network.

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