

## The Morava River Floodplains

Jan Seffer and Viera Stanova  
DAPHNE Center for Applied Ecology

### THE CONTEXT

The Morava River Floodplains are located in the most western part of Slovakia (Central Europe) and are situated along the former "Iron Curtain" which was closed until 1990. The river forms the border between the Slovak Republic and Austria in the lower section, and between the Slovak and Czech Republics in the upper section. It is part of the Záhorie lowland which belongs to the Vienna Basin situated at an average altitude of 140 m above sea level. The relief is a result of the quarter fluvial and eolic processes. The plains of the central section are less fertile, sandy and covered by pine forest, but the terraces of the Morava river contain fertile soils. Fifty one km<sup>2</sup> of the floodplain area on the Slovak side of the river are designated as a Ramsar Site.

The Morava River is a middle-European watershed, and is one of the largest tributaries flowing into the Danube River. The entire length of the river is 328 km and the river basin is approximately 26 000 km<sup>2</sup>. It is a lowland river with a small fall of the water (average about 0.18% slope). The average discharge of the river is 109 m<sup>3</sup>/s and the average speed is 0.6 m<sup>3</sup>/s. Discharges reach a maximum in March and April because of the melting mountain snow, and in the summer months, discharges are conditioned by heavy precipitation and the floods of the Danube which impact up to 32km. The average longevity of the floods is 15 days. The temperate climate of this area is dry and warm, with an average yearly temperature of +9.5°C. Precipitation is very low with a yearly average of 600 mm.

### Habitats and species

The most valuable ecosystems are the floodplain's species-rich meadows. They make up the largest complex (30 km<sup>2</sup>) of alliance *Cnidion venosi* meadow communities in Central Europe, are an important source of food and nesting places for rare and endangered bird species, and from the viewpoint of species richness, greatly increase the lowland landscape biodiversity. There are more than 30 species of higher plants per m<sup>2</sup> and more than 80 bird species which occupy these meadows, including the 50 pairs of the internationally threatened bird Corncrakes (*Crex crex*) which were recorded in the meadows of the Ramsar Site. The white stork is also a typical and visible inhabitant of the meadow. This impressive bird usually searches for its food in the meadows on the Slovak riverside, but nests in the big old or dead oak trees still found in the Austrian WWF Reserve at Marchegg. It is the biggest white stork colony in Europe. Despite their importance, the floodplain meadows are among the most endangered ecosystems as a result of river drainage.

Floodplain forests represent an original and preserved unique ecosystem with a total area of 13 km<sup>2</sup>. Because of regulation measures, the only remains of the formerly extensive soft-wood forests are found on young river sediments that have a high level of underground water and have a long flooding period. Dominant tree species are willows and poplars. It is one of the most threatened types of wetlands in Slovakia. The dominant species of the hard-wood forest are elm, ash and oak. They occur in the more elevated parts of the floodplain that have lower and shorter floods as well as a deeper level of underground water.

Water bodies and meanders (or ox bows) were cut-off from the river naturally in historic times (16 meanders) or artificially by building of cut-offs. Thirty four river meanders have been artificially cut off. They are in different stages of sedimentation depending on age and topography. These habitats are important for the protection of threatened plant and animal species including frogs, fish, insects and nesting birds.

The Morava River floodplain contains many species of migrating birds, including some which are threatened on a European and global scale, and therefore was designated as an Important Bird Area (IBA) by Birdlife International. The designation is further supported by the fact that there are 118 birds nesting here, out of the 176 species registered in the floodplain.

Forty eight fish species have been recorded, and forty of these have recently been confirmed. From these, 36 are endangered on a European scale, and ten species are moving towards extinction. Some of them are not found in other parts of the world, such as the balon's ruffe, the larger Danubian perch and smaller Danubian perch.

More than 850 plant species are registered, including the water macrophytes *Nuphar lutea*, *Nymphaea alba*, *Nymphoides peltata* and *Stratoides aloides*, which are all on the Red list for Slovakia. *Fraxinus angustifolia* subsp. *danubialis* is the dominant elm species in the hardwood forests and is endemic to the Pannonian region. Included in the meadow Red list are: *Ophioglossum vulgatum*, *Viola pumila*, *Gratiola officinalis*, *Plantago altissima*, *Iris sibirica*, *Leucojum aestivum*, *Cnidium dubium*, *Clematis integrifolia*, *Allium angulosum*, *Cerastium dubium*, *Gentiana pneumonanthe* and *Lathyrus pannonicus*.

## **Importance**

Wetland areas have many benefits including flood control, the improvement of water quality, a high biomass productivity for food, and wildlife and plant habitat areas. But considering these functions, more than 4,500 km<sup>2</sup> of wetlands have been drained in Slovakia, encompassing almost 1/10 of the total area. The wetlands of the Danube inland delta were destroyed by the construction of the Gabčíkovo barrage system, and even though the Morava river has been regulated, a large section of the floodplain area, including the largest complex of wet meadows in Central Europe, has been designated as a protected area. Considering these facts, the Morava River Floodplains are one of the last lowland river ecosystems with a natural flood dynamic which can be preserved in Slovakia.

Flood control is secured by the retention capacity of the floodplain which is more than 150 million m<sup>3</sup> on Slovak side. Wetlands catch surges of flooding water and slow down running water. Captured water is then slowly released.

Temperate wetlands belong to an ecosystem which has very high biomass yields. The productivity of meadow plant communities varies from 10-30 tons per ha (dependent upon moisture), in comparison to rain forests which have an average productivity of about 20 tons per ha. When meadows are mowed regularly, they become valuable not only because of their high biodiversity, but also because of their function as a huge nutrient sink. In the meadows, the growing vegetation removes nutrients from the water, and then when the vegetation is removed through mowing, the net result becomes a reduction of nutrients. A rough estimation found that the Morava meadows remove 290 tons of nitrogen and 30 tons of phosphorus in the form of hay every year.

## **Human impact**

For thousands of years the inhabitants of this region were conservationists. They understood that if they did not take care of the land and keep it healthy, the land would no longer provide them the necessities for life. In the last 50 years, they have started to forget this very important concept held by the early inhabitants of this land. In the last half of this century, we have seen an intensification of agriculture, river regulation, drainage and other destructive activities such as gravel mining. The results of this negative impact have been a changed environment, loss of native species of plants and animals and an increase of non native species to this region. Intense non-sustainable agriculture has caused soil erosion, an increase of pollution in the Morava River and a decrease of species richness.

In the past, the river meandered in its own sediments. This allowed the water to flood the surrounding area with low discharges. The surrounding area became flooded before the water level reached the river banks, and the water remained in the side arms long after the flood ended. Regulation measures now allow the riverbed to conduct discharges of about 440 m<sup>3</sup>/s (originally it was only 210 m<sup>3</sup>/s). Most of the flood protection measures of the Morava river were developed according to a project from 1935. This project included regulation of the river bed in a way that abbreviated the river from its original 99 km to 78.4 km. This was accomplished by building cut-offs on the Slovak/Austrian and Slovak/Czech part of the river. Today's floodplain area is only 20 % of its original size and is bounded by dikes. The average width of the river bed is 66-71 m. The width during floods is within 360-3,000 m.

Serious threats to the meadow ecosystem biodiversity have also been caused by the plowing of 500 ha of meadows during socialism from 1960-1989. The plowing was concentrated on the middle section of the Ramsar site, and the arable land was regularly fertilized and herbicides were used. Some fields are still active, but most fields have been abandoned for a few years and are under invasion from weed and alien species, especially *Aster novi-belgii* agg. Intensive use of chemicals has caused an increase of pollution in the Morava River and a decrease of species richness. These fields have low biodiversity and have become a barrier for nesting and migrating bird species.

One of the greatest problems is sport fishing. On some sections of the river meanders you can find, on some days, 30-35 fishermen on a 150 m long section of the meander. They are damaging the reed vegetation, disturbing nesting birds and polluting the area. Motor transportation in the floodplain is prohibited, but fishermen do not respect this restriction. There is clear evidence showing the decrease of nesting bird populations after the opening of area in 1989-1990.

Gravel mining is one of the biggest threats to the species rich meadows and forests in the Morava River Floodplain Area, and since 1980, more than 40 hectares of land have been destroyed. In 1972, the state company, Quarries and Gravel Mining, received permission to mine gravel in the lower part of the Morava River region and covers 420 hectares of meadows and forest. In 1989, this area was designated as the first protected lowland area in Slovakia, and therefor changed the status of the land but did not stop the mining. The previously stated company was changed into a private Slovak/Austrian company, StrMak.

If implemented, two large scale projects would cause substantial changes in the land use of the area. The first is Wolfsthal, a Bratislava dam project, which includes a dam and power station on the Danube River between Bratislava and Devin as a common project of Slovakia and Austria. The storage lake and the dikes would destroy about a 32 km section of the Morava River Floodplains. After opening the Danube National Park, it is unlikely that Austria will support such a project, but in Slovakia, it is still part of the Regional Spatial Planning.

The second project is the Danube-Odra-Elbe navigation canal. The two alternatives are the construction of a by-pass canal or the improvement of the navigation conditions in the main Morava River bed. The construction of a by-pass canal would discharge only 6 - 13 % of today's river discharge. It is planned as trilateral Czech-Slovak-Austrian project.

### **Local communities**

The rural land surrounding the floodplain area is composed of agricultural, forest and woodland, as well as wild uncultivated tracts in a natural or semi-natural state. The area is visually dominated by agrarian activities, and gives an impression of space for a non-traditional, non-urban, non-industrial economy. After the political changes in 1989, the transfer to a market economy started and the standard of living decreased. The average monthly wage in the area is about US\$220.

There is an unemployment rate of about 10%, which is under the average of 14% in Slovakia. The hardest hit by the current socio-economic situation are connected to young families and retired people.

The population size is about 46,000 inhabitants. The growth rate compared to before 1989 is rapidly falling. In 1991 it was 3%, in 1994 0.3% and in 1995 it was -0.7%. Natality is falling too. In 1991 the crude birth rate was 14.4 births per 1,000 population; by 1994 it had declined to 11.6 and in 1995 10.8. The rapid falling of birth rate is caused by the decline in socio-economical conditions. There is a stable situation concerning migration.

The local communities have job possibilities mainly in agriculture, food, chemical and light industry. Agriculture has a long tradition and supports 16% of the active population, services support about 38%, and about 60% commute to cities for work. The number of workers traveling to Austria is increasing because of the lack of job opportunities in the region.

### **History of land ownership and management practices**

The Morava River floodplains were settled more than 2 000 years ago. The Slavic settlement prevailed in the territory from 6<sup>th</sup> century, but during the Middle Ages, there were several waves of Germans and Croatians settling in the smaller areas.

At the beginning of the 20th century, the majority of the land was owned by landowners and the rest of the area was owned by a large number of small farmers. The management was traditional and sustainable. Fifty years ago, private ownership was suppressed in favour of large-scale production, the industrialization of agriculture and collective and state ownership. A law in 1949 led to the creation of co-operative and state farms.

After the political changes in 1989, the process of the re-privatisation of state and co-operative farms began. The process is not finished yet, but we can distinguish three types of ownership. There are co-operative farms which rent the land from small private owners, private companies which bought former state farms and small private owners.

The floodplain was traditionally used by local farmers as meadows and pastures. Today, some parts have been plowed and turned into fields. The productivity of these fields is several times lower than the production from meadows. Land use practices are not sustainable, and the intensive agriculture practices and development of industry caused the pollution of the river and its tributaries.

### **Stakeholders**

The management of meadows for the use as hay for cattle food and fishing are long term traditional uses of the land, but the opening of area to the public after the “iron curtain” was brought down in 1989, created great changes in the area's condition. The area has witnessed a great influx of visitors, development activities including the building of fishing cottages and new bridge connections to Austria and the process of re-privatization.

The main stakeholder groups in the region are the co-operative farm and private farm owners, the mayors of the villages and local governments, the administration of the Zahorie protected landscape area, the water management authority, the fishing and hunting associations, the forest associations, the commercial users of resources, tourists and scientists. Most stakeholders are well organised in local associations, governmental organizations or business companies.

The benefits from the wetlands for all stakeholders are flood control, water resources, water purification, food (hay for cattle, fish, game animals), recreation and timber.

In some territories, the interests of the stakeholders are in conflict. Plowing of floodplain meadows and using them for intensive agriculture (short-term profit for farmers) created a problem, not only for nature conservation, but also for the water management authority because of the increasing in water pollution. The gravel mining company is in conflict with nature conservationists, farmers, fishermen, tourists and scientists because of the changes to the natural community. The mining creates deep reservoirs with very low biodiversity which can only be partially used for recreation.

On the other side, many interests of stakeholders are focused on the maintenance of the floodplain meadows. The maintenance of the area will offer many benefits for farmers, nature conservationists, scientists and tourists, as a unique ecosystem with high biodiversity, productivity and recreational and scientific value.

The main conflicts in the territory are caused by the Administration of Zahorie Protected Landscape Area (Zahorie PLA) restrictions. A conflict arose due to the restriction of fishing during the nesting period, and this was caused by the lack of communication between the local and national fishing associations and the PLA Administration. Illegal building of fishing cottages and gravel mining are other conflicts between private individuals and companies on one side, and local governments and the PLA Administration on the other side.

A regular trilateral round table of environmental NGOs was established in 1995. The main goal is to secure the wise use of wetlands and increase transfrontier cooperation between all stakeholders.

## **AN ECOSYSTEM MANAGEMENT INITIATIVE**

About 20% of the wetland territory suffers from unsustainable use resulting mainly from intensive agriculture practices and gravel mining. The rest of area is covered by ecosystems of high biodiversity value.

The GEF Biodiversity Protection Project (1993-97) has provided a series of demonstration projects that determine appropriate methods then implement ecosystem restoration. The largest included the management and restoration of floodplain meadows, preparation of floodplain forest management plan and the partial restoration of the original water regime in the Morava River.

The project concerned with reopening three cut-off river meanders was managed by the Slovak Ministry of the Environment, on behalf of GEF Project, the Water Management Authority (Povodie Dunaja) and Záhorie PLA. The opening of these oxbow arms will serve as a model for the opening of other closed meanders in the future.

In 1997, “Strategy For Sustainable Agriculture in the Lower Part of the Záhorie Region” was prepared by DAPHNE Centre for applied ecology. In the same year, implementation of this strategy started as the trilateral project “Floodplain Meadow and Forest Restoration in the Lower Dyje-Morava System”. The project is a part of the Strategic Action Plan Implementation Programme of Danube Environmental Programme and is founded by PHARE. DAPHNE is working in cooperation with WWF Austria and the Czech State Forest Authority Zidlochovice.

The project on the Slovak side is focused on the revitalization of 150 ha of arable or abandoned land in the inundation area to species rich meadows, and in support of the management of 1,000 ha of degraded meadows by direct subsidies to farmers. In the context of this project, a detailed management plan for meadows will be prepared, the monitoring system for revitalization will be introduced and a system for incentive financial measures will be designed. Without the participation of local communities, especially farmers, it is impossible to implement the planned restoration measures. The project is therefore based on the mutual agreement of the owners and users of the arable land, abandoned fields and good meadows with the implementation agency.

The restoration goals are focused on the application of wise-use principles, and the results of the activities will benefit both nature conservation and farmers. The restoration of the floodplain meadows will increase the self-purification capacity of the wetlands and will improve sources of ground and surface water. The increasing of hay production will improve the income of the owners of the restored meadows. The restored habitats with increased biodiversity will serve as biotope for fish breeding and game animal which will be a benefit for the fishing and hunting associations. The protection of the natural beauty will attract more tourists which will have benefit for the providers of services from local communities.

Information activities designed by NGO DAPHNE (campaigns “Meadows for People” and “Wetlands for Life”) aims to increase awareness of the natural value and functions of this territory and to open discussion about the possibility of conserving traditional land use.

We started from the assumption that reasonable land-use consistent with sustainable living can be achieved only with active participation of local people living on this territory for hundreds of years. Therefore it is necessary to renew the positive and direct attitudes of local people towards this territory that have been broken within the past 40 years and comprehension of their role in shaping their environment.

A very useful and significant tool for selecting the best way of working with local people is an public opinion poll. Conclusions from this research were helpful in targeting of our information campaign, in selecting more suitable methods and tools in work with local people. Among the principal conclusions of this poll are the following:

- Seventy percent of the public want to learn more about natural value of the Morava River floodplain and problems connected with their environment.
- Thirty one percent feel that the best way of learning more is through slide shows, 21% feel that it is through informational brochures, and 16% feel that it is through excursions.

- Forty six percent wish to renew the traditional land use.

We appreciate that almost a hundred percent of respondents think it is good that this territory belongs to a protected landscape area. But from the answers that followed, half the number of respondents know nothing about activities connected with nature conservation. This is a result of the low level of publicity of these activities and of insufficient work with local communities. We take positively the fact that among local people the dominant opinion is that it is necessary to save this territory regardless of the profit motive. Nobody through about using the territory for the highest immediate profit without taking into account its natural value. This roughly corresponds with the image of future regional development. Almost half the number of respondents agree with a type of development able to be oriented towards a return to traditional styles of land-use. So it is up to us to determine how the future will look for this area with its rare and magical qualities.

## **RECOMMENDATIONS**

In Morava River floodplains, the involvement of local communities in wetland management is a crucial condition for their existence. Especially since the floodplain meadows are an ecosystem created and maintained by human activity. Historically the floodplain meadows present in this area are more than 2 000 years old. The ecosystem developed here is an example of the mutual benefit for nature conservation (it has very high biodiversity), farmers (food for cattle), tourists (high recreational value), and the entire community (nutrient sink, flood control).

The most important need is to increase public awareness centered on values and functions of wetlands. For stakeholders who are directly involved in wetland management (farmers), it is necessary to develop and implement incentives for conservation of biodiversity.

The following key elements contributed to participatory management of the area:

- Conducting a public opinion poll for an evaluation of the perception of local people regarding their environment.
- Awareness raising among local people about natural and economical values of wetlands by undertaking an information campaign to find practical solutions with most important stakeholders that balance nature conservation and local development.
- Creation of financial incentives if necessary

In principle, written agreements are helpful for establishing participatory management. The project does not yet have experience with such procedures, but it is in the phase of developing first agreements among stakeholders. In the Morava River floodplains, the ideal management institution is a coalition between NGOs and the state nature conservation agency.