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The history of the WWF Floodplain Reserve Marchegg: Land use change along a border section of the Morava River

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Abstract

The Morava River is a tributary of the Upper Danube and one of the largest Austrian lowland rivers. Its floodplains were once intensively used for agriculture and forestry. In the first decades of the 20th century, land use transformation and intensification processes started, comparable to other Danube tributaries. However, the political divide between East and West made the area a border region along the Iron Curtain and slowed down this development. Already in 1970, the section became a WWF nature protection reserve, and since 1989, the Morava floodplains have been part of the European Green Belt.

Introduction

The Morava River is a central European lowland river and one of the larger tributaries of the Danube (*fig. 1*). The lowest section forms the border between Austria and Slowakia. Here, the river and its adjacent floodplains are part of the European Green Belt, a nature protection programme focusing on the former border region between Western and Eastern Europe. Especially between the Austrian communes Marchegg and Zwerndorf, extensive floodplains have been preserved. Although these

are located 14 to 28 kilometers upstream of the mouth of the Morava at the Danube, they were – and still are – surprisingly closely linked to the Danube's runoff. The interplay of Danube and Morava floods influenced not only the lower Morava, but also the Danube itself. Depending on the Morava's water level, the Danube's backwater extended upstream as far as Marchegg, Zwerndorf or even Dürnkrut during floods. If both rivers were in flood simultaneously, catastrophic deluges were inevitable (Weber-Ebenhof 1894). To understand the river morphological development of the once intensively meandering course of the Morava and the associated possibilities of human use in the floodplain, the hydromorphological influence of the Danube far downstream must also be considered.

Although a project to regulate the Morava had already been agreed with the Hungarian government in 1898, hydraulic works on the estuary section upstream of the Danube did not begin until 1911 (Benz 2019). The regulation project aimed to improve the flood discharge capacity of the Morava by significantly straightening its course while at the same time preventing large-scale flooding of the surrounding area. To this end, massive dam systems were built on both sides of the straightened river course, cutting through the former floodplain. However, due to the two world wars, it was to take until the 1960s before the construction programme could be completed. Additional regulation measures were carried out until the end of the 1970s (Hohensinner 2022).

The Austrian Morava floodplains were utilised for many centuries. The forests provided wood, litter, resin, and berries, and the landowners hunted game. Large areas were cleared and served the neighbouring communities as fields, meadows or pastures. Settlements such as Marchegg or Zwerndorf on the Austrian side or Vysoka pri Morave on the Slovakian side were built close to the river on old, higher river terraces (Jelem 1975). In contrast to many rivers where the floodplains have disappeared, large areas remained on the Morava between Marchegg and Zwerndorf that are still flooded today and are valuable from a nature conservation and ecological point of view. The WWF Marchegg floodplain

Figure 1. The location of the Morava River within the Danube catchment (see white insert and orange/red line; the red line indicates the location of the study site)

reserve was therefore established here in 1970. However, as a recent study showed, the land use history of this area is more complex and involves periods with more intensive agriculture than assumed at first sight (Haidvogl & Sauer 2022).

Pre-industrial patterns of land use around 1820

The spatial extent and distribution of agricultural land in the Morava floodplains can be reconstructed in detail using historical maps from the 19th century onwards. The location of the fields, meadows and pastures in the vicinity of the March and in the three Austrian March communities of Marchegg, Baumgarten and Zwerndorf shows a typical pre-industrial land use pattern (Haidvogl 2010). Around 1820, less than 3% of the land near the river was cultivated as fields and, except for Zwerndorf, these were mainly located around the historic settlement centres (*fig. 2*). In the entire municipalities, however, the proportion was more than 41%. The fields were preferably located at a greater distance from the Morava or on elevated areas, the so-called 'Parzen', remnants of older terraces (Umweltbundesamt 1999). Around 1820, the fields in all three municipalities were farmed according to the classic three-field system. The typical cereals cultivated were wheat, barley, rye and oats. Wheat and barley were sold, while rye and oats were mainly produced for the farmers´ use in fields with poorer soil quality and lower yields. In contrast to other regions of Austria, the utilisation of fallow land in the form of green fodder cultivation had not yet been introduced along the Morava around 1820. However, cattle were sometimes brought here to graze. In the crop fields in frequently flooded areas and near the Morava or the Maritz water system, the soils were described as 'shallow and weak'. After flooding, water often remained here for a long time. This sometimes spoilt the seed, as did the fine sediments deposited during flooding. In Marchegg, even the most productive farmland was regularly flooded, damaged by ice drifts or affected by heavy summer rains.

Farmers sometimes planted maize to compensate for the seeds that were destroyed if there was flooding or ice in the spring. In contrast to the winter and summer cereals, typically planted in September after the harvest or in March, this crop can also be planted in April and May, as it requires higher temperatures to germinate. The Marchegg estate also cultivated potatoes on a large scale. These were primarily used to make brandy, and the unusable leftovers were used as fodder for the oxen kept by the estate.

Around 1820, there was a considerable amount of grassland near the marshes. In total, 45% of the land in the surveyed area fell into this category, while the proportion was less than 37% in the entire three villages. Flooding and ice flows in the Morava and Maritz rivers also affected the grassland used as meadows or pastures. As a result, the areas silted up, and the grass harvest often failed utterly. Pastures were used intensively, especially for sheep and pigs. Cows were also regularly taken to pasture and oxen and horses, at least

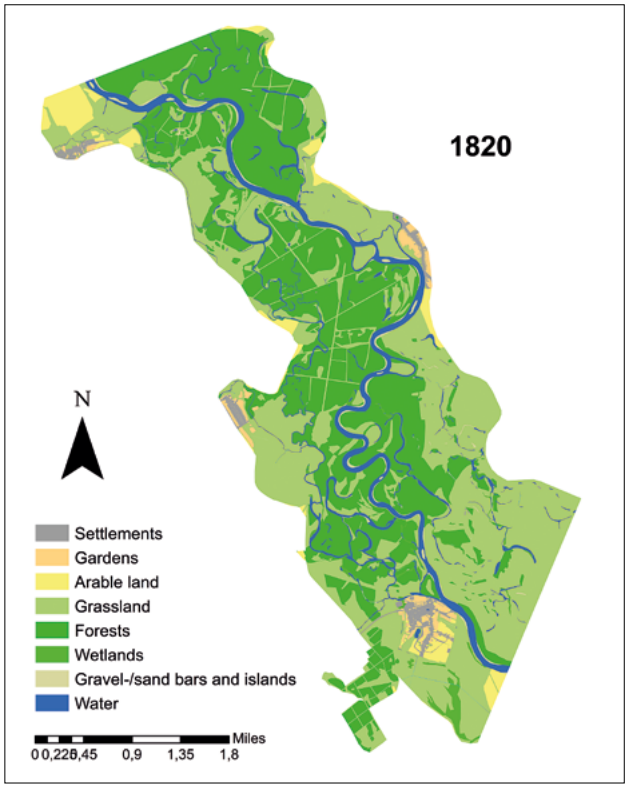

Figure 2. Land use in the Morava floodplains between Zwerndorf and Marchegg

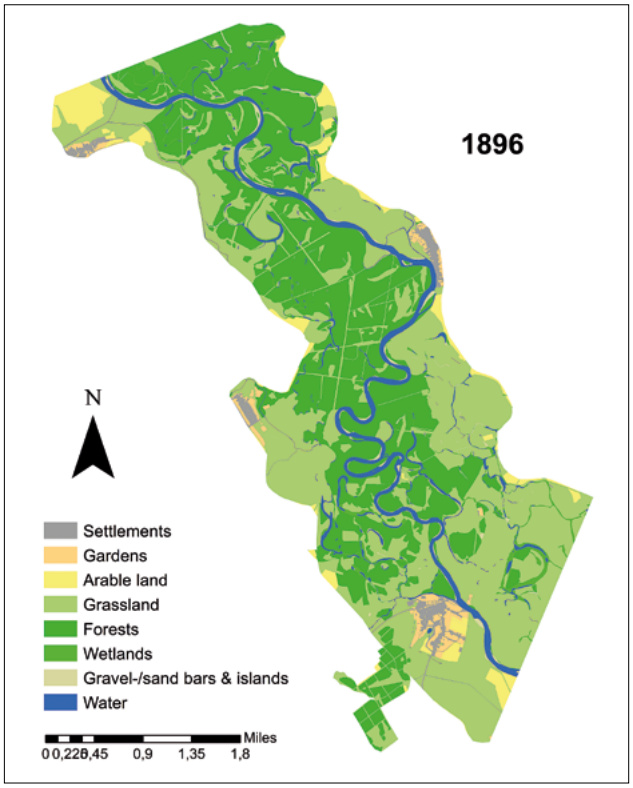

Figure 3. Land use in the Morava floodplains between Zwerndorf and Marchegg 1896

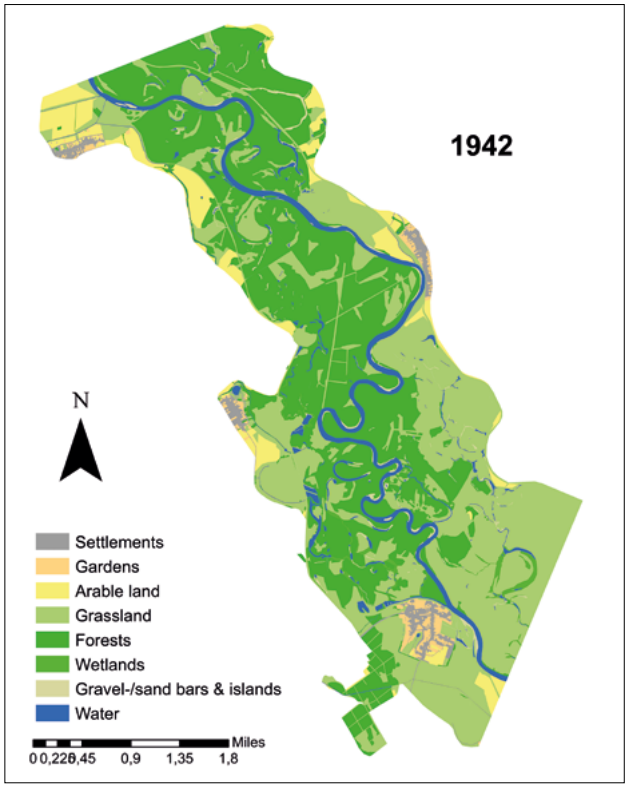

Figure 4. Land use in the Morava floodplains between Zwerndorf and Marchegg 1942

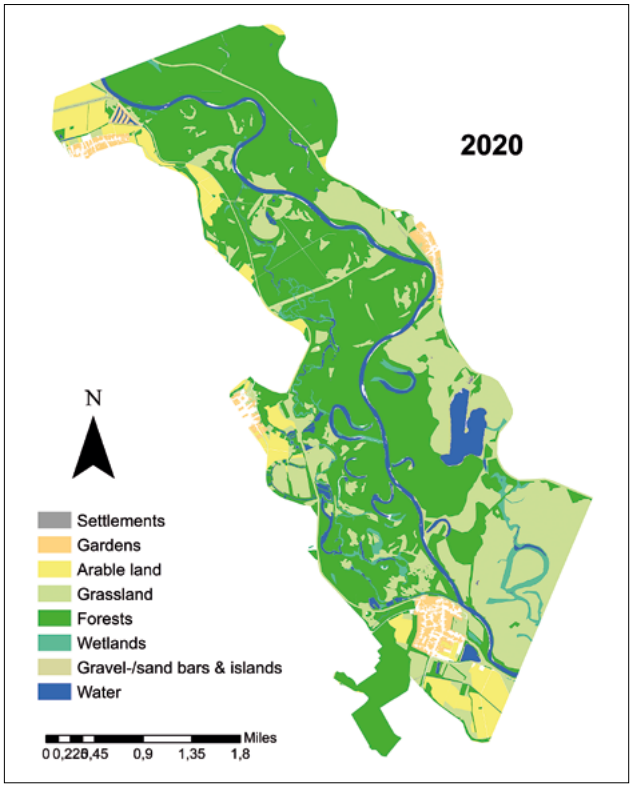

Figure 5. Land use in the Morava floodplains between Zwerndorf and Marchegg 2020

on Sundays and public holidays when they were not needed for work. The grazing areas did not cover the demand, so the animals were also driven onto the fallow fields or harvested fields. The lack of pasture was particularly noticeable in Zwerndorf. Stable feeding, already common in all three communities around 1820, was, therefore, not only a means of collecting livestock manure more efficiently as fertiliser, but it was also necessary to provide the cattle with sufficient food. Areas where reeds grew were also utilised. The reeds were used to cover the roofs and, like wood, were used as fuel.

Large areas of (floodplain) woodland remained. These were found on a total of 40% of the analysed area, while in the entire municipalities of Marchegg, Baumgarten and Zwerndorf they wonly accounted for about 13%. Willows, aspens and black poplars dominated in the alluvial forests of Baumgarten, but elms and oaks were also found. A large proportion of the wood was used locally as fuel. However, some larger oaks remained as individual trees. Historical sources document typical successional stages of the alluvial forests. At some sites, silver poplar dominated the stand. In Marchegg and Zwerndorf the alluvial forests were composed of willow, silver and black poplar, aspen, black alder, maple, oak and elm. Birch trees also occurred and were utilised. Except for the oaks, which were used as timber and lumber, the trees were also used as fuel in Marchegg and Zwerndorf.

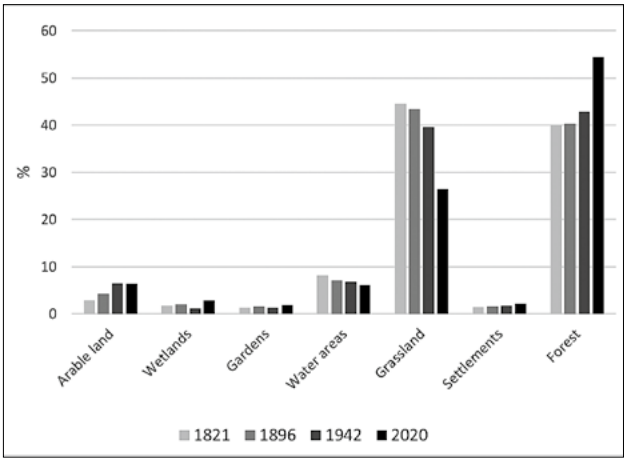

Figure 6. Overview of land use change in the Morava floodplains between Zwerndorf and Marchegg

Land use at the beginning of industrialisation

On several Austrian rivers, the framework conditions for land use in floodplains changed around 1900 due to regulation or drainage. However, along the Morava fluvial processes and, thus, the framework conditions for agriculture and forestry changed little. Pre-industrial practices were preserved mainly here. With only a moderate increase in the productivity of the grain fields, one of the most important triggers for changes in land use was the development of population figures. In Marchegg, around 1,100 people lived in 1830, around 1,800 in 1870 and by 1900, the number had risen by a further 1,000 people to around 2,750 (NÖLA 1828, Statistik Austria 2021). Consequently, in the floodplains between Marchegg and Zwerndorf the settlement areas increased from around 44 ha to almost 50 ha between 1821 and 1896. This growth affected the Austrian municipalities of Marchegg, Baumgarten and Zwerndorf as well as Vysoka pri Morave on the Slovakian side. It occurred around the historic settlement centres, primarily on former grassland and garden areas (*fig. 3*).

Figure 7. In the WWF Floodplain Reserve Marchegg open grasslands as part of the former cultural landscape are preserved (© Michael Stelzhammer)

Figure 8. Disconnected meander in the Morava floodplains (© Severin Hohensinner)

During the same period, the arable land in the Morava floodplains of Marchegg, Baumgarten, Zwerndorf and Vysoka pri Morave grew from 90 to 134 ha. They were mainly created in the vicinity of settlements or on the edges of the area studied, for example, on land classified as gardens, grassland or woodland in 1821. Even in today's WWF floodplain reserve, some forests were cleared in favour of fields and meadows. The reduction in grassland from 1,417 to 1,380 ha was small in absolute terms, but there were larger-scale shifts in location, meaning that the change in land use was considerably more significant. The reduction was, among others, due to the declining demand for pastureland because of more frequent livestock stabling and a general change in livestock farming. Some exceptionally wet pastures and meadows were no longer farmed until 1896. In other places, new grassland was created, mainly in woodland. The inhabitants sometimes established new fields and settlement areas on the abandoned grassland.

The total area of woodland had changed little until around 1900. However, even here, the absolute figures conceal more significant transformations, as almost a tenth of the woodland in 1896 was still being used as meadows and pastures in 1821.

The trends in land use development of the 19th century continued in the first decades of the 20th century. The municipalities continued to record rising population figures associated with an ever-increasing number of buildings and settlement areas. The latter grew to 56 ha by the 1940s *(fig. 4*). Arable land continued to increase, from 134 ha in 1896 to more than 206 ha in 1942, with new arable land cultivated primarily on former grassland. In Marchegg, fields located directly in the town were converted into gardens. Grassland continued to decline in the first decades of the 20th century. Apart from fields, new forests were created in many of these areas. These expanded until 1942 – including along the River March.

New drainage projects were carried out in the March floodplains at the beginning of the 20th century to improve agricultural productivity. A project was negotiated in Baumgarten, Zwerndorf, Oberweiden and Stripfing in 1904 and construction began in 1907. This project also included regulating the section of the Mühlbach running east of Baumgarten (Sümecz 2017).

The Morava floodplains as part of the 'European Green Belt' and nature conservation as a guiding principle for the management

After World War II, industrialisation gradually came to dominate agriculture. Machines gradually replaced human and animal labour. The large-scale production of maize

replaced fodder legumes. Transport infrastructures were improved, and agricultural land ameliorated. Under the slogan of the 10th federal state, the Austrian administration initiated a systematic drainage of wetlands and bogs, which also affected the floodplains in connection with water regulation and flood protection (Ramsauer 1948).

As the Morava floodplains had been a border region between Austria and Slovakia since 1918, they were far less affected by these developments than most of the Austrian agricultural land. The proportion of arable land remained largely the same the investigated villages. However, their locations had shifted by 2020 (*fig. 4*). More than 20% of these areas were still forested in 1942, and 15% were ploughed as grassland. Grassland was converted into cereal fields, especially in the south of Marchegg. In contrast, the fields in the Slovakian floodplains almost entirely disappeared by 2020 (*fig. 5 and 6*).

The settlements in the analysed area grew from 56 to 68 ha between 1942 and 2020. The new areas mainly expanded around the historic centres. With a few exceptions, urban sprawl did not affect the Morava floodplains. Outside the floodplains, however, such processes did occur.

The most obvious change was the increase in forests in the second half of the 20th century. At around 1,730 ha, this land use type reached its most considerable extent since the 1820s. On the one hand, this expansion affected the area of today's WWF floodplain reserve, where the forest areas grew from 800 to 913 ha. However, this applied far more to the area outside the reserve, where the forests increased from 564 ha in 1942 to 818 ha in 2020, mainly on former grassland.

The two land use maps from 1942 and 2020 (*fig. 4 and 5*) show further developments in the second half of the 20th century: Single patches of forests as well as arable land and grassland were much larger due to rezoning plans following Austrian agricultural policy after the World War II. Pre-industrial plot divisions with small-scale utilisation structures were abandoned in favour of more efficient land cultivation with machines.

From 1970 onwards, most of the Morava floodplains studied here came under the care of the WWF. Since then, this area has been managed according to nature conservation principles as the Marchegg floodplain reserve (WWF 2022).

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The EU Mission 'Restore our Ocean and Waters' and its Danube & Black Sea Lighthouse coordinated by the EcoDaLLi Project

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Background

Around 75% of the Earth's surface is covered by oceans, seas and inland waters. They play a crucial role in the Earth's global ecosystem; their protection is fundamental to our future. Unfortunately, our oceans and waters are under serious threat from pollution, overfishing, unsustainable tourism and inappropriate land use. In addition, the consequences of the climate crisis, such as floods, droughts, rising temperatures, rising sea levels and heatwaves, are putting considerable pressure on water systems. One of the consequences of this is the loss of valuable biodiversity in water systems all over the world.

Restoration and full exploration of European marine and freshwater ecosystems by 2030

For this reason, the European Commission has launched a dedicated mission: The EU Mission 'Restore our Ocean and Waters by 2030'. It aims to contribute to the restoration, protection and full exploration of European marine and