

The history of the Lobau in the 19th and 20th century: Land use change, diversification of human uses and long-term conflicts between conservation and utilization

Gertrud Haidvogel

The history of the Lobau differs from that of the Viennese Danube floodplains for various reasons. Due to specific property conditions, but also due to the relative distance to the city compared to transport possibilities until the 20th century, large unbuilt areas remained here as green space. Nevertheless, the hydromorphological character of the riverine landscape and occurring plant and animal species were fundamentally altered by the Viennese Danube channelization from 1870 to 1875 and in the following years. Moreover, the area was used by humans for many centuries. Until the beginning of the 20th century hunting dominated. In addition, forestry was practiced on a somewhat larger scale. In 1917 and 1918, respectively, the area was divided into the Upper and Lower Lobau and thus, for about 60 years, the northern and southern parts developed differently. Especially Upper Lobau experienced a substantial intensification and diversification of urban uses. But Lower Lobau was also affected by similar developments. Further, the entire 20th century was characterized by conflicts between nature conservation and human uses. These still determine the preservation of the area today, although the Lobau has been part of the Danube Floodplains National Park since 1996.

Haidvogel G (2023) Die Geschichte der Lobau im 19. und 20. Jahrhundert: Landnutzungswandel, Diversifizierung menschlicher Nutzungen und langfristige Konflikte zwischen Naturschutz und Nutzung.

Die Geschichte der Lobau unterscheidet sich aus verschiedenen Gründen von jener der Wiener Donauauen. Aufgrund spezifischer Besitzverhältnisse, aber auch aufgrund der bis zum 20. Jahrhundert nach wie vor schwierigen Erreichbarkeit für die Stadtbewohner blieben hier große unverbaute Flächen als Grünraum erhalten. Trotzdem wurden die Hydromorphologie der Auenlandschaft und die vorkommenden Tier- und Pflanzenarten durch die Wiener Donauregulierung 1870 bis 1875 bzw. in den darauffolgenden Jahren grundlegend verändert. Außerdem wurde das Areal über viele Jahrhunderte genutzt. Bis zum Beginn des 20. Jahrhunderts dominierte die Jagd. Daneben wurde die Forstwirtschaft in größerem Umfang betrieben. In den Jahren 1917 beziehungsweise 1918 kam es zur Trennung in die Obere und Untere Lobau und damit über circa 60 Jahre zu unterschiedlichen Entwicklungen im nördlichen und südlichen Teil. Besonders die Obere Lobau war von einer starken Intensivierung und Diversifizierung urbaner Nutzungen gekennzeichnet. Aber auch die Unteren Lobau war von ähnlichen Entwicklungen betroffen. Das gesamte 20. Jahrhundert war zudem von Konflikten zwischen Naturschutz und Nutzungen gekennzeichnet. Diese bestimmen auch heute noch die langfristige Erhaltung des Gebiets, obwohl die Lobau seit 1996 Teil des Nationalparks Donauauen ist.

Keywords: Lobau, Danube Floodplains, historical change, human uses, land use, conservation.

Introduction

Rivers and their adjacent floodplains have been modified by humans for centuries to meet various societal needs. Especially since the shift to fossil energy resources about 200 years ago, the industrialization of rivers has followed new paradigms of maximization, rationality and large-scale human imprinting (Jakobsson 2002). Subsequently, the ecological conditions of riverine landscapes have been fundamentally altered in particular by systematic

channelization measures to enable and maintain navigation, levee construction to avoid inundations of floodplains which were increasingly transformed into human settlements or arable land, and by large hydropower dams. Floodplains have decreased or often vanished entirely during the 20th and 21st century. A large-scale study investigating wetland losses in parts of Europe, North America and Asia found that wetland areas have decreased by 87 % since 1700, whereas the decline was especially strong in the 20th and 21st century (Davidson 2014). This development contributes among others to global biodiversity degradation (Kingsford 2015).

Along the whole Danube upstream of the delta, a recent study identified a historical floodplain area of 22 850 km² (incl. the main river channel). Today, almost 80 % has been lost and only an area of 4 711 km² remains as active floodplains (Eder et al. 2022). In the Upper Danube, former floodplains have been intensively colonized especially in and close to urban areas. The Viennese Danube is undoubtedly the most prominent example. Here, more than 20 % of the built-up land were situated in former Danube floodplains at the beginning of the 2000s (Haidvogel et al. 2013).

For various reasons, larger parts of the Danube floodplains located at the south-eastern end of the present-day city of Vienna were not integrated into the urban area¹⁾. Rather, they persisted as green spaces. However, due to their relative vicinity to a large metropolis several, partly conflicting, human uses developed and intensified during the 20th century. This paper aims at describing the specific history of the Viennese Lobau in the 19th and 20th century. It depicts land use change, the establishment of other human activities and their diversification in the last century and the efforts of conservationists to preserve the floodplain landscape. The history of the Lobau makes transparent why the area remained as a zone fulfilling the criteria to be integrated into the Donau-Auen Nationalpark (Danube Floodplain national park) in the 1990s.

Investigating historical land use change and human uses of the Lobau floodplains

A wealth of historical sources and maps are available to investigate the changes of historical land cover and human uses in the Lobau floodplains. For this manuscript, historical maps were used for four different points in time. The first official cadastral map of the Austrian monarchy enabled the reconstruction of land use in the 1820s, i.e. before the systematic channelization of the Viennese Danube (so called Franciscan Cadastral map, scale 1:2880, Bundesamt für Eich- und Vermessungswesen). The third military survey of the Austro-Hungarian Empire (scale 1:12.500, Bundesamt für Eich- und Vermessungswesen) and a map from the Danube Channelization Commission (scale 1:5760, viadonau) served as basis for the 1880s and beginning of the 1890s, the period directly after the completion of the flood protection dikes. For 1934, a specific topographical map of Lobau was available (scale 1:25.000, Bundesamt für Eich- und Vermessungswesen). It represents the interwar period. These three maps were digitized in ArcGIS and the different land use types depicted harmonized into nine categories (see Perschl 2007 for details). Finally, for 1986 a digitized land use map existed (provided by the Institute/Unit of Limnology, University of Vienna) and was adapted to the land use types identified for the three other historical maps.

1) Unless mentioned otherwise “Vienna” relates in this article to the city in its current extension

Land use management practices were identified based on various archival documents. Of particular interest were the descriptions of the relevant municipalities, which accompany the cadastral maps of the 1820s (so called Schätzungselaborate, Niederösterreichisches Landesarchiv). Changes in forestry were obtained from technical reports of forestry management plans of the responsible institutions (Stadt Wien, Magistratsabteilung 49, Österreichische Bundesforste). Published literature and newspaper articles were analyzed to summarize other human uses (see references).

Lobau as part of the Viennese Danube floodplains and major legal frameworks

Before the channelization of the Viennese Danube in the 1870s and 1880s, Lobau was a large island crisscrossed by several Danube side arms and floodplain waters. It was located in the south-east of Vienna in the cadastral municipalities Herrschaft Kaiser Ebersdorf and Landjägermeisteramt as well as small parts of Aspern and Essling to the north. Especially judging by the transport facilities prevailing until the beginning of the 20th century, the area was located at some distance from the urban center and its surrounding districts. As several other parts of the Viennese Danube floodplains, Lobau was also for centuries under the administration of the imperial family. In 1745, Empress²⁾ Maria Theresia donated the revenues of Herrschaft Kaiser Ebersdorf, to which Lobau belonged, to a special welfare fund for poor Viennese citizens. However, hunting rights remained with the Habsburgs.

An important legal change happened in 1905. In this year, the city of Vienna had declared large parts of the Viennese Woods (Wienerwald) in the north and north-west of the city as protection zone. This Viennese Forest and Meadow Belt (Wiener Wald- und Wiesengürtel) should form a green belt around the urban settlements and among others help to improve air quality in the quickly industrializing city. Lobau became part of this zone in the south-east of Vienna.

In 1917, Emperor Karl I handed over the property and use rights of the northern part of Lobau to the city of Vienna, thereafter called Upper Lobau or in the beginning also Municipal Lobau. In turn, he got full use rights and income in the southern part, called Lower Lobau. After 1918, when the Austro-Hungarian Empire collapsed, Lower Lobau was handed over to a special fund for victims of World War I (Kriegsgeschädigtenfonds). Upper Lobau remained with the city of Vienna and was after 1919 administered by the newly established Viennese Forestry and Agriculture Business Company (Forst- und Landwirtschaftliche Betriebsgesellschaft). These agreements initiated the different developments of Upper and Lower Lobau in the following decades, which still characterize the place.

During the national-socialist period the Viennese Forest and Meadow Belt was ceased. Already in 1937, the special fund for victims of World War I was abandoned. The national-socialists declared Lower Lobau as a nature protection area in spring 1938. However, it was administered by the federal forestry department and hunting was again the dominating use. Inaccessible to the public, management and uses resembled the former imperial period (Pausch 2005). In contrast, between 1938 and 1945 Upper Lobau was subject to large industrialization projects. Above all, the oil harbor reduced the extent of the Lobau and defined the boundaries of the later nature reserve and national park, respectively (see below).

2) For simplicity, I use the common title Empress, although this is formally not correct

It was not until 1973 that the City of Vienna succeeded in bringing both parts, the Upper and Lower Lobau, into its ownership. At that time, the necessity of nature conservation efforts was also increasingly perceived by the public. In the following two decades or so, between the 1970s and 1996, the protection status for the entire Lobau was increasingly improved until it finally became a national park in 1996.

Land use change and management between 1820 and 1996

Land use in the Lobau was mapped using various historical maps from the period between 1820 and 1986, ten years before Lobau became part of the Donau-Auen Nationalpark. In total, an area of approx. 26 km² was analysed and the following land use types were distinguished: aquatic areas, sediment bars and islands; marshes; arable land; meadows; pastures; orchards; buildings and industry; transport routes and dikes. Details can be found in Perschl (2007).

Around 1820, forests covered 45 % of the area of present Lobau, the highest proportion of all land use types also exceeding water and sediment areas (approx. 28 %, see Tab. 1, Fig. 1). Like the other floodplain forests of the Viennese Danube, the responsible forest administration also managed the Lobau as coppice forest until the end of the 19th century. The rotation time, i.e. the age of the trees at harvest, was usually 30 to 40 years. Only alders were harvested by the foresters already after 20 to 24 years, while elms were harvested much later, sometimes after 80 years. Willows were among the most important floodplain forest trees. The main species were probably white and purple willows (*Salix alba*, *Salix purpurea*), but almond willows (*Salix triandra*) were also common in the Danube floodplains around 1850 (Neilreich 1846). Black and silver poplars (*Populus nigra*, *Populus alba*), aspens (probably *Populus tremula*) or grey alders (*Alnus incana*) were other typical softwood tree species. Ash (*Fraxinus excelsior*), elm and maple were present on some older sites. Harvested trees served until the end of the 19th century mainly as firewood, but some logs were used for river engineering structures or as construction wood and for various commodities. While in other Danube floodplains young trees were fenced to prevent browsing by game, in the forests of the Lobau little was done against such kinds of damages. The game frequently impaired the crop fields in the surrounding villages but farmers could not successfully oppose and protect their land (NOeLA 1828/29, NOeLA 1829/30a, NOeLA 1829/30b). In the Lobau foresters tried obviously to adapt forest management to the large number of game. For example, it is reported that in the 18th century, grey alder was specifically promoted, as it suffered less from game browsing. In addition, it was easy to plant and was excellently suited as firewood (Doppler 1991).

In 1820, approximately a fourth of the area's forests were cleared for meadows and a few fields. The little grain produced in Herrschaft Kaiser Ebersdorf or Oberstlandjägermeisteramt mainly supplied a pheasantry on site. Numerous floods threatened agricultural land in Lobau and the surrounding area. In the 19th century, when no artificial fertilizer was available, farmers judged floods differently depending on their timing and severity. If they occurred during the growing or harvesting phases in late spring or summer, they destroyed crops and grass and caused loss of food and fodder. In early spring, however, floods brought nutrients and thus provided a natural fertilization for the soils. Such perceptions were reported, for example, from cultivated floodplain areas in Herrschaft Kaiser Ebersdorf, but were also valued in other areas along the Austrian Danube, namely in the Machland (Zechmeister 1846; Hentschel 1848).

Water and sediment areas covered in 1820 about 28 % of Lobau. No dikes existed and fluvial dynamics were not hampered by any kind of hydraulic structures. Due to frequent floods, spatial shifts of aquatic and terrestrial areas occurred regularly.

Until the end of the 19th century, the major change that affected the Lobau was initiated by the Viennese Danube channelization, which lasted basically from 1870 to 1875. However, in the southern part of Vienna – along Lobau – levees were not built until the following years. The most visible effect on land cover was the decrease in water and sediment areas, which had declined quickly to 16 % in the 1880s. Forests had developed on former aquatic areas initiating an increase of this land cover type to more than 50 % (Tab. 1, for a figure see Hein et al. 2023, this issue). Forest management did not change immediately, but according to forestry reports some consequences of the channelization soon affected forest trees and management had to adapt to the new conditions. Especially, the groundwater table was lowered. In places north of Lobau, e.g. in the municipality of Floridsdorf (nowadays the 21st district of Vienna) wells with a depth of less than 7 m fell dry. In some sections of the Viennese Danube floodplains, willows and black poplars died few years after completion of the channelization. Often, white poplar, alder and even hard wood trees were planted here (Österreichische Bundesforste 1947). Such a shift to hard wood tree species was triggered also by the transition to a new energy resource. In the 1870s and thereafter, the substitution of wood by coal was in full swing also in Vienna. Less and less firewood was needed, while timber for construction purposes and various commodities was in greater demand (Bösenhofer 1995). Lobau forests were still exposed to game browsing and due to the large stocks bare areas without timber production formed. Here, sometimes black locust trees (*Robinia pseudoacacia*), a tree species native to North America and used in Europe from the 17th century onward, were planted (Perschl 2007; Pusz 2009).

First attempts to intensify forestry and to shift from coppice management to timber foresting were discussed in the first decades of the 20th century (Österreichische Bundesforste 1947). But only after 1918, this was realized in the Lower Lobau. The transition was hampered by the altered hydrology after the Danube channelization, but partly also by

Tab. 1: Proportion of eight land use types in Lobau 1820–1986. – Tab. 1: Anteil von acht Landnutzungsklassen in der Lobau 1820–1986.

	Lobau (national park, total area 26,8 km ²)			
	1820	1880	1934	1986
Forest	45,0	51,6	49,2	55,9
Arable	0,3	3,8	19,3	16,1
Meadow	25,9	27,1	19,7	15,2
Pasture	0,4	0,3	0,0	0,0
Orchard	0,0	0,0	0,1	0,0
Buildings	0,0	0,0	0,0	0,4
Roads, dykes	0,3	1,1	1,3	0,4
Water, sediment areas, marshes	28,1	16,0	10,2	12,0
Others	0,0	0,0	0,0	0,0
	100,0	100,0	100,0	100,0

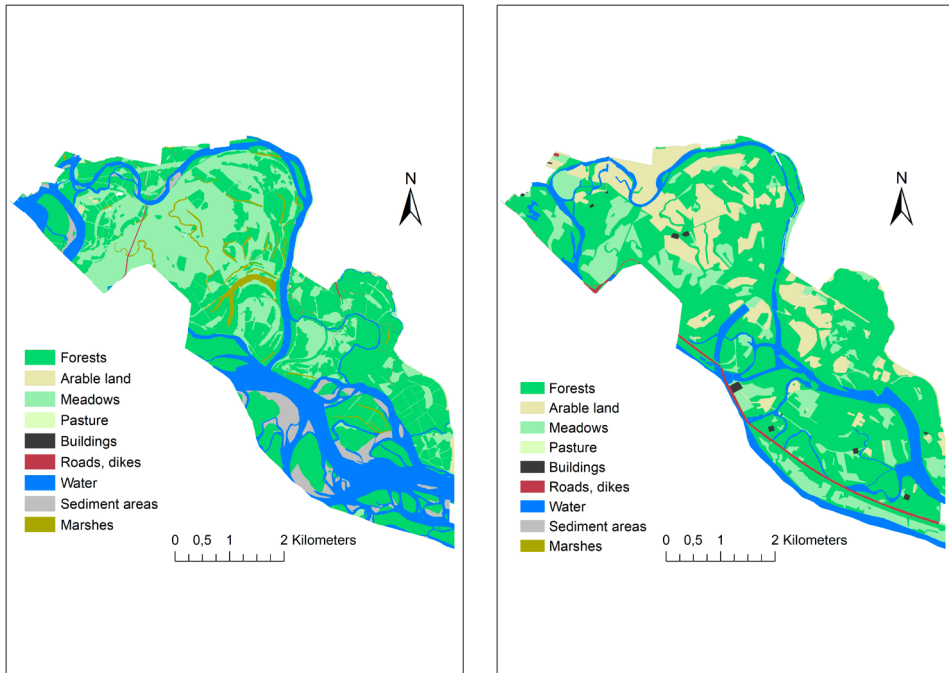


Fig. 1: Land use in Lobau in 1820 (left) and 1986 (right) (Digitalization Martin Perschl; see Perschl 2007). – Abb 1: Landnutzung in der Lobau 1820 (links) und 1986 (rechts) (Digitalisierung Martin Perschl; siehe Perschl 2007).

the ongoing importance of hunting and game damage, in particular during the national-socialist period in Austria (1938-1945). In the 1940s, the lack of nutrient input from Danube floods and the lowering of the groundwater table were explicitly reported to have a negative influence on tree growth (Österreichische Bundesforste 1947). The systematic change to timber management and fast-growing trees occurred mainly after World War II. It was supported by the increasing demand for construction timber and raw material for paper production (Forstverwaltung Lobau 1962). In combination with the preference for certain allochthonous tree species (e.g. Canadian poplar, black locust), the tree composition changed considerably up until the 1960s. By 1961, in the Upper Lobau only 49 % were softwood trees, while 41 % were hardwood species and the rest was pine (Forstverwaltung Lobau 1962). In contrast, in the Lower Lobau hardwood tree species were in the 1960s still limited to approx. 23 % (Österreichische Bundesforste 1967).

While arable land had increased only slightly from 0.3 % to 3.8 % until 1880, a major intensification of crop and vegetable production happened during and after World War I. It was particularly evident in the Upper Lobau, due to its location closer to the city center. This increase was a consequence of the precarious food supply of the Viennese population. Already in 1915, an area of 43 ha was created on the initiative of the mayor of Vienna, Richard Weiskirchner, and on instigation of the city administration. The military administration agreed to provide 500 Russian prisoners of war as labor force, the camps for

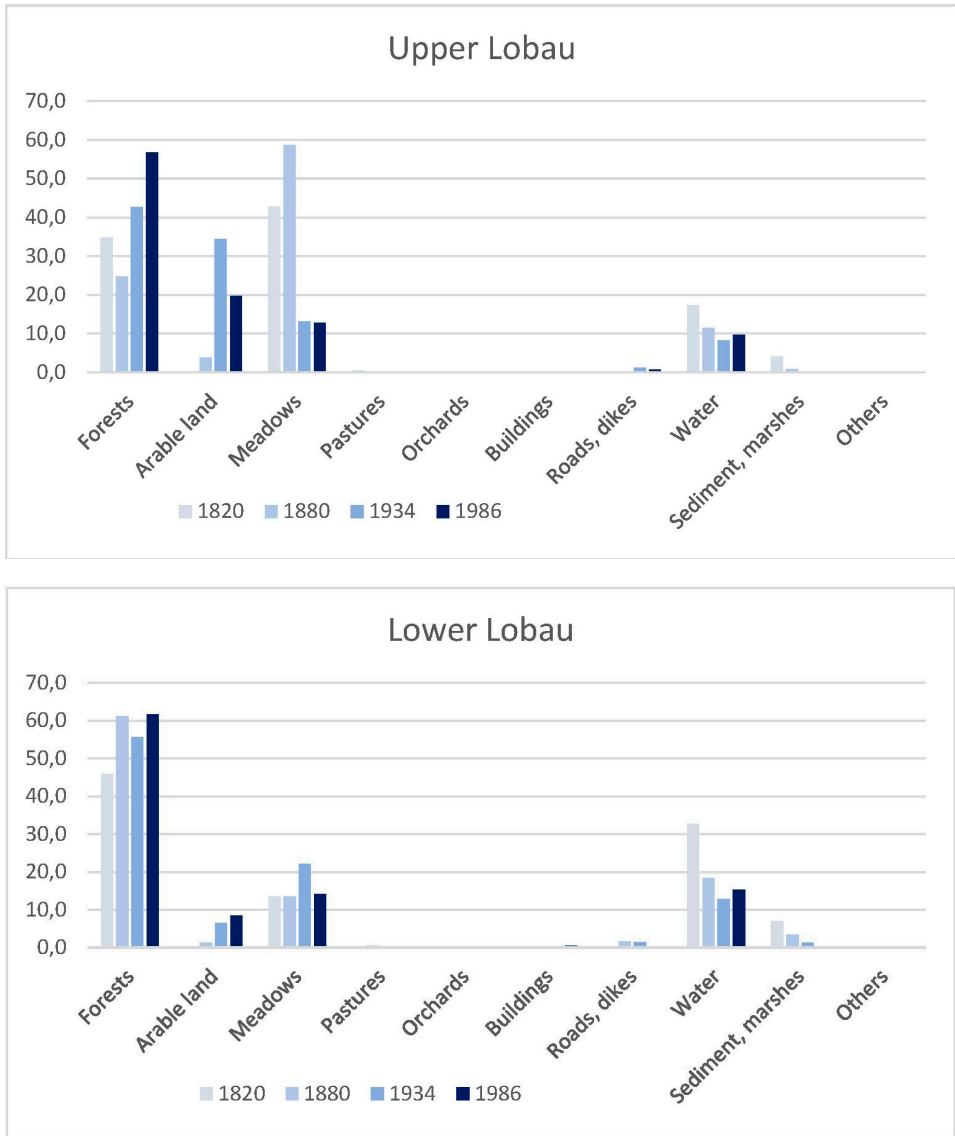


Fig. 2: Land use change in the Upper (top) and Lower Lobau (bottom): proportions of different land use types in 1820, 1880, 1934 and 1986. – Abb 2: Landnutzungsveränderung in der Oberen Lobau (oben) und Unteren Lobau (unten): Anteile unterschiedlicher Landnutzungstypen 1820, 1880, 1934 and 1986.

housing were to be made available by the responsible imperial organization (i.e. Oberstjägermeisteramt; Veichtlbauer 2018).

In February 1918, few months before the end of the war, the urban agricultural company was created (since 1919 Agricultural and Forestry Business Company/Land- und Forstwirtschaftliche Betriebsgesellschaft). It was among other things responsible for agriculture

in the Lobau. Again, prisoners of war had to plant the fields, mainly with potatoes and cabbage (Veichtlbauer 2018). In 1934, the proportion of arable land had increased in the Upper Lobau to almost 35 % and approximately 13 % of the area was covered by grassland (see Fig. 2 and also Figure in Hein et al. 2023, this issue). The Lower Lobau was much less affected by such a transition to agriculture. In 1934, the proportion of arable land amounted here to 6.5 %, that of grassland to 22 %. Until 1986, the extent of crop fields had decreased especially in the Upper Lobau while the area of grassland remained stable. In the Lower Lobau, a somewhat different trend can be observed, although much smaller in absolute area (Fig. 2).

After World War I, the Upper Lobau also was strongly affected by urban development. In several places small settlements with simple, wooden houses and gardens were built. People produced here in the interwar period vegetables for their own needs and sometimes even supplied the urban population. Municipal authorities granted leasehold plots to 61 families covering a total area of 104 ha, most of which located downstream from the Stadlau rail bridge (Veichtlbauer 2018). However, many of these primitive settlements were also built illegally and tacitly accepted by the city of Vienna. Only later in the 20th century, still illegal settlements were legalized and connected to urban infrastructure. The extension of settlements in 1934 is difficult to estimate as due to their illegal status they were not displayed in the official city maps.

Aquatic areas and sediment bars had until 1934 further decreased to only 10 % in the whole Lobau due to continuing terrestrialization (Tab. 1). As this process was not linked to shifts in land use, a similar decrease is visible in the Upper and in the Lower Lobau (Fig. 2). An increase of water areas until 1986 was caused by newly built artificial waters, in particular Donau-Oder-Kanal and the basin of oil harbor Lobau (Fig. 1, see also text below).

Other human uses in the 19th century and diversification of uses after 1918

Not all human uses of the Lobau are depicted in the land use maps, among them even some of the dominating ones of the 19th and over longer periods of the 20th century.

Until 1918, hunting was the dominant human activity in the Lobau area and even forestry was subordinate to hunting interests, as evidenced by the acceptance of game damage to (young) trees discussed above. At the beginning of the 19th century, the abundance of red deer had declined. However, their population was deliberately increased thereafter – for example, by feeding clover and hay as well as corn, potatoes, chestnuts – and the numbers had increased again by the beginning of the 20th century. Also, various species of birds were hunted. In 1917, after the shift of property rights, a fence was erected between the Upper Lobau, which had become municipal property in that year, and the imperial Lower Lobau, and red deer in particular was pushed into the Lower Lobau. Remaining deer in Upper Lobau were shot and hunting came here to a halt with few exceptions when pheasants, partridges, some deer and brown hares were shot (Strauss 1935). In the Lower Lobau, hunting exhibited a revival especially during the national-socialist period, when the area was declared a state forest and nature protection zone. In the Lower Lobau, the number of deer increased to such an extent that severe damage was reported by forestry, with legacies still mentioned in forestry reports after World War II (Forstverwaltung Lobau 1962; Österreichische Bundesforste 1967).

Another long-term human use was fishing in the floodplain waters of Lobau. While in the 19th century, professional fishermen exploited the waters to supply among others the Vien-

nese population with Danube fish, in the later 19th century and especially during the 20th century recreational angling came to the foreground. Because of the many stagnant waters developing after channelization, fishery and its management focused on cyprinid fish and in particular on carp, which were stocked in larger numbers. Pike (*Esox lucius*) and pike perch (*Sander lucioperca*) but also European catfish (*Silurus glanis*) or tench (*Tinca tinca*) were other appreciated fish species (Claas 1957).

In the 1920s, the Upper Lobau became a popular recreation place for Viennese citizens. Although it remained enclosed and visitors had to pay a small entrance fee, it was soon appreciated after its opening in 1926. Walking trails along with facilities like small lodges selling snacks and beverages were established (Strauss 1935; Eder & Eichert 2005). The area was reachable with several public transport means, including ferries crossing the Danube (Land- und Forstwirtschaftliche Betriebsgesellschaft 1928). From 1935, the Lower Lobau also became accessible to the public although in contrast to the municipal Lobau upstream no supply points for visitors existed. An exception was the national-socialist period, when visitors were again not allowed to enter.

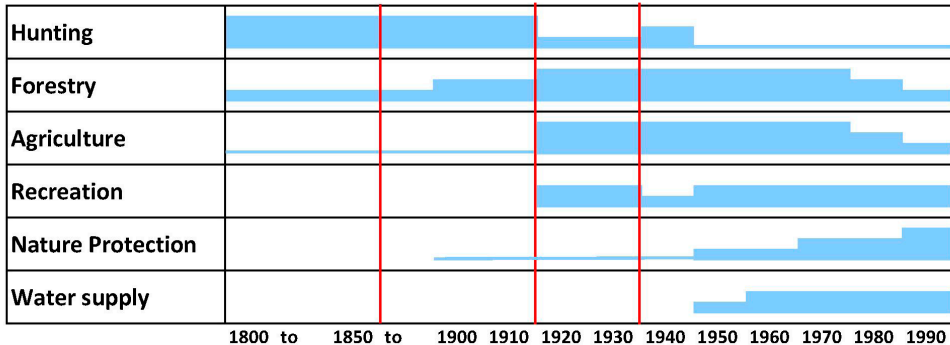
In the interwar period and during World War II, sections of the Upper Lobau close to the Danube were strongly affected by industrialization, even if this is nowadays not visible in the area of the national park itself, as these zones were of course not included. Plans to use the hydropower of the Danube in and downstream of Vienna date back to 1910. A particular concern for example by hunters raised a project from 1927, which would have also affected Lobau (Hauer & Hohensinner 2019; Mitteilungen der Jagdschutzvereine 1929; Schoder 2019). By the end of 1939, the implementation of a centuries-old idea to connect the Danube and the Oder River via an artificial waterway started (Illustrierte Kronen-Zeitung 1939). Due to the war, only a 4,2 km long section of this Danube-Oder-Canal was built together with a 1,3 km long harbor basin. As the main function of the harbor was to supply Germany with crude oil from Romania, Hungary and southern Poland via the Donau-Oder Kanal, also oil storage tanks with a capacity of 120 000 tons and an oil refinery were constructed (Tillmann 1948). Due to intensive bombing of the oil harbor and the storage tanks from the summer of 1944 onwards, many facilities were damaged and oil seeped into the ground and groundwater. After first actions to prevent further contamination in 1990, the site was secured only between 2003 and 2009 (Umweltbundesamt 2022).

In the 1950s, first wells for water supply were drilled in Lobau. Initially they were only used by farmers to irrigate their fields. When attempts to tap groundwater resources south of the city failed, Lobau also came under discussion as a location to ensure sufficient quantities of drinking water. In 1961, Vienna declared about 10 km² of Lobau as a water protection area (Pickerle 1973). Between 1964 and 1966, three drinking water wells were built in the Lower Lobau. In 1970s, another facility was made in the Upper Lobau. The latter is no longer in use, as high iron and manganese values required regular processing of the groundwater. In the mid-1980s, up to 85,000 m³ of water could be drawn daily to supply the Viennese districts located on the left side of the Danube (Frischherz 1985). Today, the Lobau's groundwater is mainly used to cover peak demand and to supply the Viennese population when the main water pipes from alpine sources south and south-west of the city are being serviced.

Overall, it is evident that human uses diversified and intensified between 1918 and the 1970s, especially in the Upper Lobau. However, the Lower Lobau was also characterized

by diverse urban functions, although it was less affected by urbanization and agriculture (see Fig. 3).

Since the 1970s, movements to protect the remnants of the former Danube floodplain in the Lobau have been revived in response to infrastructure projects of the City of Vienna and the improvement of urban flood protection. Like similar movements before, these initiatives triggered severe conflicts.



important events:

Channelisation /Flood protection 1870-1880s
 Change property rights 1917/18
 national-socialist period 1938-45

Fig. 3. Diversification of human uses in the Lobau 1800–2000 and their importance. The thickness of the bars indicates the degree of importance from very low (thin bars) to very high (thick bars). The figure summarizes the development and does not distinguish between Upper and Lower Lobau (see text). – Abb. 3: Vielfalt und jeweilige Bedeutung menschlicher Nutzungen in der Lobau zwischen 1800–2000. Die Dicke der Linien gibt den Grad der Bedeutung zwischen sehr gering (dünne Linie) und sehr hoch (dicke Linie) an. Die Abbildung fasst die Entwicklung zusammen und unterscheidet nicht zwischen Oberer und Unterer Lobau (siehe Text).

Nature protection activities and related conflicts in Lobau approx. 1900–1996

Nature conservation activities in the Lobau began as early as 1900. From the beginning, targets and corresponding projects were in conflict with human uses. One of the earliest examples was the dispute between conservationists and fishery. The Lobau was home to a large population of cormorants. It was reported to have been protected already by crown prince Rudolf, who did so however mainly for hunting purposes (Neues Wiener Journal 1923). In 1903, the Ministry of Education commissioned the Zoological-Botanical-Society (Zoologisch-Botanische Gesellschaft) to establish an Austrian register of animals, which are threatened and require special protection. There were considerations to add the cormorant colony in the Lobau to this list as it was considered the last larger population of its kind in Austria (Reichspost 1903). As cormorants prey on fish fishermen who exploited the floodplain waters called for controlling the number of birds by shooting. Conflicts with fishermen intensified, not least because the Lobau was excluded from a campaign of the government of Lower Austria, which paid a reward for every killed cormorant (Österreichische Forst- und Jagdzeitung 1917). The debate caused wide publicity. Even the “Arbeiterzeitung”, the newspaper of the Austrian Social Democrats, called cormorants useless animals, which only served the interests of the imperial family, who bred and kept them for hunting. In 1915, one year after the passionate hunter crown prince Franz Ferdinand

was shot in Sarajevo, an article stated that in this year the situation worsened as nobody hunted and thus kept the number of birds under control. There was concern of fishermen that the cormorant population in the Danube floodplains might soon increase from 4000 individuals to even 16,000. Claims were made for an immediate eradication of all birds (Arbeiterzeitung 1915).

In 1919, Günther Schlesinger, curator at the Lower Austrian Provincial Museum and expert advisor for nature conservation, reported that the Lobau was a landscape worthy of protection with a primeval forest-like quality. It was home to lush poplar, elm and willow stands, as well as alders and characteristic undergrowth vegetation. The oxbow lakes and pools reinforced according to Schlesinger the primeval impression, even if terrestrialization tendencies were obvious. Schlesinger clearly voted for a Lobau nature reserve with fences and the exclusion of more intensive human uses. He was referring primarily to the Lower Lobau, since urbanization processes already had a bearing on the Upper Lobau (see above; Schlesinger 1919a). The cormorant colony in the location called Rohrwörth close to the commune Groß-Enzersdorf should be considered in these nature protection efforts although Schlesinger recommended keeping the population size at a level of about 100 nests (see also Schlesinger 1919b). By this time, however, the fate of the cormorants had already been decided: After 1918, when Lobau came under the administration of the city of Vienna and the Kriegsgeschädigtenfonds, respectively, hunting the Lobau cormorants was allowed and the population seems to have declined steadily. According to newspaper reports, at the latest around 1930 the colony seems to have been abandoned (e.g., Arbeiterzeitung 1930).

The increase of crop fields and vegetable production in the Upper Lobau during and after World War I caused concerns and criticism of conservationists. For example, in 1934 Leo Schreiner reported in the journal of the Austrian Nature Protection Society (Österreichischer Naturschutzbund), that he noticed in one of his recent visits to the area that a large agricultural company had developed there, which not only uses modern agricultural methods but seems to transform the whole Lobau into a “cultivated steppe”. According to Schreiner only the forestry administration, which is also active there, seems to prevent this development (Schreiner 1934).

As written above, in 1938 Lower Lobau was declared a protected area by the national-socialist government, albeit mainly for hunting purposes. Nature protection efforts did not stop during and after World War II. But it lasted until the 1960s that again a large movement to assign to Lobau an explicit nature protection status commenced, involving this time also a larger public. The background of protests and conservation efforts were several large-scale infrastructure projects which the city of Vienna had initiated during and after the 1950s. There were among others plans to build a large refinery and to increase the oil harbor and oil storage facilities Lobau. In the 1960s, plans to improve technical flood protection for Vienna took on more and more concrete form. Parallel to the river, construction was to take place on the left bank of the Danube, as was a new bridge, and finally the sewer system in the Viennese districts on the left side of the Danube was to be extended along the Danube.

All these projects increased the risk of further deterioration of the already precarious hydrological and ecological conditions in the Lobau and provoked the protest of various groups. A leader of this movement was Anton Klein, a district inspector with the Vien-

na police. Klein was since his childhood a passionate aquarist, who collected feed for his fish among others in the small pools of the Lobau. Over the years, he noticed that these increasingly silted up. In 1969, he contacted the then mayor of Vienna, Bruno Marek. Klein and his fellow campaigners were invited to meet Marek, but the results were not satisfactory. In July 1970, when the activist group realized that the city of Vienna was building a steam power plant in the Upper Lobau, simultaneously clearing precious forest in order to construct additional tank storage facilities for the oil industry and planning a highway right through the Upper Lobau Anton Klein started a citizens' initiative and named it "Lobau Must not Die" after the academy award winning film documentary "Serengeti Must Not Die" by Bernhard und Michael Grzimek. Klein then established excellent contacts with the Austrian press, published numerous articles and initiated various local events. A breakthrough in public awareness was his plea to save the Lobau in a TV discussion in July 1972.

The successes, which the conservation movement of the 1970s and thereafter achieved are well known: In 1973, Lobau was declared a partial nature protection area; from 1977 to 2016, Lower Lobau was a UNESCO Biosphere reserve, in 1978 the "Lobau Directive" defined full and partial nature protection areas, since 1983 a Ramsar protection site Lower Lobau exists, and in 1996, Lobau became part of the Donau-Auen Nationalpark. However, multiple human uses that developed in the centuries and decades before, along with urban infrastructure and demand for (drinking) water and recreation are still in conflict with nature conservation and restoration targets and continue to degrade habitats and biodiversity. Ecological restoration programs date back to the 1980s. Hydrological conditions were improved for the Upper Lobau. However, especially the Lower Lobau remains at risk of continued drastic loss of aquatic habitats and deterioration of ecological conditions. Improving water availability is urgently needed as a first step to preserve the Lobau as an aquatic ecosystem (see Hein et al. 2023, this issue).

Conclusions

While most of Vienna's Danube floodplains were integrated into the built-up urban area especially after 1840, the Lobau remained as an undeveloped space. Already around 1900, efforts began to protect the area according to nature conservation goals. But in the course of the 20th century, the urban influence increased, especially between 1918 and the 1970s. This was strongest and most evident in the Upper Lobau, but it also affected the Lower Lobau. In the 1970s and after, nature conservation efforts were finally successful in the long term. However, these were and still are counteracted by ongoing human uses and ecological degradation caused by hydromorphological processes after the Danube canalization. Uses and urban infrastructure in and near the Lobau continue to conflict with conservation goals and restoration efforts to preserve the Lobau as part of the Danube Floodplain National Park.

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Address:

Gertrud Haidvogel, E-Mail: gertrud.haidvogel@boku.ac.at
Christian Doppler Laboratory for Meta-Ecosystem Dynamics in Riverine Landscapes, Institute of Hydrobiology and Aquatic Ecosystem Management, University of Natural Resources and Life Sciences Vienna, Gregor-Mendel-Straße 33, 1180 Wien, Austria.

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