

# Restoration of river arms within the scope of Povodí Labe, state enterprise

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*Povodí Labe, státní podnik*

## 1. Introduction

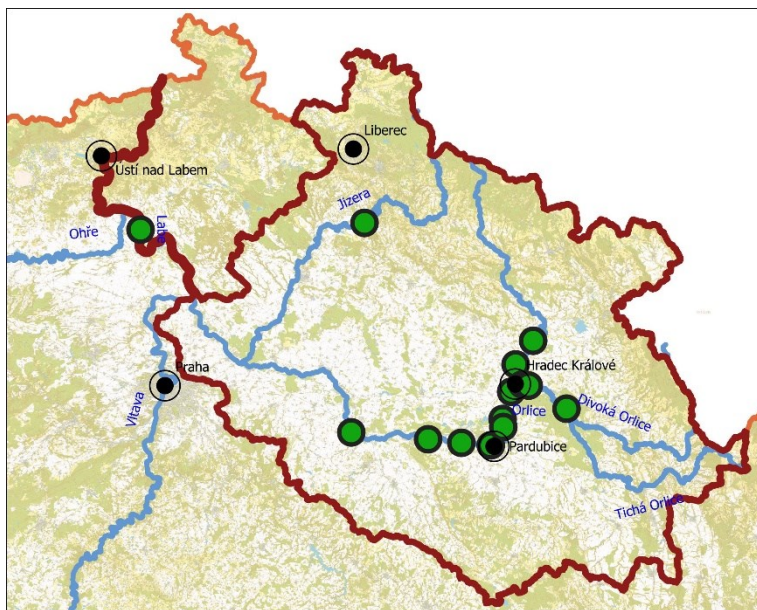
Old river arms are extremely valuable elements of landscape and serve as a sanctuary for many species of plants, fungi and animals. From the water-management point of view river arms also serve as a water retention in landscape. River arms disappear due to stream regulations, loss of active flow and ecological succession. In the regulated parts of watercourses and floodplains, in the absence of natural dynamics, technical measures must be taken to maintain and restore the ecological and water-management functions of river arms and pools. This is preceded by high-quality biological surveys, together with a design for measures to restore degraded parts and to preserve valuable parts. These measures may include, for example, restoration efforts in terms of connectivity between main streams and river arms, restoration of river beds to its original state, sediment removal, creation of pools, restoration of riparian stands, ensuring successful migration of water animals, special measures to support rare species of organisms or solution to biological invasions. Essential aspects in the selection of sites for revitalization of river arms are also solvable property-legal relations, technical feasibility of an intervention and funding source choice.

## 2. Restoration of river arms and oxbows of the Elbe River and other watercourses

Management interventions strengthen and restore the ecological and water-management functions of river arms and pools in the context of the Elbe river floodplain. Water retention ability of the floodplain can be restored by the creation of nature-friendly measures such as the restoration of river arms or oxbows, restoration of the original riverbeds, creation of nature-friendly lateral riverbeds or creation of pools.

Project realization is preceded by the collection of input data, their processing and evaluation. It is necessary to choose a suitable methodology for revitalization solutions with the possibility of processing a variant solution. The findings and conclusions of biological surveys are one of the basic starting points in designing, assessing and planning the dates of the entire revitalization intervention. The aim of revitalization should be to support stable landscape elements.

Due to the fact that the Elbe River has nowadays in the significant length the character of a canalized course, the only solution for maintaining the species diversity of degraded aquatic and wetland habitats is the ecological restoration of river arms or individual oxbow lakes or their complex in the form of wetland restoration. The disturbed river continuum together with the current land - use do not allow forming of new oxbow lakes of the Elbe, and therefore comprehensive wetland restoration and optimization of the water regime of associated tributaries of this fluvial Elbe landscape is a way to preserve the natural values of these valuable wetlands.



**Fig. 1:** Places of restoration activities of Povodí Labe, state enterprise

### 3. Selection of sites to revitalization

When selecting suitable river arms for revitalization activities, the following criteria must be taken into account: biodiversity of the area, presence of biological invasions, stage of ecological succession, type of sediment and its regime, character and condition of riparian vegetation, hydromorphological characteristics of watercourse and its floodplain, flood protection, solvable property relations and presence of migration barriers.



**Fig. 2:** Restoration of river arm Orlice called Jordan near Týniště nad Orlicí, January 2021

Primarily are chosen river arms or oxbows, which are located in specially protected areas, which provide refuge to rare species of organisms, whose populations will benefit from restoration activities, such as habitat restoration or increasing habitat diversification.

River arms and pools are often invaded by alien species. Plant invasions have a massive negative impact on ecosystems. In the riparian vegetation of the Elbe River basin, we most often encounter black locust (*Robinia pseudoacacia*), box elder (*Acer negundo*) and non-native poplar species - such as plantings of Canadian poplar (*Populus × canadensis*). Important invasive herbs include Japanese knotweed (*Reynoutria japonica*), Himalayan balsam (*Impatiens glandulifera*), small balsam (*Impatiens parviflora*), goldenrods (*Solidago* sp.) mostly native to North America, wild cucumber (*Echinocystis lobata*) and Jerusalem artichoke (*Helianthus tuberosus*). Through appropriate intervention populations of native species of plants, fungi and animals are supported.

Restoration interventions are planned in localities that are in late-succession stages with a large amount of sediments. We prefer to select river arms or oxbows on regulated watercourses or their parts, where it is impossible to create new river arms naturally. We are restoring river arms owned by Povodí Labe, state enterprise. These arms are the simplest for discussing and the actual implementation of the restoration plan. Property relations are often the cause of the failure of stream restoration, so we direct our activities in this way. When solving the restoration of river arms, we pay attention to migratory routes for fish and other migrating aquatic organisms. Migratory obstacles to the movements of fish and other aquatic organisms are mainly transverse structures, dams and places with insufficient depth of the water column.

From an environmental point of view, the restoration of river arms has the highest priority in areas with valuable habitats and landscape, and also in the basic framework of the ecological network TSES.

To ensure the highest possible level of species richness of a certain locality, it is appropriate to help create the most diversified habitat and to support the variability of successional stages.

Planning restoration activities at the site of a specially protected area need appropriate approach, the management plan for the specially protected area must be followed and all interventions should be consulted with the locally competent nature conservation authority. Natura 2000 is a network of protected areas covering Europe's most valuable and threatened species and habitats. Aquatic and wetland ecosystems are among the most endangered, due to their importance, these places are declared as The Sites of Community Importance (SCI) or Special Protection Areas (SPA) selected for protect of valuable birds.

Deadwood is an important component for the preservation of the species diversity of the river environment. It is an environment for saproxylic organisms. Saproxylic organisms are species that are at least at some stage of their life cycle dependent on dead and decaying wood to varying degrees of decomposition. These are, for example, saproxylic insects or fungi. We can support these organisms by leaving deadwood on the site, by leaving fallen trunks in the water (where it is possible), by proper care of old hollow trees or by making the proper trees to living or dead torsos. Trees with cavities are also excavated by bird species or bats.

The creation of pools along rivers is an essential tool for the protection of amphibians. Newly created pools are important as new sites for colonization of amphibians, for strengthening their local populations and for maintaining the metapopulation structure of amphibians in the area.

Among the most endangered habitats are those where the initial stages of succession are formed. These are sand and gravel deposits, sands or newly created bodies of water. Restoration plans can be prepared to support these particular habitats. Although these habitats are ephemeral in nature, they are very important for the conservation of species diversity.

Restoration of river arms can also help to realize a rescue programme. An example of this is the restoration of the river arm of the Orlice River in Malšova Lhota near Hradec Králové, where the last original population of the aquatic vascular plant of long-stalked pondweed (*Potamogeton praelongus*) exists.

The selection of restoration sites is based on approved The Upper and Middle Elbe River Basin District Plan and national part of the Elbe River Basin, where measures to improve status (potential) of the surface water bodies are included, measures are also in line with objectives from International Management Plan for the Elbe



River Basin District. Restoration of river arms is one of the measures to preserve or improve the ecological status (potential) of the important localities.



**Fig. 3:** Restoration of river arm Opočinek as a part of Elbe River near Pardubice city

#### **4. Examples of completed restoration projects**

In 2012 Povodí Labe, state enterprise successfully completed the restoration of the left river arm at Knoch Island in Kolín. In 2013 the restoration of oxbow lake of the Jizera River in Nudvojovice near Turnov city was completed. In 2015 the restoration of the river arm Polabiny in the inner part of Pardubice city was successfully completed.

In 2019 Povodí Labe, state enterprise completed the restoration of river arm Orlice River near Hradec Králové city, where is situated the last original locality of critically endangered long-stalked pondweed (*Potamogeton praelongus*) in the Czech Republic.

In 2021 were finished restoration projects of river arm Jordan (Fig. 2) as a part of Orlice River near Týniště nad Orlicí city and also of river arm Opočinek (Fig. 3) as a part of Elbe River near Pardubice city. Localities were in late-succession stage with a large amount of sediments and degraded habitats. Biological surveys have showed that these restoration projects helped to protect nature and landscape values of Elbe River floodplain and its tributaries.

#### **5. Conclusion**

The benefits of restoring river arms or oxbows are many, restoration of river arms is essential for maintaining biodiversity, preserving landscape structures and improving the ecological functions of the floodplains. Restoration of river arms is currently one of the priority green activities for the Povodí Labe, state enterprise.

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