▲ Beaver

▲ Kingfisher

▲ Spring snowflake

Installations

- 2 Sluice gates
- 1 Discharge blocking structure
- 1 Cross bridge (to lead one flow of water over another) and 9 bridges in the forest
- 7 fords
- 6 km of new river system
- 1 Sluice

Preliminary Investigations

- Floodplain: flora and fauna
- Rivers: Morphology, chemistry, biology, groundwater tables

Post-Project Monitoring

The Floodplain Institute of the Catholic University of Eichstaett-Ingolstadt coordinated the MONDAU Monitoring together with scientists from the Universities of Munich, Freising and Osnabrueck. Investigations on hydrology, hydromorphology, forest development, vegetation, aquatic and terrestrial fauna were conducted. Since 2015 monitoring has occured at a reduced level.

Cost

- Total €15 M
- Costs for installations €11 M
- Compensation to forest owner €3 M
- Monitoring €1 M

Project Funding

- Free State of Bavaria
- European Union
- Bavarian Conservation Foundation
- Energy company E.ON
- German Federal Agency for Nature Conservation
- Cities of Ingolstadt and Neuburg

Project leaders

Free State of Bavaria, Germany represented by the State Office for Water Management Ingolstadt and the Arbeitsgemeinschaft Auenrenaturierung

▼ Natural Flooding in June 2013

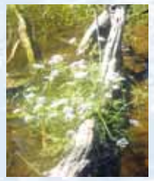
State Office for Water Management Ingolstadt

Monitoring and diversity in the floodplain

◀ Trap for insects in the crown of an oak tree

◀ Fish monitoring by electro-fishing

◀ Phytoplankton sampling in the Ottheinrichbach



◀ left: Fine-leaved Water-dropwort (Oenanthe aquatica), typical species for silty substrates where water fluctuates

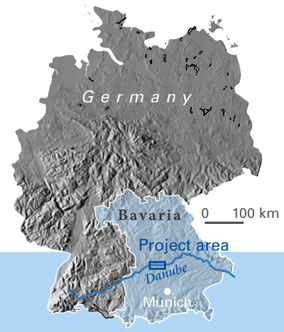
◀ right: Macro invertebrates: bioindicators for water quality and hydromorphology

◀ Hydrodiversity: ditches, pools and dead wood

◀ Dynamics of hydromorphology: bank erosion at the 2nd connection

Chronology

1997	Feasibility study by the World Wide Fund for Nature (WWF)
since 1998	Project leadership under the Government of Upper Bavaria
since 2003	Project leadership by the Free State of Bavaria represented by the State Office for Water Management Ingolstadt
since 2005	Permit approvals, construction of control structures and Ottheinrichbach bypass
since 2009	Monitoring
2010	Implementation of the project



www.wwa-in.bayern.de

Publisher: State Office for Water Management, Ingolstadt (under the jurisdiction of the Bavarian State Ministry of the Environment and Consumer Protection), Auf der Schanz 26, D-85051 Ingolstadt

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Translation Editor: L. Van Eeckhaute
Design: Claudia Pietsch
Photos: Aueninstitut Neuburg, WWA Ingolstadt, G. Heidemeier, C. Pietsch

1st english edition, December 2016

River and Floodplain Restoration

on the upper Danube by establishing river continuum and ecological flooding

Project of Bavaria, Germany, represented by the State Office for Water Management, Ingolstadt

Why restore the Danube floodplain?

The Danube floodplain between Neuburg and Ingolstadt still contains a 2,100 ha remnant of alluvial forest, evidence of a former magnificent wild river ecosystem. Due to stream regulations enacted in the 19th and 20th centuries, which allowed straightening of the river and the building of hydropower dams in Bergheim and Ingolstadt in the 1970s, the Danube lost its natural dynamics and river continuum. Flooding events declined and the groundwater fluctuations decreased from a range measured in meters to that of a few decimetres. Hydropower dams are preventing migration of aquatic organisms and causing a loss of stream habitats.

Reestablishing flood and groundwater dynamics, length and lateral connectivity between the Danube and floodplain and stream habitat enhancement are the major goals of this project. A **bypass river system**, **controlled ecological flooding** and **groundwater management** are the three strategies employed on the southern side of the Danube floodplain to achieve the ecological objectives listed above.

Danube Floodplain Restoration

Bypass river

(named after Ottheinrich 1502–1559, earl of Pfalz-Neuburg)

In order to attain upstream migration options for aquatic organisms, an eight kilometre river, the Ottheinrichbach, was built. The Ottheinrichbach bypasses the Bergheim dam with a maximal discharge of 5 m³/s and has three lateral connections to the Danube. A sluice gate, which guarantees permanent water flow of 1.5 m³/s to 5 m³/s from the Danube into the Ottheinrichbach, works on a graded, automatic system.
An integrated vertical-slot-pass of permanent 0.5 m³/s water flow enables fishes and macro invertebrates to pass the sluice gate from Ottheinrichbach upstream to the Danube above the Bergheim dam.
A new cross bridge leads the Ottheinrichbach over the ground water drainage ditch (Längenmühlbach), which is also connected with the Ottheinrichbach by a short cut upstream of the cross bridge. The Ottheinrichbach finally meets the Zeller Canal which runs in an old Danube meander to the mouth (3rd connection).

▲ Sluice gate to Ottheinrichbach with fish way (left)

▲ Short cut passage between Ottheinrichbach and Längenmühlbach

Controlled Ecological Flooding

At a discharge of between 600 m³/s and 1,100 m³/s in the Danube (mean discharge is 300 m³/s), a second sluice gate further upstream of the first opens to let 25 m³/s of water flow towards the Längenmühlbach. At the same time, the mouth of the Längenmühlbach closes in order to deliver 30 m³/s in total (25 m³/s plus 5 m³/s from Ottheinrichbach) through the floodplain forest along the Ottheinrichbach corridor. In this way, up to 100 ha of the floodplain is flooded, 3–4 times per year, for a period of 5–10 days.
Above a discharge of 1,200 m³/s, natural flooding occurs and the sluice gate closes.

▲ Sluice gate for controlled ecological flooding

▲ Ottheinrichbach during ecological flooding in January 2015

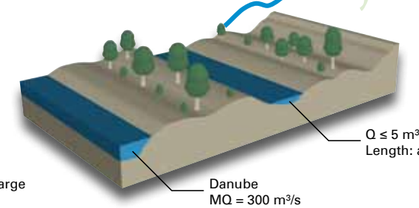
Groundwater Management

Since the Danube was blocked by hydropower dams, built mostly in the 1970s, the groundwater table changed from fluctuations in the meter range to high groundwater levels above the dam and a drop off with low water levels below. Both are now showing variations only in the decimetre range. In order to gain slightly more groundwater oscillations, the groundwater table is artificially dropped in some areas.
During low discharge seasons, when the Danube flow is below 150 m³/s, the lower part of the project area is drained by a drainage ditch while the Ottheinrichbach is blocked past the 2nd Danube connection as well as at the mouth of the Zeller Canal.

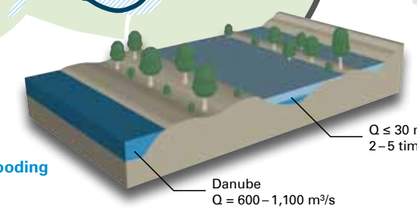
▲ Zeller Canal during groundwater management

▲ Structure to block the drainage ditch

Map reference:
7233 Neuburg, 7234 Ingolstadt
based on TM25



Bypass river
MQ = Mean discharge
Q = Discharge



Ecological flooding
Q = Discharge

Danube