Restoration of Ecosystem Functions at a (new) Danube Side Channel (Bavaria/Germany) – The Crux of too much or too little Water

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This talk will be about a large field lab experiment, in detail about:

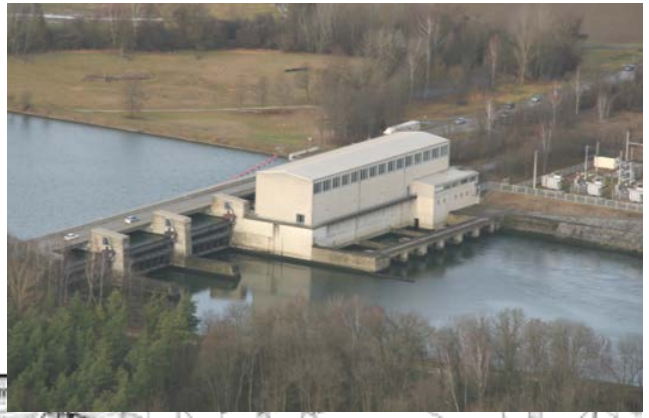
- Study Area
- Background and Problems
- Technical Set-up and Measures
- Monitoring Design
- Results and Management Strategies
- Lessons Learned

Study Area

- Study Area
- Background
- Technical Set-up
- Monitoring
- Results
- Lessons Learned

Historical Background

Since 1971: Hydropower stations of Bergheim and Ingolstadt



Since 1830: Embankment and straightening

Inventory of Disturbance

- Lack of natural floods and changes in groundwater dynamics – the floodplain is generally drying out
- No typically hydrological and morphological features like active meanders, ox-bows, and sand or gravel banks
- Danger of extinction of floodplain specific species
- Extinction of softwood riparian forests with e.g. *Populus nigra, Salix alba* or *Alnus incana,* and even change of hardwood forests – only remnants of original composition
- No possibility for migrating fish and other species to pass the dams (criteria of *European Water Framework Directive!)*

Objectives of Restoration

1. Connectivity!
2. Dynamics!

(In a dammed-up environment with hydropower stations and managed forest stands)

Purpose of Restoration

1. Nature conservation
2. Flood protection

Costs

1. Technical / hydraulic constructions: 14.2 million USD
2. Compensation to the land owner: 3.9 million USD
3. Monitoring: 1.6 million USD

Sums up roughly to : 20 million USD

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Objectives of Restoration

The model – a nature-like side channel along the Danube

- Study Area
- Background
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- Results
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Photo: National Park „Donau-Auen“ (Danube Floodplain), Vienna/Austria

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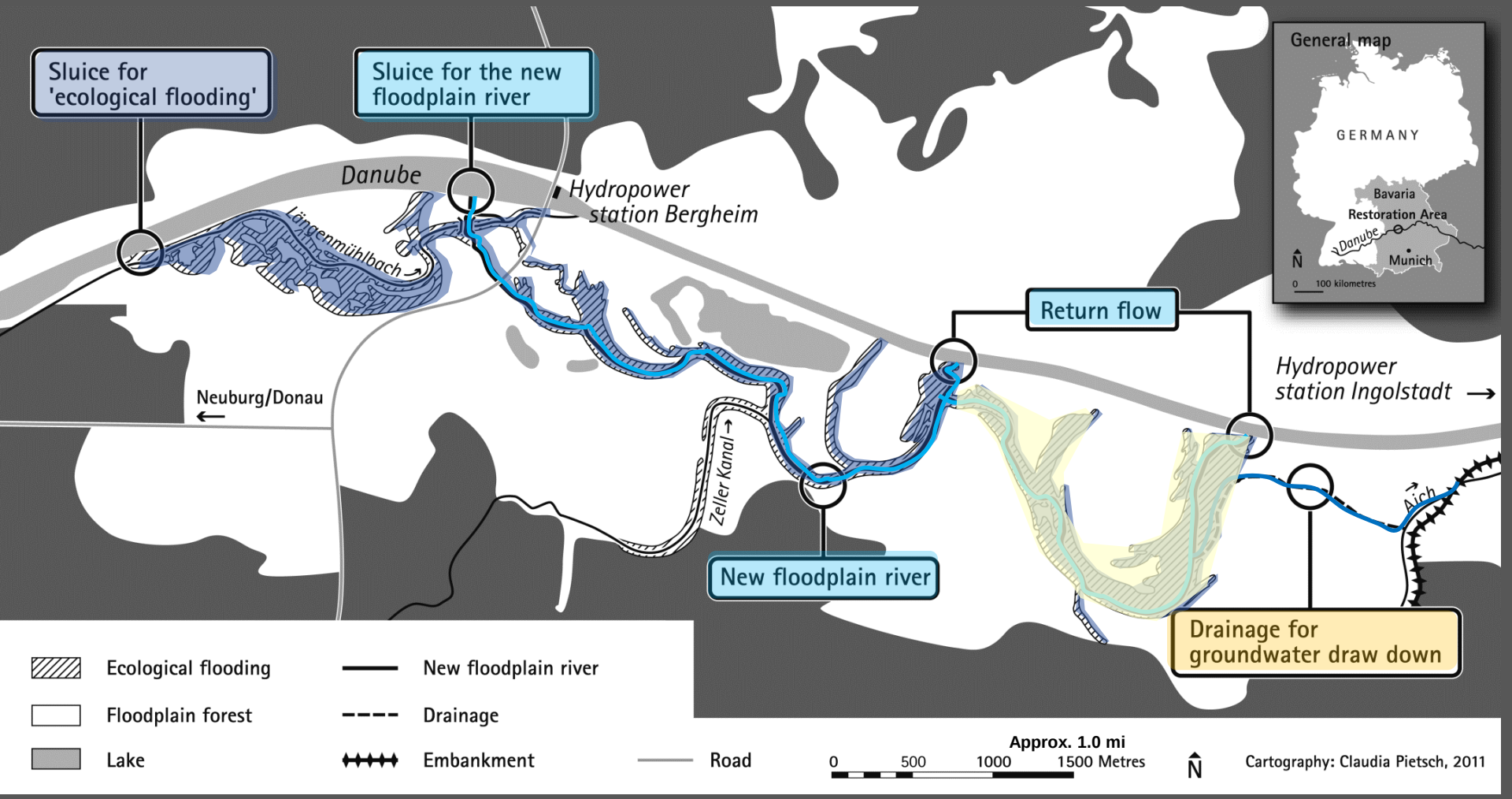
The Restoration Project



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Starting the Side Channel

- Study Area
- Background
- Technical Set-up
- Monitoring
- Results
- Lessons Learned

Maximum discharge: 175 ft^3/s or 5 m^3/s

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Opening of Sluice Gates for ‘Ecological Flooding’

- Study Area
- Background
- Technical Set-up
- Monitoring
- Results
- Lessons Learned

Maximum discharge: 880 ft^3/s (combined with the bypass approx. 1,050 ft^3/s)
25 m^3/s 30 m^3/s

Monitoring Design and most Important Aspects

Floodplain Institute Neuburg

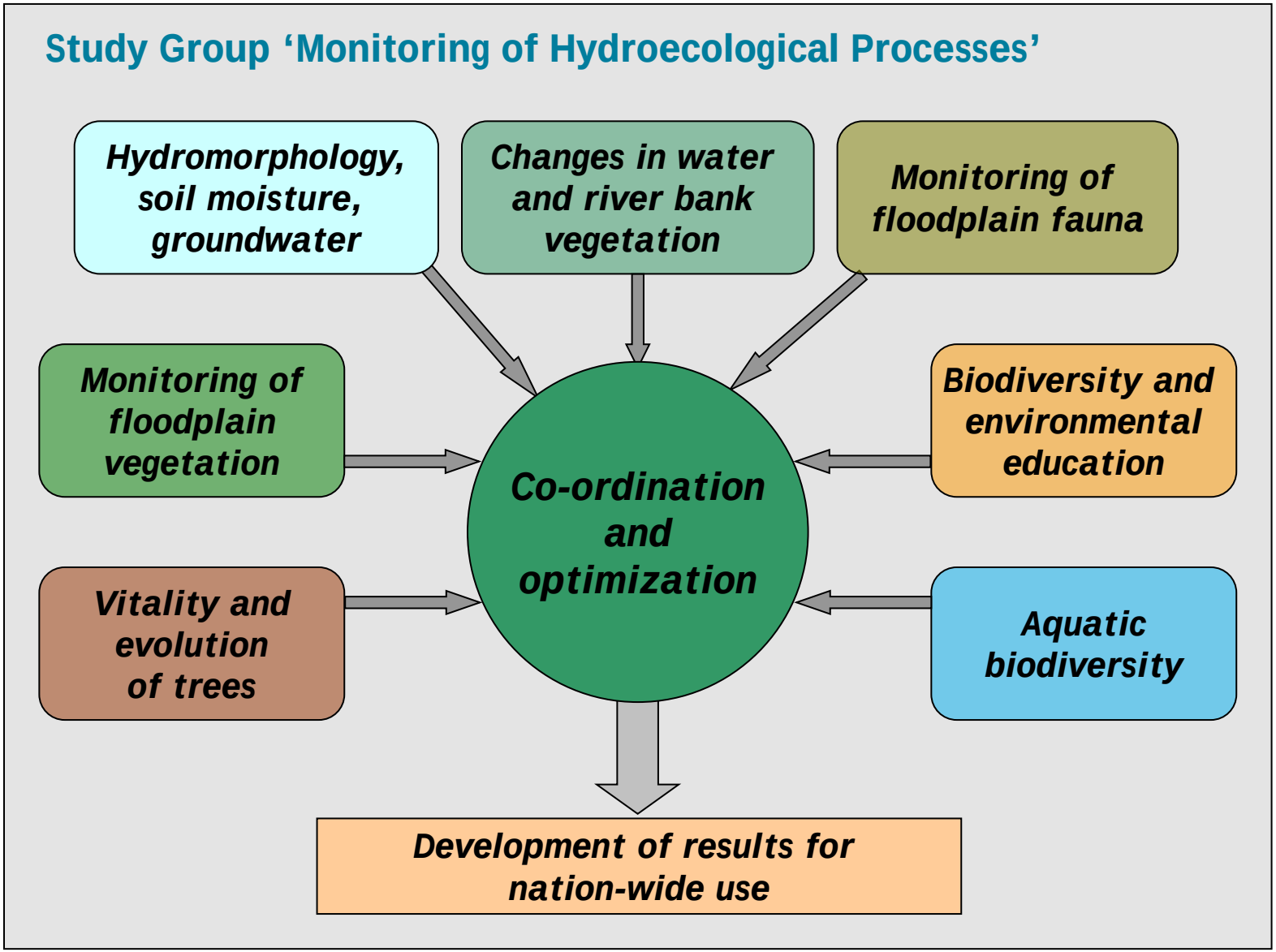
University of ...

Eichstaett

Osnabrueck

Munich

Weihen-stephan



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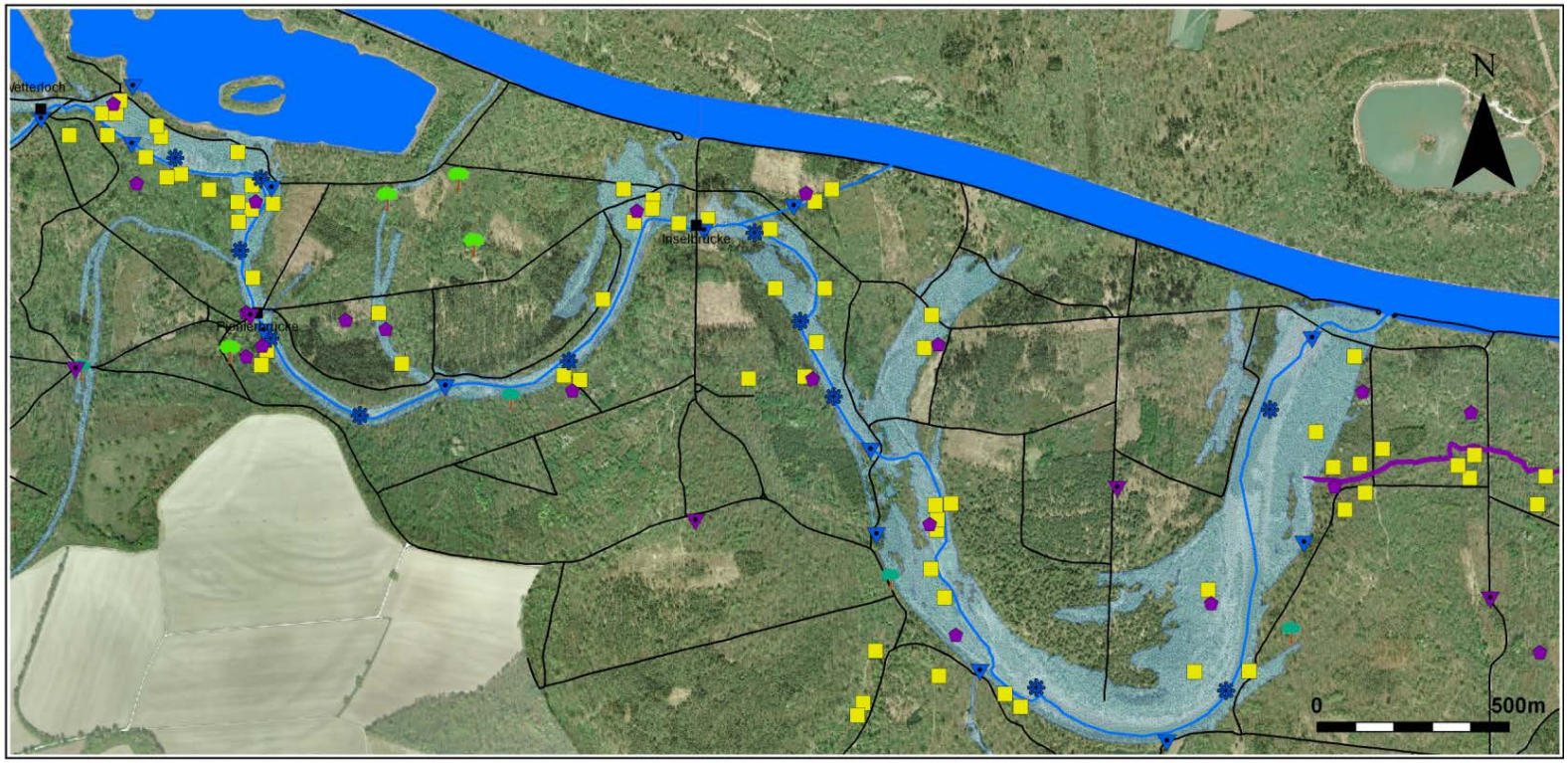
Monitoring Design

Gauges and monitoring plots – eastern project area



Location of gauging stations for soil moisture (⬟ 31), runoff (▼ 15) and groundwater (▼ 22) as well as vegetation permanent plots (■ 131) and vegetation transects (✹ 25)
(digits valid for entire project area)

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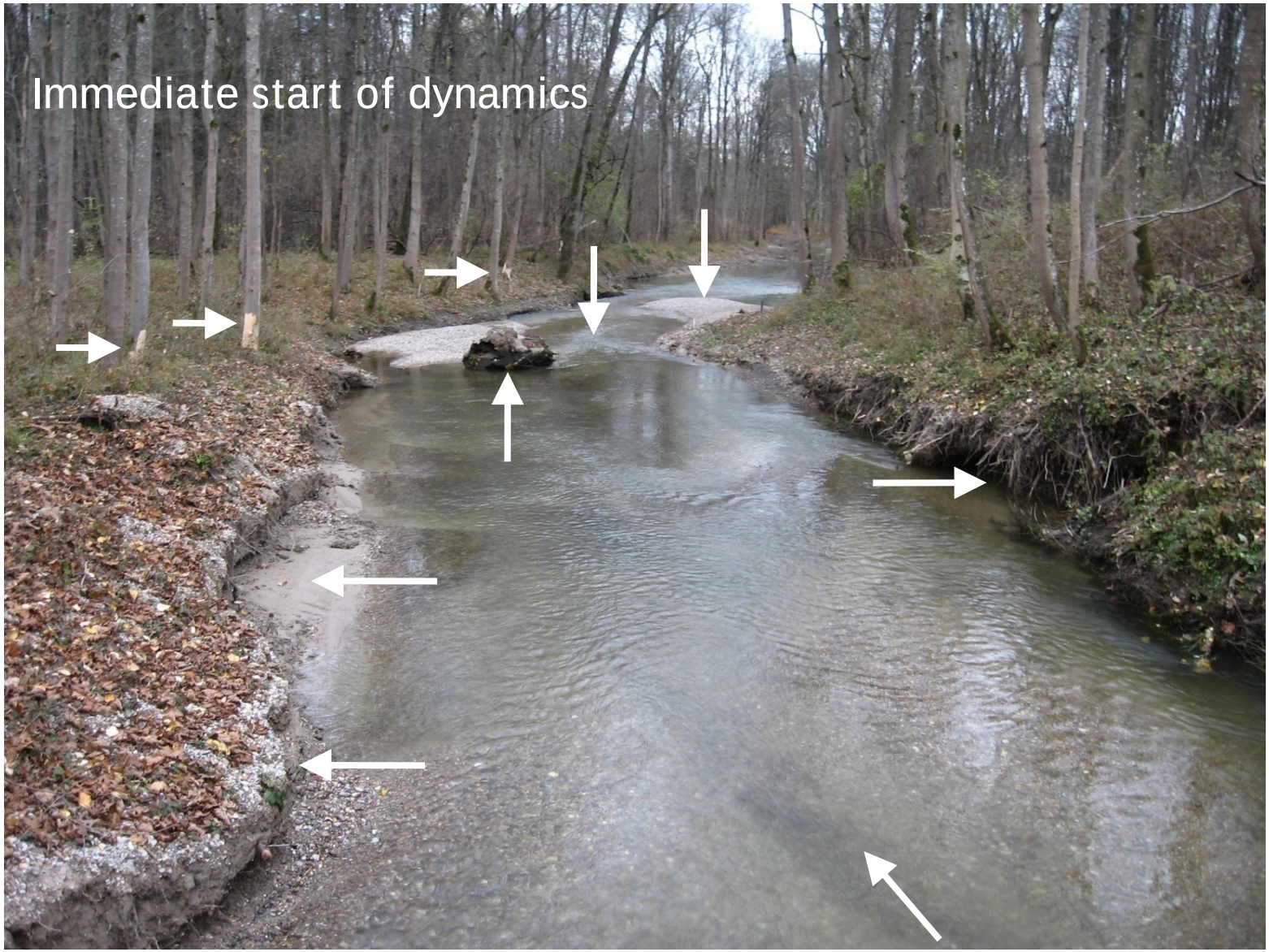
Results

- Bed erosion
- Bank erosion
- Sand bank
- Undercut slope
- Drifted dead wood
- Beaver activity
- Riffle
- Gravel bank



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Different Interests of Management or Management of Different Interests?

Main interests of restoration (stakeholder view):

- Fostering areas of softwood riparian forests (e.g. with willows and cottonwood) *(Habitats Directive of European Union)*
- Dynamics, expressed by longer and more extremes
- Developing areas in the range between high and low water *(Habitats Directive of European Union)*
- Longitudinal connectivity, and therefore 'flowing waters' *(Water Framework Directive of European Union)*

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Different Interests of Management or Management of Different Interests?

- *Water Framework Directive* demands connectivity by law!
- *Habitats Directive* demands the protection of floodplain dynamics and respective habitats by law!
- You need longer periods of low water level (ranging partly to nil) for the germination of softwood species (e.g. white willow) on habitats like sand banks
- 'No water' > no connectivity > problems for fish + destruction of population of macroinvertebrates in the respective year
- **Management clash between supporters of dynamics and supporters of species conservation!**

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Management Strategies

- Protection of processes prior to protection of species
- Dynamics going to extremes (ranging from flood to no water at all)
- Creation of as many floodplain habitats as possible along different stretches of side channel
- Monitoring of species and the development of habitats

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Lessons Learned

- It is not possible to restore each and every floodplain habitat along an 5 miles / 8 km stretch of a side channel
- Directives are not tuned in every paragraph
- Stakeholder management is important to balance out different interests from the beginning
- If possible let nature design the habitats – even if nature sorts out protected species
- If you try to design habitats by 'controlling the controlled' you will get in trouble – with stakeholders and with environmental ethics

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The first trees have fallen by active dynamics!

Credits:

Water Management Authority of Bavaria/Germany

Federal Agency for Nature Conservation

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