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

Catchment size: 315,000 mi²
Average annual discharge:
- German-Austrian border: 26,500 f³/s
- Romanian estuary: 230,000 f³/s

The Alps
Vienna Munich
Budapest
Bucharest
Historical Background

Since 1830: Embankment and straightening

Since 1971: Hydropower stations of Bergheim and Ingolstadt
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!** (In a dammed-up environment with hydropower stations and managed forest stands)

2. **Dynamics!**

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
Objectives of Restoration

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

Photo: National Park „Donau-Auen“ (Danube Floodplain), Vienna/Austria
Area of Restoration/Monitoring: 3,000 acres / 12 km²
Length of Side Channel: 5 miles / 8 km
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The Restoration Project

IGC 2012, Cologne: Session SE 03-01 ‘Can we manage human-nature interactions’

Bernd Cyffka, August 30, 2012
Starting the Side Channel

Maximum discharge: 175 ft³/s or 5 m³/s
Opening of Sluice Gates for ‘Ecological Flooding’

Maximum discharge: 880 ft³/s (combined with the bypass approx. 1,050 ft³/s) 25 m³/s 30 m³/s
Monitoring Design and most Important Aspects

Study Group ‘Monitoring of Hydroecological Processes’

- Hydromorphology, soil moisture, groundwater
- Changes in water and river bank vegetation
- Monitoring of floodplain fauna
- Monitoring of floodplain vegetation
- Vitality and evolution of trees
- Biodiversity and environmental education
- Aquatic biodiversity

Co-ordination and optimization

Development of results for nation-wide use
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)
Results

Immediate start of dynamics

Bed erosion
Bank erosion
Sand bank
Undercut slope
Drifted dead wood
Beaver activity
Riffle
Gravel bank
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*
• Study area
• Background
• Technical set-up
• Monitoring
• Results
• Lessons learned
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!
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
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.
The first trees have fallen by active dynamics!

Many thanks for your attention!

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