ETIP HYDROPOWER

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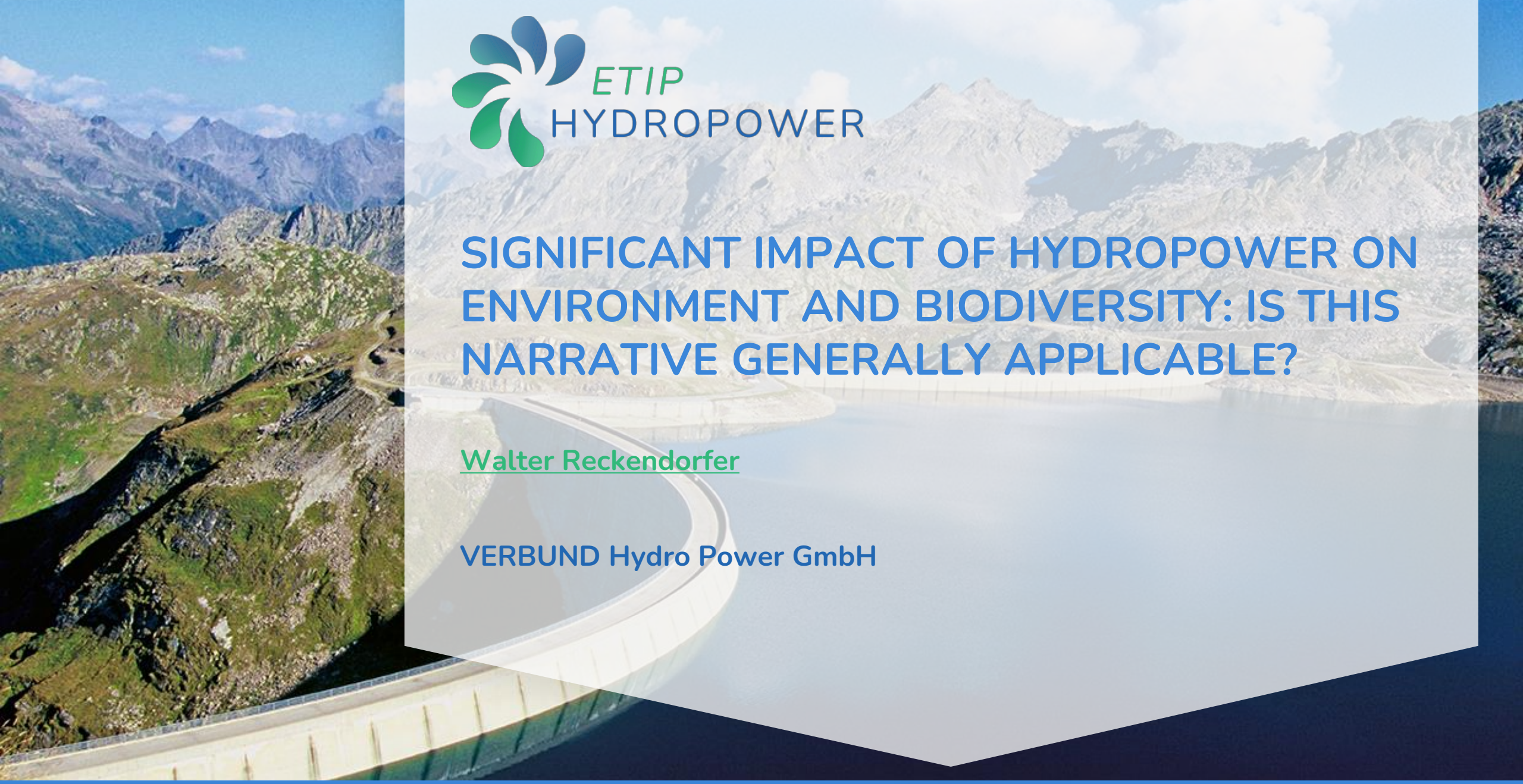

SIGNIFICANT IMPACT OF HYDROPOWER ON ENVIRONMENT AND BIODIVERSITY: IS THIS NARRATIVE GENERALLY APPLICABLE?

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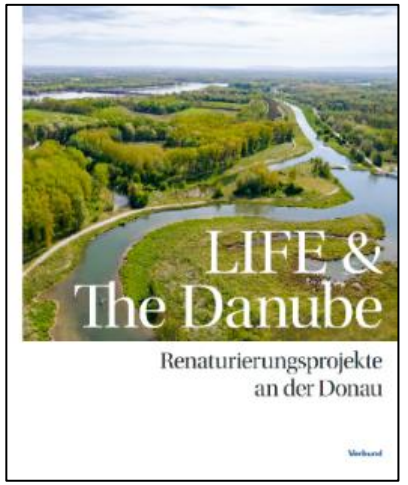
Outline

- Background
- The VHP approach to mitigate HPP effects
- Three (best practice) examples
  - LIFE Traisen
  - LIFE Netzwerk Donau (fishway at HPP Ottensheim-Wilhering)
  - Fishway at HPP Ering-Frauenstein / Inn river
- Challenges / Replicability

Background

- Hydropower provides renewable energy and flexibility and plays an important role in the de-carbonisation of our energy systems
- Like all forms of energy generation, hydropower has some environmental impacts, both on aquatic and terrestrial habitats near water bodies
- Specific impacts of hydropower
  - **Fish migration**
  - Sediment continuity
  - Hydropeaking
  - **Habitat alteration** (impoundment, lateral connectivity – floodplains, …)
  - ….

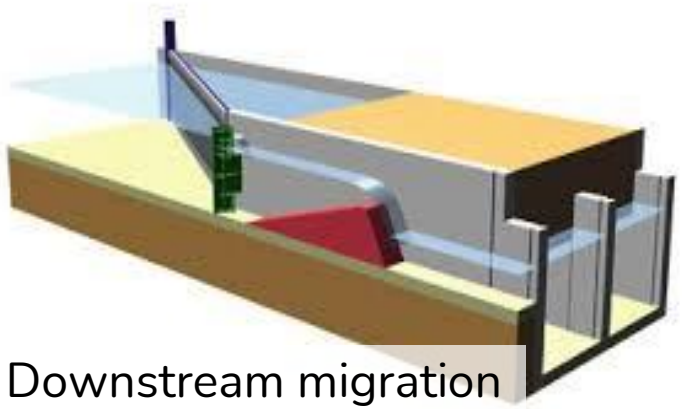
The VHP approach to mitigate HPP effects
Success Story LIFE Projects



	LIFE - Projekt	Maßnahmen in NATURA 2000 Gebieten	Projektdauer
Projekte unter Führung VHP			
	Traisen	7 km neues naturnahes Flussbett bis zur Traisenmündung	2009-2019
	Netzwerk Donau	FAH KW Greifenstein, Abwinden-Asten, Ottensheim-Wilhering, Stauwurzel KW Melk	2011-2020
	Network Danube+	FAH KW Altenwörth, FAH's Schmieda/Gießgang	2019-2021
	Riverscape Lower Inn	FAH KW Egglfing, KW Braunau, Renaturierungen	2020-2028
	Blue Belt Danube-Inn	FAH's der KW Ybbs, Aschach, Passau-Ingling, Schärding, Maßnahmen KW Jochenstein	2021-2026
Projekte mit VHP als Partner			
	Vernetzung Donau-Ybbs	FAH KW Melk, Anbindung Ybbs	2004-2009
	Danube Wild Island Habitat Corridor	Insel Unterwasser KW Abwinden-Asten (Kompensation)	2021-2025
	Flusslandschaft Mittlere Enns	Aufweitungen Mittlere Enns (Schwallreduktion KW Sölk)	2011-2015

The VHP approach to mitigate HPP effects

- Achieve good ecological status/potential using a cost-effective combination of measures
- Lessons learned and recommendations
  - Think systemically (don't tackle individual problems, look at the whole picture)
  - Don't stick to paradigms (e.g. fish passes don't work for downstream migration)
  - Use synergistic approaches (e.g. **nature-based solutions**)
  - Technical solutions are not always the best answer, although they are often promoted in guidelines
  - Implement best practice


Downstream migration


Upstream migration


Fish protection


Synergistic solution

Life Traisen

LIFE Traisen

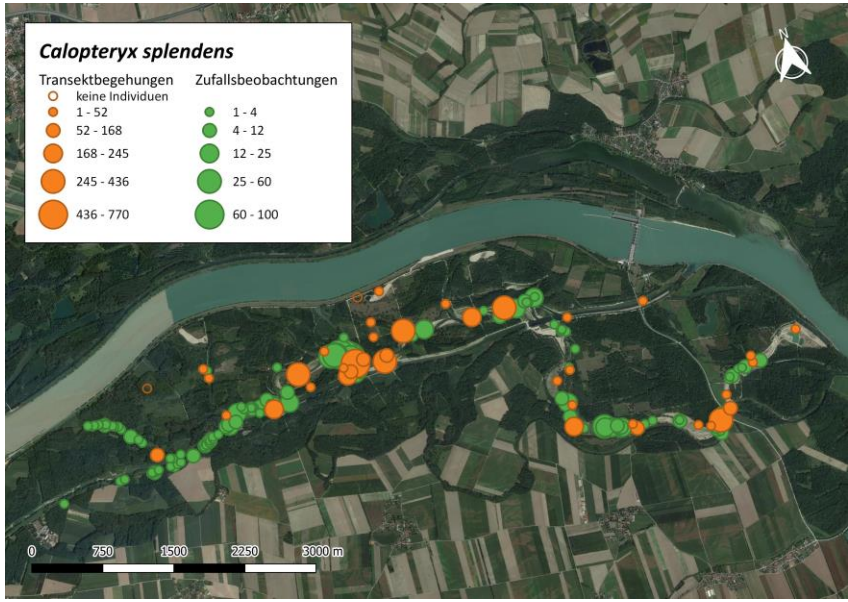
- The LIFE+ project “Lebensraum im Mündungsabschnitt des Flusses Traisen“ is the largest LIFE project dealing with (semi)aquatic habitats in Austria.
- € 30 Mio
- 10 km new river corridor
- Riverbed 30 m
- Lowering of the floodplain at about 60 m– 60 ha new
- 160 Engineered log jams / Large woody debris
- 30 ha dry grassland (6210)
- The project created a new large natural river ecosystem with connected tributaries and adjacent floodplains typical for the Danube River.
- The results with regard to fauna, flora, and habitats exceed all expectations.

Biodiversity

Arten	Rote Liste		Anzahl Reviere/Brutpaare	
	Ö	NÖ	Jahr 2009	Jahr 2018
Flussregenpfeifer *Charadrius dubius*	VU	VU	1(–2)	7(–8)
Flussuferläufer *Actitis hypoleucos*	EN	EN	0	3(–5)
Eisvogel *Alcedo atthis*	VU	EN	7(–9)	10(–15)
Uferschwalbe *Riparia riparia*	NT	NT	0	Große Kolonie (ca. 210 frische Brutröhren) und einzelne Brut-röhren

- Fish ecological status from bad to (very) good
- Habitats of European significance (ca. 60 ha softwood forest)
- Steep banks with Riparia riparia (new in the area), Kingfisher (breeding pairs increased from 9 to 15, gravel breeders from 2 to 13 pairs)
- Forest birds benefit from high insect availability
- Extremely high densities of dragonflies

year	bird species
2018	111!
2009	72

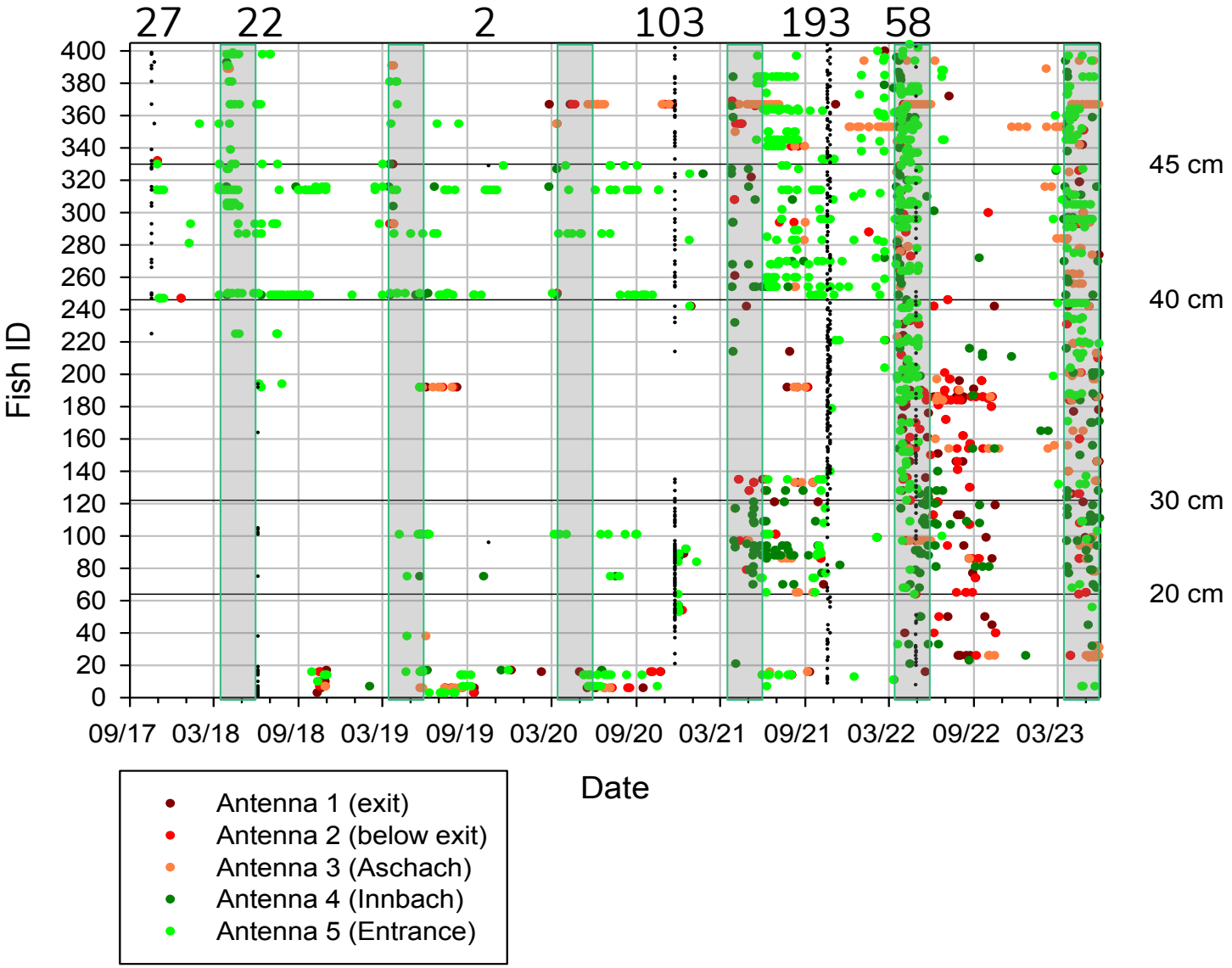


Fishway Ottensheim-Wilhering

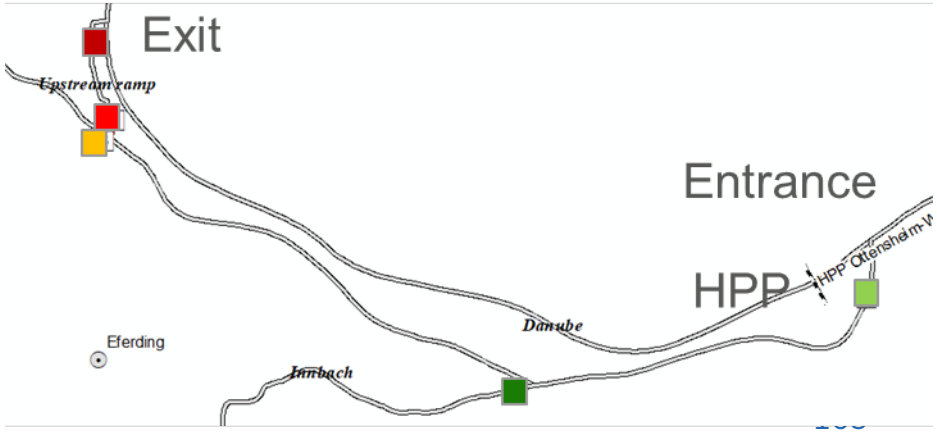
LIFE Netzwerk Donau

- The approach of providing both – fish migration and high-quality key habitats – ensures a significant contribution to the goals of the Water Framework Directive as well as the Habitats Directive.
- 14.2 km nature-like fish way
- Finished in 2016
- Integration of natural water bodies
- Restauration measures in the water bodies
- Habitat improvement & creation
- Increased connectivity (lateral & longitudinal)

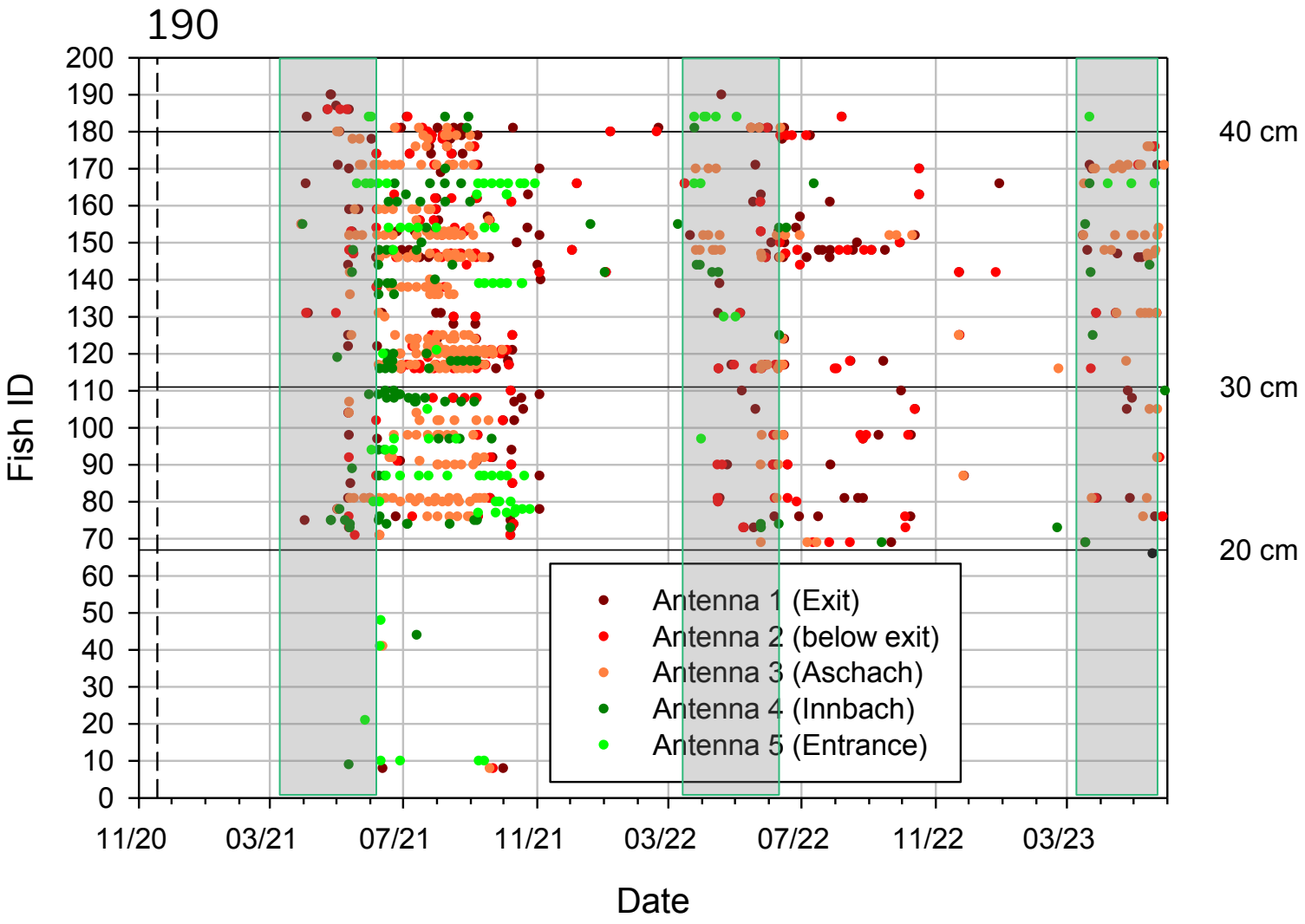
NbS for bi-directional fish movement



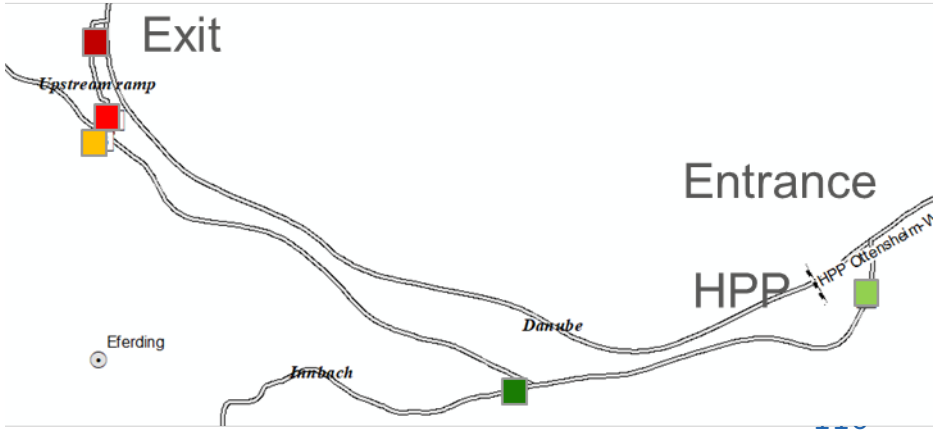
- 404 nase (5 batches) released downstream
- 276 of 404 nase (68 %) detected in the fish pass;
- 251 of 341 nase > 20 cm (74 %) detected in the fish pass
- The first and last detections are mostly on the downstream antenna - most fish enter and leave the fishway from and to the tailwater.
- Most of the fish use the fishway not only for spawning, but the whole growing season from March to October



NbS for bi-directional fish movement

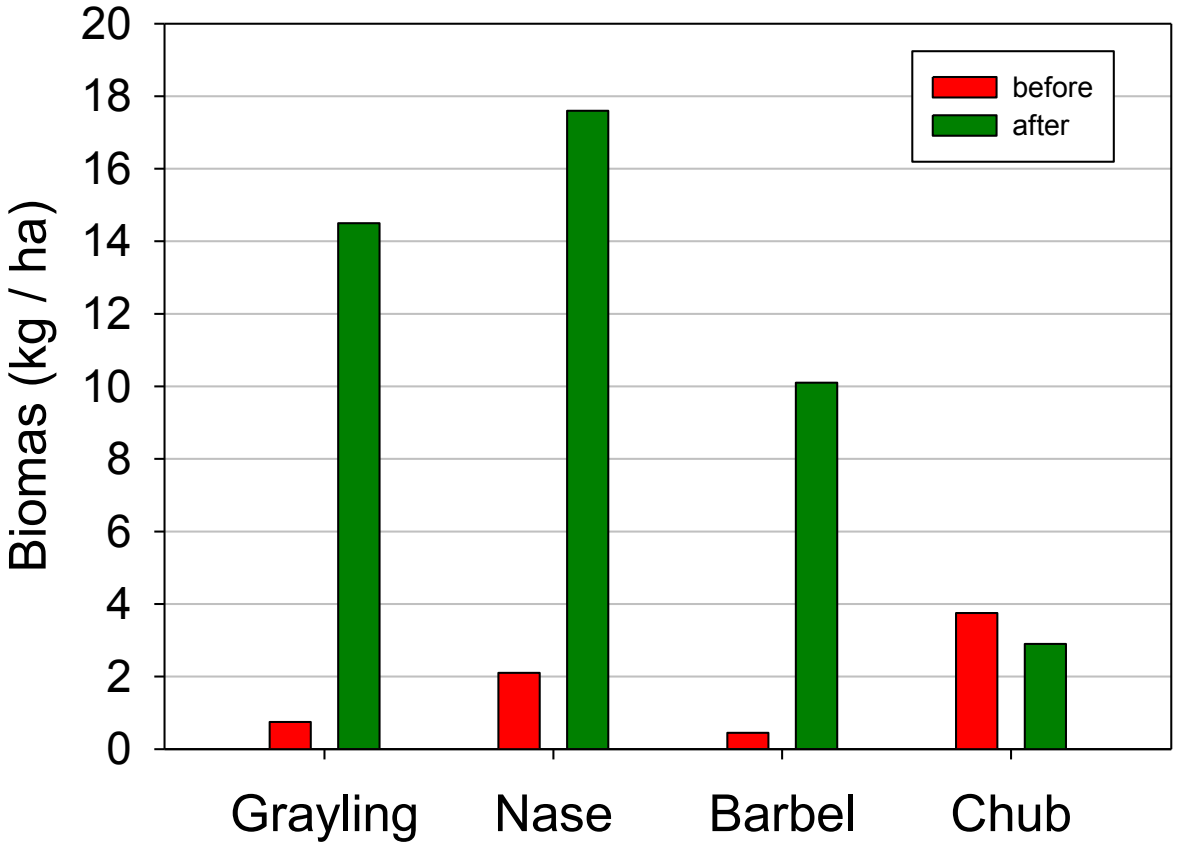


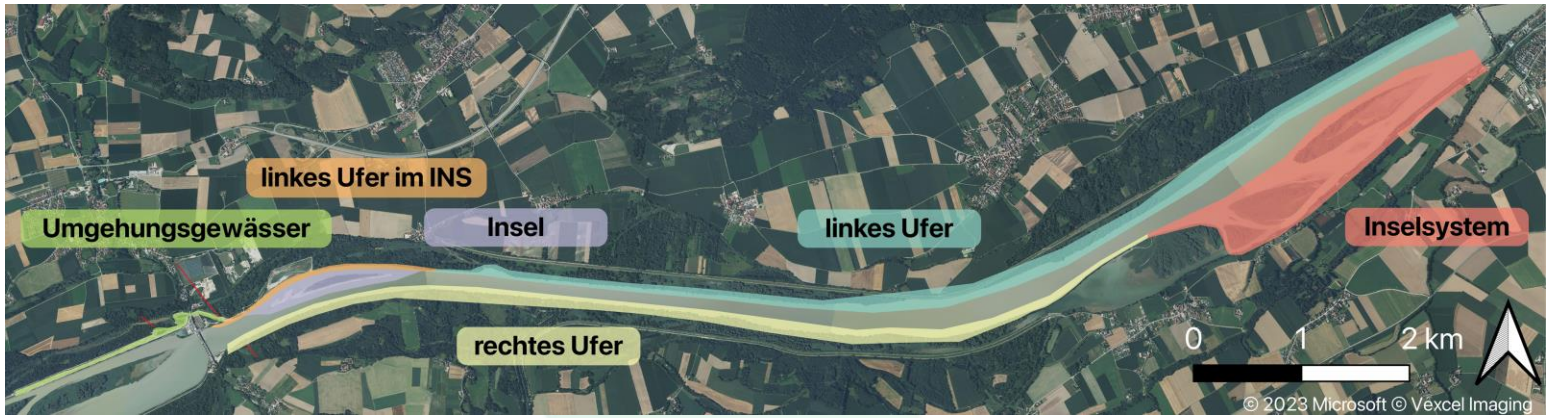
- 190 nase (one batch) released upstream
- 80 of 190 nase (42 %) detected in the fish pass;
- 73 of 123 nase > 20 cm (59 %) detected in the fish pass
- The first and last detections are mostly on the upstream antenna - most fish enter and leave the fishway from and to the impoundment.
- Most of the fish use the fishway not only for spawning, but the whole growing season from March to October



Fishway HPP Ering/Inn

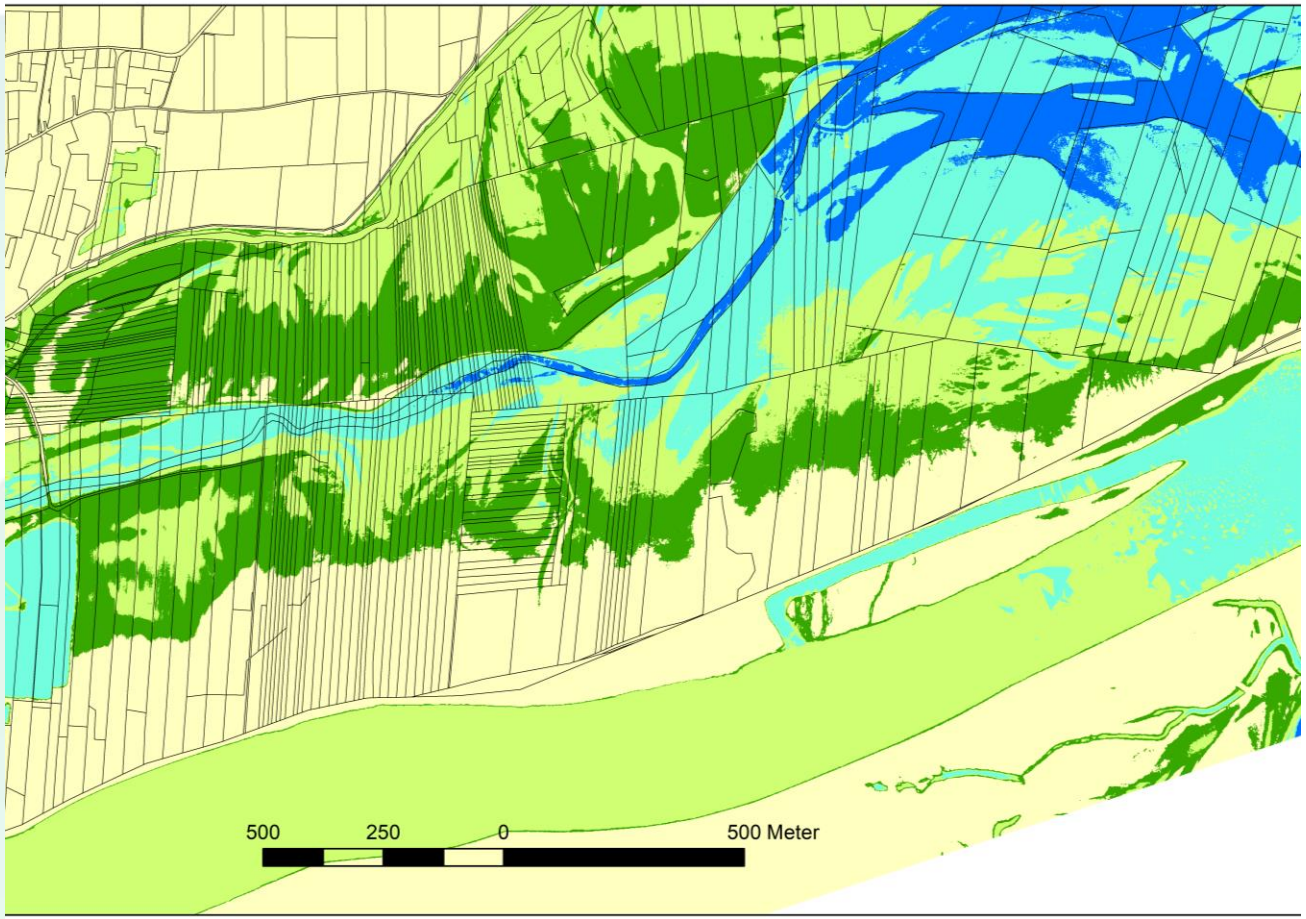
- The bypass river at Ering restored the longitudinal connectivity for the species rich Inn fish fauna, and created spawning und nursery grounds for rheophilic species
- The approach of providing both – fish migration and high-quality key habitats – ensures a significant contribution to the goals of the Water Framework Directive as well as the Habitats Directive.
- Discharge: 2-12 m^3/s
- Length. 2.6 km
- Slope: max 4.7 ‰





Spatially explicit population model

- At the Ering-Frauenstein hydropower plant, a quantitative assessment of fish recruitment of selected river fish species was be carried out using spatially explicit population models.
- Aim: to estimate the contribution of newly created habitats to the total fish population
- Results: Additional fish biomass can be recruited through the measures implemented:
  - + 11.800 Grayling = 14,5 kg / ha
  - + 4.300 Nase = 17,6 kg / ha
  - + 6.200 Barbel = 10,1 kg / ha
  - + 3.100 Chub = 2,9 kg / ha
  - In total ca. 45 kg/ha additional fish biomass
- Significant contribution to target achievement (good ecological status) in accordance with the Water Framework Directive.



Challenges / Replicability

Often big landowners: former aristocrats, church

In some parts hundreds of land owners per river-km; Little willingness to sell land (Ukraine crisis, High Inflation, ..)

Guidelines with a focus on technical solutions

Environmental Impact Assessment linked to forestry (> 10 ha logging / wood cutting) – law changed!

Often Compensation for habitats in Natura 2000 necessary, even if measures are foreseen in the management plans

Share experience: Together with other European renewable energy producers, we are now developing guidelines for the integration of renewable energy in an ongoing Eurelectric project

Take home message

- So the short answer is that, like all forms of energy generation, HPP has an impact on the environment, but a lot has changed from the past:
  - The increase in environmental awareness has led to the recognition that HPP operation includes a responsibility to protect the natural resources that depend on water
  - Large scale river restoration projects proved to be highly effective
  - NbS benefits not only fish, but biodiversity as a whole
  - All species and habitats typical for large river-floodplain systems benefit
- Challenges
  - Land availability
  - Existing guidelines (e.g. are recommendations developed for small HPP valid for large ones?)
  - Nature law (e.g. Natura 2000) vs. WFD - but also a big chance

THANK YOU!

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