

The river as a habitat for river ecologists

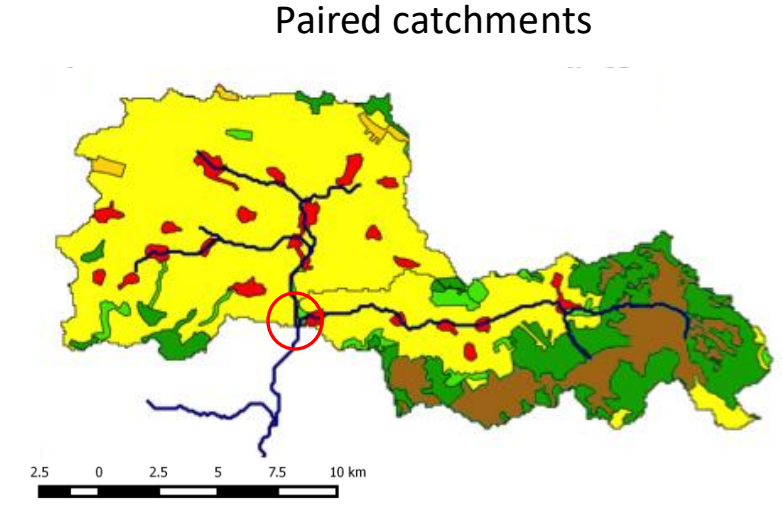
Gabriel Singer (FLEE, Dep. for Ecology, Innsbruck University)

ADVOCACY NETWORK



SCIENCE

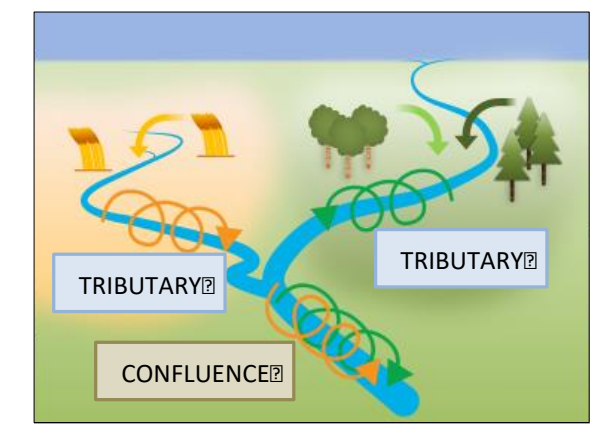
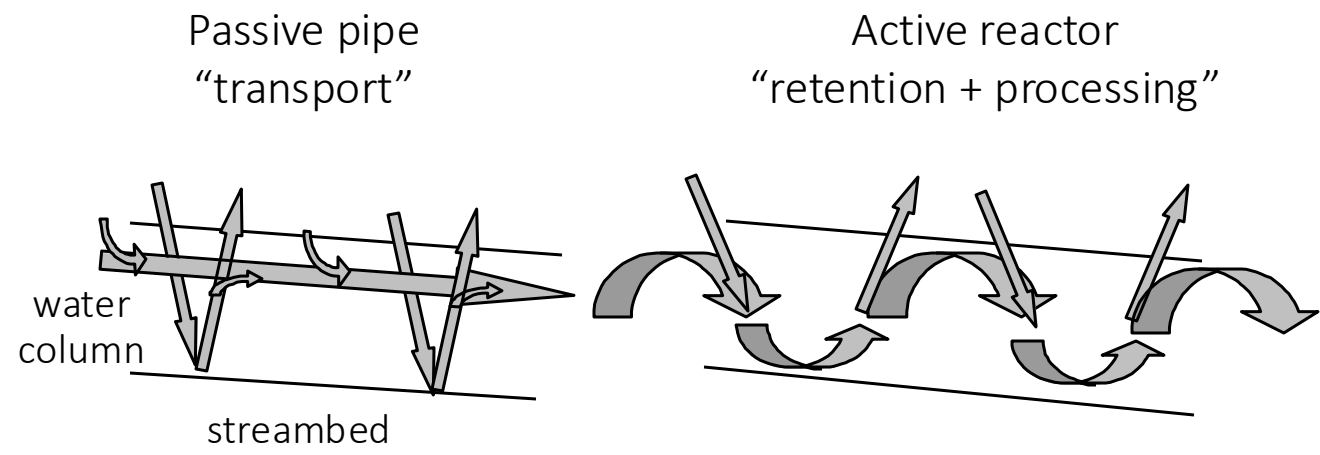
Rivers drive flow of materials, including transport and processing.



Bioreactor: Processing of materials during transport

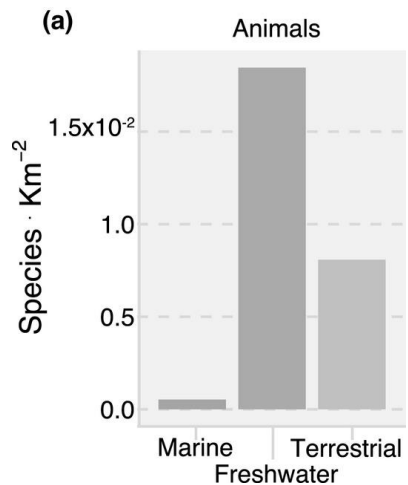
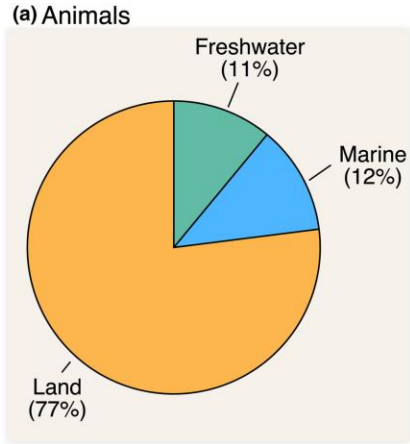


Absorbance and fluorescence

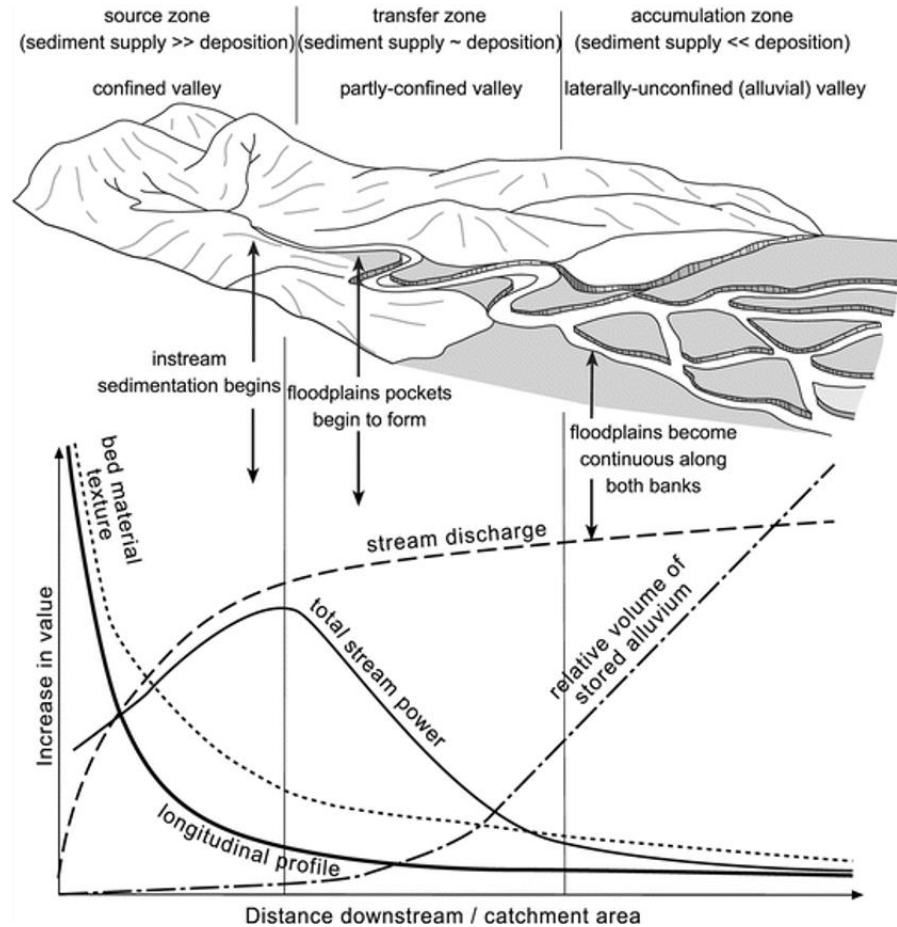


How to explain the high biodiversity in rivers?

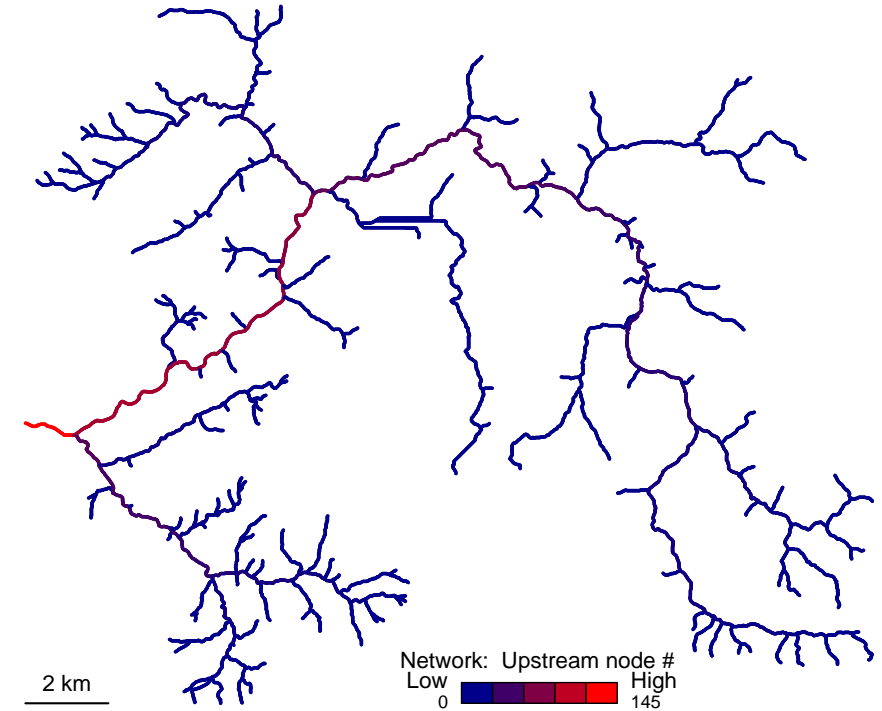
Distribution of species richness



Gradients in habitat properties



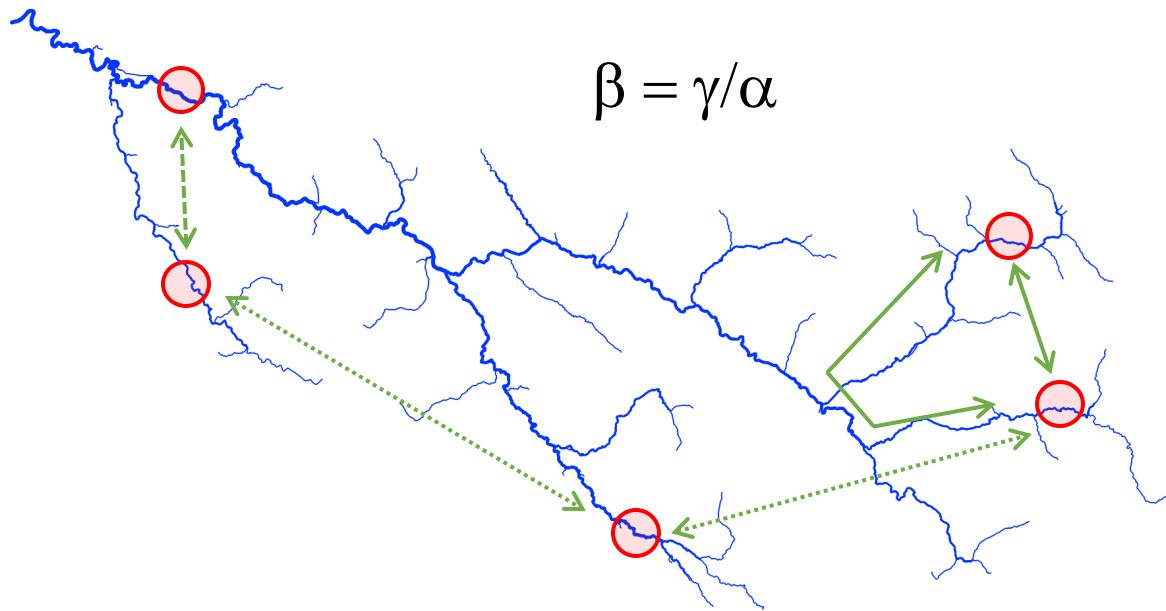
Dendritic Network structure





Also biodiversity is a consequence of moving/flowing (organisms)

1. Niche-based: Habitat diversity, across several spatial scales



2. Niche-independent: caused by disturbance, extinction and recolonization, “neutral”, implies movement in space (microbes, insect, fish)

- **Beta-Diversity:** A large fraction of the regionally available diversity (γ) may be contained in the differentiation (β) of local communities (α).
- Changes of **connectivity** (fragmentation, flow regime) alter the ability of the river to host biodiversity.

Prosopistoma pennigerum (Ephemeroptera) – the Vjosa-“flagship”

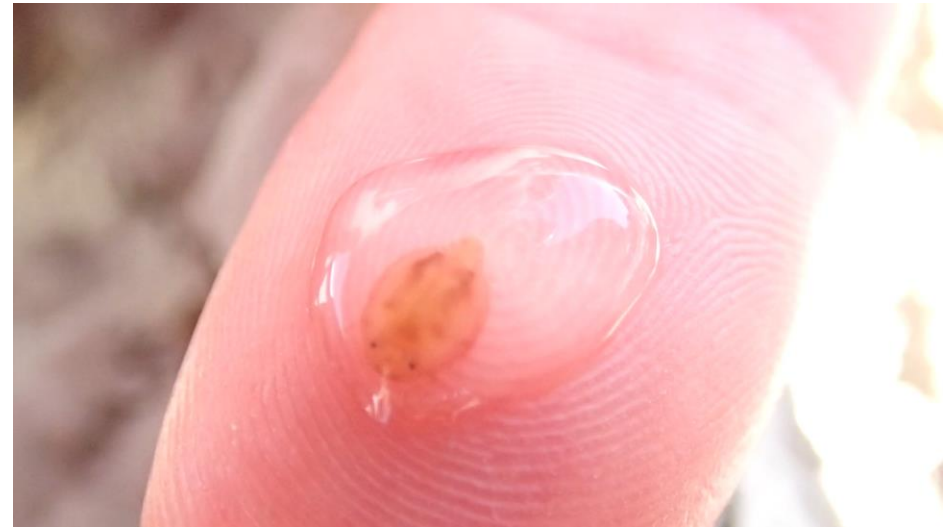
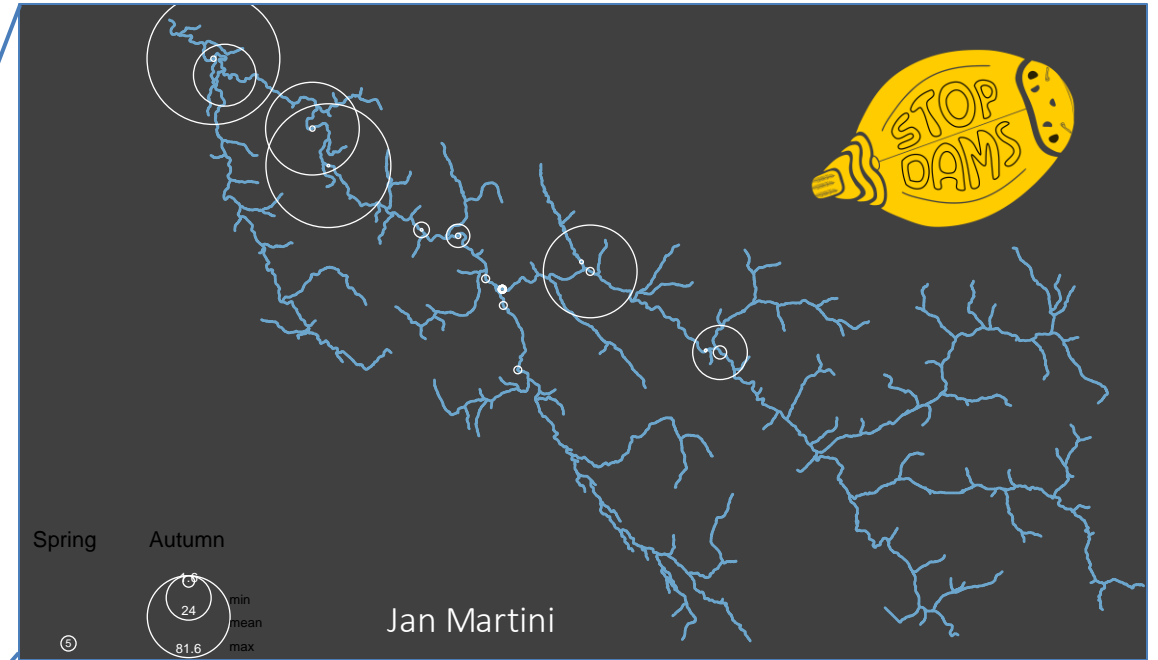
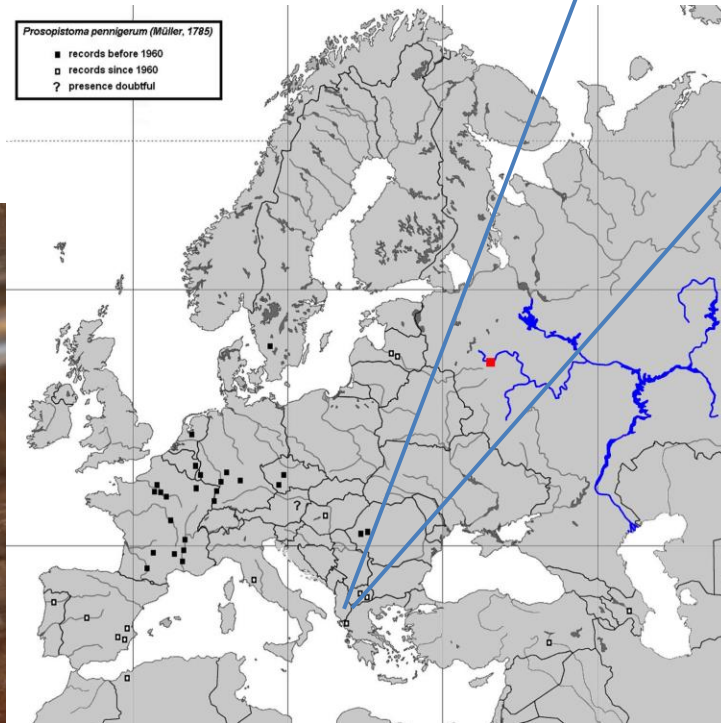
ORIGINAL ARTICLE



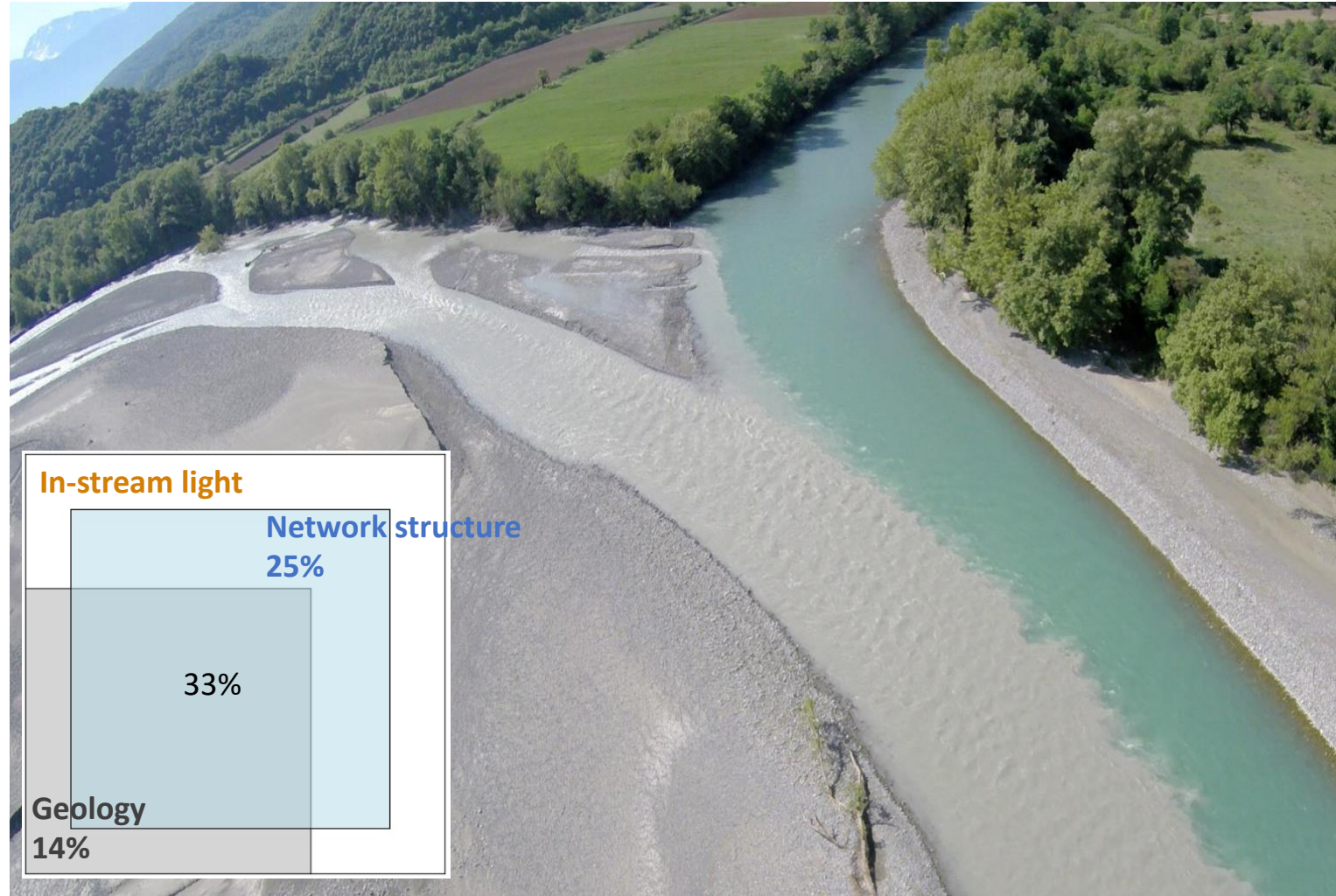
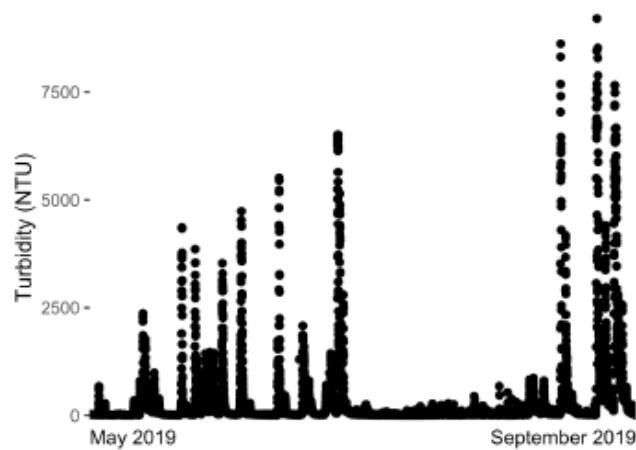
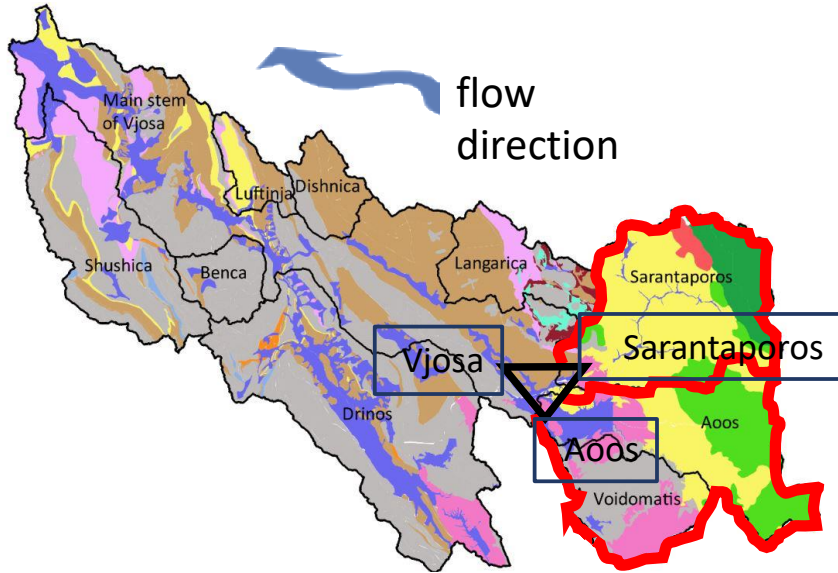
The last hideout: Abundance patterns of the not-quite-yet extinct mayfly *Prosopistoma pennigerum* in the Albanian Vjosa River network

Jan Martini^{1,2} | Franziska Walther³ | Tamara Schenekar^{1,4} | Emil Birnstiel^{5,6} | Remo Wüthrich^{5,6} | Rebecca Oester^{5,7,8,9} | Bernadette Schindelegger² | Thea Schwingshackl¹ | Olivia Wilfling¹⁰ | Florian Altermatt^{8,9} | Matthew V. Talluto¹ | Gabriel Singer^{1,11} | Simon Vitecek^{2,10}

Imago?
Parthenogenetic?



At the confluence of Aaos and Sarantaporos – Geological diversity creates a dynamic turbidity gradient in the river network



Turbidity by kayak and satellite

<https://doi.org/10.5194/egusphere-2023-156>
Preprint. Discussion started: 14 February 2023
© Author(s) 2023. CC BY 4.0 License.



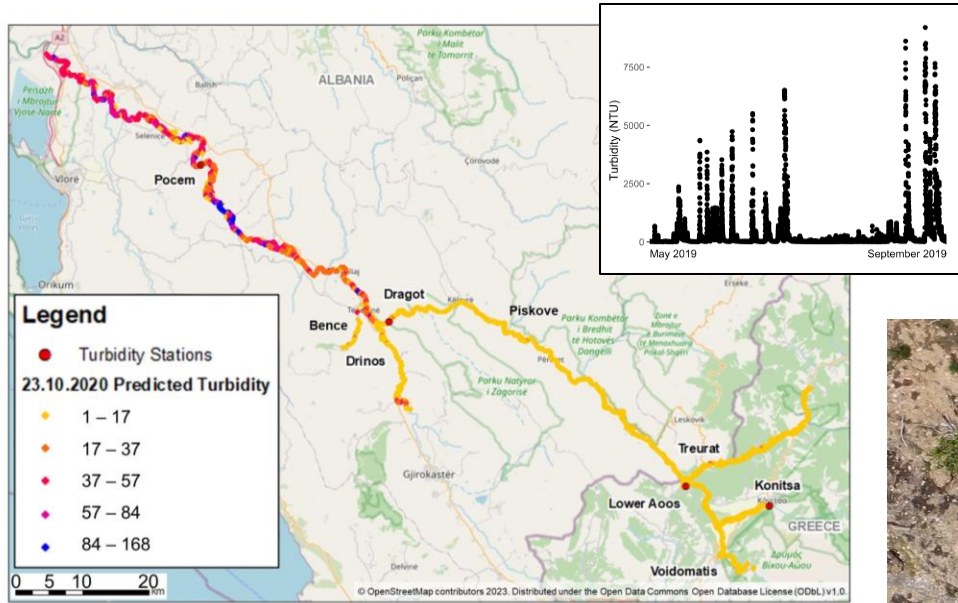
Sediment source and sink identification using Sentinel-2 and (kayak-based) lagrangian river turbidity profiles on the Vjosa River

Jessica Droujko^{1,*}, Srividya Hariharan Sudha¹, Gabriel Singer², and Peter Molnar¹

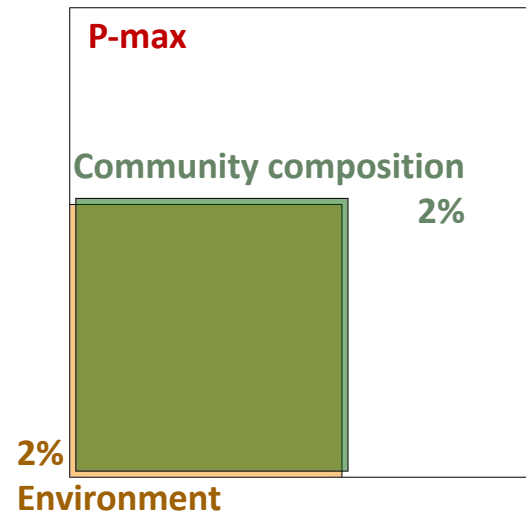
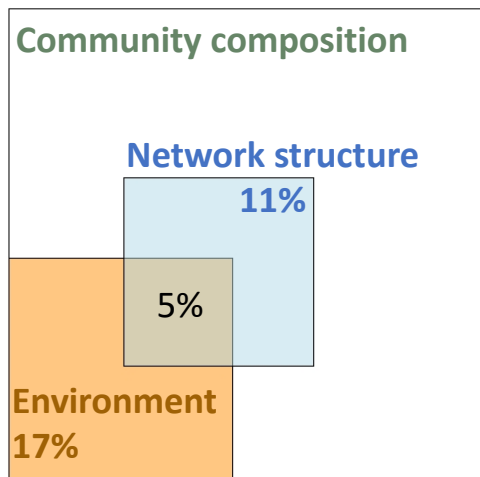
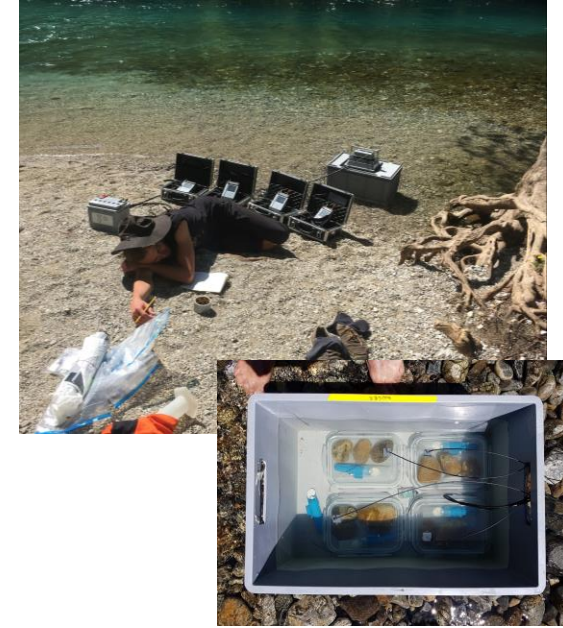
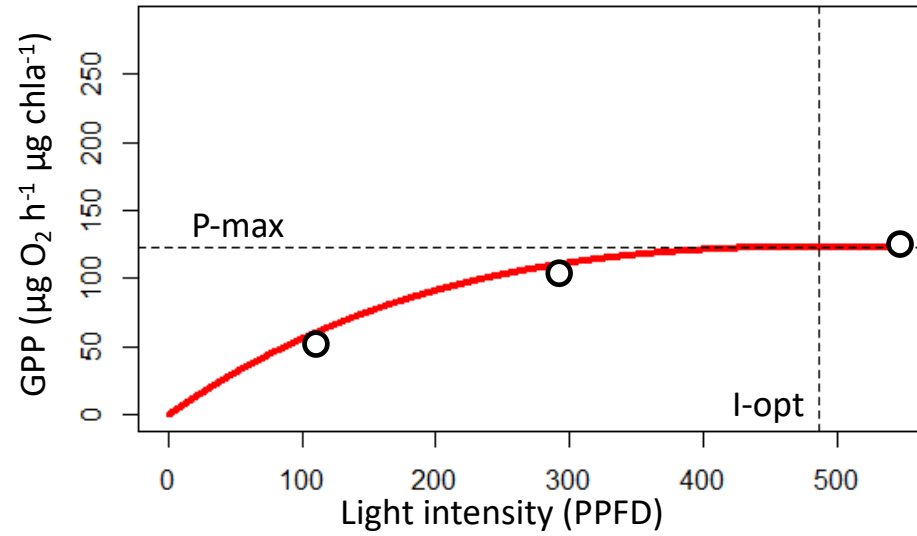
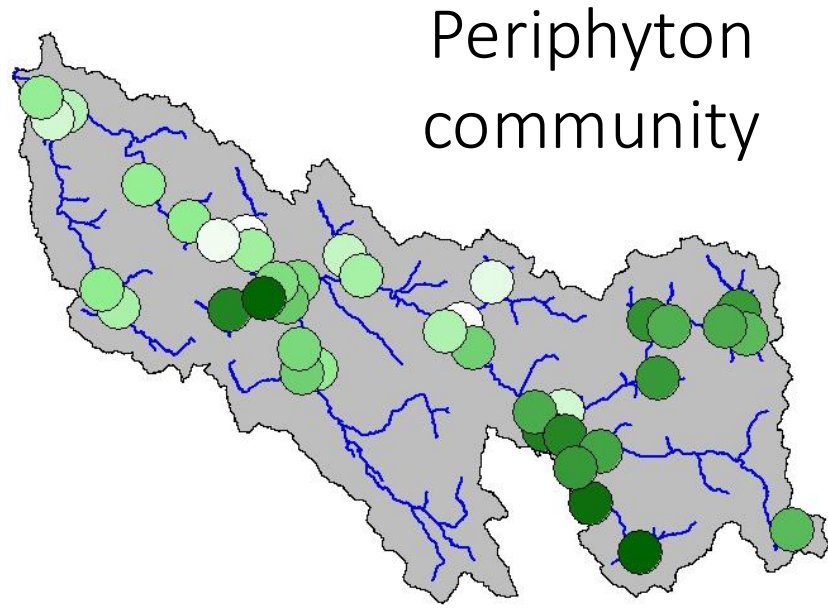
¹Institute of Environmental Engineering, ETH Zurich, Zurich, Switzerland

²Department of Ecology, University of Innsbruck, Innsbruck, Austria

Correspondence: Jessica Droujko (droujko@ifu.baug.ethz.ch)

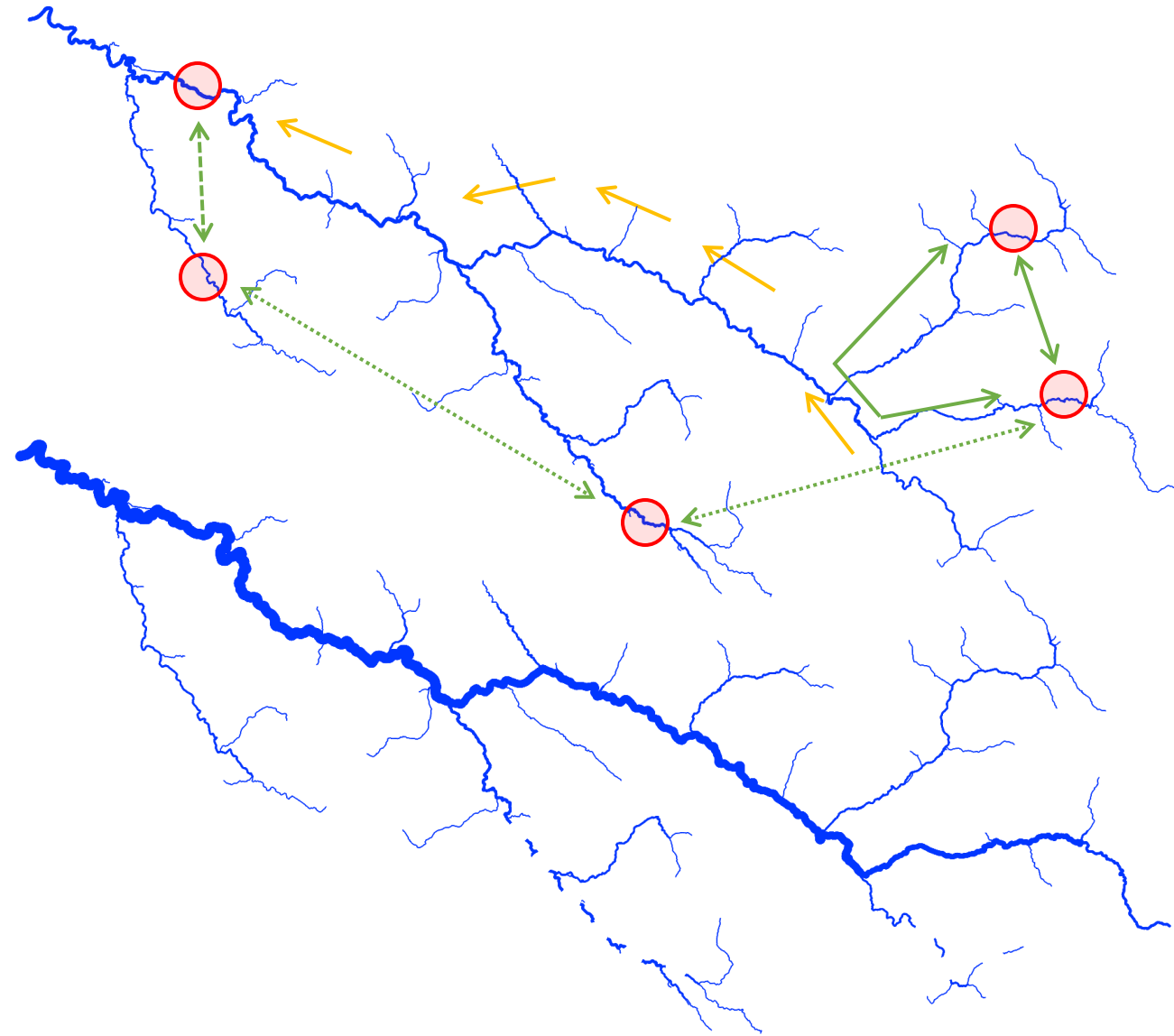


Biodiversity and function of periphytic algae in the turbidity gradient



1. Niche-based and niche-independent mechanisms drive biodiversity!
2. Function controlled exclusively through the niche-dependent share of the community!

A (The?) relevant (but understudied) “lotic” scale: the river network



River network

- Long, slender shape in space
- Dendritically branching
- Asymmetric through directive flow

Metacommunity/-ecosystem

A set of “local” ecosystems that exchange species and materials at a larger, regional scale.

Material transport ≠ **Organism mobility**

Connectivity is dynamic!

If I were tasked to make a river: A network, differentiated landscape, resources, a few bugs, a flow regime.

- A river network integrates its watershed,...
- ...transports and processes materials,...
- ...shapes movement of organisms and thus biodiversity and function.

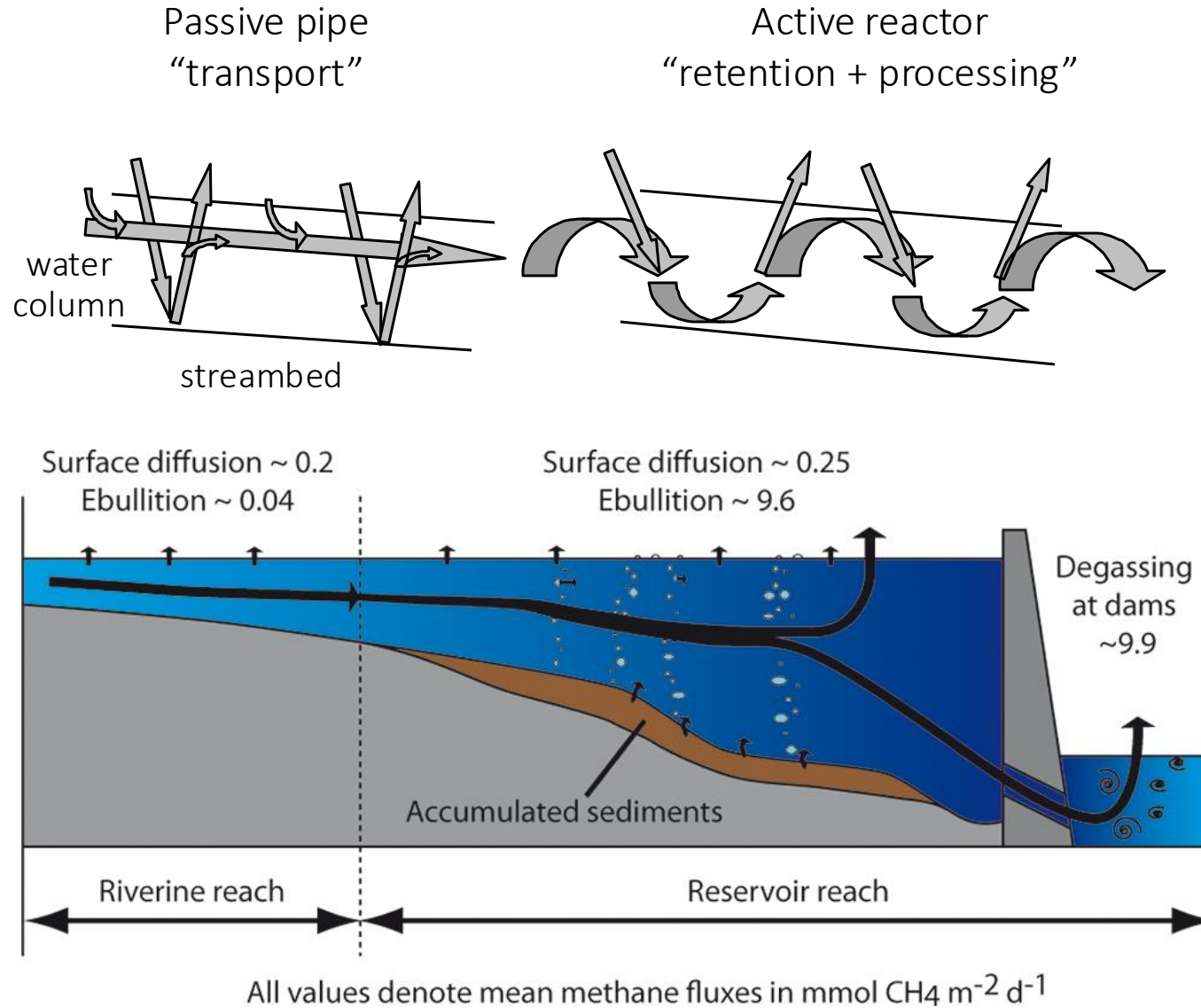
And it's all tied to flow...



And now?



No flow crisis I: Reservoirs are greenhouse gas sources



Learning about greenhouse gases from the free-flowing Neretva

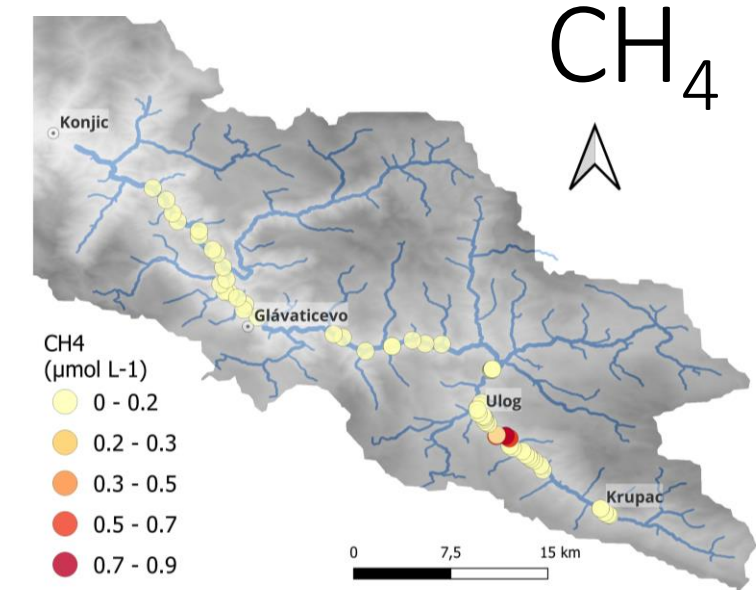
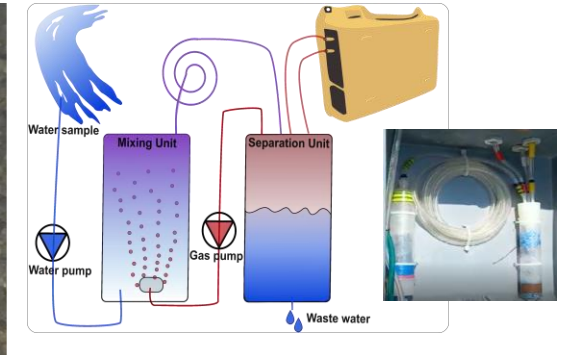
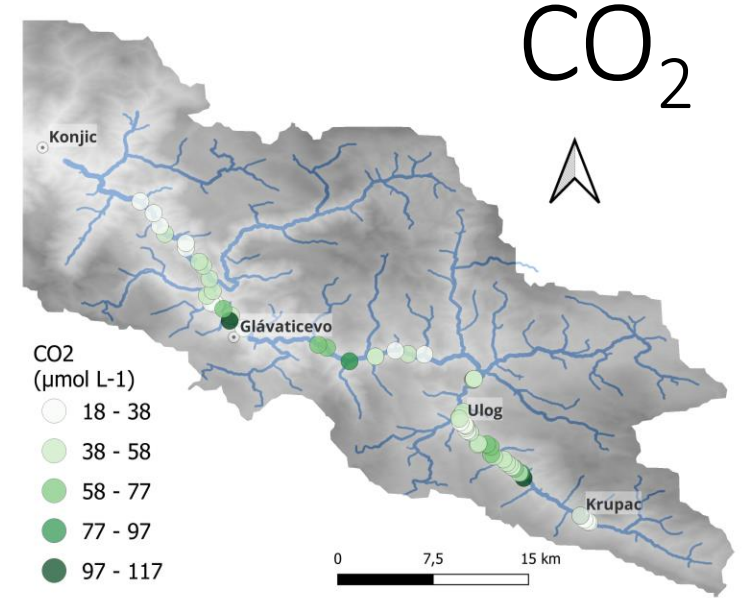
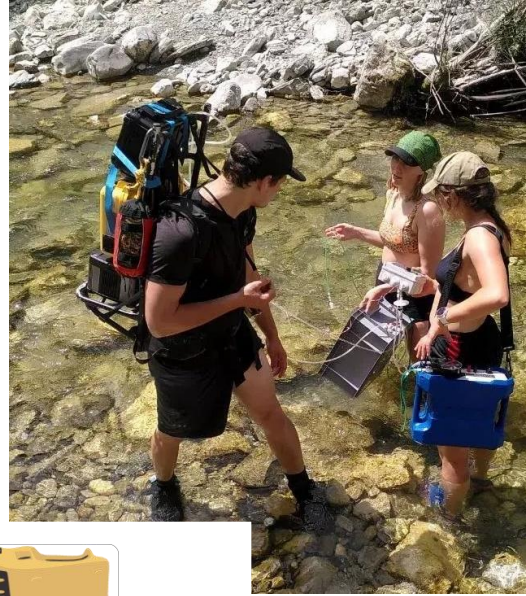
NATURA SLOVENIAE 25(3): 213-237
NERETVA SCIENCE WEEK 2022 – SCIENTIFIC PAPER

DOI: 10.14720/ns.25.3.213-237

Prejeto / Received: 15. 3. 2023
Sprejeto / Accepted: 16. 6. 2023

Differential controls on CO₂ and CH₄ emissions from the free-flowing Neretva River, Bosnia and Herzegovina

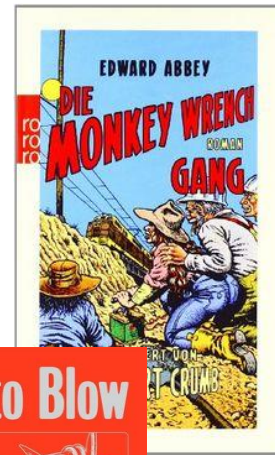
Martin DALVAI RAGNOLI, Thea SCHWINGSHACKL, Serafine KATTUS, Julius LISSY, Elisabeth WENINGER, Gabriel SINGER



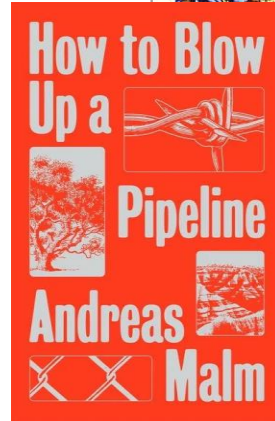
And now???



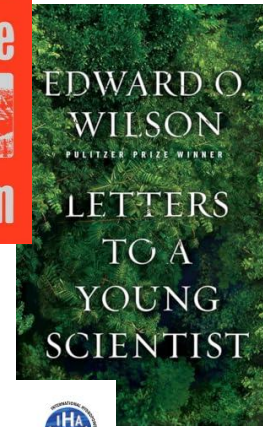
No flow crisis II: How do *you* react?



The Monkey Wrench Gang
(Edward Abbey)



How to Blow Up a Pipeline
(Andreas Malm)



Letters to a Young Scientist
(Edward O. Wilson)

GHG Measurement Guidelines
for Freshwater Reservoirs

Derived from:
The UNESCO/IAH Greenhouse Gas Emissions from Freshwater Reservoirs Research Project



GHG Measurement Guidelines
for Freshwater Reservoirs
(International Hydropower
Association)

No flow crisis II: How do you react?

Monkey wrencher

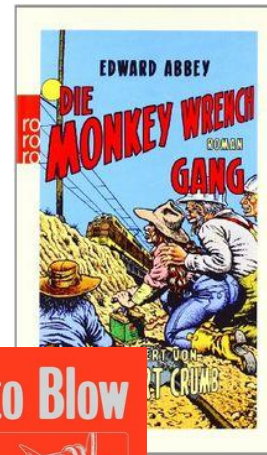
Activist

Advocating steward

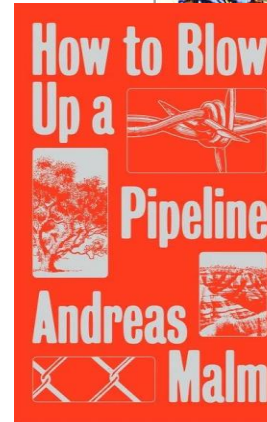
(In)credible (ivory tower) scientist

Industry researcher

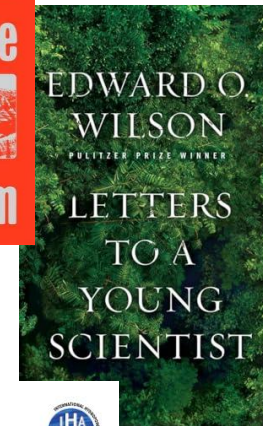
(This is a question of personal attitude, but also a niche gradient for many personalities.)



The Monkey Wrench Gang
(Edward Abbey)



How to Blow Up a Pipeline
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GHG Measurement Guidelines
for Freshwater Reservoirs
(International Hydropower
Association)

The ecologist of the 21st century is an active steward of ecosystems

ADVOCACY NETWORK

- Study what you love in order to save it!
- Invest into outreach beyond peers.
- Speak up in public.
- Work with broadcasters, don't hesitate to collaborate with NGOs.
- Don't worry about credibility loss, you are the expert!

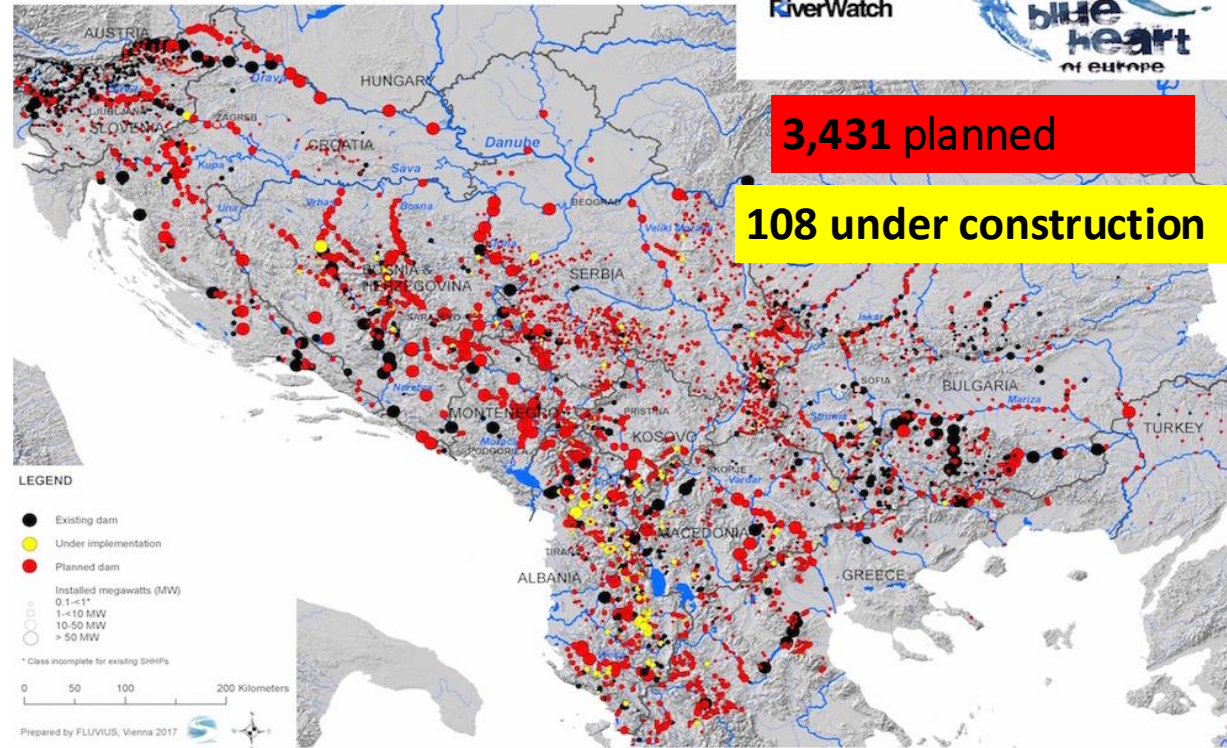


SCIENCE

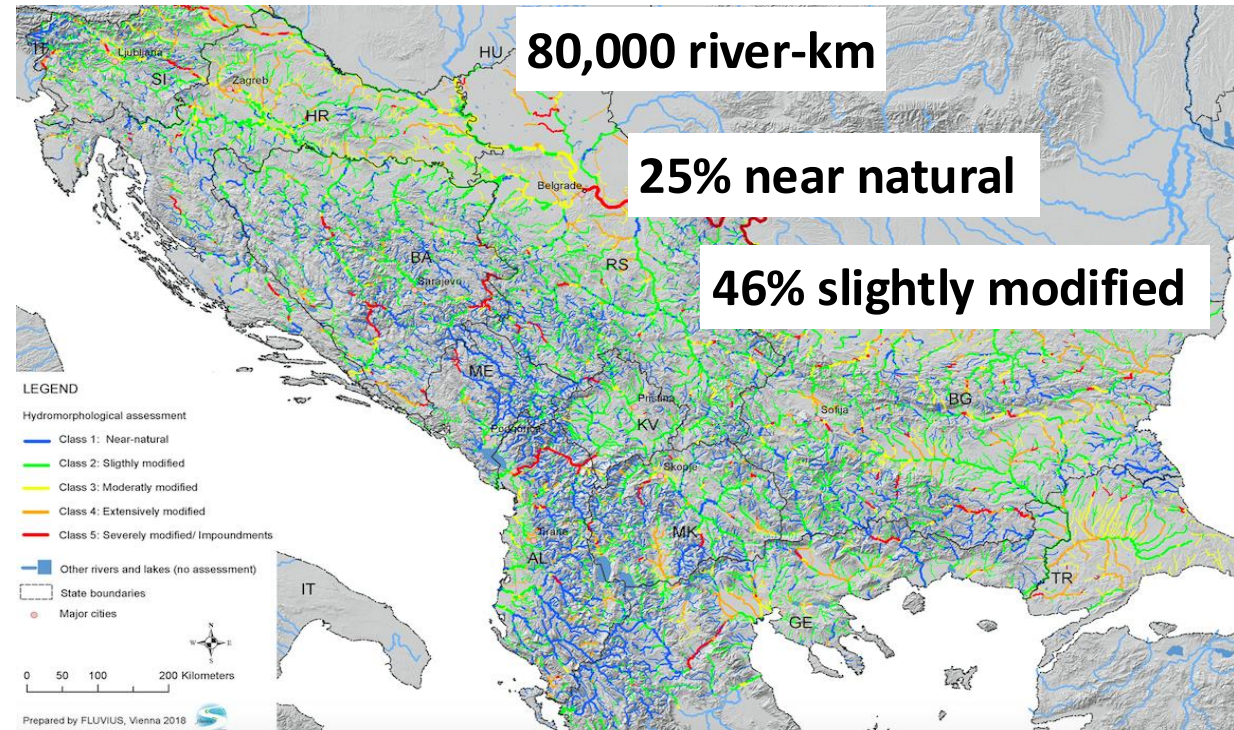


If this wasn't a challenge, take this! How do you react?

Hydropower plan(t)s in Balkan rivers



Hydromorphological assessment





SCIENTISTS
for Balkan Rivers

250

members

**Science
Weeks**

Webinars

Ideas

Meetups

The Science Week Idea

OUTREACH 2.0

PARTY

ADVOCACY

NETWORK

expose
yourself

build
capacity



SCIENCE

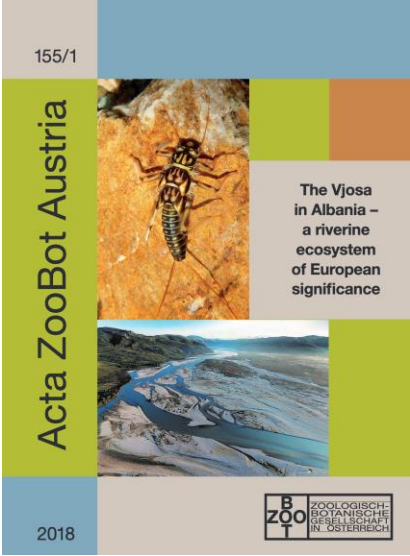
foster
your reputation

PUBLISH

The triangle in action



The triangle in action: The Vjosa blueprint – to repeat, please!





Neretva Science Week	2022	2023
scientists and students	59	62
countries	7	16
study groups	18	18
Others (journalists, photographers, activists, artists, lawyers)	>20	>30



NSW22 and 23 DIVERSITY OF SCIENTISTS

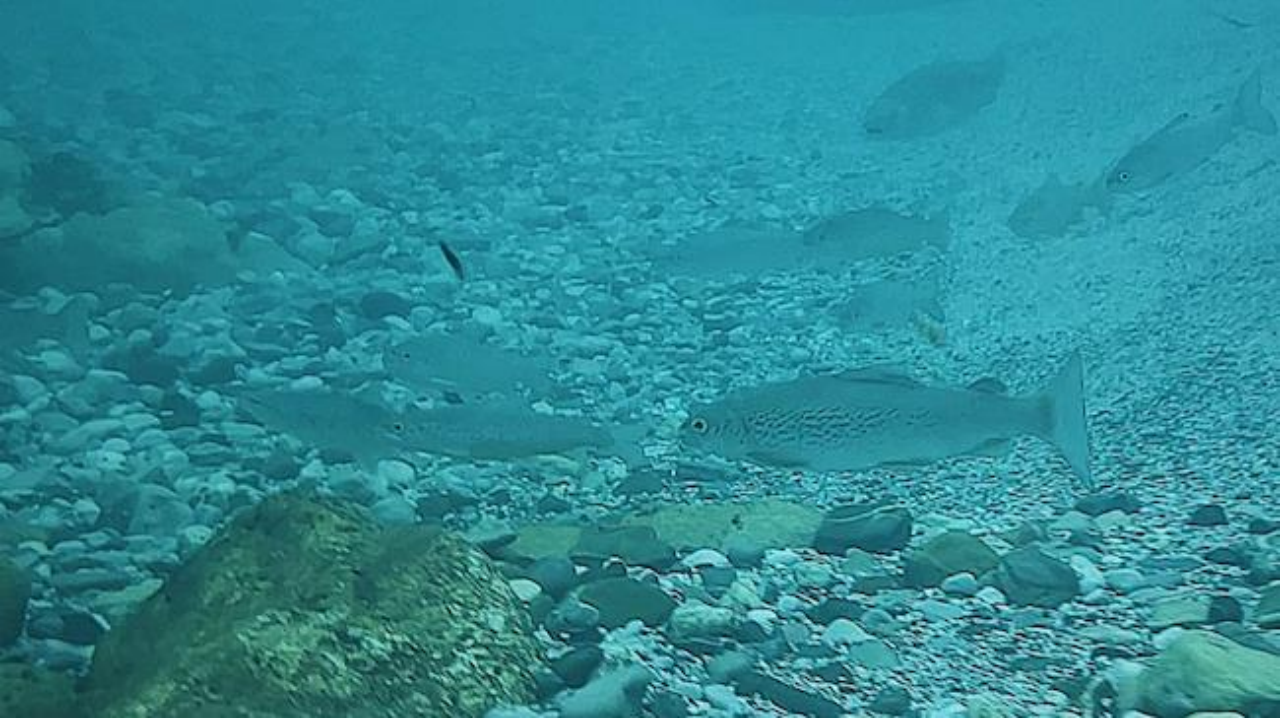


OF SCIENTISTS



Vladimir Tadić, Una Rebič, Adam Polhorsky, Piotr Bednarek, Linda Majdanova, Robert Oroz, Ester Premate, Saudin Merdan, Ulrich Eichelmann, Prelim.Rep.22





Salmo obtusirostris



At the end of the day...

- >2100 species
- 9 species new to science
- 60 rare + endangered species
- 25 endemic to the Balkans
- Various protected or strictly protected by national or EU Habitats and Bird Directives

For 3 min of fame
on youtube:



It's one of Europe's last pristine rivers. Can scientists save it from 50 dams?



The age of extinction is supported by

the guardian .org

About this content

Karen McVeigh

@karenmcveigh1

Fri 17 Nov 2023 06:00 CET

A 'tsunami' of hydropower threatens some of Europe's last wild rivers

Campaigners say the ecologically extraordinary waters of the Western Balkans are facing potential devastation from hydropower projects. But the tide may be turning.

taz THEMEN POLITIK ÖKO GESELLSCHAFT KULTUR SPORT BERLIN NORD WAHRHEIT suchen ...

Wasserkraft in Bosnien

Wie rettet man einen Fluss?

Foto: Joshua David Lim

CAREERS COMMENTARY JOURNALS Science

NEWS | ENVIRONMENT

In the Balkans, researchers mobilize to protect a wild river

Plans to dam the upper Neretva River draw concern

24 JUN 2022 · 2:55 PM ET · BY RICHARD SCHIFFMAN

science ORF.at

Forscher/innen schreiben Radio & TV

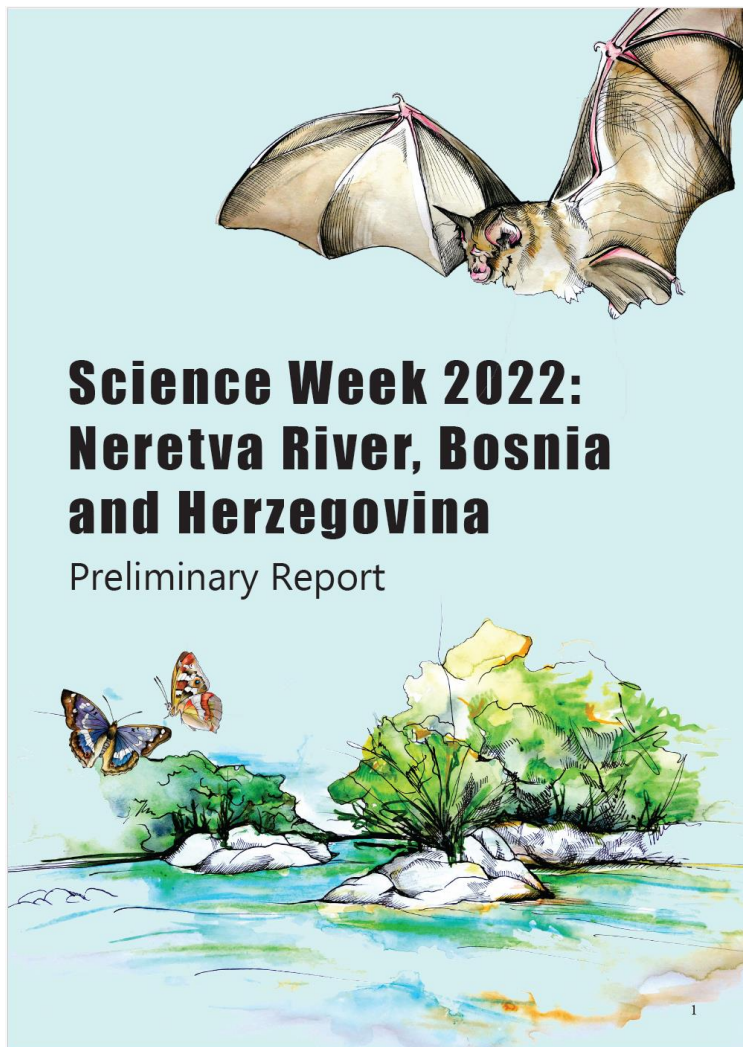
NERETVA

Ein wertvolles Flusssystem in Gefahr

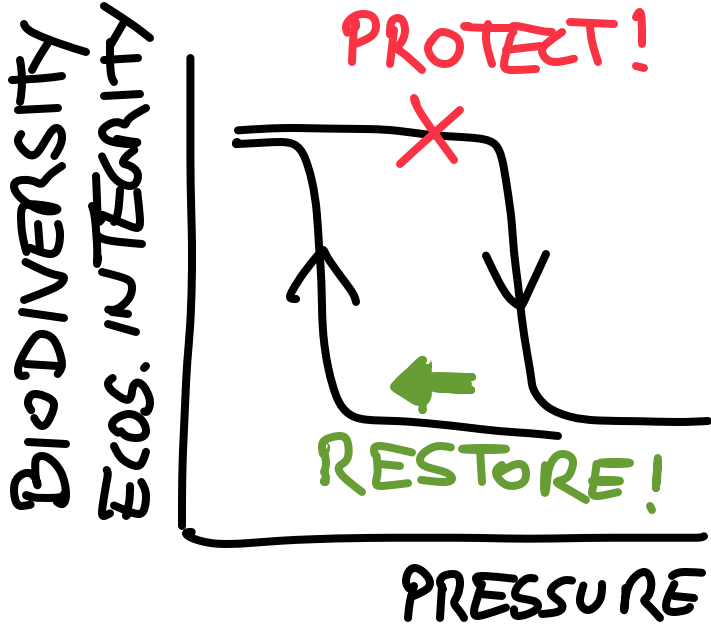
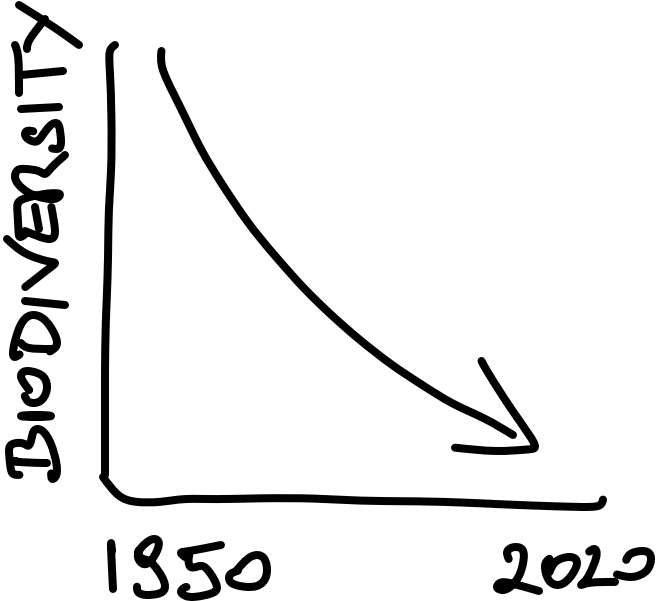
Scientists are fighting to save the 'blue heart' of Europe

By Neil Lewis, CNN

Published 5:18 AM EDT, Thu August 10, 2023



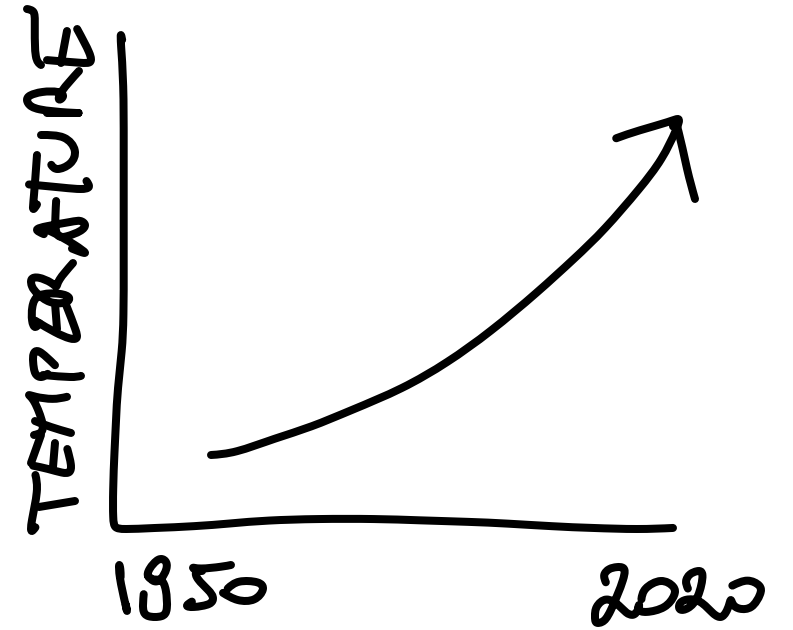
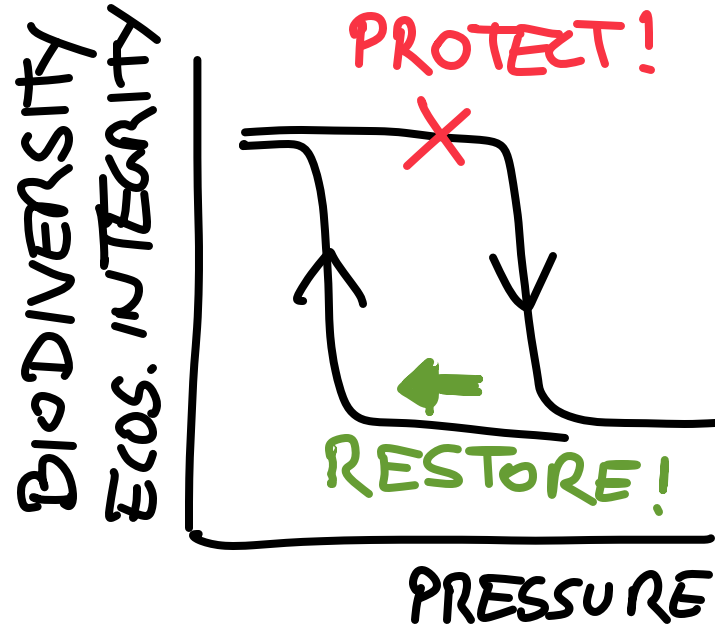
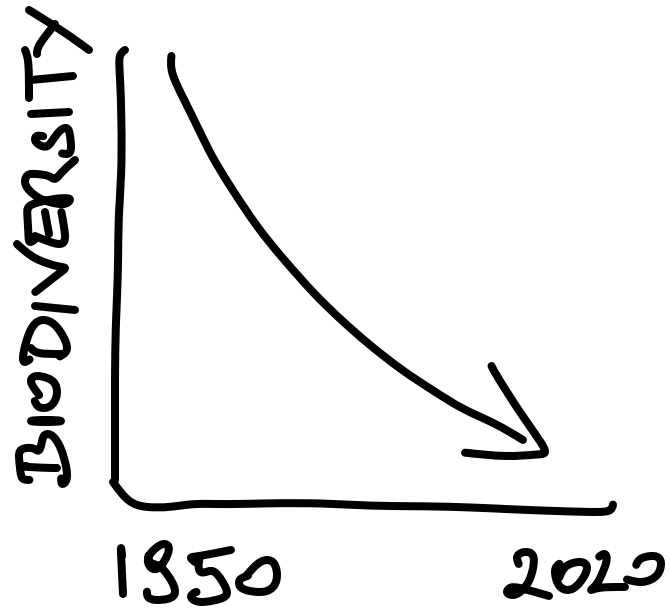
Our approach to "free-flowing": Keep intact systems intact!



Fill the form:

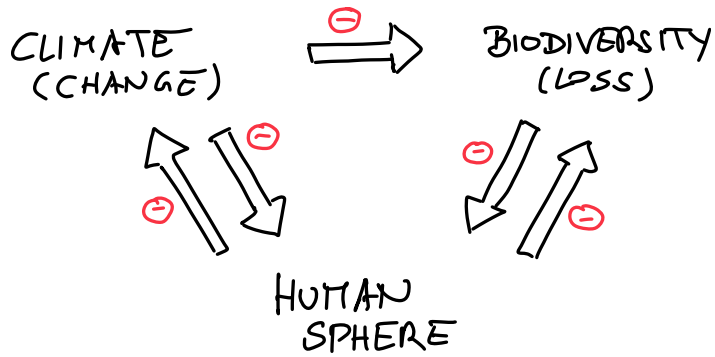


Yeah! Protect! Restore! – WAIT: Are we missing something?

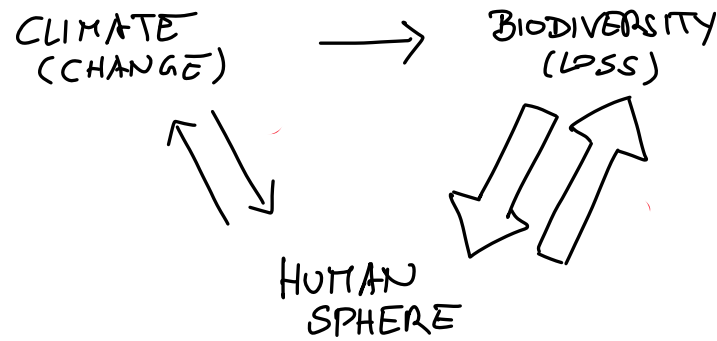


Two strategies to tackle the two biggest challenges

The problem triangle

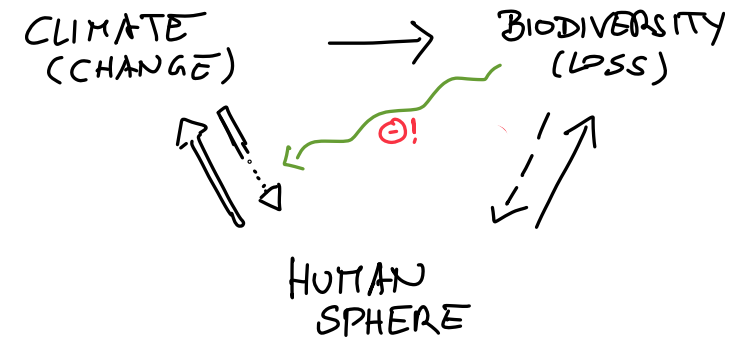


Strategy 1



Stop climate change @ all costs (except economic ones)

Strategy 2



Save biodiversity + adapt to climate change (ecologically informed and realistic)

Take home and acknowledgements

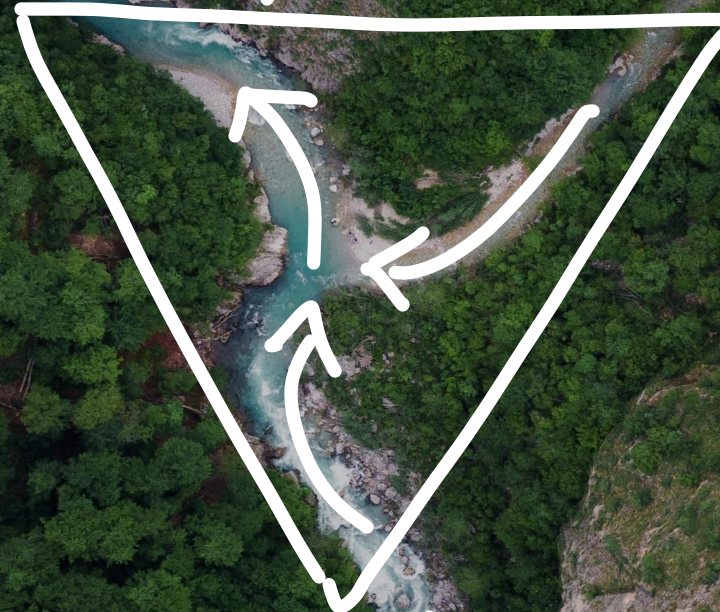
Martin Dalvai, Jessica Droujko,
Lukas Thuile Bistarelli,...

Connect in creative
and diverse networks!

ADVOCACY NETWORK

Speak up for what you
love and know!

Ulrich Eichelmann,
Vera Knook, Spela Borko,...



Rivers are damn cool!

Thomas Fuß, Jan Martini,
Thea Schwingshackl,...

SCIENCE