COST Action CONVERGES Synthesis

Bringing the margin to the focus: 10 challenges for riparian vegetation science and management

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On the behalf of the COST Action CONVERGES contributions

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CONVERGES
European Riparian Ecosystems

Bringing the margin to the focus: 10 challenges for riparian vegetation science and management

(Paper in review for WIREs Water)

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Introduction

- Riparian ecosystems concentrate many ecosystem services in a relatively small area while traversing entire landscapes due to their network shape
- Yet, progress in improving condition of riparian vegetation has been limited, and degradation proceeds



- **Goal:** to compile a synthesis of the current main challenges and potential solutions to enhance science and management

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Approach

- We mobilized the COST Action CONVERGES network (200members)
- Online survey with two open questions:
  - what are the 3 main challenges to enhance riparian vegetation (A) science and (B) management and policies?
- Analyzed responses with a qualitative coding approach*

- **Results**
  - 62 submissions received from 33 countries
  - Included at least 5 answers from each European region – Balkan Peninsula, Scandinavia, Central, Eastern, Southern and Western Europe
  - 10 challenges grouped into three major themes

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*Kuckartz, U. (2014). Qualitative Text Analysis : A Guide to Methods, Practice & Using Software. SAGE Publications Ltd

10 main Challenges for riparian science and management

Reinforcing a transdisciplinary field of knowledge

Ch1. Bring to life a distinct scientific community by establishing stronger bridges between disciplines

Ch2. Increase riparian vegetation visibility and emphasis in society and policies

Progressing in scientific knowledge on riparian ecosystem functioning

Ch3. Improve our understanding of biodiversity - ecosystem functioning links

Ch4. Manage spatial scale and context-based issues in research

Ch5. Improve knowledge on the social dimensions of riparian ecosystems

Ch6. Anticipate responses to emergent issues and future trajectories

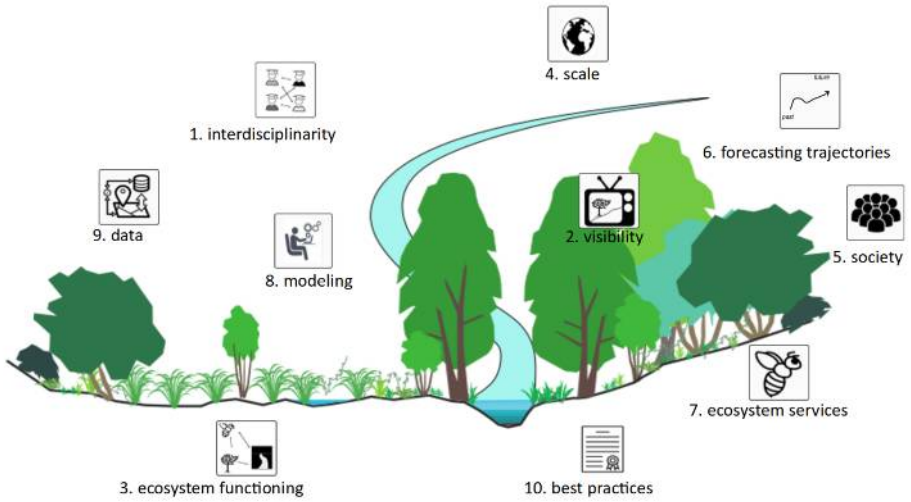
Aligning riparian ecosystems science with management demands

Ch7. Enhance tools to quantify and prioritize ecosystem services

Ch8. Improve numerical modeling and simulation tools

Ch9. Calibrate methods and manage data availability for better indicators and monitoring practices

Ch10. Validate best management practices



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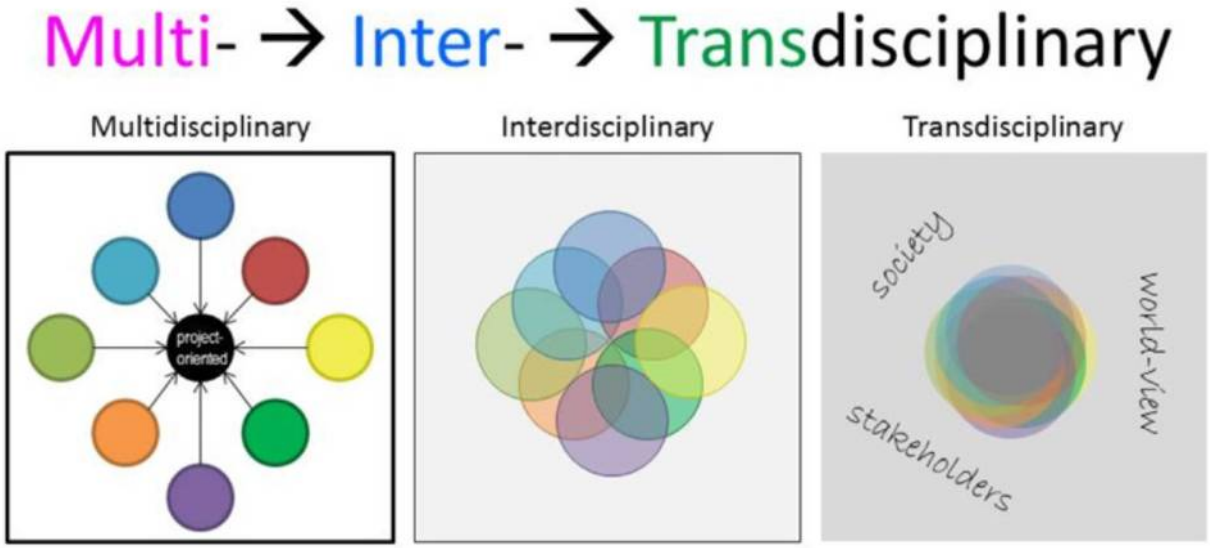
Challenge 1. Bring to life a distinct scientific community by establishing stronger bridges between disciplines

- Multifaceted nature of riparian vegetation

- More collaboration within and between disciplines
- Global riparian network experts with a good representation of disciplines / sectors (e.g. biological sciences, geophysical sciences, engineering and social sciences)



https://imaqpress.com/2678/differentiation-between-interdisciplinary-and-transdisciplinary-concepts/

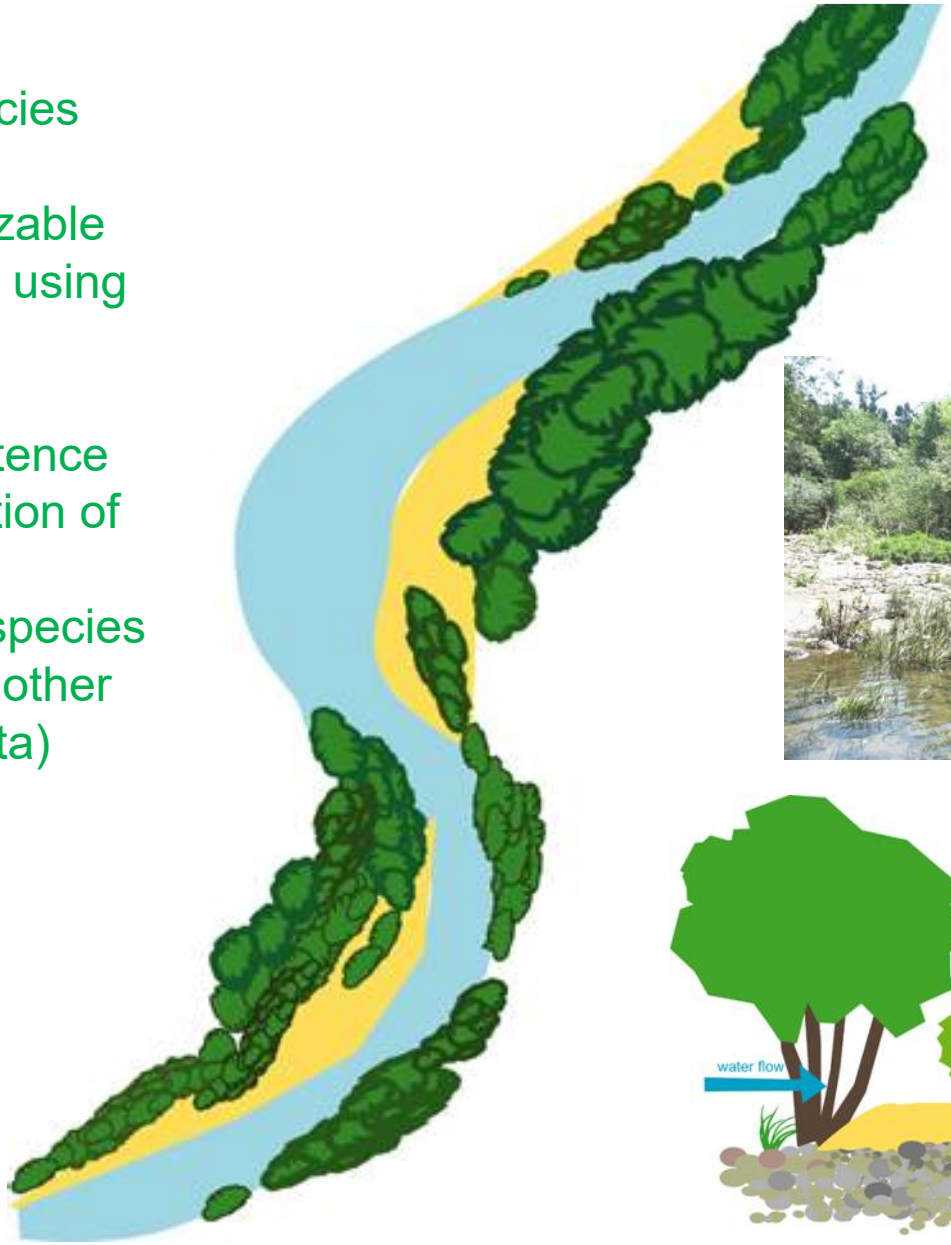
Challenge 2. Increase riparian vegetation visibility and emphasis in society and policies

- Low profile of riparian vegetation

- Improve communication & channels to stakeholders and society, including Education and participatory approaches
- Legislation considering multiple ecological functions and services

Challenge 3. Improve our understanding of biodiversity - ecosystem functioning links

- Biodiversity beyond species level
- Geographically generalizable & mechanistic approach using functional traits
- Better understanding on regeneration and persistence processes on the formation of riparian corridors
- Improve knowledge on species interactions and links to other biota (animals, microbiota)



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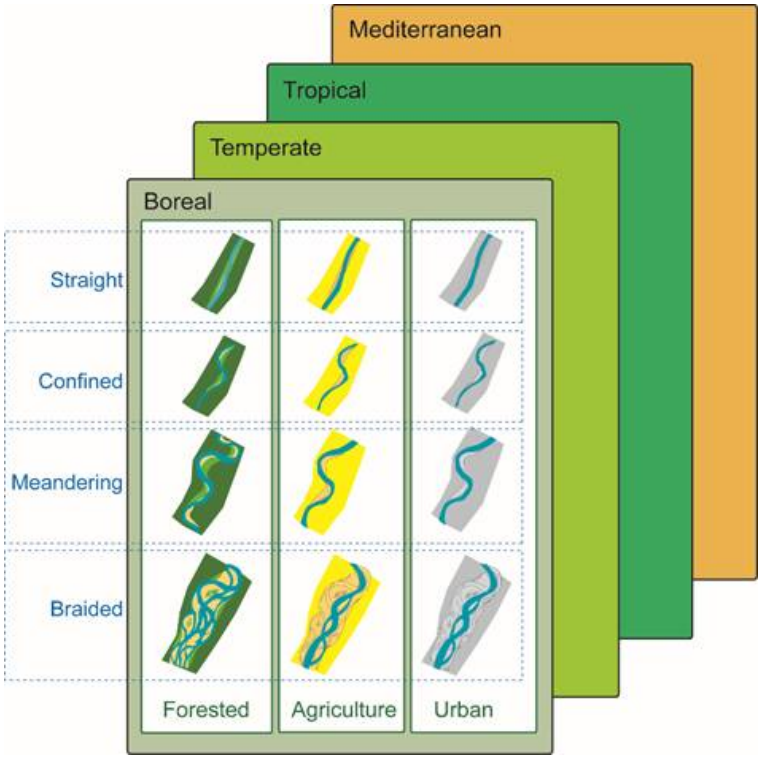
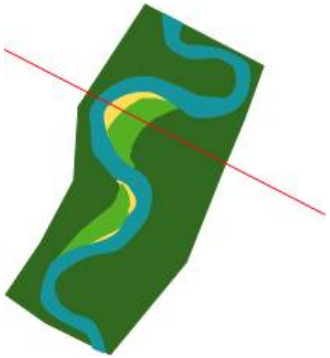
Challenge 4. Manage spatial scale and context-based issues in research

- Reach scale to network and catchment
- Understand effects of stressors and cumulative effect
- Greater diversity of studied contexts





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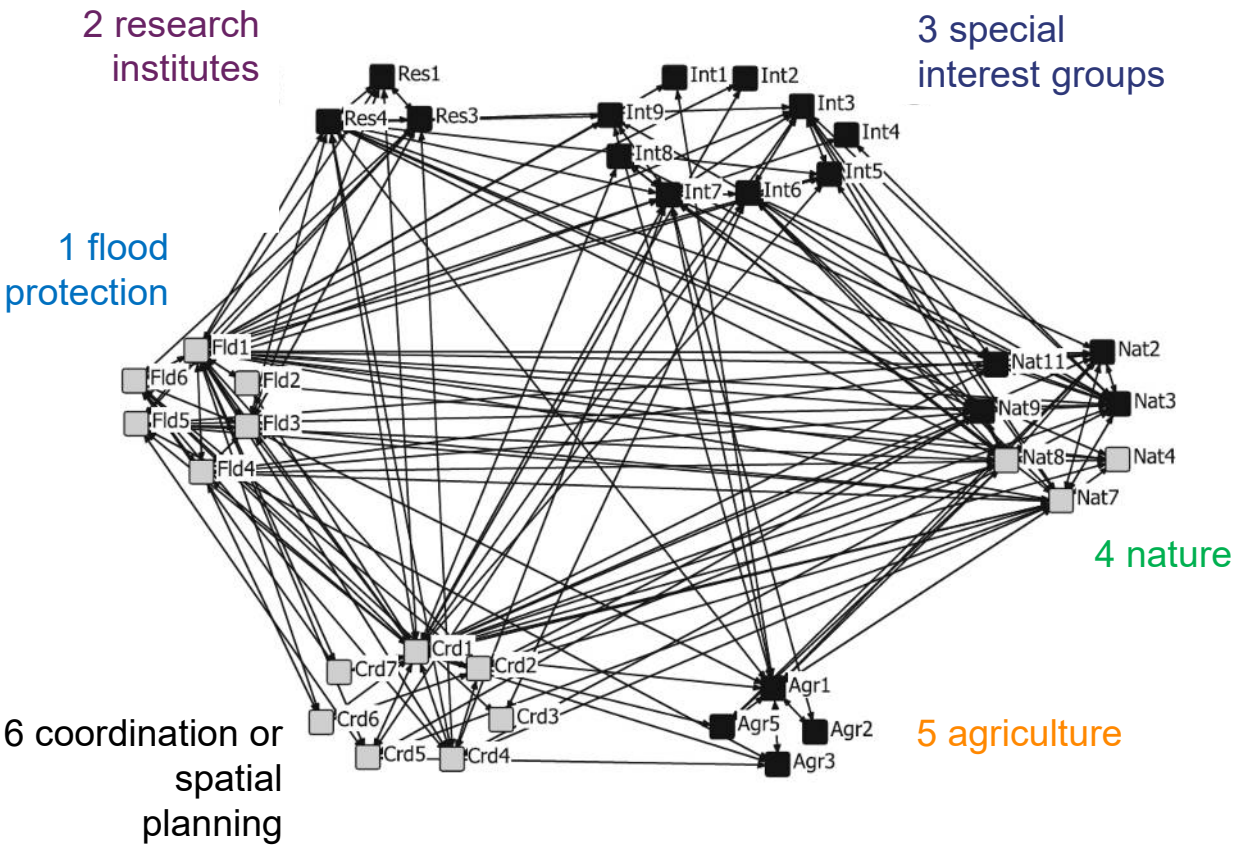
Dufour S., Rodríguez-González P.M. (2019). RIPARIAN ZONE / RIPARIAN VEGETATION DEFINITION: PRINCIPLES AND RECOMMENDATIONS. Report, COST Action CA16208 CONVERGES, 20 pp. (https://converges.eu/)

Challenge 5. Improve knowledge on the social dimensions of riparian ecosystems

- Social dimension largely absent from scientific literature
- Appropriate understanding of people perception, role, values, needs and interests
- Effective engagement required

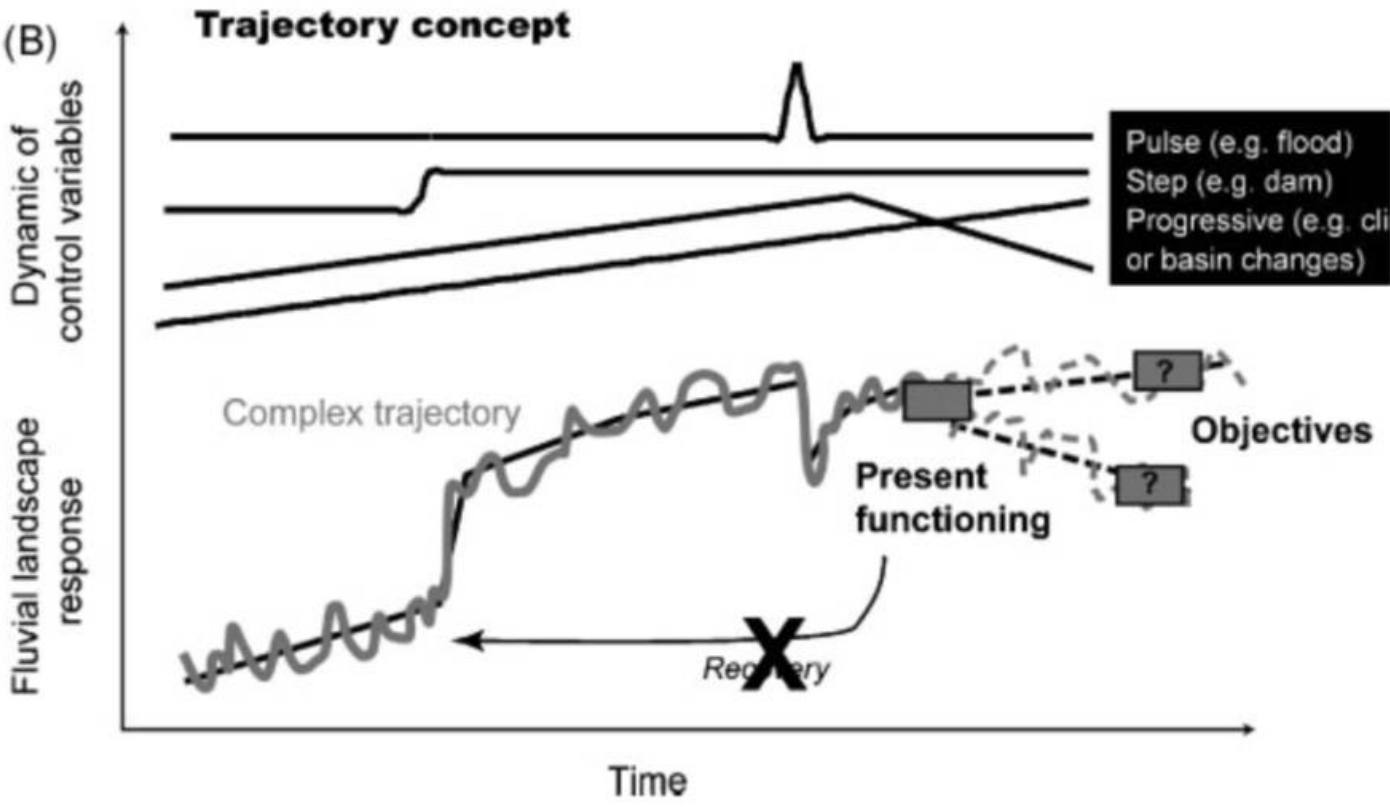


Fliervoet et al (2016). Analyzing Collaborative Governance Through Social Network Analysis : A Case Study of River Management Along the Waal River in The Netherlands. Envir Manag 57(2), 355-367.

Challenge 6. Anticipate responses to emergent issues and future trajectories

- Global change: accelerated velocity of change affects intensity and nature of interactions among stressors

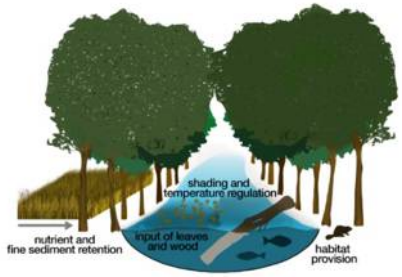
- Trajectory paradigm in forecasting riparian changes
- Long term monitoring and research projects



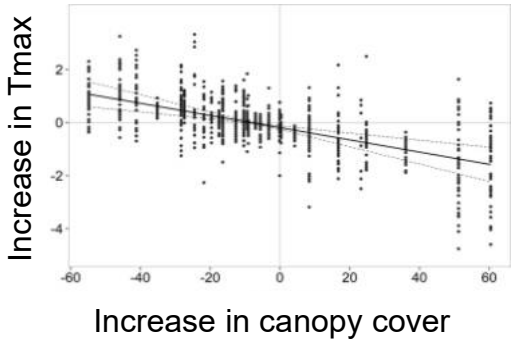
Dufour, S., & Piégay, H. (2009). From the myth of a lost paradise to targeted river restoration: forget natural references and focus on human benefits. *River Research and Applications, 25, 568-581*

Challenge 7. Enhance tools to quantify and prioritize ecosystem services

- ES are recognized but not fully quantified and prioritized

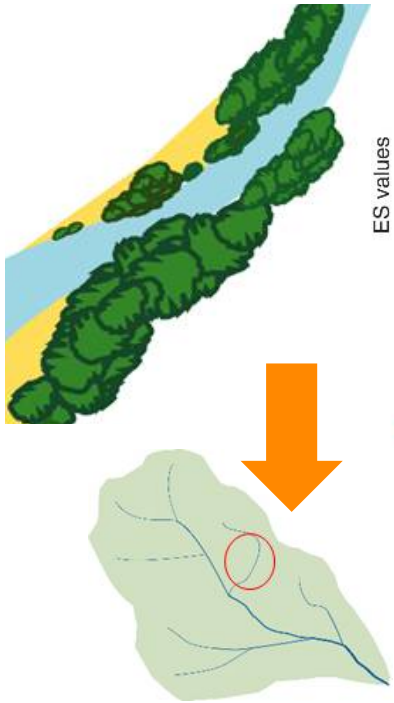


http://oscar-biodiversa.eu/index.php/about-oscar.html

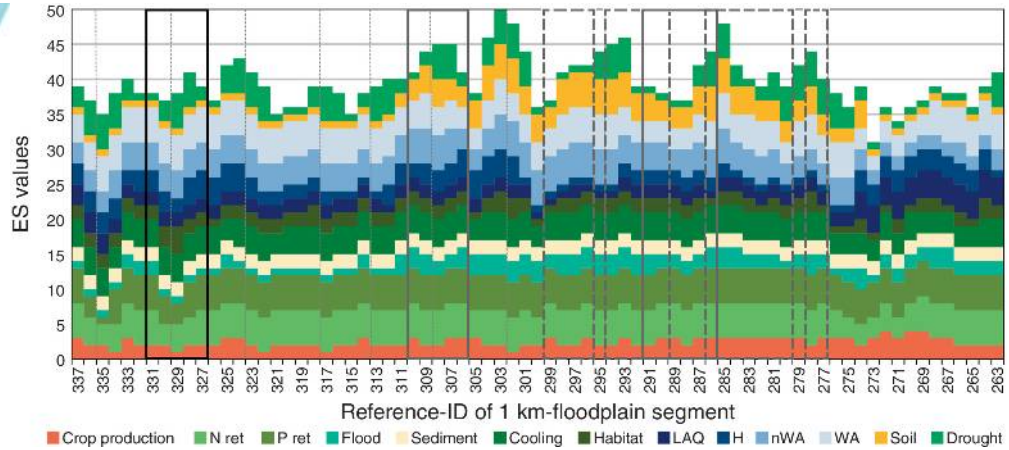


Kail, et al (2021). Woody buffer effects on water temperature :The role of spatial configuration and daily temperature fluctuations. Hydrological Processes, 35(1).

- Key indicators, setting open databases and toolboxes



Spatial distribution of the provided ES value scores (1 to 5 per ES) along 75 km stretch of the Danube (APPLICATION OF RESI Iindex)



Stammel, et al (2021) Assessing land use and flood management impacts on ecosystem services in a river landscape (Upper Danube, Germany). River Research and Applications, 37(2), 209-220.

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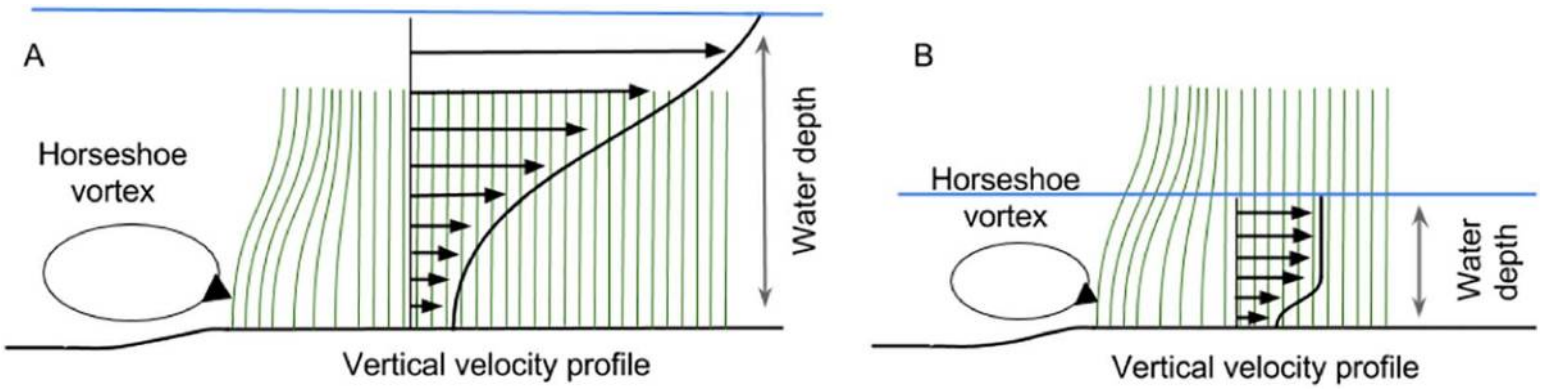
Challenge 8. Improve numerical modeling and simulation tools

- Recent progress but reliable modeling still needed, data input with higher requirements, difficulties to transfer to practice

- Illuminating long term processes with enough detailed resolution to model trajectories
- Anticipating critical tresholds
- Incorporating interactive effects of stressors

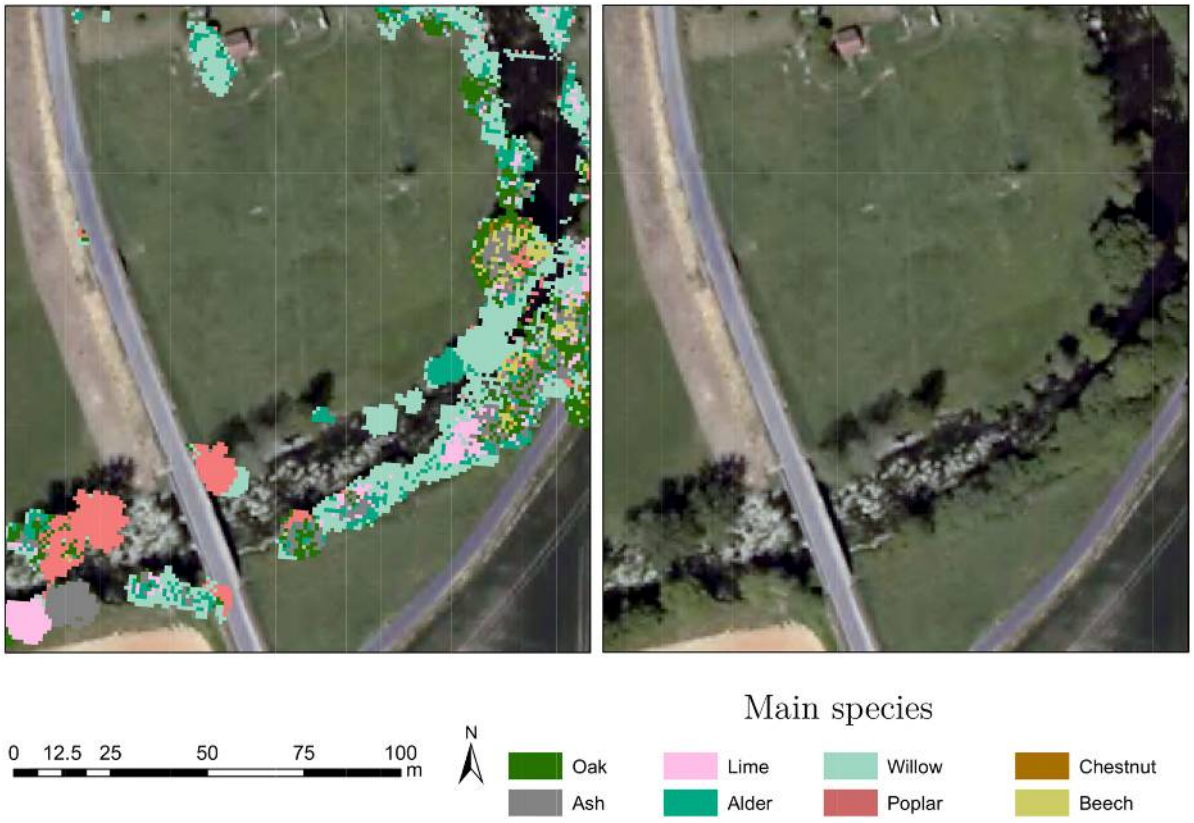
Effects on the flow field vertical distribution of a submerged (A) and partially submerged (B) vegetation patch.



Politti, et al. (2018). Feedbacks between the riparian Salicaceae and hydrogeomorphic processes : A quantitative review. Earth-Science Reviews,176, 147-165.

Challenge 9. Calibrate methods and manage data availability for better indicators and monitoring practices

- To develop reliable indicators
- To make the data available for researchers and practitioners
- Multiscale protocols
- Promote integration of riparian vegetation in mandatory river status assessments



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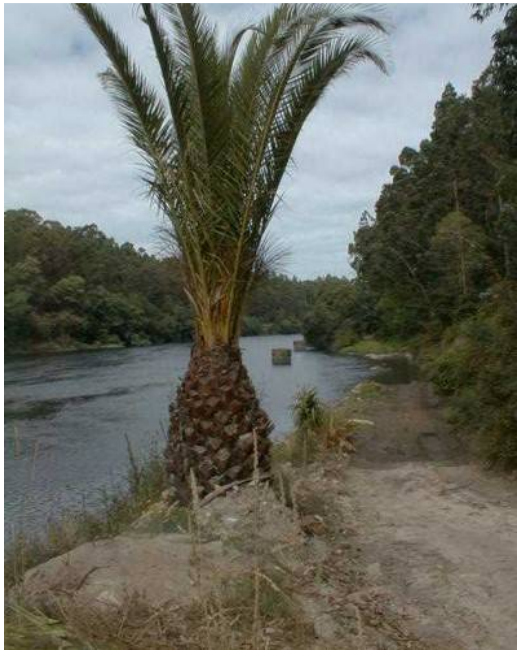
Piégay H., F. Arnaud, B. Belletti, M. Bertrand, S. Bizzi, P. Carbonneau, S. Dufour, F. Liébault, V. Ruiz-Villanueva & L. Slater (2020). Remotely sensed rivers in the Anthropocene: state of the art and prospects. Earth Surf. Process. Landforms

Challenge 10. Validate best management practices



- Promote evidence-based decision-making
- Demonstration projects
- Promote involvement of society

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CONCLUSION: RECOGNIZE RIPARIAN ZONES AS CO-CONSTRUCTED SOCIO-ECOLOGICAL SYSTEMS

- Enhancing **riparian vegetation science**

- **Reducing the dispersion/heterogeneity** of current knowledge, policies, and management practices across contexts.

- In many regions, **riparian vegetation remains marginal** in environmental policies, and management tends to focus on the control of riparian ecosystems rather than creating appropriate levels of functioning.

- **Communication and sharing of knowledge among stakeholders** (including academics, managers and practitioners) and with society need to be substantially improved.

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