

# CONSERVATION OF BIODIVERSITY IN FLOODPLAINS: IS MULTIFUNCTIONALITY THE SOLUTION?

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## Introduction.

Green Infrastructure (GI) and multifunctional land-use are recently proposed as key concept to reconcile nature conservation with economical interests.

Floodplains are good examples for multifunctional landscapes and GI because their management requires close coordination among sectors and poses multi-dimensional challenges to policy-makers and project managers.

In the following study, we implemented a 'network of knowledge'-approach (Livoreil et al. 2012) in the frame of the EU FP7 Communication Action 'Biodiversity.Knowledge' to specify the effects of multifunctional floodplain management on biodiversity.

## Applied approaches. We conducted for European lowland floodplain and rivers:

(i) a country specific expert consultation covering IRE, NL, D, SLK, H and UKR to assess regulation history, multifunctional management projects and biodiversity effects (Schindler et al. 2013b, in prep.)

(ii) An expert consultation that elaborated a matrix specifying the effects of 38 bundles of floodplain interventions to 21 ecosystem services (Schindler et al. 2013b, submitted)

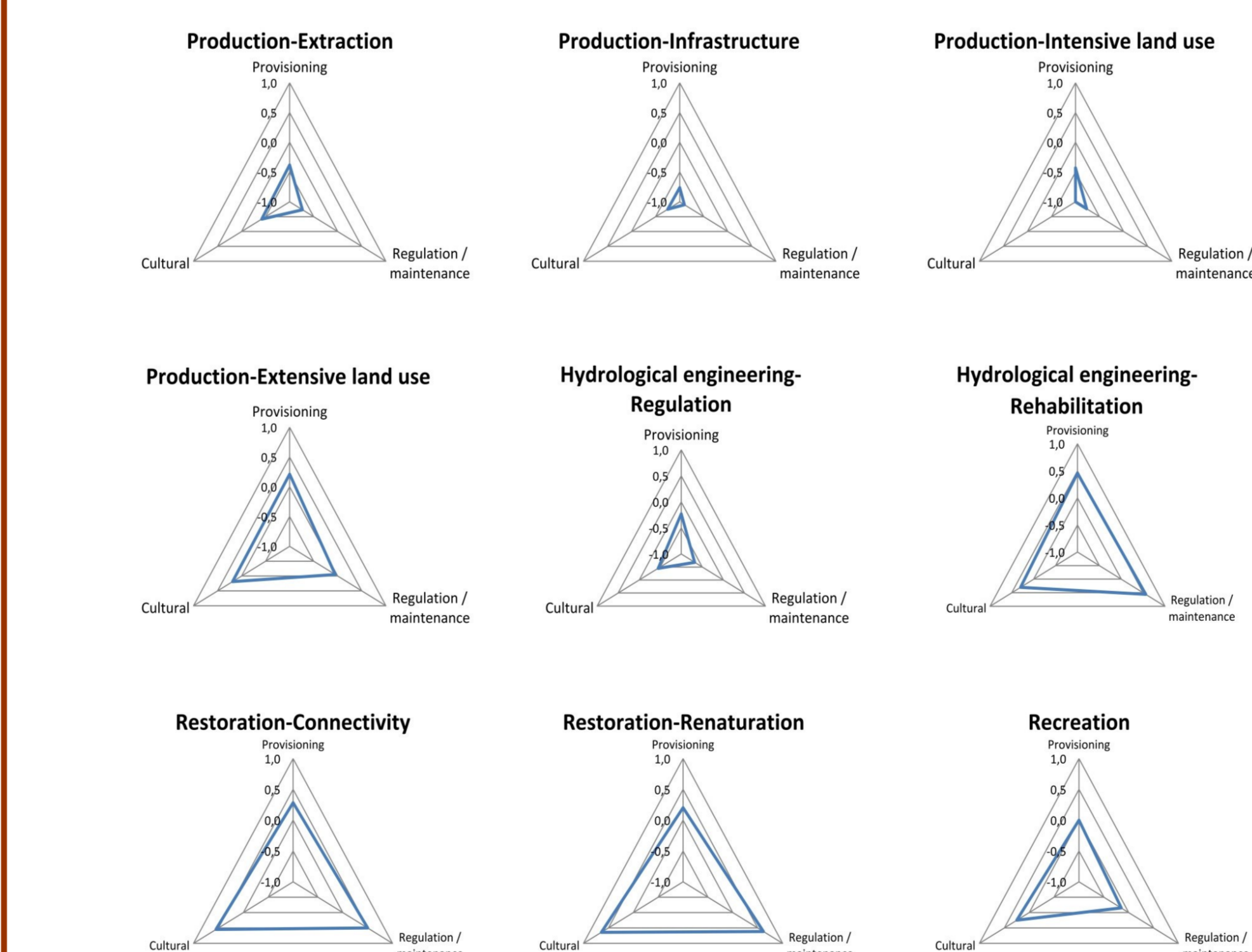
(iii) a systematic review protocol (Schindler et al. 2013a) and systematic map (Schindler et al. 2013b) dealing with the impact of floodplain management measures on biodiversity

## Results

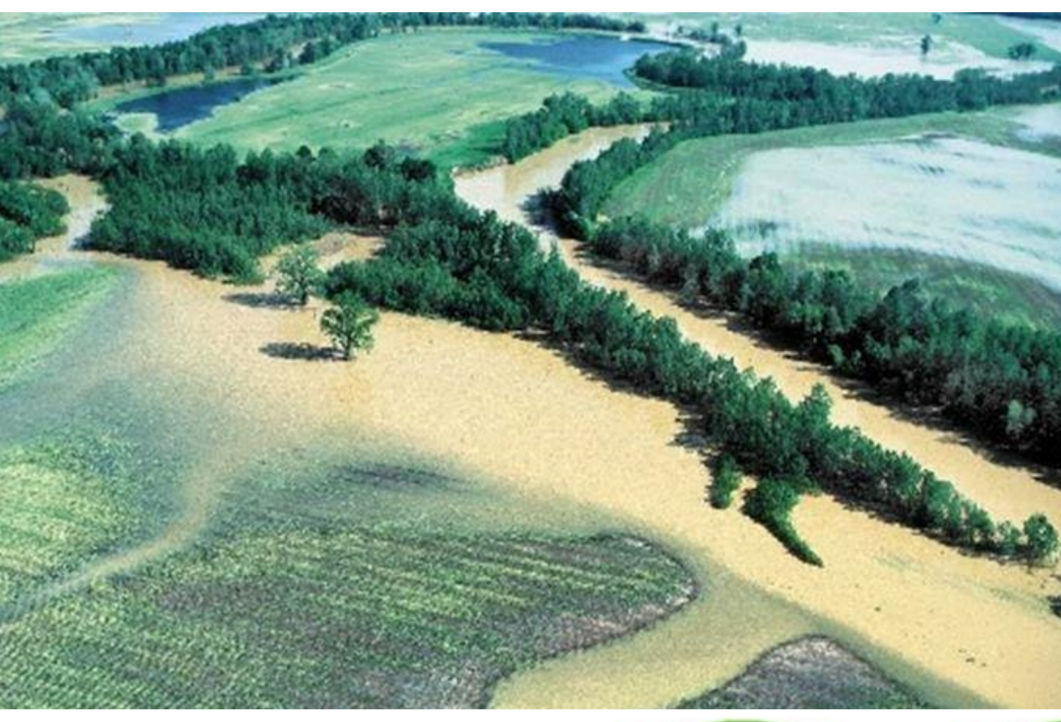
- (i) Considered floodplains (fig. 1) and their management in 6 countries (Tab. 1);
- (ii) Matrix showing effects of interventions on ecosystem services (Tab. 2) and related spider web graphs (fig. 2);
- (iii) Systematically detected articles on biodiversity impact of floodplain management and considered taxa (fig. 3, 4).

**Table 2.** Expected effects of 38 floodplain interventions on the supply of 21 different ecosystem services. "0": no effect; "\": reducing effect; "+": supporting effect; "\-/+": ambiguous effect.

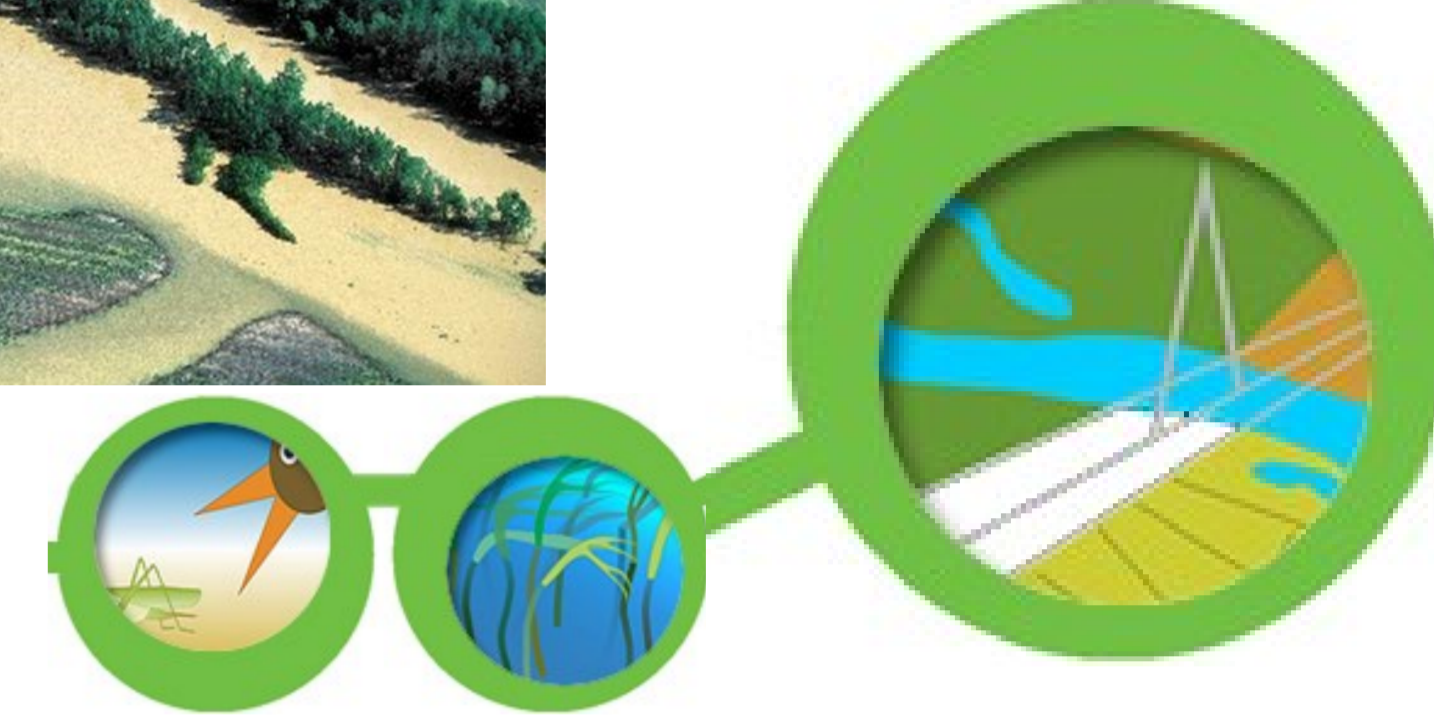
Intervention	Provisioning	Regulation / maintenance	Cultural	Provisioning	Regulation / maintenance	Cultural	Provisioning	Regulation / maintenance	Cultural	Provisioning	Regulation / maintenance	Cultural
Surface water extraction	\	\	\	\	\	\	\	\	\	\	\	\
Groundwater extraction	\	\	\	\	\	\	\	\	\	\	\	\
Mineral resource extraction	\	\	\	\	\	\	\	\	\	\	\	\
Settlement and traffic infrastructure	\	\	\	\	\	\	\	\	\	\	\	\
Energy conversion	\	\	\	\	\	\	\	\	\	\	\	\
Navigational infrastructure	\	\	\	\	\	\	\	\	\	\	\	\
Forestry intensive	\	\	\	\	\	\	\	\	\	\	\	\
Agriculture intensive	\	\	\	\	\	\	\	\	\	\	\	\
Fishery intensive	\	\	\	\	\	\	\	\	\	\	\	\
Forestry extensive	\	\	\	\	\	\	\	\	\	\	\	\
Agriculture extensive	\	\	\	\	\	\	\	\	\	\	\	\
Fishery extensive	\	\	\	\	\	\	\	\	\	\	\	\
Hunting	\	\	\	\	\	\	\	\	\	\	\	\
Channel corrections	\	\	\	\	\	\	\	\	\	\	\	\
Dike construction	\	\	\	\	\	\	\	\	\	\	\	\
Bank/bed stabilization	\	\	\	\	\	\	\	\	\	\	\	\
Sediment removal/dredging	\	\	\	\	\	\	\	\	\	\	\	\
Detention basins	\	\	\	\	\	\	\	\	\	\	\	\
Controlled retention areas	\	\	\	\	\	\	\	\	\	\	\	\
Dike relocation	\	\	\	\	\	\	\	\	\	\	\	\
Ecologically improved groynes	\	\	\	\	\	\	\	\	\	\	\	\
Lowering floodplain/foreland	\	\	\	\	\	\	\	\	\	\	\	\
Sediment addition into river bed	\	\	\	\	\	\	\	\	\	\	\	\
Removing obstacles	\	\	\	\	\	\	\	\	\	\	\	\
Removal of bank fixations	\	\	\	\	\	\	\	\	\	\	\	\
Removal of dams and weirs	\	\	\	\	\	\	\	\	\	\	\	\
Lateral floodplain reconstruction	\	\	\	\	\	\	\	\	\	\	\	\
Channel, oxbow and pond creation	\	\	\	\	\	\	\	\	\	\	\	\
Construction of fish passages	\	\	\	\	\	\	\	\	\	\	\	\
Creating natural habitat from forest	\	\	\	\	\	\	\	\	\	\	\	\
Creating natural habitat from agro land	\	\	\	\	\	\	\	\	\	\	\	\
Creating nat. habitat from extraction sites	\	\	\	\	\	\	\	\	\	\	\	\
Control of invasive alien species	\	\	\	\	\	\	\	\	\	\	\	\
Creation of gravel banks	\	\	\	\	\	\	\	\	\	\	\	\
Elimination of top soil	\	\	\	\	\	\	\	\	\	\	\	\
Land use extensification	\	\	\	\	\	\	\	\	\	\	\	\
Recreational infrastructure	\	\	\	\	\	\	\	\	\	\	\	\
Recreational use of the floodplain	\	\	\	\	\	\	\	\	\	\	\	\



**Figure 2.** Impact of bundles of intervention on the supply of different ESS sections. Shown is the average net change of all interventions per bundle as multifunctionality index ranging between -1 (all ESS are negatively affected) and +1 (all ESS are positively affected).



Biodiversity Knowledge

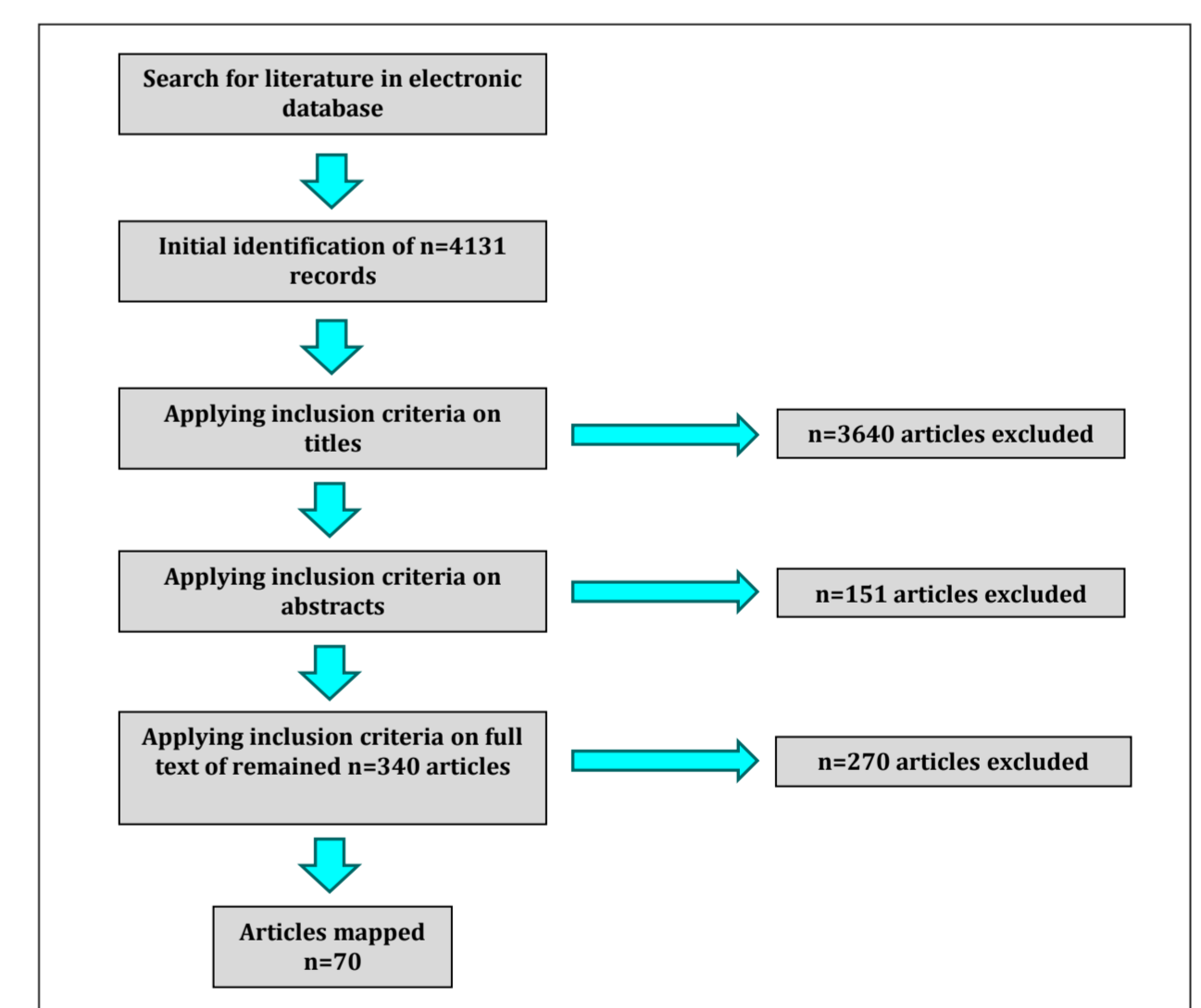


## Systematic Review Protocol

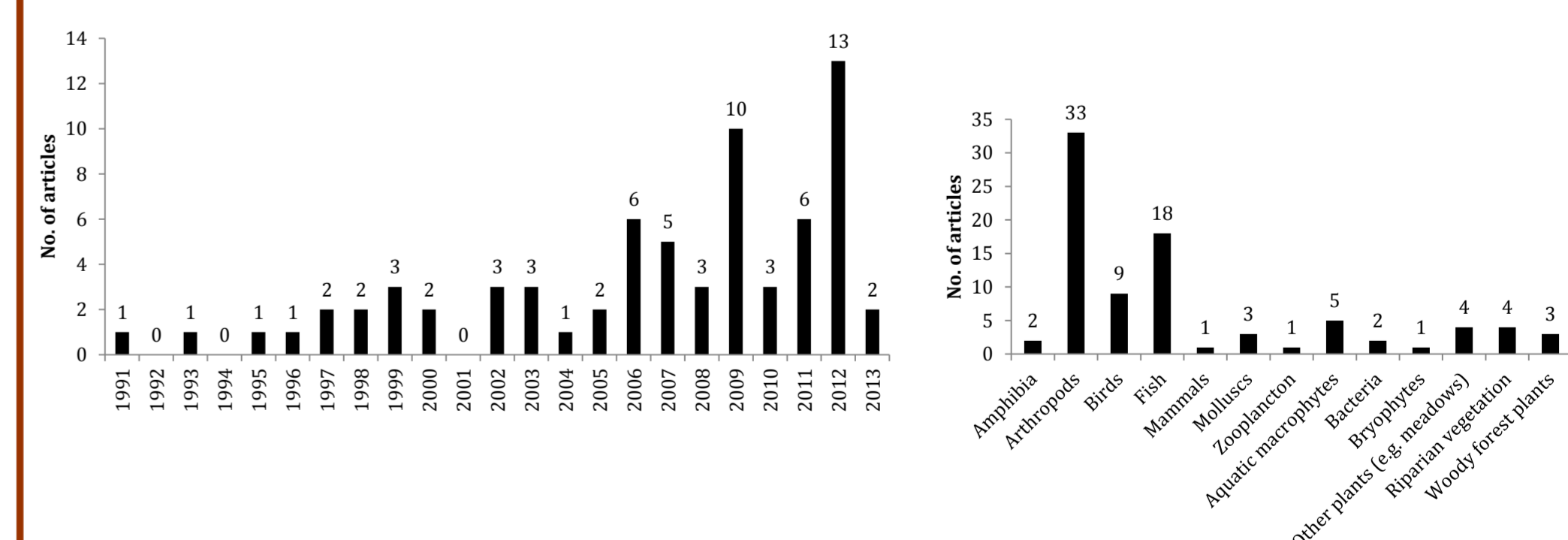
**Primary question:** What is the impact of floodplain management measures on biodiversity and how does the impact vary according to the level of multifunctionality of the measures?

- **Population:** floodplains and rivers.
- **Intervention:** floodplain management measures, commonly related to production and transport, water regulation and flood protection, conservation and restoration as well as recreation activities.
- **Outcome:** change in biodiversity indicators

## Systematic Map



**Figure 3.** Articles included and excluded at different stages of the review and mapping process.



**Figure 4.** Number of articles published each year and number of analyses per taxon encountered in the 70 papers.

## Conclusions and recommendations.

- (i) Multifunctional floodplain management has become an issue of growing attention in several European countries; however, it is still a complex and underresearched topic especially regarding its impact on biodiversity.
- (ii) Restoration and rehabilitation measures strongly improve the multifunctionality of the landscape and cause win-win situations for enhancing overall ecosystem supply from all three sections, i.e. provisioning, regulation/maintenance, and cultural services. Conventional regulation but also interventions related to extraction, infrastructure and intensive land use cause lose-lose situations.
- (iii) Evidence for biodiversity effects of floodplain management interventions is still scarce and scattered, focusing on few interventions, countries and taxa. Analytical research often fails to assess the large (spatial and temporal) scale effects on biodiversity.



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