Introduction

Anthropogenic land use drives recent declines in biodiversity. Land use leads to inputs of agrochemicals, habitat loss, and something else. Different kinds of land use affect neighboring systems to varying degrees. A response to this challenge has been to dives less intrusive forms of agricultural practice. Organic agriculture aims to reduce the burden by reducing agrochemical inputs or reducing the selection of allowed chemicals. These practices have had mixed success in conserving and restoring biodiversity but often lead to reduced yield.

Not only the amount of kind of land use matters but also its spatial arrangement. Heterogenous, and multifunctional landscapes support higher biodiversity. Clustering organic fields can increase the achieved reduction in agrochemical application. While the study of landscape heterogeneity is produced impressive insights, it currently neglects freshwater ecosystems. Rivers and lakes are tightly connected to their catchments and catchments land use is a strong determinant of riverine biodiversity. Schürings et al 2024 highlighted that thematically and spatially highly resolved data sets are better explanatories for observed patterns in aquatic biota. But their study only investigates the amount and intensity of agriculture, not its spatial distribution.

Why would you expect this?

We aim to fill this gap by leveraging high resolution land use data to test whether the spatial arrangement of agricultural areas in a catchment influences the response of aquatic biota. To this end, we use a joint species distribution model together to determine the influence

Methods

Biological data

We used large biomonitoring databases available for four countries France, Finland, Germany, and the UK. Describe data.

Environmental data

From each sampling locations we determined all upstream catchments in the EU HydroDEM database. Within each upstream catchment, we extracted the land use data from darimont. Describe the data set. Using he weightings Schürings et al 2024 derivded from that paper, we determined Nitrogen, Phospohrous, and pesticides intensity scores for each crop type. Non-agricultural types were set to 0.

We used two independent approaches to identify the relevance of agricultures spatial arrangement.

First

MOSAIC type

Sparing vs sharing