

Scan to Connect

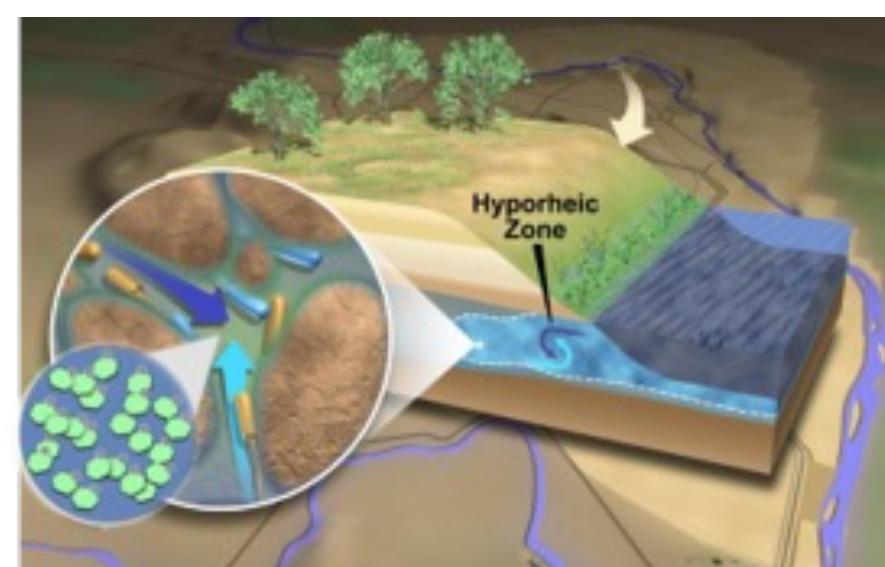


# Allometric scaling of hyporheic respiration across contrasting basins in the Pacific Northwest, USA

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## Background and Motivation

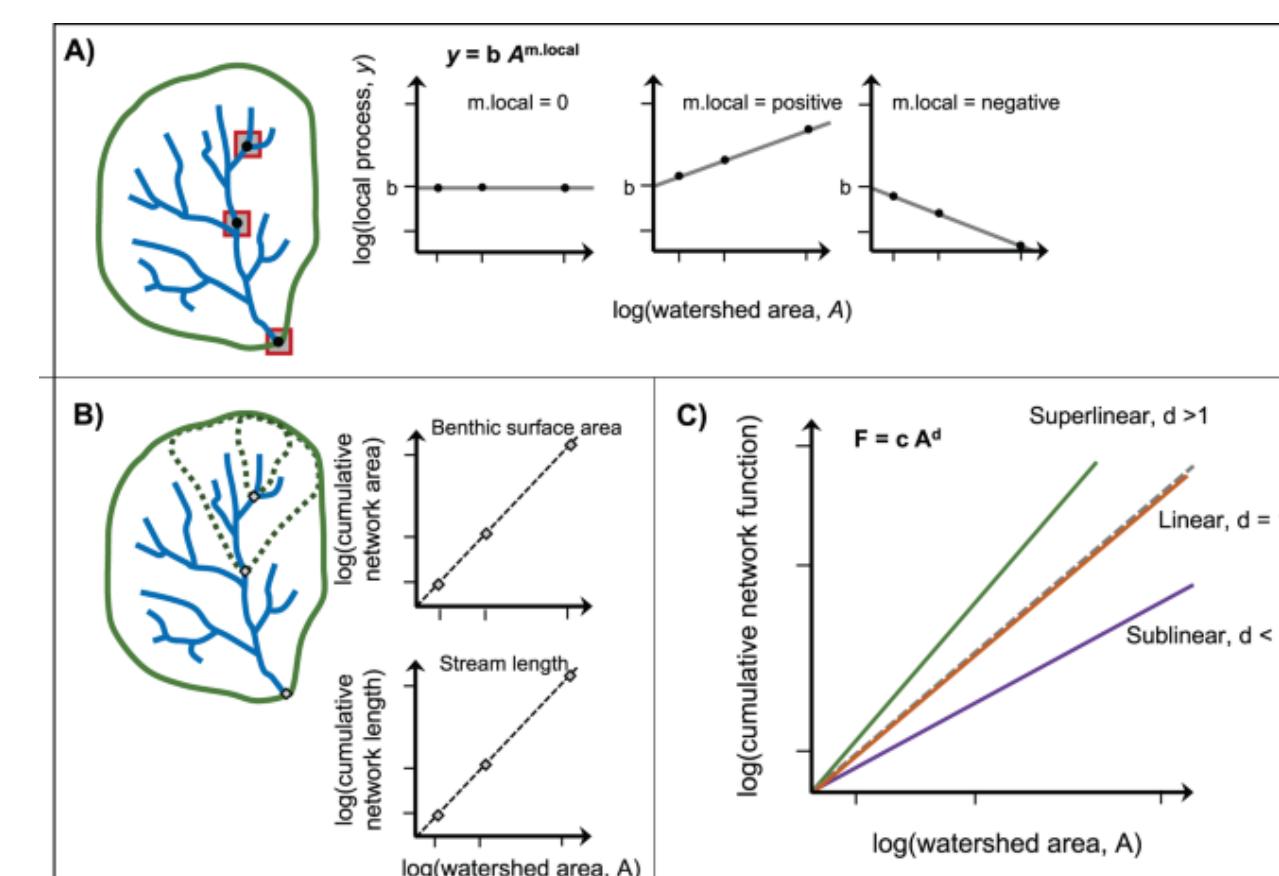


**Hyporheic zones** (the interface between surface and groundwater) in river corridors regulate aquatic metabolism. They are temporally dynamic and spatially heterogeneous interfaces, **making it difficult to predict hyporheic respiration across scales**.

**Allometric scaling** (processes scaling with watershed area) are a valuable framework for Wollheim et al. (2022) showed consistent linear to super-linear allometric scaling of ecosystem respiration with watershed area.

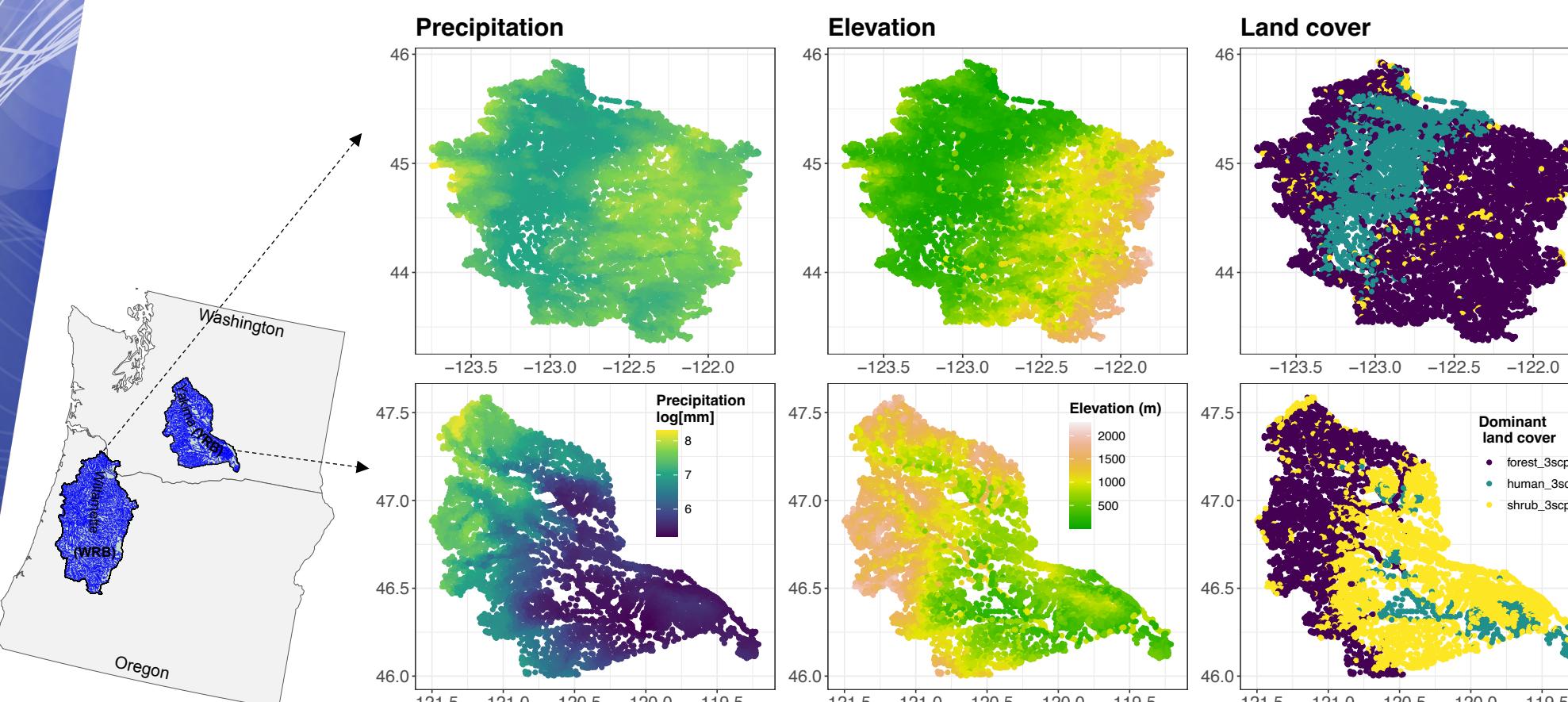
### Questions

1. Does hyporheic respiration scale allometrically?
2. Do watershed characteristics influence allometric scaling relationships?



Wollheim et al. (2022) *Nat. Comm.*

## Study Basins



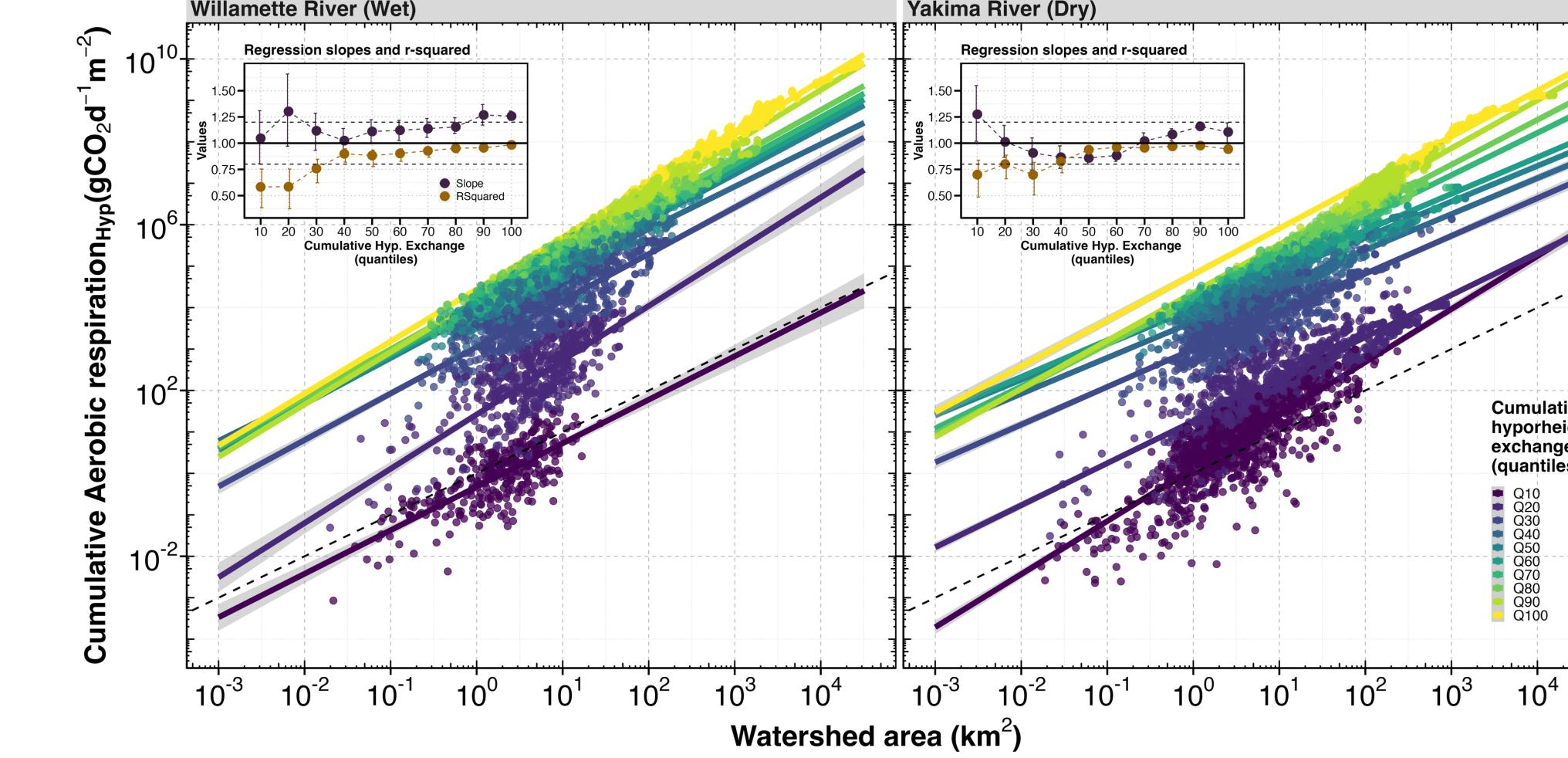
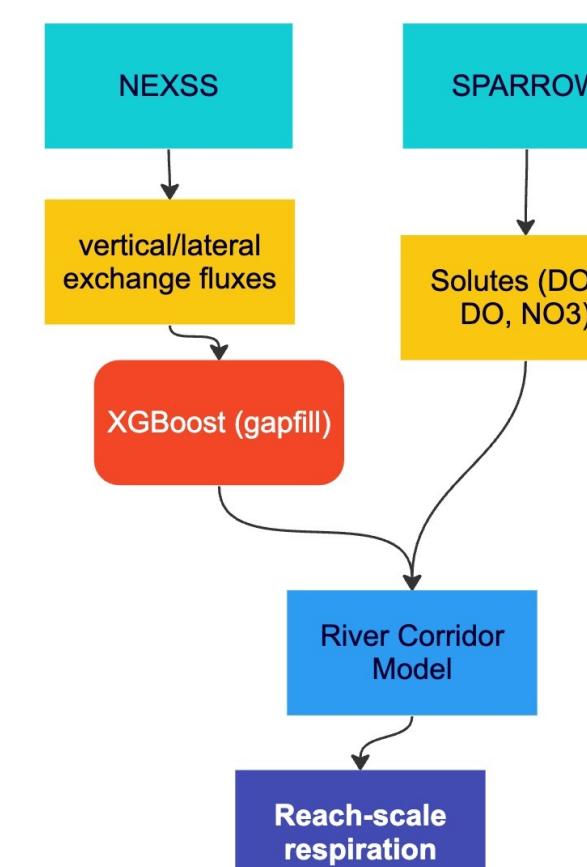
### Willamette (WRB)

- Wetter
- Lower elevation
- Primarily human and forested landcover

### Yakima (YRB)

- Drier
- Higher elevation
- Primarily shrub and forested landcover

## Modeling



## Allometric Scaling

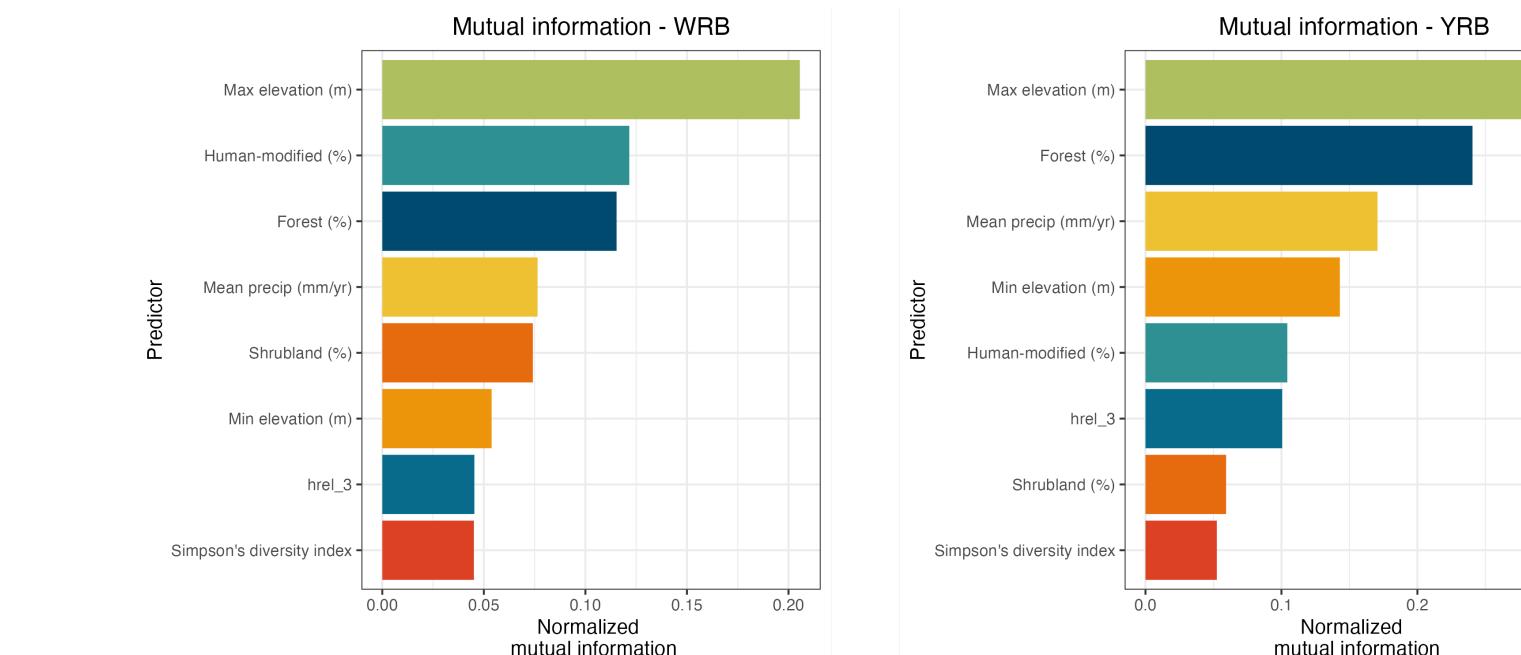
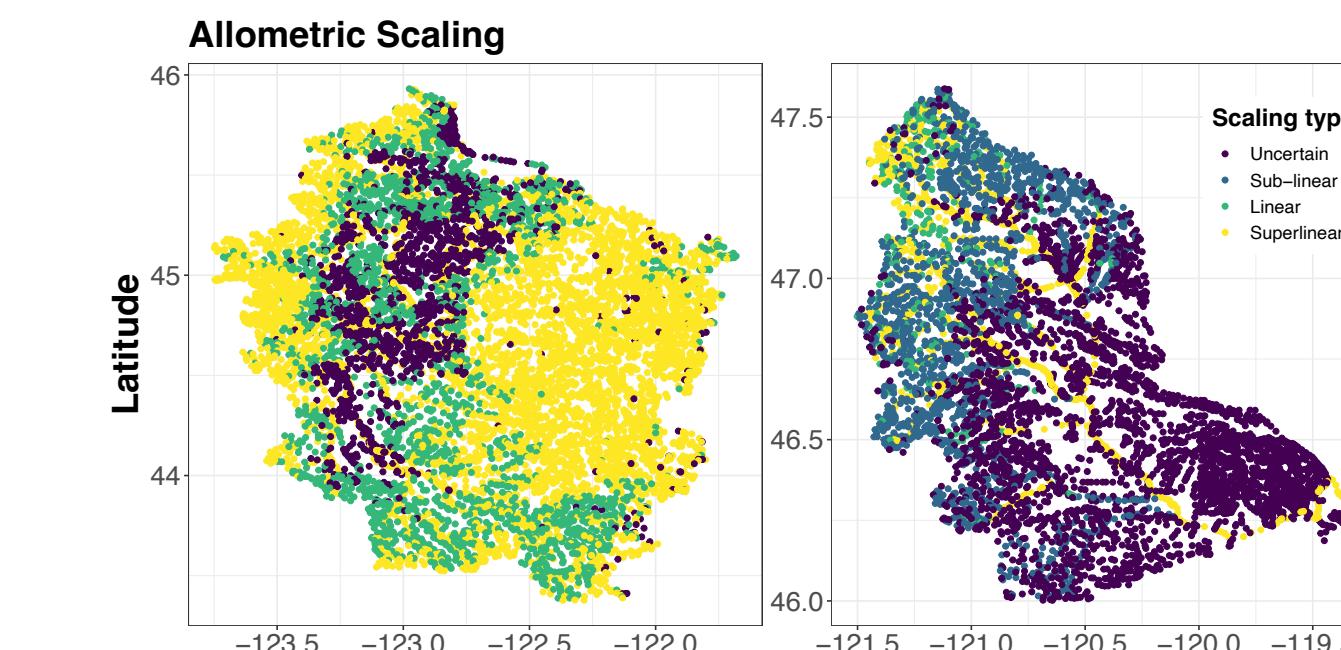
### Consistent patterns

- Strongest allometric scaling ( $R^2$ ) at highest hyporheic exchange fluxes
- **Super-linear** scaling (slope  $> 1$ ) at highest exchange fluxes

### Basin-specific patterns

- **Sublinear** scaling in YRB for mid exchange flux quantiles
- **Linear** scaling: Q40/Q50 in WRB, Q70 in YRB

## Relating to Ecosystem Characteristics



### Consistent relationships

- Maximum elevation shares the most mutual information with cumulative respiration
- % Forest and annual precipitation are in the top four mutual information

### Basin-specific relationships

- Human-modified land-cover shares 2<sup>nd</sup>-most mutual information with cumulative respiration in WRB, but 5<sup>th</sup>-most in YRB

## Take-homes

1. Hyporheic respiration generally scales allometrically, with weakest relationships at lowest exchange fluxes
2. Elevation, land cover and precipitation all share information with spatial scaling patterns