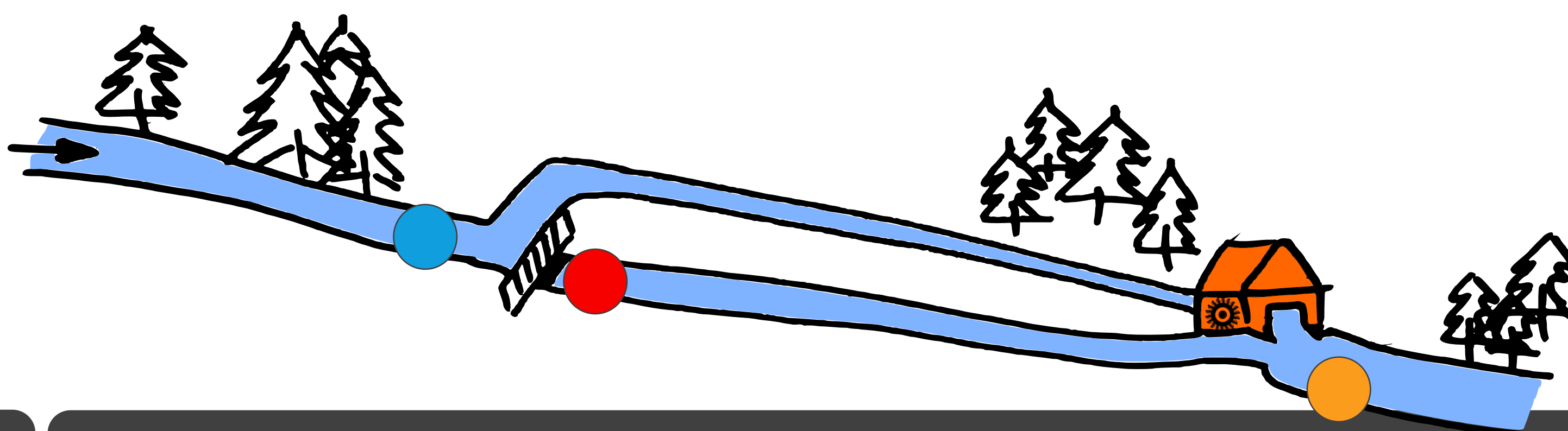


# Ecological impacts of small-scale run-of-river hydropower plants

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## Studying seven small-scale run-of-river hydropower plants (< 3MW)

Small-scale hydropower plants are perceived to have a small ecological impact but studies assessing their local impacts are rare. A better process-based understanding is needed for designing efficient mitigation measures.



## Objective

Systematic evaluation of changes in habitat conditions (habitat size, habitat stability and resources for lower trophic levels), invertebrate and fish communities among the three river reaches.

## Hypotheses

### Habitat size

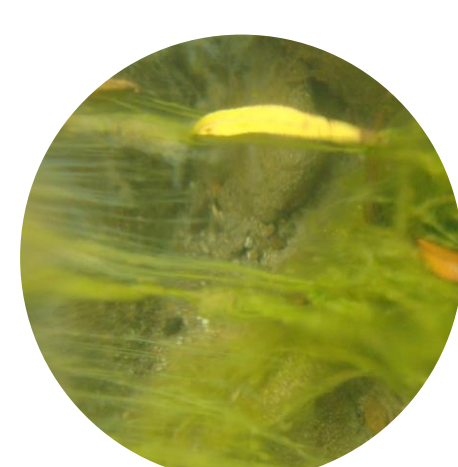
Discharge reduced from point of abstraction to return (Anderson et al. 2014).

### Habitat stability



Diversion weir traps sediments -> more stable conditions downstream (Anderson et al. 2014).

### Resources for algal production



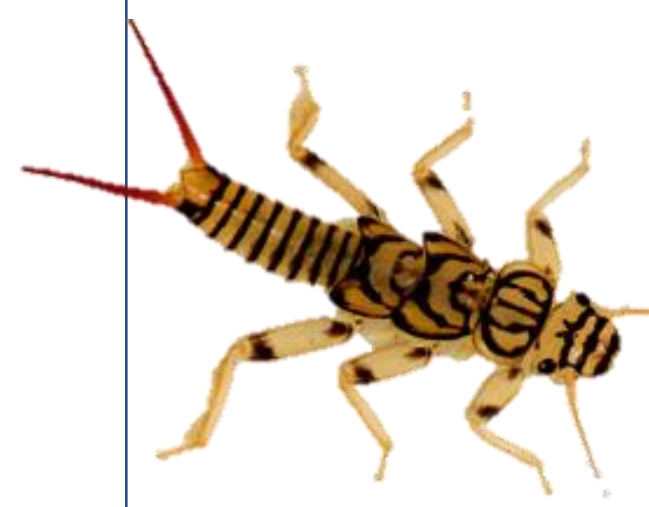
Differences in flow velocity alter nutrient uptake rates -> lower nitrate concentrations (von Schiller et al. 2016).

### Resources for heterotrophs



Water diversion reduces organic matter retention -> lower fine particulate organic matter concentrations (Arroita et al. 2015).

### Sensitive invertebrate taxa



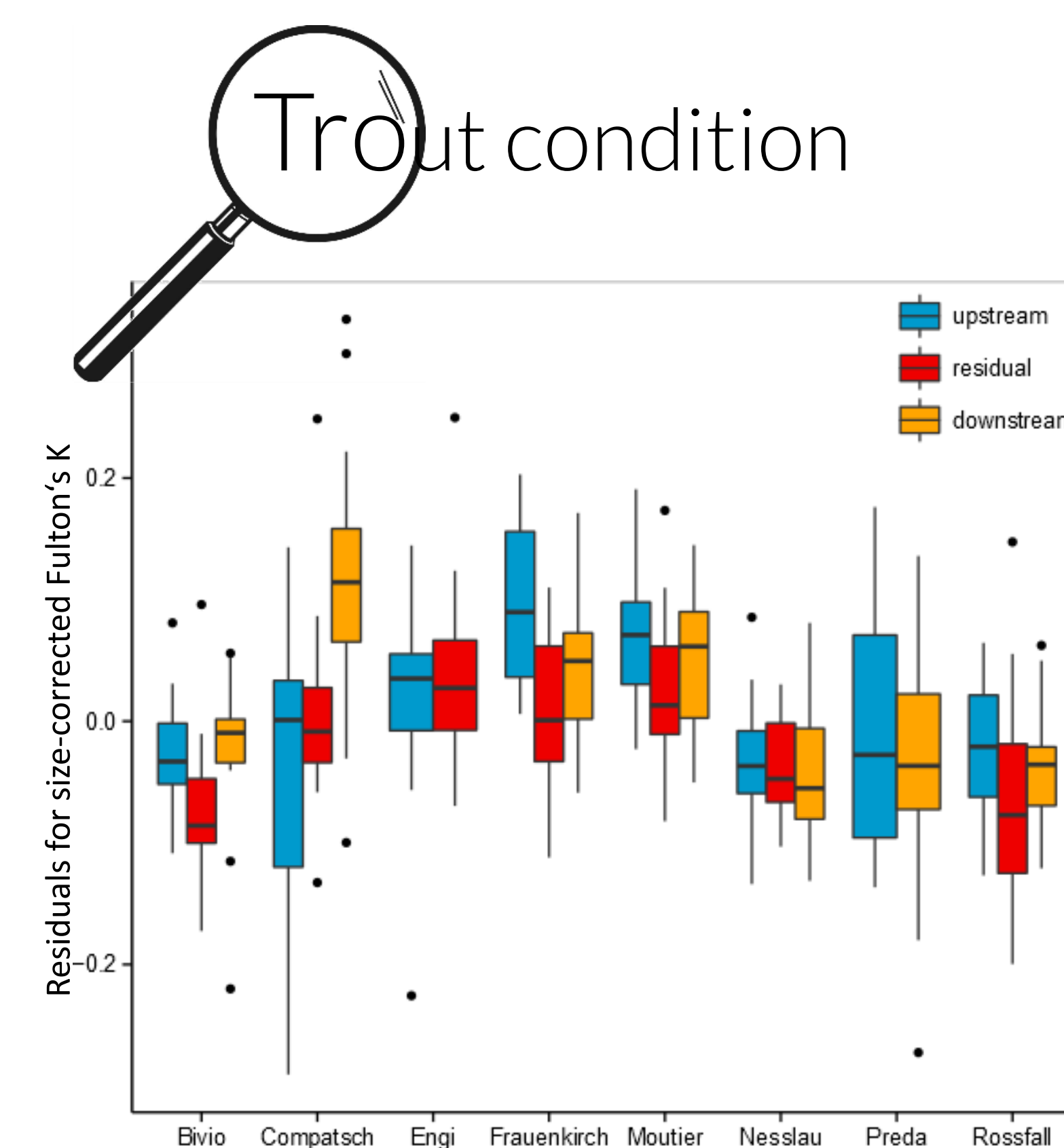
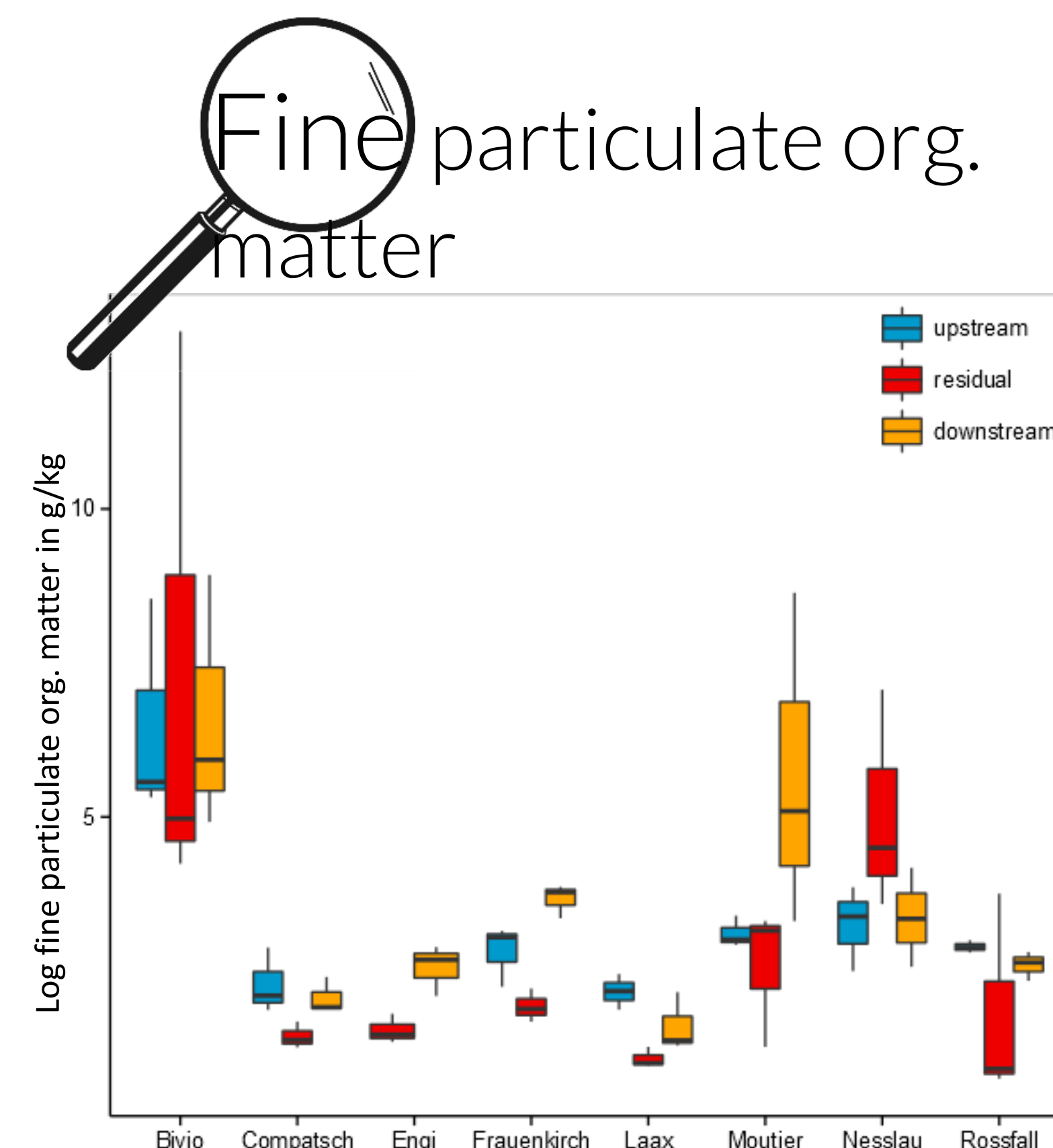
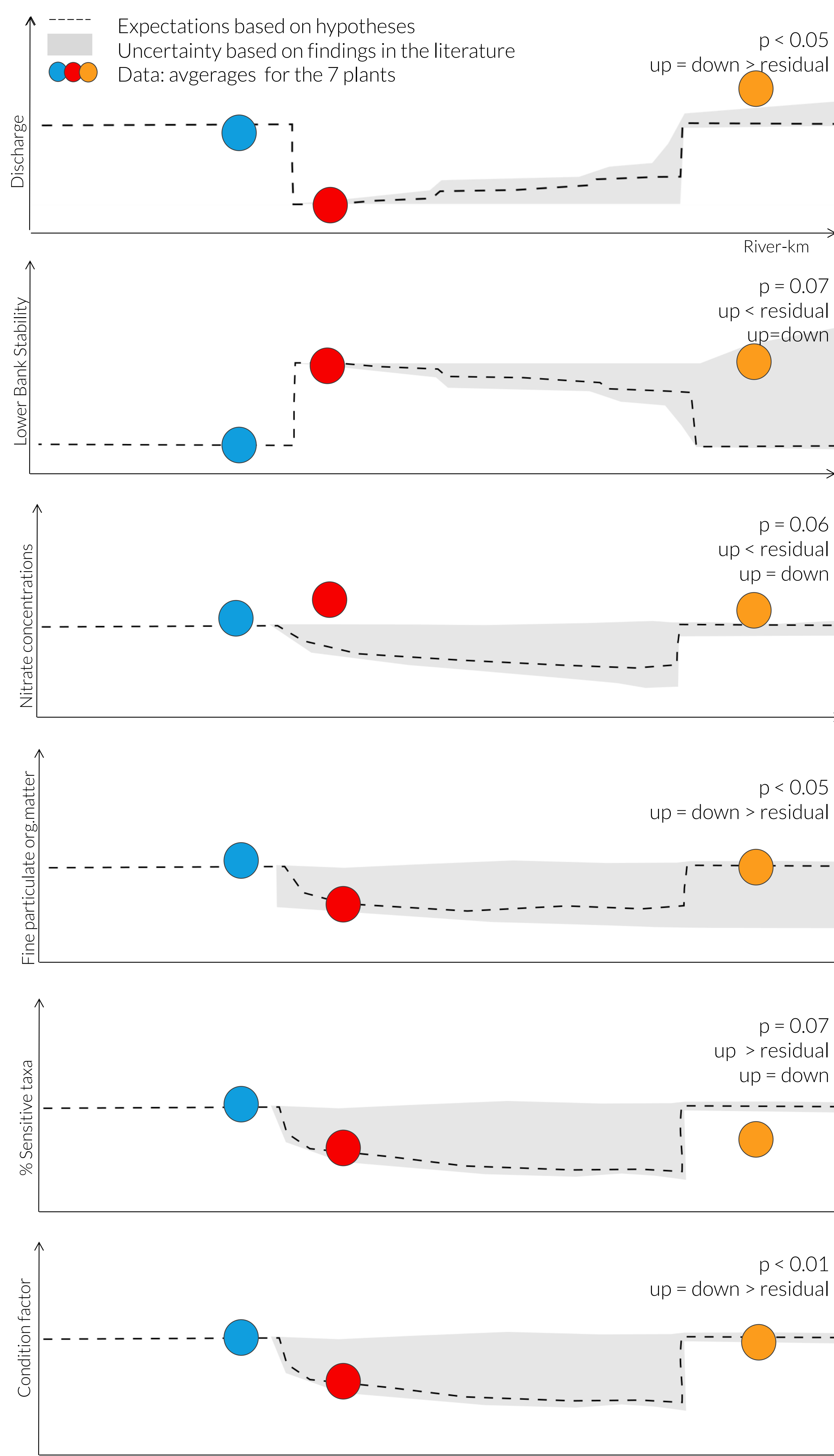
Reduced habitat size, sediment dynamics and an altered resource supply reduce the proportion of the sensitive mayfly, stonefly & caddisfly taxa (Anderson et al. 2014).

### Trout somatic condition



Reduced habitat availability and altered food supply will adversely affect trout somatic condition (Benejam et al. 2015).

## Schematic expectations (---; incl uncertainty) and results (circles)



## Conclusions

Small-scale hydropower plants reduced discharge and sediment dynamics which has led to more stable conditions in the residual flow reaches. This had consequences for the supply of resources for algal and invertebrate communities which may have then reduced the proportion of sensitive invertebrate taxa and trout condition.

## Outlook

Trout body condition may be reduced due to harsher habitat conditions, increased intraspecific competition or an altered invertebrate food supply. Therefore we aim to determine which variables are driving this decline. Further, we will be investigating changes ecosystem functions such as shifts in carbon resources and food-web architecture.

## References

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