

# Beavers influence stream dissolved organic carbon by coupling terrestrial-aquatic ecosystems



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# Research project team

## Principal Investigators:

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## Ph.D. Student

- Valentin Moser (WSL & Eawag)

## Msc students

- Dominic Tinner & Julia Holmes (WSL)

## Co-Investigators:

- Aline Frossard (WSL)
- Steffen Boch (WSL)
- Christopher Robinson (Eawag)

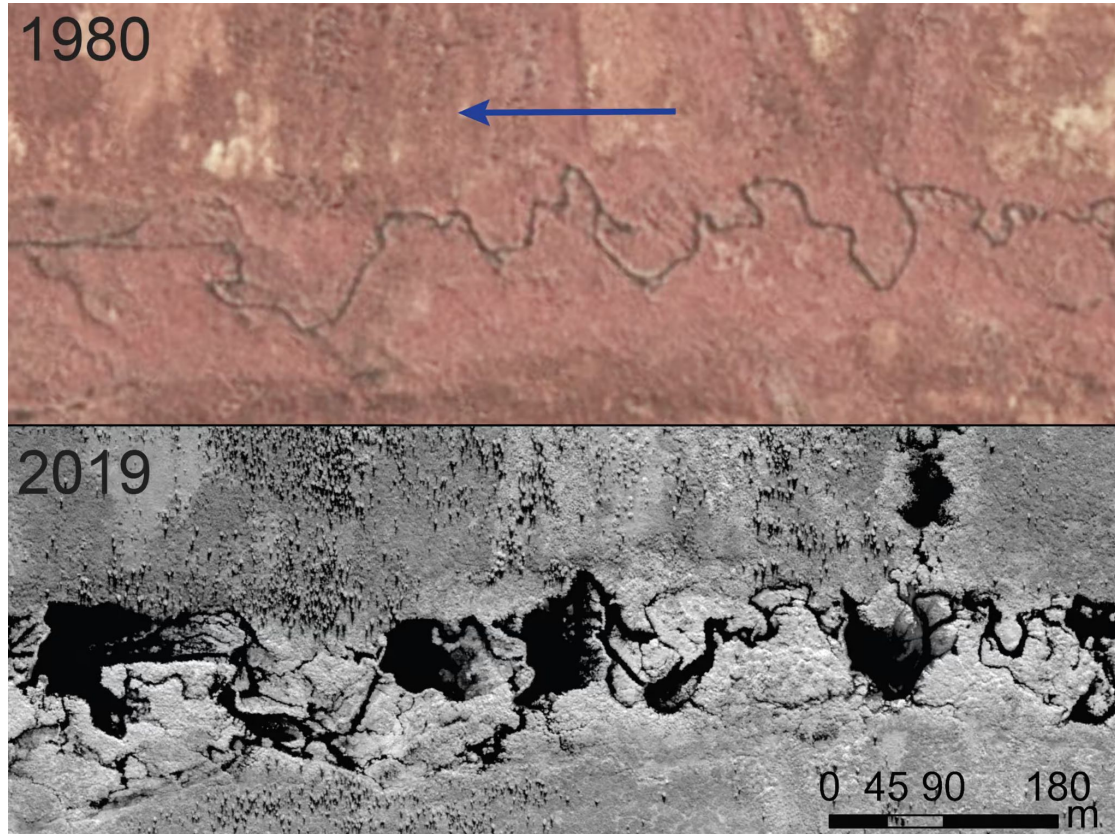
## External collaborators:

- Christof Angst (Biberfachstelle CH)
- Silvan Minnig (umweltbildner.ch)



# Beavers increase stream lateral connectivity and decrease longitudinal connectivity

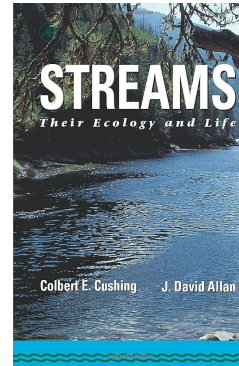
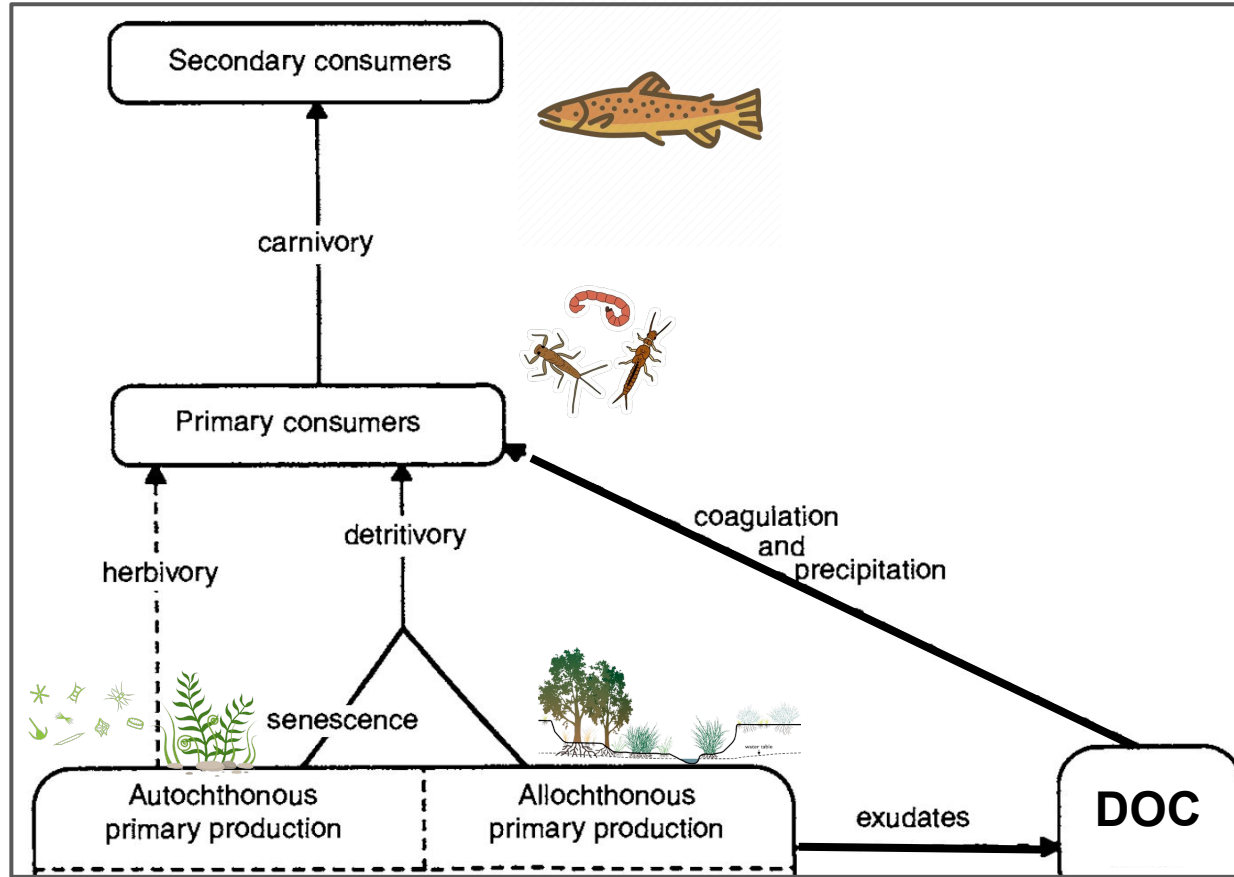
north-western Alaska



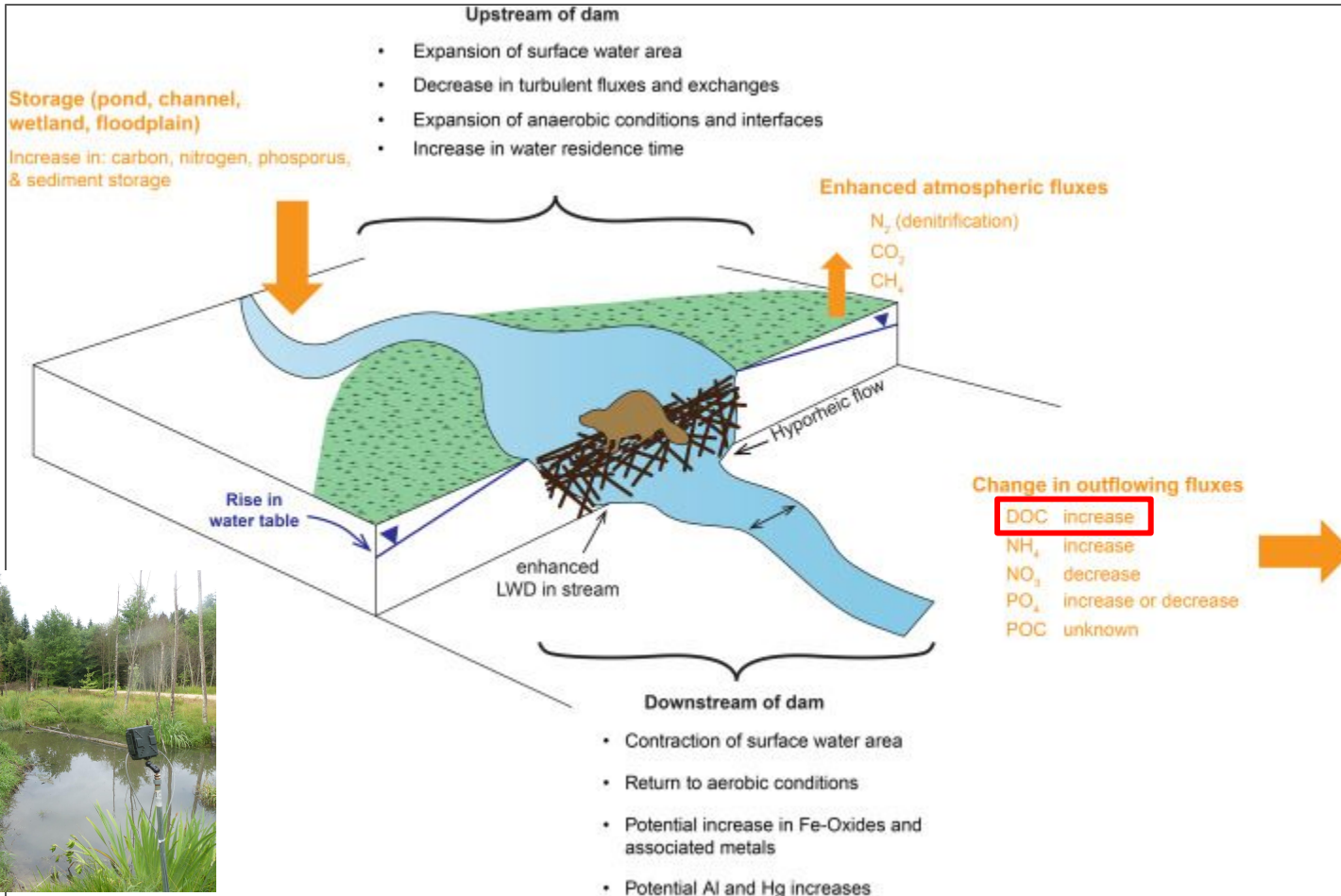
# Beavers increase stream lateral connectivity and decrease longitudinal connectivity



# What we do know: the carbon cycle in streams



# How do beavers influence stream nutrient content?



# Research questions

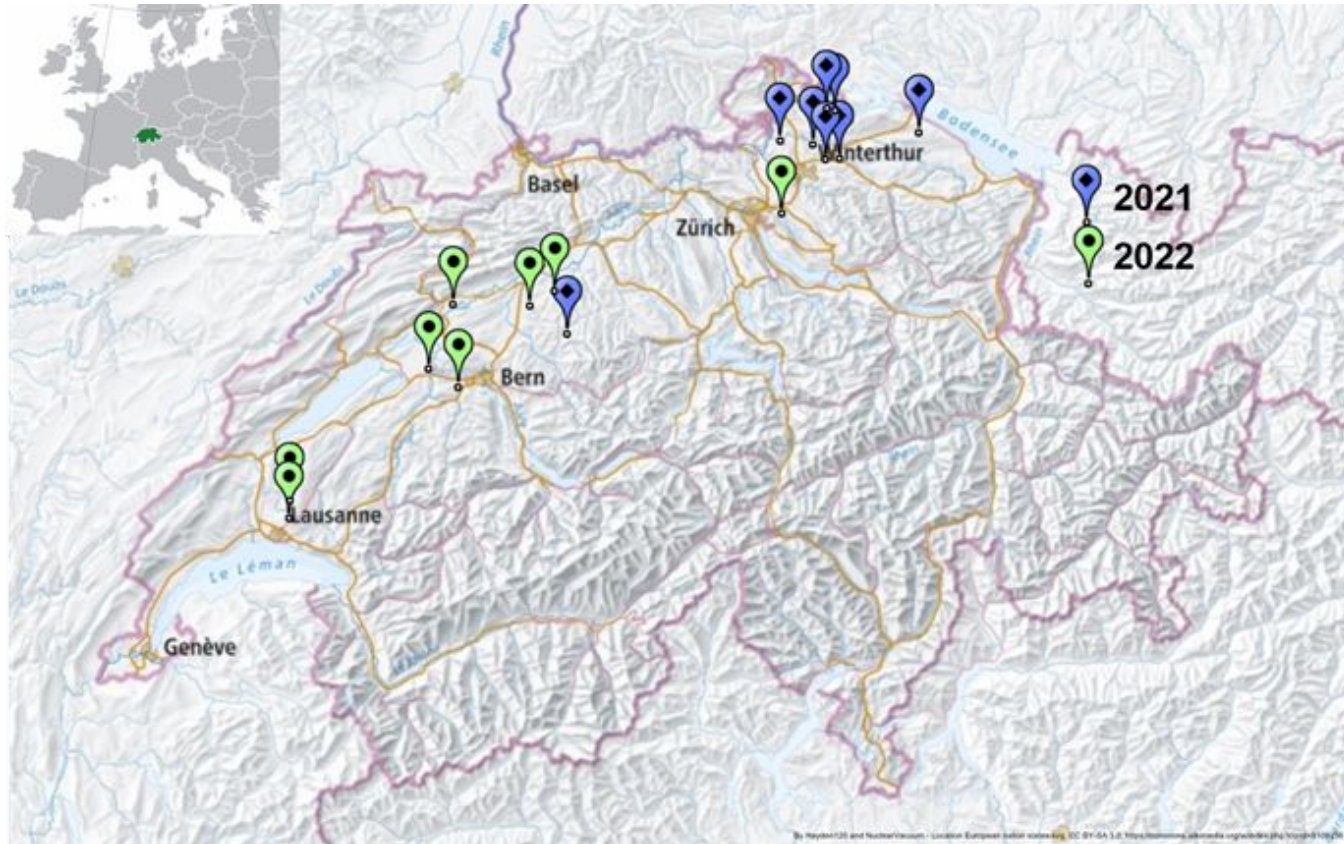
1. How much does the beaver damming activity influence the dissolved organic carbon content from upstream to downstream?



2. Do aquatic primary producers and terrestrial inputs influence the change of dissolved organic carbon content from upstream to downstream?

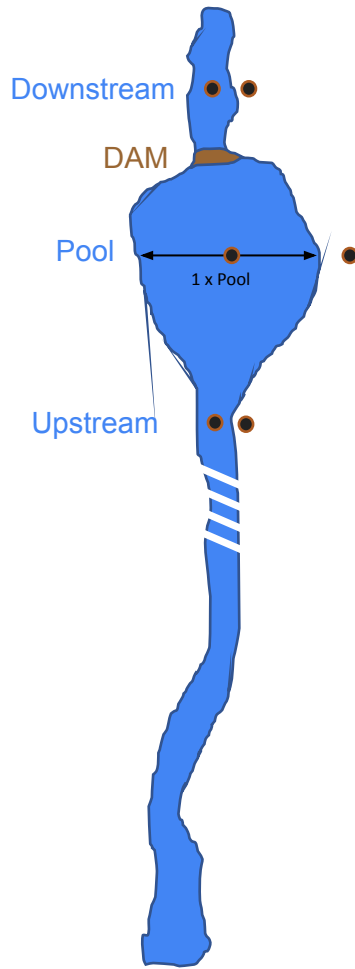
3. Does the age of the beaver pond influence the change of dissolved organic carbon content from upstream to downstream?

# Methods: sampling design



16 sites sampled: 8 sites in 2021 & 8 sites in 2022

# Sampling design & outcome



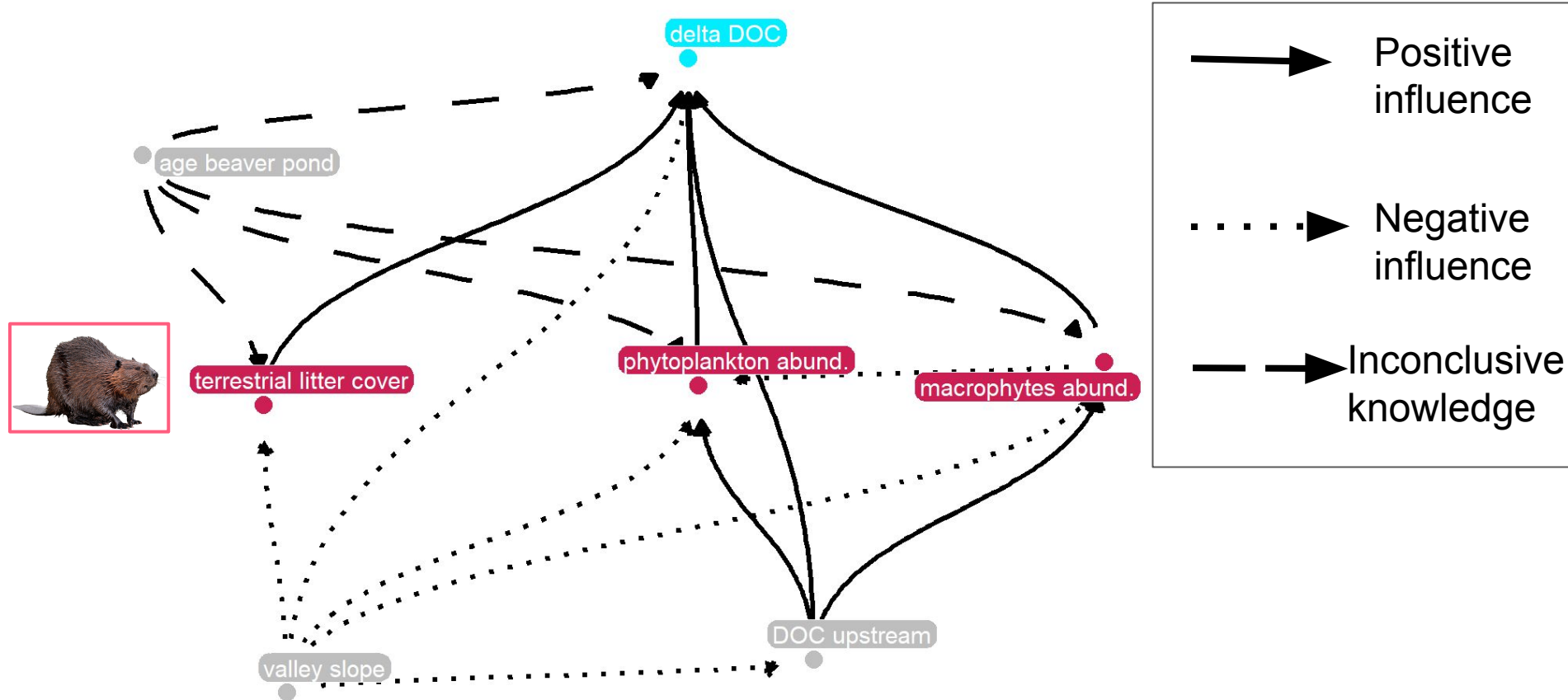
Outcome:  $\text{delta DOC} \rightarrow \text{DOC}_{\text{downstream}} - \text{DOC}_{\text{upstream}}$

mg/L                      mg/L                      mg/L

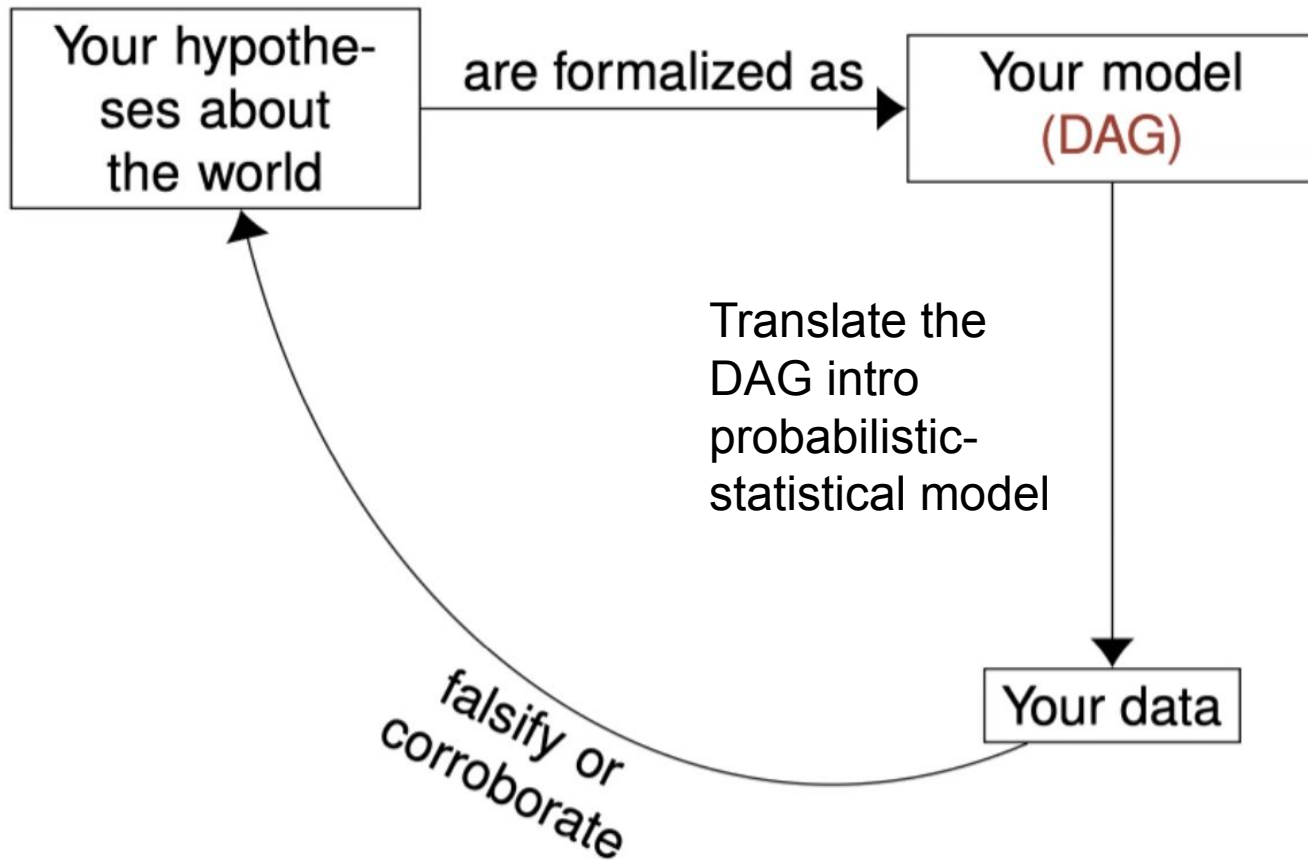
## Outcome interpretation

- if  $\text{delta DOC} > 0$  then the beaver pond is a **source** of DOC to the stream
- if  $\text{delta DOC} < 0$  then the beaver pond is a **sink** of DOC
- if  $\text{delta DOC} = 0$  then the beaver pond **does not influence** the DOC content

# Our hypothesis: the directed acyclic graph (DAG)

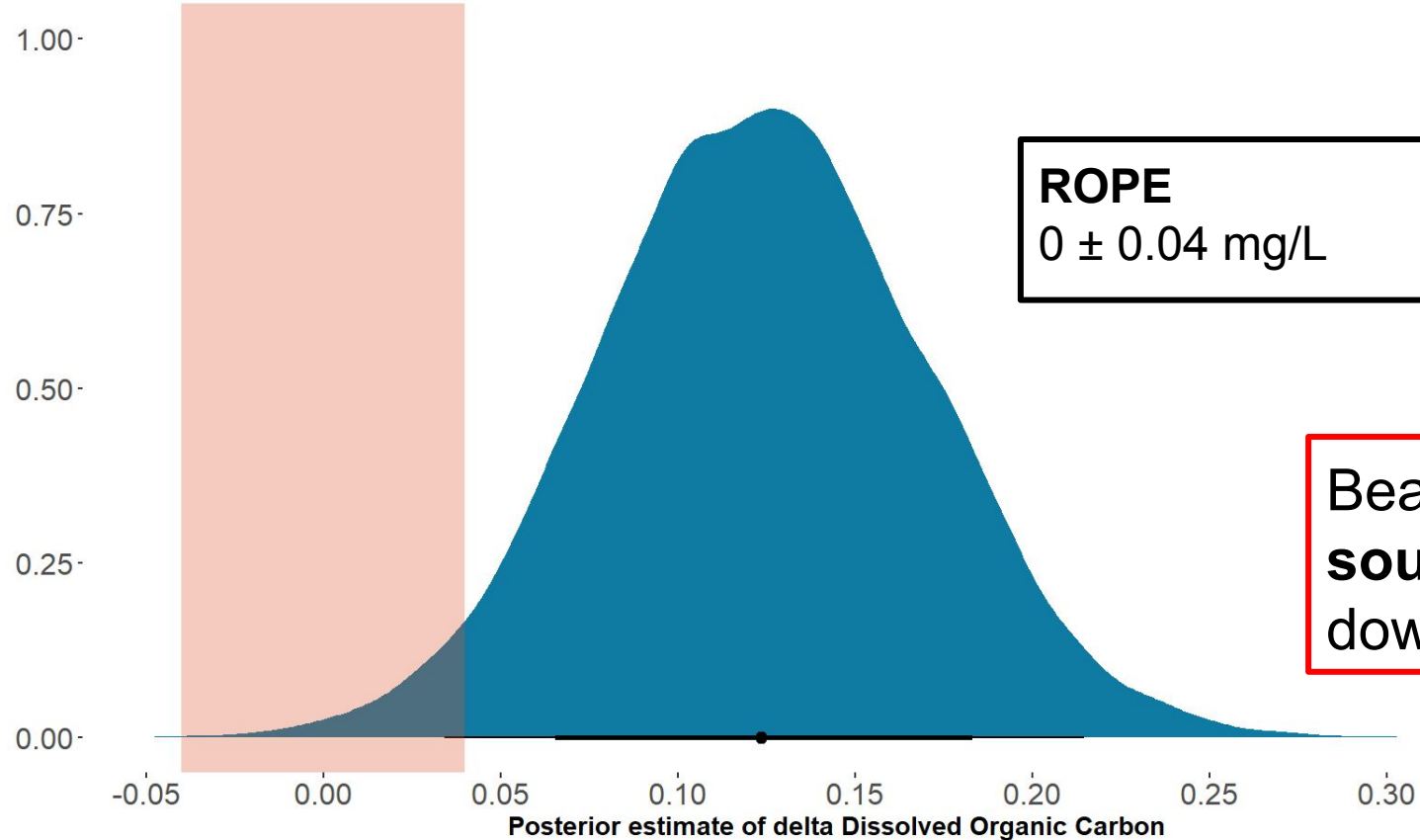


# The Model Building Cycle



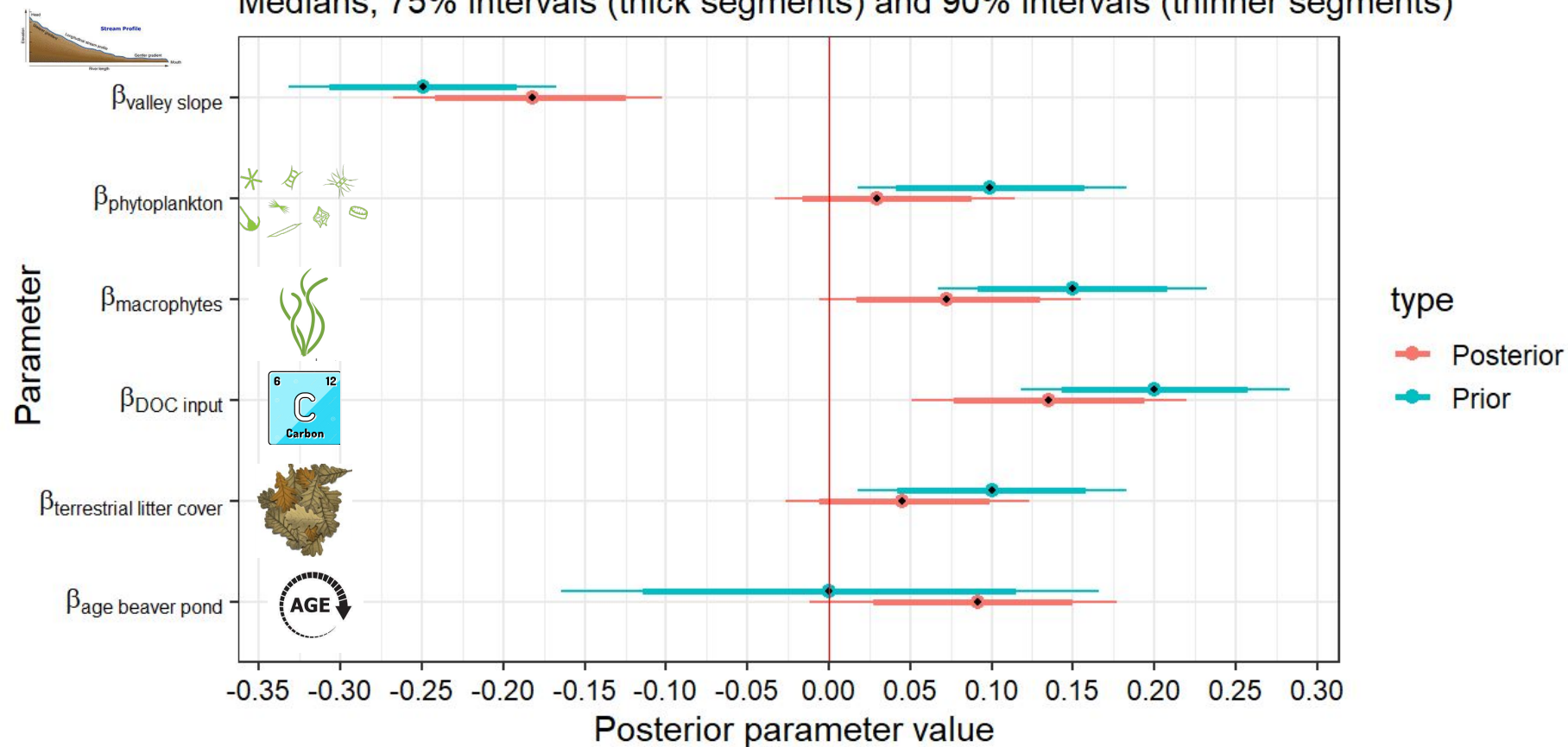
# Results

Median shown with point; 80% and 95% credible intervals shown with black bars

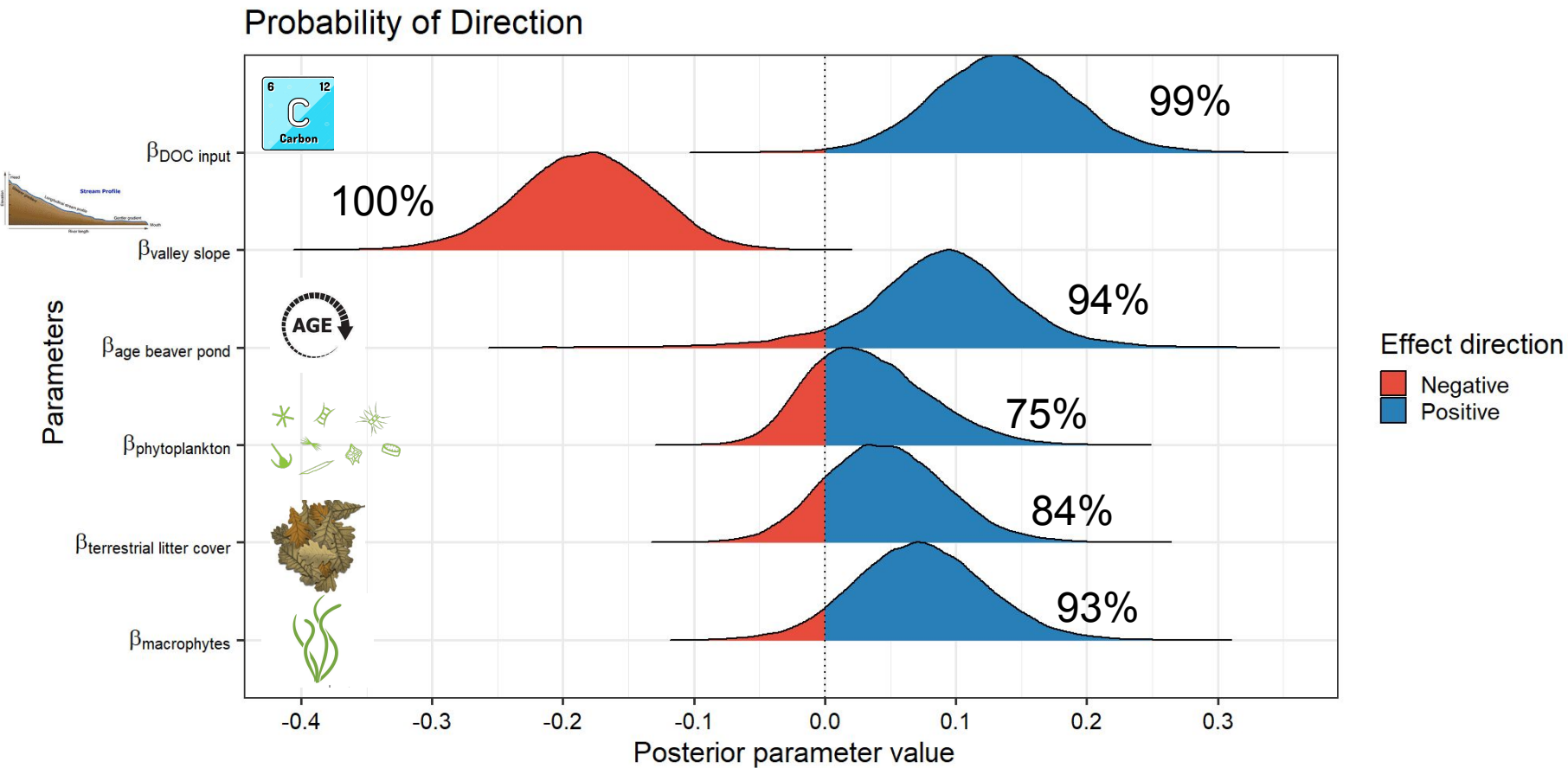


Beaver's pond are  
**source** of DOC  
downstream

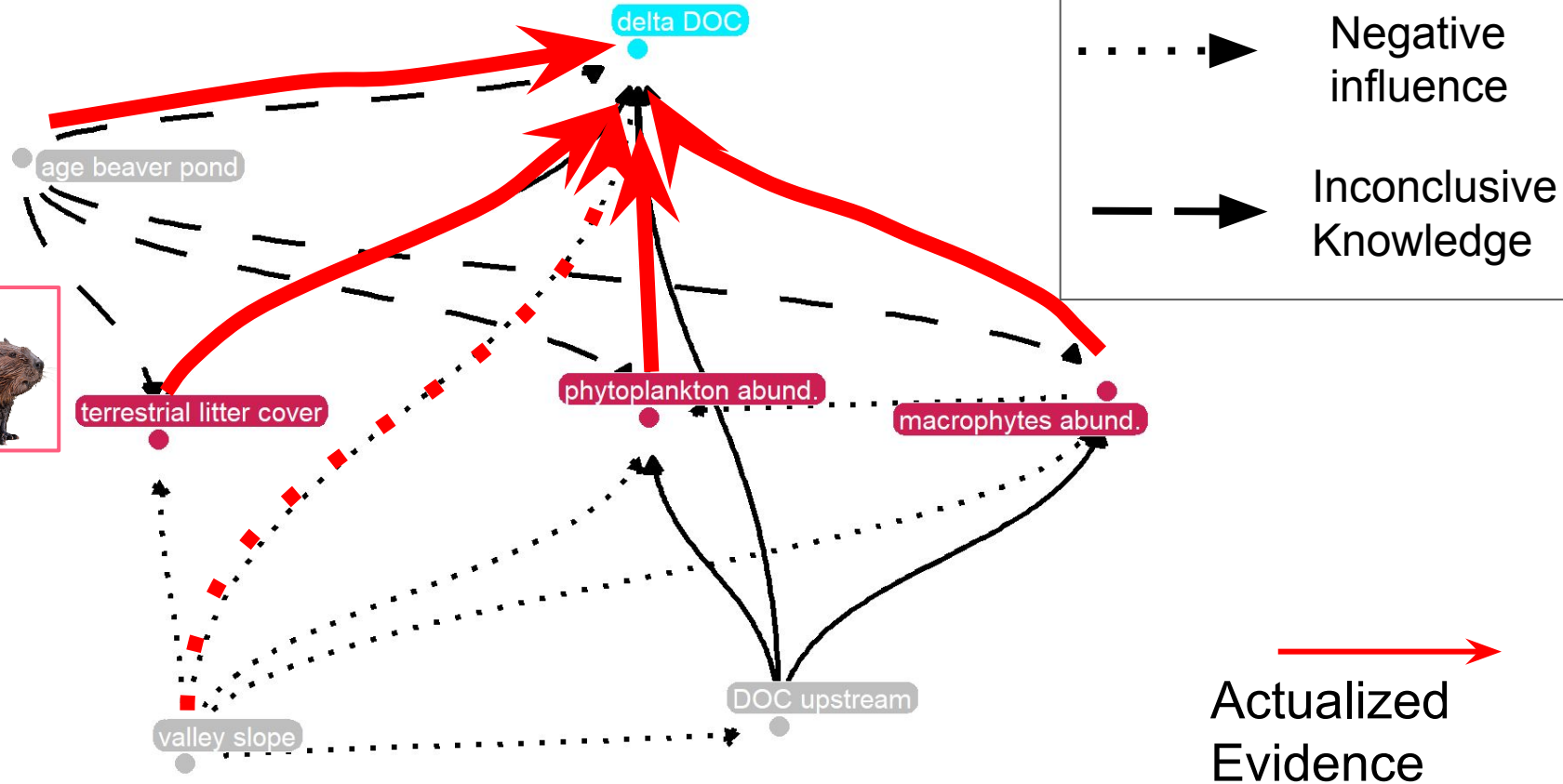
# Medians, 75% intervals (thick segments) and 90% intervals (thinner segments)



# Results



# Conclusions



# Take home messages

- Beaver ponds can be considered **sources** of DOC
- The main that influence DOC releasing in the water are:
  - aquatic primary producers ( from 2% to 8% increase)
  - terrestrial litter inputs (from 5 to 15% increase)
- The older the beaver pond, the more carbon is released into the water

