Beavers banking on carbon: drivers of carbon storage across annual and decadal scales in a Swiss beaver wetland

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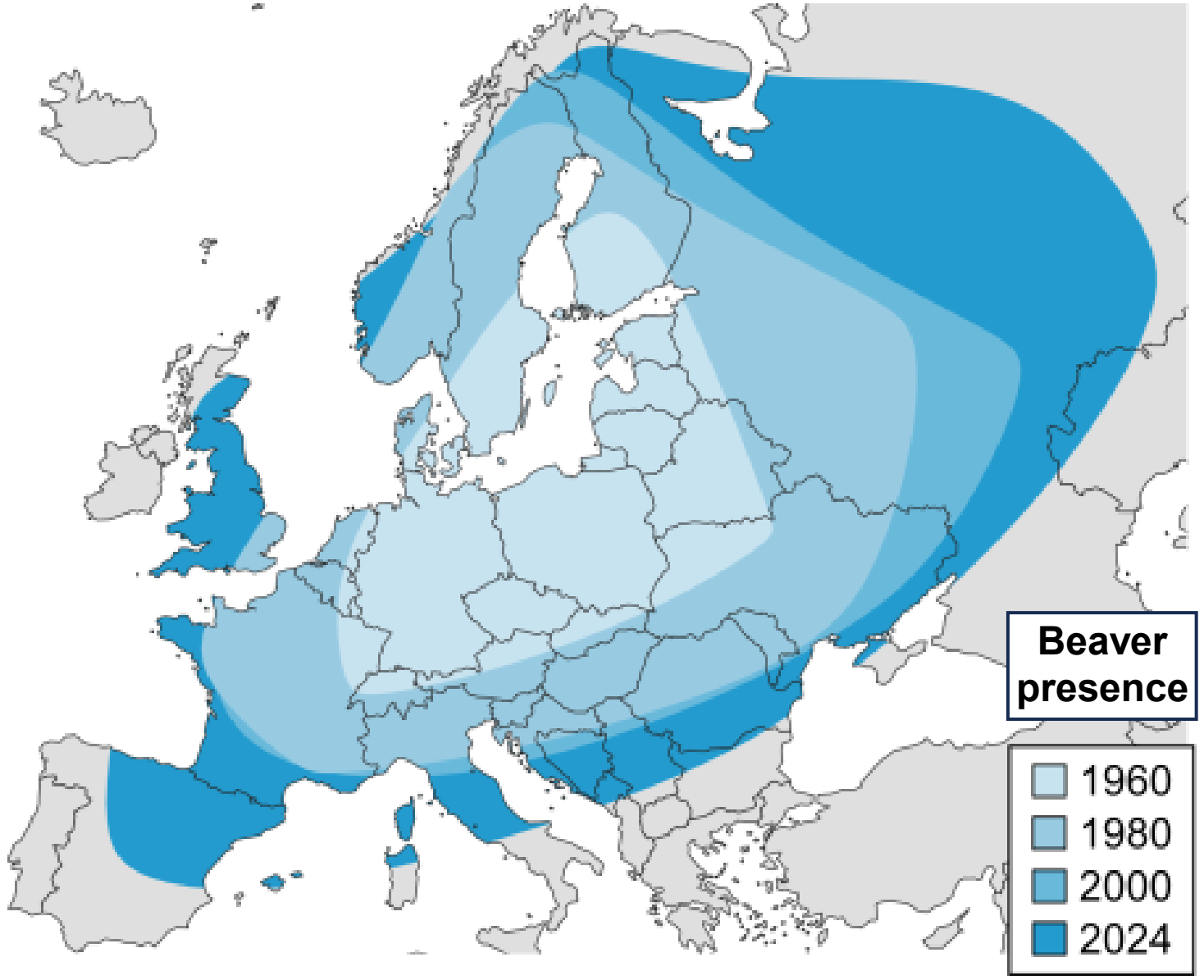
Photo: Christof Angst, 2021

February 2022

Recolonisation of beavers in Europe



Data from GBIF Backbone Taxonomy, 2024

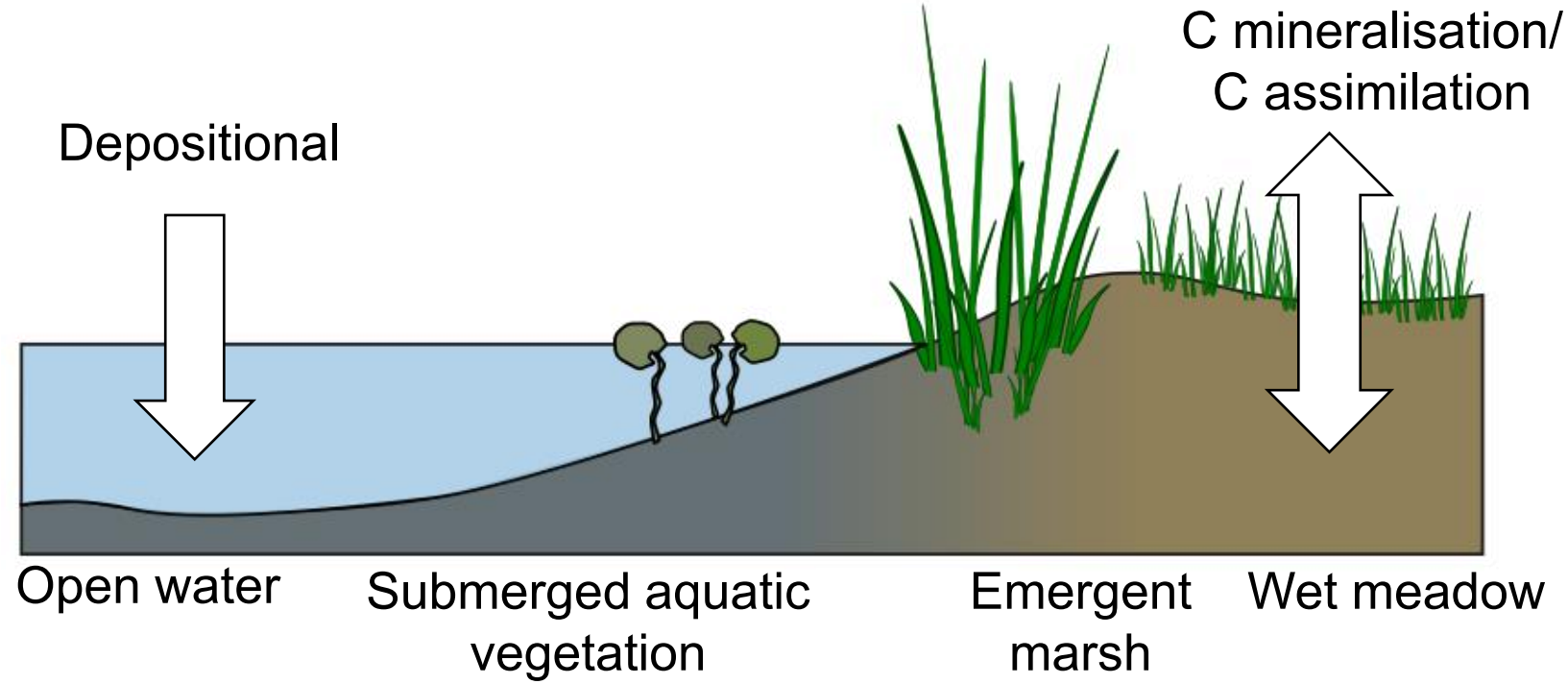
Beaver wetland ecosystem feedbacks

Increased water residence time

Vegetation shift & riparian connectivity

Raised groundwater table

Sediment deposition



Beaver wetland succession

Current unknowns:

- Role of hydrology and/or biogeochemistry in driving C turnover?
- Importance of processing and storage of fluvial C?
- Potential for long-term C sequestration?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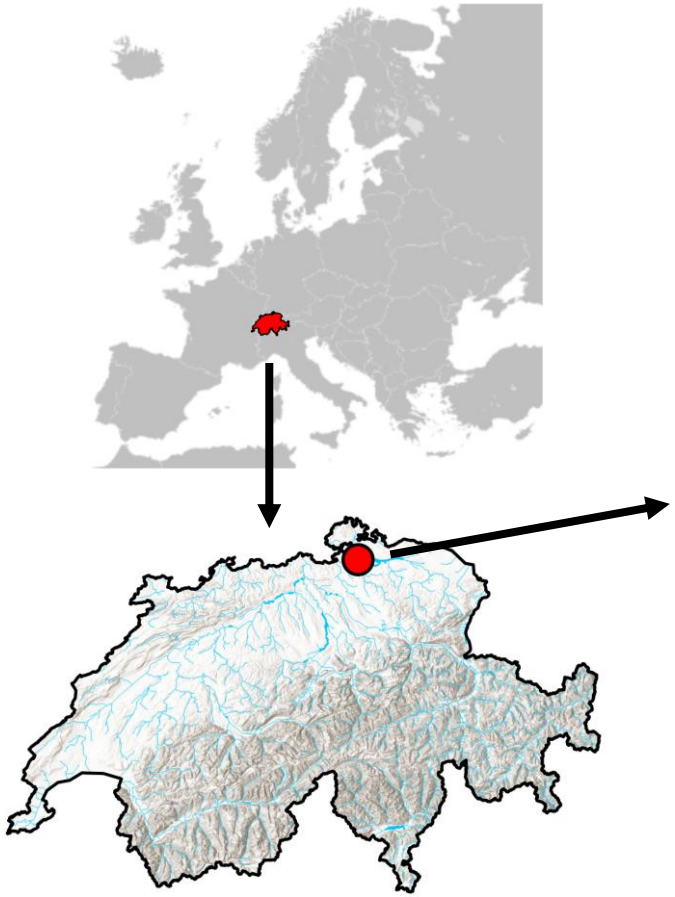
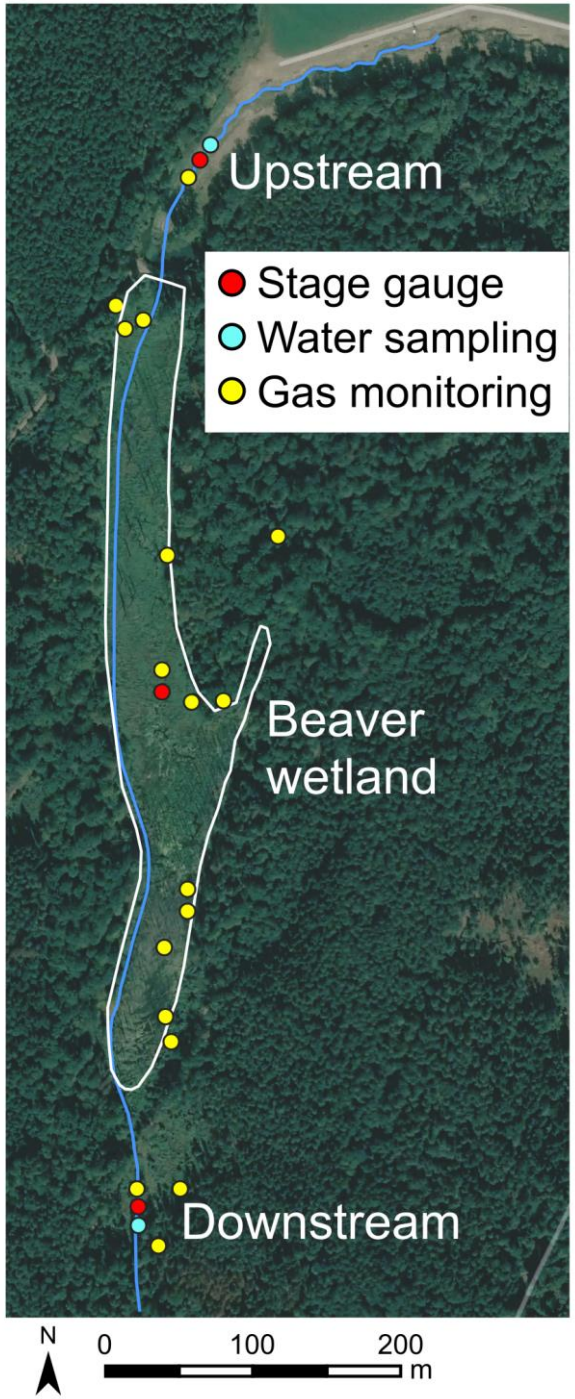
Study area

Marthalen, Switzerland





Beaver wetland (3.6 ha)

Data collection (2022)

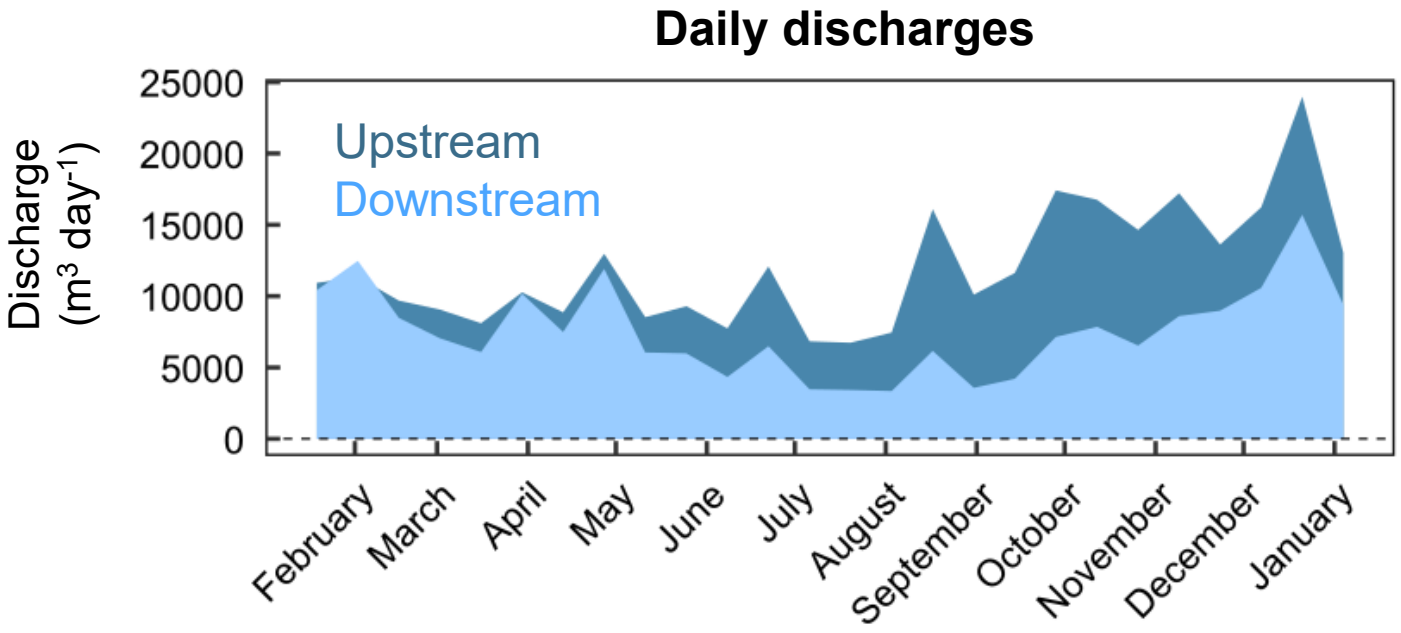
Hydrological monitoring

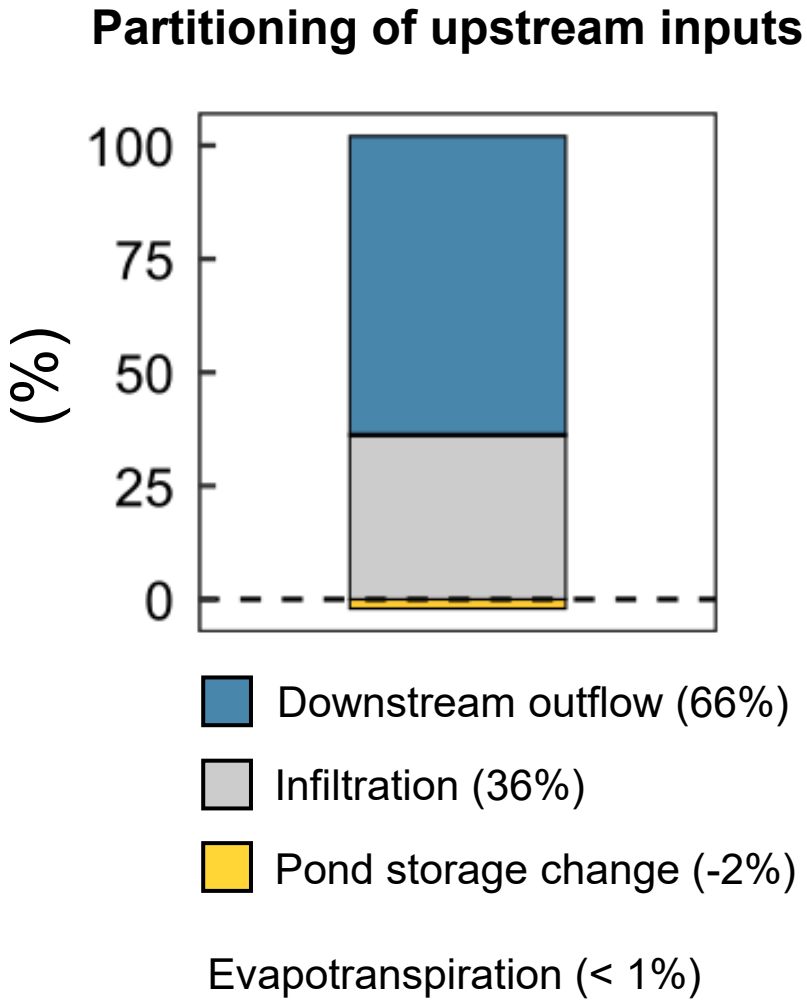
- Upstream, downstream discharge
- Wetland water area and volume

C budget monitoring:

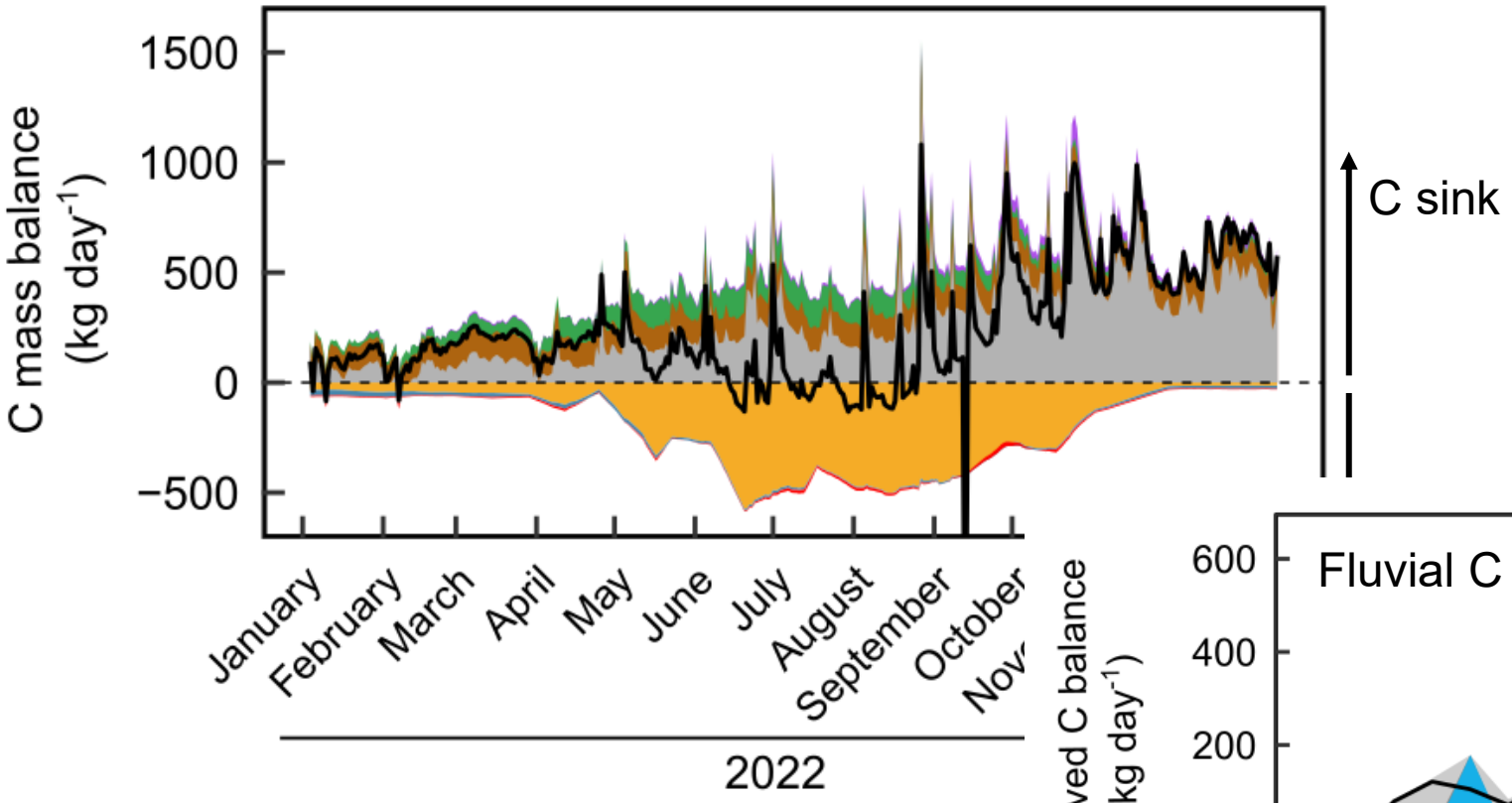
- GHG gases
- Dissolved C loads (upstream-downstream)
- Sediment C
- Biomass C

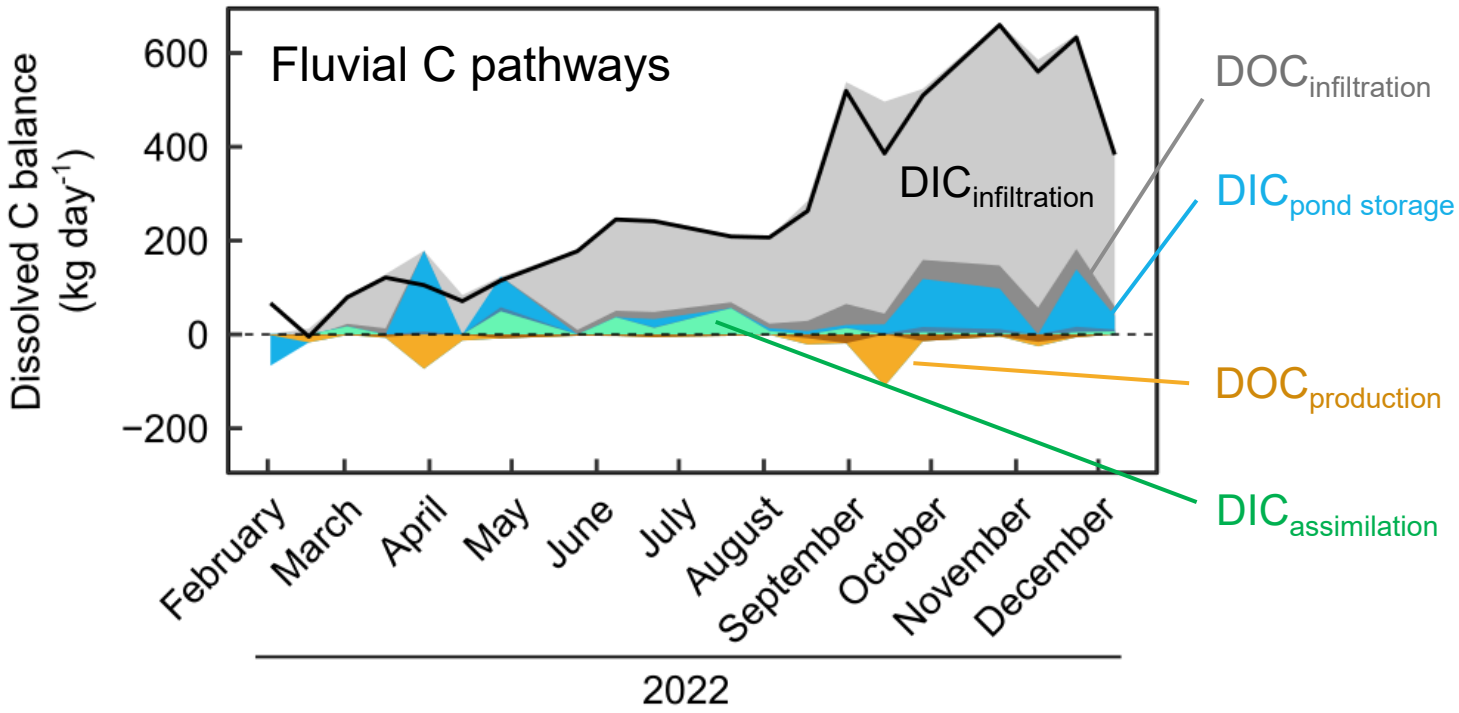
Wetland water balance





Annual C budget dynamics





Abbreviations:

DOC=Dissolved organic carbon (water)

DIC=Dissolved inorganic carbon (water)

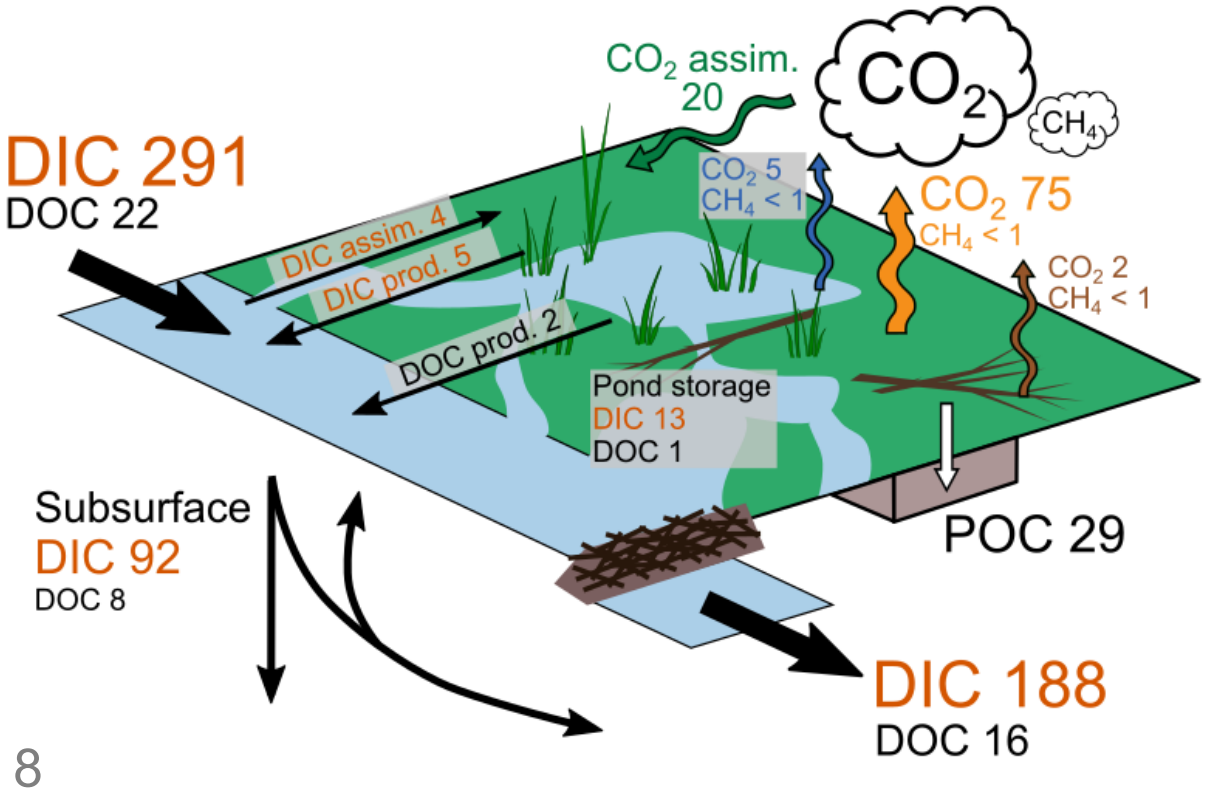
POC=Particulate organic carbon (water)

Counterfactual scenario

Abbreviations:
DOC=Dissolved organic carbon (water), DIC=Dissolved inorganic carbon (water), POC=Particulate organic carbon (water)

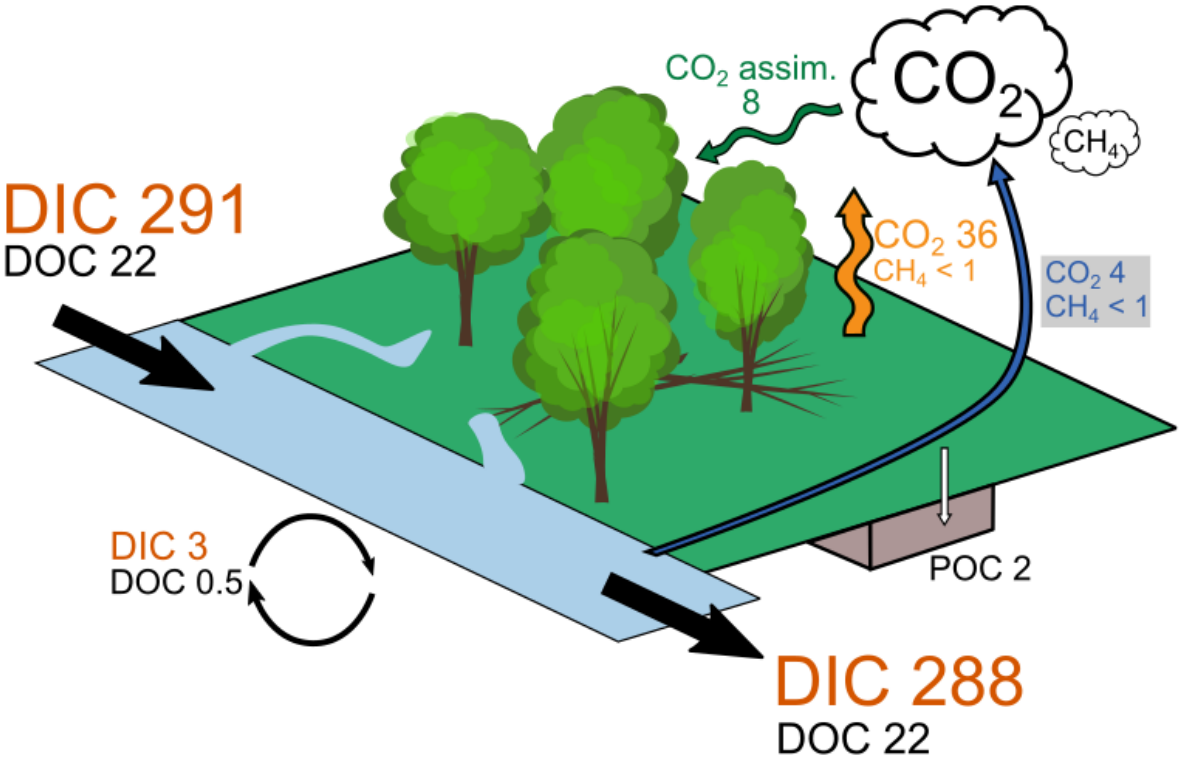
Beaver wetland

Net C = 79 ± 32 t C (sink)

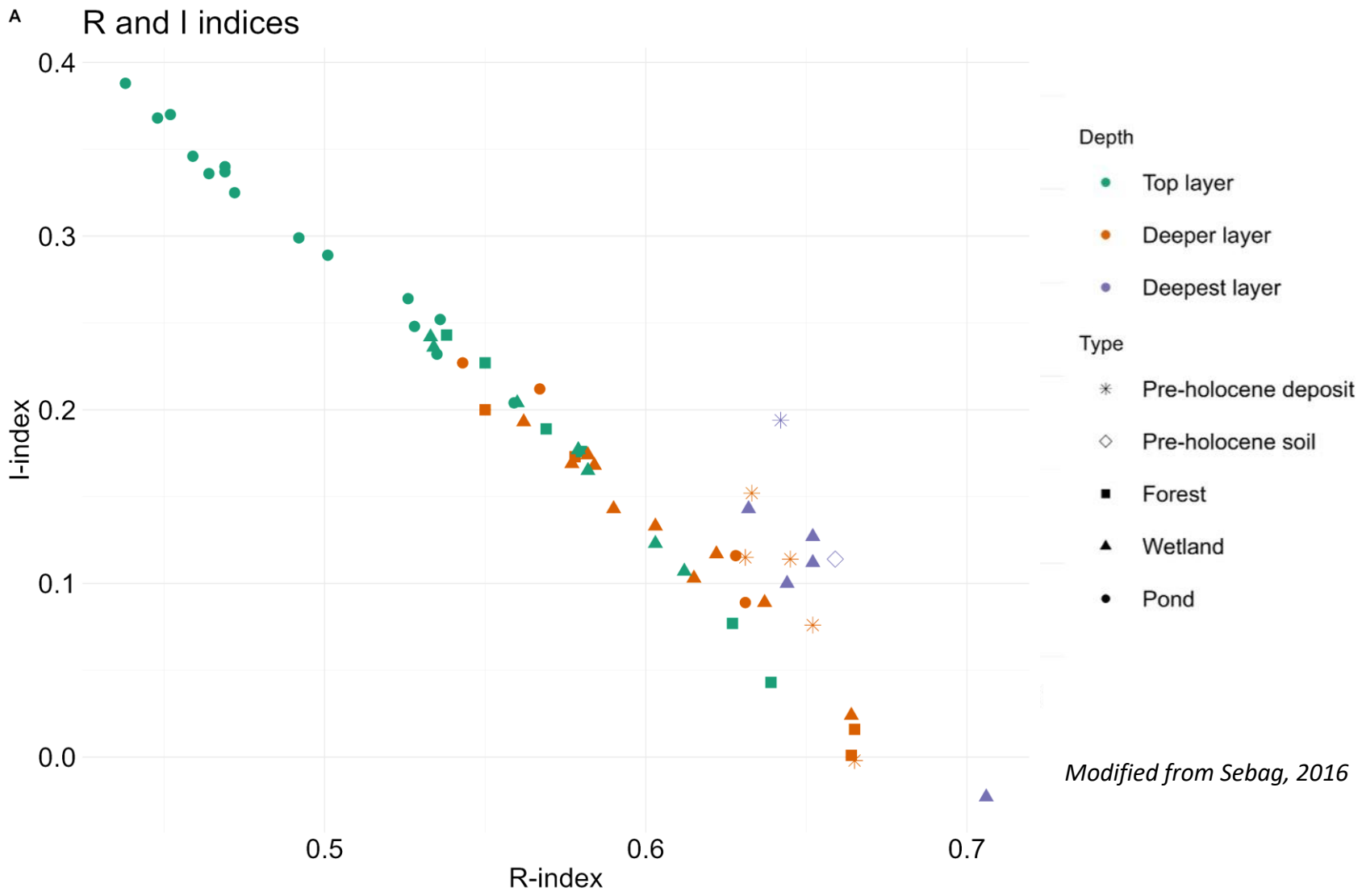


Non-beaver scenario

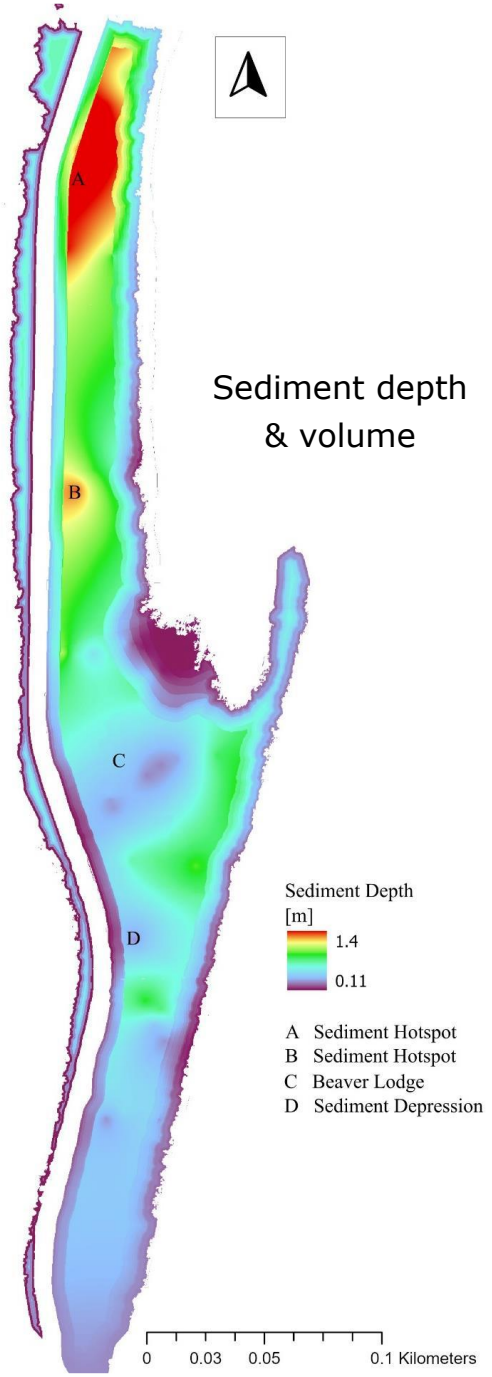
Net C = -22 ± 31 t C (source/neutral)



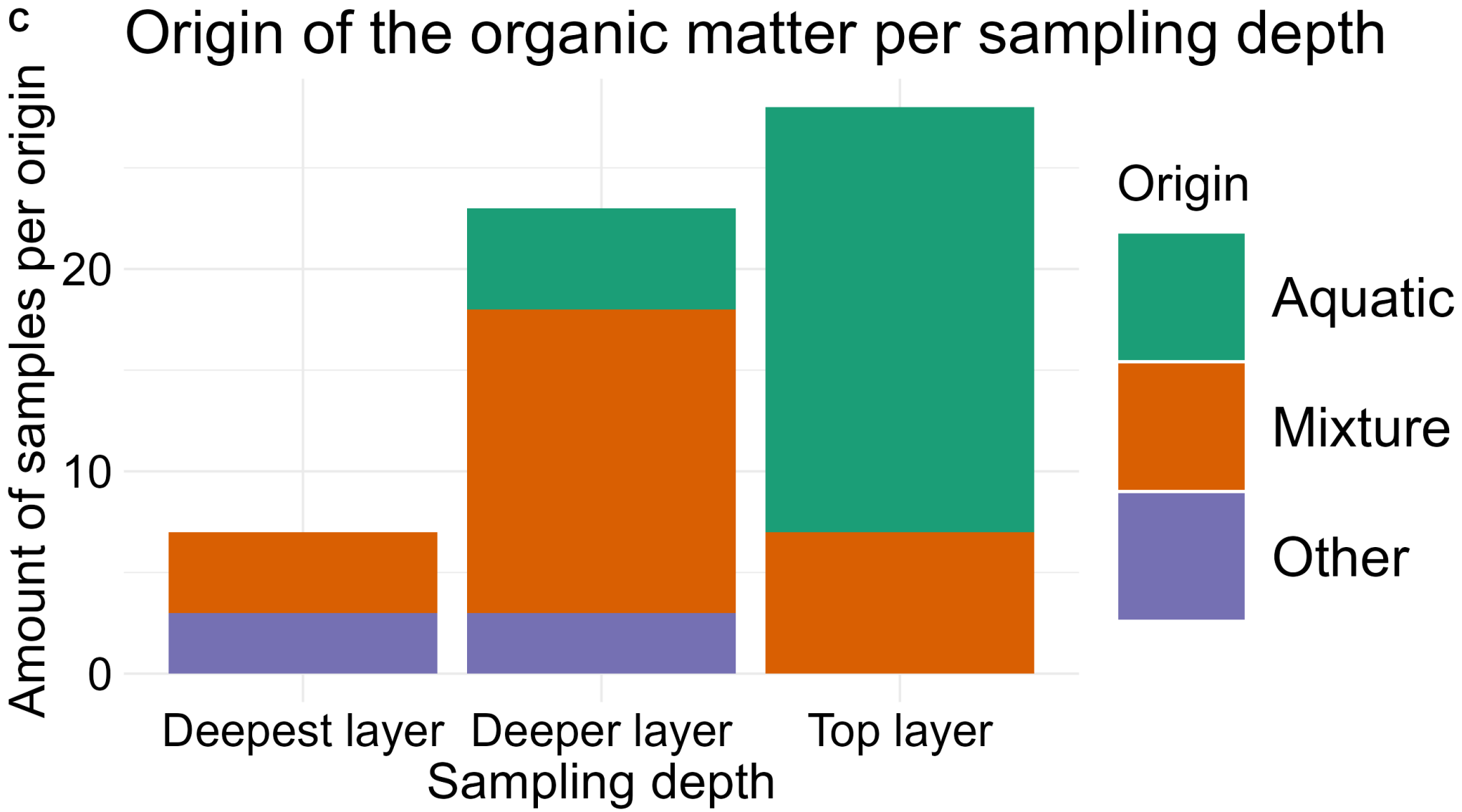
Carbon storage and sequestration (RockEval)



Modified from Sebag, 2016

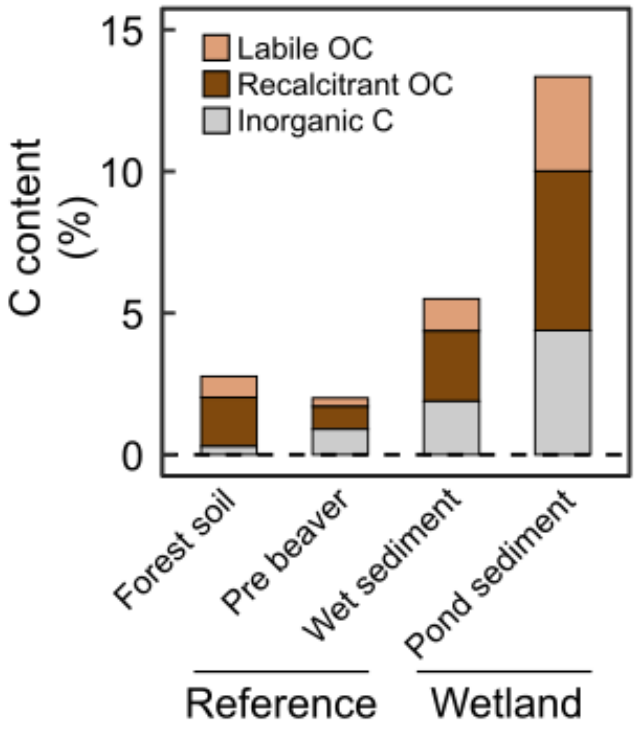


Carbon storage and sequestration (RockEval)



Sediment C content and sequestration

Carbon quality and content



Conclusions

- Hydrology overrides biogeochemical C controls
  – DIC infiltration dominant short-term sink
- Wetland C sink substantially greater than scenario without beaver impact
- Burial of stabile C fractions provides large potential for C sequestration
- Implications for constraining C fluxes across larger spatial scales

Thank you for the attention!

hotpot.ai/art-generator

Thank you for your attention

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This is team work

To explore the potential of nature to improve the quality of life

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