

Mixing Downstream of Stream Confluences Alters Carbon and Nutrient Cycling in Freshwater Networks

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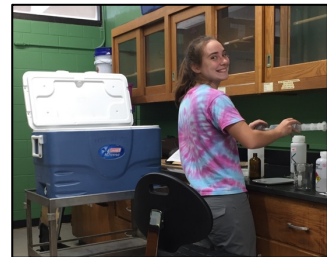
 [@stephenplont](https://twitter.com/stephenplont)

Acknowledgements

- **Funding Sources**

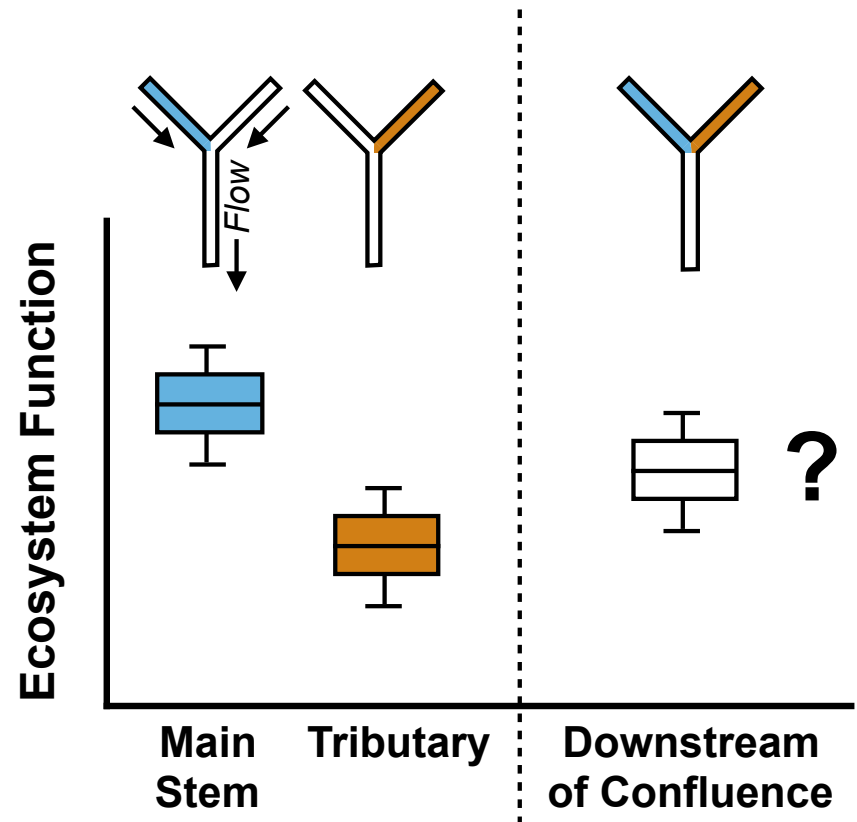
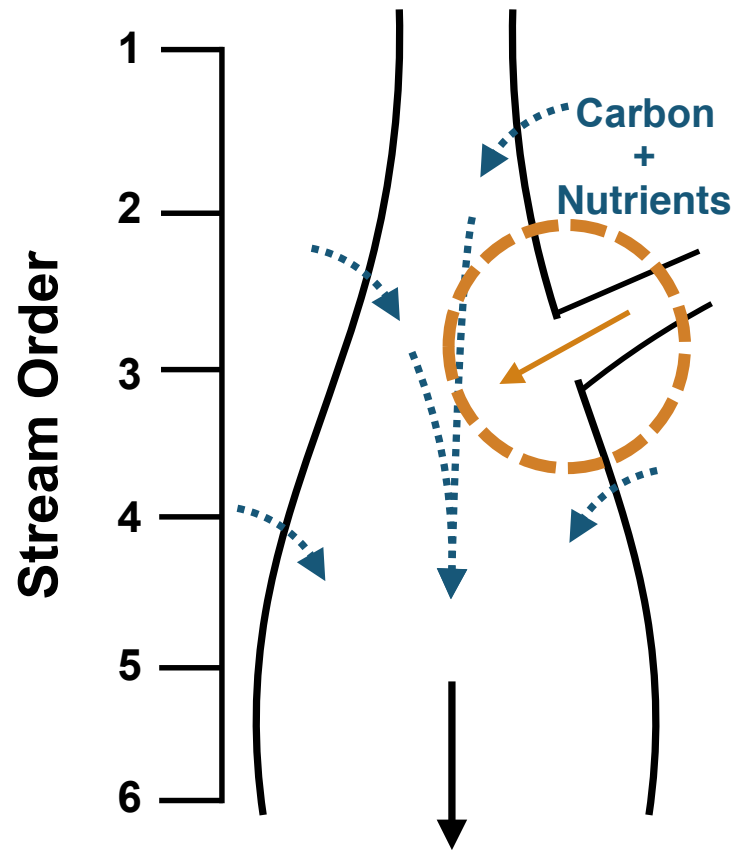
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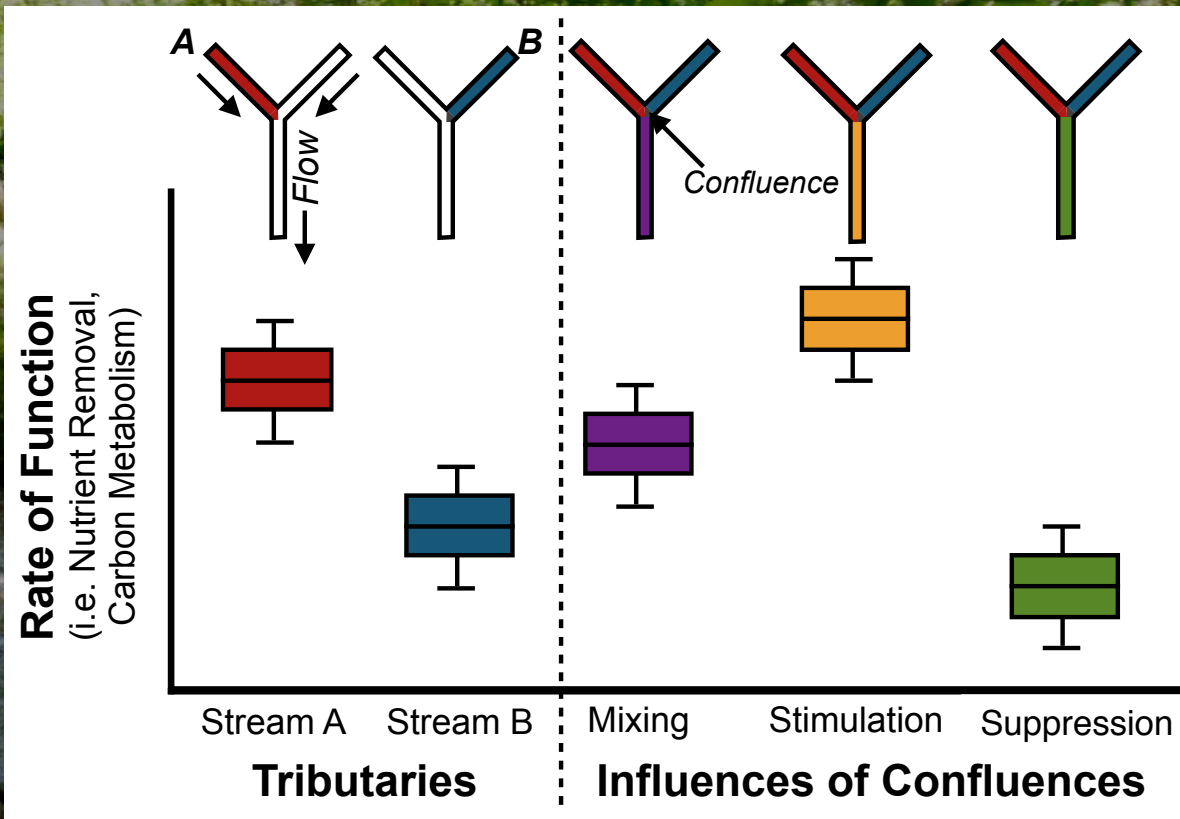


What are the roles of confluences in ecosystem function?

Stream Continuum + Confluence Effects

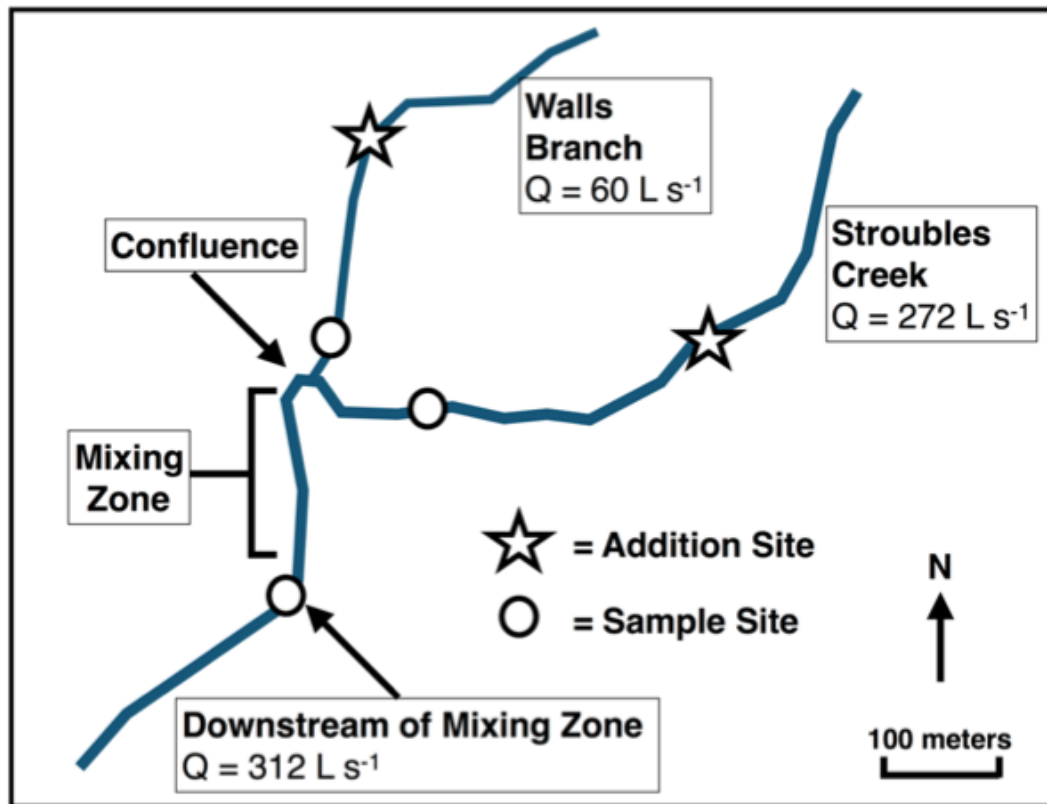


How do stream confluences influence the fate of carbon and nutrients?

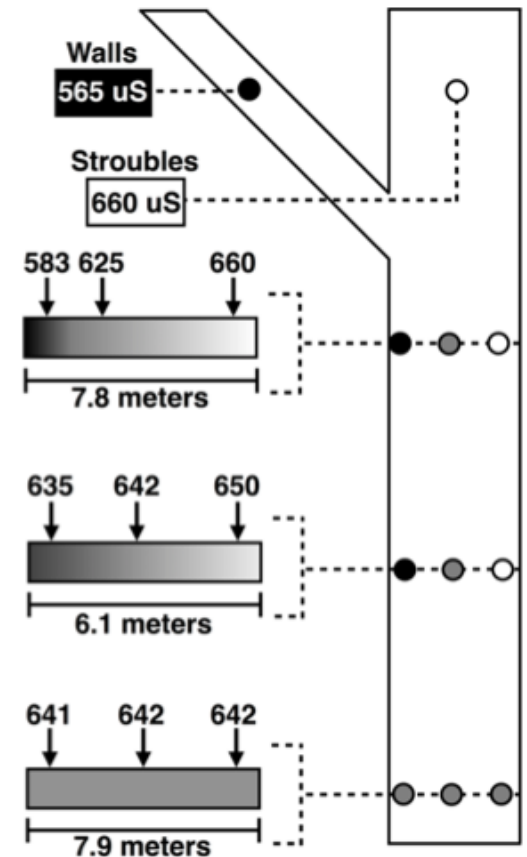


Stroubles-Walls Confluence

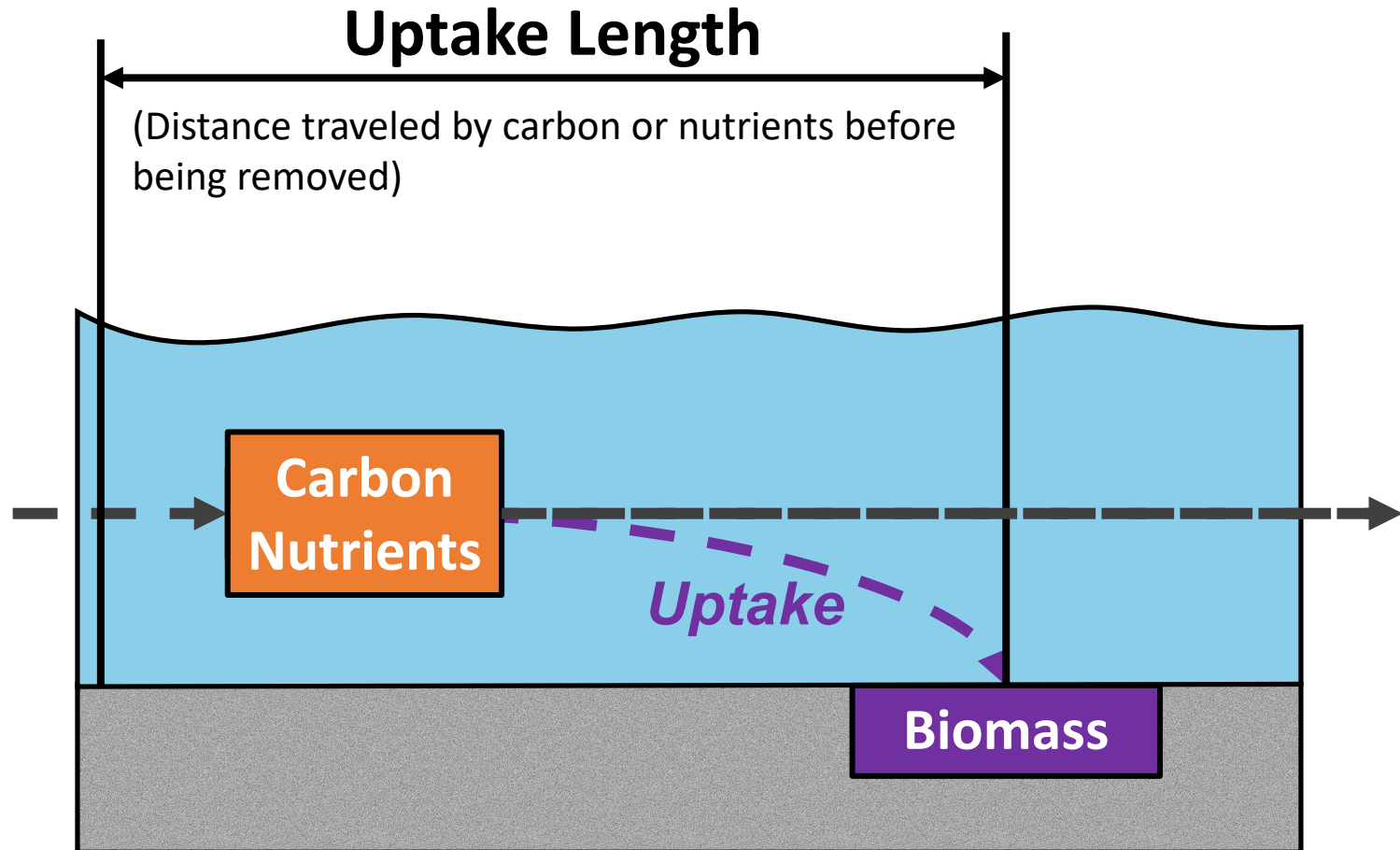
Urban/Agricultural catchment,
High NO_3^- and conductivity



Confluence mixing zone mapped using conductivity

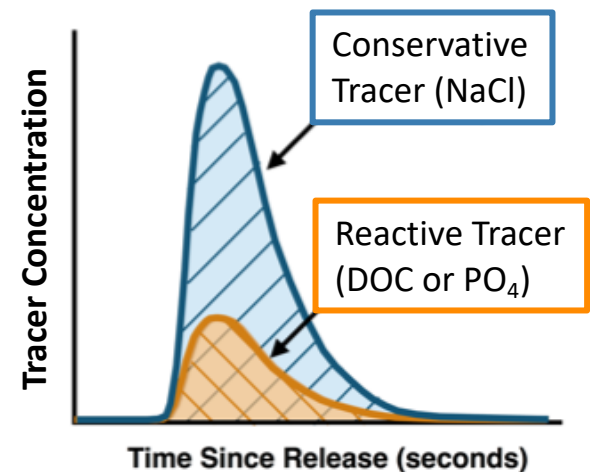


Linking Process (Biology) and Transport (Hydrology)

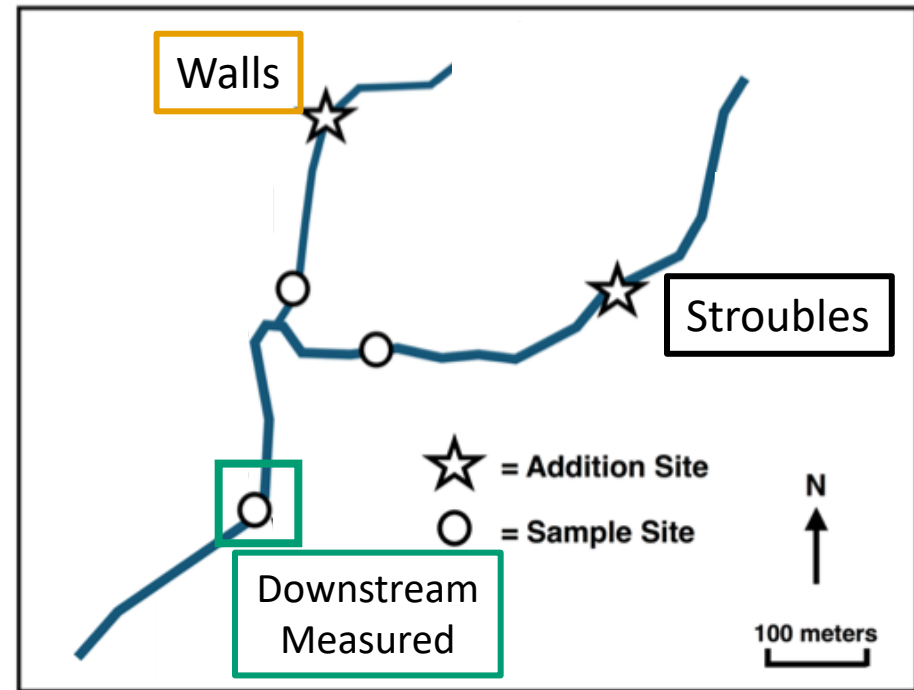
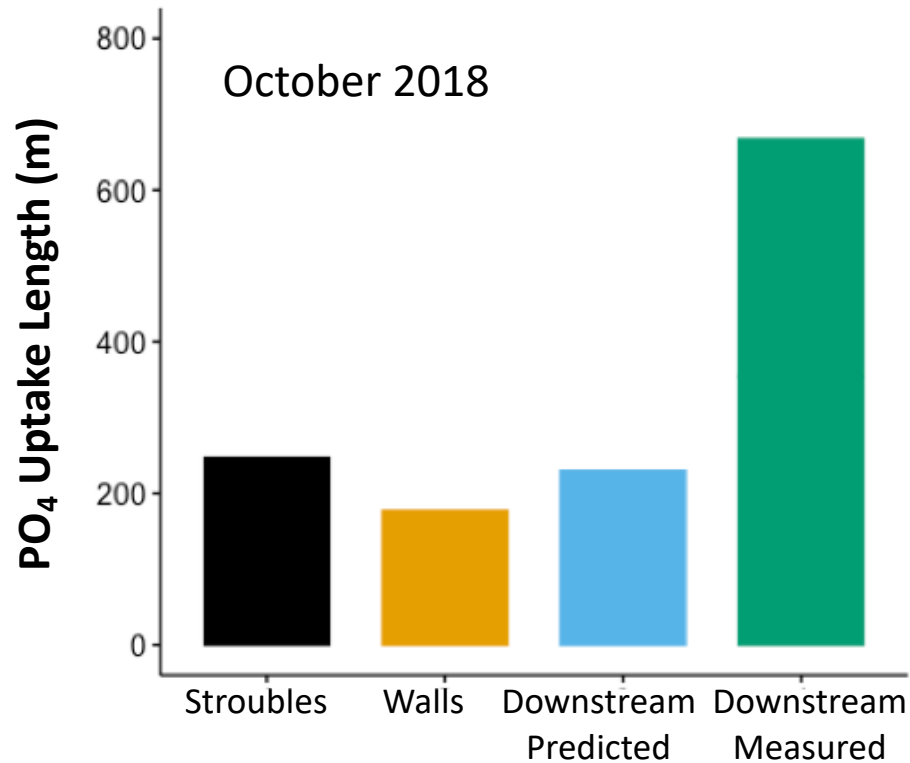


Confluence DOC and PO₄ Uptake Experiments

- DOC, PO₄, and NaCl pulsed in each tributary
- Measured changes in concentration in tributaries and downstream of confluence mixing zone
- Roasted Barley Leachate as a DOC source
 - Similar bioavailability to ambient stream DOC
- Calculated DOC and PO₄ uptake length
 - Breakthrough curve integration method (Tank et al., 2008 Ecology)



PO₄ Uptake Suppressed Downstream



Downstream
Predicted
Uptake*

=

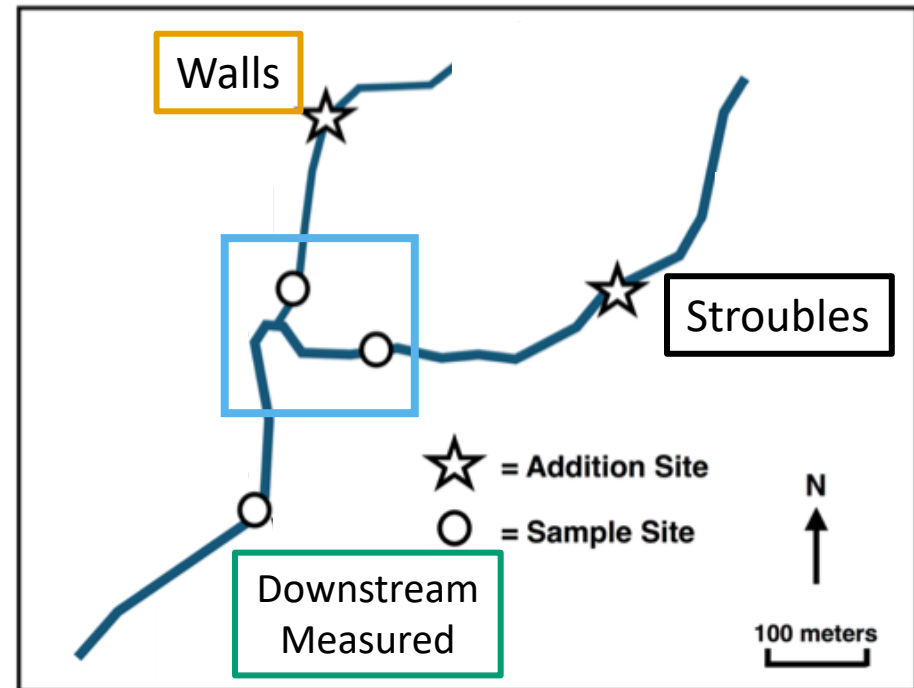
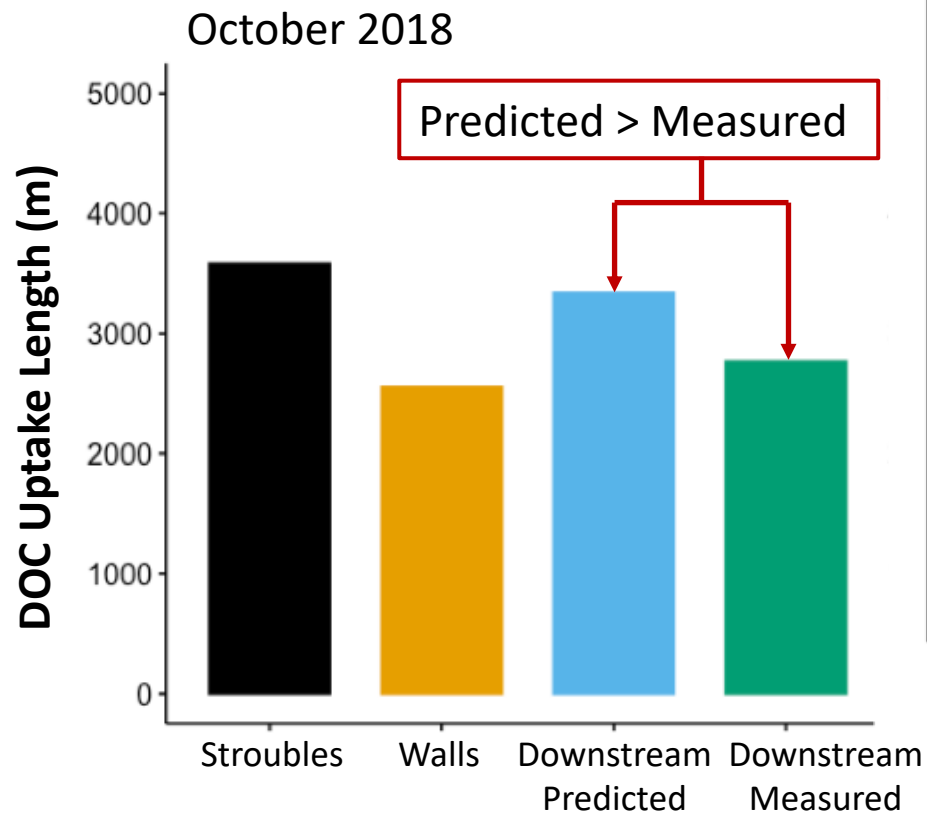
Stroubles
Uptake*

+

Walls
Uptake*

*corrected for changes in discharge

DOC Uptake Stimulated Downstream



Downstream
Predicted
Uptake*

=

Stroubles
Uptake*

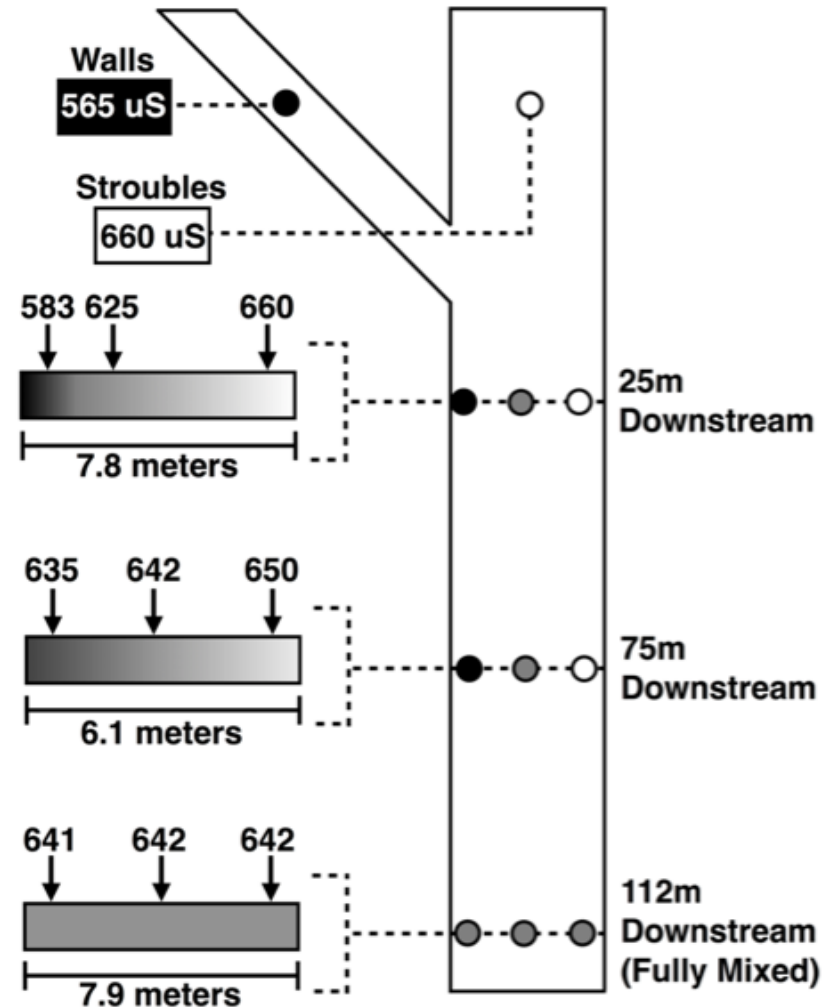
+

Walls
Uptake*

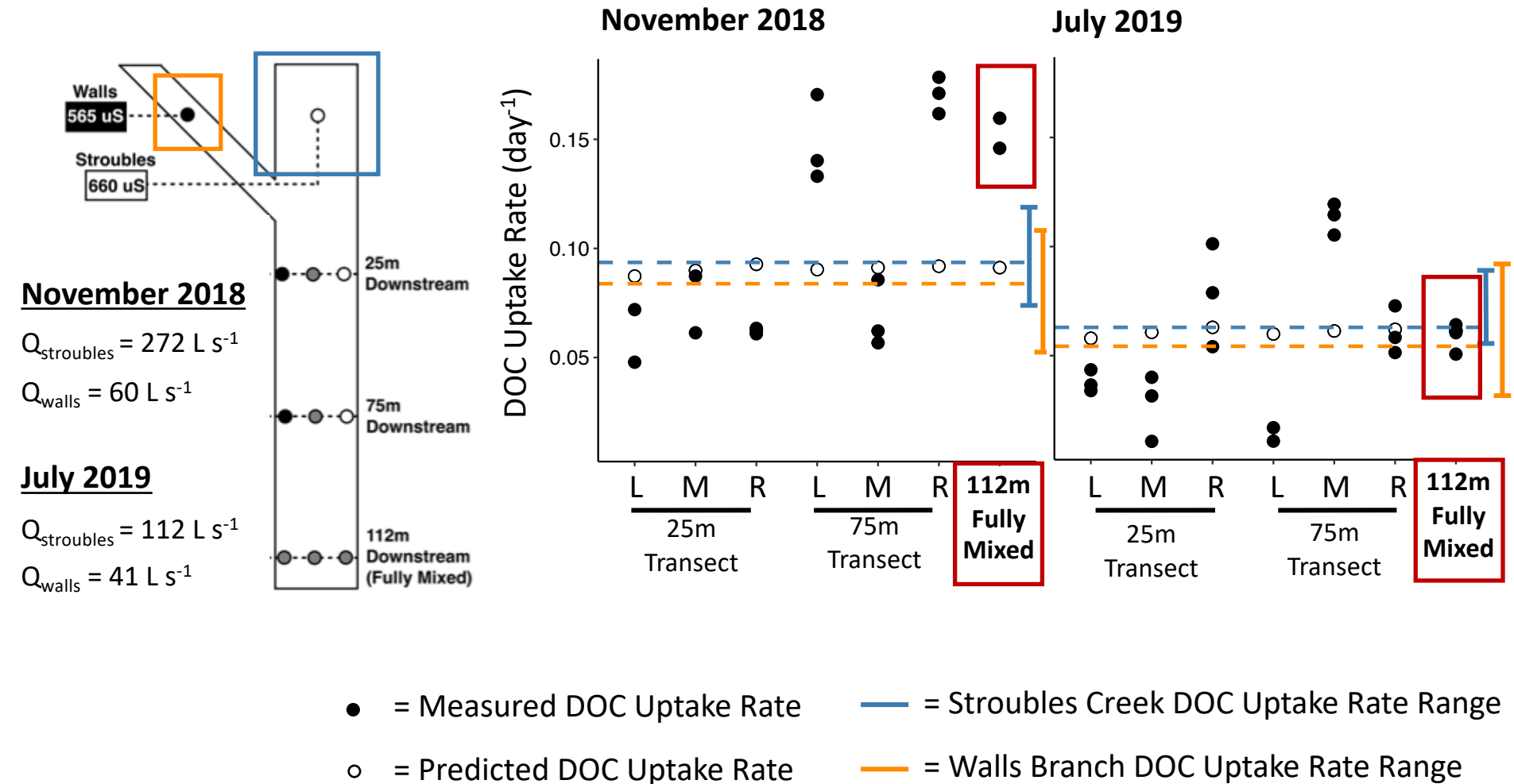
*corrected for changes in discharge

Removal within Confluence Mixing Zone

- Mixing of tributaries assessed using conductivity
- Water collected from transects in confluence mixing zone
- Bioassays to measure water column DOC uptake
- Enriched with roasted barley leachate (2 mg DOC L^{-1})
- Mixing model of tributaries for **predicted DOC uptake**



DOC Uptake Spatially and Temporally Variable in Mixing Zone



Concluding Remarks

- PO_4 uptake length was longer downstream of confluence than predicted \rightarrow suppression?
- DOC uptake length was shorter downstream of confluence than predicted \rightarrow stimulation?
- Bioassay DOC uptake was spatially and temporally dynamic and more variable in mixing zone than tributaries

