

# Enhanced Carbon Metabolism Downstream of a Stream Confluence Mixing Zone

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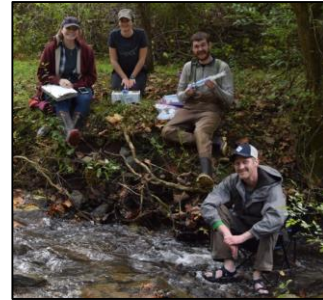
 @stephenplont



# Acknowledgements

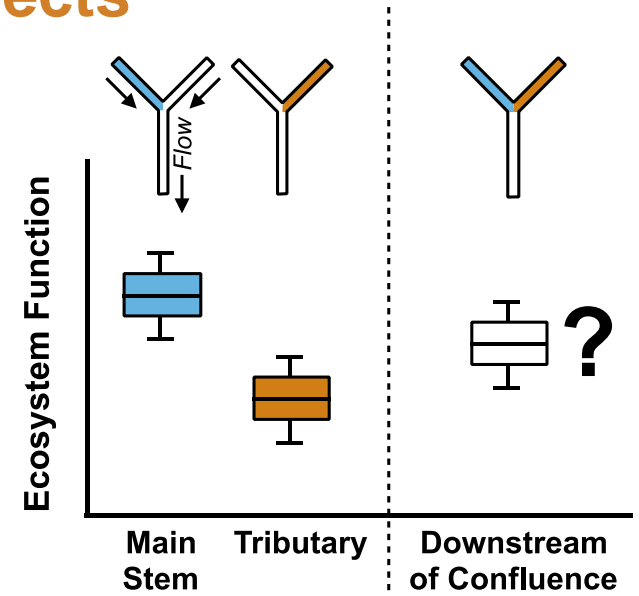
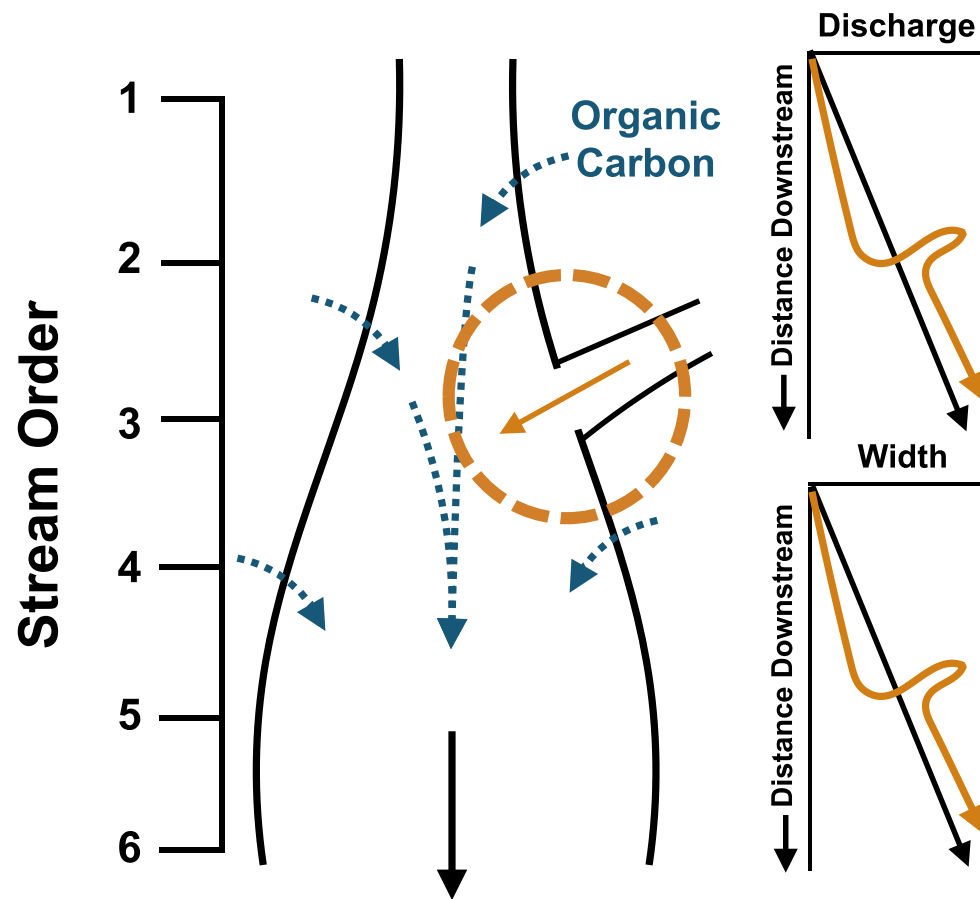
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- 
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  - Bob Hall, Michelle Baker for method development
  - Melissa Castillo, Caitlin Miller for bioassay experiments



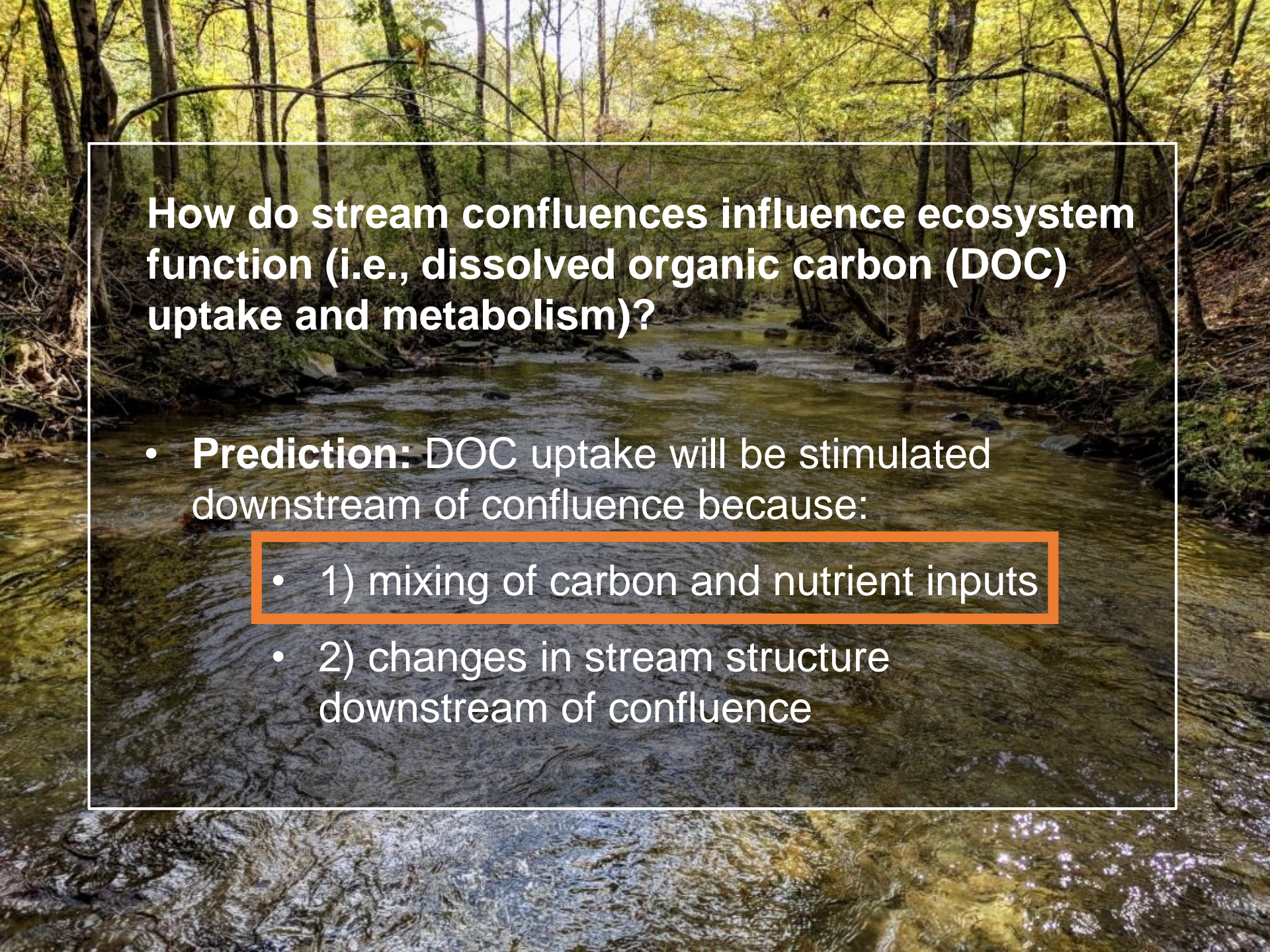
# Energy Flow Along Stream Continua

## Stream Continuum + Confluence Effects



What are the role(s)  
of confluences in  
ecosystem function?



A photograph of a stream flowing through a forest. The water is dark and rippled, reflecting the surrounding trees. The banks are covered in moss and fallen branches. The trees have yellow-green leaves, suggesting autumn. A white rectangular box is overlaid on the image, containing text.

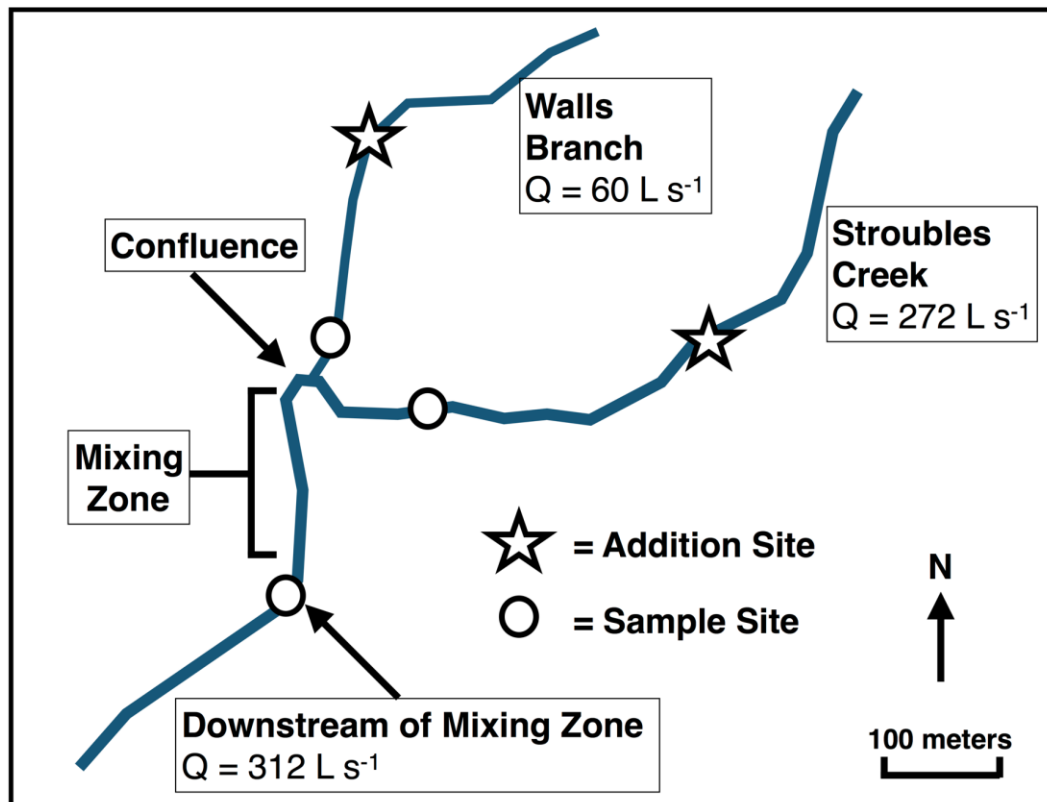
## How do stream confluences influence ecosystem function (i.e., dissolved organic carbon (DOC) uptake and metabolism)?

- **Prediction:** DOC uptake will be stimulated downstream of confluence because:
  - 1) mixing of carbon and nutrient inputs
  - 2) changes in stream structure downstream of confluence

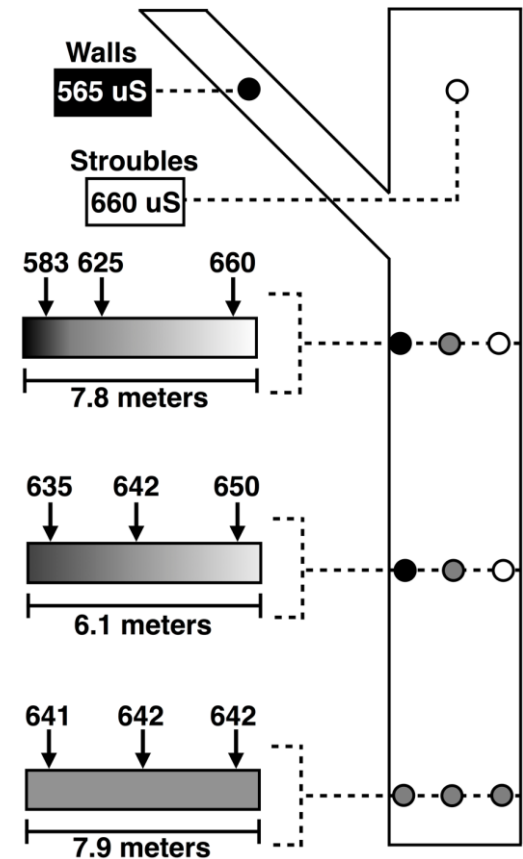


# Stroubles-Walls Confluence

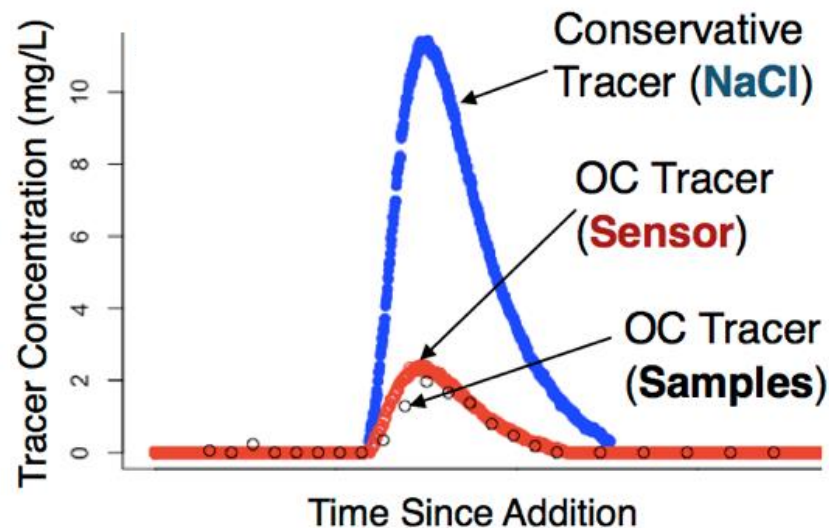
Urban/Agricultural catchment,  
High  $\text{NO}_3^-$  and conductivity



Confluence mixing zone mapped using conductivity



# Confluence DOC Pulse Additions

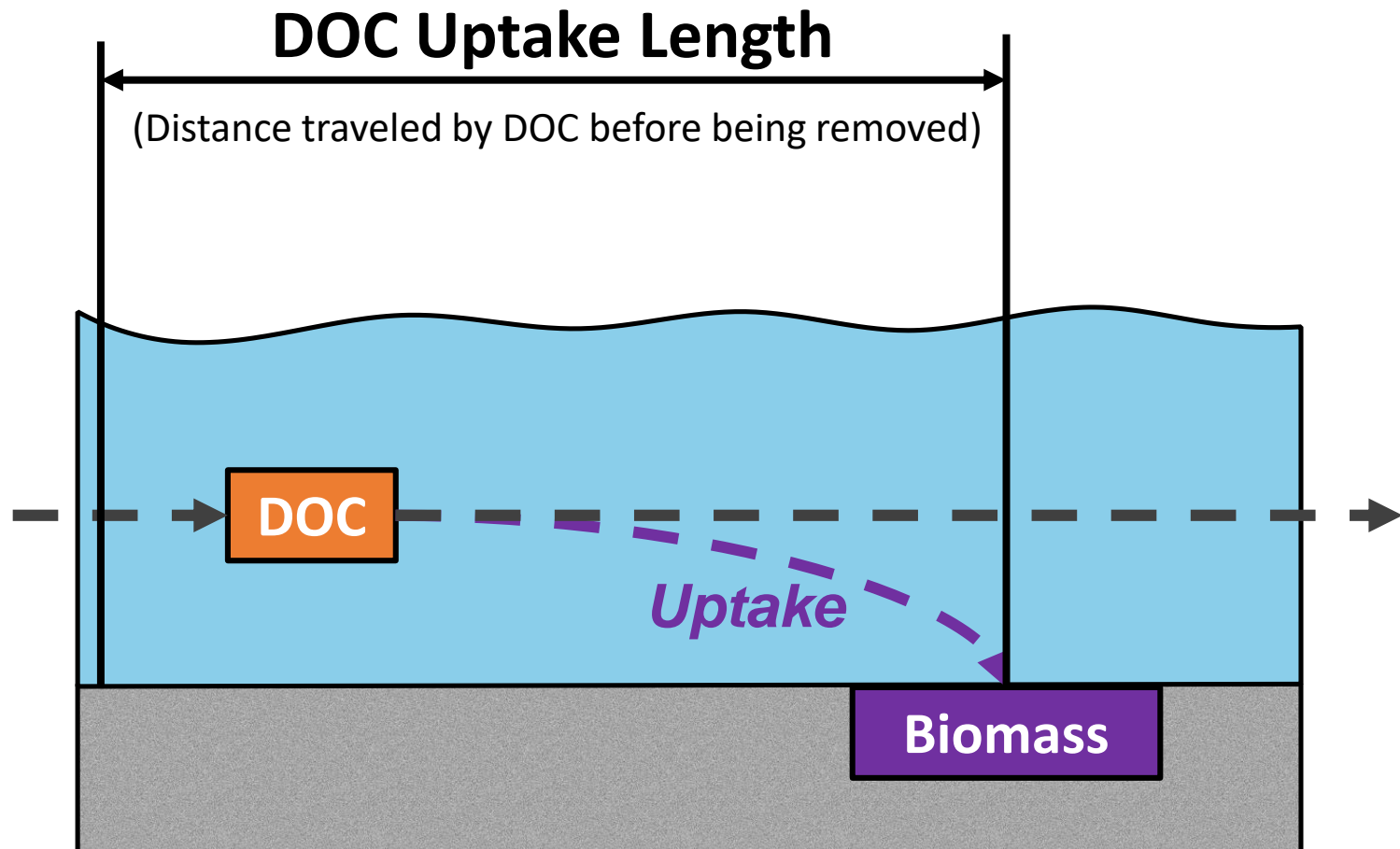


- Roasted Barley Leachate as a DOC source
  - Similar bioavailability to ambient stream DOC
  - Detectable on Turner Cyclops 7F fDOM sensors

- DOC pulsed in each tributary
- Calculated DOC uptake using sample and sensor data

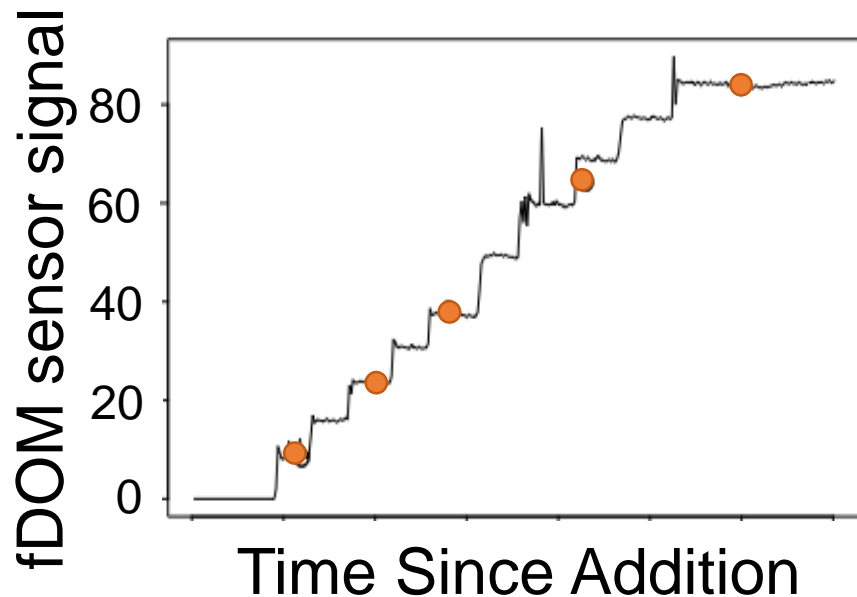


# Linking Process (Biology) and Transport (Hydrology)

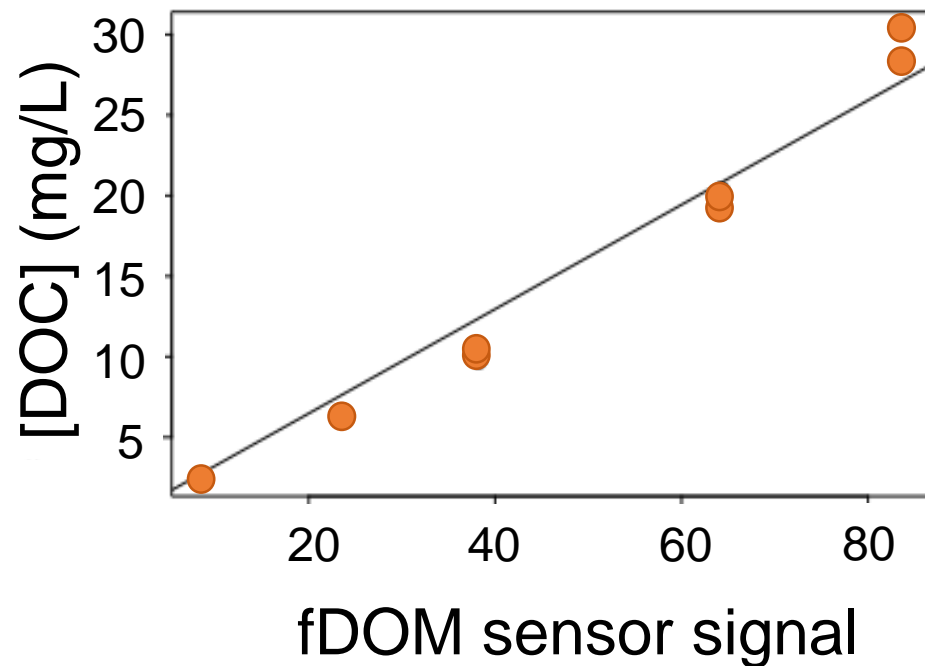


# Converting Sensor Data to DOC

## Sensor Calibration to Roasted Barley Leachate



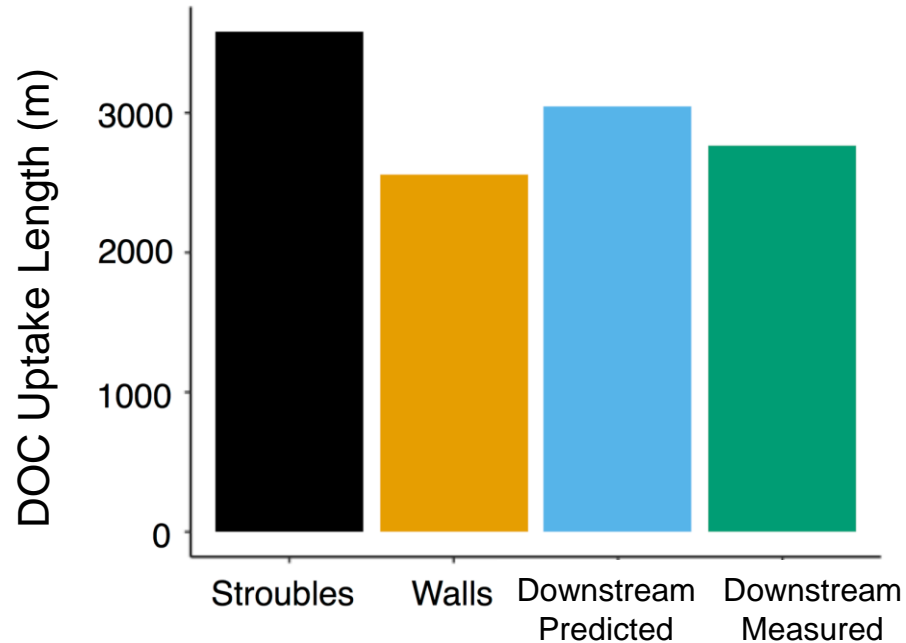
## Sensor Signal to DOC concentration



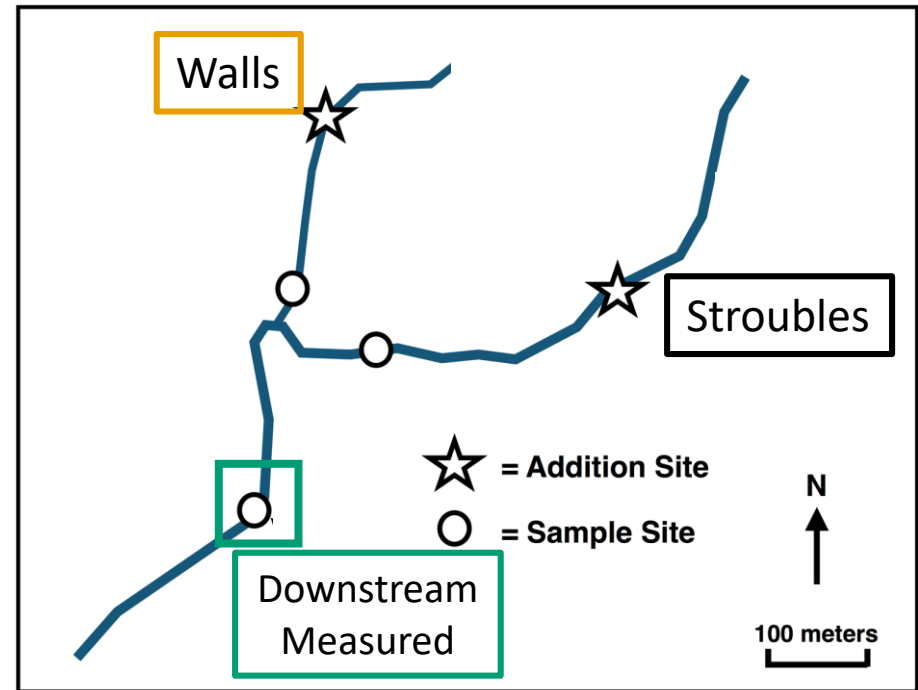
● = DOC bucket sample



# DOC Uptake Stimulated Downstream



- Downstream DOC uptake length shorter than predicted



Downstream  
Predicted  
Uptake\*

=

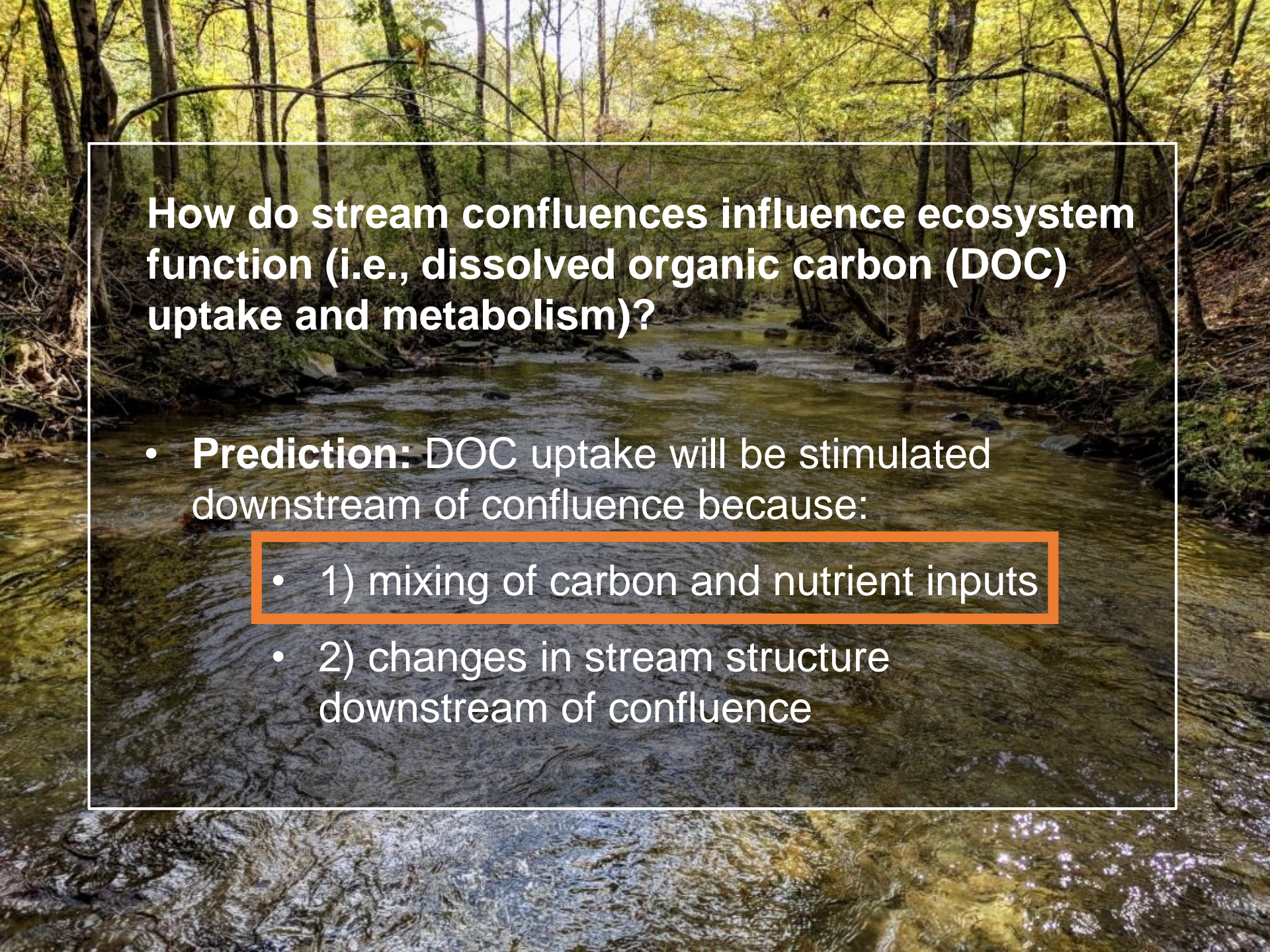
Stroubles  
Uptake\*

+

Walls  
Uptake\*

\*corrected for changes in discharge



A photograph of a stream flowing through a forest. The water is clear and reflects the surrounding trees. The banks are covered with rocks and fallen branches. The foliage is a mix of green and yellow, suggesting autumn. The stream flows from the background towards the foreground, where it becomes more turbulent over rocks.

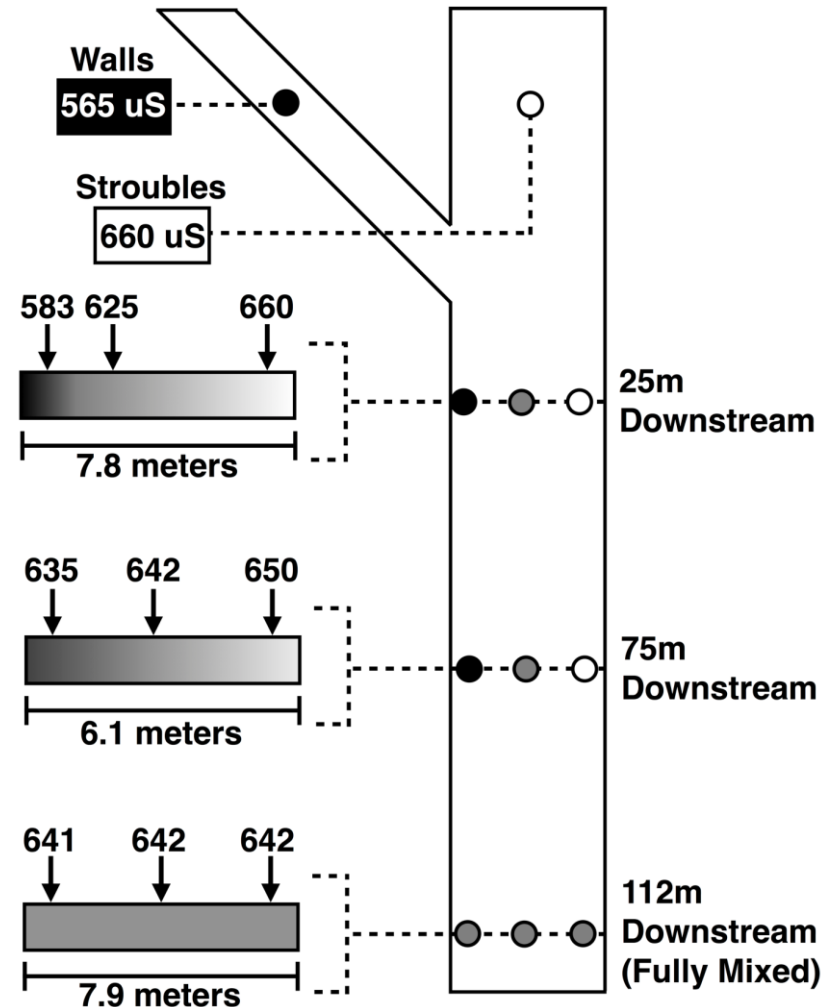
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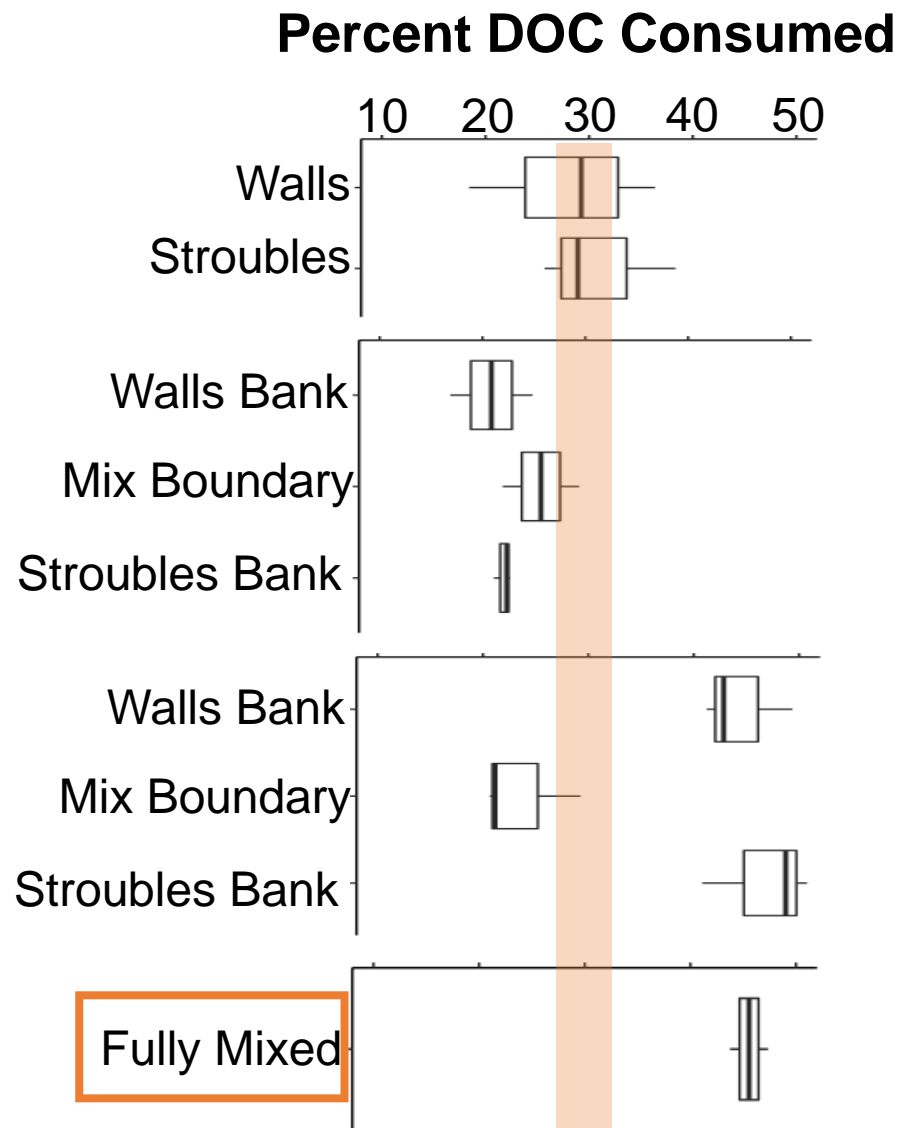
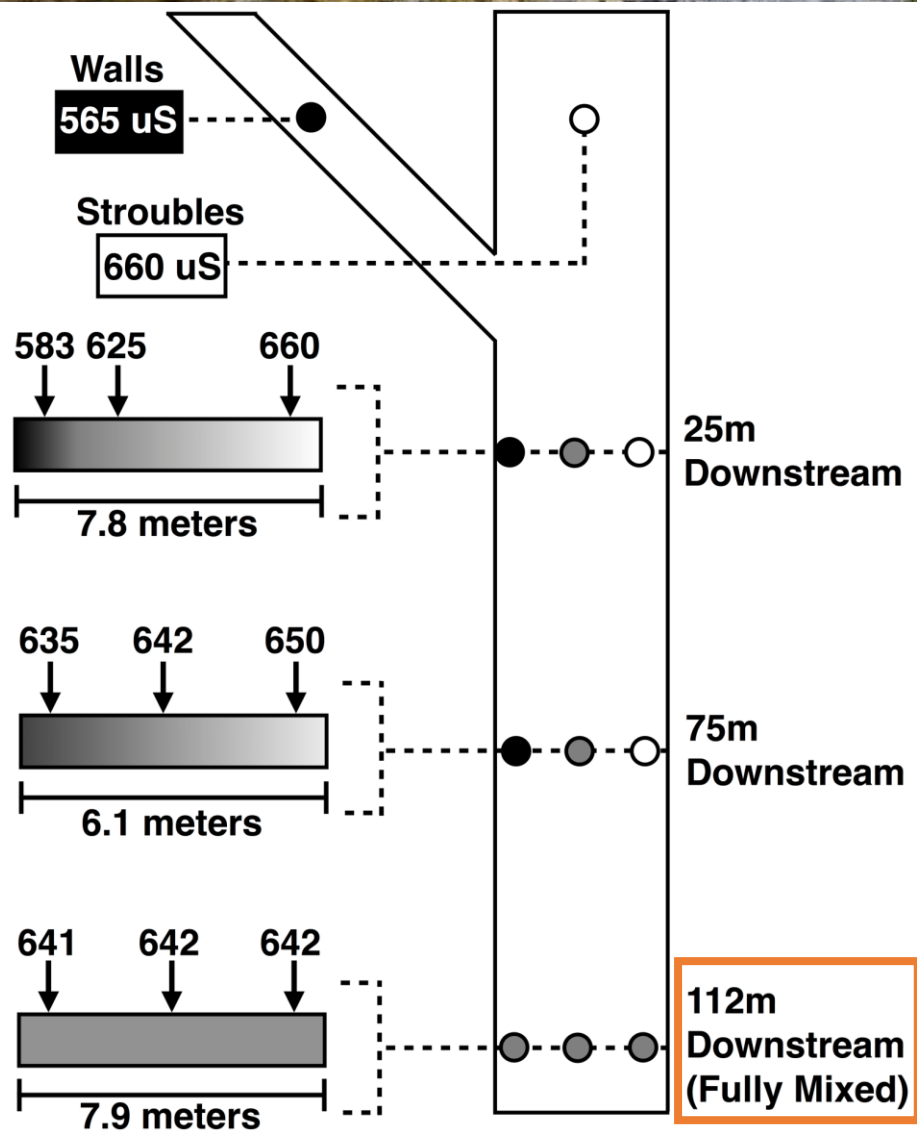
# Mapping the Confluence Mixing Zone

- 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 ( $2 \text{ mg DOC L}^{-1}$ )



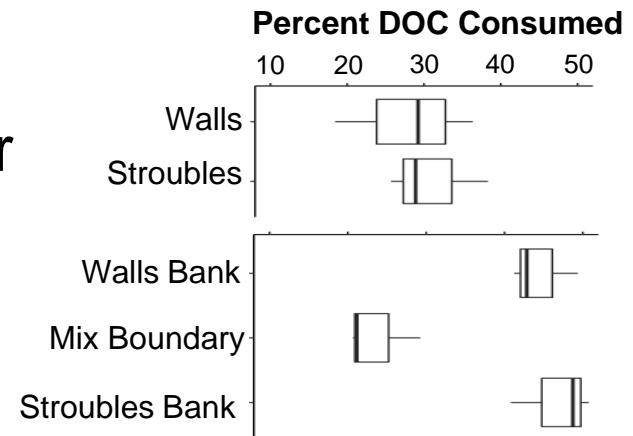
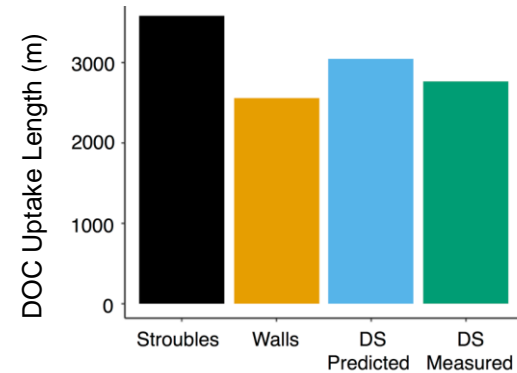


# Heterogeneous and Stimulated DOC Uptake in Mixing Zone



# Concluding Remarks

- Whole stream DOC uptake downstream of confluence greater than predicted
- Water column DOC uptake (from bioassays) heterogeneous and greater in mixing zone than tributaries
- Future Work:
  - Nutrients!
  - Influence of network position, different tributary inputs on confluence functions





A photograph of a river flowing through a forest. The water is clear and reflects the surrounding trees and foliage. The banks are covered with rocks and fallen branches. The trees have yellow and green leaves, suggesting autumn. The word "Questions?" is written in white text across the middle of the image.

Questions?