*Introduction:*

* *Landscape hydrology predicates that hydrologic and biogeochemical changes in one region of a watershed has the potential to cascade across the entire basin.*
* *Through the lens of landscape hydrology, the watershed is viewed as a singular, relatively closed system, encompassing micro-ecosystems that collectively contribute to the basin’s distinct biogeochemical and hydrologic fingerprint.*
* *However, the relevance of “landscape hydrology” is watershed specific, dependent on the basin's connectedness, or how water flows and is stored between inland waters.*
* *This “connectedness” is dependent on isolated, depressional wetland area.*
* Depressional wetlands are basin that interrupt the flow of water as it “runs off” across the landscape. Instead of flowing downstream, water is intercepted by wetlands and stored within the landscape.
* This water and the nutrients accumulated within them like carbon, are fated to either exchange with the atmosphere, remain in the catchment, or infiltrate into the surficial aquifer.
* Wetlands modulate the surficial aquifer by sourcing water (infiltration), storing water (exfiltration), and buffering the watershed against flow streams, namely drought as wetland coverage have a positive relationship with watershed inundation, insuring surficial aquifer, the lateral transport network.
* This exchange of water between the depressional wetlands and the surficial aquifer dictates the hydrologic connectedness, connecting the watersheds inland water even when surface connections are absent.
* Wetland water depth dictates stream baseflow, and the biogeochemical activity within is basins can influence downstream biogeochemistry.
* In low-relief, wet biomes where water is transported and mixed through both subsurface and surface flow paths, viewing the watershed as a unified hydrologic unit is particularly pronounced. The biogeochemical signature of each specific inland water body tends to be more homogenous and influenced by nearby waters. In contrast, dry, unconfined watersheds with less exchange between inland waters feature aquatic environments that are more independent from one another, each with distinct characteristics.
* Isolated wetlands are recognized to significantly contribute to global carbon cycling, and dually, stream carbon.
* Considered global hotspots and carbon sinks, isolated, depression wetlands, act as "capacitors" for the landscape, storing water and transforming nutrients within their basins.
* Wetland anaerobic conditions, long residence times, and extended hydroperiods can re-mineralize carbon and emit greenhouse gases (GHG), while also exporting processed nutrients downstream via subsurface flow or overland flow ("spill-and-fill").
* Due to their productivity and carbon storage potential, despite covering only 2-6% of Earth's surface, they are assumed to be infinite carbon sources for streams, especially in low-relief landscapes.
* While wetland-stream carbon contributions in higher-order, tropical streams have been investigated, few studies have explored the influence of isolated wetlands on lower-order streams.
* Existing research interrogating headwater-wetland exchanges have primarily focused on perennial wetlands and did not include river corridor (RC) estimates.
* Furthermore, current river-wetland and headwater-wetland carbon flux estimates are contrasting, indicating that larger river-floodplain are not directly comparable to smaller, headwater streams.
* Wetlands of high-order rivers are recorded to contribute the majority of stream carbon (approximately 80%), whereas isolated wetlands associated with smaller, low-order streams only source about 20% of stream carbon Assuming one scenario over the other can lead to significant inaccuracies in carbon inventories, and inflate isolated wetland contributions.

The present global carbon budget has major discrepancies, especially when parsing inland water inputs and outputs. To resolve these discrepancies, more detailed observational studies across various landscapes are necessary. For the third chapter of my dissertation, I will estimate the carbon contributions from isolated, depressional wetlands to streams by longitudinally sampling for DIC, DOC, and POC from three BEF streams within basins of various wetland densities. Thus far in my PhD, I will have explored stream-carbon temporal dynamics and RC fluxes in fluctuating hydrologic settings. By coupling my longitudinal sampling results with the findings from Chapters 1 and 2, I can isolate the influence of isolated wetlands. Assuming RC -fluxes and stream-productivity responses to fluctuating discharge are homogeneous throughout the reach, I can investigate how nearby wetlands influence stream carbon as water downstream. Few studies have directly explored isolated wetland carbon contributions, and none have yet to include observed RC fluxes or stream metabolism inferences. **(1)** I hypothesize that each stream will gain carbon, increasing in DIC, DOC, and POC as water flows downstream. Although I expect depressional wetlands to contribute to the stream carbon, (**2)** I hypothesize the RC will remain the dominant carbon source. However, during flooded conditions, (**3)** I anticipate the wetland contribution will be greatest due to a shallower surficial aquifer and overland flow. Additionally, **(4)** I expect streams in watersheds with greater wetland density (wetland area/wetland quantity) to have higher total carbon (TC) concentrations and more homogeneous carbon quality across wetland, RC, and stream boundaries. Using the results from my entire dissertation, I aim to holistically map stream carbon sources and fluxes, allowing me to draw detailed inferences on low-relief, “wetlandscape” carbon budgets.

By testing these hypotheses and developing a regional carbon budget, I aspire for this chapter to offer both improved understanding of low-relief carbon cycling and provide practical applications. Specifically, my objective for Chapter 3 is to inform management decisions on how to optimize landscape hydrology for carbon storage.