*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 as significant contributors to global carbon cycling and stream carbon.
* Considered global hotspots and carbon sinks, isolated wetlands act as "capacitors" for the landscape, storing water and transforming nutrients within their basins.
* The anaerobic conditions, long residence times, and extended hydroperiods of wetlands promote the re-mineralization of carbon and the emission of 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 only covering 2-6% of Earth's surface, wetlands are assumed to be infinite carbon sources for streams, especially in low-relief landscapes.
* Due to their productivity and carbon storage potential wetlands, GIWs or riparian, are hypothesized to be an inexhaustible source of stream carbon.
* Although GIWs are modeled to contribute significantly to stream hydrologic function, despite their ecosystem function and high biogeochemical activity, observed GIW-stream carbon fluxes are minimal.
* Research investing GIW influence on both stream carbon quality and quantity observed GIWs contribute less than 20% of total stream carbon.
* Instead, the riparian wetlands, by defaulted estimates, were deemed the main contributor.
* However, these either (1) only sample from overland GIW-stream flow paths, (2) do not investigate or observe riparian influence, (3) do not include in-stream carbon production, or (4) interrogate how GIWs may influence external carbon sources transport.
* Including all of these objectives is energy-intensive and systematically challenging, however excluding any of the objectives poorly represents the “wetlandscape.”
* As mentioned, GIWs modulate the surficial aquifer, sustaining it even drought.
* In turn, the surficial aquifer connects downstream water even surface flow is absent.
* These hydrologic connection between GIWs, riparian wetlands and eventually the exporting stream, linked by the surficial, is the wetlandscape, and the interactions dictate downstream baseflow, surface-groundwater exchange, watershed inundation, and of course, lateral export.
* Current research fails to explore or consider the cumulative, biogeochemical affects across the landscape, undermining the influence of GIWs in global carbon cycle.
* By not observing the accumulative effects of the “wetlandscape”, including river corridor estimates, the role of GIWs is undermined.
* GIWs may significantly, directly impact stream carbon but indirectly impacts carbon storage, export, and baseflow.
* Althoough modeling national and global modeling endeavors endorse these sentiments direct observation is few
* Zanestke
  + Most of DOC moving through inland waters is delivered via subsurface flow paths
  + Understanding the relationship between DOC concne

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.