Outline:

I want to include a graphical abstract.

* **Big picture: introduce stream and wetland contribution to the global carbon budget**
* Inland waters- streams and wetlands- play a crucial role in the global carbon budget, functioning as the primary drainage network for their watersheds (Cole et al., 2007; Drake et al., 2018; Raymond et al., 2013).
* Streams, the “active pipes” of the watershed, “plumb” the terrestrial uplands transporting and transforming uphill debris and particulates (Abril & Borge; Cole et al, 2007).
* Wetlands are “capacitors” for their watersheds serving as storage reservoirs for water and nutrients. Nutrients held within wetlands can circulate through the watershed via subsurface or overland flow pathways while the stored water raises the local water table, providing a watershed-scale buffer against drought (Evenson et al., 2018; Li et al., 2023; McLaughlin et al., 2014) (CITE, Cohen & Kaplan).
* Through the streams downstream movement of water and the lateral flow from wetlands, inland waters form a dual-pathway transport network (Leibowitz et al., 2018), with wetlands acting as stream headwaters and catchments, and streams facilitating connectivity between the upstream and downstream boundaries (Abril & Borges, 2019; Casson et al., 2019; Li et al., 2023; Moustapha et al., 2022).
* The exchange of water and its nutrients, and the subsequent transformation of nutrients as it passes through each ecosystem, creates a distinct biogeochemical fingerprint of the watershed (maybe sight Bernhardt? Fingerprint stuff).
* **Discuss the current issues with current global carbon budget in relation to inland waters (Dive deeper into streams as pipes)**
* Current global C-budget models estimate that of the 4.5 Pg-C/year produced by the terrestrial landscape, 3.4 Pg-C/year is fated to settle in streams (Regnier et al., 2022).
* As a result, stream carbon is predominantly allochthonous (sourced from the terrestrial uplands), and is therefore regarded as a global carbon source, emitting more carbon dioxide (CO2) than what is accounted for by stream metabolism alone (Cole et al., 2007; Raymond et al., 2013, Battin et al., 2009; Regnier et al., 2022).
* Utilizing mass counting and employing estimated global stream-CO2 emissions, of the 3.4 Pg-C/year produced by terrestrial landscapes, 0.6 Pg-C/year is buried in sediment, 0.3 Pg-C/year is photosynthesized, and 0.95 Pg-C/year is transported to oceans, leaving a significant 1.5 Pg-C/year gap.
* This tremendous gap, by default, is assumed to be degassing from groundwater seepage (Hotchkiss et al., 2015), however, current global carbon budgets exempt wetlands, leaving their contributions to stream carbon unclear, and potentially overestimating groundwater’s significance. (Battin et al., 2009; Drake et al., 2018; Kirk & Cohen, 2023; Regnier et al., 2022).
* Wetlands, at the global scale, are challenging to delineate; wetlands are not terrestrial nor are they always aquatic, often drying outside of the wet season and thus, are frequently excluded from global C budget assessments (Raymond et al., 2013; Vlek, 2014). (Harvey & Gooseff, 2015; Kirk & Cohen, 2023; Leibowitz et al., 2018; Vázquez et al., 2007)
* This oversight likely overestimates global groundwater influence while overlooking wetlands carbon contribution.
* Furthermore, in-depth knowledge of stream carbon trends such as seasonality, transport and transformation potential, and direct carbon sources are largely surmised- few studies have observed the long-term trends in stream carbon transport and fluxes.
* Most publications target hot-spot moments, namely post-disturbance responses, or have a single, wet-season study period.
* Projects with longer study periods, largely only periodic sample dissolved organic carbon (DOC), ignoring and inferring trends in dissolved organic carbon (DIC).
* Sampling and processing all carbon species (organic carbon, carbonate, CO2, and CH4) is laborious; carbon-detecting instruments are costly, DIC samples expire quickly, and researchers are always battling with the inevitable degassing (CO2, CH4) and reactivity (DIC, CH4) of their samples.
* However, with the advancements of high-frequency, durable and submersible sensors, and the research push to develop alternative, low-cost options, understanding the detailed mechanisms of stream carbon transport and transformation is now possible.
* For my dissertation, I aim to investigate the detailed mechanism of stream carbon within Bradford Experimental Forest (BEF), a flatwood landscape located in North Florida. Primarily managed for pine stands, BEF features a low relief terrain dotted with numerous wetland depressions ideal for carbon storage. Due to the Hawthorne Formation and BEF’s dense wetland area
* Deep groundwater seepage from the Upper Floridia Aquifer (UFA) is minimal, and the flux of carbon to streams is driven by lateral transport via the shallow water table where particulates flow laterally downhill before ultimately discharging into tannic, blackwater streams.
* My dissertation is divided into three chapters: stream carbon, river corridor carbon, and surrounding landscape influences.
  + Chapter 1. Exploring the seasonal timing of stream carbon and its relationship to discharge,
  + Chapter 2. The carbon contribution and fluxes of the river corridor,
  + Chapter 3. The surrounding landscapes influence, namely wetland area, to stream carbon fluxes.
* From my findings, I will establish a detailed understanding of how landscape hydrology dictates stream carbon flux and transport, and aid in future research endeavors exploring and how carbon is stored (wetlands, soils) and lost (downstream transport and fluxes), as well as draw broad inferences of stream carbon patterns with discharge and its surrounding landscape outside of my ecosystem of interest.
* Furthermore, this research will provide evidence that hydrologic management can (or cannot) be used as a means to optimize carbon sequestration and storage, optimizing managed land for fiscal gain and ecosystem services.