**Original Introduction:**

MAIN NARRATIVE: APPLY SFT in TCP in order to predict community responses to climate change

1. reorganize ideas to promote flow and remove redundancies
2. Bolster why the study region and study objects are good data
3. Improve conceptual framework for evaluating top-down and bottom-up community assembly regulators

* Freshwater communities are a highly valued resource, an excellent study model, and their highly impacted status increases the imperative to understand them.
* Climate change is predicted to cause ABC in freshwater communities.
* Meaningful action on these predictions necessitates a mechanistic understanding of the links between climate and these communities.
* The effects of altered thermal regime tend to be direct; ABC
* Here, we focus on the effects of altered precipitation regime which can be direct or indirect; ABC
* Climate change necessitates need to understand relationships with biological communities (Wrona 06)
* global warming changes precipitation systems (Allen 02, Held 06)
* Arid systems are sensitive to changes in precipitation (Grimm 13)
* Freshwater systems are sensitive to precipitation and temperature (Woodward 2010)
* Changes in precipitation change annual flow regimes (Doll 12)
* We don't know how communities will respond to changes in flow regime
* Understanding the specific mechanisms relating precipitation to stream communities improves our ability to predict the biological consequences of global warming.
* Arid freshwater communities are extremely sensitive to changes in precipitation because ABC.
* Precipitation regime directly effects stream systems by determining the flow regime (which includes flood and drought characteristics).
* Flow regime restricts freshwater communities by ABC.
* Precipitation indirectly affects stream systems by altering the configurations of streamside vegetation (aka riparian zone).
* The riparian zone acts to mitigate interactions between the stream environment and the watershed by ABC.
* Understanding the direct and indirect effects of altered precipitation regimes informs managers on which systems can and cannot be conserved.
* Stream systems are shaped by flow regime (Rolls 2012)
* Streamside vegetation regulate interactions with watershed (Schade 01)
* Precipitation regime regulates streamflow and riparian
* Predicted changes in flow regimes under global warming create the need to understand the mechanisms relating precipitation to biological systems (Hirabayashi 08)
* Hierarchical community assembly models help us organize our hypotheses (poff 97)
* Dispersal limitations, abiotic filters, and biological interactions determine species distributions (Patrick 11)
* Physiological tolerances limit distributions across environmental gradients, so we expect climate change to alter the gradients and consequently biological distributions (Whittaker 01)
* Biological interactions are harder to predict due to their complexity (Seabra 15)
* Environmental filter effects on community assembly are disjointed due to the different spatial scales of biogeography and community ecology studies (Ricklefs 11)
* Studying spatial distributions along environmental gradients can be used in a space-for-time substitution to infer how communities will change through time as environmental conditions shift (Ricklefs 11)
* SFT studies link climate drivers, local conditions, organism abundances.
* Species co-occurrences can also shed light on shifts in biotic interactions (D'Amen 18)
* SFT assumes changes in climate cause distribution changes
* but studies indicate that dispersal limitation, habitat heterogeneity, and local evolution influence distributions (citation needed)
* SFT studies are large in scale to capture gradients.
* This limits interpretation due to confounding environmental variables
* Thus, although there are evident biome shifts across temperature and latitude (De Frenne 13), predictions at community levels are hindered by confounding variables.
* The power of SFT to delineate precipitation effects is enhanced in systems with limited confounding environmental variables.
* The TCP is an ideal study system bc of its natural precipitation gradient (Falcone 11)
* There are minimal confounding environmental variables
* Applying SFT in the TCP maximizes the analytical power to enhance our predictions for the effects of altered precipitation regimes on biological communities
* Here, we apply SFT on the TCP to measure how changes in precipitation alter stream communities.
* Riparian vegetation changes across the study region (Chapman 18) edit citation needed
* There is limited biological sampling in this region, so these samples improve our knowledge of sub-tropical ecosystems (reference = NARS data, TCP SWMP database) edit citation needed
* We surveyed 10 USGS gauged wadeable streams for fish, inverts and environmental variables
* Here, we characterize variation in Texas stream communities based on precipitation regime and apply a space for time substitution to predict stream community responses to climate change.
* Our objectives are to identify patterns in diversity and composition and relate them to environmental drivers.
* We expect precipitation to correlate diversity because humidity creates more stable environmental conditions through habitat heterogeneity and flow regimes which promote greater biodiversity (Boulton 92)
* We also expect aridity and evapotranspiration will increase solute concentrations in semi-arid streams beyond the osmoregulatory capacity of fish and invertebrates