

Independent Project Proposal

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Introduction

Freshwater ecosystems are biodiversity hotspots, hosting 10% of species while covering only 1% of Earth's surface. Understanding freshwater community resilience in the face of anthropogenic stressors is particularly important in the face of increasing human impact, from noise pollution to farm runoff, to human introduced invasive species. Running through the center of Nebraska, the Platte River provides crucial habitat to thousands of local native species. Additionally, the Platte River Basin is an important stop on the Central Flyway for over 300 migrating bird species. Understanding and maintaining this central freshwater hotspot is crucially important for preserving this complex web of native and diverse species.

At large, we have much to understand about Nebraska's Platte River resilience to various anthropogenic stressors. This project aims to statistically analyze how Platte River fish responded to a severe drought in 2012 using data collected by Dr. Mark Pegg and his lab in the School of Natural Resources. We will compare resilience across different categorization methods- origin/role, functional group, and body size. Species of interest from each category will be featured, and matrix population models will be constructed using survival rates for each species (and assumed standard distribution across ages). Additionally, we will investigate if river depth and flow rate play a role in river diversity.

This project will contribute to a larger goal (and potential thesis) of optimizing conservation strategies for the Platte River, with a purpose of maintaining the highest possible levels of functional biodiversity while balancing the economic needs and cultural uses of the Platte.

Objectives

- Compare diversity before and after 2012's drought of the Platte River with various diversity indices (diversity, evenness, Shannon, Jaccard, Simpson).
- Group and independently analyze drought response across various categorization methods:
 - Origin or Role: (native, invasive, recreational)
 - Functional groups (primary consumer, secondary consumer, predator).
 - Body size

- Select interesting sample species from each categorization. For example sturgeon (native), catfish (native, recreational), and carp (invasive).
- Formulate matrix population models that fit the observed survival rates for 2012 drought response for the selected species.
- Plot populations and diversity across river flow rate and depth

Methods

1. Calculate and plot various diversity indices across time for all species.
2. Calculate and compare resilience across multiple species categorization methods (origin/role, functional group, body size).
3. Analyze survival rates for sample species from various categories, (spurgeon - native, carp - invasive, catfish - native/recreational).
4. Create Leslie matrix population models for each sample species.
5. Compare various populations and diversity indices against river depth and flow rate.

References

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