# Introduction

A regional species pool is the set of species which form communities in a specific region; local communities are subsets of the regional pool. The composition of a regional species pool changes over time due to speciation, migration, extinction. Local scale processes like resource competition only affect the regional species pool if all communities are affected.

Fourth-corner modeling is concerned with explaining either species abundance or presence/absence as a product of species traits, environmental factors, and the interaction between these factors. In modern ecological studies, the matrix being modeled is of species occurrence at localities distributed in region. In this study, the matrix being modeled is of species occurrence in temporal bins across the Cenozoic in North America. These dimensions are all axes of the same three dimensional occurrence matrix: species by locality by time.

One of the greatest challenges with analyzing species occurrence data is the inherent incompleteness of any sample CITATION. In the modern, only presences are certain as an absence can be caused by both the species being truly absent or the species never having been sampled CITATION. For paleontological data in the context of this study, the incomplete preservation of fossil communities combined with the incomplete sampling of what fossils there are means that the true times of origination or extinction may not be observed CITATION.