Presentation Outline:

* Biodiversity loss is a global phenomenon, linked to many human environmental changes.
* While certain trends are universally recognized, such as an increase in global extinction rates, we often have trouble generalizing these impacts to the sorts of areas we use for land management, research, and conservation planning.
* Case in point: meta-analyses of biodiversity change in response to a number of different human factors don’t show clear patterns when examining a number of manipulative experiments.
  + There are many reasons why this might be the case (and this study did receive some criticism on its methodology), but one key concern is that biodiversity loss is a **scale-dependent phenomenon: I.e. depending on what area you examine biodiversity change, you will produce very different results.**
* If we were quantifying worldwide biodiversity change in the last 100 years, we would generally find that globally, increases in species extinction rate have reduced worldwide species richness.
  + However, continential species richness has primarily increased during this time, as humans have introduced far more species than they have caused extinction.
  + Similarly, you might find that regional species richness has often increased somewhat, but local introductions and extirpations often balance each other out.
  + At very local scales, these scale-dependent patterns are much more variable and more poorly understood.
    - One of the best known examples of local—scale impacts is a study by Powell et al. (2013), which noted that species invasion often reduces diversity at very local scales (1m2 or less), but has a much smaller effect at larger scales.
* While this is a nice observation, what I’m going to try to convince you in this talk is that quantifying effects in a scale-dependent fashion is:
  + Not very difficult
  + Provides greater insight into your studied process than a single scale or two-scale (alpha-beta-gamma comparison) analysis can offer.
* How to generate species accumulation curves:
  + Series of smaller subplots are established within a given area of interest
  + Measurements are taken in each subplot
  + Subplots are aggregated in series to produce biodiversity curves
    - A number of different scale-independent biodiversity metrics can be used, with different advantages (effective number of species).
  + Curves are compared to provide plot-by-plot comparisons of biodiversity accumulation. Depending on their shape, we can gain insight into key inflection points, spatial extents where effects are greatest, etc.
* What produces variation in species accumulation curves?
  + Species accumulation curves are the merging between two key phenomena:
    - Relative abundance of different species
    - The spatial distribution of communities
  + Walk through example of spatial accumulation curves.
* How this framework pertains to nutrient enrichment:
  + Nutrient enrichment is one of the most pervasive human impacts
  + There are many ways to think about nutrient enrichment—in the classic R\* framework, addition of a limiting nutrient reduces all relevant variation for a given resource. Because fitness is often determined not by competition over a number of different resources axes, nutrient enrichment generates what has been termed a “collapsed niche dimension”.
  + When there is variation in a number of limiting resources (which often appears to be the case in California), addition of a single resource is likely to have spatially variable effects—effect size of biodiversity loss may depend on what other resources are limiting, which may produce spatially clustered distributions of diversity.
* Background to study design
  + From QE talk
  + Light meter readings
* Comparison of different trends
  + Display of classic methods in biodiversity calculation
  + Demonstration of change in light competition
  + Display of spatial scaling patterns 1 year after nutrient enrichment in spatially explicit growth
  + Display of spatially explicit scaling patterns
  + Display of total effect size, effect size due to spatial reorganization, and due to change in species abundance distribution.
* Conclusions:
  + Nutrient enrichment does have spatially variable effects on species diversity, even just