Notes on progress in analyzing NutNet data:

* LRR may not work well for data with high variance – likely due to the fact that the LRR with a positive control response ratio dampens the overall effect.
  + Subtracting correction from both sides of response (LRR\_N – LRR\_Control x LRR\_P – LRR\_Control) constrains relationship to a 1-1 line, even if there is no temporal trend, but just random noise.
* I also think that we may not be looking for the right signal of a tradeoff. While in theory the single tradeoff axis makes sense, I think it’s important to remember that this change is realized in a community context, rather than on a pure species-by-species basis. For example, it’s difficult to quantify the R\* for a given species if its not grown in monoculture. The presence of a single, uniform tradeoff axis for two nutrient addition treatments would result in perfectly negatively correlated community change between two species assemblages.
* We know that nutrient addition causes decreases in species richness / reduction in SAD evenness. If nutrient use trade-offs may be the driver behind observed multiple nutrient addition effects on plant diversity, what sort of figures would that produce?
  + For species to exist on a single, negatively correlated axis, responses would have to be entirely different depending on what nutrient is added. While this is perhaps a way we could measure tradeoffs in individual biomass change when grown individually, it ignores the effects of **competition.**
  + Instead of a simple linear response, I predict that we will see a “diamond” response in contexts where a tradeoff exists. When comparing two different nutrient addition treatments, I think we can divide species responses into 4 main categories:
    - **Uniform decreasers:** With most fertilization treatments, nutrient enrichment reduces plant diversity – increasing the abundance of a few species comes at the expense of the many. These are the many. Whether these species are better colonizers, rely on temporal mechanisms of coexistence, etc., a majority of species responses to nutrient enrichment should be negative, regardless of nutrient identity.
    - **Uniform increasers:** Species that increase in response to both added nutrients. Can occur in situations where there are too few species to produce a consistent tradeoff, multiple nutrient limitation of a dominant species, etc.
    - **Conditional increasers:** *These* are the species that I think are most interesting. If there are nutrient use tradeoffs, this is the primary axis on which they will be distributed, and is particularly relevant to our desire to understand how multiple nutrient limitation controls patterns of diversity loss.



**How would we quantify?**

I think there are a number of different ways in which we could quantify this tradeoff, some which are more individually-focused versus more community focused. I think both are valid, and provide a bit of a hybrid between some of the methods we initially discussed and those that were a focus during the Nutrient Network meeting.

I would argue that we really need both a community-level focus, and to delve into the individual-level data to understand what is going on.

At the community scale:

* If the sets of species that change in response to nutrient enrichment are distinct between treatment types, and species respond positively to both treatments, we should see:
  + Significant compositional differences in both treatment 1 and treatment 2
  + Vectors of compositional change that are not significantly correlated

At the individual scale, provided we see these differences, we could then ask what species are driving this relationship, i.e.:

* What species fall along the major tradeoff axis? What species show the highest affinity towards N treatments vs. P treatments? If we were to project species responses to the trade-off surface, where would they lie?

