Ty Spangler
4/30/16

1. Stability analyses of models are likely to be useful tools to understand communities in nature. For example, carrying capacity is an important stable state of a population that is incorporated into multiple models that are commonly used. Being able to calculate and understand the stable states of models provides more information that can be applied to real world situations.

2. In a predator-prey model, one species will benefit while the other is harmed. Therefore the signs should be one positive and one negative sign. In a competition model, both species will have a negative impact on each other so both signs will be negative. In a mutualism model, both species would benefit each other so both signs would be positive.

3. The alpha ij notation used in chapter 6 and 7 are both used to describe the interactions between two species. In chapter 6, this notation is used in an exponential growth type of model; dn/dt=An, where A is computed with the values of alpha ij. In chapter 7 the same notation is used in a logistic growth model where alpha ij represents interspecific and intraspecific density dependence. A simple solution would be to use another variable other than alpha.

4. In the simulation, when the p value is increased it signifies that more individuals are moving from New York to California.

5. *Cephalopholis argus*, more commonly known as the peacock grouper, is a reef fish originally found in the coral reefs of the Indo-Pacific. It is a predatory species that feeds primarily on small fish and sometimes crustaceans. This species was introduced to the Hawaiian Islands in 1958 from French Polynesia to contribute to the local fishery. Their populations were kept in check by commercial fishermen until the 1980's, when they became known for carrying a disease called ciguatera. This disease starts in dinoflagellates, a type of phytoplankton, and pass the ciguatera toxins up the food chain, where they become more concentrated. Once enough toxin accumulates in an individual, they can experience a varying degree of symptoms, which includes nausea, vomiting, diarrhea, muscle pain, numbness, tingling, and reversal of cold and hot. In extreme cases, it has caused death. In Hawaii, peacock groupers don't have any natural predators so they are able to accumulate a large amount of ciguatera toxins. A study done by the University of Hawaii found that an average of 20% of peacock grouper contained high levels of toxins. Also, since peacock groupers are predatory fish that eat a wide array of species, they have noticeable negative impacts on native marine species, some of which are endemic and rare. Since the 1980's, the peacock grouper population has grown with very little deterrence. It wasn't until relatively recently that people started efforts to reduce their population. Now, spearfishing tournaments targeting these and other invasive

species are common and have shown promising results. Public awareness has also grown as a result of these tournaments. This species relates to population ecology because if we are able to model their population sizes, we can know which reefs are the most threatened. A better understanding of their population dynamics will allow us to better control their impacts to the fragile coral reef ecosystem in Hawaii.

https://docs.google.com/document/d/1ZMlesInxq3RIvuRco2CRquXAiUNjIo64M0YOXnoRRLU/edit