

Native vs. Invasive Species

The introduction of an invasive species into a new environment can have catastrophic consequences for the native species. Examples of non-native species that out compete native wildlife include asian carp, kudzu, and zebra mussels. In this project, you will develop a population model between two competitive species and determine under what conditions would one population dominate the other and when both populations would coexist. Additionally, you will examine how predation of one species will effect the population dynamics.

Background

Assuming a native species experiences logistic growth in the absence of an invasive species, the environment will have sufficient resources to support a certain native population, the carrying capacity. When an invasive species is introduced, the two species compete of the resources in the environment so the carrying capacity is split between the two populations. This split it typically uneven.

Some Model Requirements

- Your model will consist of the population of two species: native and invasive.
- In the absence of either species, the remaining population will behave logistically.
- The presence of one species has a negative effect on the other species through changes in the effective carrying capacity.

Some Questions to Answer

- In the absence of one of the species, does the other species have a stable population?
- What are the possible steady states in the system?
- Are steady states created or destroyed as parameters change?
- Are these steady states stable or unstable?
- Do the steady states change stability as the parameters change?
- Under what conditions does the native species have a stable, non-zero population while the invasive species dies out (out-competes the invasive species)?
- Under what conditions does the invasive species have a stable, non-zero population while the native species dies out (out-competes the native species)?
- Under what conditions do both the native and invasive species have a stable, non-zero population? How does the population mixture vary with the parameters?
- Do your results suggest any ways the invasive species can be eliminated/contained?