

# Harvesting

When harvesting from a population, it is important to understand the effect of removing members has on the stability of the population. This is important for both farm grown and wild populations since over-harvesting can be a big concern for many animals species. In this project, you will develop a population model subject to logistic growth with harvesting. How does different harvesting strategies effect the total population? Can harvesting collapse the population? What is the maximum number of members that can be removed from the population without collapsing the entire population?

## Some Model Requirements

- In the absence of harvesting, the population will behave logistically with a given growth rate and carrying capacity.
- Harvesting is the removal of members from the population that is separate from the logistic growth/decay inherent in the population. It will be a function of the size of the population.
- There are different harvesting strategies, which can have difference effects on the population and how many members can be harvested without collapsing the population.
- One harvesting strategy is constant harvesting where harvesting is done at a fixed rate independent of the population size.
- Another harvesting strategy is constant effort where harvesting is done a rate proportional to the population size. The harvesting function here is linear in the population size.
- Another harvesting strategy is to harvest using sigmoidal functional relationship between the rate of harvesting and the size of the population. A sigmoid function is a function that has a “S” shape. Here, your sigmoid harvesting function will be zero when the population is zero and will saturate to a constant value when the population goes to infinity.

## Some Questions to Answer

- What are the steady states of the population for each harvesting strategy and without harvesting? Are they stable? It is possible to collapse the population due to harvesting for each harvesting strategy?
- What is the total yield for each strategy over a unit time for each harvesting strategy?
- How would one view the results if they were interested in controlling a population (culling) instead of harvesting?