1.1.1 Introduction and Learning Goals for Section

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How do populations change over time? What limits their growth? What happens when populations interact and what effect do humans have on these interactions?

In **Part I**, we'll take a historical tour of the most fundamental models for population growth, with Ethan Addicott (Environmental Science and Public Policy Major, Harvard College '14) as our host.

Ethan will share a biological puzzle from World War I about how fishing affects predator and prey fish species. We'll see how this puzzle inspired the creation of the famous Lotka-Volterra predator-prey models and analyze the model ourselves.

In **Part II**, we'll solve the biological puzzle using this model and explore the implications this model has today on fishing regulations and other complicated biological systems.

In Part I, you will:

- become familiar with the **exponential and logistic models for population growth**, from their historical formulation to their modern-day differential equations,
- use **qualitative analysis** on the logistic model to understand the possible outcomes for a population,
- become familiar with the **Lotka-Volterra predator-prey model**, a system of differential equations, and
- use **phase plane analysis** to understand how predator and prey populations change over time

For this section you'll need to know the **basics of differential equations** and **integration**. **Familiarity with systems of differential equations** is also helpful but not necessary.

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