* Population Ecology

Certain principles govern the growth and sustainability of all populations

* Population
* A group of individuals of the same species occupying a given area
* Can be described by specific demographics
  + Size
  + Density
  + Distribution
  + Age structure
* Density & Distribution
* Number of individuals in some specified area of habitat
* Crude density information is more useful if combined with distribution data
* Determining Population Size
* Direct counts are most accurate but seldom feasible
* Can sample an area, then extrapolate
* Capture-recapture method is used for mobile species
* Changes in Population Size
* Births
  + add individuals
* Deaths
  + subtract individuals
* Immigration
  + adds individuals
* Emigration
  + subtracts individuals
* Zero Population Growth
* Number births equals number deaths
* Assume no change from migration
* Population size remains stable

Reproductive Rate (r)

* Number births per individual per unit time
* Variable combines per capita birth and death rates (assuming both constant)
* Can be used to calculate population growth rate
* Exponential Growth
* Population size expands by ever increasing increments during successive intervals
* The larger the population gets, the more individuals there are to reproduce
* Biotic Potential
* Maximum rate of increase per individual under ideal conditions
* Varies between species
* In nature, biotic potential is rarely reached
* Primarily due to limiting factors
* Limits to Growth
* A population’s growth depends on the resources available
* Deer introduced to Angel Island
  + Population outstripped resources
* Limiting Factors
* Any essential resource that is in short supply
* All limiting factors acting on a population dictate sustainable population size
* Most common are food (nutrients) and space
* Carrying Capacity (*K*)
* Maximum number of individuals that can be sustained in a particular habitat
* Limits population size
* Creates Logistic growth
* Logistic Growth
* As size of the population increases, rate of reproduction decreases
* When the population reaches carrying capacity, population growth slows
* Overshooting Capacity
* Population may temporarily increase above carrying capacity
* Overshoot is usually followed by a crash; dramatic increase in deaths
* Density-Dependent Controls
* Logistic growth equation deals with density-dependent controls
* Limiting factors become more intense as population size increases
* Disease, competition, parasites, toxic effects of waste products
* Density-Independent Controls
* Factors unaffected by population density
* Natural disasters or climate changes affect large and small populations alike
* Population Age Structure
* Populations are divided into age groups
  + Pre-reproductive
  + Reproductive
  + Post-reproductive
* Population’s reproductive base includes members of the reproductive and pre-reproductive age categories
* Age Structure Diagrams

Show age distribution of a population