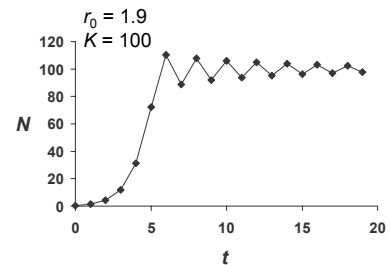


Population Growth III. Overabundance and its Consequences

Discrete Logistic Growth



Overshooting Equilibrium Density

- Can occur when density dependence has a time lag
 - Lag is built into discrete logistic equation
- What isn't built in is that overabundance can reduce **carrying capacity**
- **Carrying capacity**: population density that an environment can support indefinitely
 - *not necessarily the same as K*

Overabundance

- **Dynamic Overabundance**: when a population is so dense that it **substantially** reduces its own carrying capacity
 - population reduces the rate at which resources are replenished
 - the longer at high density, the more dramatic the crash that follows
- **Ecological Overabundance**: when a population is so dense that it **threatens** the persistence of other species
- **Societal Overabundance**: when a population is so dense that it becomes **unacceptable** to humans
 - “acceptance capacity”

Overabundance

- **Dynamic Overabundance**: ...**substantially** reduces
- **Ecological Overabundance**: ...**threatens** other species
- **Societal Overabundance**: ...**unacceptable** to humans
- The word “overabundance” implies value judgement
 - substantially reducing own carrying capacity is bad...why?
 - threatens other species is bad...why?
 - unacceptable to humans...why?

Examples

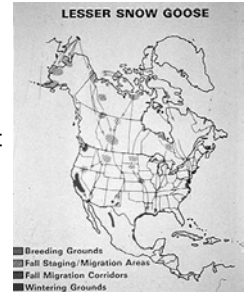
- Mid-continent light geese
- Cormorants on Great Lakes
- White-tailed deer, especially in parks

Case Study: Light Geese

- Light geese = snow geese & Ross' geese

Case Study: Light Geese

- Problem is with Mid continent population
- Breeding Grounds: Arctic tundra near Hudson Bay
- Wintering grounds: Coast of Gulf of Mexico



Case Study: Light Geese

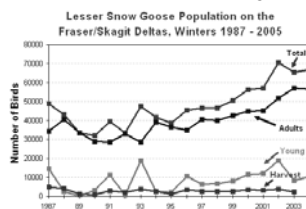
- Agricultural development in wintering grounds and along migration route has provided abundant food, causing population to increase

Case Study: Light Geese

- This is a problem primarily because of these animals' **foraging and social behavior**:
 - geese arrive on breeding grounds in spring, before green vegetation has begun to appear
 - arriving geese forage by “**grubbing**”
 - **kills the plants** and prevents regrowth
 - control by harvest has been difficult due to **flocking behavior**
 - large flocks are difficult to lure in

Case Study: Light Geese

- Effects:
 - reduced reproduction and juvenile survival
 - age structure skewed toward old age classes



Source:
Environment
Canada

Case Study: Light Geese

- Effects:
 - reduced reproduction and juvenile survival
 - age structure skewed toward old age classes
 - major impacts on slow-growing tundra vegetation
 - “goose ghettos” can be seen in satellite imagery
 - removal of vegetation has caused drying & salinity of soil
 - indirect impacts on other birds breeding in same areas
 - economic damage to crops along migration route and in wintering areas

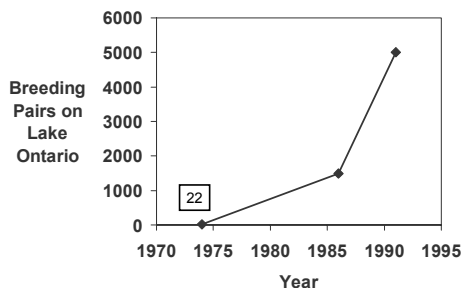
Case Study: Light Geese

- Management Challenges:
 - higher bag limits & longer seasons have NOT increased harvest
 - ethics and sportsmanship: does technology that can increase harvest violate the notion of **fair chase**?
 - The ultimate result is clear: Unless the goose population is controlled quickly it will crash, and the habitat will recover very slowly.
 - Should managers intervene or let “nature” take its course?

Case Study: Cormorants

- Problem:
 - populations of double-crested cormorants have increased greatly in recent decades
 - rebounding from low populations due to pesticides (DDT)
 - concerns:
 - competition with recreational & commercial fishing
 - damage to trees where they nest & roost
 - competition for nest sites and food with other bird species (terns & herons)

Case Study: Cormorants



Case Study: Cormorants

- Evidence
 - reduction in fish stocks has been documented
 - adverse effects on trees & other birds has not been well documented
 - an example of societal overpopulation
- Management efforts
 - oiling eggs to prevent hatch
 - harassment to prevent establishment of new colonies

Things To Remember

- Three forms of overabundance & their definitions
- Dynamical abundance can occur when population exceeds carrying capacity and decreases the resource recovery rate
- Examples: light geese and cormorants
 - cause of population increase
 - problems that have resulted
 - management challenges