



Invasive Species and Population Growth



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Questions

- What is population growth?
- What factors affect population growth?
- What is an invasive species?
- How can invasive species affect population growth of native species in a local ecosystem?



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Vocabulary

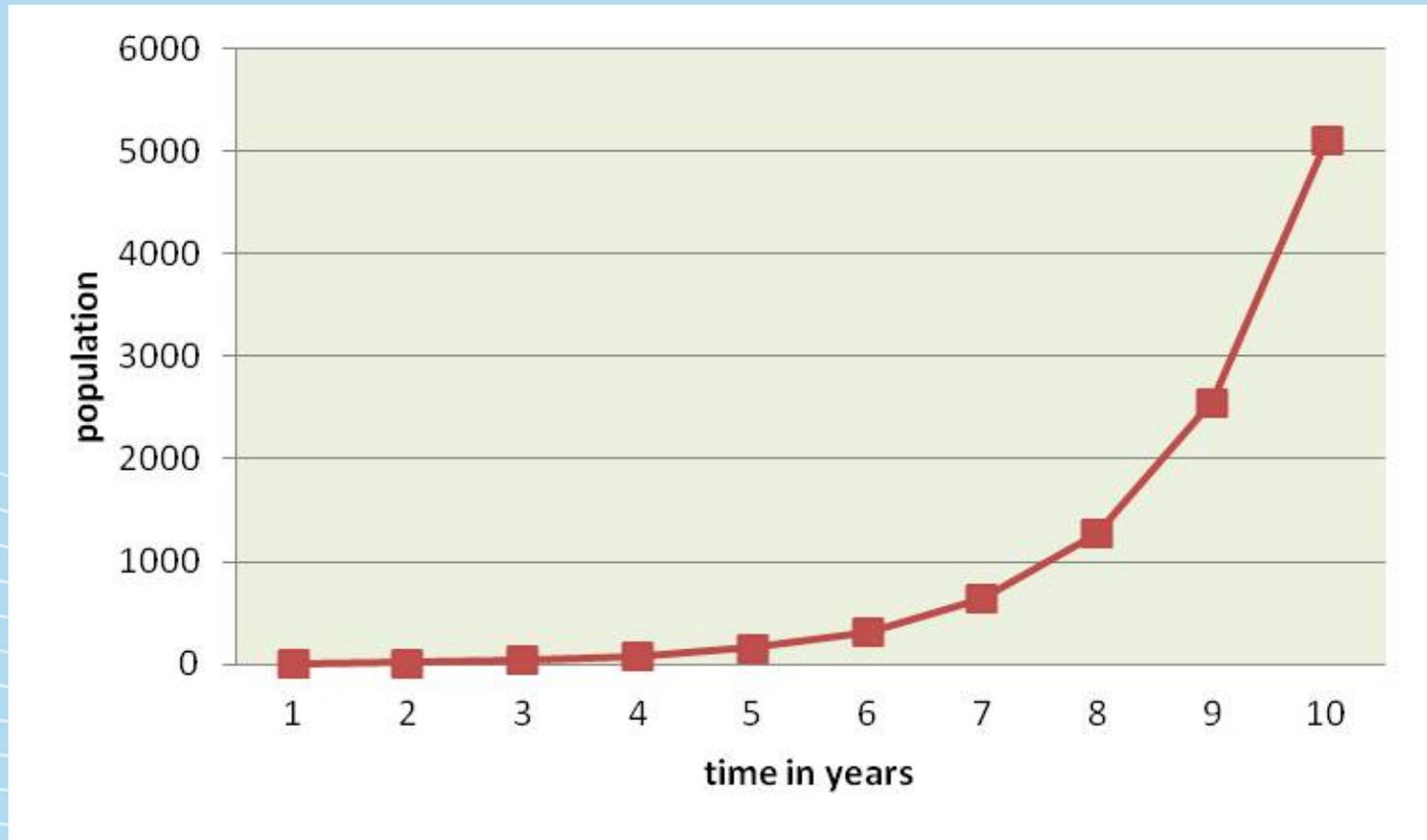
- Population
- Population growth
- Exponential growth
- Logistic growth
- Limiting factors
- Abiotic factors
- Biotic factors
- Carrying capacity
- Native species
- Invasive species
- Competition
- Predation



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Exponential Growth



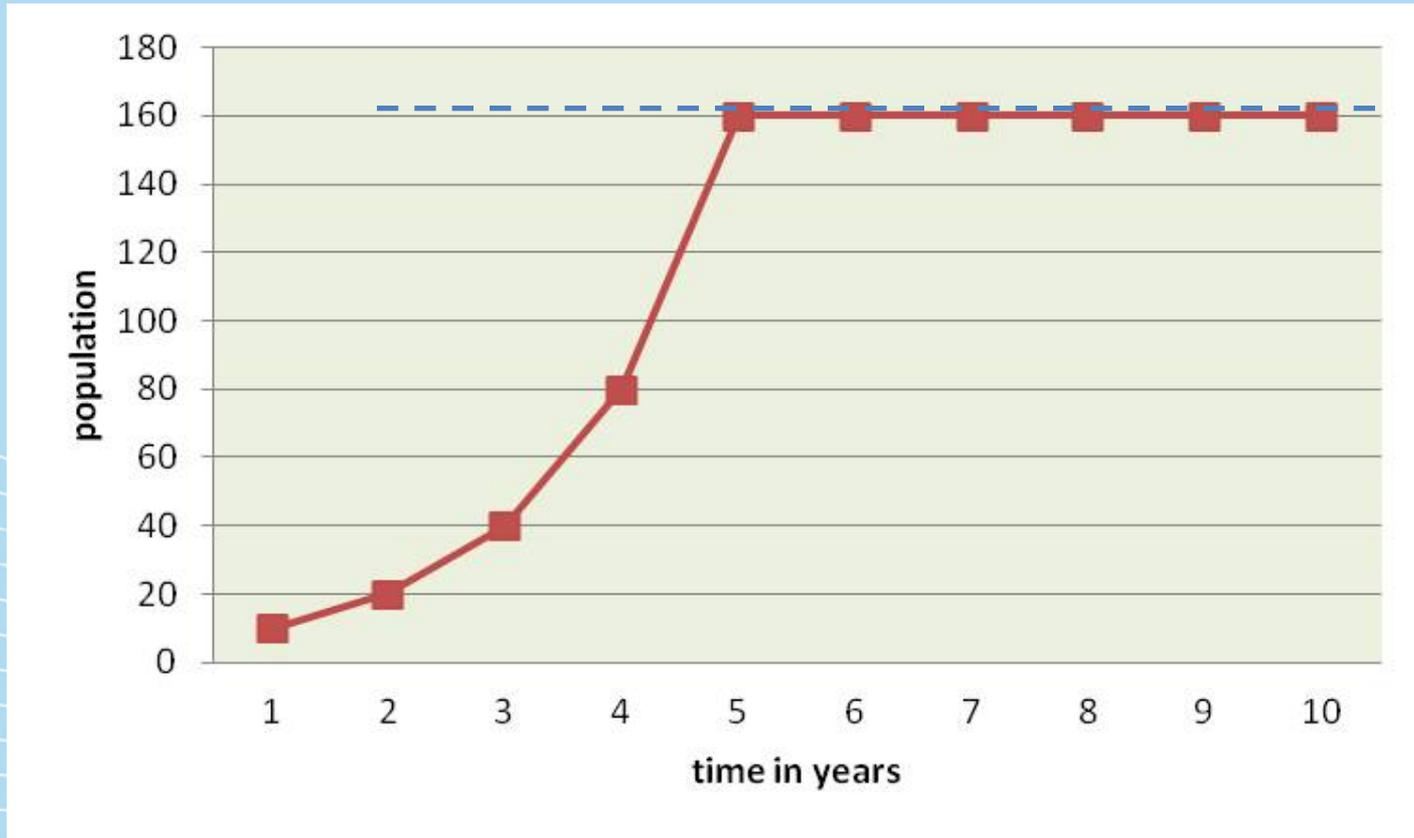
J-shaped exponential growth curve



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Logistic Growth



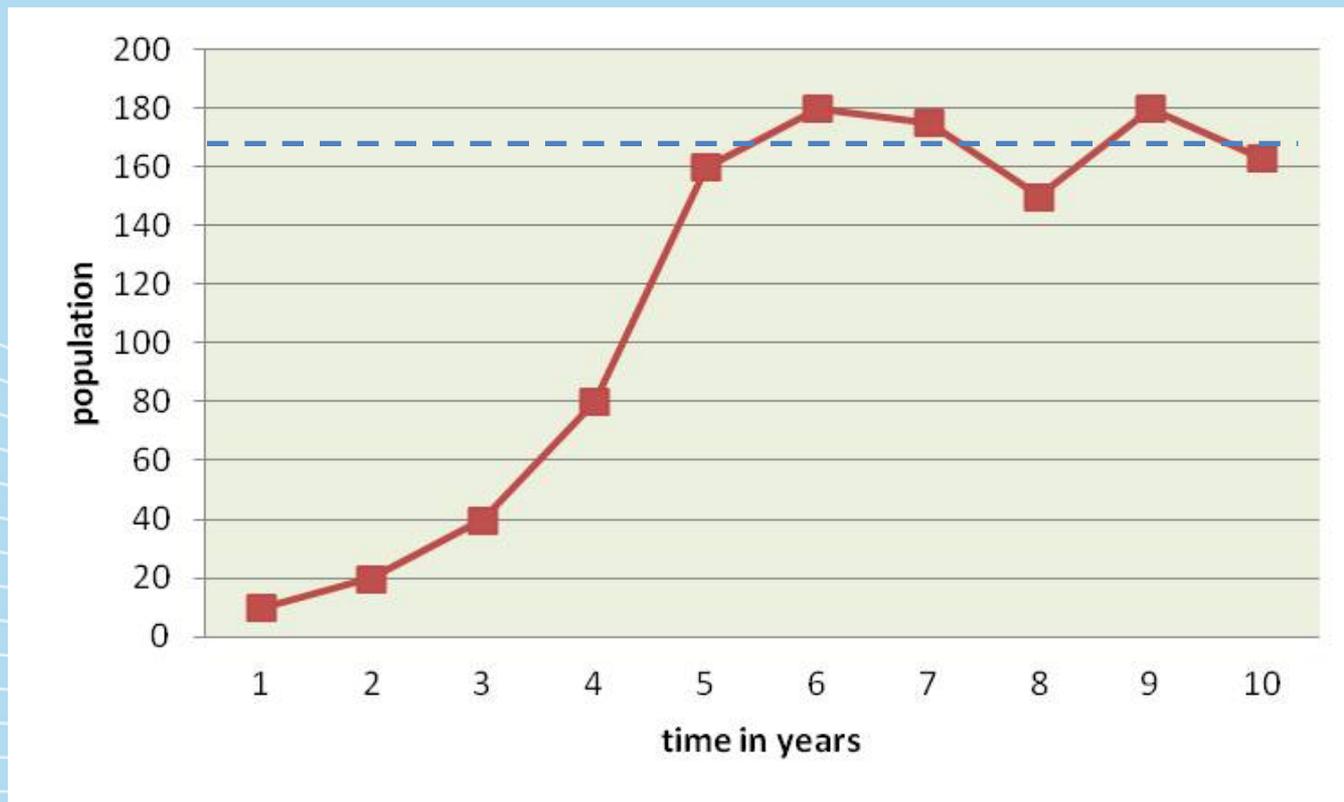
S-shaped logistic growth curve



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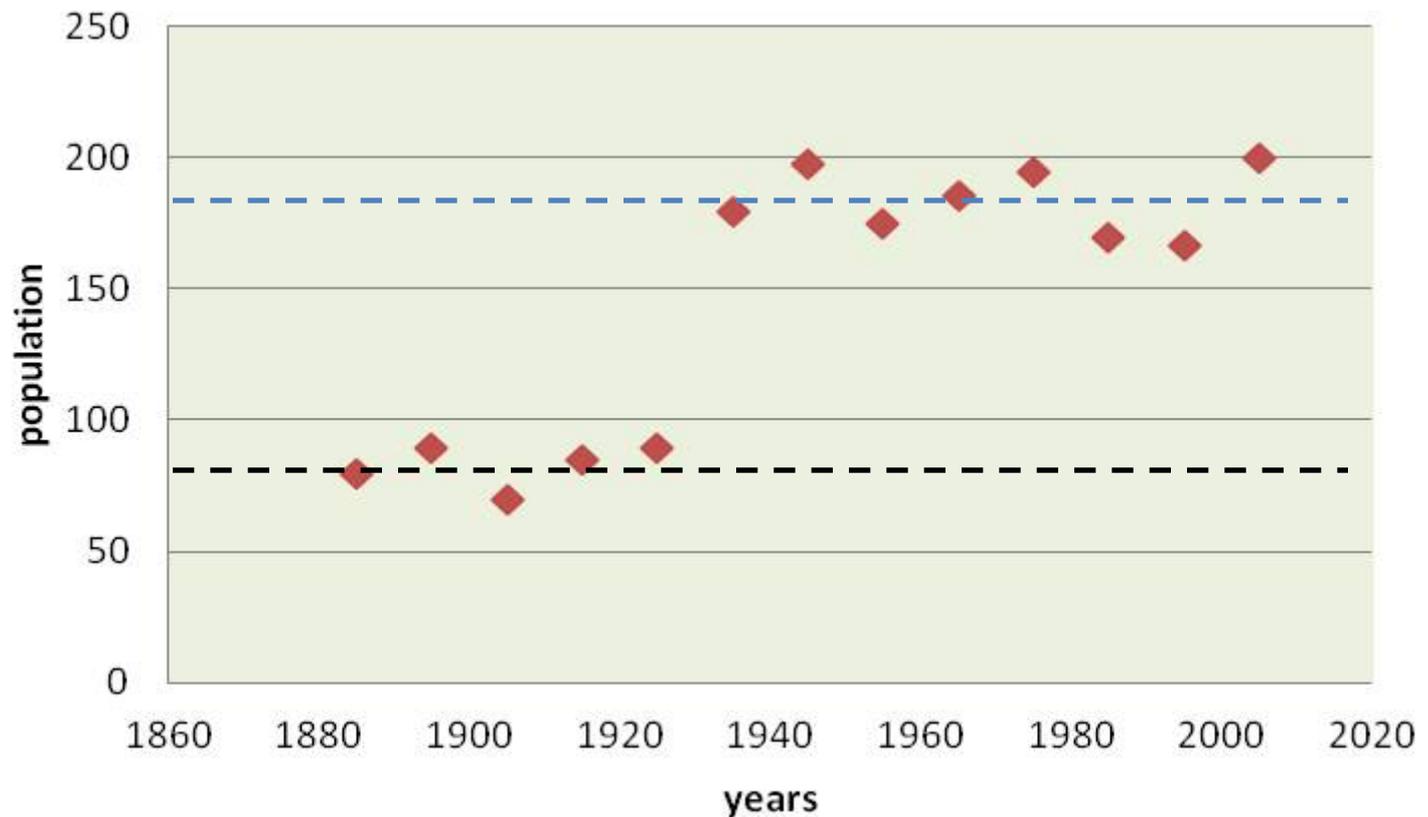
Factors that cause the population to fluctuate around the carrying capacity



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Adjusting the carrying capacity



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Other factors that affect the population size

- Disease
 - Impact depends on lethality and ability to spread
- Competition
 - Occurs between individuals of the same species and individuals of different species
 - Can be over resources
 - Has three outcomes
- Predation
 - animals that eat other animals or animals that eat plants
 - Predators can come in all shapes and sizes



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Invasive species as diseases

- Sudden oak death



Photo Credit: Joseph O'Brien, USDA Forest Service
<http://www.invasive.org/> Image No. 1427112



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Invasive species as diseases

- Laurel wilt



Photo credits:

Damage: CL Harmon, University of Florida

Adult and tunneling: Lyle Buss, University of Florida



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Invasive species as competitors

- Red Imported Fire Ant



Photo credits:

Fire ant – April Noble, Antweb.org, www.bugwood.org, #2121038

Mounds – USDA APHIS PPQ Archive, USDA APHIS PPQ, www.bugwood.org, #1148038

Bites – USDA APHIS PPQ Archive, USDA APHIS PPQ, www.bugwood.org, #1148032



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Invasive species as competitors

- European paper wasp



Photo credits:

Adult – Whitney Cranshaw, Colorado State University, www.bugwood.org, #5024086

Close-up – David Cappaert, Michigan State University, www.bugwood.org, #5381057

Nest - David Cappaert, Michigan State University, www.bugwood.org, #5255019



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Invasive species as predators

- Emerald Ash Borer



Photo Credit:
Damaged ash trees: Daniel Herms, The Ohio State University, www.bugwood.org, #5171038
Beetle: David Cappaert, Michigan State University, www.bugwood.org, #2106098
Larvae: David Cappaert, Michigan State University, www.bugwood.org, # 1460071
Tunnels: Art Wagner, USDA APHIS PPQ, www.bugwood.org, #5147090



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Invasive species as predators

- Asian long horned beetle



Photo Credit:
Chipping trees: Larry R. Barber, USDA Forest Service, www.bugwood.org, #3047034
Beetle: Michael Bohne, www.bugwood.org, #1262001
Larvae: Thomas B. Denholm, New Jersey Department of Agriculture, www.bugwood.org, #1253027
Tunnels: Steven Katovich, USDA Forest Service, www.bugwood.org, #1398111



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Summary

- Population growth can be positive or negative.
- Over time, populations remain fairly constant, though there will be population fluctuations that will occur over the course of a year or years.
- There are many factors that affect population growth. These factors include food, space, water, nesting sites, diseases, competition, and predation.
- Invasive species are introduced in an area and cause economic harm or harm to human health.
- Invasive species affect population growth of a native species in a given community through the introduction (or transmission) of a disease, competition with native species, or predation on native species.



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Activity #1: Manipulating the Carrying Capacity

- Questions:
 - What is the carrying capacity of duckweed in a given “environment”?
 - Can the carrying capacity of duckweed be manipulated by changing the limiting factors available in its “environment”?



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How can you manipulate the carrying capacity?

- Follow along in your handout
- Duckweed is a freshwater aquatic plant that can reproduce asexually.
- Each plant consists of a single leaf and a root.
 - If there are two leaves, count them as two separate plants.
 - Use a magnifying glass to count the plants.



Photo Credit:
WikiMedia Commons.



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For this assignment...

- Work in groups to monitor the population growth of duckweed (*Lemna minor*) for 4 weeks
 - Control – spring water in a cup
 - Test group 2 – spring water with fertilizer in a cup
 - Test Group 3 – spring water in a sandwich container
 - Test group 4 – spring water with fertilizer in a sandwich container
 - Test group 5 – spring water in a cup with less light
- Take data twice a week and chart growth
 - Estimate the carrying capacity of each group to see if it is the same



Activity #2: Estimating the Carrying Capacity

- Follow along in your handout
- Use “rabbits” and an “environment” to estimate the carrying capacity
 - Start with 25 rabbits and dump them into the “environment”
 - 5 or more “rabbits” in a square are removed from the population
 - 2, 3, or 4 “rabbits” reproduce and are added to the population
 - 1 “rabbit” does not reproduce but remains part of the population
 - Count all “rabbits” and record that number
 - Continue this for 8 rounds
 - Graph your results and estimate the carrying capacity



Activity #3: Computer Lab

- Go to the computer lab and complete the online e-learning module



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