

Agenda Item 17

Predator- Prey Management



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Wildlife Program

Predator Prey Management Outline

- Predatory/Prey Overview
 - History and ecosystem function
 - Science
 - Examples
- Predator/Prey Management Guidelines
- Next Steps
 - Ungulate assessment
 - Predator/Prey investigations



Cougar

History of Predator-Prey Management

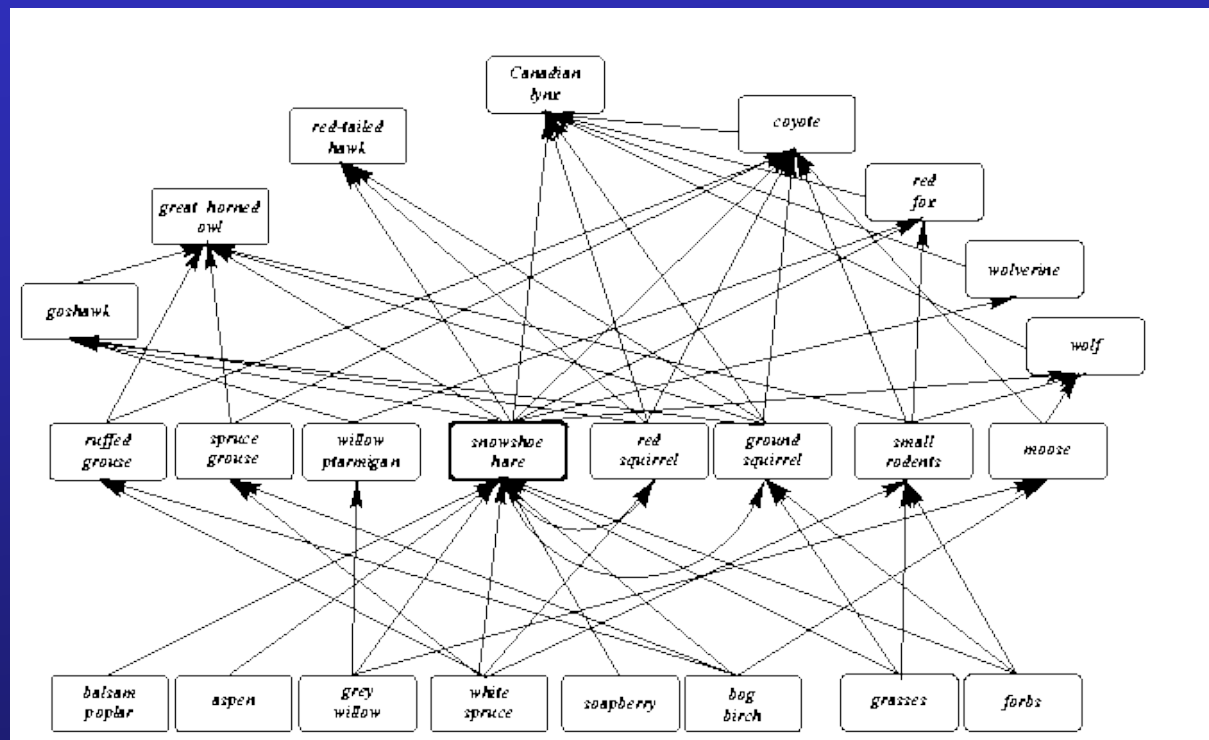
- Debated since beginning of wildlife management science in 1933
- Aggressive predator persecution in early 20th century
- Concerns of excess control raised in 1930's
- Began recognizing vital ecosystem function by 1960-1970s – focused on individual offenders



Bear Hunters – early 1900's

Ecosystem Function

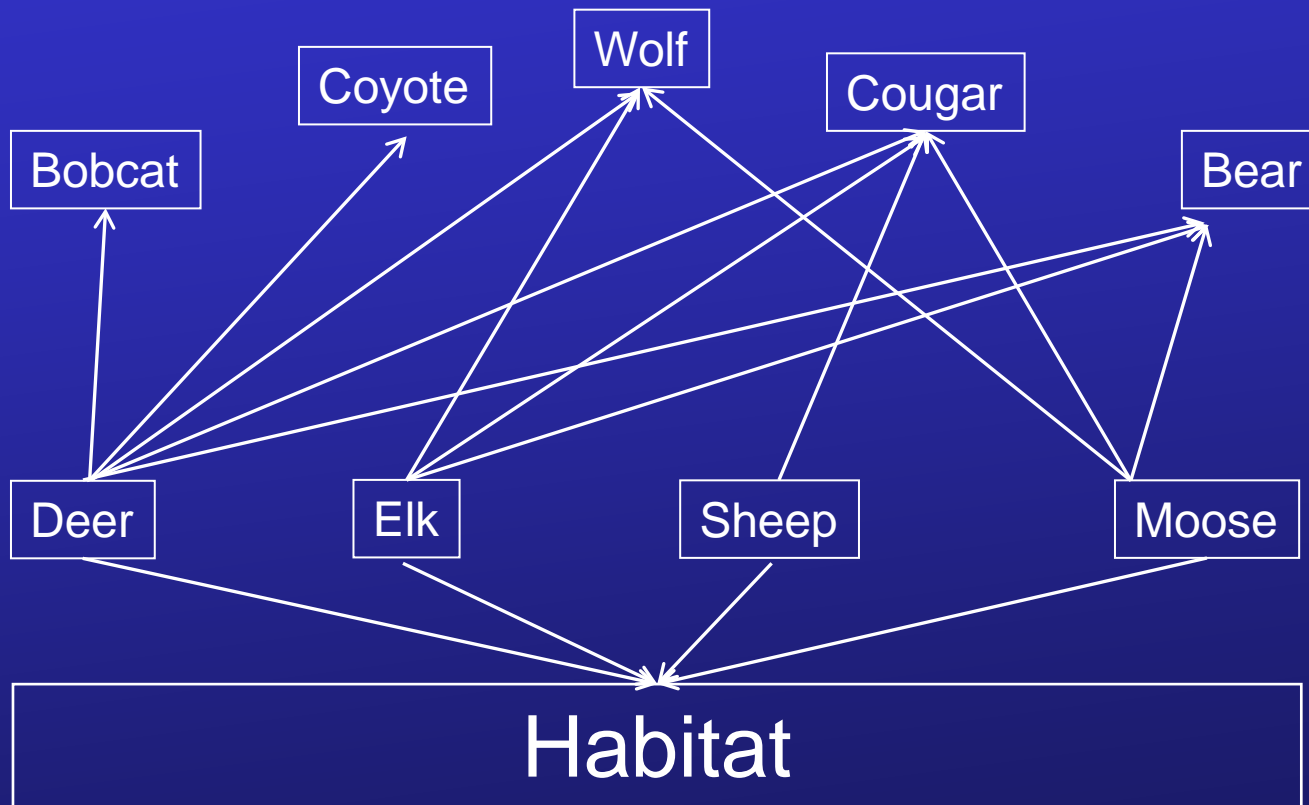
- Complex issue
- Incomplete understanding of predator-prey dynamics



Example food web

Ecosystem Function

Ungulate Predators



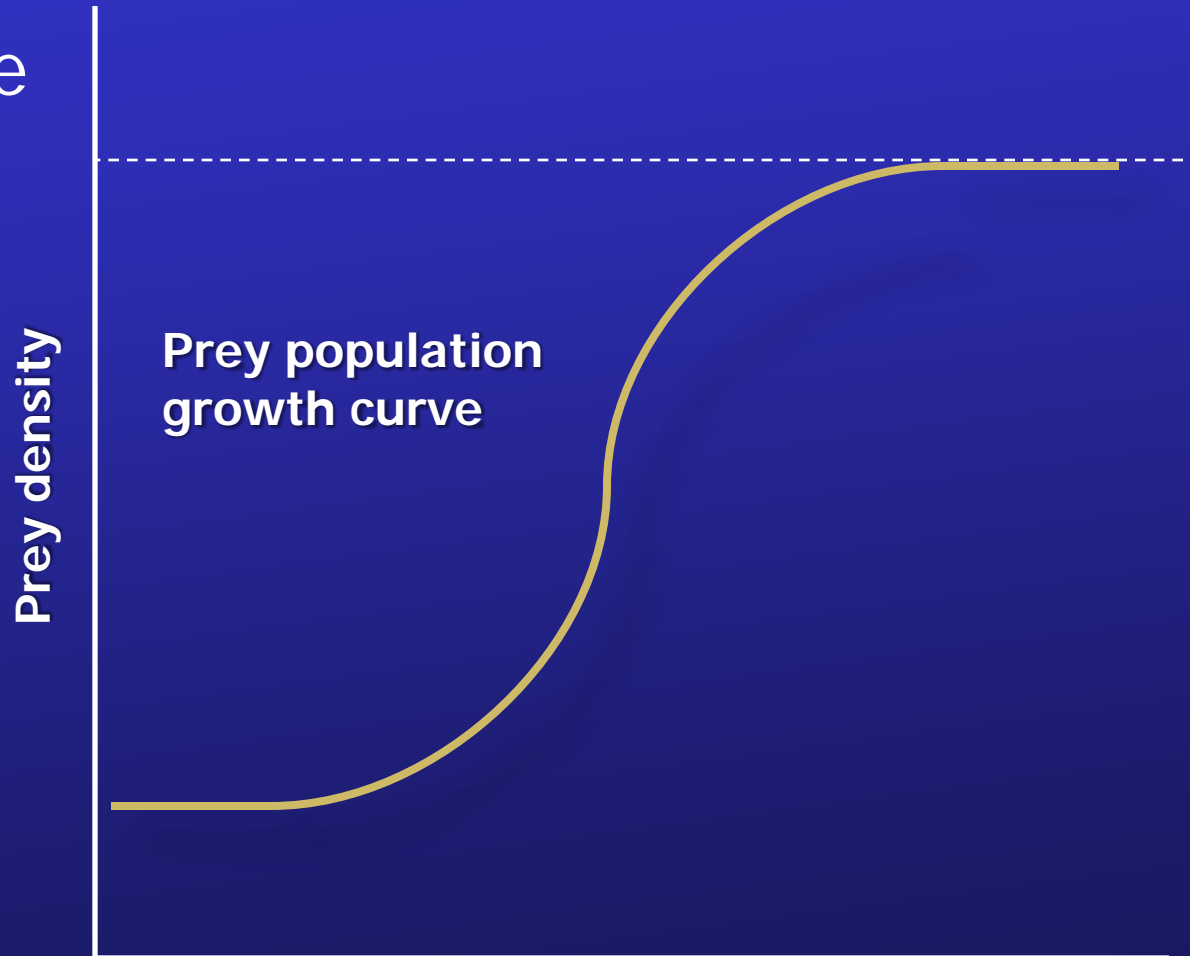
Science of Predator-Prey Management Overview

1. Review principles and scientific theories of predator-prey dynamics
2. Summarize knowledge from relevant studies
3. Review characteristics of predator impacts



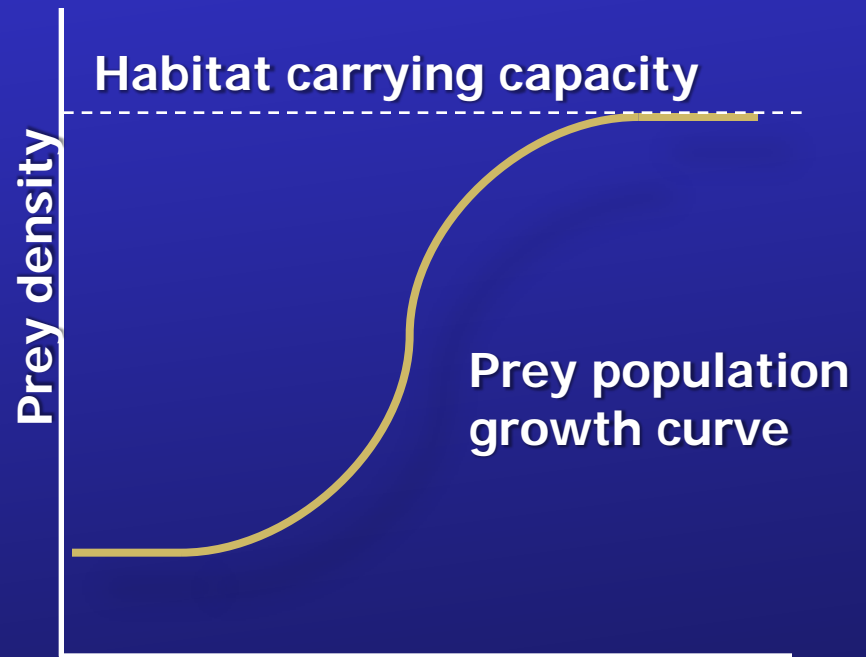
Terminology

- Prey growth rate
 - Increasing
 - Stable
 - Decreasing



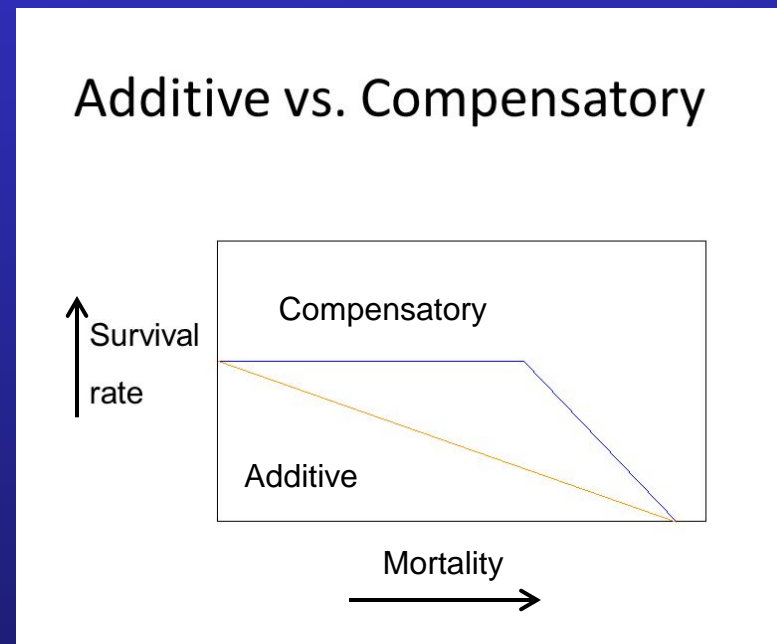
Terminology

- Prey growth rate
- Carrying capacity
 - Level at which population is limited by resource availability (e.g., food)

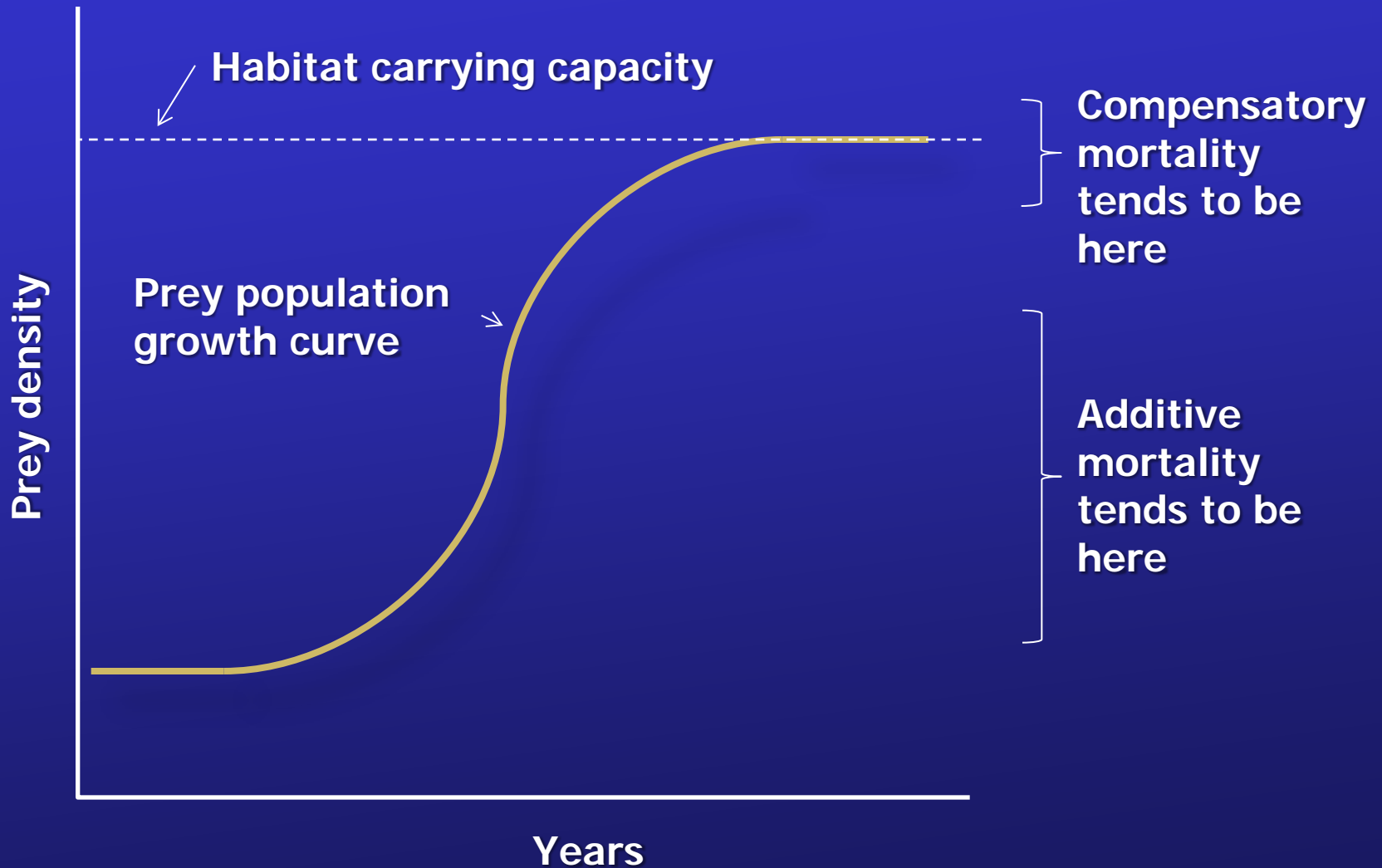


Terminology

- Prey growth rate
- Carrying capacity
- Additive versus compensatory mortality
 - Additive - the mortality from individual factors adds directly to total mortality
 - Compensatory – the mortality from one factor compensates for another, so total mortality remains the same

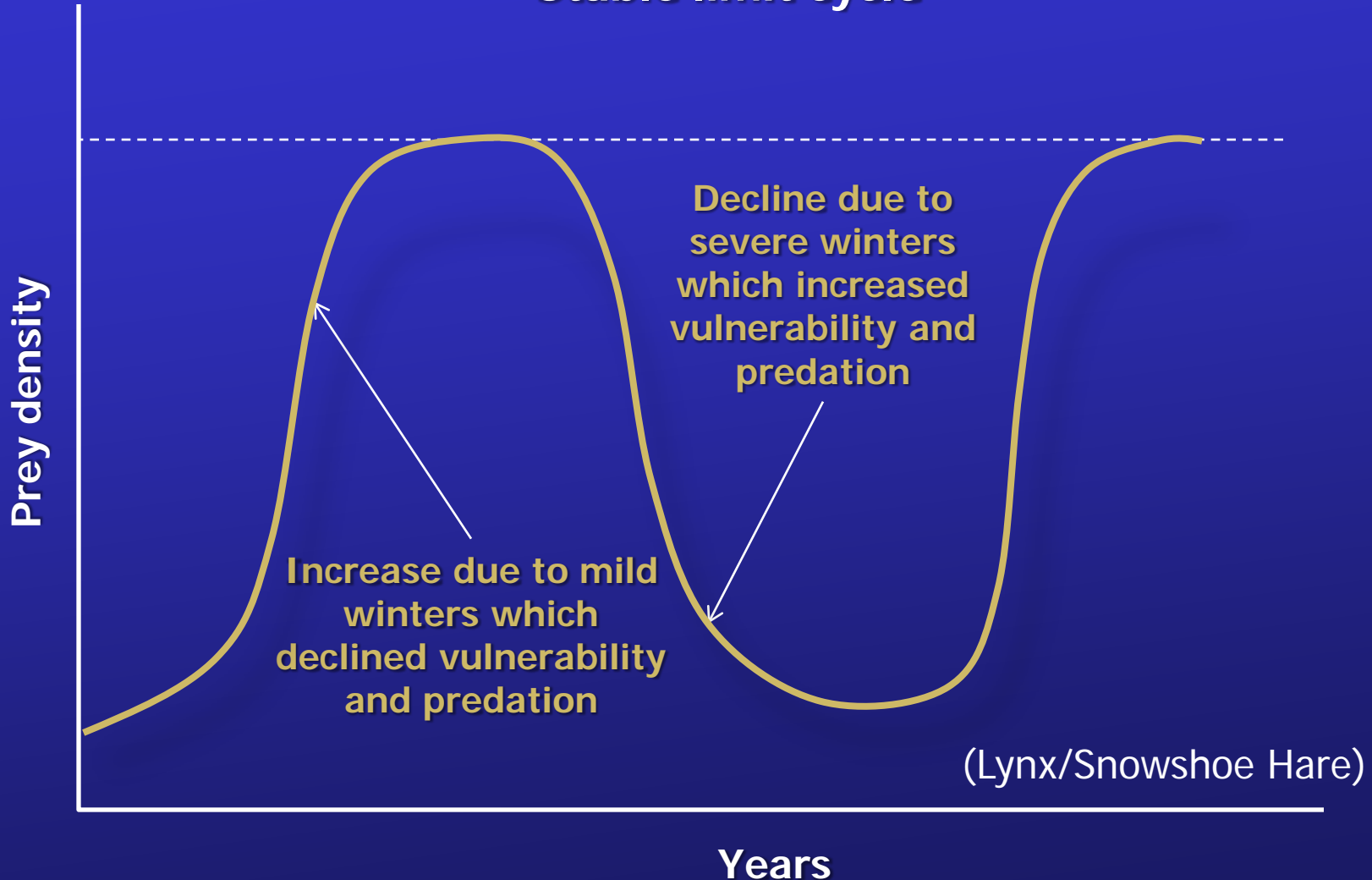


Conceptual Model



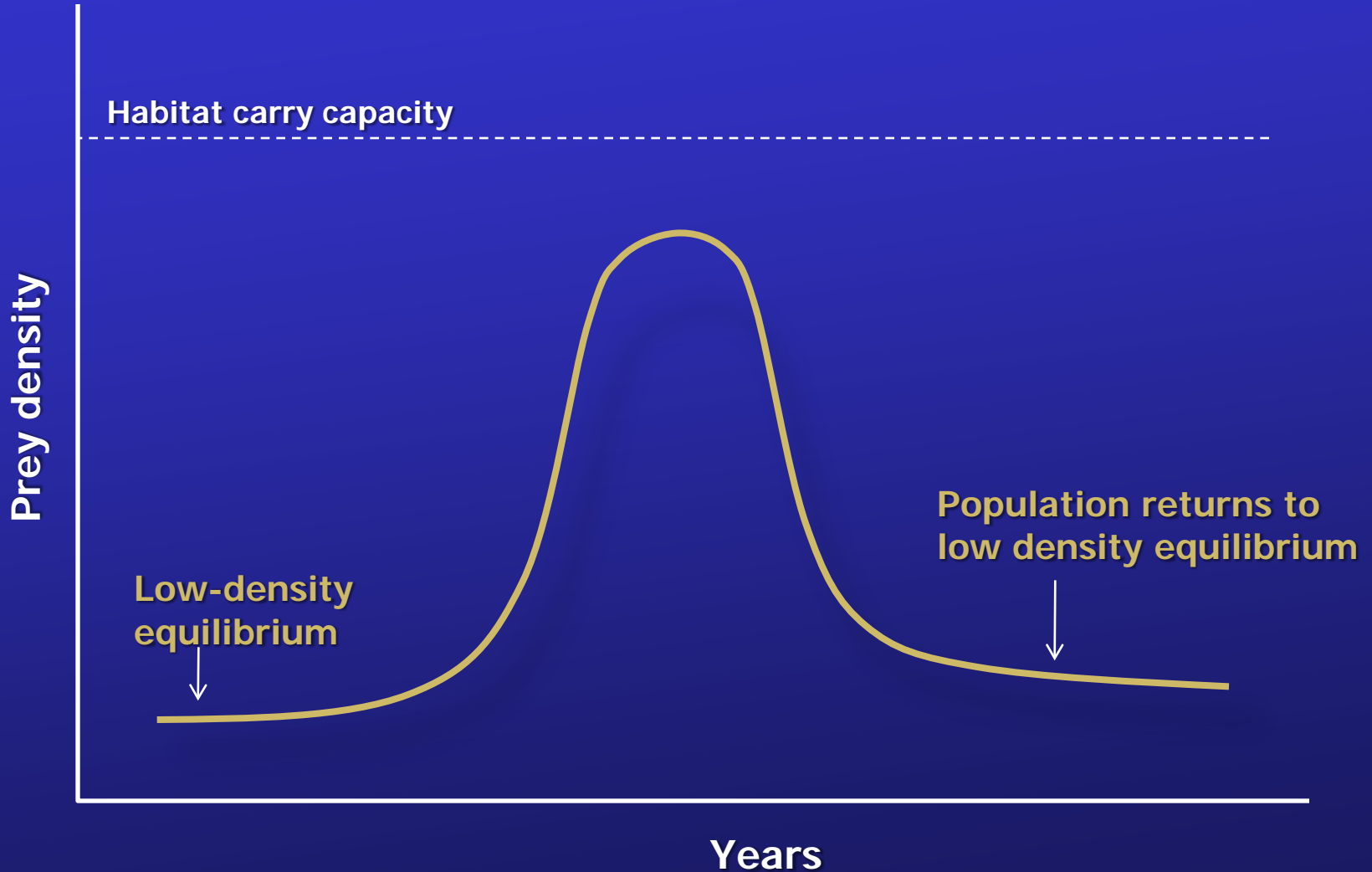
Conceptual Model

Stable limit cycle



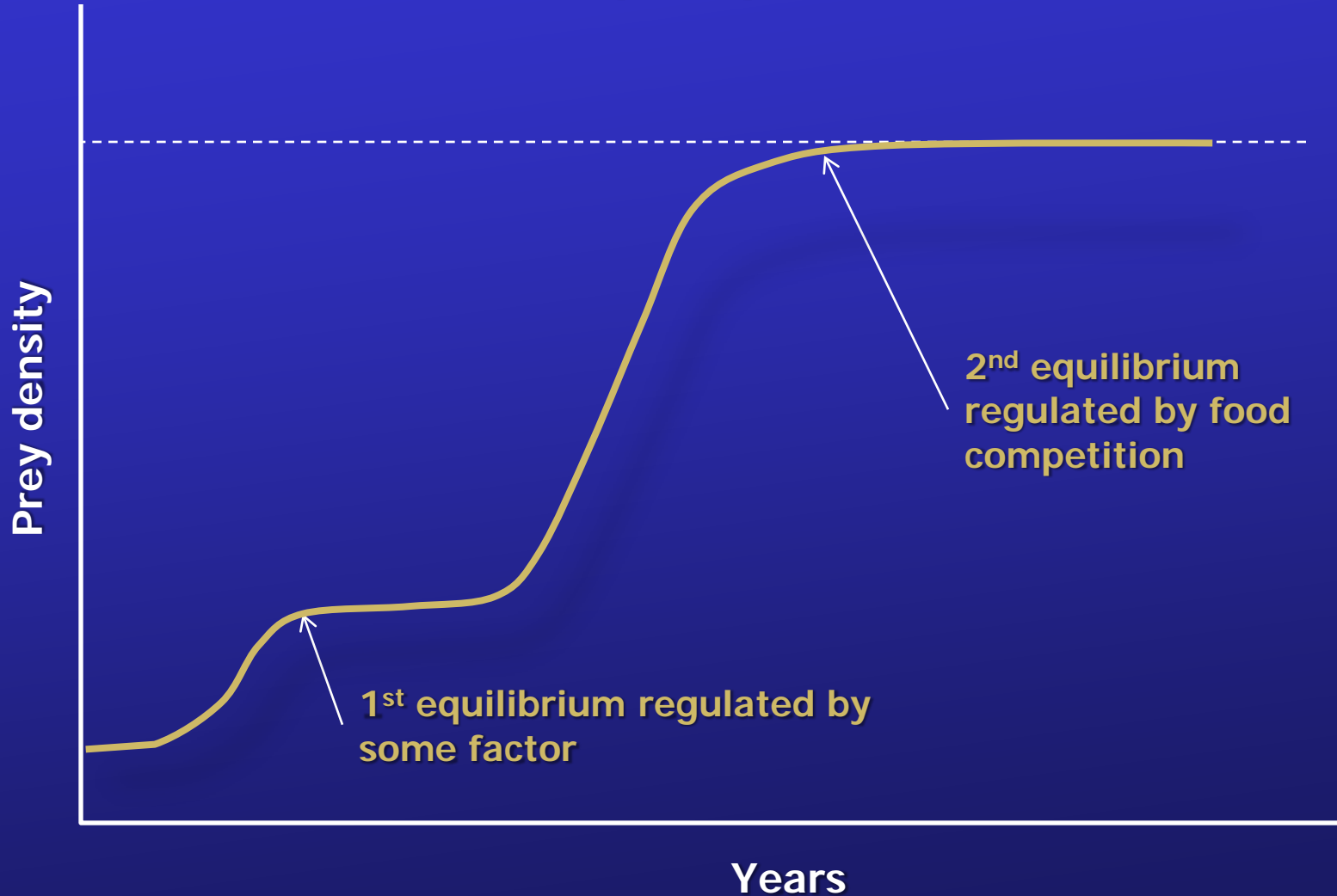
Conceptual Model

Low Density Equilibrium



Conceptual Model

Multiple Equilibrium

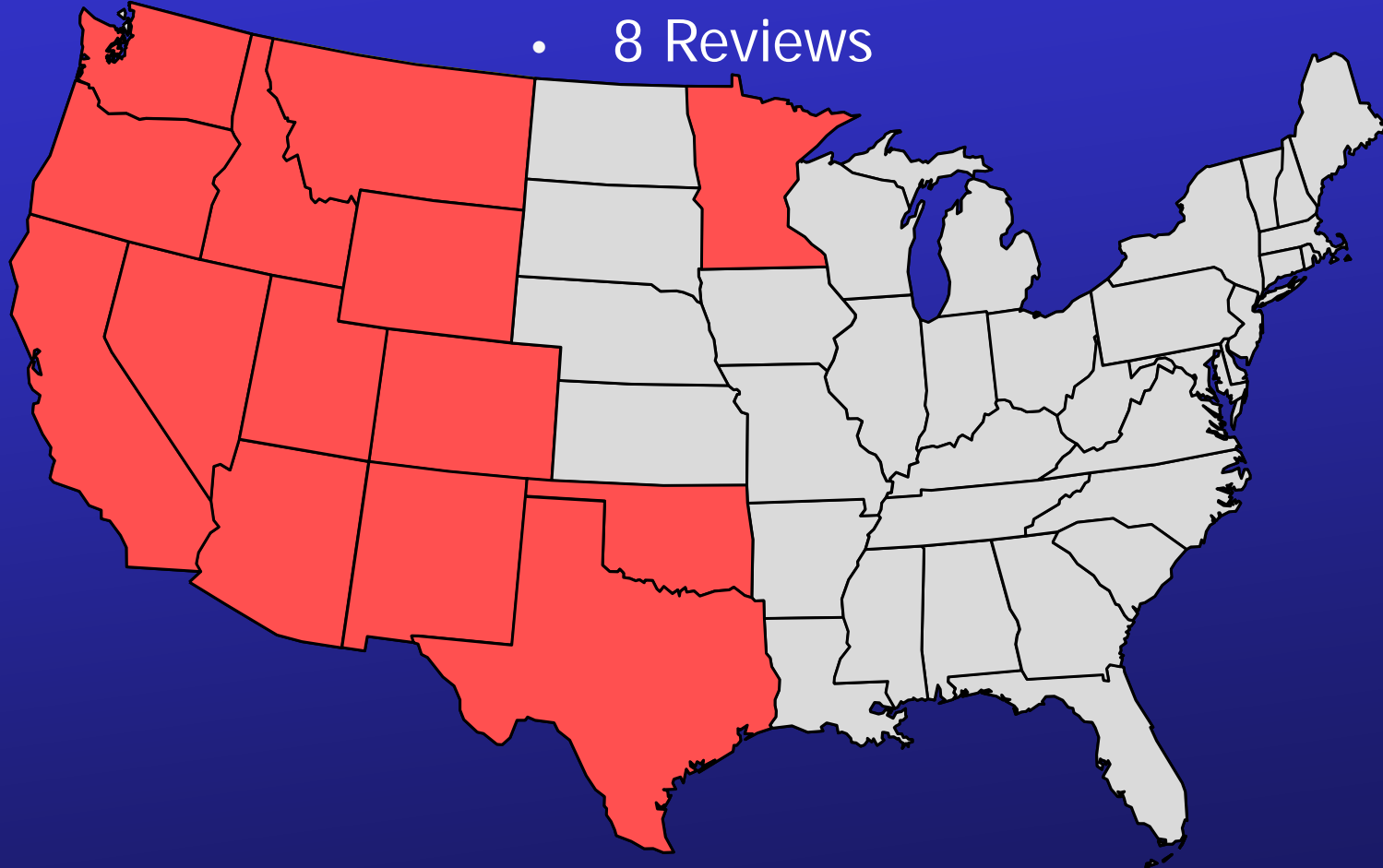


Literature Review

- Common themes
- Primary ungulate predators
- When is predation a likely candidate regulating prey growth rate?

Literature Review

- 35 Studies
- 8 Reviews



 States with predator-prey studies

Initial Findings

- All 8 reviews of predator-prey dynamics acknowledge predation can limit ungulates
- But fairly rare



Common Themes

- No universal finding
 - Habitat conditions (carrying capacity)
 - Weather conditions
 - Multiple predators
 - Other regulatory factors
 - Disease



Primary Predators Found to Influence Growth Rates of Ungulates

- Coyotes were the primary predator in 18 of 21 deer studies (Ballard et al 2001)
- Predation typically on fawns



Primary Predators Found to Influence Growth Rates of Ungulates



- Black bear has been documented as the primary mortality factor in elk, deer, moose, and caribou (Zager and Beecham 2006)
- Typically on newborn calves

Primary Predators Found to Influence Growth Rates of Ungulates

- Deer and elk are major prey items for cougar
- Cougar predation was believed to limit deer in 5 of 14 studies but in 0 of 4 elk studies (Ruth and Murphy 2010)
- Predation on young and adult deer



Other Noteworthy Findings

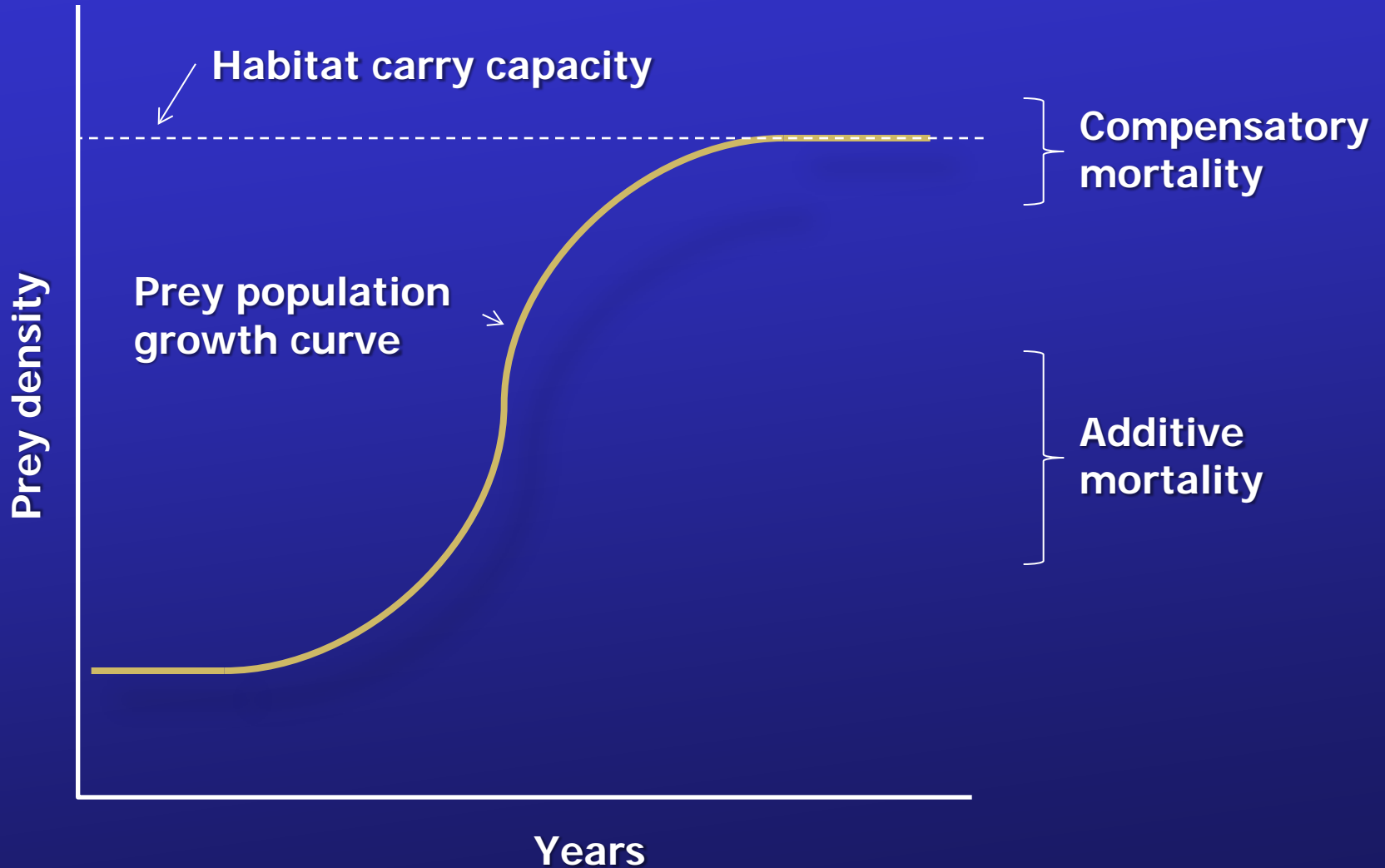
- Events that dramatically lower carrying capacity temporarily
- Events that change vulnerability of young ungulates (e.g., deep snow)



When is Predation a Likely Factor



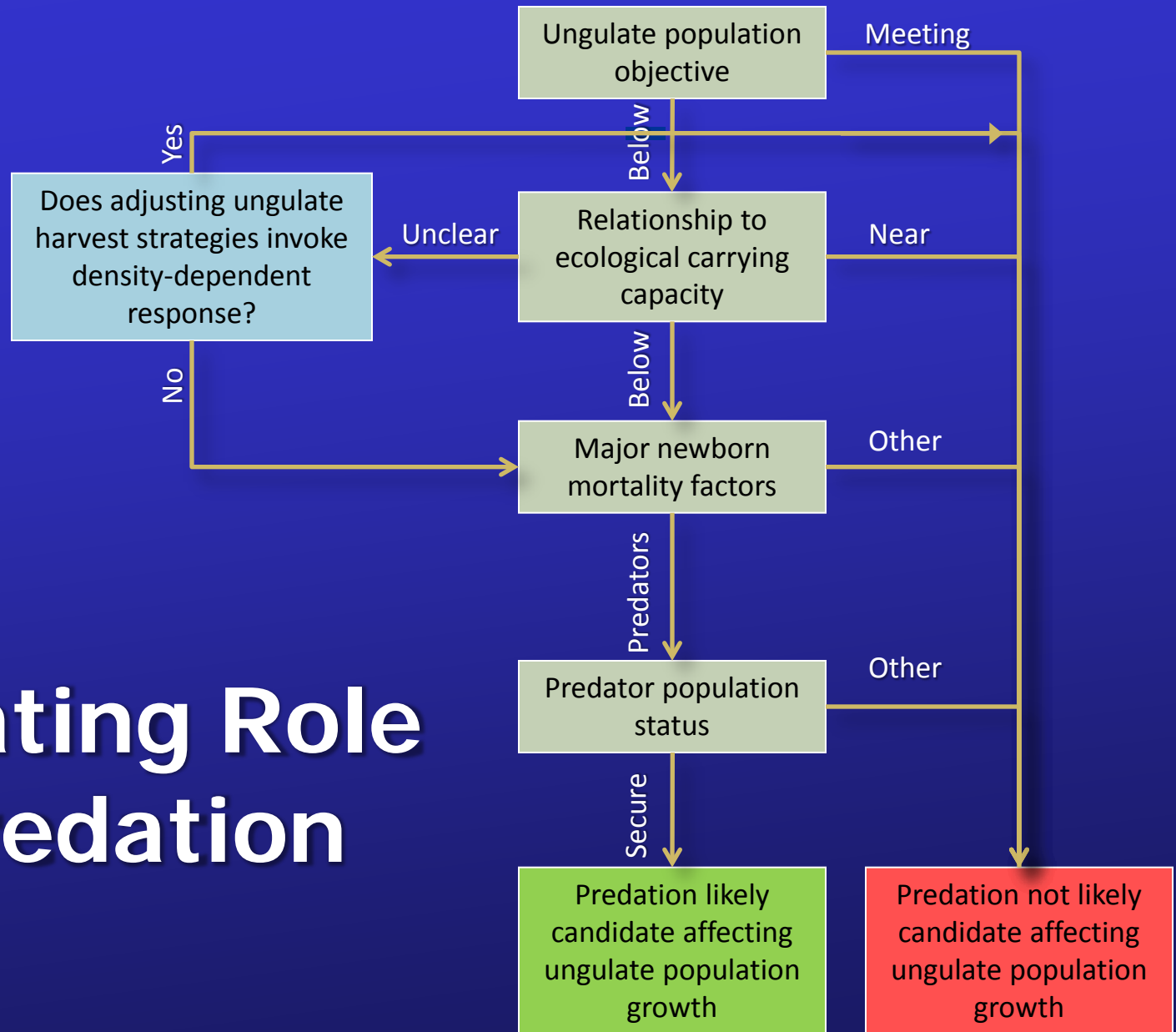
Conceptual Model



Characteristics Predation v. Habitat

| Prey life history characteristics | Population size could be affected by predation | Population size mainly affected by resources |
|---|---|---|
| Physical condition of adult females | Better | Poorer |
| Pregnancy rate of adult females | Higher | Lower |
| Pause in annual production by adult females | Less likely | More likely |
| Yearlings pregnant | Usually | Seldom |
| Litter size | Higher | Lower |
| Age of first reproduction | Younger | Older |
| Weight of newborns | Heavier | Lighter |
| Mortality of young | Additive | Compensatory |
| Diet quality | Higher | Lower |

Evaluating Role of Predation



Informative Studies

\$ Least
↑
\$\$\$\$ Most

1. Compare population trends of ungulates and predators
2. Estimated mortality rate of ungulates due to predation
3. Experimentally reduced predators and measured ungulate survival
4. Experimentally reduced predators in one area and compare it to a control area

Predator Prey Management

Overview

- Current Examples
- Population Growth Characteristics
- Management Guidelines



Northern Pike



Salmon Smolt

Examples of Predator Prey Management

Sage Grouse



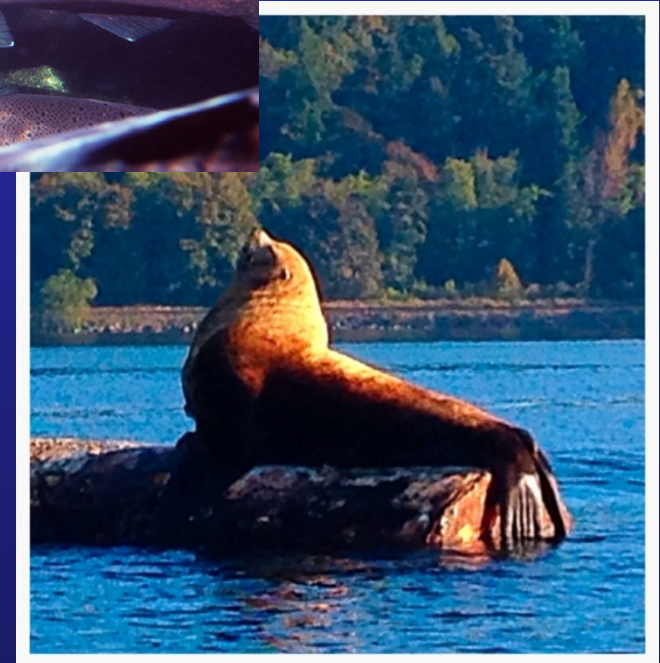
Chinook Salmon



Coyote



Pygmy Rabbit



Sea Lion

Examples of Predator Prey Management

Barred Owl



Raven

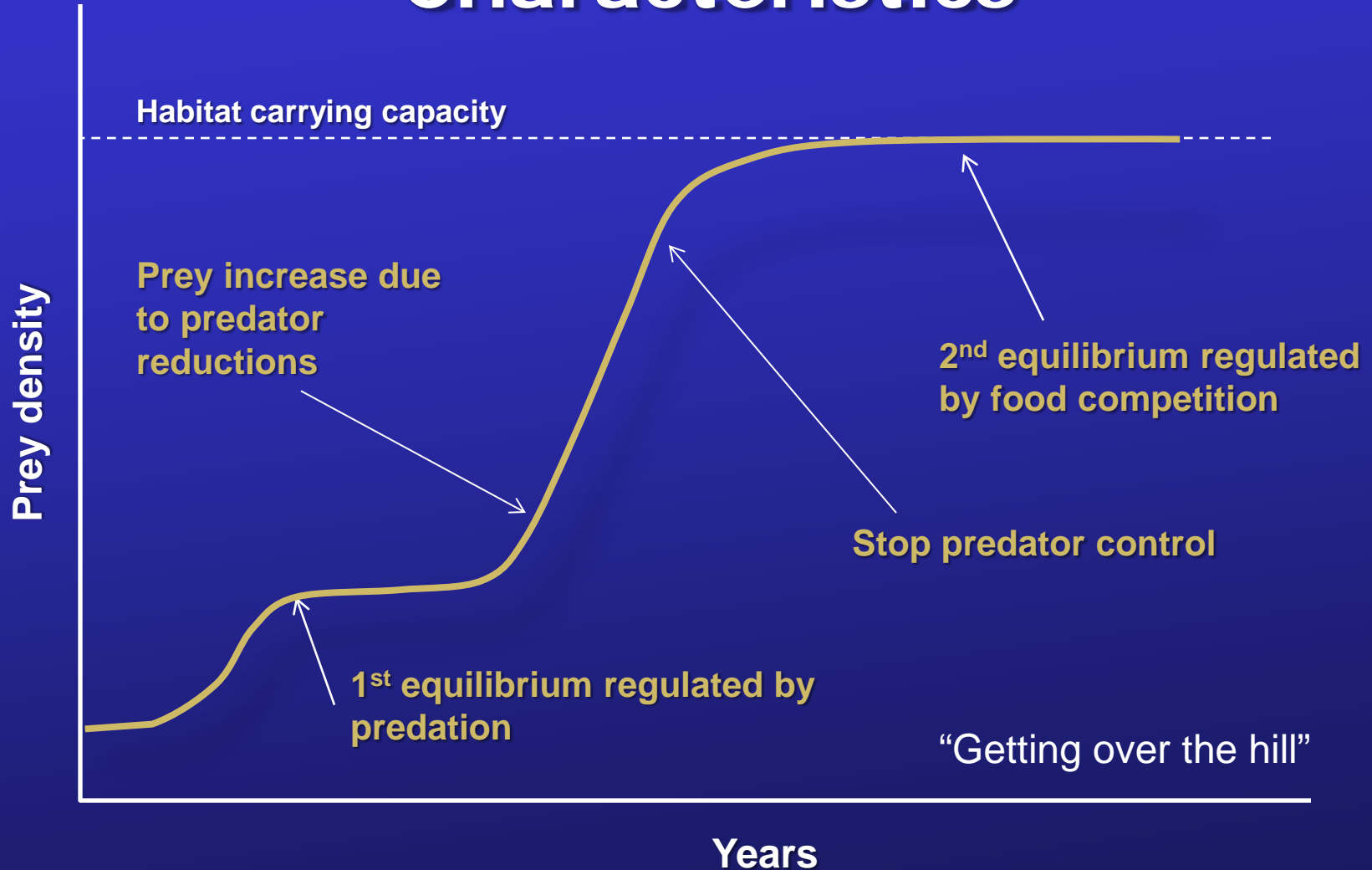


Spotted Owl

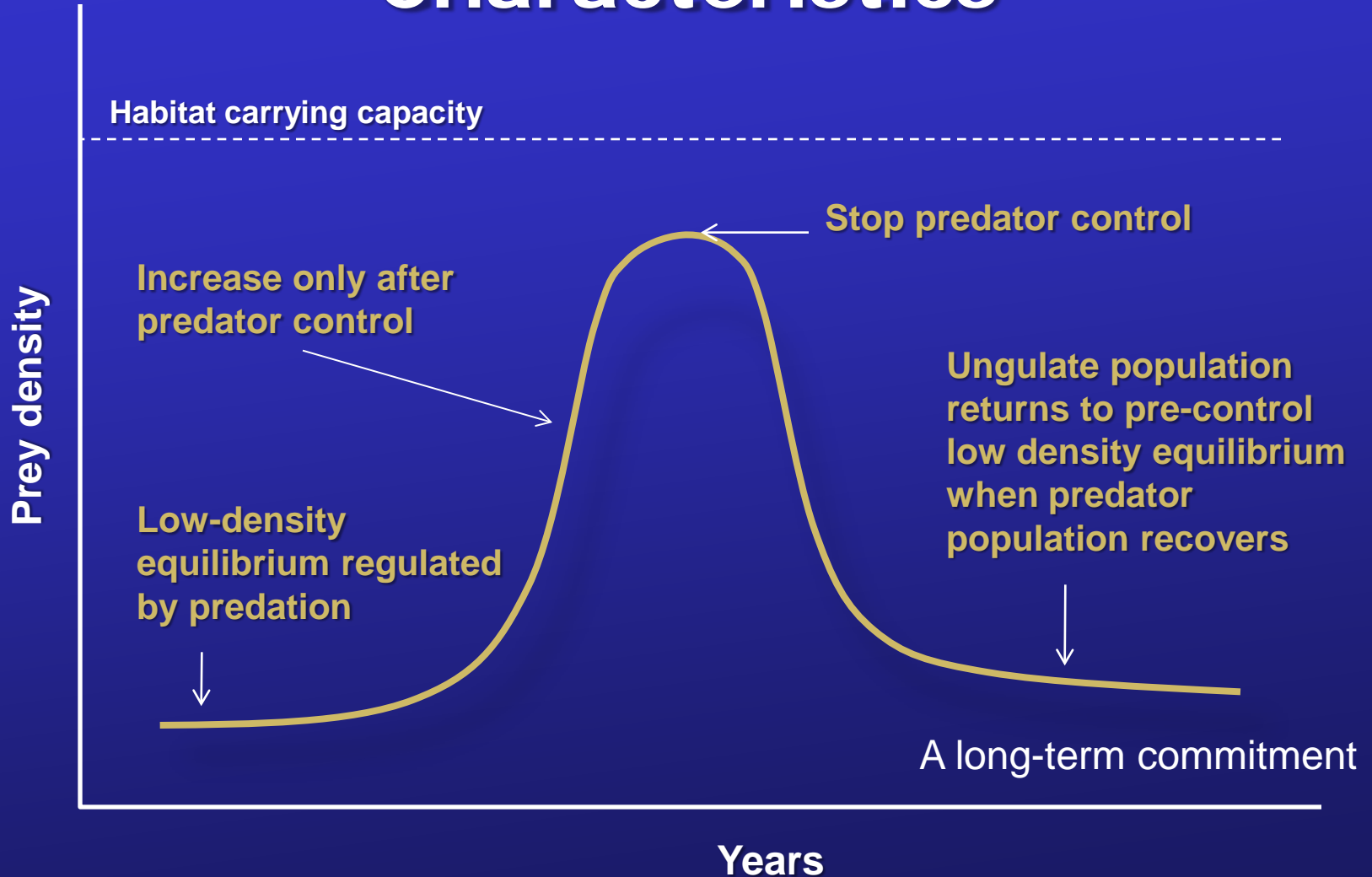


Snowy Plover

Population Growth Characteristics



Population Growth Characteristics



Predator-Prey Management Guidelines



Predator/Prey Management

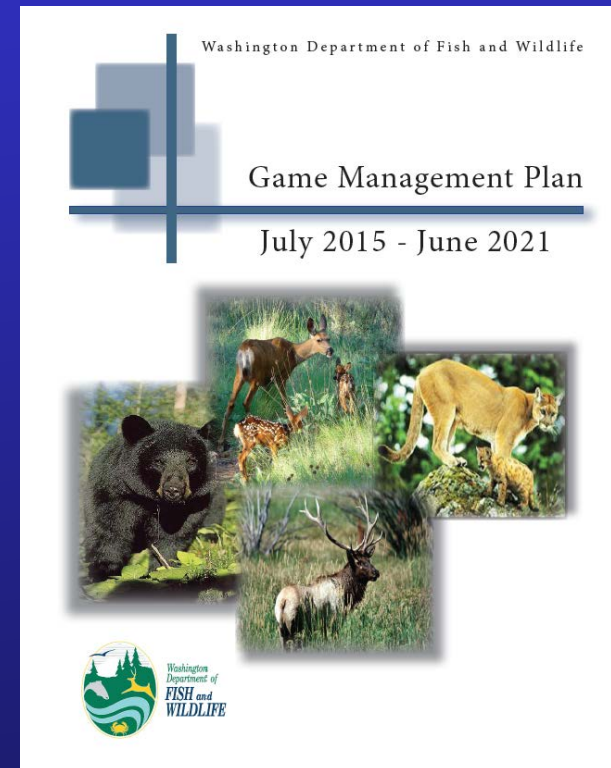
(adapted from 2015-21 GMP and 2011 Wolf Plan)

- Predator and prey populations are managed to ensure the long-term perpetuation of each species.
- Manage predators for a variety of recreational, educational and aesthetic purposes.
- Improve our understanding of predator-prey relationships and the potential impacts of predators on ungulate populations.

Game Management Plan

(Chapter 2)

- Recognizes that predator management is a viable population management tool to achieve prey population objectives.
- Provides direction for when the Department would recommend actions to achieve ungulate population objectives.



GMP Guiding Principles

- Manage for healthy predator and prey populations.
- Management of predators considered when there is evidence that predation is a significant factor
- Conservation, economic, recreational, and societal values will be considered.
- Decisions will be based on scientific principles.

Implementation

- Describe the problem and rationale for a proposed action:
 - Biological status of the predator and prey populations.
 - Describe why predation is suspected to be limiting the prey population.



Implementation

- Describe the problem and rationale for a proposed action (cont.):
 - Evaluate ecological factors other than predation (e.g. habitat, disease, etc.).
 - Population-level or individual-level management?



Implementation

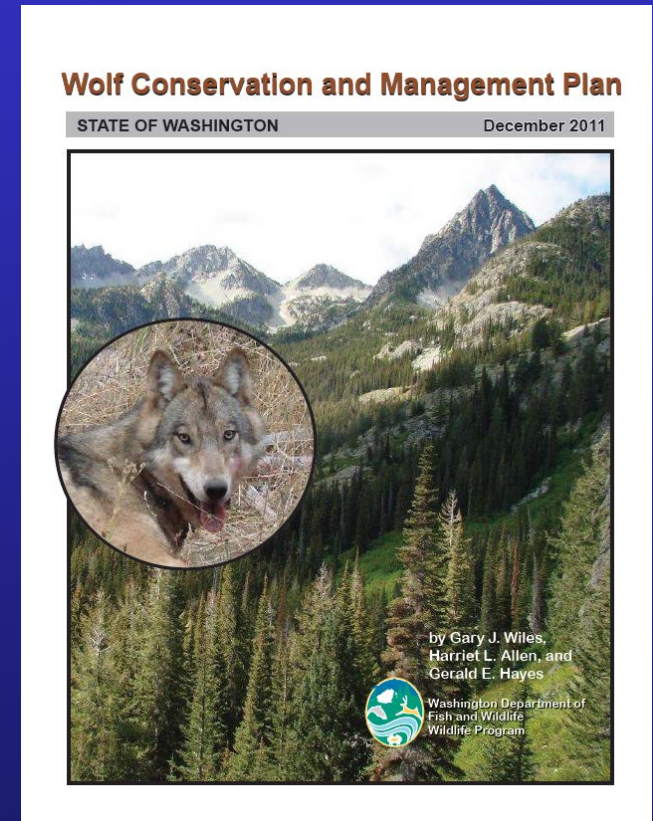
- Develop boundaries and define objectives and methods
- Assess the anticipated effect of proposed management actions.
- Develop a monitoring plan
- Public review



Wolf Management Plan

(Wolf-Ungulate Interactions)

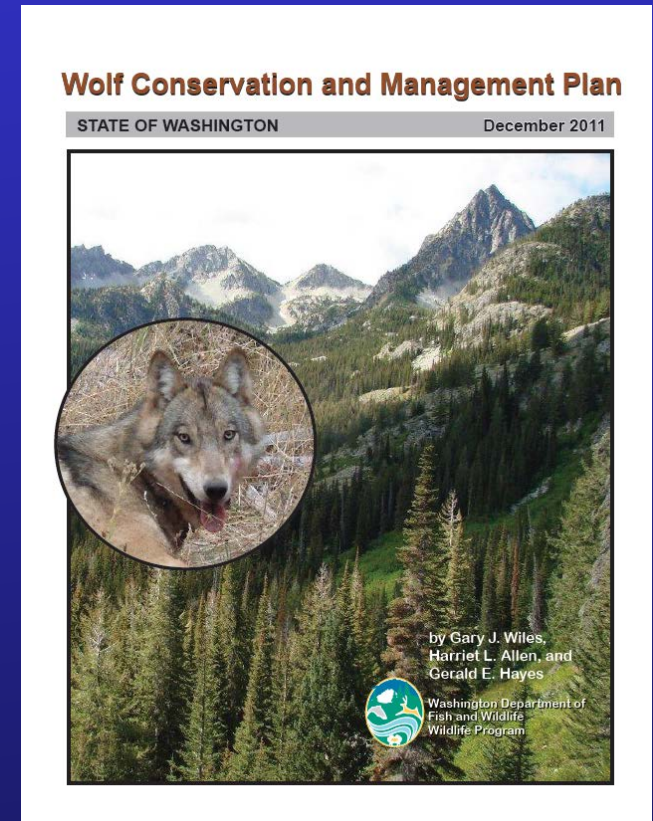
- Wolf predation of ungulates
- Recent impacts of wolves on ungulates in others states
- Status of ungulates in Washington



Wolf Management Plan

(Wolf-Ungulate Interactions)

- Estimates of predicted wolf predation on deer and elk in Washington
- Description of the management tools available for managing wolf-ungulate interactions in Washington
- “At Risk” populations



Next Steps

- Ungulate Population Assessment
- Predator Prey Investigations



Ungulate Assessment 2016

- GMP Objective: “Identify herds or local populations that are below population objectives where predation effects might be a limiting factor
- Deer, elk, bighorn sheep, and moose
- Utilizing existing data
 - Population surveys,
 - Ongoing studies,
 - Harvest statistics



Mule Deer

Ungulate Assessment 2016

- Assessment Review
 - Elk - 10 herds
 - Deer - Management Zones
 - Sheep – 16 herds
 - Moose – general
- Spring 2016
- External review by U.W.



Predator Prey Investigations

Three Main Objectives

1. Identify ungulate population response
wolf colonization
2. Investigate role of habitat change in predator/prey systems
3. Model prey response to predators.

Cooperators

- WDFW
- UW
- WSU
- UM





Questions