



Population Ecology:

Demographics

What is population demography?

- Demography is the study of population dynamics and the factors that contribute to population increase or decline.
- Important factors are:
 - Natality
 - Mortality
 - Immigration
 - Emigration
 - Sex ratio of the breeding population
 - Age Structure
- Importance of life history traits

What is population demography? (continued)

- K-selected species are at high risk with either high juvenile or adult mortality rates
 - age at first reproduction (alpha) is large
 - fecundity is low
 - conflicts with humans are more likely since these are large organisms (often predators as well)
- r-selected species are more resilient to population disasters
 - age at first reproduction is low
 - fecundity is high



Regulation of population size

- **Density dependent mortality factors:**
 - **competition for resources**
 - **intraspecific**
 - **interspecific**
 - **predation**
 - **parasitism or disease**

Regulation of population size (*continued*)

- **Density independent mortality factors:**
 - Weather
 - Natural disasters
 - Habitat destruction



Habitat Specific Demography

■ Sources and Sinks

- Sources - area where local reproductive success is greater than local mortality
- Sinks - area where local reproductive success is lower than mortality rates.
- Metapopulations - subpopulations linked by immigration and emigration.
- As little as 10% of a metapopulation existing as a "source" could be responsible for maintaining 90% of the population found in "sinks". Note: high population density is not an indicator of a "source" area.

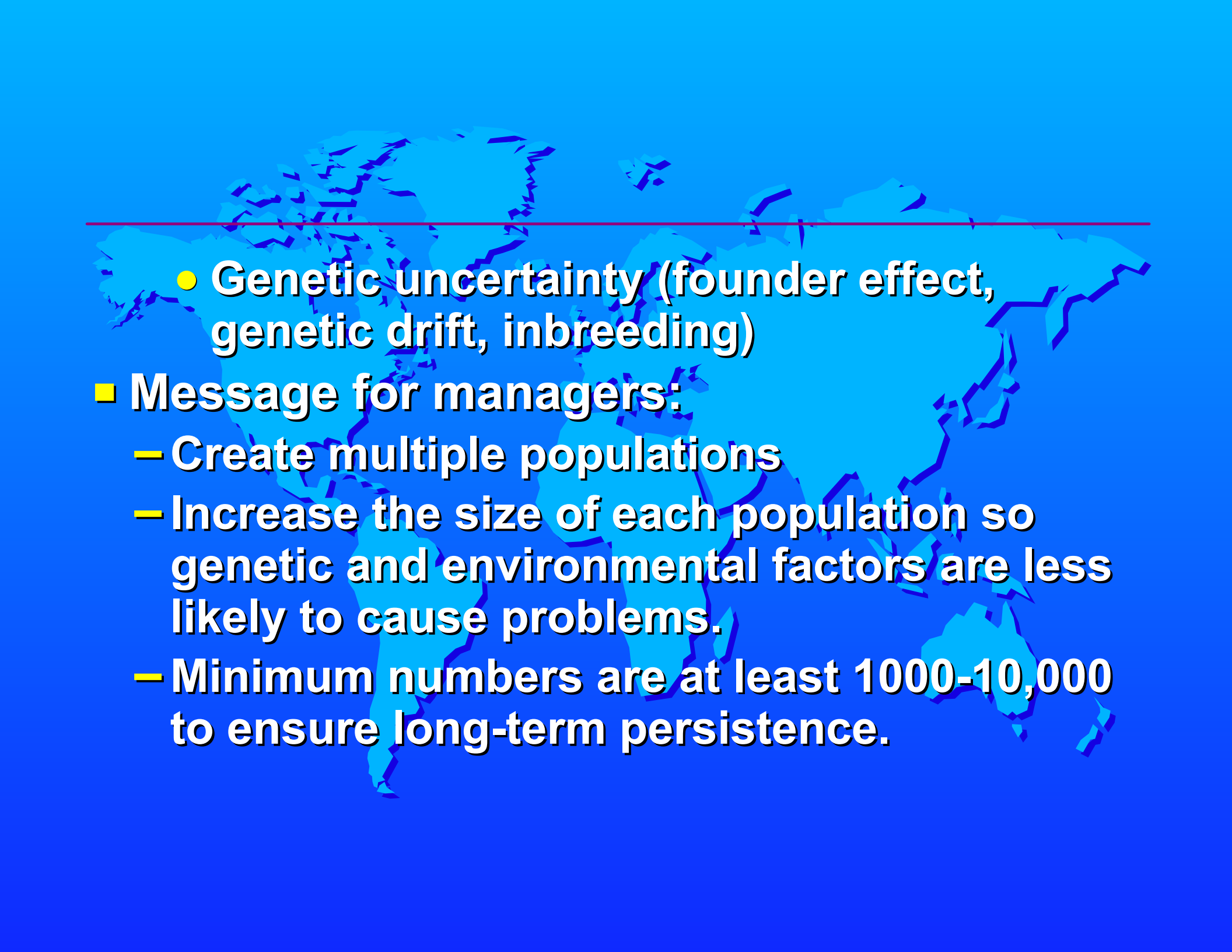


■ Metapopulation Concepts:

- A collection of subpopulations of a species, each occupying a suitable patch of habitat in a landscape of otherwise unsuitable habitat.
- Rescue effect: local extinction is prevented by occasional immigration from adjacent patches.
- SLOSS Debate: Single Large OR Several Small?

Population Viability Analysis

- **PVA - the study of the ways in which habitat loss, environmental uncertainty, demographic stochasticity and genetic factors interact to determine the probability of extinction for a particular species.**
 - **Shaffer lists four categories of factors that influence the likelihood of population extinction:**
 - **Demographic uncertainty**
 - **Environmental uncertainty**
 - **Natural catastrophes**

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- **Genetic uncertainty (founder effect, genetic drift, inbreeding)**
 - **Message for managers:**
 - **Create multiple populations**
 - **Increase the size of each population so genetic and environmental factors are less likely to cause problems.**
 - **Minimum numbers are at least 1000-10,000 to ensure long-term persistence.**

The Landscape Approach

- **Landscape** - a mosaic of habitat patches across which organisms move, settle, reproduce and eventually die.
- **Spatially Explicit Population Models** - incorporate the actual locations of organisms and suitable patches of habitat and consider movement of organisms among such patches (MAP - Mobile Animal Population models).
- **MAP models** are normally associated with GIS systems.