Lesson 1

Population Dynamics

Focus Question

What are characteristics of populations and how are they determined?

New Vocabulary

population density

dispersion

density-independent factor

density-dependent factor

population growth rate

emigration

immigration

carrying capacity

Review Vocabulary

population: the members of a single species that share the same geographic location at the same time

Population Characteristics

Population Density

- The number of organisms per unit area is the **population density**.
- Population density can be calculated by dividing the number of organisms in the population by the area the population occupies.

Population Characteristics

Spatial Distribution

- The pattern of spacing of a population within an area is called **dispersion**.
- One of the primary factors in the pattern of dispersion for all organisms is the availability of resources such as food.

Population Characteristics

Population Ranges

- Some species have a very limited population range, or distribution. Other species have a vast distribution.
- A species might not be able to expand its population range because it cannot survive the abiotic conditions found in the expanded region.

Population-Limiting Factors

- Limiting factors are biotic or abiotic forces that keep populations from increasing indefinitely.
- Limiting factors are either density-independent or density-dependent.

Population-Limiting Factors

Density-Independent Factors

Any factor in the environment that does not depend on the number of members in a population per unit area is a **density-independent factor**.

These factors are usually abiotic. They include:

- Weather events
- Fire
- Human alterations of the landscape
- Air, land, and water pollution

Population-Limiting Factors

Density-Dependent Factors

- Any factor in the environment that depends on the number of members in a population per unit area is a **density-dependent factor**.
- These factors are often biotic. They include:
  - Predation
  - Disease
  - Competition
  - Parasites

Population-Limiting Factors

Population Growth Rate

The **population growth rate** (PGR) explains how fast a given population grows.

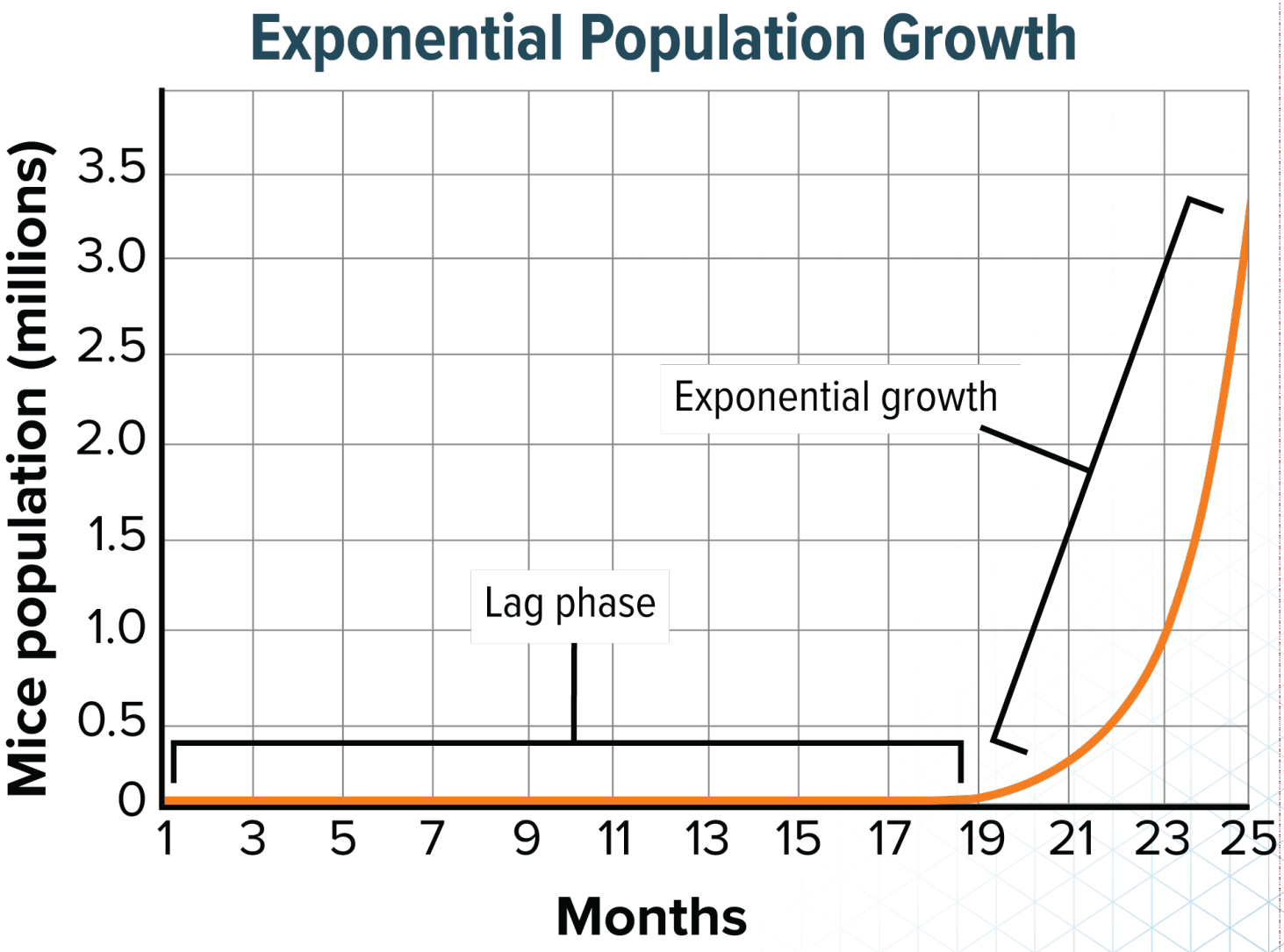
- Natality is the birthrate of a population in a given year.
- **Emigration** is the number of individuals moving away from a population.
- **Immigration** is the number of individuals moving into a population.

Population-Limiting Factors

Population Growth Rate

- Exponential growth occurs when the growth rate is proportional to the population size.
- All populations grow exponentially until they encounter a limiting factor.

Population-Limiting Factors



Population-Limiting Factors

Population Growth Rate

- Logistic growth occurs when a population's growth slows or stops following exponential growth.
- A population stops increasing when the number of births < number of deaths, or when emigration > immigration.

Population-Limiting Factors

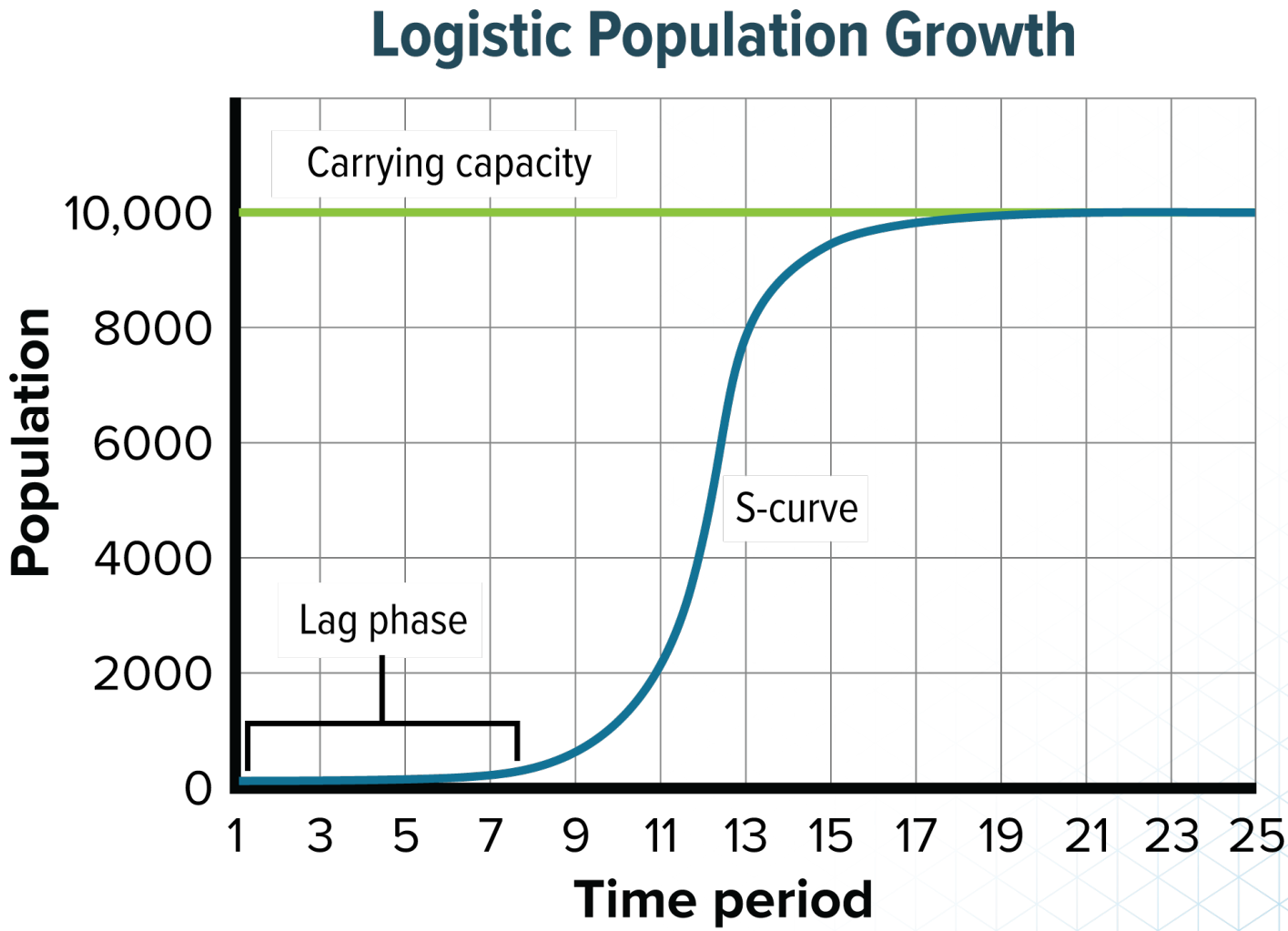
Population Growth Rate

Carrying capacity is the maximum number of individuals in a species that an environment can support for the long term.

Carrying capacity is limited by:

- factors such as the availability of living and nonliving resources
- challenges such as predation, competition, and disease

Population-Limiting Factors



Population-Limiting Factors

Reproductive Patterns

- Species vary in the age at which reproduction begins, the number of births per reproduction cycle, and life span.
- Plants and animals are placed into groups based on their reproductive factors.
  - *r*-strategy: produce as many offspring as possible in a short time period to take advantage of some environmental factor
  - *k*-strategy: produce a few offspring that are more likely to survive due to parental care