**What factors limit population growth?**

**Limiting Factors**

* The primary productivity of an ecosystem can be reduced when there is an insufficient supply of a particular nutrient.
* Ecologists call such substances limiting nutrients.
* A limiting nutrient is an example of a more general ecological concept: a limiting factor.
* In the context of populations, a **limiting factor** is a factor that causes population growth to decrease.

**Density-Dependent Factors**

* A limiting factor that depends on population size is called a **density-dependent limiting factor**.
* Density-dependent limiting factors include:
  + competition
  + predation
  + parasitism
  + disease
* Density-dependent factors operate only when the population density reaches a certain level. These factors operate most strongly when a population is large and dense.
* They do not affect small, scattered populations as greatly.
* **Competition**
  + When populations become crowded, organisms compete for food, water space, sunlight and other essentials.
  + Competition among members of the same species is a density-dependent limiting factor.
  + Competition can also occur between members of different species.
  + This type of competition can lead to evolutionary change.
  + Over time, the species may evolve to occupy different niches.
* **Predation**
  + Populations in nature are often controlled by predation.
  + The regulation of a population by predation takes place within a **predator-prey relationship**, one of the best-known mechanisms of population control.

* **Parasitism and Disease**
  + Parasites can limit the growth of a population.
  + A parasite lives in or on another organism (the host) and consequently harms it.

**Density-Independent Factors**

* **Density-independent limiting factors** affect all populations in similar ways, regardless of the population size.

* **Examples of density-independent limiting factors include:**
  + unusual weather
  + natural disasters
  + seasonal cycles
  + certain human activities—such as damming rivers and clear-cutting forests

**5-2**

**5-2**

* ***A limiting factor that affects all populations in similar ways regardless of their size might be***
  + *drought.*
  + *disease.*
  + *predation.*
  + *crowding.*

***5-2***

* ***Which of the following would be a limiting factor affecting the panda population of China?***
  + *programs that educate people about endangered species*
  + *capture of some pandas for placement in zoos*
  + *laws protecting habitat destruction*
  + *a disease that kills bamboo plants*

***5-2***

* ***Density-dependent factors operate most strongly when a population is***
  + *large and dense.*
  + *large but sparse.*
  + *small and sparse.*
  + *small, but growing.*

***5-2***

* ***Within a limited area, if the population of a predator increases, the population of its prey is likely to***
  + *increase.*
  + *decrease.*
  + *remain about the same.*
  + *become extinct.*

***5-2***

* ***Which of the following is a density-independent factor affecting populations?***
  + *predation*
  + *disease*
  + *a destructive hurricane*
  + *parasites*