CHAPTER 9

POPULATION ECOLOGY

Summary

1. Populations change in size, density, makeup, and distribution in response to environmental stress, but there is no direct relationship between the stressors and the population characteristics. Populations distributed throughout a habitat vary from species to species. The age of a population may influence its size directly. The carrying capacity is determined by biotic potential and environmental resistance.

2. A population increases with births and immigration, and decreases with deaths and emigration.

3. The biotic potential is a population's capacity for growth, and environmental resistance includes all of the factors that limit population growth. Both the biotic potential and environmental resistance determine the carrying capacity (the maximum number of individuals that can live in an area indefinitely).

4. A J-shaped growth curve is typical of a population that grows exponentially, and one that does not have resource limitations. An S-shaped curve (logistic growth) represents a population that grows exponentially, and then eventually levels off due to environmental resistance.

5. Populations sometimes exceed (overshoot) their carrying capacity because of a reproductive time lag. The population then crashes (suffers a dieback) unless substitute resources or a new area can be used.

6. Floods and hurricanes are examples of density-independent population controls, and competition for resources and infectious disease are examples of density-dependent population controls.

7. The four general types of population fluctuations are stable, irruptive, cyclic, and irregular.

8. Some predator and prey populations are cyclical, and it has been hypothesized that interacting species regulate one another. Other factors are most likely involved in these cyclic changes.

9. K-selected species reproduce late in life, have a small number of offspring, and have fairly long lifespans; r-adapted species reproduce early, have many offspring, and do not look after their young.

10. Populations exhibit three types of survivorship curves: late loss (humans), constant loss (songbirds), and early loss (annual plants).

11. When a population is fairly large, genetic diversity is fairly constant, and the size of the population will be maintained. When a population is small or isolated, limited genetic diversity will threaten it. If a few individuals survive a catastrophe, they may be unable to rebuild the population. Inbreeding and genetic drift also influence a population's viability.

12. Human activities and the use of technology now threaten the survival of many species and may affect our own quality of life. We have reduced biodiversity, simplified natural ecosystems, wasted or destroyed the Earth's net primary productivity, strengthened some pest species and disease-causing bacteria, eliminated most predators, introduced non-native species into ecosystems, overharvested renewable resources, interfered with chemical cycling and energy flows in ecosystems, and become dependent on nonrenewable resources.

