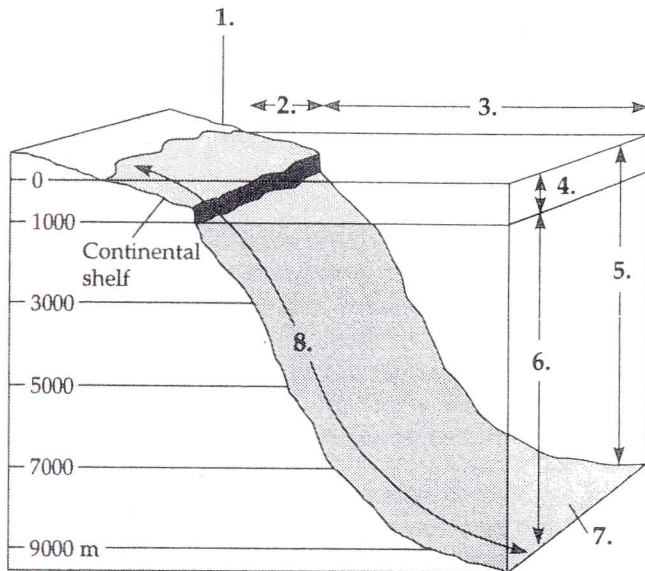


# AP Biology – Worksheet #1

Design your own answer sheet/Transfer your answers to your own paper.

## ■ INTERACTIVE QUESTION 50.4

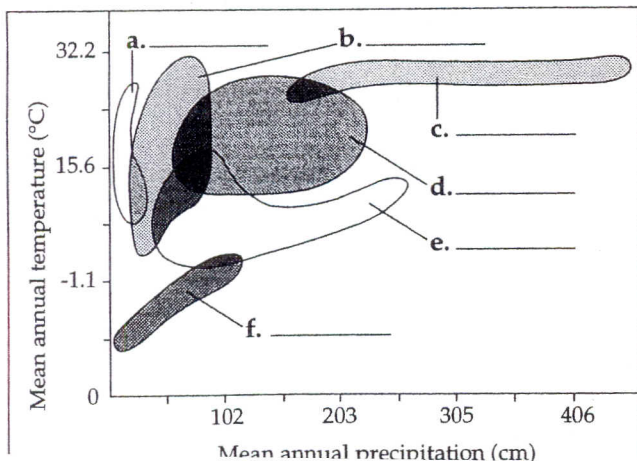
Different marine environments can be classified on the basis of light penetration, distance from shore, and open water or bottom. Match the following zones to their corresponding numbers on the diagram below:



- |                     |                  |
|---------------------|------------------|
| _____ a. aphotic    | _____ e. neritic |
| _____ b. abyssal    | _____ f. oceanic |
| _____ c. benthic    | _____ g. pelagic |
| _____ d. intertidal | _____ h. photic  |

## ■ INTERACTIVE QUESTION 50.5

Temperature and precipitation are two of the key factors that influence the vegetation found in a biome. On the climograph shown below, label the North American biomes (arctic and alpine tundra, coniferous forest, desert, grassland, temperate forest, and tropical forest) represented by each area of temperature and precipitation.



## ■ INTERACTIVE QUESTION 50.6

- What are the advantages and disadvantages of being a regulator?
- How does the principle of allocation relate to a conformer?
- What is acclimation?

## STRUCTURE YOUR KNOWLEDGE

- Define *ecology*.
  - What methods are used to answer ecological questions?
  - What theory guides the interpretation of data?
- What are biomes?
  - What accounts for the similarities in life forms found in the same type of biome in geographically separated areas?

## TEST YOUR KNOWLEDGE

**MULTIPLE CHOICE:** Choose the one best answer.

- Which level of ecology considers energy flow and chemical cycling?
  - community
  - ecosystem
  - organismal
  - population
  - abiotic
- Which of the following would be *least* true of a regulator?
  - It can live in a variable climate because of its homeostatic mechanisms.
  - It may have a larger geographic range than a conformer.
  - Much of its energy budget can be allocated to reproduction.
  - It can increase its tolerance limits through acclimation.
  - It has behavioral mechanisms for responding to changing conditions.

3. Ecologists use mathematical models and computer simulations because
  - a. ecological experiments are too broad in scope to be performed.
  - b. most of them are mathematicians.
  - c. ecology is becoming a more descriptive science.
  - d. these approaches allow them to study the interactions of multiple variables and simulate large-scale experiments.
  - e. variables can be manipulated with computers but not in field experiments.
4. In which of the following biomes is light most likely to be a limiting factor?
  - a. desert
  - b. estuary
  - c. coral reef
  - d. grassland
  - e. ocean pelagic zone
5. Acclimation
  - a. is a morphological response to a change in environmental conditions.
  - b. can extend the tolerance limit of an organism.
  - c. involves behavioral responses to a change in environmental conditions.
  - d. is an irreversible physiological response to a change in environmental conditions.
  - e. is an evolutionary change in the range of a species.
6. Which of the following is *incorrectly* paired with its description?
  - a. neritic zone—shallow area over continental shelf
  - b. abyssal zone—benthic region where light does not penetrate
  - c. littoral zone—area of open water
  - d. intertidal zone—shallow area at edge of water
  - e. profundal zone—deep, aphotic region of lakes
7. A conformer is most likely to be successful in a(n)
  - a. intertidal zone.
  - b. coral reef.
  - c. taiga.
  - d. chaparral.
  - e. estuary.
8. Two communities have the same mean temperature and rainfall but very different compositions and characteristics. The best explanation for this phenomenon is that the two
  - a. are found at different altitudes.
  - b. are composed of species that have very low dispersal rates.
  - c. are found on different continents.
  - d. receive different amounts of sunlight.
  - e. have a different range of temperatures and pattern of rainfall throughout the year.
9. Phytoplankton are the basis of the food chain in
  - a. streams.
  - b. wetlands.
  - c. the oceanic photic zone.
  - d. rocky intertidal zones.
  - e. deep-sea thermal vents.
10. The ample rainfall of the tropics and the arid areas around 30° north and south latitudes are caused by
  - a. ocean currents that flow clockwise in the northern hemisphere and counterclockwise in the southern hemisphere.
  - b. the global circulation of air initiated by intense solar radiation near the equator producing wet and warm air.
  - c. the tilting of the earth on its axis and the resulting seasonal changes in climate.
  - d. the heavier rain on the windward side of mountain ranges and the “rainshadow” on the leeward side.
  - e. the location of tropical rain forests and deserts.
11. The permafrost of the arctic tundra
  - a. prevents plants from getting established and growing.
  - b. protects small animals during the long winters.
  - c. prevents plant roots from penetrating very far into the soil.
  - d. helps to keep the soil from getting wet since water cannot soak in.
  - e. both c and d.
12. Many plant species have adaptations for dealing with the periodic fires typical of a
  - a. savanna.
  - b. chaparral.
  - c. temperate grassland.
  - d. temperate deciduous forest.
  - e. a, b, or c.
13. Track athletes may train at high altitudes in order to
  - a. take advantage of the better weather.
  - b. produce more red blood cells through acclimation.
  - c. get used to running hills.
  - d. extend their tolerance limits for altitude.
  - e. adapt physiologically and morphologically to cold and wind.
14. Upwellings in the ocean
  - a. are locations of reef communities.
  - b. occur over deep-sea hydrothermal vents.
  - c. are responsible for ocean currents.
  - d. bring nutrient-rich water to the surface.
  - e. are most common in tropical waters, where they bring oxygen-rich water to the surface.



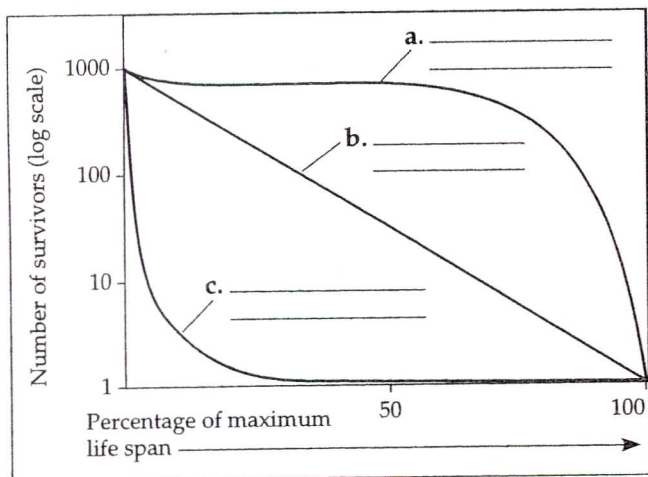
15. Why do the tropics and the windward side of mountains receive more rainfall than areas around 30° latitude or the leeward side of mountains?
- Rising air expands, cools, and drops its moisture.
  - Descending air condenses and drops its moisture.
  - The tropics and the windward side of mountains are closer to the ocean.
  - There is more solar radiation in the tropics and on the windward side of mountains.
  - The rotation of the earth determines global wind patterns.
16. According to the principle of allocation, which type of organism would have the greatest amount of energy to devote to reproduction?
- an organism with behavioral or physiological responses to maintain homeostasis
  - an endotherm
  - a regulator
  - a deregulator
  - a conformer

**MATCHING:** Match the biotic description with its biome.

Biome	Biotic Description
_____ 1. chaparral	A. broad-leaved deciduous trees
_____ 2. desert	B. lush growth, vertical layers
_____ 3. savanna	C. evergreen shrubs, fire-adapted vegetation
_____ 4. taiga	D. tropical grasses and forbs
_____ 5. temperate forest	E. coniferous forests
_____ 6. temperate grassland	F. low shrubby or matlike vegetation
_____ 7. tropical rain forest	G. grasses in relatively cool regions
_____ 8. tundra	H. widely scattered shrubs, cacti, succulents

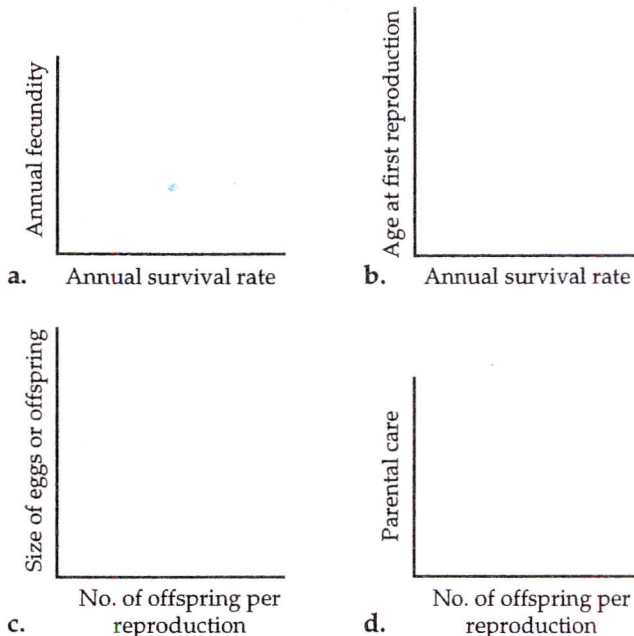
■ INTERACTIVE QUESTION 52.2

Identify the types of survivorship curves shown below and give examples of groups that exhibit each curve.



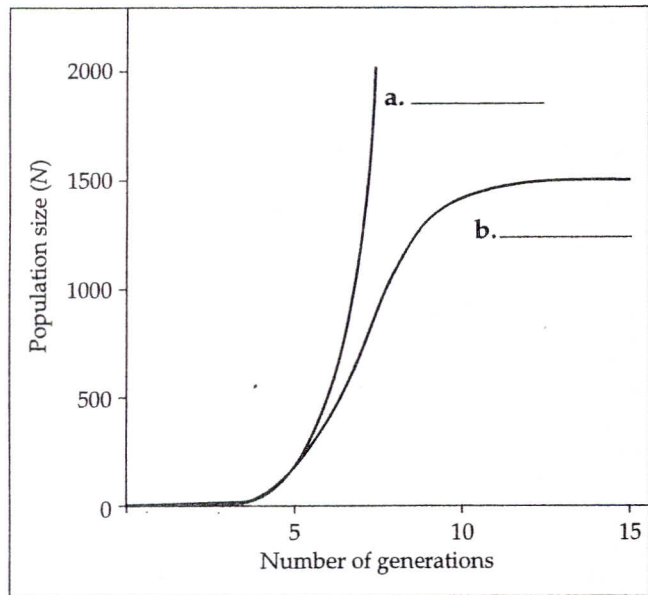
■ INTERACTIVE QUESTION 52.3

Fecundity, mortality, age at first reproduction, number of offspring per reproduction, and parental investment are usually interrelated. On the following graphs, sketch the relationship you would predict between the two variables.



## ■ INTERACTIVE QUESTION 52.4

Label the exponential and logistic growth curves, and show the equation associated with each curve. What is  $K$  for the population shown with curve **b**?



## TEST YOUR KNOWLEDGE

**MULTIPLE CHOICE:** Choose the one best answer.

- In a range with a heterogeneous distribution of suitable habitats, the dispersion pattern of a population probably would be
  - clumped.
  - uniform.
  - random.
  - unpredictable.
  - dense.
- The age structure of a population influences population growth because
  - younger females have more offspring than do older females.
  - populations with shorter generation times grow more rapidly.
  - different age groups have different reproductive capabilities.
  - life tables show that mortality rates change with age.
  - the more individuals that are immature, the slower the population will grow.
- A Type I survivorship curve is level at first, with a rapid increase in mortality in old age. This type of curve is
  - typical of many invertebrates that produce large numbers of offspring.
  - typical of humans and other large mammals.
  - found most often in  $r$ -selected populations.
  - almost never found in nature.
  - typical of all species of birds.

## ■ INTERACTIVE QUESTION 52.5

- List some density-dependent factors that may limit population growth.
- List some density-independent factors that may limit growth.

4. The middle of the S growth curve in the logistic growth model
  - a. shows that at middle densities, individuals of a population do not affect each other.
  - b. is best described by the term  $r_{max}N$ .
  - c. shows that reproduction will occur only until the population size reaches  $K$  and  $dN/dt$  becomes 0.
  - d. is the period when competition for resources is highest.
  - e. is the period when the population is increasing the fastest.
5. A Type III survivorship curve would be more likely to be found in
  - a. a semelparous species that produces many offspring.
  - b. a  $K$ -selected population.
  - c. a species that undergoes periodic molting.
  - d. a species that is territorial.
  - e. a population that is regulated by density-dependent factors.
6. A few members of a population have reached a favorable habitat with few predators and unlimited resources, but their population growth rate is slower than that of the parent population. What is a possible explanation for this situation?
  - a. The genetic makeup of these founders may be less favorable than that of the parent population.
  - b. The parent population may still be in an exponential part of its growth curve and not yet limited by density-dependent factors.
  - c. The Allee effect may be operating; there are not enough population members present for successful reproduction.
  - d. a, b, and c may apply.
  - e. This scenario would not happen.
7. The term  $(K-N)/K$ 
  - a. is the carrying capacity for a population.
  - b. is greatest when  $K$  is very large.
  - c. is zero when population size equals carrying capacity.
  - d. increases in value as  $N$  approaches  $K$ .
  - e. accounts for the overshoot of carrying capacity.
8. Density-independent factors
  - a. tend to maintain a population around the carrying capacity.
  - b. are involved in the population cycles seen in some mammals.
  - c. are important in the regulation of  $K$ -selected populations.
  - d. include climatic events and habitat disruptions.
  - e. affect a higher proportion of a small population.
9. Which of the following is *not* a characteristic of a  $K$ -selected population?
  - a. usually one reproductive episode per lifetime with little parental care
  - b. extensive homeostatic capability to deal with environmental fluctuations
  - c. long maturation time
  - d. usually low mortality
  - e. large offspring or eggs
10. Which of the following is *not* true? A population with a large  $r_{max}$  value
  - a. probably has a short generation time.
  - b. probably produces a large number of offspring per reproductive episode.
  - c. is most likely found in variable environments.
  - d. is most likely to be regulated by density-independent factors.
  - e. is most likely to have a large body size.
11. The human population is growing at such an alarmingly fast rate because
  - a. technology has increased our carrying capacity and, thus, density-dependent factors have not slowed reproduction.
  - b. the death rate has greatly decreased since the Industrial Revolution.
  - c. the age structure of many countries is highly skewed toward younger ages.
  - d. infant mortality has decreased.
  - e. all of the above are true.
12. As a population approaches its carrying capacity in a particular environment, which of the following would be expected to occur?
  - a.  $N$  moves toward and becomes 0.
  - b.  $r$  becomes negative.
  - c. Birthrate decreases and death rate increases.
  - d. Births cease and zero population growth is achieved.
  - e. Exponential growth begins to slow.
13. Which of the following would *not* be a density-dependent factor limiting a population's growth?
  - a. switching behavior of a predator
  - b. a limited number of available nesting sites
  - c. a stress syndrome that alters hormone levels
  - d. a very early fall frost
  - e. intraspecific competition
14. The carrying capacity for a population is estimated at 500; the population size is currently 400; and  $r_{max}$  is 0.01. What is  $dN/dt$ ?
  - a. 0.01
  - b. 0.8
  - c. 8
  - d. 40
  - e. 50



15. In order to maintain the largest sustainable fish harvest, fishing efforts should
- take only postreproductive fish.
  - maintain the population close to its carrying capacity.
  - reduce the population to a very low number to take advantage of exponential growth.
  - maintain the population density close to  $\frac{1}{2} K$ .
  - be prohibited.

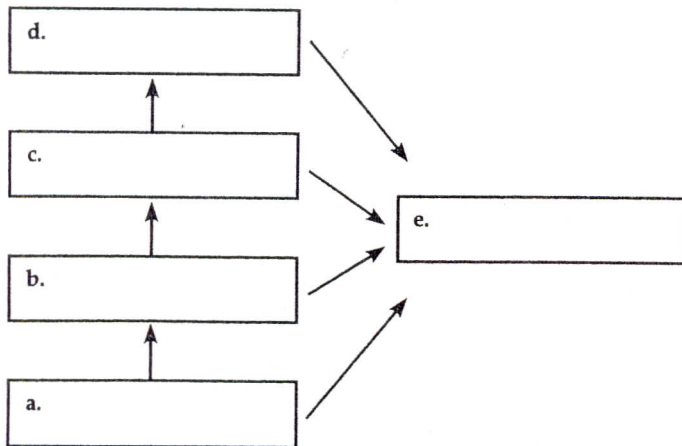
**Questions 16–22.** Use the following choices to indicate how these life history characteristics would be affected by the described changes.

- increase
  - decrease
  - stay the same
  - no relationship or unable to predict
16. How would  $r_{max}$  be expected to vary with an increase in generation time?

17. How would generation time be expected to vary with an increase in body size?
18. For a population regulated by density-dependent factors, how might clutch or seed crop size change with increased population density?
19. How would the number of offspring per reproductive episode be expected to vary with a decrease in size of eggs or offspring?
20. For a population in a particular environment, how would  $K$  be expected to change with an increase in  $N$ ?
21. In a population showing exponential growth, how would  $dN/dt$  be expected to change with an increase in  $N$ ?
22. How would generation time be expected to vary with an increase in  $K$ ?

### INTERACTIVE QUESTION 54.1

Name and give example organisms for the trophic levels of this food chain. How does a food chain differ from a food web?

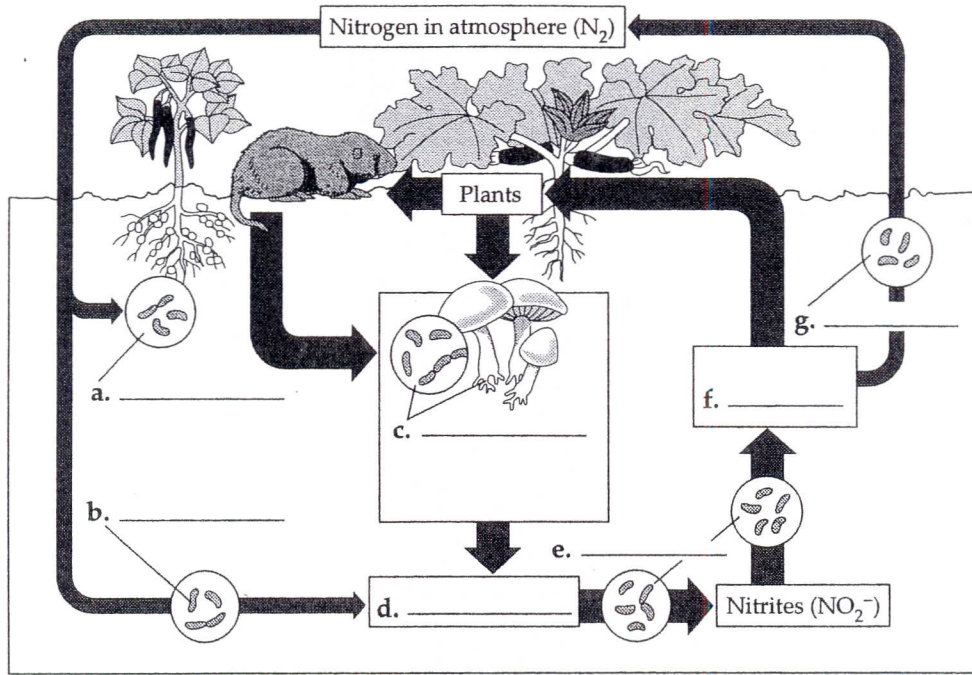


### INTERACTIVE QUESTION 54.2

- List some ecosystems with high rates of productivity.
- List some ecosystems with low rates of productivity.
- The open ocean has low net primary productivity yet contributes the greatest percentage of Earth's net primary productivity. Explain.
- Antarctic seas are often more productive than most tropical seas, even though they are colder and receive lower light intensity. Explain.

■ INTERACTIVE QUESTION 54.4

Label the organisms and compounds indicated in the nitrogen cycle.



■ INTERACTIVE QUESTION 55.6

Is the effective population size usually larger or smaller than the actual number of individuals in the population?

## STRUCTURE YOUR KNOWLEDGE

1. What is conservation science? List the many areas of human endeavors that intersect with this field.
2. How does the loss of biodiversity threaten human welfare?

## TEST YOUR KNOWLEDGE

**MULTIPLE CHOICE:** *Choose the one best answer.*

1. Why do migratory species present special preservation challenges?
  - a. Because they are endemic, they are especially susceptible to habitat destruction.
  - b. Their conservation may require international cooperation when they require habitats in different countries.
  - c. They are often prone to population number decline during their long migratory journeys.
  - d. Migratory species spend most of the year in suitable habitats, but travel to marginal habitats where they are likely to become endangered.
  - e. They reside in biodiversity hot spots that are most susceptible to habitat degradation.
2. According to the concept of species-area relations,
  - a. the number of species in an area increases with the size of the area.
  - b. larger species require larger habitat areas than do smaller species.
  - c. most species within any given area are endemic.
  - d. the larger the area, the greater the extinction rate.
  - e. the species along the edge of two ecosystems differ from the species found in either one of the ecosystems.
3. Which of the following is the most serious threat to biodiversity?
  - a. competition from exotic species
  - b. commercial harvesting
  - c. habitat destruction
  - d. overexploitation
  - e. pollution
4. Some grassland and conifer forest preserves have effective fire prevention programs. What might result from such programs?
  - a. an increase in species diversity because fires are prevented
  - b. a decrease in species diversity because fires are natural disturbances that maintain the community
  - c. a change in the composition of the preserved community, possibly to a deciduous forest
  - d. no change in the species composition of the preserved community
  - e. Both b and c may occur.
5. The increasing diversity of the benthic community with depth is an example of
  - a. the diversity of an area correlating with its productivity.
  - b. a cline that may be related to increasing environmental stability.
  - c. the nonequilibrium model of community structure.
  - d. the environmental patchiness of benthic environments.
  - e. the diminishing effects of pollution as the distance between the community and the shoreline increases.
6. Which of the following is typical of biodiversity hot spots?
  - a. a large land or aquatic area
  - b. a high rate of habitat degradation
  - c. little species diversity
  - d. a large proportion of endemic species
  - e. very large populations of migratory birds
7. According to the Endangered Species Act, what is the definition of a threatened species?
  - a. an exotic species that cannot successfully compete with indigenous organisms
  - b. an endemic species that is found nowhere else in the world
  - c. a species that is in a sink habitat
  - d. a species that is in danger of extinction in all or a large part of its range
  - e. a species that is likely to become endangered
8. What are movement corridors?
  - a. strips or clumps of habitat that connect isolated habitats
  - b. the routes taken by migratory animals
  - c. the routes between source and sink habitats through which dispersal occurs



- d. the areas forming the boundary or edge between two ecosystems
  - e. buffer zones that promote the long-term viability of protected areas
9. What does it mean if a population's effective population size ( $N_e$ ) is the same as its actual population size?
- a. The population is not in danger of becoming extinct.
  - b. The population has high genetic viability.
  - c. All the members of the population breed.
  - d. The population's minimum viable population will not sustain the population.
  - e. The population's minimum dynamic area must be enlarged.
10. Gap analysis may be used to
- a. predict a species's minimum viable population and its minimum dynamic area.
  - b. estimate the effective population size based on sex ratio, the number of individuals that breed, and life history characteristics.
  - c. perform a population viability analysis to predict the long-term viability of a population in a particular environment.
  - d. compare physical maps and species distribution to locate unprotected habitats of endangered species.
  - e. determine what types of bioremediation and augmentation of ecosystem processes are required to restore degraded areas.