Conservation in the Context of a Changing World

Answers To Selected Study Questions

In many cases, you will be able to provide correct and complete answers to the questions in this study guide without going into the amount of detail that is provided here. Additional explanation is provided with these answers to help you understand the material.

[PREFACE: BALANCE AND FLUX]

QP.1

A) Book borrowed without permission.

   1. My roommate's behavior makes me angry and keeps making me angrier and angrier. Since it causes my anger to increase (continue in the same direction) it is an example of positive feedback.
   2. My roommate's behavior causes my anger to decrease (reverse direction). I am no longer angry. This is an example of negative feedback.

B) Shoveling snow. Shoveling reveals the dark sidewalk, which absorbs heat, which in turn melts some snow. The more I shovel, the larger the dark area of sidewalk that is exposed becomes. This causes even more snow to melt, and the rate at which snow melts increases, which is an example of positive feedback.

C) Driving speed. I regulate my driving speed to keep it right around the speed limit, in a manner that is similar to the way a thermostat regulates temperature at a set point. If my speed gets above the speed limit, I slow down (because I don't want to get a speeding ticket). But if my speed drops below the limit, I speed up, because I am in a hurry. This is negative feedback.

[CHAPTER 1: 1.3.2.4 MARINE MAMMALS]

Q1.1

Commercial whaling in the nineteenth and first half of the twentieth centuries was an example of economic extinction.

[CHAPTER 1: 1.5.2.1 FORESTRY]

Q1.3

Leopold and Greeley assumed that fire was bad and that the best way to manage forests was through regulated harvests of timber.

[CHAPTER 2: 2.1.1.1 EXPONENTIAL GROWTH]

Q2.1

A) Not exponential increase. With exponential increase, each number in a series is multiplied by a constant number. But in the series shown here, each number in the series is the result of adding a constant (1,000) to the previous number.

B) Exponential increase. Each number in the series is multiplied by a constant (2) to give the next number.

C) Exponential increase. Each number in the series is multiplied by 3 to give the next number.

D) Exponential increase. Each number in the series is multiplied by 2 to give the next number. (Even though the numbers are very small, they are nevertheless increasing exponentially.)

E) Not exponential increase. The numbers in the series are not multiplied by a constant to give the next number.

F) Exponential increase. Each number in the series is multiplied by 1.5 to give the next number.

[CHAPTER 2: 2.1.1.3 DENSITY-DEPENDENT GROWTH]

Q2.2

A) From Years 1 through 5, Population A increases rapidly, doubling every year. But from Years 6 through 9, Population A grows more slowly. In fact, from Years 7 through 12 the population remains fairly stable at 60 to 66 individuals. This pattern is characteristic of a density-dependent population curve.

B) Population B increases and decreases in ways that are not related to population density. It has a density-independent population curve.

C) Population C goes through a growth phase (Years 1 through Year 5 or 6), a plateau phase (Years 6 and 7), and a decline phase (Years 8 through 12). This type of population curve is typical of a population in a closed system, which by definition, has limited resources.

[CHAPTER 2: 2.1.2.1 COMPETITION]

Q2.3

A) Pickford and Reid assumed that their method of estimating what proportion of each plant species was grazed was accurate. They also assumed that the only thing that influenced the percentage of each plant species that was grazed was the species (elk or sheep) that grazed it. In other words, they assumed that nothing other than grazing by sheep or elk could have affected how much of each plant species was grazed. (They did not consider factors such as weather in the three-year period that might have affected how much forage was produced and therefore what proportion was grazed.)

B) Pickford and Reid concluded from their research that sheep and elk competed for forage on their summer range.

[Chapter 3: 3.2.2.1 Maximum Sustained Yield]

Q3.2

A) Chris has the best understanding of the model.

B) The predicted growth rate of a population that exhibits density-dependent population growth is highest when the population is at approximately half of the carrying capacity of the environment for that species. According to the model of the relationship of density-dependent population growth to harvest, that would occur when this population of mink was at 100/2 or 50 mink.

C) Since the mink population is regulated by density-dependent processes, it will not be growing rapidly when the population is low, that is, when it is at an early point on its growth curve. Not many mink will be added to the population, and the harvestable surplus will be low. So Roberto’s recommendation is unlikely to result in the maximum sustained yield.

Similarly, the population will not be growing rapidly when it is near the carrying capacity of its environment. At that point, the reproductive rate will be relatively low and/or the mortality rate will be relatively high, so again not many mink will be added to the population, and the harvestable surplus will be low. Pat's recommendation will not result in the maximum sustained yield.

[CHAPTER 3: 3.2.2.2 COMPENSATORY MORTALITY]

Q3.3

A) Since 25% of the juvenile muskrats survived to the end of their first year when the population was not trapped, there was 75% mortality. With trapping, mortality was still 75%. Trapping did not result in a change in the mortality rate. Apparently, trapping mortality compensated (substituted) for other things that would have killed the young muskrats. Trapping mortality was compensatory.

B) If 400 deer die from natural causes when the deer population is not hunted, and when the population is hunted, the hunters harvest 75 deer, then

1. If hunting mortality is compensatory, hunting will not cause total mortality in the hunted population to change. In that situation, 400 – 75 = 325 deer will die from natural causes.
2. If hunting mortality is additive, hunting will cause 75 deaths in addition to the 400 deaths due to natural causes. Therefore, 400 + 75 = 475 deer will die in the harvested population if hunting mortality is additive.
3. If natural mortality of deer decreases by 49 animals when the population is hunted, then natural mortality will be 400 – 49 = 351 deer, and total mortality with hunting

will equal 75 deaths from hunting plus 351 deaths from natural causes, or 426 deer. Total mortality increases somewhat but not as much as it would if hunting mortality were additive. Because hunting mortality partially compensates for natural mortality in the above example, the total mortality of the deer population is more than what it would be if mortality were compensatory (400 deaths) but less than what it would be if mortality were additive (475 deaths). Hunting mortality is partly additive and partly compensatory in this case.

[CHAPTER 3: BOX 3.2 COMMUNITY HARVEST OF SEA TURTLE EGGS IN OSTIONAL, COSTA RICA]

Q.3.4

B) Video Between the Harvest

1. The video shows – and in some cases interviews – egg collectors, scientists, a villager in her kitchen, heads of local organizations that are in favor of or opposed to the harvest, a government researcher, security guards, workers at the point of sale, local children, the owner of a fish market, a businesswoman, bar patrons, a town elder, and egg thieves. It also includes shots of people living in poverty, turtle faces, young men surfing, and vultures eating turtle eggs. Some of these will likely evoke sympathy from you; some may result in anger.

[CHAPTER 3: BOX 3.5: EVALUATING EVIDENCE: TESTING THE BENEFITS OF EDGES FOR BREEDING BIRDS]

Q3.5

Some potential problems with Lay's research methods are described below along with some ways that his methods could be improved in order to address those problems. You may be able to think of others.

Lay recorded sightings of bird species that he recognized. If he was able to recognize every species that might have occurred in his study area, this method would not be a problem. However, if Lay was unable to recognize some of the species he saw, then those species would be omitted from his sample. In that case, his results would be biased in favor of bird species that he could recognize.

As an alternative, birds that were not recognized might be photographed and their songs might be recorded. People with additional expertise could then be consulted for help in identifying those species so that they could be included in the study's results.

"Occasionally" when he heard the song of a familiar bird in nearby cover, Lay did not spend time confirming this, and that information was added to Lay's dataset. This added another potential source of bias in this study in favor of bird species that had recognized songs. This problem might be addressed by adopting a rigorous methodology and following it consistently in cases where familiar bird songs were heard nearby.

If Lay had field assistants, and if those assistants differed in their ability to recognize bird species by sight or sound, this would have introduced another source of inaccuracy. This problem might be addressed by making sure that field assistants had similar training and experience in identifying birds by sight and sound and by testing their skill.

Lay did not take into consideration the fact that breeding male birds often sing near the edges of habitat patches even if their territories include the interiors of habitat parches. This may have caused his results to be biased by over-estimating the use of habitat edges. This problem might be addressed by including additional information about if and how the different bird species used habitats far from patch edges and using that information to interpret his results.

[CHAPTER 3: 3.3.2 MODIFYING THE ARRANGEMENT AND SHAPE OF HABITAT COMPONENTS]

Q3.6

A) Edge: 12

Area: 9

Edge:Area ratio: 12:9 = 4:3 = <u>1.33</u>

B) Edge: 8

Area: 4

Edge:Area ratio: 8:4 = <u>2</u>

C) Edge: 28

Area: 24

Edge:Area ratio: 28:24 = 7:6 = <u>1.16</u>

D) Edge: 20

Area: 24

Edge:Area ratio: 20:24 = 5:6 = <u>0.83</u>

E) B has relatively more edge than A. Small areas have relatively more edge (in relation to their area) than large areas of the same shape.

F) C has more edge in relation to its area than D. Long, thin shapes have more edge in relation to their area than compact shapes.

[Chapter 5: Box 5.1 Some Responses to the Publication of *Silent Spring*]

Q5.2

When *Silent Spring* was published, the USA was in a Cold War with the Soviet Union. One of Carson's critics refers to this in a suggestion that she was advocating something which would serve the interests of the communist nations in Eastern Europe.

There were few women scientists at the time when Carson wrote. Women were often considered too emotional to be good scientists.

Silent Spring appeared during a period of optimism about science and technology (although that was beginning to change when she wrote). There was a tendency to be suspicious of anyone who was critical of science because science was equated with progress.

[Chapter 5: 5.2.2.2 Water Management]

Q5.3

Scott Ferris (a Congressional Representative from Oklahoma) regarded water that was running "idly" as a waste of energy. He stated that "when it comes to weighing the highest conservation, on the one hand, of water for domestic use against the preservation of a rocky, craggy canyon, allowing 200,000 gallons of water daily to run idly to the sea, doing no one any good, there is nothing that will appeal to the thoughtful brain of a commonsense, practical man."

[Chapter 5: 5.2.2.2 Water Management, continued]

Q5.4

Barry Commoner and Rachel Carson expressed concern that scientists were promoting the adoption of new technologies without adequately understanding their effects. Carson wrote that “we have allowed these chemicals [such as synthetic insecticides] to be used with little or no advance investigation of their effect on soil, water, wildlife, and man himself.” Commoner wrote that “Modern science and technology are simply too powerful to permit a trial-and-error approach.”

[CHAPTER 5: 5.2.3 DISAPPEARING SPECIES]

Q5.5

A) The Ehrlichs used the metaphor of a mechanic removing rivets that held an airplane together to suggest that people are allowing species to go extinct without understanding how those species support the functioning of other livings things. Paul Ehrlich used cancer as a metaphor for human population growth.
B) Rachel Carson used the fabric of life as a metaphor for the Clear Lake ecosystem. Frederick J. Stare compared scientific evidence and propaganda to two buckets of water that can’t be carried on one person’s shoulders.

[CHAPTER 5: 5.3 DIAGNOSING THE PROBLEM]

Q5.6

- Human nature

Garrett Hardin suggested that environmental problems were caused by overpopulation, which he said was due to human nature, specifically a tendency of people to act in their short-term self-interest. Ehrlich had a similar view of human population growth. (He thought that the “population explosion” was “an uncontrolled multiplication of people.”) However, Ehrlich also believed that economic and social conditions played a major part in causing environmental problems. (See below.)

- Political, economic, and social conditions

Coale saw externalities as an important problem because free markets do not make people pay for the negative impacts of their actions. Myers, Ordway, Galbraith, and Ehrlich emphasized the problems that come from high rates of consumption in the developed world. Commoner and Naess focused on problems stemming from the power of military and industrial interests.

- Philosophical and ideological viewpoints

White and Naess saw the roots of environmental problems in the dominance of the human-centered, or anthropocentric, mindset that people should dominate nature. Instead, they advocated a biocentric philosophy that emphasizes respect for other species. (Note that this position was held by Lynn White, a philosopher, rather than Richard White, the historian (Box 9.4 and Section 9.5.2)). Naess, however, also saw unjust social and economic conditions as part of the problem.

[Chapter 6: 6.1 Natural Selection]

Q6.1

A) Adaptations do not occur because they would be beneficial. As the climate becomes warmer, individual crop plants that have genetic variations which allow them to tolerate heat stress have better survival and reproduction than individual crop plants that do not have those characteristics. The individuals with those variations will have greater fitness than individuals that do not have those favorable variations. Natural selection will favor individual crop plants that have those advantageous traits. As a result, those favorable traits will become more common in a population of that crop. Through this process, a population of that crop may develop improved ability to tolerate heat stress. When that happens, the population will have adapted to the warmer temperature of their environment.

B) Mutations (genetic changes) do not occur because they would be beneficial; they are random mistakes that occur when genetic material is copied. If a plant's genetic material includes some DNA that codes for traits that allow it to withstand drought, that individual plant will be likely to survive and reproduce better than individual plants that lack that mutation. When that is the case, over time the ability to withstand drought will become more common in a population of that crop.

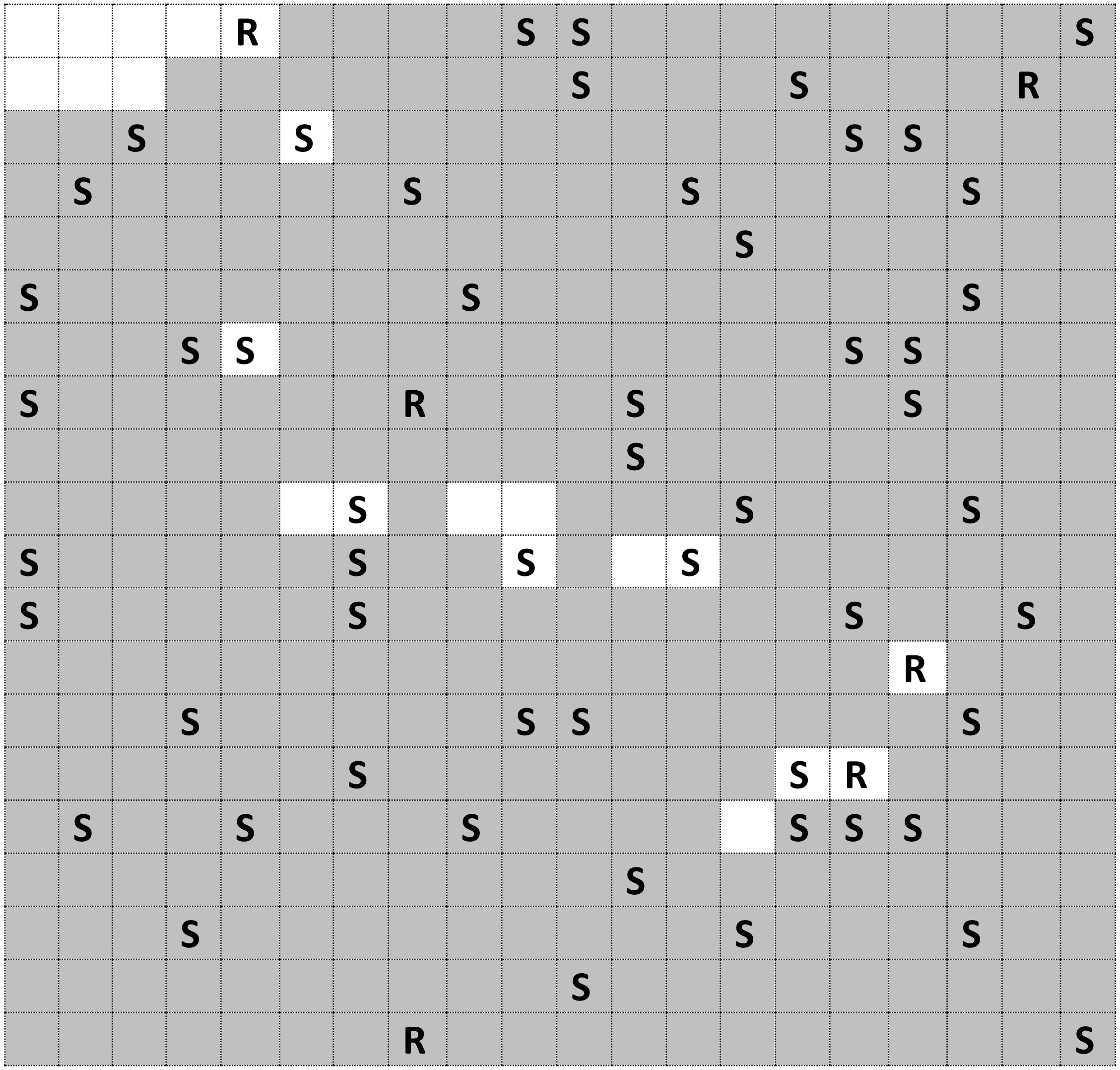
C) Roses did not evolve thorns because they needed protection. As noted in examples (A) and (B), above, adaptation occurs when (1) random mutations that are beneficial in a changed environment occur and (2) individuals that have those beneficial mutations are more likely to survive and reproduce than individuals without those traits. During the evolution of roses, some plants produced thorns. Those plants would have been less likely to be eaten than plants that did not have thorns, and natural selection would have favored plants with thorns.

D) Spraying insecticide can, over time, lead to the development of resistance to that insecticide. The insecticide does not cause the resistance to occur, however. It only causes resistance to become more common in a population. The development of resistance happens through the process of natural selection described in examples (A), (B), and (C), above. Differences in the survival and reproduction of individuals in a population cause genetic material that is responsible for resistance to become more prevalent in that population. Natural selection does not create the mutations. It just acts as a filter, favoring beneficial mutations that happen to be present. The specific example in Q6.2, below, demonstrates this.

E) Fish did not develop limbs because they "wanted" to live on land. (In fact, they had no way of knowing whether land would be a good environment for them.) During their evolution, some individuals of some kinds of fish developed genetic changes to their fins that made them able to support themselves on land. Natural selection favored those changes and future changes that led to even more effective movement on land. These individuals were the ancestors of amphibians.

[CHAPTER 6: BOX 6.2 EVOLUTION OF RESISTANCE TO PESTICIDES]

Q6.2



(1) Total ticks	(2) Total resistant ticks	(3) Total resistant ticks that were sprayed	(4) Total ticks that were not sprayed
4	1	0	1
3	1	1	0
4	0	0	1
4	0	0	0
1	0	0	0
3	0	0	0
4	0	0	1
4	1	1	0
1	0	0	0
3	0	0	1
4	0	0	2
4	0	0	0
1	1	0	1
4	0	0	0
3	1	0	2
6	0	0	0
1	0	0	0
3	0	0	0
1	0	0	0
2	1	1	0
Totals: **60**	**6**	**3**	**9**

Figure 1. Distribution of ticks with and without resistance to *TickBuster*. Gray squares were sprayed with *TickBuster*. White squares were not sprayed. R's represent ticks that are genetically resistant to *TickBuster*; S's represent ticks that are susceptible to *TickBuster*.

A) Before the population is sprayed, 60 ticks are in the population (Column (1)).

B) Before the population is sprayed, 6 ticks are resistant to *TickBuster* (Column (2)).

C) Before the population is sprayed, (6/60)*100 = 0.1*100 = 10% of the tick population is resistant to *TickBuster*.

D) After the population is sprayed, 3 + 9 = 12 ticks are left alive (Column (3)+ Column (4)).

E) After the population is sprayed, 6 ticks are resistant to *TickBuster* (Column (2)).

F) After the population is sprayed, (6/12)*100 = 0.5*100 = 50% of the tick population is resistant to *TickBuster*.

G) The percentage of ticks that were resistant to *TickBuste*r increased from 10% to 50% of the population after the ticks were sprayed.

H) The susceptible ticks that were sprayed died. Only the resistant ticks and a few that were not sprayed with *TickBuster* were left. Since the all the resistant ticks survived and only a small proportion of the ticks that were not resistant survived (because the person who applied *TickBuster* missed them), the resistant ticks made up a greater proportion of the population after spraying. Applying the pesticide did not change the number of ticks that were resistant to it, but it did change the frequency of the resistant ticks in the remaining tick population. The resistant ticks that were left after the spray treatment made up a much greater proportion of the population than they had before *TickBuster* was sprayed. In other words, spraying *TickBuster* selected for resistance to *TickBuster*.

[CHAPTER 6: BOX 6.6 EXTREME DIETARY SPECIALIZATION IN A PLANT-EATING SPECIES OF BEAR]

Q6.5

A) Mass flowering could be adaptive for bamboo because it prevents populations of antagonistic species such as herbivores from building up. For example, populations of species that eat bamboo may disappear during times when bamboo has died throughout a large area.

B) Passenger pigeons (Section 1.3.3.1) fed on the fruits of mast trees, which produced large amounts of fruits and seeds erratically. (Although this was advantageous for the mast trees, because it denied resources to species that ate their fruits, it meant that during a period of low food production in one area, the passenger pigeons had to search large areas to find another source of food.)

[CHAPTER 7: BOX 7.2 ILLEGAL CACTUS TRADE]

Q7.1

A) Since this question asks about your opinions, there are no right or wrong answers. However, it is worth noting the way the author uses some blatant devices to get their point across. A photograph in the article shows the naked belly of an overweight smuggler and refers to “a roll of his bare belly spilling over his khaki shorts.” This is, to put it bluntly, a cheap shot. It is likely to evoke a negative reaction in many, perhaps most, readers for a reason that is related to a common bias about body types but is not relevant to the point of the article or the worth of the person who is described (although his actions may be reprehensible for other reasons). The use of this device to influence readers also perpetuates a hurtful stereotype without adding anything to our understanding of the issue of cactus smuggling.

[CHAPTER 7: BOX 7.3 PROTECTING YOUNG PITCHER'S THISTLE PLANTS FROM INSECT HERBIVORY]

Q7.2

A) Two ways that the researchers experimentally manipulated the amount of insect herbivory on juvenile Pitcher's thistle plants were: (1) using wire cages in the treatment plots to block insects from reaching the plants, and (2) spraying the treatment plots with a mixture of water and insecticide to kill insect herbivores.

B) The researchers used two types of controls: (1) wire cages were placed over the juvenile Pitcher's thistles in the control plants, but the cages were left open on one side so the insects could get in, and (2) the control plots were sprayed with water only instead of water and insecticide. In both cases, insects were able to get to the Pitcher's thistle plants in the control plots.

C) This study showed that in an area where insects did a lot of damage to young Pitcher's thistle plants, reducing insect herbivory was associated with an increase in the estimated seed output of the plants when they matured. This was because when the herbivorous insects had access to the Pitcher's plants the number of viable seeds that were produced declined.

D) In order to demonstrate that herbivory on juvenile Pitcher's thistle plants limited their reproductive success, it would be necessary to show that herbivory eventually resulted in a reduction in the number of seeds that developed into plants which contributed to the next thistle generation. The researchers would have needed to follow the plants through another generation to see if the seeds germinated and did produce plants that survived long enough to reproduce.

[CHAPTER 7: 7.7 SETTING PRIORITIES: WHICH SPECIES SHOULD WE TRY TO SAVE?]

Q7.3

The answers to questions (A) through (E) are shown in the completed Table 2, below.

F) The California condor has the highest total conservation importance score (14) in this hypothetical analysis. The Andean condor's score is a close second, (12) but it has a larger population and is more widely distributed. The two condor species are similar in biology and ecology, but they differ in their current status.

G) If you decided to refine your analysis, you could include other proximate and ultimate risk factors.

H) You could broaden your analysis or do a separate analysis to include the four snail kite subspecies and additional relevant variables such as habitat specialization.

Table 2. Ranking system for evaluating the needs of four species of birds of prey for protection.

	Estimated wild population		Food resources		Geographic range		Age at sexual maturity (years)		Total risk score	Number of additional species in same genus	Evolutionary significance score	Total conservation importance score
	A	B	C	D	E	F	G	H	I	J	K	L
	Data	Score	Data	Score	Data	Score	Data	Score	Columns B+D+F+H		-	Columns I+K
Turkey vulture	More than 4 million	1	Dead animals	2	Most of North America and all of South America	1	3 to 5	2	6	2	2	8
Andean condor	10,000	2	Dead animals	2	West coast of South America	2	6	3	9	0	3	12
California condor	300 to 400	3	Dead animals	2	West coast lower 48 USA states, southern tip Canada, northern tip Mexican coast	3	6	3	11	0	3	14
Snail kite	More than 2 million	1	Apple snails	3	Most of S America, part of Caribbean and Mexico	2	1	1	7	0	3	10

[CHAPTER 8: BOX 8.2 EVALUATING EVIDENCE: DOES AREA INFLUENCE EXTINCTION RATE? AND CHAPTER 6: BOX 6.12: SOME SOURCES OF EVIDENCE ABOUT RATES OF COLONIZATION AND EXTINCTION ON ISLANDS]

Q8.1

A) Assumptions

Karr (birds on Barro Colorado Island study) assumed that:

- Bird species that were present in an area which was very nearby had been present at Barro Colorado before it was isolated.
- After Barro Colorado became an island, the only difference between it and the nearby continuous habitat was area.
- Any bird species that were not documented at Barro Colorado Island but were presumably present before the area became an island had become extinct.

Simberloff and Wilson (arthropods on mangrove islands study) assumed that:

- All arthropods were observed before the islands were treated (fumigated).
- All arthropods were killed when the islands were fumigated.
- All arthropods that reached the island survived until the census took place.
- All arthropods that reached the island after the treatment occurred and survived until the census took place were detected during the post-fumigation census. (None fell into the water, were eaten by predators, or disappeared for other reasons.)

B) Conclusions

Karr concluded that any bird extinctions on Barro Colorado were caused by the reduction in area that occurred after it became an island.

Simberloff and Wilson concluded that any species which was found during the censuses after the experimental treatment must have colonized the island.

D) Advantages

Karr's study

- Karr was able to study the effect of area on the extinction rate of birds because of an unplanned before-and-after experiment that allowed him to observe what happened after an area of bird habitat was reduced in size when the island of Barro Colorado was created.
- Karr's sampling method did not kill the birds.
- Karr was able to compare experimental and control sites that were similar in elevation, type of vegetation, and microhabitat and differed in only one variable: area.

Simberloff and Wilson's study

- Simberloff and Wilson did not have to rely on assumptions about which arthropod species were present at the start of their experiment because they were able to census them before the experimental treatment (fumigation of the islands) took place.
- The islands were small enough to be thoroughly censused.
- The researchers were able to compare the results of their experiment from several different islands rather than relying on a single site.

[CHAPTER 8: 8.4.2 GAP ANALYSIS]

Q8.2

Table 3. Results of a hypothetical gap analysis that looked at the level of biodiversity protection and the species diversity of four groups of organisms at four sites. The biodiversity of each of

the groups at the different sites is ranked in three categories: *** = high, ** = moderate, and * = low.

	Site			
Group of organisms	1	2	3	4
Trees	*	*	***	*
Butterflies	--	--	*	*
Amphibians	**	***	**	*
Small mammals	***	--	**	*
Protection level	High	Low	Low	Intermediate

A gap analysis would usually identify Site 3 as a priority for protection because there is moderate to high species diversity in each of the groups that was studied, and this site is not well protected.

You might select Site 1, reasoning that a site with a high level of protection would have high conservation value. But the objective of gap analysis is to identify priorities for additional protection, rather than places that are already protected. Therefore, gap analysis would prioritize sites that are not well protected.

If you are aware that amphibians have high rates of extinction you might suggest that Site 2 should be prioritized for protection because it has a high diversity of amphibians. In this example, as in many cases involving gap analysis, there is a tradeoff between protecting the site with the greatest biodiversity of several groups and protecting the site with the greatest diversity of a very vulnerable group.

Q8.3

A) This video was produced by the organization *Sustainable Human*.

B) The narrator is George Monbiot.

C) George Monbiot is British environmental writer who writes for the newspaper *The Guardian* and is the author of a several books.

D) Several answers are possible here, depending on how you reacted to the video. To me, the narrator sounds excited and enthusiastic about the topic.

E) The point of the video is that the introduction of wolves to Yellowstone National Park caused changes in populations of elk and many other kinds of animals and brought about changes in vegetation as well as physical changes in the stream channel.

F) The findings described in the video have received a lot of attention in popular media and scientific discussions. There is much interest in the reintroduction of large predators as a way to restore predation and other natural ecological processes. Some biologists who study wolves or other carnivores point out, however, that other variables changed around the same times the wolves returned, so it is not possible to conclusively determine that the wolves caused all the changes that are described in the video. This does not mean that the conclusions presented in the video are incorrect. But it does suggest that additional research on the effects of wolf reintroduction is needed.

Note: If you have spent time in open habitats of central and western North America you might have noticed that the photograph of a badger which is included in the video is a Eurasian badger. That species would not have been wild in Yellowstone National Park, where the American badger (which has different markings and a more pointed snout) occurs. This error is an outlier in this video, and it is not relevant to the main point that is presented. It does not discredit the material that is presented. However, this can serve as a reminder that it is a good idea to fact check your source material wherever possible. If there are many errors in material you encounter, it makes sense to be especially careful when you evaluate that material.

[CHAPTER 9: 9.2.1 CONSEQUENCES OF HALFWAY TECHNOLOGIES]

Q9.1

A) Any intervention that improves a species' odds of survival without addressing the causes of its low survival would meet Frazer's definition of a halfway technology. For instance, the cases covered in Section 7.4.1, Improving the Odds for Little Things, are in this category.

B) Young turtles may have important ecological functions regardless of whether we see them doing those things ("whatever little things do"), even if they do not survive to adulthood.

[CHAPTER 9: 9.2.2 THE ANTHROPOCENE]

Q9.2

B) Emma Marris uses the term "rambunctious garden" to mean a garden that is not under our control and that may have non-native species and/or species which have neither economic value nor conservation value.

[CHAPTER 9: BOX 9.1 CAUSES OF DEFORESTATION IN EL SALVADOR]

Q9.3

Durham argues that land use (production of crops for export) and land tenure (decline in land owned by subsistence farmers) also contributed to deforestation in El Salvador.

[CHAPTER 9: BOX 9.1, CAUSES OF DEFORESTATION IN EL SALVADOR, AND BOX 9.2, CAUSES OF DECLINES IN WILDLIFE HABITAT AND ABUNDANCE IN EAST AFRICA]

Q9.4

Both Homewood et al. (2001) and Durham (1979) look at economic and political variables as well as ecological ones. Homewood looks at many more variables (including some that are related to weather, human health and livelihoods, trends in wildlife and livestock populations, government policies, and trends in land use) than Durham.

[CHAPTER 9: 9.4.3 SHOULD TREES HAVE STANDING?]

Q9.5

Because this is a what-would-you-do question, any answer is acceptable. It highlights an issue in rights-of-nature cases that involve antagonistic interactions such as predation. Although the rights of nature are sometimes understood to include natural processes, deciding on the rights of nature in cases that involve antagonistic interactions would be complex because, by definition, such interactions are harmful to at least one species. How do people decide on what is best for nature in such cases? The larger point in these examples is that in order to be represented in legal actions, nature must be interpreted by people, and people disagree in their interpretations. There is no objective way to define those rights.

[CHAPTER 10: BOX 10.1 COOPERATIVE FISHERIES MANAGEMENT DEVELOPED BY LOCAL RESOURCE USERS]

Q10.2

Here are some things to think about when you answer this question.

Could local control of the lobster harvest create an "old-boy" network that would make it difficult for newcomers and outsiders to participate in the system?

Could local control of the resource lead to a situation in which participants are motivated more by local concerns than by large-scale environmental concerns (for example, climate change)?

[CHAPTER 10: BOX 10.2 LOCAL FOREST MANAGEMENT IN TWO COMMUNITIES IN GUATEMALA]

Q10.3

A) The communities of Morán and Las Cebollas are about the same size. Both are inaccessible. They occur in similar environments, have similar economies, and are largely self-governed.

B) The community of Las Cebollas set aside part of its forest as a Protective Forest within which harvesting of forest resources is prohibited. The community of Morán did not designate a Protective Forest.

[CHAPTER 10: BOX 10.3 METTLER'S WOODS]

Q10.4

Barnett described Mettler's Woods as a "truly virgin" and "primeval" forest that is close to equilibrium (a "climax" state), which he considered good. (His attitude was that disturbance was bad. He apparently was not aware that Native Americans had burned the forest regularly before Euro-Americans arrived. He thought that in the absence of disturbances, communities reached a state of equilibrium after which they perpetuated themselves under the conditions they created.)

[Box 11.4 Retaining Legacies that Promote Reproduction and Regeneration]

Q11.1

B) Frederic Clements (Section 2.2.2) proposed that plant associations were like superorganisms: collections of interdependent species that were so closely associated that he thought of them as individual organisms.

C) Video

1. Examples of the cooperative side of plant interactions: trees are described in the video as altruistic individuals that talk, trade, share, swap, chat, and send messages with each other. They are said to help other trees by sending messages to warn them of danger and by providing seedlings with resources. Sick or dying trees supposedly dump their resources so that other trees will be able to use them.
2. Examples of the dark side of plant interactions: plants are described in the video as engaging in hacking, sabotaging, and cybercrime. Trees are described as waging war on one another.
3. The following devices convey the ideas referred to in (1) and (2), above.

   Diagrams show trees shaking hands but also setting off bombs.

   Lively music accompanies parts of the video that describe positive interactions.

   A mother tree is pink, a color that we associate with advocacy for breast cancer awareness, a cause that is likely to appeal to mothers and people with cooperative values.

The part of the video that describes “cybercrime” among trees shows a black diagram against a background of dark red and orange hues, colors we may associate with wildfire. The branches of a sick tree droop.

[CHAPTER 12: BOX 12.5 THE TADO CULTURAL ECOLOGY CONSERVATION PROGRAM]

Q12.2

A) Flowers smell like rotting meat that would attract pollinating flies.

B) Hoodia is an example of an unrelated species with similar adaptations that attract pollinators.

C) Convergent evolution refers to two unrelated species that have evolved similar characteristics.

D) The Tasmanian wolf and true wolves are another example of convergent evolution.

The rest of the study questions in this guide require you to synthesize material about concepts and examples covered in this course. Because these questions ask about your opinions, answers are not provided.

Use these questions to help you consolidate what you have learned and practice your skill in critical evaluation.

QSyn2

Dabbling ducks that use patches of cattails might be able to distinguish differences in the amount of patch edges that many people are not able to distinguish.

Some species of frogs respond to differences in mating calls that many people might not be able to distinguish.

To most people the eggs of nest parasites such as cowbirds and cuckoos look very different from the eggs of host species (such as the Kirtland's warbler). But the host species does not seem to be able to distinguish between its own eggs and the eggs of the nest parasite.

Something to think about as you consider differences in sensory abilities: People with limitations to their perception of one sensory mode often have keener ability in other modes. For example, people who are visually impaired may have exceptionally good ability to perceive sounds.