Conservation in the Context of a Changing World

Study Questions

The answers to some of these questions are available at www.cambridge.org/weddell.

For some questions, there is no single, right answer. Although your responses to those questions will express your opinions, when you answer them you should also (1) demonstrate understanding of the subject matter and (2) explain what you base your opinions on.

Parts of your text that discuss the material covered in these questions are identified in brackets.

[PREFACE: BALANCE AND FLUX]

QP.1

For each example below, state whether the situation that is described is an example of positive feedback or negative feedback (in the scientific sense of these terms) and explain your reasoning.

A) Book borrowed without permission. One day I come home and find that my roommate has borrowed a book which I need for an assignment without telling me or asking my permission. To make matters worse, my roommate is not home, so I cannot even confront them and get my book back. This worries me and makes me angry because I need to turn in a hard copy of the assignment later that afternoon. I stew about this while I wait for my roommate to come home. The longer I wait, the angrier I get. Finally, after 45 minutes, my roommate comes home. By this time, I am really angry. I yell at my roommate and say some insulting things.

1. My roommate yells and curses at me. They say that it is my fault because I should have told them not to take the book. I get even angrier. Over the next several days we have even more heated arguments, which make me even angrier.

2. My roommate apologizes and says they had no idea that borrowing the book would create a problem. They return the book right away and offer to drive me to campus to make sure I can get the assignment dropped off in time. My roommate also asks if there is anything else they can do to make it up to me. I accept my roommate's apology and get the assignment done on time. We go out for ice cream after I drop the assignment off.

B) Shoveling snow. There is a heavy snowfall at my house. After it stops snowing, I shovel a narrow pathway through my sidewalk, leaving a clear trail with snowbanks on either side. My sidewalk is darker than the snow, so the cleared trail absorbs some heat from the air. Because of this increase in temperature, some snow melts at the places where the walk has been cleared. This exposes a little more of the dark sidewalk, which absorbs more heat and causes more snow to melt.

C) Driving speed. I am driving to a friend's wedding several hundred miles away. I am worried about getting there on time because I got a late start. I predict that I will be able to make it if I drive at the speed limit. Every time I start to go slightly above the speed limit, I let up on the accelerator and decrease my speed. I manage to get there on time, just barely.

[INTRODUCTION: GETTING AND EVALUATING INFORMATION FOR MAKING DECISIONS ABOUT CONSERVATION]

QIntro.1

Pick an article that is at least 200 words from print or digital media.

A) Where is the article published? By whom?

B) Identify at least three words or phrases that convey a point of view and/or an emotion in the article. This is not necessarily bad, but you should be aware of it. What are the words, and what do they convey?

[CHAPTER 1: 1.3.2.4 MARINE MAMMALS]

Q1.1

What other example of economic extinction occurred in the nineteenth and first half of the twentieth centuries?

[CHAPTER 1: 1.3.3.2 GIANT TORTOISES ON MAURITIUS]

Q1.2

The meaning of the word "endemic" in ecology is different from its meaning in medicine. What does "endemic" mean in ecology?

[CHAPTER 1: 1.5.2.1 FORESTRY]

Q1.3

In the 1920s, Leopold and Greeley assumed that Indian burning did not reflect an understanding of forest ecology. List two additional assumptions that Leopold and Greeley had about Indigenous forest management.

[CHAPTER 2: 2.1.1.1 EXPONENTIAL GROWTH]

Q2.1

Which of these sets of increasing numbers demonstrates exponential increase? Explain your reasoning.

A)   1,000; 2,000; 3,000; 4,000; 5,000

B)   8; 16; 32; 64; 128

C)   9; 27; 81; 243; 729

D)   0.0002, 0.0004, 0.0008, 0.0016, 0.0032

E)   500; 750; 850; 1,100; 1,500, 4,000

F)   120; 180; 270; 405

[CHAPTER 2: 2.1.1.3 DENSITY-DEPENDENT GROWTH]

Q2.2

Table 1 below shows the changes in the sizes of three populations over 12 years. Each population starts with 2 individuals. Assume that the area inhabited by each population does not change.

Table 1. Changes in the size of three populations over 12 years.

Population A

Year	Size of Population A
1	2
2	4
3	8
4	16
5	32
6	50
7	60
8	64
9	65

10	62
11	63
12	66

Population B

Year	Size of Population B
1	2
2	4
3	13
4	16
5	35
6	11
7	8
8	30
9	65
10	56
11	10
12	95

Population C

Year	Size of Population C
1	2
2	4
3	8
4	25
5	48
6	50
7	50
8	45
9	25
10	8
11	4
12	2

A) What kind of population curve does population A exhibit? _____

B) What kind of population curve does population B exhibit? _____

C) What kind of population curve does population C exhibit? _____

Q2.3

A) What did Pickford and Reid assume in their research on the diets of elk and sheep on summer range?

B) What did Pickford and Reid conclude from their research on the diets of elk and sheep on summer range?

Q3.1

Table 3.1 in your text presents arguments for and against recreational hunting and trapping in seven categories: animal welfare, conservation, culture, ethics, personal development, safety, and values. Choose three of those categories and state whether you agree or disagree with the statements in the "For" column and the "Against" column and explain why.

Q3.2

Chris, Pat, and Roberto are ecologists who work for a hypothetical conservation organization that manages a large private preserve for sustainable hunting and trapping. They want to decide how large the mink population should be when they allow trapping to begin.

To arrive at their recommendation, the ecologists use a model of the relationship of density-dependent population growth to harvest (Figure 3.2 in your text) along with the following information:

- The estimated carrying capacity of the preserve is 100 mink.

- Information from an area of similar habitat nearby suggests that mink populations in this region exhibit density-dependent population regulation.

- Five mink were recently introduced into the preserve, and their population is growing.

The three ecologists disagree about what policy is likely to lead to the maximum sustained yield of mink.

Roberto thinks that trapping should begin the following year.

Chris thinks they should not allow trapping to begin until the population has grown to about 50 mink.

Pat thinks it would be best to wait even longer, until the population reaches about 90 mink.

A) Which ecologist's position demonstrates the best understanding of the model of the effects of harvest on a population that experiences density-dependent regulation?

_____

B) Explain how the model leads to that ecologist's conclusion.

C) What are the problems with the other two ecologists' reasoning?

[CHAPTER 3: 3.2.2.2 COMPENSATORY MORTALITY]

Q3.3

A) Suppose a wildlife biologist says that 25% of juvenile muskrats in her state survive their first year of life when trapping is not allowed. An experimental trapping season is opened for one year so that biologists can study the effect of trapping on the survival of juvenile muskrats. By the end of their first year, 75% of the juvenile muskrats had died.

Was trapping mortality in this situation additive, compensatory, or a combination of both?

B) Suppose that in another state 400 deer die from natural causes when the deer population is not hunted, and when the population is hunted, the hunters harvest 75 deer.

    1. How many deer will die from natural causes in this situation if hunting mortality is compensatory?_____

    2. What is the total number of deer that will die if hunting mortality is additive? _____

    3. If deer mortality decreases by 49 animals when the population is hunted, what will total deer mortality be? _____

    Is mortality additive, compensatory, or a combination in this case?

    _____

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

Q.3.4

Suppose you are an expert on marine turtles, and you are asked to make recommendations for managing a harvest of olive ridley turtle eggs during the *arribada* at Ostional, Costa Rica.

A) What would you recommend? Why?

B) Watch the video *Between the Harvest* (vimeo.com/152900668) about the controversy regarding the Ostional turtle egg harvest.

    1. What groups of people have a stake in whether the eggs are harvested? Who, if anyone, benefits from allowing the harvest? Who, if anyone, is harmed?

2. What is the main point of the video?

3. What methods are used in the film to influence your point of view?

4. Give one advantage and one disadvantage of allowing a turtle egg harvest at
   Ostional.

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

Q3.5

Imagine that you are now a wildlife biologist in Texas. You want to follow up on Daniel Lay's

research on the number of breeding bird species that use habitat edges. You have some doubts

about the way that Lay did his research, however. Describe two ways that you could improve

upon the methods that Lay used.

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

Q3.6

The geometric figures below represent patches of habitat. (You could also think of them as

nature reserves.) Calculate the edge (perimeter), the area, and the ratio of edge to area for
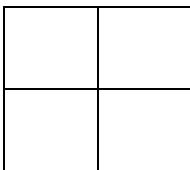
each patch.

A)
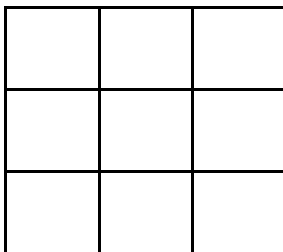
Edge: _____

Area: _____

Edge:Area ratio: _____

B)

Edge: _____
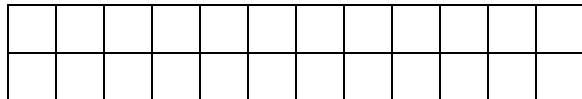
Area: _____

Edge:Area ratio:_____

C)

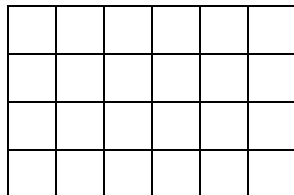Edge: _____

Area: _____

Edge:Area ratio:_____

D)

Edge: _____

Area: _____

Edge:Area ratio: _____

E) Squares A and B have the same shape, but they have different ratios of edge to area.

Which has relatively more edge? Why?

F) Squares C and D have the same area, but they have different ratios of edge to area.

Which has relatively more edge? Why?

[CHAPTER 4: BOX 4.1 EVALUATING EVIDENCE: BIOLOGICAL CONTROL OF INVASIVE, INTRODUCED WEEDS]

Q4.1

If you were in charge of policy for a regulatory agency, what policies would you recommend for

biological control?

A) What kinds of information would you like to have when you are considering your

decision?

B) Where would you look for that information?

[CHAPTER 4: BOX 4.2 THE SPARROW WAR]

Q4.2

In the book *American Perceptions of Immigrant and Invasive Species: Strangers on the Land*,

Peter Coates (2007:7) wrote: "The English sparrow controversy in the late nineteenth- and early

twentieth-century United States shows . . . how animate forms of nature can become

embroiled in the cultural politics of nationalism." Comment on this passage.

[CHAPTER 4: SECTIONS 4.4 – 4.8]

Q4.3

In your opinion, what are the three worst examples of pest control that are described in sections 4.4 through 4.8? Why?

Q4.4

In your opinion, what are the three best examples of pest control that are described in sections 4.4 through 4.8? Why?

Q5.1

Do you think there is a conflict between writing that (1) is engaging and appeals to the public and (2) is scientifically rigorous? Do you think there is a middle ground? Why or why not?

Q5.2

How did the reception to *Silent Spring* reflect the political context in the USA at the time of its publication?

Q5.3

Who else besides Woody Guthrie regarded water running idly to the sea as a waste of energy?

Q5.4

Watch the segment from *Fantasia*, an animated film released in 1940 by Walt Disney Productions that is available here: https://video.disney.com/watch/sorcerer-s-apprentice-fantasia-4ea9ebc01a74ea59a5867853. The video uses Mickey Mouse to dramatize the well-known fable of the sorcerer's apprentice, in which Mickey Mouse makes use of magic forces that he does not understand to bring water to him, with disastrous results. A French physicist referred to this story in a scientific paper about earthquakes.

What other scientists who are quoted in this chapter expressed the same concern (although they did not refer to the fable or the movie explicitly)?

[CHAPTER 5: 5.2.3 DISAPPEARING SPECIES]

Q5.5

A) What metaphors did Paul Ehrlich and Anne Ehrlich use in the excerpts from their writing that are quoted in this chapter?

B) What other metaphors were used by writers quoted in this chapter?

[CHAPTER 5: 5.3 DIAGNOSING THE PROBLEM]

Q5.6

As concern about environmental problems mounted after World War II, many explanations for the causes of those problems were proposed. These explanations tended to see environmental problems as stemming from three types of causes:

- Human nature,

- Political, economic, and social systems, and

- Philosophical and ideological viewpoints.

A) Describe the opinions of three of the people discussed in Chapter 5 and discuss in which category or categories their explanations fit.

B) Which of these opinions (if any) do you agree with? Why?

C) Which of these opinions (if any) do you disagree with? Why?

Q6.1

Misunderstandings about the concepts of natural selection and adaptation are common. The statements below are examples of incorrect explanations. For each example, explain what is incorrect and then state a correct explanation in terms of evolutionary theory.

A) "As the Earth's climate becomes warmer, crops will adapt in order to improve their ability to tolerate heat stress."

B) "A drier climate will cause crops to develop mutations that allow them to withstand drought."

C) "Roses have thorns to keep animals from eating them."

D) "Spraying an insecticide causes individual mosquitoes to develop genetic changes that allow them to become resistant to the insecticide."

E) "Fish developed limbs so that they could inhabit land."

Q6.2

Imagine that the area represented by the grid shown in Figure 1 below was sprayed with a pesticide known as *TickBuster* that kills ticks. It works well enough to kill most of the ticks in an

area, but some ticks are genetically resistant to this product. Instead of dying, they survive when they come in contact with it. When these ticks breed, their offspring inherit this resistance.

In addition, the hypothetical person who sprayed the area represented by the grid was a bit sloppy and missed some spots, so not all the ticks came in contact with *TickBuster*. Those ticks survived.

TickBuster does not cause the ticks to become resistant to its effects. But it does do three important things that affect the prevalence of resistance in the tick population:

- *TickBuster* kills all ticks it comes in contact with if they are not resistant to it,

- *TickBuster* selects for ticks that were already resistant to its effects (because they survive when they come in contact with it), and

- Since resistance to *TickBuster* is an inherited trait, the resistant ticks pass this trait on to their offspring.

In Figure 1 below, fill in the appropriate numbers of ticks in each category for each row (Columns (1), (2), (3), and (4)). Then compute and enter the totals for each column and use those numbers to answer the questions below.

	(1) Total ticks	(2) Total resistant ticks	(3) Total resistant ticks that were sprayed	(4) Total ticks that were not sprayed
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
	—	—	—	—
Totals:	_____	_____	_____	_____

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, how many ticks are in the population? _____

B) Before the population is sprayed, how many ticks are resistant to *TickBuster*?

_____

C) Before the population is sprayed, what percentage of the tick population is resistant to *TickBuster*? (To calculate this number, divide the number of resistant ticks by the number of ticks in the population and multiply that number by 100.) _____

D) After the population is sprayed, how many ticks are left alive? In other words, what is the size of the tick population after it has been sprayed? (This number is the total of: (1) all the ticks in areas that were *not sprayed* plus (2) all the *resistant* ticks that were in areas that *were* sprayed.) _____

E) After the population is sprayed, how many ticks are resistant to *TickBuster*?

_____

F) After the population is sprayed, what percentage of the tick population is resistant to *TickBuster*? _____

G) What effect did spraying have on the percentage of ticks that were resistant to *TickBuster*?

H) What caused the change in the percentage of ticks that were resistant to *TickBuster*?

[CHAPTER 6: 6.4.1.1 THE PREHISTORIC OVERKILL HYPOTHESIS]

Q6.3

What do you think is the most likely explanation for the prehistoric extinctions of megafauna?

Why?

Q6.4

To answer this question, you will need to apply what you have learned about the immediate (or proximate) and innate (or ultimate) causes of species' declines. From your outside research, find two examples of declining plant or animal species or subspecies that are not described in this course. For each of the species or subspecies that you select, answer the following questions:

A) What is the species or subspecies?

B) Is it declining everywhere it occurs or only in part of its range?

C) List at least one proximate factor that appears to be contributing to its decline.

D) List at least one ultimate factor that appears to be contributing to its decline.

E) What is the source of this information?

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

Q6.5

A) The bamboo populations that giant pandas feed on experience periods of mass flowering as well as mass die-offs. In what way could mass die-offs of bamboo be adaptive for bamboo populations? (In other words, how could mass die-ffs benefit bamboo populations?)

B) Where else in this course have we come across a similar situation?

[CHAPTER 7: BOX 7.2 ILLEGAL CACTUS TRADE]

Q7.1

Read www.theatlantic.com/science/archive/2016/02/cactus-thieves/470070/. This article is

quoted in Box 7.2 about illegal trade in cacti.

A) What are the main points of the article?

B) How does the author make those points?

C) Did the article convince you? Why or why not?

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

Q7.2

Box 7.3 describes experiments that were designed to test the hypothesis that protecting young

Pitcher's thistle plants from insect damage would cause population growth in this species to

increase.

A) What were the two ways that researchers manipulated the amount of insect herbivory

on juvenile Pitcher's thistle plants in this study?

B) What were the controls in this experiment?

C) What did the study show?

D) What else would researchers need to show in order to determine whether herbivory on

juvenile Pitcher's thistles ultimately limits their reproductive success?

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

Q7.3

Imagine that you are a biologist with a private organization that is dedicated to bird

conservation. They have just received funding for a program to conserve vultures and hawks.

To do this, they need to decide which species are most in need of their help. Therefore, they

have asked you to create a ranking system to assess four species of birds of prey that they are

particularly interested in: three kinds of vultures and a hawk known as the snail kite.

To begin, you need to decide what aspects of the species' biology you are going to use

in your ranking. You decide to consider the four variables listed below as indicators of the

species' vulnerability:

- Population size,

- Degree of specialization on food resources,

- Size of geographic range, and

- Age at sexual maturity.

You also decide to take the evolutionary significance of each species into consideration.

Species that have no close relatives are generally considered to have high evolutionary

significance, and therefore they are considered high priorities for conservation. This is because

the extinction of such a species causes more genetic diversity to be lost than if a species that is

closely related to many other species dies out. In other words, when a species that is on an

unbranched limb of the supertree of life (Section 6.3.2) disappears, more genetic diversity is

lost than when a single twig of a many-branched limb is lost.

Next, you decide on categories for these risk variables and for evolutionary significance

as follows. (Higher numbers indicate greater risk.)

Population size (global)

High risk: Less than 500, rank = 3,

Medium risk: 500 to 20,000, rank = 2,

Low risk: higher than 20,000, rank = 1.

Specialization on food resources

High risk: dependence on one to five foods, rank = 3,

Medium risk: dependence on one general category of food (such as carrion, insect

larvae, or seeds), rank = 2,

Low risk: use of a wide variety of plant and animal foods, rank = 1.

Geographic range (assessed from range maps)

High risk: Limited distribution, rank = 3,

Medium risk: Moderate distribution, rank = 2,

Low risk: Widespread, rank = 1.

Age at sexual maturity

High risk: more than 5 years, rank = 3,

Medium 3 to 5 years, rank = 2,

Low risk: 1 or 2 years, rank = 1.

Evolutionary significance

For evolutionary significance you decide to use the number of other species grouped

together in the species' genus as an indication of its evolutionary uniqueness.

High importance: no other species in the same genus, rank = 3,

Medium importance: 1 to 5 other species in the same genus, rank = 2,

Low importance: more than 5 other species in the same genus, rank = 1.

Finally, you use the data below to assign numerical values (ranks) to these categories for

the species you are interested in.

Estimated population(global)

Turkey vulture: more than 4 million

Andean condor: 10,000

California condor: 300 to 400

Snail kite: more than 2 million

Specialization on food resources

    Turkey vulture: dead animals

    Andean condor: dead animals

    California condor: dead animals

    Snail kite: apple snails

Geographic range

    Turkey vulture: most of North America and all of South America

    Andean condor: west coast of South America

    California condor: west coast of lower 48 USA states, southern tip of Canada, northern

        tip of Mexican coast

    Snail kite: most of South America, part of Caribbean and Mexico

Age at sexual maturity

    Turkey vulture: 3 to 5 years

    Andean condor: 6 years

    California condor: 6 years

    Snail kite: 1 year

Evolutionary significance

    Turkey vulture, *Cathartes aura*: two other species in the genus *Cathartes.*

    Andean condor: *Vultur gryphus:* no other species in the genus *Vultur.*

    California condor: *Gymnogyps californianus*: no other species in the genus *Gymnogyps.*

    Snail kite, *Rostrhamus sociabilis*: no other species in the genus *Rostrhamus*

A) Use the information provided above to fill in Columns A, C, E, G, and J (shaded columns)

    in Table 2.

B) Use the information you entered in columns A, C, E, and G to assign ranks (scores) for

    each species. Enter these numbers in Columns B, D, F, and H .

C) Use the information you entered in Columns B, D, F, and H to calculate the total risk score for each species and enter those values in Column I.

D) Use the information you entered in Column J to determine the evolutionary significance score for each species and enter those values in Column K.

E) Calculate the total conservation importance score for each species by adding its total risk score (Column I) and its evolutionary significance score (Column K). Enter those values in Column L.

F) Which species has the highest total conservation score in this hypothetical example?

G) If you decided to refine your analysis, what other variables would you include?

H) The snail kite has a very large geographic range. However, there are four subspecies of snail kite. One of these occurs only in flooded grasslands of southern Florida (Section 11.2.2). How could your procedure be changed to account for this situation?

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	Total number of 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 from data	Data	Score from data	Data	Score from data	Data	Score from data	Columns B+D+F+H			Columns I+K
Turkey vulture												
Andean condor												
California condor												
Snail kite												

Q8.1

To answer this question you will need to compare: (1) Karr's research on bird extinctions at

Barro Colorado Island (Box 8.2) with (2) Simberloff and Wilson's research on colonization and

extinction rates of terrestrial arthropods on islands (Box 6.12).

    A) What were the researchers' assumption(s)?

    B) What were their conclusions?

    C) Do you agree or disagree that their assumption(s) were reasonable?

    D) List at least two advantages of each study.

Q8.2

Table 3 below shows the results of a hypothetical gap analysis that examined the species

diversity of trees, butterflies, amphibians, and small mammals at four sites, and noted the

degree of overall biodiversity protection (which was assumed on the basis of land ownership) at

each site.

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			
	1	2	3	4
Trees	*	*	***	*
Butterflies			*	*
Amphibians	**	***	**	*
Small mammals	***		**	*
Protection level	High	Low	Low	Intermediate

What site would be most likely to be identified by gap analysis as a high priority for protection?

_____ Why?

[CHAPTER8: 8.7 REWILDING: A LANDSCAPE APPROACH TO LARGE CARNIVORE RESTORATION]

Q8.3

Watch the video *How Wolves Change Rivers* at www.youtube.com/watch?v=oSBL7Gk_9QU.

A) Who produced this video?

B) Who is the narrator?

C) What is the narrator's affiliation?

D) Describe the narrator's tone.

E) What is the main point of this video?

F) Are these findings widely accepted?

[CHAPTER 9: 9.2.1 CONSEQUENCES OF HALFWAY TECHNOLOGIES]

Q9.1

A) Give three examples of things which have been covered in this course that Frazer would

consider halfway technologies.

B) What is Frazer's point about "whatever little things do"?

Q9.2

A) Evaluate "new conservation" using concepts covered in this course as well as your own opinions.

B) What does Emma Marris mean by a "wild rambunctious garden"?

Q9.3

Durham argues that population growth is not the only cause of past deforestation in El Salvador. What other factors does he suggest played an important role?

Q9.4

Compare Homewood's and Durham's approaches to understanding causes of environmental problems. How are they similar? How do they differ?

Q9.5

Imagine that you are a judge who must decide how to rule in rights-of-nature cases. In a jurisdiction where all living things have legal rights, could a prey animal get legal protection

from predators? Could a predator respond by claiming its right to food security? Why or why not?

Q9.6

Page 241 of your text contains a quote attributed to a Yanomamo Indian about the opinions of "ecologists, missionaries, and the government" regarding the rights of forest-dwelling peoples of the Amazon.

What is your reaction to this statement? Why?

Q10.1

Work in groups of four to six students. Each group's members should consult two textbooks that discuss the tragedy of the commons. The books could be in ecology, wildlife management, conservation, history, sociology, psychology, political science, economics, anthropology, or other disciplines.

After discussing each book with the other members of your group, answer the questions below individually.

A) For each of the textbooks you selected, what is the discipline of the author(s) and when was it published?

B) What interpretation of the concept of a tragedy of the commons does the author provide?

C) What is your reaction to this interpretation?

You may want to rate your reactions according to these categories:

strongly disagree   disagree slightly   agree slightly   completely agree

D) Discuss your reactions. Be specific. Consider your reasoning as well as your subjective responses to the arguments that are presented, and make sure that you are clear on the difference between them.

E) Compare your results with the other members of your group.

F) Do you see any trends in the books that are related to when they were published? To discipline? To any other variables?

G) Compare your group's results with the rest of the class.

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

Q10.2

There are advantages and disadvantages to the kind of local resource management that regulates the Maine lobster fishery. One the one hand, until recently, the system appeared to be ecologically sustainable and economically viable. On the other hand, it appears that the system is now less diverse than it used to be, and therefore perhaps it is more vulnerable to collapse. List one other potential disadvantage of this type of management.

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

Q10.3

A) In the comparative study that is described in Box 10.2, which variables are the same in the communities of Morán and Las Cebollas?

B) Which variable(s) is/are different in the two communities?

Q10.4

What words did Barnett use to imply that the Mettler's Woods site was undisturbed?

Q10.5

The geologists Shumm and Lighty suggested that it is important to view ecosystems at different spatial scales. This is analogous to zooming in and zooming out as we try to understand landscapes.

A) Give one example (either from this course or from your outside knowledge or research) of a situation in which zooming in increases our understanding of an ecosystem.

B) Give one example (either from this course or from your outside knowledge or research) of a situation in which zooming out increases our understanding of an ecosystem.

Q10.6

Discuss this paragraph from an article in *The Conversation*, a network of non-profit news outlets. Do you agree with the ideas expressed in this selection? Why or why not?

When people make appeals to delay or limit action on climate change, it is often couched in the language of optimism and progress. Take the remarks on aviation by UK health minister Matt Hancock in January 2020. He said that there is no need to reduce how much we fly because electric planes are on the horizon

(disclaimer: they aren't). On the other hand, tackling climate change can just as easily be undermined by a sense of futility or hopelessness in the potential for meaningful action.

Capstick, 2020. Climate denial hasn't gone away. *The Conversation*. (theconversation.com/climate-denial-hasnt-gone-away-heres-how-to-spot-arguments-for-delaying-climate-action-141991)

[CHAPTER 11: BOX 11.4 RETAINING LEGACIES THAT PROMOTE REPRODUCTION AND REGENERATION]

Q11.1

By attributing human characteristics to nonhuman things, a writer can evoke emotions. Suzanne Simard and her colleagues say that trees can talk to each other and help each other. Simard argues that this creates empathy for trees in her readers and therefore promotes conservation.

A) Do you agree or disagree with Simard about this?

B) Some researchers suggest that forests are actually superorganisms. What early ecologist made a similar argument?

C) Watch www.youtube.com/watch?v=yWOqeyPIVRo. This video describes forests as cooperative societies, but it also says that "like our internet, the Wood Wide Web has its dark side too."

1. Give three examples of cooperative interactions that are attributed to plants in the video.

2. Give three examples of what the video describes as a "dark" side of nature.

3. What devices are used to convey the ideas referred to in (1) and (2), above?

Q11.2

A) Which examples of stewardship that are covered in this chapter do you like best? Why?

B) Which examples of stewardship that are covered in this chapter do you like least? Why?

Q11.3 Select three examples of stewardship conservation that are discussed in this chapter

and describe tradeoffs that are involved in each example.

Q12.1

The links below go to sites that provide very different perspectives on the Dja Biosphere

Reserve.

- en.unesco.org/biosphere/africa/dja

- www.youtube.com/watch?v=aRj_8Zna_F8

A) Describe the viewpoints presented by each video. How do they differ?

B) Are the points of view and information presented in each video consistent with what

you have learned in this course? Why or why not?

Q12.2

Box 12.5 in your text includes an example of convergent evolution involving flowers that have

adaptations which attract pollinators.

A) What are the adaptations and what kinds of pollinators do they attract?

B) What unrelated species with similar adaptations that attract pollinators have we covered in this course?

C) In this example, two unrelated species have evolved similar characteristics. What is the term for this phenomenon?

D) What other example of this has been covered in this course?

[CHAPTER 12: 12.8 EVALUATING CONSERVATION OF BIOCULTURAL DIVERSITY]

Q12.3

Find an example of a current controversy about a conservation policy that is not covered in this course.

Fill in Table 4, below showing gains and losses that are predicted if the policy goes into effect.

	Tradeoffs	
	Gains	Losses
Conservation		
Human well-being		

Q12.4

The cases described in this chapter cover several kinds of governance for the management of living natural resources.

A) Which examples of governance that are covered in this chapter do you like best? Why?

B) Which examples of governance that are covered in this chapter do you like least? Why?

Q12.5

This chapter describes several situations in which Western approaches to conservation and Indigenous or traditional approaches interact. Choose three of these and answer the following questions.

A) What were the objectives of the Western participants?

B) What did or does Western involvement provide?

C) What were the objectives of the Indigenous or traditional participants?

D) What did or does the involvement of Indigenous or traditional participants provide?

E) What were the achievements of each example?

F) What have been the problems in each case?

G) Were the problems successfully resolved?

[PREFACE, INTRODUCTION, AND CHAPTERS 1–12]

Synthesis

QSyn.1

The terms listed below have specific meanings in science that are different from their meanings in everyday usage.

Adaptation

Coevolution

Evolution, to evolve

Feedback, positive and negative

Fitness

Organic

Primitive

Symbiosis

Select four of these terms and compare their meanings in science and in common use.

QSyn.2

In the study of wild animals, it is important to remember that they don't necessarily perceive things the same way most people do.

A) List three examples of situations that we have covered in this course where that might be the case.

B) If you have pets, do you think they hear, see, or smell things that you are not aware of?

C) How could increasing our awareness of animal sensory perception help us to understand interactions in ecosystems?

QSyn.3

Although scientists try to be objective, there are unconscious biases in how we approach the natural world. However, recognizing the potential for bias can allow us to understand things in a new way.

A) Select three examples of the potential influence of unconscious bias from the list below and describe how bias might have influenced interpretations of what was going on.

B) Did recognition of bias point the way to new understanding? Did this recognition suggest additional questions that should or could be addressed?

Censusing bird populations in edge and interior habitats

Censusing bowhead whales in the Beaufort Sea

Comparing past and current bird populations on the Channel Islands

Deciding where to look for new branches on the supertree of life

Determining what percentage of wetlands has been lost

Determining whether different species are competing

Estimating deer populations on the Kaibab Plateau

Evaluating predator control

Evaluating the effects of English sparrow populations

Evaluating the role played by people in prehistoric extinctions

Measuring the brain size of different groups of people

Ranking countries' biocultural diversity

Selecting sites for nature reserves

Understanding the effects of people in ecosystems

Understanding the role of fire in ecosystems

QSyn.4

Consider four examples of involvement by NGOs in conservation that are covered in this course.

A) Which examples do you like best? Why?

B) Which examples do you like least? Why?

QSyn.5

Consider four examples of tourism (two from this book and two from outside research) that

have impacts on organisms and ecosystems. (These examples might be termed ecotourism,

nature tourism, wildlife tourism, adventure tourism, heritage tourism, cultural tourism, etc.)

Discuss the objectives and the results of each example.

QSyn.6

Watch two videos listed below and evaluate them using the methods of evaluating sources that

you have been learning about in this course.

- Biggest-ever wolf hunt sparks debate in Sweden,

www.youtube.com/watch?v=Ktu32i1ZmG4

- Cévennes Gard Hérault 2008, www.youtube.com/watch?v=yGDEd4GVfwY

- Sharing the Range, www.youtube.com/watch?v=SPpPYKmbpL4

- Tárcoles: *Al Ritmo del Mar* (To the Rhythm of the Sea),

www.youtube.com/watch?v=pd7w5KEeqMs

- The Whale Hunters, www.youtube.com/watch?v=20y7p_kENOM

QSyn.7

Have your opinions changed as a result of taking this course? How? Why or why not?