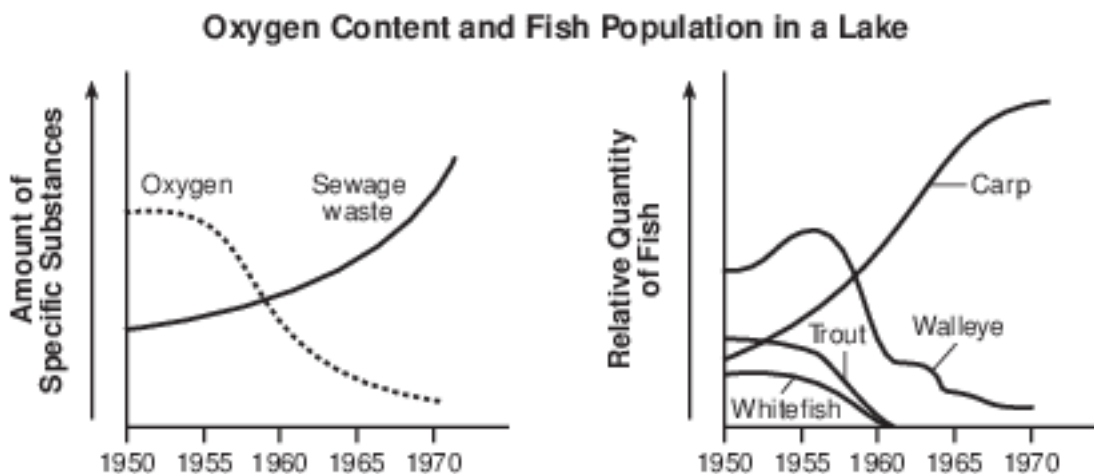


## Human Impacts On Biodiversity

Base your answers to questions 1 on the graphs below and on your knowledge of biology. The graphs show the effect of sewage (human organic waste) flowing into a lake on the level of dissolved oxygen in the water and the size of different fish populations.



- 1 Which statement concerning the oxygen level in the lake can be inferred from the graphs?
- (1) Trout and whitefish require higher oxygen levels than do carp.
  - (2) Carp are more sensitive to oxygen levels than are other fish.
  - (3) The fish in this lake all require the same amount of oxygen for survival.
  - (4) Walleye populations were highest when the oxygen levels were lowest.

Base your answers to questions 2 on the information below and on your knowledge of biology.

The emerald ash borer is an insect that was introduced into North America sometime in the 1990s. It probably arrived in the United States in wooden packing material carried in cargo ships or on airplanes coming from Asia. The ash borer was first reported killing ash trees in Michigan in 2002. Since then, it has spread to Pennsylvania and New York.

Since its arrival, the insect has destroyed tens of millions of trees. One of the ways the ash borer has been able to spread so quickly is through the transport of wood that is infested with their larvae. The USDA has proposed the introduction of Asian wasps to control the ash borer population.

- 2 One action that individuals can take to control the spread of the emerald ash borer is to
- (1) spray all the oak trees at one time with a variety of pesticides
  - (2) plant only trees from Asia in yards and parks
  - (3) plant more ash trees to replace those that are infected
  - (4) use wood from only local sources for heating and for campfires
- 3 Humans have an effect on ecosystems when they use native grasslands or forested areas for farming or urban use. One negative effect of these changes on the ecosystem is that there will be
- (1) less biodiversity
  - (2) more homes
  - (3) successful economic growth
  - (4) increased food production

- 4 Monarch butterflies migrate from the U.S. and Canada to Mexico every winter. Over the past 10 years, there has been a drastic decrease in the number of monarch butterflies. Scientists have estimated that the population may have decreased from about 1 billion to 35 million. Which action would not be considered a reason for the decline in monarch butterfly populations?
- (1) illegal deforestation
  - (2) extreme temperature changes
  - (3) decreasing food supplies
  - (4) habitat preservation

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Base your answers to questions 5 on the information below and on your knowledge of biology.

#### The Extinction of the Passenger Pigeon

In the early 1800s, the passenger pigeon was the most abundant bird species in North America. These pigeons traveled in flocks sometimes larger than a billion birds. The enormous flock sizes helped protect them from predation by foxes, lynx, owls, and falcons. It also helped them outcompete other animals (squirrels, chipmunks) for chestnuts and acorns, their main food source.

Unfortunately, this flocking behavior made the passenger pigeons easy targets for the people who killed them for food. The invention of the telegraph to broadcast flock locations to hunters and the expansion of the railroads to ship the pigeons to new food markets had devastating results. By the 1890s, their numbers had dwindled dramatically, with flocks only numbering in the hundreds. In 1914, the passenger pigeon became extinct when the last member of the species died at the Cincinnati Zoo.

- 5 Which factor contributed least to the extinction of the passenger pigeon species?
- (1) laws that banned the hunting of passenger pigeons to sell in new markets
  - (2) improved communication technology, which tracked the pigeon flocks
  - (3) expansion of the railroads, which opened up new markets for selling pigeons
  - (4) increased use of the passenger pigeons as a food source for humans
- 6 An increased demand for soybeans has led to an increase in converting native forests and grasslands to fields for growing soybeans. One negative consequence of this environmental change has been
- (1) an increase in natural resources for the future
  - (2) an increase in the kinds of foods that can be produced
  - (3) a decrease in suitable habitats for wildlife
  - (4) a decrease in the need to set aside land for conservation

7 In which row in the chart below is a human action correctly paired with its environmental impact?

Row	Human Action	Environmental Impact
(1)	deforestation	increased biodiversity
(2)	population growth	increased number of species
(3)	industrialization	increased global temperature
(4)	overharvesting	increased mineral resources

- (1) 1
- (2) 2
- (3) 3
- (4) 4

8 In some parts of the world, forests are being cut down and burned to clear land for new homes and new farmland. A negative effect of these activities might be

- (1) an increase in global warming
- (2) destruction of the ozone shield
- (3) a decrease in the average temperature of the atmosphere
- (4) an increase in biodiversity of the deforested areas

9 Deforestation most directly results in

- (1) an increase in oxygen in the atmosphere
- (2) a decrease in soil erosion
- (3) a decrease in biodiversity in the area
- (4) an increase in the absorption of carbon dioxide

10 Some scientists have collected and stored seeds for many types of food-producing plants. The purpose of this is to

- (1) increase the destruction of environments
- (2) continue the deforestation of world ecosystems
- (3) decrease the dependence on plants for food
- (4) preserve the diversity of plant species

Base your answers to questions 11 on the information and data table below and on your knowledge of biology.

Onondaga Lake is a small lake located near Syracuse, New York. Industrialized municipal wastes have been polluting the lake for decades. Eating fish from the lake has been banned due to mercury concentrations in the fish. The data table below indicates the mercury concentrations in smallmouth bass taken from Onondaga Lake. Smallmouth bass eat smaller fish, which feed on aquatic plants.

At each feeding level in the food chain, more mercury accumulates. The older and larger the fish, the greater the concentration of mercury.

**Mercury in Onondaga Lake  
Smallmouth Bass**

<b>Year</b>	<b>Mercury Concentration (ppm – wet weight)</b>
2000	1.5
2001	2.0
2002	1.75
2003	1.0
2004	2.5
2005	2.25

Directions: Using the information in the data table, construct a line graph on the grid below, following the directions below.

- 11 Explain how mercury dumped into the lake and taken up by plants reached the smallmouth bass population. [1]

Base your answers to questions 12 on the information below and on your knowledge of biology.

**Project Frozen Dumbo – Saving the Elephant Population Means Using Special Breeding**

Over the last 10 years, 70 percent of Africa’s wild elephant population has been killed off. The main cause is ivory poaching, in which elephants are slaughtered for their valuable tusks. At the same time, efforts to breed captive zoo elephants have not been very successful.

Now there is some good news. At zoos in Austria and England, two baby elephants were born, using sperm from South African wild elephants. For the first time, elephant sperm gathered in the wild was frozen and given to zoos. Two female zoo elephants were artificially impregnated with the sperm and went on to deliver calves. ...

Source: Saving the Elephant Population Means Using Special Breeding, Pittsburgh Post-Gazette, 8/21/14

- 12 Identify one likely reason, other than poaching and hunting, for the decline of the elephant population. [1]

Base your answer to question 13-16 on the information below and on your knowledge of biology.

The year 2010 was declared the International Year of Biodiversity. However, significant loss of biodiversity is still occurring. Researchers around the world are working on a variety of ways to protect natural resources. According to an article in Science News, March 13, 2010, “reversing the downward spiral of biodiversity will take more than protecting wild places, but that’s where scientists are starting.”

13-16 Explain the importance of biodiversity to an ecosystem. In your answer, be sure to:

- state one effect of a loss of biodiversity in an ecosystem [1]
- identify a source of variation within a species that leads to biodiversity [1]
- identify one specific ecosystem that has shown a decrease in biodiversity and state one cause of the decrease in biodiversity in the ecosystem you identified [1]
- identify one human activity, other than setting up protected wildlife areas, that has helped to preserve biodiversity [1]

Base your answer to question 17-19 on the information below and on your knowledge of biology.

### Fish Farming

Fish farming has risen in popularity to the point that, in 2009, it was estimated that 30% of all fish consumed by humans came from fish farms. Fish farms tend to specialize in one or two species of fish, which are produced in great numbers. Fish farms are conveniently located along shorelines, where the fish are contained in pens. Deep-sea vessels are not necessary to harvest the fish, as they are when fish are caught in the wild. The farms provide a relatively inexpensive way to provide protein for a growing world population.

As the technique gains in popularity, however, scientists and coastal residents have become concerned that the concentrated mass of fish in fish farms is producing large quantities of wastes. These wastes may be carried by ocean currents to public beaches and recreational boating areas, making them unusable. Others are concerned that uneaten fish food will decay, produce strong odors, and pollute marine environments miles away. If the wastes are not flushed out of the pens, they accumulate on the ocean floor and create a toxic “dead zone” beneath the fish.

17-19 Describe some aspects of fish farming that are examples of humans interacting with the environment. In your answer, be sure to:

- state one specific benefit humans gain from fish farming [1]
- state how biodiversity may be reduced by fish farming and support your answer [1]
- describe the impact, other than a reduction in biodiversity, fish farming may have on the natural ecosystems of coastal water if no changes are made [1]

Base your answers to questions 20 on the passage below and on your knowledge of biology.

On April 20, 2010, an explosion occurred at an oil well in the Gulf of Mexico, causing millions of gallons of oil to escape into the water over the next few months. Large areas of the Gulf were covered by oil. As the oil washed ashore, many areas along the coastline that were breeding grounds for various bird species were contaminated. By November 2010, researchers along the coast and in the Gulf had collected 6104 dead birds, 609 dead turtles, and 100 dead mammals. Although the oil well had provided oil for energy for a large number of people, the oil spill had a great effect on the ecosystems in and around the Gulf of Mexico.

20 State one possible reason why it will most likely take the bird populations more time to recover from this oil spill than it will mammal populations. [1]

## Answer Keys

1 1

2 4

3 1

4 4

5 1

6 3

7 3

8 1

9 3

10 4

11 Allow 1 credit. Acceptable responses include, but are not limited to:

- — It was taken up by plants, which were eaten by small fish, which were then eaten by the bass.
- — Small fish that ate these aquatic plants were then eaten by smallmouth bass.

12 Allow 1 credit. Acceptable responses include, but are not limited to:

- — habitat destruction/loss of food
- — lack of reproductive success
- — illness/disease
- — Breeding programs were not successful.
- — climate change
- — natural predators
- — lack of genetic diversity
- Note: Do not allow credit for hunting or poaching.

13-16 The student's response to the bulleted items in the question need not appear in the following order.

- 13. Allow 1 credit for stating one effect of a loss of biodiversity in an ecosystem. Acceptable responses include, but are not limited to:
  - — The less biodiversity there is in an ecosystem, the less stable the ecosystem will be.
  - — A loss of biodiversity would make it harder for the ecosystem to maintain stability.
  - — It would reduce resources/food/shelter that are used by the organisms in the ecosystem.
  - — A species might become extinct.
- Note: Allow credit only for an “effect of a loss of biodiversity,” not just less biodiversity.
- 14. Allow 1 credit for identifying a source of variation within a species that leads to biodiversity. Acceptable responses include, but are not limited to:
  - — mutations
  - — genetic changes
  - — genetic recombination
  - — sexual reproduction
- 15. Allow 1 credit identifying one specific ecosystem that has shown a decrease in biodiversity and for stating one cause of the decrease in biodiversity in the ecosystem identified. Acceptable responses include, but are not limited to:
  - — a tropical rain forest – deforestation
  - — Lake Erie – agricultural runoff/overfishing/introduction of non-native species
  - — Gulf of Mexico – oil spill
  - — lakes in Adirondack Mountains – acid rain
  - — arctic seas – global warming
- 16. Allow 1 credit for identifying one human activity, other than setting up protected wildlife areas, that has helped to preserve biodiversity. Acceptable responses include, but are not limited to:
  - — establishing endangered species lists and laws that protect endangered species and their habitats
  - — setting up laws that regulate the release of pollutants
  - — enacting hunting or fishing regulations that protect endangered species
  - — recycling of metals and plastics
  - — replanting trees
  - — stopping/slowing deforestation
  - — breeding programs
  - — regulating what chemicals can be used on farms



17-19 The student's response to the bulleted items in the question need not appear in the following order.

- 17. Allow 1 credit for stating one specific benefit humans gain from fish farming. Acceptable responses include, but are not limited to:
  - — Fish farming provides a convenient source of food.
  - — inexpensive source of protein
  - — a source of food for a growing human population
  - — Decreased use of deep-sea vessels reduces the cost of fishing.
- 18. Allow 1 credit for stating how biodiversity may be reduced by fish farming and supporting the answer. Acceptable responses include, but are not limited to:
  - — Biodiversity is decreased because waste from fish farms may produce dead zones on the ocean floor.
  - — It is reduced because pollution from fish farms may destroy the habitats of other fish.
  - — The farms concentrate one species of fish in one area.
- 19. Allow 1 credit for describing the impact, other than a reduction in biodiversity, fish farming may have on natural ecosystems of coastal waters if no changes are made. Acceptable responses include, but are not limited to:
  - — Large quantities of wastes from fish farming pollute marine environments.
  - — Uneaten fish food may pollute marine environments.
  - — Beaches may become unusable.
  - — It may create a toxic “dead zone.”
- Note: Do not accept just “pollution” without a description.

20 Allow 1 credit. Acceptable responses include, but are not limited to:

- — More birds were killed.
- — The breeding grounds were contaminated.