

Biomeforge — Activity Book

A Spark & Anvil activity book — puzzles, questions, and fun from Biomeforge.

Write in the book, circle your answers, and check the Answer Key at the back.

1. Food Webs

Circle the correct answer

1. What is a producer in a food web?

(A) An organism that only eats plants (B) An organism that makes its own food using sunlight (C) An organism that eats other animals (D) An organism that breaks down dead matter

2. What is the role of a decomposer in an ecosystem?

(A) Breaking down dead organisms and recycling nutrients back into the soil (B) Producing oxygen through photosynthesis (C) Storing water for other organisms (D) Hunting and eating live prey

3. In a food chain, what does an arrow represent?

(A) Which organism lives longer (B) The flow of energy from one organism to another (C) Which organism is larger (D) Which organism is faster

4. What is a herbivore?

(A) A plant that eats insects (B) An animal that eats both plants and meat (C) An animal that eats only plants (D) An animal that eats only meat

5. What is a carnivore?

(A) An animal that eats both plants and animals (B) A plant that traps insects (C) An animal that eats only other animals (D) An animal that eats only plants

6. What is an omnivore?

(A) An animal that eats both plants and animals (B) An animal that eats only plants (C) An animal that eats only meat (D) An organism that makes its own food

Write the answer

7. What is a food web?

Answer: _____

8. Which trophic level has the most energy in a food web?

Answer: _____

9. What percentage of energy is typically passed from one trophic level to the next?

Answer: _____

10. What is a primary consumer?

Answer: _____

Match each question to its answer

1. What is a secondary consumer? →

2. What would most likely happen if all the producers in an ecosystem disappeared?
→

3. Why are there usually fewer top predators than herbivores in an ecosystem? →

4. What is a keystone species? →

5. In the following food chain: Grass → Grasshopper → Frog → Snake → Hawk, which organism is the tertiary consumer? →

(A) All consumer populations would eventually decline because the energy source is gone

(B) A species that has an outsized impact on its ecosystem relative to its population size

(C) Snake

(D) An animal that eats primary consumers

(E) Because only 10% of energy transfers between trophic levels, so less energy is available at the top

2. Population Dynamics

Circle the correct answer

11. What is a population in ecology?

(A) A city of people (B) A group of organisms of the same species living in the same area at the same time (C) Any group of animals (D) All living things in an ecosystem

12. What is carrying capacity?

(A) How far an animal can migrate (B) The maximum population size an environment can sustain indefinitely (C) The weight an animal can carry (D) The number of species in an ecosystem

13. What are limiting factors?

(A) Factors that make animals grow larger (B) Environmental conditions that restrict population growth (C) Rules that scientists set for experiments (D) Boundaries between different ecosystems

14. What is the difference between density-dependent and density-independent limiting factors?

(A) Density-independent factors only occur in deserts (B) Density-dependent factors are affected by population size; density-independent factors are not (C) Density-dependent factors only affect large animals (D) There is no real difference between them

15. What does exponential growth look like on a graph?

(A) An S-shaped curve that levels off (B) A straight horizontal line (C) A line that goes up then straight down (D) A J-shaped curve that gets steeper over time

16. What does logistic growth look like on a graph?

(A) A J-shaped curve going up forever (B) A circle (C) A straight line going down (D) An S-shaped curve that levels off at the carrying capacity

Write the answer

17. What is immigration in population ecology?

Answer: _____

18. What four factors determine whether a population grows or shrinks?

Answer: _____

19. What is competition in an ecosystem?

Answer: _____

20. A deer population grows rapidly for several years, then suddenly crashes. What most likely happened?

Answer: _____

Match each question to its answer

1. What is a population density? →

2. Which is an example of a density-independent limiting factor? →

3. What is predation? →

4. What happens to predator populations when prey populations decline? →

5. What is an invasive species? →

- (A) Predator populations usually decline after a delay because food becomes scarce
 - (B) A severe drought that dries up a watering hole
 - (C) A non-native species introduced to an area where it causes ecological harm
 - (D) When one organism (predator) kills and eats another organism (prey)
 - (E) The number of individuals per unit area
-

3. Biomes

Circle the correct answer

21. What two factors most determine which biome exists in a given location?

- (A) Altitude and longitude (B) Temperature and precipitation (C) Soil type and wind speed (D) Human population and pollution

22. What is the key difference between a tropical rainforest and a temperate rainforest?

- (A) Tropical rainforests have more rain (B) Temperate rainforests have more species
(C) Tropical rainforests are near the equator with warm temperatures year-round; temperate rainforests are at higher latitudes with cooler temperatures (D) There is no real difference

23. Why do deserts receive very little rainfall?

- (A) Because sand absorbs all the rain (B) Because deserts are always near volcanoes (C) Because desert plants use up all the moisture (D) Because they are located in areas where dry air sinks, preventing cloud formation

24. What adaptation do many desert plants have to conserve water?

- (A) Thick, waxy coatings on leaves and stems that reduce water loss (B) Extra-large leaves to catch rain (C) The ability to move to find water (D) Deep taproots that reach the ocean

25. What is the tundra biome characterized by?

- (A) Tall trees and heavy rainfall (B) Extremely cold temperatures, permafrost, and low-growing vegetation like mosses and lichens (C) Hot temperatures and sandy soil (D) Moderate temperatures and grasslands

26. What is permafrost?

- (A) Soil that never gets cold (B) A layer of soil that remains frozen year-round, even during summer (C) A permanent rainstorm in the Arctic (D) A type of glacier

Write the answer

27. Why are grasslands also called 'breadbaskets of the world'?

Answer: _____

28. What is the main difference between a savanna and a temperate grassland?

Answer: _____

29. What biome has the greatest biodiversity on Earth?

Answer: _____

30. What is a microhabitat?

Answer: _____

Match each question to its answer

1. Why do boreal forests (taiga) have mostly coniferous trees like spruce and pine? →

2. What is the canopy layer of a rainforest? →

3. What is an estuary? →

4. How do animals in the tundra adapt to extreme cold? →

5. What is a wetland? →

(A) The dense upper layer of treetops that forms a continuous cover, blocking most sunlight from reaching the forest floor

(B) An area of land that is saturated with water either permanently or seasonally

(C) A partially enclosed body of water where freshwater from rivers meets and mixes with saltwater from the ocean

(D) They develop thick fur or feathers, store body fat, and some hibernate or migrate

(E) Because conifers are adapted to cold, snowy conditions with their needle-shaped leaves and conical shape

4. Adaptation

Circle the correct answer

31. What is natural selection?

(A) Animals choosing their mates (B) Scientists selecting which organisms to study
(C) The process where organisms with traits better suited to their environment survive and reproduce more successfully (D) The strongest animal always winning fights

32. What is camouflage?

(A) Being the brightest animal in the area (B) Wearing armor for protection (C) A physical adaptation where an organism's coloring or shape helps it blend in with its surroundings (D) Moving to a new habitat

33. What is mimicry in ecology?

(A) When animals copy each other's behaviors (B) When one species evolves to closely resemble another species or an object for protection (C) When two species live together (D) When animals learn new tricks

34. Why do polar bears have white fur?

(A) Because they eat a lot of snow (B) Because white fur is warmer than dark fur (C) Because they bleach their fur in sunlight (D) It provides camouflage in their snowy Arctic habitat, helping them hunt seals

35. What is behavioral adaptation?

(A) A change in fur color (B) A change in an organism's actions or behavior that helps it survive in its environment (C) A chemical change in blood (D) A change in body structure

36. Why do some animals hibernate during winter?

(A) To conserve energy when food is scarce and temperatures are dangerously cold (B) Because they need to grow new fur (C) Because they are lazy (D) Because they are afraid of snow

Write the answer

37. What is an ecological niche?

Answer: _____

38. What is convergent evolution?

Answer: _____

39. How do cacti store water in the desert?

Answer: _____

40. What is aposematic coloring?

Answer: _____

Match each question to its answer

1. What structural adaptation helps fish breathe underwater? →

2. Why do many prey animals have eyes on the sides of their heads? →

3. What is an adaptation? →

4. How do mangrove trees adapt to living in saltwater? →

5. What is countershading and how does it help marine animals? →

- (A) To have a wider field of vision (nearly 360°) to detect predators approaching from any direction
 - (B) They have special salt-filtering roots and can excrete excess salt through their leaves
 - (C) Having a dark back and light belly that makes the animal hard to see from both above and below in the water
 - (D) Gills that extract dissolved oxygen from water as it flows over them
 - (E) An inherited trait that increases an organism's chance of survival and reproduction in its specific environment
-

5. Nutrient Cycles

Circle the correct answer

41. What is the nitrogen cycle?

- (A) The rotation of Earth on its axis (B) How nitrogen gas becomes oxygen (C) The cycle of day and night (D) The biogeochemical process by which nitrogen is converted between its various chemical forms as it circulates through the atmosphere, soil, water, and organisms

42. What is nitrogen fixation?

- (A) The process of making nitrogen fertilizer in factories only (B) Plants absorbing nitrogen through their leaves (C) Animals exhaling nitrogen gas (D) The process of converting atmospheric nitrogen gas (N₂) into ammonia or related compounds that organisms can use

43. What is the carbon cycle?

- (A) The lifecycle of a carbon atom (B) The biogeochemical cycle by which carbon moves between the atmosphere, oceans, soil, rocks, and living organisms (C) How carbon dioxide is produced only by factories (D) The cycle of seasons caused by carbon

44. How does deforestation affect the carbon cycle?

- (A) It releases stored carbon into the atmosphere and reduces the number of trees available to absorb CO₂ through photosynthesis (B) It converts carbon into nitrogen (C) It has no effect on carbon (D) It increases carbon absorption

45. What is eutrophication?

- (A) When a lake freezes completely in winter (B) The process of water becoming cleaner over time (C) The excessive enrichment of a water body with nutrients (usually nitrogen and phosphorus), causing algal blooms and oxygen depletion (D) The natural aging of a pond into a meadow

46. What is the phosphorus cycle and how does it differ from the nitrogen and carbon cycles?

(A) Phosphorus only exists in the atmosphere (B) It's identical to the nitrogen cycle
(C) Phosphorus doesn't cycle — it stays in one place (D) Phosphorus cycles through rocks, soil, water, and organisms but does NOT have a significant atmospheric phase

Write the answer

47. What is bioaccumulation?

Answer: _____

48. What is biomagnification?

Answer: _____

49. How do wetlands help purify water?

Answer: _____

50. What is the water cycle's role in ecosystems?

Answer: _____

Match each question to its answer

1. What is a dead zone in the ocean? →

2. How does the carbon cycle connect photosynthesis and cellular respiration? →

3. What is denitrification? →

4. How do mycorrhizal fungi help plants? →

5. What is ecological succession? →

(A) Photosynthesis removes CO_2 from the atmosphere and stores it as glucose; cellular respiration breaks down glucose and releases CO_2 back

(B) An area with oxygen levels too low to support most marine life, usually caused by nutrient pollution and algal decomposition

(C) They form symbiotic relationships with plant roots, extending the root system to absorb more water and nutrients (especially phosphorus) in exchange for sugars

(D) The microbial process that converts nitrates (NO_3^-) back into nitrogen gas (N_2), returning it to the atmosphere

(E) The gradual process by which an ecosystem changes and develops over time, from a barren area to a mature community

6. Ecosystem Dynamics

Circle the correct answer

51. What is ecosystem resilience?

(A) An ecosystem's total number of species (B) An ecosystem's ability to absorb disturbance and reorganize while maintaining its essential structure and functions
(C) How large an ecosystem is (D) The age of an ecosystem

52. How does climate change affect species distribution?

(A) Climate change has no effect on where species live (B) All species can easily adapt to warmer temperatures (C) Rising temperatures shift suitable habitat zones toward higher latitudes and elevations, forcing species to migrate, adapt, or face extinction (D) Species only move closer to the equator

53. What is an ecological footprint?

(A) A measure of the amount of natural resources a person or population consumes and waste generated, expressed as the area of land needed to sustain that consumption (B) The number of species in a habitat (C) The physical footprint of an animal (D) The size of an ecosystem

54. What is the relationship between biodiversity and ecosystem services?

(A) Ecosystem services don't depend on living organisms (B) Only one species provides all ecosystem services (C) Biodiversity decreases ecosystem services (D) Greater biodiversity generally provides more robust ecosystem services because diverse communities are more productive and resilient

55. How do invasive species affect native biodiversity?

(A) They only affect one trophic level (B) They have no effect on native species (C) They always increase biodiversity (D) They outcompete native species for resources, prey on native species, introduce diseases, and alter habitat structure, often reducing native biodiversity

56. What is habitat fragmentation?

(A) Connecting habitats with corridors (B) The natural formation of different biomes (C) Creating new habitats for animals (D) The breaking up of continuous habitat into smaller, isolated patches separated by human-modified land

Write the answer

57. What is the edge effect in ecology?

Answer: _____

58. How do coral bleaching events illustrate ecosystem vulnerability to climate change?

Answer: _____

59. What is carrying capacity and how does human technology affect it for our species?

Answer: _____

60. What is the difference between endangered and threatened species?

Answer: _____

Match each question to its answer

1. How do wildlife corridors help conserve biodiversity? →
2. What is the precautionary principle in environmental science? →
3. What role do keystone species play in maintaining ecosystem structure? →
4. How does the tragedy of the commons apply to environmental issues? →
5. What is rewilding? →

(A) They connect isolated habitat patches, allowing animals to move between them for food, mates, and genetic diversity

(B) When an action could cause harm to the environment, precautionary measures should be taken even if the cause-and-effect relationship is not fully established scientifically

(C) When shared resources (like fisheries, atmosphere, water) are overexploited because individuals benefit from overuse while costs are spread across everyone

(D) The conservation approach of restoring natural ecosystems by reintroducing native species and removing human interventions to let natural processes recover

(E) They have a disproportionately large impact on their ecosystem — their removal causes dramatic changes in species composition and ecosystem function

7. Advanced Ecology

Circle the correct answer

61. What is an ecosystem engineer?

(A) A species that significantly modifies, creates, or destroys habitats, thereby affecting the availability of resources for other organisms (B) The smartest animal in an ecosystem (C) A machine that cleans up pollution (D) An ecologist who designs nature reserves

62. How does the island biogeography theory explain species diversity?

(A) Larger islands closer to the mainland have more species because they receive more colonizers and have lower extinction rates (B) Smaller islands always have more species (C) All islands have the same number of species (D) Distance from mainland doesn't matter

63. What is the intermediate disturbance hypothesis?

(A) Disturbance has no effect on biodiversity (B) No disturbance creates maximum biodiversity (C) Biodiversity is highest at intermediate levels of disturbance, because too little disturbance allows competitive exclusion and too much prevents establishment (D) Maximum disturbance creates maximum biodiversity

64. What is metapopulation dynamics?

(A) The study of metabolism in populations (B) The study of how groups of spatially separated populations of the same species interact through immigration and emigration between habitat patches (C) How metamorphosis works in amphibians (D) The study of the largest population on Earth

65. How does the albedo effect relate to climate feedback loops?

(A) More ice causes more warming (B) Albedo has nothing to do with climate (C) Ice and snow reflect sunlight (high albedo); as they melt due to warming, darker surfaces absorb more heat, causing more warming and more melting — a positive feedback loop (D) Darker surfaces reflect more light

66. What is ecological stoichiometry?

(A) The study of rock formations in ecology (B) Counting species in an ecosystem (C) Measuring the height of trees (D) The study of the balance of chemical elements (like carbon, nitrogen, and phosphorus) in ecological interactions and processes

Write the answer

67. What is the Red Queen hypothesis?

Answer: _____

68. What is niche partitioning and how does it reduce competition?

Answer: _____

69. How does the concept of ecological debt apply to human resource use?

Answer: _____

70. What is the biodiversity-ecosystem function (BEF) relationship?

Answer: _____

Match each question to its answer

1. What is an ecological trap? →

2. What is the landscape of fear concept? →

3. How do regime shifts differ from gradual ecosystem change? →

4. What is the Janzen-Connell hypothesis? →

5. What is the concept of planetary boundaries? →

(A) Seedlings and young plants are less likely to survive near their parent tree due to species-specific herbivores and pathogens, promoting tropical tree diversity

(B) A framework identifying nine Earth system processes with critical thresholds that, if crossed, could generate large-scale environmental changes threatening human civilization

(C) The spatially variable perception of predation risk that influences how prey species use their habitat, often more powerfully than direct predation

(D) Regime shifts are abrupt, large-scale changes in ecosystem structure and function that occur when a threshold is crossed, often difficult or impossible to reverse

(E) A low-quality habitat that an organism preferentially selects over higher-quality alternatives because environmental cues have been altered by human activity

8. Ecosystem Assessment

Circle the correct answer

71. What is the concept of ecosystem health?

(A) The physical beauty of an ecosystem (B) The number of trees in a forest (C) Whether all organisms in an ecosystem are disease-free (D) A holistic assessment of an ecosystem's organization, vigor (productivity), and resilience — analogous to evaluating multiple vital signs of health in medicine

72. How does the source-sink model explain population persistence?

(A) Sources and sinks are types of water features (B) Sources are always smaller than sinks (C) Source habitats produce surplus individuals that emigrate to sink habitats where mortality exceeds reproduction; sinks persist only because of immigration from sources (D) Sink populations produce the most offspring

73. What is environmental DNA (eDNA) and how is it used in ecology?

(A) DNA found only in laboratory environments (B) DNA that is specifically designed for environmental use (C) Genetic material shed by organisms into their environment (water, soil, air) that scientists can collect and analyze to detect species presence without directly observing them (D) Artificial DNA created by scientists

74. How does the mass ratio hypothesis differ from the keystone species concept?

(A) Mass ratio only applies to large animals (B) The mass ratio hypothesis states that ecosystem properties are primarily determined by the traits of the most abundant species, while keystone species have outsized effects relative to their abundance (C) Keystone species are always the most abundant (D) They are the same concept

75. What is ecological connectivity and why does it matter?

(A) The internet connection speed in ecological research stations (B) How well organisms communicate with each other (C) The degree to which the landscape facilitates or impedes organism movement between habitat patches, affecting gene flow, population viability, and species persistence (D) The social connections between ecologists

76. What is the role of disturbance in maintaining landscape heterogeneity?

(A) Landscapes are naturally uniform (B) Disturbance always reduces heterogeneity (C) Natural disturbances (fire, floods, windstorms) create a mosaic of habitat patches at different successional stages, increasing landscape-level biodiversity (D) Only human disturbance creates heterogeneity

Write the answer

77. What is the extinction debt concept?

Answer: _____

78. How does assisted migration work as a conservation strategy?

Answer: _____

79. What is the concept of ecological integrity?

Answer: _____

80. How do Allee effects threaten small populations?

Answer: _____

Match each question to its answer

1. What is the concept of safe minimum standard in conservation? →

2. What is the difference between alpha, beta, and gamma diversity? →

3. How does ecological economics differ from environmental economics? →

4. What is the half-earth concept? →

5. What is the concept of ecological resilience versus engineering resilience? →

(A) E.O. Wilson's proposal to protect half of Earth's surface as nature reserves to safeguard approximately 85% of species from extinction

(B) Ecological economics views the economy as a subsystem of the biosphere with hard biophysical limits; environmental economics treats environmental problems as market failures within a growth-compatible framework

(C) Engineering resilience measures how quickly a system returns to equilibrium after disturbance; ecological resilience measures how much disturbance a system can absorb before shifting to a different state

(D) Resources should be preserved unless the social costs of doing so are

intolerably high, shifting the burden of proof from conservationists to developers

(E) Alpha diversity is species richness within a single habitat; beta diversity is the turnover of species between habitats; gamma diversity is total diversity across all habitats in a region

9. Cross-Topic Connections

Circle the correct answer

81. How do subsidized predators affect native prey populations?

(A) Predators subsidized by human resources (pet food, garbage, crops) maintain artificially high populations that then over-prey on native species (B) Government subsidies help predators and prey equally (C) Subsidized predators have no effect on native species (D) Only subsidized herbivores affect ecosystems

82. What is the difference between density-dependent and density-independent limiting factors?

(A) Density-independent factors only occur in deserts (B) Density-dependent factors are affected by population size; density-independent factors are not (C) Density-dependent factors only affect large animals (D) There is no real difference between them

83. What is a food web?

(A) A diagram showing multiple interconnected food chains in an ecosystem (B) A single chain of organisms eating each other (C) A web spiders use to catch food (D) A list of all plants in an area

84. What role do fires play in maintaining grassland biomes?

(A) Fires have no effect on grasslands (B) Fires destroy grasslands permanently (C) Fires prevent trees from taking over, recycle nutrients, and stimulate new grass growth (D) Fires only occur in forests, not grasslands

85. What is an estuary?

(A) A type of desert oasis (B) A mountain lake fed by glaciers (C) A deep ocean trench (D) A partially enclosed body of water where freshwater from rivers meets and mixes with saltwater from the ocean

86. What is the main difference between a savanna and a temperate grassland?

(A) Savannas have more grass (B) Savannas are tropical with scattered trees and distinct wet/dry seasons; temperate grasslands have no trees and four seasons (C) Temperate grasslands are hotter (D) There is no difference

Write the answer

87. What is a population density?

Answer: _____

88. What is carrying capacity?

Answer: _____

89. What is the concept of ecological integrity?

Answer: _____

90. How do ecosystem services contribute to human well-being?

Answer: _____

Match each question to its answer

1. What is an energy pyramid? →

2. What is niche partitioning and how does it reduce competition? →

3. What is a dead zone in the ocean? →

4. What percentage of energy is typically passed from one trophic level to the next? →

5. Which trophic level has the most energy in a food web? →

(A) A diagram showing that energy decreases at each higher trophic level

(B) When competing species evolve to use different portions of a shared resource (different food sizes, different feeding times, different microhabitats), reducing direct competition

(C) Producers (the bottom level)

(D) About 10%

(E) An area with oxygen levels too low to support most marine life, usually caused by nutrient pollution and algal decomposition

10. Systems Thinking in Ecology

Circle the correct answer

91. Why are grasslands also called 'breadbaskets of the world'?

(A) Because they are shaped like bread baskets (B) Because bread grows naturally there (C) Because their rich soil is ideal for growing grain crops like wheat and corn (D) Because early humans kept bread in baskets there

92. What is the difference between primary and secondary succession?

(A) Primary only occurs in water (B) There is no real difference (C) Primary succession begins on bare substrate with no soil; secondary succession begins on

disturbed land that still has soil (D) Primary is faster than secondary

93. What is the Red Queen hypothesis?

(A) Species must constantly evolve and adapt just to maintain their existing fitness relative to the organisms they co-evolve with (B) Evolution only occurs during environmental disasters (C) Species naturally become more fit over time without effort (D) The most beautiful species survive longest

94. What is the photic zone in aquatic biomes?

(A) The upper layer of water where enough sunlight penetrates for photosynthesis (B) Any body of water with fish (C) The deepest, darkest part of the ocean (D) The zone where photos are taken underwater

95. What is the role of a decomposer in an ecosystem?

(A) Breaking down dead organisms and recycling nutrients back into the soil (B) Producing oxygen through photosynthesis (C) Storing water for other organisms (D) Hunting and eating live prey

96. Why do invasive species often grow rapidly in new environments?

(A) Because they are always larger than native species (B) Because they can photosynthesize (C) Because they don't need food or water (D) Because they usually have few natural predators or diseases to control their population

Write the answer

97. What is a dead zone in the ocean?

Answer: _____

98. How do mangrove trees adapt to living in saltwater?

Answer: _____

99. How do payment for ecosystem services (PES) programs work?

Answer: _____

100. What is an invasive species?

Answer: _____

Match each question to its answer

1. What is permafrost? →

2. What is an adaptation? →

3. What is carrying capacity? →

4. Which organism would be most affected if the grasshopper population suddenly increased: the grass, the frog, or the hawk? →

5. What would most likely happen if a predator species was removed from an

ecosystem? →

- (A) Prey populations would increase dramatically, potentially leading to overgrazing and ecosystem degradation
 - (B) An inherited trait that increases an organism's chance of survival and reproduction in its specific environment
 - (C) The maximum population size an environment can sustain indefinitely
 - (D) The grass, because grasshoppers directly eat it
 - (E) A layer of soil that remains frozen year-round, even during summer
-

11. Conservation Applications

Circle the correct answer

101. What is a scavenger?

- (A) An animal that hunts live prey (B) A plant that grows on dead trees (C) An animal that feeds on dead organisms it did not kill (D) An animal that only eats plants

102. How does biodiversity loss threaten food security?

- (A) Only wild animals are affected by biodiversity loss (B) Fewer species means more food for humans (C) Reducing genetic diversity in crops and livestock makes food systems more vulnerable to diseases, pests, and climate change (D) Biodiversity loss has no connection to food

103. What is camouflage?

- (A) Being the brightest animal in the area (B) Wearing armor for protection (C) A physical adaptation where an organism's coloring or shape helps it blend in with its surroundings (D) Moving to a new habitat

104. What is the Anthropocene and why is it ecologically significant?

- (A) A type of rock formation (B) The time period before humans existed (C) A proposed geological epoch defined by humanity becoming the dominant force shaping Earth's geology and ecosystems, characterized by mass extinction, climate change, and global pollution (D) A brand of anthropology textbook

105. What is the concept of planetary boundaries?

- (A) The limits of space exploration (B) The physical boundary of Earth's atmosphere (C) A framework identifying nine Earth system processes with critical thresholds that, if crossed, could generate large-scale environmental changes threatening human civilization (D) A political agreement about country borders

106. What is parasitism?

(A) Both organisms benefit (B) Both organisms are harmed equally (C) Neither organism is affected (D) A symbiotic relationship where one organism (the parasite) benefits at the expense of the other (the host)

Write the answer

107. What is metapopulation dynamics?

Answer: _____

108. What role do natural predators play in maintaining healthy prey populations?

Answer: _____

109. What is a trophic level?

Answer: _____

110. What would most likely happen if all the producers in an ecosystem disappeared?

Answer: _____

Match each question to its answer

1. What is ecological connectivity and why does it matter? →

2. What biome has the greatest biodiversity on Earth? →

3. What is natural selection? →

4. How does the debt-for-nature swap mechanism work? →

5. What is a microhabitat? →

(A) Tropical rainforest

(B) A small, specialized habitat within a larger ecosystem that has its own unique conditions

(C) The degree to which the landscape facilitates or impedes organism movement between habitat patches, affecting gene flow, population viability, and species persistence

(D) A portion of a developing nation's foreign debt is forgiven in exchange for the country committing to fund domestic conservation programs with the freed-up resources

(E) The process where organisms with traits better suited to their environment survive and reproduce more successfully

12. Advanced Biogeochemical Cycles

Circle the correct answer

111. What is the extinction debt concept?

(A) The delayed extinction of species following habitat loss — species may persist temporarily but are committed to eventual extinction because remaining habitat is insufficient for long-term viability (B) The cost of preventing extinction (C) Species that are already extinct (D) A financial debt owed by extinct species

112. How does altitude affect biome distribution similarly to latitude?

(A) Higher altitude always means more rain (B) Altitude has no effect on biomes (C) Mountains only have one biome type (D) Going higher in altitude is like going to higher latitudes — both get colder, creating similar biome transitions

113. What is the concept of ecological resilience versus engineering resilience?

(A) Engineering resilience measures how quickly a system returns to equilibrium after disturbance; ecological resilience measures how much disturbance a system can absorb before shifting to a different state (B) They are the same concept (C) Ecological resilience means ecosystems never change (D) Engineering resilience is for machines only

114. How do Allee effects threaten small populations?

(A) Allee effects only affect plants (B) Below a critical population threshold, per-capita reproduction or survival decreases (due to difficulty finding mates, reduced group defense, or inbreeding), potentially driving the population to extinction (C) Small populations always recover naturally (D) Population size has no effect on individual fitness

115. What is the concept of ecosystem health?

(A) The physical beauty of an ecosystem (B) The number of trees in a forest (C) Whether all organisms in an ecosystem are disease-free (D) A holistic assessment of an ecosystem's organization, vigor (productivity), and resilience — analogous to evaluating multiple vital signs of health in medicine

116. If a disease killed most of the rabbits in a grassland food web, what would most likely happen to the fox population?

(A) The fox population would stay the same (B) Foxes would start eating grass instead (C) The fox population would increase (D) The fox population would decrease because they have less food available

Write the answer

117. What is the landscape of fear concept?

Answer: _____

118. What is novel ecosystem ecology?

Answer: _____

119. If a forest fire destroys 50% of a rabbit population's habitat, what is this an example of?

Answer: _____

120. What is rewilding?

Answer: _____

Match each question to its answer

1. What is an estuary? →

2. What is the competitive exclusion principle? →

3. How does acid rain affect freshwater ecosystems? →

4. What would most likely happen if a predator species was removed from an ecosystem? →

5. What is an ecotone? →

(A) It lowers water pH, which can kill fish and amphibians, dissolve calcium shells, and disrupt aquatic food chains

(B) A partially enclosed body of water where freshwater from rivers meets and mixes with saltwater from the ocean

(C) Two species competing for the exact same resources cannot coexist indefinitely

(D) A transition area between two different biomes where both communities overlap

(E) Prey populations would increase dramatically, potentially leading to overgrazing and ecosystem degradation

13. Interdisciplinary Ecology

Circle the correct answer

121. What is the difference between a food chain and a food web?

(A) There is no difference between them (B) A food chain shows a single pathway of energy flow, while a food web shows many interconnected pathways (C) A food chain is for water animals and a food web is for land animals (D) A food web has fewer organisms than a food chain

122. What is the tundra biome characterized by?

(A) Tall trees and heavy rainfall (B) Extremely cold temperatures, permafrost, and low-growing vegetation like mosses and lichens (C) Hot temperatures and sandy soil (D) Moderate temperatures and grasslands

123. How does the island biogeography theory explain species diversity?

(A) Larger islands closer to the mainland have more species because they receive more colonizers and have lower extinction rates (B) Smaller islands always have more species (C) All islands have the same number of species (D) Distance from mainland doesn't matter

124. What is an ecological niche?

(A) The hole where an animal sleeps (B) The type of food an animal prefers (C) The size of an animal's territory (D) The specific role and position a species occupies in its ecosystem, including what it eats, where it lives, and how it interacts with other species

125. What is the concept of One Health in ecology?

(A) A fitness program for ecologists (B) The recognition that human health, animal health, and ecosystem health are interconnected and must be studied and managed together (C) A healthcare plan for one organism (D) The idea that ecosystems only need one species to be healthy

126. What is environmental DNA (eDNA) and how is it used in ecology?

(A) DNA found only in laboratory environments (B) DNA that is specifically designed for environmental use (C) Genetic material shed by organisms into their environment (water, soil, air) that scientists can collect and analyze to detect species presence without directly observing them (D) Artificial DNA created by scientists

Write the answer

127. What is habitat fragmentation?

Answer: _____

128. How does deforestation affect the carbon cycle?

Answer: _____

129. What is reconciliation ecology?

Answer: _____

130. What is bioremediation?

Answer: _____

Match each question to its answer

1. Which is an example of a density-independent limiting factor? →

2. What is a coral reef biome and why is it important? →

3. What is a population density? →

4. How do animals in the tundra adapt to extreme cold? →

5. How does deforestation contribute to the sixth mass extinction? →

- (A) The number of individuals per unit area
 - (B) An underwater ecosystem built by colonies of coral animals; it supports 25% of all marine species
 - (C) It destroys habitat for millions of species, fragments populations, disrupts ecosystems, and accelerates climate change — the primary driver of modern species loss
 - (D) They develop thick fur or feathers, store body fat, and some hibernate or migrate
 - (E) A severe drought that dries up a watering hole
-

14. Real-World Ecology Applications

Circle the correct answer

131. How do invasive species affect native biodiversity?

- (A) They only affect one trophic level (B) They have no effect on native species (C) They always increase biodiversity (D) They outcompete native species for resources, prey on native species, introduce diseases, and alter habitat structure, often reducing native biodiversity

132. Which organism would be most affected if the grasshopper population suddenly increased: the grass, the frog, or the hawk?

- (A) None of them would be affected (B) The hawk, because it's at the top (C) The grass, because grasshoppers directly eat it (D) The frog, because frogs eat grasshoppers

133. Why are there usually fewer top predators than herbivores in an ecosystem?

- (A) Because herbivores reproduce faster (B) Because predators are harder to find (C) Because predators choose to live alone (D) Because only 10% of energy transfers between trophic levels, so less energy is available at the top

134. What is the difference between density-dependent and density-independent limiting factors?

- (A) Density-independent factors only occur in deserts (B) Density-dependent factors are affected by population size; density-independent factors are not (C) Density-dependent factors only affect large animals (D) There is no real difference between them

135. What is an invasive species?

- (A) The most common species in an ecosystem (B) A species that has lived in an area for thousands of years (C) A non-native species introduced to an area where it causes ecological harm (D) Any species that migrates seasonally

136. What is the Anthropocene and why is it ecologically significant?

(A) A type of rock formation (B) The time period before humans existed (C) A proposed geological epoch defined by humanity becoming the dominant force shaping Earth's geology and ecosystems, characterized by mass extinction, climate change, and global pollution (D) A brand of anthropology textbook

Write the answer

137. Why do invasive species often grow rapidly in new environments?

Answer: _____

138. How do Allee effects threaten small populations?

Answer: _____

139. What is a dead zone in the ocean?

Answer: _____

140. How does the concept of ecological debt apply to human resource use?

Answer: _____

Match each question to its answer

1. What is the difference between a food chain and a food web? →

2. What is the nitrogen cycle? →

3. What would most likely happen if a predator species was removed from an ecosystem? →

4. What is the difference between alpha, beta, and gamma diversity? →

5. What is the relationship between the water cycle and the carbon cycle? →

(A) They are interconnected: CO₂ dissolves in water forming carbonic acid, ocean currents distribute carbon, and precipitation carries nutrients that support carbon-fixing organisms

(B) Prey populations would increase dramatically, potentially leading to overgrazing and ecosystem degradation

(C) A food chain shows a single pathway of energy flow, while a food web shows many interconnected pathways

(D) Alpha diversity is species richness within a single habitat; beta diversity is the turnover of species between habitats; gamma diversity is total diversity across all habitats in a region

(E) The biogeochemical process by which nitrogen is converted between its various chemical forms as it circulates through the atmosphere, soil, water, and organisms

15. Ecology Misconceptions & Reasoning

Circle the correct answer

141. How do mycorrhizal fungi help plants?

(A) They have no relationship with plants (B) They eat plant roots for food (C) They form symbiotic relationships with plant roots, extending the root system to absorb more water and nutrients (especially phosphorus) in exchange for sugars (D) They protect plants from sunlight

142. Why do invasive species often grow rapidly in new environments?

(A) Because they are always larger than native species (B) Because they can photosynthesize (C) Because they don't need food or water (D) Because they usually have few natural predators or diseases to control their population

143. What is a climax community?

(A) The first community to appear after a disturbance (B) The final, stable stage of ecological succession that persists until a major disturbance occurs (C) Any community that has predators (D) The community with the most individual organisms

144. What is a producer in a food web?

(A) An organism that only eats plants (B) An organism that makes its own food using sunlight (C) An organism that eats other animals (D) An organism that breaks down dead matter

145. What is a coral reef biome and why is it important?

(A) A deep-sea volcanic vent (B) An artificial structure built by humans (C) An underwater ecosystem built by colonies of coral animals; it supports 25% of all marine species (D) A rocky shoreline covered in seaweed

146. What is the edge effect in ecology?

(A) The effect of being at the edge of a continent (B) The advantage of being at the top of a food chain (C) Competition between species at the edge of their range (D) Changes in species composition and environmental conditions that occur at the boundary between two different habitats

Write the answer

147. What would happen to a population if birth rate equals death rate and there is no immigration or emigration?

Answer: _____

148. How do coral bleaching events illustrate ecosystem vulnerability to climate change?

Answer: _____

149. What are limiting factors?

Answer: _____

150. What is the Anthropocene and why is it ecologically significant?

Answer: _____

Match each question to its answer

1. What is mimicry in ecology? →

2. How do subsidized predators affect native prey populations? →

3. What is the difference between alpha, beta, and gamma diversity? →

4. What is the landscape of fear concept? →

5. What two factors most determine which biome exists in a given location? →

(A) The spatially variable perception of predation risk that influences how prey species use their habitat, often more powerfully than direct predation

(B) Alpha diversity is species richness within a single habitat; beta diversity is the turnover of species between habitats; gamma diversity is total diversity across all habitats in a region

(C) Predators subsidized by human resources (pet food, garbage, crops) maintain artificially high populations that then over-prey on native species

(D) Temperature and precipitation

(E) When one species evolves to closely resemble another species or an object for protection

16. Advanced Ecology Synthesis

Circle the correct answer

151. What is the difference between density-dependent and density-independent limiting factors?

(A) Density-independent factors only occur in deserts (B) Density-dependent factors are affected by population size; density-independent factors are not (C) Density-dependent factors only affect large animals (D) There is no real difference between them

152. What is parasitism?

(A) Both organisms benefit (B) Both organisms are harmed equally (C) Neither organism is affected (D) A symbiotic relationship where one organism (the parasite) benefits at the expense of the other (the host)

153. What is behavioral adaptation?

(A) A change in fur color (B) A change in an organism's actions or behavior that helps it survive in its environment (C) A chemical change in blood (D) A change in body structure

154. What is the canopy layer of a rainforest?

(A) The area above the tallest trees (B) The ground level of the forest (C) The underwater part of the forest (D) The dense upper layer of treetops that forms a continuous cover, blocking most sunlight from reaching the forest floor

155. In the following food chain: Grass → Grasshopper → Frog → Snake → Hawk, which organism is the tertiary consumer?

(A) Snake (B) Grasshopper (C) Frog (D) Hawk

156. How do payment for ecosystem services (PES) programs work?

(A) Those who benefit from ecosystem services (clean water, carbon storage) pay landowners or communities who manage the ecosystems that provide those services
(B) Only corporations can participate in PES (C) Governments pay ecosystems directly
(D) Ecosystems pay humans for using them

Write the answer

157. How does the island biogeography theory explain species diversity?

Answer: _____

158. What is a scavenger?

Answer: _____

159. What is the original source of energy for most food webs on Earth?

Answer: _____

160. What is an ecological footprint?

Answer: _____

Match each question to its answer

1. What is a trophic level? →

2. What is rewilding? →

3. What four factors determine whether a population grows or shrinks? →

4. What is the extinction debt concept? →

5. How does the mass ratio hypothesis differ from the keystone species concept? →

- (A) The mass ratio hypothesis states that ecosystem properties are primarily determined by the traits of the most abundant species, while keystone species have outsized effects relative to their abundance
 - (B) Births, deaths, immigration, and emigration
 - (C) The delayed extinction of species following habitat loss — species may persist temporarily but are committed to eventual extinction because remaining habitat is insufficient for long-term viability
 - (D) The conservation approach of restoring natural ecosystems by reintroducing native species and removing human interventions to let natural processes recover
 - (E) A feeding position in a food chain or food web
-

Riddle & Joke Break

Guess the answer, then check the key!

161. I take energy from the sun and turn it into food. I'm at the bottom of every food chain. What am I?

162. I eat dead plants and animals and return their nutrients to the soil. Without me, the world would be buried in waste. What am I?

163. I'm hot during the day, cold at night, and almost never rain falls on me. Yet I'm full of life -- cacti, lizards, and scorpions all call me home. What biome am I?

164. I eat only plants. I have flat teeth for grinding leaves and grasses. What kind of consumer am I?

165. I'm the layer of the rainforest where most animals live. Sunlight reaches me, but I'm not at the very top. What am I?

166. A pond has 10 frogs, 100 mosquitoes, and 2 herons. Which population is most likely the apex predator?

167. I'm a relationship between two species where both benefit. A bee gets nectar from a flower while spreading the flower's pollen. What am I called?

168. I'm the role an organism plays in its ecosystem -- what it eats, where it lives, and how it interacts with others. What am I?

169. Why did the mushroom get invited to every forest party?

170. Why don't predators ever play hide and seek with prey?

171. What did the photosynthesizing leaf say to the sun?

172. Why was the food chain so well-organized?

173. Why did the tundra refuse to chill out?

174. What do you call a sneaky decomposer?

Fun Facts

- Did you know? A single teaspoon of healthy soil can contain over 1 billion bacteria, plus fungi and tiny insects. The soil beneath your feet is more alive than most science fiction planets!
 - Did you know? The Amazon rainforest produces about 20% of the world's oxygen. It's often called the "lungs of the planet" because so many of its plants are photosynthesizing at once!
 - Did you know? Honey bees are responsible for pollinating about 1/3 of the food humans eat. Without them, apples, almonds, blueberries, and pumpkins would basically vanish from grocery stores!
 - Did you know? The Saharan silver ant can survive in temperatures over 120 degrees F (50 C). It has long legs to lift it off the burning sand and silver hairs that reflect heat like tiny mirrors!
 - Did you know? Sea otters keep kelp forests alive by eating sea urchins. Without otters, urchins multiply and eat all the kelp, turning underwater forests into barren "urchin deserts." That makes otters a keystone species!
 - Did you know? A single mature oak tree can support over 500 species of insects, birds, fungi, and mammals. One tree is basically an apartment building for biodiversity!
 - Did you know? The water you drink today has been on Earth for about 4 billion years. Earth recycles the same water through evaporation, condensation, and precipitation forever -- no new water is being made!
 - Did you know? Wolves were reintroduced to Yellowstone National Park in 1995 after being absent for 70 years. Their return changed the ecosystem so much that rivers literally changed course as elk behavior shifted and plants regrew!
-

Answer Key

1. B — An organism that makes its own food using sunlight
2. A — Breaking down dead organisms and recycling nutrients back into the soil
3. B — The flow of energy from one organism to another
4. C — An animal that eats only plants

5. C — An animal that eats only other animals
6. A — An animal that eats both plants and animals
7. A diagram showing multiple interconnected food chains in an ecosystem
8. Producers (the bottom level)
9. About 10%
10. An animal that eats producers (plants)
Matching (Food Webs): 1→D, 2→A, 3→E, 4→B, 5→C
11. B — A group of organisms of the same species living in the same area at the same time
12. B — The maximum population size an environment can sustain indefinitely
13. B — Environmental conditions that restrict population growth
14. B — Density-dependent factors are affected by population size; density-independent factors are not
15. D — A J-shaped curve that gets steeper over time
16. D — An S-shaped curve that levels off at the carrying capacity
17. Individuals moving into a population from another area
18. Births, deaths, immigration, and emigration
19. When organisms struggle for the same limited resources
20. The population exceeded its carrying capacity and ran out of resources
Matching (Population Dynamics): 1→E, 2→B, 3→D, 4→A, 5→C
21. B — Temperature and precipitation
22. C — Tropical rainforests are near the equator with warm temperatures year-round; temperate rainforests are at higher latitudes with cooler temperatures
23. D — Because they are located in areas where dry air sinks, preventing cloud formation
24. A — Thick, waxy coatings on leaves and stems that reduce water loss
25. B — Extremely cold temperatures, permafrost, and low-growing vegetation like mosses and lichens
26. B — A layer of soil that remains frozen year-round, even during summer

27. Because their rich soil is ideal for growing grain crops like wheat and corn
28. Savannas are tropical with scattered trees and distinct wet/dry seasons; temperate grasslands have no trees and four seasons
29. Tropical rainforest
30. A small, specialized habitat within a larger ecosystem that has its own unique conditions
Matching (Biomes): 1→E, 2→A, 3→C, 4→D, 5→B
31. C — The process where organisms with traits better suited to their environment survive and reproduce more successfully
32. C — A physical adaptation where an organism's coloring or shape helps it blend in with its surroundings
33. B — When one species evolves to closely resemble another species or an object for protection
34. D — It provides camouflage in their snowy Arctic habitat, helping them hunt seals
35. B — A change in an organism's actions or behavior that helps it survive in its environment
36. A — To conserve energy when food is scarce and temperatures are dangerously cold
37. The specific role and position a species occupies in its ecosystem, including what it eats, where it lives, and how it interacts with other species
38. When unrelated species independently evolve similar traits because they face similar environmental challenges
39. In their thick, fleshy stems that expand to hold water during rare rainfall
40. Bright warning colors that signal to predators that an organism is toxic, venomous, or dangerous
Matching (Adaptation): 1→D, 2→A, 3→E, 4→B, 5→C
41. D — The biogeochemical process by which nitrogen is converted between its various chemical forms as it circulates through the atmosphere, soil, water, and organisms
42. D — The process of converting atmospheric nitrogen gas (N₂) into ammonia or related compounds that organisms can use
43. B — The biogeochemical cycle by which carbon moves between the atmosphere, oceans, soil, rocks, and living organisms

44. A — It releases stored carbon into the atmosphere and reduces the number of trees available to absorb CO₂ through photosynthesis
45. C — The excessive enrichment of a water body with nutrients (usually nitrogen and phosphorus), causing algal blooms and oxygen depletion
46. D — Phosphorus cycles through rocks, soil, water, and organisms but does NOT have a significant atmospheric phase
47. The gradual buildup of a substance (like a toxin) in an organism's body over its lifetime because it absorbs it faster than it can eliminate it
48. The increasing concentration of a persistent substance in organisms at each higher trophic level of a food chain
49. Wetland plants and microorganisms filter pollutants, absorb excess nutrients, and trap sediment, acting as natural water treatment systems
50. It distributes freshwater across Earth's surface, regulates temperature, transports nutrients, and shapes habitats
Matching (Nutrient Cycles): 1→B, 2→A, 3→D, 4→C, 5→E
51. B — An ecosystem's ability to absorb disturbance and reorganize while maintaining its essential structure and functions
52. C — Rising temperatures shift suitable habitat zones toward higher latitudes and elevations, forcing species to migrate, adapt, or face extinction
53. A — A measure of the amount of natural resources a person or population consumes and waste generated, expressed as the area of land needed to sustain that consumption
54. D — Greater biodiversity generally provides more robust ecosystem services because diverse communities are more productive and resilient
55. D — They outcompete native species for resources, prey on native species, introduce diseases, and alter habitat structure, often reducing native biodiversity
56. D — The breaking up of continuous habitat into smaller, isolated patches separated by human-modified land
57. Changes in species composition and environmental conditions that occur at the boundary between two different habitats
58. Rising ocean temperatures stress corals, causing them to expel their symbiotic algae, turning white and often dying — destroying habitat for thousands of species

59. Carrying capacity is the maximum population an environment can sustain; technology has repeatedly increased Earth's carrying capacity for humans through agriculture, medicine, and energy
60. Endangered species are at immediate risk of extinction; threatened species are likely to become endangered in the foreseeable future
Matching (Ecosystem Dynamics): 1→A, 2→B, 3→E, 4→C, 5→D
61. A — A species that significantly modifies, creates, or destroys habitats, thereby affecting the availability of resources for other organisms
62. A — Larger islands closer to the mainland have more species because they receive more colonizers and have lower extinction rates
63. C — Biodiversity is highest at intermediate levels of disturbance, because too little disturbance allows competitive exclusion and too much prevents establishment
64. B — The study of how groups of spatially separated populations of the same species interact through immigration and emigration between habitat patches
65. C — Ice and snow reflect sunlight (high albedo); as they melt due to warming, darker surfaces absorb more heat, causing more warming and more melting — a positive feedback loop
66. D — The study of the balance of chemical elements (like carbon, nitrogen, and phosphorus) in ecological interactions and processes
67. Species must constantly evolve and adapt just to maintain their existing fitness relative to the organisms they co-evolve with
68. When competing species evolve to use different portions of a shared resource (different food sizes, different feeding times, different microhabitats), reducing direct competition
69. Ecological debt accumulates when resource consumption exceeds the ecosystem's regenerative capacity, creating a deficit that future generations must address
70. Research shows that ecosystems with more species are generally more productive, more stable, and provide more ecosystem services than species-poor ecosystems
Matching (Advanced Ecology): 1→E, 2→C, 3→D, 4→A, 5→B
71. D — A holistic assessment of an ecosystem's organization, vigor (productivity), and resilience — analogous to evaluating multiple vital signs of health in medicine

72. C — Source habitats produce surplus individuals that emigrate to sink habitats where mortality exceeds reproduction; sinks persist only because of immigration from sources
73. C — Genetic material shed by organisms into their environment (water, soil, air) that scientists can collect and analyze to detect species presence without directly observing them
74. B — The mass ratio hypothesis states that ecosystem properties are primarily determined by the traits of the most abundant species, while keystone species have outsized effects relative to their abundance
75. C — The degree to which the landscape facilitates or impedes organism movement between habitat patches, affecting gene flow, population viability, and species persistence
76. C — Natural disturbances (fire, floods, windstorms) create a mosaic of habitat patches at different successional stages, increasing landscape-level biodiversity
77. The delayed extinction of species following habitat loss — species may persist temporarily but are committed to eventual extinction because remaining habitat is insufficient for long-term viability
78. Deliberately moving species to areas outside their current range where climate is projected to become suitable, preempting climate-driven habitat loss
79. The condition of an ecosystem that is considered characteristic of its natural region, including the composition and abundance of native species and biological communities, rates of ecological processes, and supporting environmental conditions
80. Below a critical population threshold, per-capita reproduction or survival decreases (due to difficulty finding mates, reduced group defense, or inbreeding), potentially driving the population to extinction
Matching (Ecosystem Assessment): 1→D, 2→E, 3→B, 4→A, 5→C
81. A — Predators subsidized by human resources (pet food, garbage, crops) maintain artificially high populations that then over-prey on native species
82. B — Density-dependent factors are affected by population size; density-independent factors are not
83. A — A diagram showing multiple interconnected food chains in an ecosystem
84. C — Fires prevent trees from taking over, recycle nutrients, and stimulate new grass growth

85. D — A partially enclosed body of water where freshwater from rivers meets and mixes with saltwater from the ocean
86. B — Savannas are tropical with scattered trees and distinct wet/dry seasons; temperate grasslands have no trees and four seasons
87. The number of individuals per unit area
88. The maximum population size an environment can sustain indefinitely
89. The condition of an ecosystem that is considered characteristic of its natural region, including the composition and abundance of native species and biological communities, rates of ecological processes, and supporting environmental conditions
90. Ecosystems provide essential services including clean air and water, food production, climate regulation, flood protection, disease regulation, and cultural/recreational value
- Matching (Cross-Topic Connections): 1→A, 2→B, 3→E, 4→D, 5→C
91. C — Because their rich soil is ideal for growing grain crops like wheat and corn
92. C — Primary succession begins on bare substrate with no soil; secondary succession begins on disturbed land that still has soil
93. A — Species must constantly evolve and adapt just to maintain their existing fitness relative to the organisms they co-evolve with
94. A — The upper layer of water where enough sunlight penetrates for photosynthesis
95. A — Breaking down dead organisms and recycling nutrients back into the soil
96. D — Because they usually have few natural predators or diseases to control their population
97. An area with oxygen levels too low to support most marine life, usually caused by nutrient pollution and algal decomposition
98. They have special salt-filtering roots and can excrete excess salt through their leaves
99. Those who benefit from ecosystem services (clean water, carbon storage) pay landowners or communities who manage the ecosystems that provide those services
100. A non-native species introduced to an area where it causes ecological harm
- Matching (Systems Thinking in Ecology): 1→E, 2→B, 3→C, 4→D, 5→A

101. C — An animal that feeds on dead organisms it did not kill
102. C — Reducing genetic diversity in crops and livestock makes food systems more vulnerable to diseases, pests, and climate change
103. C — A physical adaptation where an organism's coloring or shape helps it blend in with its surroundings
104. C — A proposed geological epoch defined by humanity becoming the dominant force shaping Earth's geology and ecosystems, characterized by mass extinction, climate change, and global pollution
105. C — A framework identifying nine Earth system processes with critical thresholds that, if crossed, could generate large-scale environmental changes threatening human civilization
106. D — A symbiotic relationship where one organism (the parasite) benefits at the expense of the other (the host)
107. The study of how groups of spatially separated populations of the same species interact through immigration and emigration between habitat patches
108. They prevent prey from overshooting carrying capacity and help maintain ecosystem balance
109. A feeding position in a food chain or food web
110. All consumer populations would eventually decline because the energy source is gone
Matching (Conservation Applications): 1→C, 2→A, 3→E, 4→D, 5→B
111. A — The delayed extinction of species following habitat loss — species may persist temporarily but are committed to eventual extinction because remaining habitat is insufficient for long-term viability
112. D — Going higher in altitude is like going to higher latitudes — both get colder, creating similar biome transitions
113. A — Engineering resilience measures how quickly a system returns to equilibrium after disturbance; ecological resilience measures how much disturbance a system can absorb before shifting to a different state
114. B — Below a critical population threshold, per-capita reproduction or survival decreases (due to difficulty finding mates, reduced group defense, or inbreeding), potentially driving the population to extinction
115. D — A holistic assessment of an ecosystem's organization, vigor (productivity), and resilience — analogous to evaluating multiple vital signs of health in

medicine

116. D — The fox population would decrease because they have less food available
117. The spatially variable perception of predation risk that influences how prey species use their habitat, often more powerfully than direct predation
118. The study of ecosystems that have been fundamentally altered by human activity and contain new combinations of species that never existed historically
119. A density-independent limiting factor
120. The conservation approach of restoring natural ecosystems by reintroducing native species and removing human interventions to let natural processes recover
Matching (Advanced Biogeochemical Cycles): 1→B, 2→C, 3→A, 4→E, 5→D
121. B — A food chain shows a single pathway of energy flow, while a food web shows many interconnected pathways
122. B — Extremely cold temperatures, permafrost, and low-growing vegetation like mosses and lichens
123. A — Larger islands closer to the mainland have more species because they receive more colonizers and have lower extinction rates
124. D — The specific role and position a species occupies in its ecosystem, including what it eats, where it lives, and how it interacts with other species
125. B — The recognition that human health, animal health, and ecosystem health are interconnected and must be studied and managed together
126. C — Genetic material shed by organisms into their environment (water, soil, air) that scientists can collect and analyze to detect species presence without directly observing them
127. The breaking up of continuous habitat into smaller, isolated patches separated by human-modified land
128. It releases stored carbon into the atmosphere and reduces the number of trees available to absorb CO₂ through photosynthesis
129. The science of finding ways for humans and wildlife to coexist in human-dominated landscapes, by modifying human activities to accommodate biodiversity
130. Using living organisms (bacteria, fungi, plants) to clean up environmental pollution

Matching (Interdisciplinary Ecology): 1→E, 2→B, 3→A, 4→D, 5→C

- 131. D — They outcompete native species for resources, prey on native species, introduce diseases, and alter habitat structure, often reducing native biodiversity
- 132. C — The grass, because grasshoppers directly eat it
- 133. D — Because only 10% of energy transfers between trophic levels, so less energy is available at the top
- 134. B — Density-dependent factors are affected by population size; density-independent factors are not
- 135. C — A non-native species introduced to an area where it causes ecological harm
- 136. C — A proposed geological epoch defined by humanity becoming the dominant force shaping Earth's geology and ecosystems, characterized by mass extinction, climate change, and global pollution
- 137. Because they usually have few natural predators or diseases to control their population
- 138. Below a critical population threshold, per-capita reproduction or survival decreases (due to difficulty finding mates, reduced group defense, or inbreeding), potentially driving the population to extinction
- 139. An area with oxygen levels too low to support most marine life, usually caused by nutrient pollution and algal decomposition
- 140. Ecological debt accumulates when resource consumption exceeds the ecosystem's regenerative capacity, creating a deficit that future generations must address

Matching (Real-World Ecology Applications): 1→C, 2→E, 3→B, 4→D, 5→A

- 141. C — They form symbiotic relationships with plant roots, extending the root system to absorb more water and nutrients (especially phosphorus) in exchange for sugars
- 142. D — Because they usually have few natural predators or diseases to control their population
- 143. B — The final, stable stage of ecological succession that persists until a major disturbance occurs
- 144. B — An organism that makes its own food using sunlight
- 145. C — An underwater ecosystem built by colonies of coral animals; it supports 25% of all marine species

146. D — Changes in species composition and environmental conditions that occur at the boundary between two different habitats
147. The population size would remain stable (zero population growth)
148. Rising ocean temperatures stress corals, causing them to expel their symbiotic algae, turning white and often dying — destroying habitat for thousands of species
149. Environmental conditions that restrict population growth
150. A proposed geological epoch defined by humanity becoming the dominant force shaping Earth's geology and ecosystems, characterized by mass extinction, climate change, and global pollution
Matching (Ecology Misconceptions & Reasoning): 1→E, 2→C, 3→B, 4→A, 5→D
151. B — Density-dependent factors are affected by population size; density-independent factors are not
152. D — A symbiotic relationship where one organism (the parasite) benefits at the expense of the other (the host)
153. B — A change in an organism's actions or behavior that helps it survive in its environment
154. D — The dense upper layer of treetops that forms a continuous cover, blocking most sunlight from reaching the forest floor
155. A — Snake
156. A — Those who benefit from ecosystem services (clean water, carbon storage) pay landowners or communities who manage the ecosystems that provide those services
157. Larger islands closer to the mainland have more species because they receive more colonizers and have lower extinction rates
158. An animal that feeds on dead organisms it did not kill
159. The Sun
160. A measure of the amount of natural resources a person or population consumes and waste generated, expressed as the area of land needed to sustain that consumption
Matching (Advanced Ecology Synthesis): 1→E, 2→D, 3→B, 4→C, 5→A
161. A producer! Plants and algae use photosynthesis to make their own food.
162. A decomposer! Fungi, bacteria, and worms all play this role.

- 163. A desert!
- 164. A herbivore! Examples include cows, deer, and rabbits.
- 165. The canopy! It's the dense layer of treetops that shelters most rainforest species.
- 166. The herons! They eat frogs, which eat mosquitoes -- making herons top of this food chain.
- 167. Mutualism! A type of symbiotic relationship.
- 168. A niche! Each species has its own unique niche.
- 169. Because it was a fungi to be around!
- 170. Because the prey always squeaks first!
- 171. "You really make my day -- I couldn't make food without you!"
- 172. Because every link knew its place!
- 173. It said it was already cold enough, thanks!
- 174. A fun-gus in disguise!

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