# Chapter 34 – Ecology Succession & Population Growth

**Highlighted portions are HONORS only.**

1. Ecosystems
	1. \_\_\_\_\_ Flows *through* the components of an ecosystem 🡪 \_\_\_\_\_ level to trophic level in living and non-living ways.
	2. \_\_\_\_\_ Cycling is the transfer of \_\_\_\_-living materials *WITHIN* the ecosystem.
	3. Energy and Matter move through an ecosystem in very different ways.
2. Energy moves through an ecosystem in a \_\_\_-way path.
3. Energy enters an ecosystem in the form of \_\_\_\_\_ and exits the ecosystem in the form of \_\_\_\_\_.
4. This energy cannot be \_\_\_\_\_.
5. \_\_\_\_\_, however, is recycled within and between \_\_\_\_\_.
6. Biochemical Cycles
	1. Overview
		1. Organisms need more than just energy to survive. They also need \_\_\_\_\_, minerals, \_\_\_\_\_, etc.
		2. Most organisms are made of \_\_\_\_\_, but organisms cannot use these elements unless the elements are in a chemical form that cells can take up.
		3. Matter passes between organisms and parts of the biospheres through \_\_\_\_\_ Cycles.
		4. Matter (\_\_\_\_\_) can cycle through the biosphere because biological systems don’t use up matter, they \_\_\_\_\_ it.
		5. Biogeochemical cycles pass the same molecule around again and again within the biosphere.
	2. W\_\_\_\_\_ Cycle
7. All living things require water to survive.
8. \_\_\_\_\_: Major Reservoir
9. Main Processes:
10. \_\_\_\_\_: water changes from \_\_\_\_\_ form to atmospheric \_\_\_\_\_.
11. \_\_\_\_\_: water vapor condenses into tiny droplets (\_\_\_\_\_).
12. \_\_\_\_\_: water returns to the earth’s surface.
13. \_\_\_\_\_: water is \_\_\_\_\_ into the ground (versus run off). Percolation.
14. Water seeps into the soil to be absorbed by \_\_\_\_\_ roots.
15. \_\_\_\_\_ directly drink water or eat plants that contain water.
16. Water returns to where it came from by:
17. Plant \_\_\_\_\_.
18. \_\_\_\_\_ from land and water bodies.
	1. C\_\_\_\_\_ Cycle
		1. Carbon is part of all \_\_\_\_\_ molecules.
		2. Main Reservoir: \_\_\_\_\_.
		3. Plants absorb it through Photosynthesis to produce sugar that they “burn” to make energy.
		4. Animals get it by eating plants or other animals.
		5. Cellular \_\_\_\_\_ releases Carbon back to the atmosphere as \_\_\_\_\_.
		6. \_\_\_\_\_ Effect
19. Life on Earth depends on the “greenhouse effect”.
20. Carbon dioxide, water vapor, and other gases trap the \_\_\_\_\_ from the sun in our atmosphere.
21. This \_\_\_\_\_ the Earth and \_\_\_\_\_ it from the deep cold of space.
22. Carbon dioxide is a greenhouse gas, meaning that the increase of carbon dioxide also increases the greenhouse effect.
23. Over the past 150 years, earth’s temperature has risen 1.4⁰ F, leading to the current period of Climate Change.
	* 1. \_\_\_\_\_ Change
24. A 0.5°C \_\_\_\_\_ in the average temperature of the biosphere in the past 120 years (abiotic factor).
25. Some scientists believe the rising temperature may be due to \_\_\_\_\_ variations in climate.
26. Others believe it is caused by \_\_\_\_\_ activities adding carbon dioxide and other greenhouse gases into the atmosphere, making the atmosphere retain more heat.
27. More carbon dioxide from burning \_\_\_\_\_ fuels, cutting down \_\_\_\_\_ and burning forests.
	* 1. Global Warming Effects
28. The \_\_\_\_\_ is the major absorber of \_\_\_\_\_. \_\_\_\_\_ ocean water absorbs \_\_\_\_\_ CO2.
29. Polar \_\_\_\_\_ melt adding freshwater to the oceans (*salt water*).
30. Ocean levels \_\_\_\_\_ (removing land).
31. The different densities between salt & fresh water produces \_\_\_\_\_ currents.
32. New ocean currents change \_\_\_\_\_ patterns and form \_\_\_\_\_ weather (*floods, typhoons, cyclones, tsunamis & droughts*)
	* 1. Major Greenhouse Gases
33. Carbon dioxide (burning \_\_\_\_\_ fuels, \_\_\_\_\_)
34. \_\_\_\_\_ (livestock, \_\_\_\_\_)
35. Nitrous oxide (\_\_\_\_\_)
36. W\_\_\_\_\_
37. O\_\_\_\_\_
	1. N\_\_\_\_\_ Cycle
38. Atmospheric Nitrogen (\_\_\_) makes up nearly \_\_\_\_\_ % of air.
	1. Organisms cannot use it in that form.
	2. \_\_\_\_\_ are needed to:
39. convert nitrogen into usable forms.
40. to release it back to the atmosphere.
41. Bacteria “fix” it by producing \_\_\_\_\_ (NH3) 🡪 \_\_\_\_\_.
42. Bacteria \_\_\_\_\_ ammonia to Nitrites and nitrates that enters \_\_\_\_\_ (Ex. Legumes) 🡪 “\_\_\_\_\_”.
43. Animals get nitrogen by eating plants or other animals.
44. Bacteria also \_\_\_\_\_ organic matter and return Nitrogen back into the atmosphere 🡪 \_\_\_\_\_.
45. Community Ecology: Interactions
	1. C\_\_\_\_\_:
		1. A community is all of the \_\_\_\_\_ organisms found in a particular area.
		2. When organisms live in communities, they \_\_\_\_\_ and have a powerful effect on the \_\_\_\_\_.
	2. Different types of community interactions include competition, predation, and symbiosis (mutualism, commensalism, parasitism).
		1. C\_\_\_\_\_
46. Competition occurs when organisms of the same or different species attempt to use the same \_\_\_\_\_ in the same \_\_\_\_\_ at the same \_\_\_\_\_.
47. Competition involves an interaction where two species require the same \_\_\_\_\_ resource such as
48. \_\_\_\_\_, water,
49. \_\_\_\_\_, or
50. \_\_\_\_\_.
51. A resource is an element needed for survival (food, water, shelter, or sunlight).
52. What is a resource?
53. A \_\_\_\_\_ refers to anything that is required for \_\_\_\_\_.
54. Resources might include: food, water, light, nesting sites, or room to grow.
55. When organisms are competing for the same resource, there is often a winner and a loser.
56. The winner thrives and the loser fails to survive.
57. This is called the “\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_.” Two species can’t have the same \_\_\_\_\_ in a habitat and stably coexist.
	* 1. Predation
58. \_\_\_\_\_ is an interaction in which one organism \_\_\_\_\_ and \_\_\_\_\_ on another organism.
59. The \_\_\_\_\_: the organism that does the killing and \_\_\_\_\_.
60. The \_\_\_\_\_ is the \_\_\_\_\_ organism.
61. Predation is a powerful force in the community.
62. Predation determines relationships in \_\_\_\_\_ and is a very effective regulator of \_\_\_\_\_.
63. Predators have \_\_\_\_\_ that make them \_\_\_\_\_.
64. Examples:
65. Snakes have \_\_\_\_\_ \_\_\_\_\_ pits to help them locate prey.
66. Predators may have acute \_\_\_\_\_, fangs, claws, poison, singers, and sharp teeth.
67. Spiders have \_\_\_\_\_ to catch their prey.
68. Prey must have features that help them \_\_\_\_\_ being \_\_\_\_\_ and eaten.
69. The prey may have the ability to run very fast to escape the predator.
70. The prey may be \_\_\_\_\_ to avoid \_\_\_\_\_.
71. The prey may have \_\_\_\_\_ that are advertised by \_\_\_\_\_ warning \_\_\_\_\_.
72. Plants and Herbivores
73. \_\_\_\_\_ are animals that eat \_\_\_\_\_.
74. This makes the herbivore a \_\_\_\_\_ on plants.
75. Many plants also have features that protect them from being eaten by animals.
76. Plants may have: sharp spines, \_\_\_\_\_, sticky airs, and tough leaves.
77. Plants may also produce: chemical compounds that are \_\_\_\_\_ or bad tasting.
78. Predation is an interaction where one species kills and consumes another species for survival.
	* 1. S\_\_\_\_\_: is a close and permanent relationship between organisms of different species.
	1. M\_\_\_\_\_
79. In mutualism \_\_\_\_\_ species \_\_\_\_\_ from the relationship.
80. Birds may eat ticks on the back of the antelope.
81. Flowers and insects have a mutualistic relationship.
82. The flower provides the insect with \_\_\_\_\_, and the insect helps the flower to reproduce by spreading \_\_\_\_\_.
	1. C\_\_\_\_\_:
83. The relationship between two different species in which one species \_\_\_\_\_ from the relationship. The other species is \_\_\_\_\_, neither harmed nor helped.
84. The large fish called a triggerfish is able to move large rocks that create feeding opportunities for smaller fish. There is \_\_\_ benefit to the triggerfish.
85. Barnacles are mollusks that attach to the skin of whales. The barnacle does not \_\_\_\_\_ the whale nor does it \_\_\_\_\_ the whale. The barnacle is a filter feeder and \_\_\_\_\_\_\_\_\_\_\_\_\_ from the constant flow of water. The whale doesn’t even notice the barnacles.
	1. P\_\_\_\_\_
86. Parasitism is the relationship between two different species in which one species is \_\_\_\_\_ and the other species is \_\_\_\_\_.
87. The parasite obtains its \_\_\_\_\_ from the other organism, the \_\_\_\_\_.
88. E\_\_\_\_\_ (external) are organisms that live on the skin (\_\_\_\_\_ the body) of a host, from which they derive their sustenance.
* Examples: \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
1. E\_\_\_\_\_ (internal) are organisms that live \_\_\_\_\_ the host’s body
* Examples: some \_\_\_\_\_, some \_\_\_\_\_, and intestinal \_\_\_\_\_ such as tapeworms.
1. E\_\_\_\_\_ S\_\_\_\_\_
	1. Overview
2. A \_\_\_\_\_ change in the types of \_\_\_\_\_ that live in a community.
3. Can be \_\_\_\_\_ or \_\_\_\_\_.
4. Both types occur by the gradual \_\_\_\_\_ of one plant community by another through \_\_\_\_\_ processes over time.
	1. P\_\_\_\_\_ Succession
5. Begins in a place without \_\_\_\_\_ (bare rock). E.g., After volcanic eruptions.
6. P\_\_\_\_\_ Species: \_\_\_\_\_ to colonize the area.
	1. First, \_\_\_\_\_ (do not need soil to survive) grow on rocks.
	2. Next, \_\_\_\_\_ grow to hold newly made soil.
	3. \_\_\_\_\_ break down \_\_\_\_\_ to form \_\_\_\_\_. When they die and decompose the add organic material to soil.
	4. \_\_\_\_\_ traps \_\_\_\_\_ and prevents soil \_\_\_\_\_.
7. The soil layer thickens, and grasses, wildflowers, and other plants begin to take over.
8. These plants die, and they add more \_\_\_\_\_ to the \_\_\_\_\_.
9. \_\_\_\_\_ and \_\_\_\_\_ can survive now.
10. \_\_\_\_\_, small birds, and mammals have begun to move into the area
11. What was once bare rock, now supports a variety of life.
	1. S\_\_\_\_\_ Succession
12. Begins in a place that \_\_\_\_\_ has \_\_\_\_\_ and was once the home of living organisms.
13. Community has been \_\_\_\_\_, but not \_\_\_\_\_.
14. Occurs \_\_\_\_\_ and has different pioneer species than primary succession.
15. Example: forest fires.
16. Secondary succession can be described as the \_\_\_\_\_ of a \_\_\_\_\_ that once supported plant and animal life but was \_\_\_\_\_ due to ecological disturbance.
17. Types of ecological \_\_\_\_\_ such as \_\_\_\_\_ and \_\_\_\_\_ can empty a habitat.
	1. C\_\_\_\_\_ C\_\_\_\_\_
18. A \_\_\_\_\_ group of plants and animals that is the end result of the \_\_\_\_\_.
19. Does not always mean big trees
	1. Communities and Ecosystems
20. Community: group of interacting populations.
21. Ecosystem: biotic community and the \_\_\_\_\_ or non-living environment.
22. B\_\_\_\_\_: Major types of ecosystems that occupy large geographic areas and share a characteristic \_\_\_\_\_ and group of \_\_\_\_\_.
	1. W\_\_\_\_\_ Biomes
* A biome is a \_\_\_\_\_ community of plant and animal life that is typical for a \_\_\_\_\_ region with one kind of climate:



* + 1. T\_\_\_\_\_ R\_\_\_\_\_
1. Rainfall: \_\_\_\_ cm/year. Average Temperature 25⁰ C.
2. Located at the \_\_\_\_\_) lush with tropical plants, trees, rivers, streams and rich, fertile soil. Most of the trees in the tropical rainforest keep their leaves.
3. Contain \_\_\_% of all plant and animal species on earth.
	* 1. T\_\_\_\_\_ D\_\_\_\_\_ Forest
4. Rainfall: \_\_\_ cm/year. Temperature Range \_\_\_⁰ C to -\_\_\_⁰ C.
5. These forests have \_\_\_\_\_ distinct \_\_\_\_\_ – as compared with the tropical rainforest – with many evergreen and deciduous trees, which are trees that shed their leaves in the fall and winter.
6. \_\_\_\_\_ winters and \_\_\_\_\_ summers support a variety of bird and animal life including bears that hibernate during the winter months, deer, elk, squirrels, foxes, wolves, coyotes and other small mammals.
	* 1. T\_\_\_\_\_ (Boreal Forest)
7. Rainfall: 60 cm/year. Average Temperature \_\_\_⁰ C.
8. Also called boreal forests.
9. As the \_\_\_\_\_ of the seven \_\_\_\_\_ biomes, taiga consists mostly of \_\_\_\_\_ like fir, pine and cedar with needle-shaped leaves that stay green most of the year.
10. \_\_\_\_\_, cold winters force migratory birds south and mammals to develop thick, white coats in the winter.
11. Trees block sunlight to forest floor … only lichens and moss can grow.
	* 1. D\_\_\_\_\_
12. Rainfall: \_\_\_ cm/year. Average Temperature \_\_\_⁰ C.
13. The desert biome is best known for its \_\_\_\_\_, \_\_\_\_\_ summers and cold winters. Most deserts receive \_\_\_\_\_ rainfall, and some of the plants evolved to retain water to thrive.
14. Cacti developed spines to protect their fleshy hulls that store water for those arid months. Snakes, lizards and other cold-blooded reptiles winter underground only to come out when the weather turns warm.
	* 1. G\_\_\_\_\_
15. Rainfall: \_\_\_\_\_ cm/year. Temperature Range \_\_\_⁰ C to \_\_\_⁰ C.
16. Represent the great \_\_\_\_\_ or \_\_\_\_\_ dominated by grasses, \_\_\_\_\_ plains and large herds of grazing animals like buffalo, bison or deer in the United States.
17. Enough rain falls to keep grasses and herbs growing, but dry summers and fires keep trees from taking hold.
	* 1. Savanna
18. Rainfall: \_\_\_\_\_ cm/year. Temperature Range 10⁰ C to 30⁰ C.
19. Unlike grasslands, savannas receive enough rain to support \_\_\_\_\_ in groups or dotted throughout the environment. But they do form canopies (no forests).
20. \_\_\_\_\_ season lasts up to 8 months. Dry season brings \_\_\_\_\_.
	* 1. T\_\_\_\_\_
21. Rainfall: \_\_\_ cm/year. Average Temperature -\_\_\_⁰ C.
22. Large swaths of land marked by flat, cold plains support low grasses, plants and green moss in the summer.
23. Much of the tundra includes \_\_\_\_\_ – frozen ground – just beneath the ground's surface. Mice and other small creatures go underground during winter freezes.
	* 1. M\_\_\_\_\_ Biomes
24. The marine biome is the world's \_\_\_\_\_ biome, covering three-quarters of the earth's surface.
25. The types of ecosystems found in this biome are oceans, coral reefs, and estuaries; all are saltwater environments.
26. Population Ecology
	1. Important characteristics of a population
27. G\_\_\_\_\_ D\_\_\_\_\_
28. The “\_\_\_\_\_” is the \_\_\_\_\_ that is inhabited by the population.
29. The range can vary in size. It may be just a few centimeters, such as the mold on a piece of bread.
30. Or the range may be huge, such as the migration area of whales.
31. D\_\_\_\_\_
32. Population Density is the \_\_\_\_\_ of individuals per unit \_\_\_\_\_.
33. Density is one of the main characteristics that describes a population.
34. Density varies on the species and the ecosystem.
35. Some populations have low densities, while other populations have high densities.
36. G\_\_\_\_\_ Rate
37. Some populations grow, others remain stable, and other decline
38. Population size is affected by:
39. Number of b\_\_\_\_\_
40. Number of d\_\_\_\_\_
41. Number of individuals that enter or leave the population:
42. I\_\_\_\_\_ = movement of individuals into area (growth)
43. E\_\_\_\_\_ = movement of individuals out of population (decline)
44. A\_\_\_ Structure
45. A Population’s Age Structure (distribution of age classes), helps determine whether it is \_\_\_\_\_, \_\_\_\_\_, or \_\_\_\_\_.
46. Population dominated by \_\_\_\_\_ individuals indicates \_\_\_\_\_ potential for future growth.
47. Population dominated by \_\_\_\_\_ individuals will be \_\_\_\_\_, or may even \_\_\_\_\_.
	1. An E\_\_\_\_\_ F\_\_\_\_\_ is a measure of Resource \_\_\_\_\_
48. An Ecological Footprint is an estimate of the amount of \_\_\_\_\_ required to provide the \_\_\_\_\_ materials an individual or a nation consumes, including \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
49. The growing demand of the human population for food, fibers, and water has largely been satisfied at the expense of other ecosystem services, but these practices cannot continue indefinitely.
50. \_\_\_\_\_ is the goal of developing, managing, and conserving Earth’s resources in ways that meet the needs of people today without compromising the ability of future generations to meet theirs.
	1. \_\_\_\_\_ Curves



1. Show the probability of \_\_\_\_\_ at a given age.
2. Graphs data that shows the number of survivors remaining in a population at each age.
3. Fall into 3 patterns that reflect the balance between number of offspring and the amount of parental care for each.
4. Curve I
5. Curve I is flat at the start, indicating a \_\_\_\_\_ death rate in the early and middle stages of life.
6. It drops steeply near the end indicating a \_\_\_\_\_ death rate as the organisms become \_\_\_\_\_.
7. An example is large mammals that produce very \_\_\_\_\_ offspring, but provide them with \_\_\_\_\_ parental care. Humans.
8. Curve III
9. Curve III drops sharply at the start, indicating a \_\_\_\_\_ death rate among the \_\_\_\_\_.
10. It flattens out as death rates decline for the few that do survive the early die-off.
11. This would include organisms that produce large \_\_\_\_\_ of \_\_\_\_\_, but provide them with \_\_\_\_\_ or no care.
12. Examples include: \_\_\_\_\_, many plants, and most marine \_\_\_\_\_.
13. Curve II
14. Curve II is intermediate to the above 2 curves.
15. There is a \_\_\_\_\_ death rate over the organism’s life span.
16. This may occur in \_\_\_\_\_ and \_\_\_\_\_.
	1. Types of Population Growth
17. Growth may be: EXPONENTIAL or **Logistic.**
18. Growth is \_\_\_\_\_ when resources are \_\_\_\_\_ (ideal conditions). This produces a \_\_-Shaped curve.
19. Eventually, Limiting Factors will restrict population growth, causing it to level off based on:
	1. Density-Dependent: Lack of \_\_\_\_\_, lack of \_\_\_\_\_, \_\_\_\_\_, etc.
	2. Density-Independent: Volcanic eruption, Tsunami, and other natural \_\_\_\_\_.



* 1. C\_\_\_\_\_ C\_\_\_\_\_
1. In response to these Limiting Factors the population may \_\_\_\_\_ at the habitat’s carrying capacity (K).
2. \_\_\_\_\_ number of \_\_\_\_\_ that the habitat can support indefinitely.
3. This results in \_\_\_\_\_ Growth (\_\_-shaped curve).
	1. R- and K-Selection Population Growth
4. The essence of the concept of r- and K-selection is that organisms strive to maximize their \_\_\_\_\_ for survival in either \_\_\_\_\_ (r-selection) or \_\_\_\_\_ (K-selection) environments.
5. This relates to the selection of combinations of traits in an organism that trade-off between \_\_\_\_\_ and \_\_\_\_\_ of offspring.
6. R selection has \_\_\_\_\_ growth but \_\_\_\_\_ survivorship due to ecological disruptions. Resources are used for Reproduction.
7. K selection has \_\_\_\_\_ growth with \_\_\_\_\_ survivorship due to more \_\_\_\_\_ and predictable environments. Resources are used to maximize long-term survival.

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| R-Selection | K-Selection |
| \_\_\_\_\_ population growth(R = growth rate) | Growth related to carrying capacity |
| \_\_\_\_\_ reproduction rate | \_\_\_\_\_ reproduction rate |
| \_\_\_\_\_ offspring | \_\_\_\_\_ offspring |
| \_\_\_\_\_ parental care | \_\_\_\_\_ parental care |
| \_\_\_\_\_ body size | \_\_\_\_\_ body size |
| \_\_\_\_\_ maturity | \_\_\_\_\_ maturity |
| Type III survivorship curve | Type I survivorship curve |
| \_\_\_\_\_ life span | \_\_\_\_\_ life span |

1. B\_\_\_\_\_
	1. \_\_\_\_\_ of life in Earth.
	2. Biodiversity is threatened by:
2. \_\_\_\_\_ Loss
3. \_\_\_\_\_
4. Climate Change
5. Invasive Species
6. \_\_\_\_\_ exploitation
	1. Biodiversity is \_\_\_\_\_ by tools such as:
7. Habitat \_\_\_\_\_
8. \_\_\_\_\_ Harvest (fishing)
9. Economic Incentives
10. Biotechnology