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| **AP Biology** | **Curriculum Map****Ecology**http://www.jeffersontownship.org/Portals/0/Images/Logos/hornet.jpg |
| Textbook Resources:**Chapters 52-56** | Month(s):**September** | Time Frame:**15 days (11/4 block)** | Assessment:**Reading Quizzes****Unit Test** |
| **Learning Targets** | **Support Text** | **Podcasts** |
| **EK 2.A.1: All living systems require constant input of free energy.** |
| 1. Life requires a highly ordered system.
	1. Order is maintained by constant free energy input into the system.
	2. Loss of order or free energy flow results in death.
	3. Increased disorder and entropy are offset by biological processes that maintain or increase order.
 | **Energy Flow in Ecosystems**Chapter 55 (p.1219)**Ecosystem Energy Budgets**Chapter 55.2 (p.1220-1223)**Energy Transfer Between Trophic Levels**Chapter 55.3 (p.1225-1226) | [Ecosystems](http://www.bozemanscience.com/047-ecosystems)[Ecosystem Ecology](http://www.bozemanscience.com/ap-es-007-ecosystem-ecology)[Energy Flow in Ecosystems](http://www.bozemanscience.com/ap-es-008-energy-flow-in-ecosystems) |
| 1. Changes in free energy availability can result in changes in population size.
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| 1. Changes in free energy availability can result in disruptions to an ecosystem.
	* + - Change in the producer level can affect the number and size of other trophic levels.
			- Change in energy resource levels such as sunlight can affect the number and size of the trophic levels.
 |
| **EK 2.A.2: Organisms capture and store free energy for use in biological processes.** |
| 1. Autotrophs capture free energy from physical sources in the environment.
2. Photosynthetic organisms capture free energy present in sunlight.
3. Chemosynthetic organisms capture free energy from small inorganic molecules in the environment, and this process can occur in the absence of oxygen.
 | **Photosynthesis**Chapter 10.1 (p.186-189)**Ecosystem Energy Budgets**Chapter 55.2 (p.1220-1223)**Energy Transfer Between Trophic Levels**Chapter 55.3 (p.1225-1226) | [Ecosystems](http://www.bozemanscience.com/047-ecosystems)[Energy Flow in Ecosystems](http://www.bozemanscience.com/ap-es-008-energy-flow-in-ecosystems) |
| 1. Heterotrophs capture free energy present in carbon compounds produced by other organisms.
2. Heterotrophs metabolize carbohydrates, lipids, and proteins by hydrolysis as sources of free energy.
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| **EK 2.A.3: Organisms must exchange matter with the environment to grow, reproduce and maintain organization.** |
| 1. Molecules and atoms from the environment are necessary to build new molecules.
2. Carbon moves from the environment to organisms where it is used to build carbohydrates, proteins, lipids or nucleic acids. Carbon is used in storage compounds and cell formation in all organisms.
3. Nitrogen moves from the environment to organisms where it is used to build proteins and nucleic acids. Phosphorus moves from the environment to organisms where it is used in nucleic acids and certain lipids.
 | **Biological and Geochemical Cycling**Chapter 55.4 (p.1227-1231) | [Ecosystems](http://www.bozemanscience.com/047-ecosystems)[Biogeochemical Cycles](http://www.bozemanscience.com/ap-es-011-biogeochemical-cycles) |
| **EK 2.C.1: Organisms use feedback mechanisms to maintain their internal environments and respond to external environmental changes.** |
| 1. Negative feedback mechanisms maintain dynamic homeostasis for a particular condition (variable) by regulating physiological processes, returning the changing condition back to its target set-point.
 | **Disturbance in an Ecosystem**Chapter 54.3 (p.1207-1210) | [Populations](http://www.bozemanscience.com/050-populations)[Ecosystem Change](http://www.bozemanscience.com/051-ecosystem-change) |
| 1. Positive feedback mechanisms amplify responses and processes in biological organisms. The variable initiating the response is moved farther away from the initial set-point. Amplification occurs when the stimulus is further activated which, in turn, initiates an additional response that produces system change.
 | **Earth is Changing Rapidly Due to Human Activities**Chapter 56.4 (p.1254-1260) |
| 1. Alterations in the mechanisms of feedback often results in harmful consequences.
 |
| **EK 2.D.1: All biological systems from cells and organisms to populations, communities and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy.** |
| 1. Cell activities are affected by interactions with biotic and abiotic factors.
* Water availability
* Sunlight
 | **Biotic & Abiotic Factors**Chapter 52.4 (p.1165-1167)**Seedling Germination**Figure 39.11 (p.831)**Etiolation & De-etiolation**Chapter 39.1 (p.821-824) | [Energy Flow in Ecosystems](http://www.bozemanscience.com/ap-es-008-energy-flow-in-ecosystems) |
| 1. Organism activities are affected by interactions with biotic and abiotic factors.
* Symbiosis (mutualism, commensalism, parasitism)
* Predator-prey relationships
* Water and nutrient availability, temperature, salinity, pH
 | **Community Interactions**Chapter 54.1 (p.1194-1195) | [Communities](http://www.bozemanscience.com/046-communities)[Populations](http://www.bozemanscience.com/050-populations) |
| 1. The stability of populations, communities and ecosystems is affected by interactions with biotic and abiotic factors.
	* + - Water and nutrient availability
			- Food chains and food webs
			- Species diversity
			- Population density
			- Algal blooms
 | **Terrestrial Biomes**Chapter 52.2 (p.1150-1156)**Aquatic Biomes**Chapter 52.3 (p.1157-1162)**Diversity & Trophic Structure**Chapter 54.2 (p.1200-1206)**Distribution of Species**Chapter (p.1163-1167)**Nutrient Limitation**Chapter 55.2 (p.1223-1225)**Nutrient Enrichment**Chapter 56.4 (p.1254-1255) | [Ecosystems](http://www.bozemanscience.com/047-ecosystems)[Ecosystem Change](http://www.bozemanscience.com/051-ecosystem-change)[Ecosystem Ecology](http://www.bozemanscience.com/ap-es-007-ecosystem-ecology)[Energy Flow in Ecosystems](http://www.bozemanscience.com/ap-es-008-energy-flow-in-ecosystems) |
| **EK 2.D.3: Biological systems are affected by disruptions to their dynamic homeostasis.** |
| 1. Disruptions to ecosystems impact the dynamic homeostasis or balance of the ecosystem.
* Invasive species
* Human impact
* Hurricanes, floods, earthquakes, volcanoes, fires
* Water limitation
 | **Diversity & Community Stability**Chapter 54.2 (p.1201-1202)**Human Activities Threaten Biodiversity**Chapter 56.1 (p.1239-1244)**Earth is Changing Rapidly Due to Human Activities**Chapter 56.4 (p.1254-1260)**Disturbance in an Ecosystem**Chapter 54.3 (p.1207-1210) | [Communities](http://www.bozemanscience.com/046-communities)[Populations](http://www.bozemanscience.com/050-populations)[Ecosystem Change](http://www.bozemanscience.com/051-ecosystem-change)[Natural Ecosystem Change](http://www.bozemanscience.com/ap-es-010-natural-ecosystem-change) |
| **EK 2.E.3: Timing and coordination of behavior are regulated by various mechanisms and are important in natural selection.** |
| 1. Responses to information and communication of information are vital to natural selection.
	1. Cooperative behavior within or between populations contributes to the survival of the populations.
		* + Niche and resource partitioning
			+ Mutualistic relationships (lichens)
 | **Community Interactions**Chapter 54.1 (p.1194-1195) | [Communities](http://www.bozemanscience.com/046-communities)[Populations](http://www.bozemanscience.com/050-populations)[Ecosystem Ecology](http://www.bozemanscience.com/ap-es-007-ecosystem-ecology) |
| **EK 4.A.5: Communities are composed of populations of organisms that interact in complex ways.** |
| 1. The structure of a community is measured and described in terms of species composition and species diversity.
 | **Species Diversity**Chapter 54.2 (p.1200-1201) | [Communities](http://www.bozemanscience.com/046-communities)[Ecosystem Ecology](http://www.bozemanscience.com/ap-es-007-ecosystem-ecology) |
| 1. Mathematical or computer models are used to illustrate and investigate population interactions within and environmental impacts on a community.
	* + - Predator/prey relationships
			- Graphical representations of field data
			- Introduction of species
			- Global climate change models
 | **Population Cycles**Chapter 53.5 (p. 1186-1186)**Case Studies**Figure 52.20 (p.1165)Figure 53.2 (p.1171)Figure 53.13 (p.1180)Figure 54.11 (p.1201)Figure 54.17 (p.1205)Figure 55.8 (p.1223) | [Ecosystems](http://www.bozemanscience.com/047-ecosystems)[Ecosystem Change](http://www.bozemanscience.com/051-ecosystem-change)[Natural Ecosystem Change](http://www.bozemanscience.com/ap-es-010-natural-ecosystem-change) |
| 1. Mathematical models and graphical representations are used to illustrate population growth patterns and interactions.
2. Reproduction without constraints results in the exponential growth of a population.
3. A population can produce a density of individuals that exceeds the system’s resource availability.
4. As limits to growth due to density-dependent and density- independent factors are imposed, a logistic growth model generally ensues.
5. Demographics data with respect to age distributions and fecundity can be used to study human populations.
 | **Density, Dispersion & Demographics**Chapter 53.1 (p.1170-1175)**Exponential Growth Model**Chapter 53.2 (p.1175-1177)**Logistic Growth Model**Chapter 53.3 (p.1177-1179)**Density Dependent & Independent Factors**Chapter 53.5 (p.1182-1187)**Human Population Growth**Chapter 53.6 (p.1187-1191) | [Communities](http://www.bozemanscience.com/046-communities)[Populations](http://www.bozemanscience.com/050-populations)[Population Ecology](http://www.bozemanscience.com/ap-es-012-population-ecology)[Exponential Growth](http://www.bozemanscience.com/exponential-growth/)[Logistic Growth](http://www.bozemanscience.com/logistic-growth/) |
| **EK 4.A.6: Interactions among living systems and with their environment result in the movement of matter and energy.** |
| 1. Energy flows, but matter is recycled.
 | **Energy Flow & Chemical Cycles**Chapter 55.1 (p.1219-1220)Figure 55.4 (p.1220)Figure 55.14 (p.1228-1229) | [Ecosystems](http://www.bozemanscience.com/047-ecosystems)[Energy Flow in Ecosystems](http://www.bozemanscience.com/ap-es-008-energy-flow-in-ecosystems) |
| 1. Changes in regional and global climates and in atmospheric composition influence patterns of primary productivity.
 | **Primary Productions in Ecosystems**Chapter 55.2 (p.1220-1225)**Energy Transfer**Chapter 55.3 (p.1225-1226) |
| 1. Organisms within food webs and food chains interact.
 |
| 1. Food webs and food chains are dependent on primary productivity.
 |
| 1. Models allow the prediction of the impact of change in biotic and abiotic factors.
2. Competition for resources and other factors limits growth and can be described by the logistic model.
3. Competition for resources, territoriality, health, predation, accumulation of wastes and other factors contribute to density- dependent population regulation.
 | **Exponential Growth Model**Chapter 53.2 (p.1175-1177)**Logistic Growth Model**Chapter 53.3 (p.1177-1179)**Density Dependent & Independent Factors**Chapter 53.5 (p.1182-1187) | [Communities](http://www.bozemanscience.com/046-communities)[Ecosystems](http://www.bozemanscience.com/047-ecosystems) |
| 1. Human activities impact ecosystems on local, regional and global scales.
2. As human populations have increased in numbers, their impact on habitats for other species have been magnified.
3. In turn, this has often reduced the population size of the affected species and resulted in habitat destruction and, in some cases, the extinction of species.
 | **Human Activities Threaten Biodiversity**Chapter 56.1 (p.1239-1244)**Earth is Changing Rapidly Due to Human Activities**Chapter 56.4 (p.1254-1260) | [Ecosystems](http://www.bozemanscience.com/047-ecosystems)[Populations](http://www.bozemanscience.com/050-populations)[Biodiversity](http://www.bozemanscience.com/055-biodiversity)[Ecosystem Diversity](http://www.bozemanscience.com/ap-es-009-ecosystem-diversity) |
| **EK 4.B.3: Interactions between and within populations influence patterns of species distribution and abundance.** |
| 1. Interactions between populations affect the distributions and abundance of populations.
2. Competition, parasitism, predation, mutualism and commensalism can affect population dynamics.
3. Relationships among interacting populations can be characterized by positive and negative effects, and can be modeled mathematically (predator/prey, epidemiological models, invasive species).
4. Many complex symbiotic relationships exist in an ecosystem, and feedback control systems play a role in the functioning of these ecosystems.
 | **Community Interactions**Chapter 54.1 (p.1194-1195) | [Communities](http://www.bozemanscience.com/046-communities)[Populations](http://www.bozemanscience.com/050-populations)[Ecosystem Change](http://www.bozemanscience.com/051-ecosystem-change) |
| 1. A population of organisms has properties that are different from those of the individuals that make up the population. The cooperation and competition between individuals contributes to these different properties.
 |
| 1. Species-specific and environmental catastrophes, geological events, the sudden influx/depletion of abiotic resources or increased human activities affect species distribution and abundance.
* Loss of keystone species
* Kudzu
* Dutch elm disease
 | **Diversity & Trophic Structure**Chapter 54.2 (p.1200-1206)**Impact of Disturbances on Species Diversity**Chapter 54.3 (p.1207-1210)**Introduced Species**Chapter 56.1 (p.1242-1243) | [Ecosystems](http://www.bozemanscience.com/047-ecosystems)[Populations](http://www.bozemanscience.com/050-populations)[Biodiversity](http://www.bozemanscience.com/055-biodiversity)[Ecosystem Ecology](http://www.bozemanscience.com/ap-es-007-ecosystem-ecology) |
| 1. Many adaptations of organisms are related to obtaining and using energy and matter in a particular environment.
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| **EK 4.B.4: Distribution of local and global ecosystems changes over time.** |
| 1. Human impact accelerates change at local and global levels.
* Logging, slash and burn agriculture, urbanization, monocropping, infrastructure development (dams, transmission lines, roads), and global climate change threaten ecosystems and life on Earth.
* An introduced species can exploit a new niche free of predators or competitors, thus exploiting new resources.
* Introduction of new diseases can devastate native species (Dutch elm disease, potato blight, small pox)
 | **Human Activities Threaten Biodiversity**Chapter 56.1 (p.1239-1244)**Biological Magnification**Chapter 56.4 (p.1255-1256)**Climate Change**Chapter 56.4 (p.1256-1259) | [Ecosystems](http://www.bozemanscience.com/047-ecosystems)[Populations](http://www.bozemanscience.com/050-populations)[Ecosystem Change](http://www.bozemanscience.com/051-ecosystem-change)[Biodiversity](http://www.bozemanscience.com/055-biodiversity) |
| 1. Geological events impact ecosystem distribution.
2. Biogeographical studies illustrate these changes.
* Continental drift
* Meteor impact on dinosaurs
 | **Continental Drift**Chapter 25.4 (p.520-521)**Mass Extinctions**Chapter 25.4 (p.521-524) | [Ecosystem Change](http://www.bozemanscience.com/051-ecosystem-change)[Natural Ecosystem Change](http://www.bozemanscience.com/ap-es-010-natural-ecosystem-change) |
| **EK 4.C.4: The diversity of species within an ecosystem may influence the stability of the ecosystem.** |
| 1. Natural and artificial ecosystems with fewer component parts and with little diversity among the parts are often less resilient to changes in the environment.
 | **Species Diversity**Chapter 54.2 (p.1200-1206) | [Ecosystem Change](http://www.bozemanscience.com/051-ecosystem-change)[Biodiversity](http://www.bozemanscience.com/055-biodiversity)[Ecosystem Ecology](http://www.bozemanscience.com/ap-es-007-ecosystem-ecology) |
| 1. Keystone species, producers, and essential abiotic and biotic factors contribute to maintaining the diversity of an ecosystem. The effects of keystone species on the ecosystem are disproportionate relative to their abundance in the ecosystem, and when they are removed from the ecosystem, the ecosystem often collapses.
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| Vocabulary |
| 10% rule | climax community | disturbance | introduced species | oligotrophic lakes | reproductive table |
| abiotic | climograph | ecological niche | iteroparity | ozone depletion | resource partitioning |
| acid rain | commensalism | ecological pyramid | k-strategists | parasitism | secondary consumers |
| age structure | community | ecosystem | keystone species | phosphorus cycle | secondary succession |
| Batesian mimicry | competitive exclusion | ecosystem diversity | life history table | pioneer species | semelparity |
| biogeochemical cycles | cryptic coloration | emigration | limiting nutrient | pollution | species diversity |
| biomagnification | decomposers | endangered species | logistic growth | population | species richness |
| biomes | deforestation | eutrophication | macroclimate | population density | survivorship curve |
| bioremediation | demography | exponential growth | microclimate | primary consumers | sustainable development |
| biosphere | density independent factors | extinction vortex | movement corridor | primary production | symbiosis |
| biotic | density-dependent factors | greenhouse effect | Mullerian mimicry | primary succession | tertiary consumers |
| carbon cycle | desertification | gross primary production (GPP) | mutualism | producers | threatened species |
| carrying capacity | detritovores | immigration | net primary production (NPP) | r-strategists | trophic efficiency |
| climate | dispersal | interspecific interactions | nitrogen cycle | relative abundance | reproductive table |