***Unit 08 AP Biology HyperDoc of Expectations and Resources***

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**Ecology: 10-15% of AP Exam**

**Big Ideas~ 1: Evolution *(EVO)*, 2: Energetics *(ENE)*, 3: Information Storage & Transmission *(IST)*, 4: System Interactions *(SYI)***

**EXPECTATIONS:**

| **Topic** | **Learning Targets (I can …) and** Success Criteria (I am learning how …)  *Learning targets are in bold with their success criteria listed beneath* | **✔** |
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| **8.1** | **Responses to the Environment** |  |
|  | **Explain how the behavioral and/or physiological response of an organism is related to changes in internal or external environment. *ENE-3.D*** |  |
| Organisms respond to changes in their environment through behavioral and physiological mechanisms.  *Exclusion Statement: No specific behavioral or physiological mechanism is required for teaching this concept.* |  |
| Organisms exchange information with one another in response to internal changes and external cues, which can change behavior. |  |
|  | **Explain how the behavioral responses of organisms affect their overall fitness and may contribute to the success of the population.  *IST-5.A*** |  |
| Individuals can act on information and communicate it to others. |  |
| Communication occurs through various mechanisms- |  |
| 1. Organisms have a variety of signaling behaviors that produce changes in the behavior of other organisms and can result in differential reproductive success. |  |
| 1. Animals use visual, audible, tactile, electrical, and chemical signals to indicate dominance, find food, establish territory, and ensure reproductive success. |  |
| Responses to information and communication of information are vital to natural selection and evolution - |  |
| 1. Natural selection favors innate and learned behaviors that increase survival and reproductive fitness. |  |
| 1. Cooperative behavior tends to increase the fitness of the individual and the survival of the population.   *Exclusion Statement: The details of the various communications and community behavioral systems are beyond the scope of the course and the AP exam.* |  |
| **8.2** | **Energy Flow Through Ecosystems** |  |
|  | **Describe the strategies organisms use to acquire and use energy. *ENE-1.M*** |  |
| Organisms use energy to maintain organization, grow, and reproduce - |  |
| 1. Organisms use different strategies to regulate body temperature and metabolism.    1. Endotherms use thermal energy generated by metabolism to maintain homeostatic body temperatures.    2. Ectotherms lack efficient internal mechanisms for maintaining body temperature, though they may regulate their temperature behaviourally by moving into the sun or shade or by aggregating with other individuals. |  |
| 1. Different organisms use various reproductive strategies in response to energy availability. |  |
| 1. There is a relationship between metabolic rate per unit body mass and the size of multicellular organisms - generally, the smaller the organism, the higher the metabolic rate. |  |
| 1. A net gain in energy results in energy storage or the growth of an organism. |  |
| 1. A net loss of energy results in loss of mass and, the death of an organism. |  |
|  | **Explain how changes in energy availability affect populations and ecosystems. *ENE-1.N*** |  |
| Changes in energy availability can result in changes in population size. |  |
| Changes in energy availability can result in disruptions to an ecosystem - |  |
| 1. A change in energy resources such as sunlight can affect the number and size of the trophic levels. |  |
| 1. A change in the producer level can affect the number and size of other trophic levels. |  |
|  | **Explain how the activities of autotrophs and heterotrophs enable the flow of energy within an ecosystem. *ENE-1.O*** |  |
| Autotrophs capture energy from physical or chemical sources in the environment - |  |
| 1. Photosynthetic organisms capture energy present in sunlight. |  |
| 1. Chemosynthetic organisms capture energy from small inorganic molecules present in their environment, and this process can occur in the absence of oxygen. |  |
| Heterotrophs capture energy present in carbon compounds produced by other organisms. |  |
| 1. Heterotrophs may metabolize carbohydrates, lipids, and proteins as sources of energy by hydrolysis. |  |
| **8.3** | **Population Ecology** |  |
|  | **Describe factors that influence growth dynamics of populations. *SYI-1.G*** |  |
| Populations comprise individual organisms that interact with one another and with the environment in complex ways. |  |
| Many adaptations in organisms are related to obtaining and using energy and matter in a particular environment |  |
| Population growth dynamics depend on a number of factors   | **RELEVANT EQUATION**  Population Growth -  ***d*N = *B* - D**  ***d*t** | *where*:  *d*t = change in time  *B* = birth rate  D = death rate  N = population size | | --- | --- | | Reproduction without constraints results in the exponential growth of a population. | | | **RELEVANT EQUATION**  Exponential Growth -  ***d*N = *rmaxN***  ***d*t** | *where*:  *d*t = change in time  N = population size  *rmax*  = maximum per capita growth rate of population | |  |
| **8.4** | **Effect of Density of Populations** |  |
|  | **Explain how the density of a population affects and is determined by resource availability in the environment. *SYI-1.H*** |  |
| A population can produce a density of individuals that exceeds the system’s resource availability. |  |
| As limits to growth due to density-dependent and density-independent factors are imposed, a logistic growth model generally ensues.   | **RELEVANT EQUATION**  ***d*N = *rmaxN(*K - N)**  ***D*t ( K )** | *where*:  *d*t = change in time  N = population size  *rmax*  = maximum per capita growth rate of population  K = carrying capacity | | --- | --- | |  |
| **8.5** | **Community Ecology** |  |
|  | **Describe the structure of a community according to its species composition and diversity. *ENE-4.A*** |  |
| The structure of a community is measured and described in terms of species composition and species diversity.   | **RELEVANT EQUATION**  Simpson’s Diversity Index-  **Diversity Index = 1 - Σ (n/N)2** | n = the total number of organisms of a particular species N = total number of organisms of all species | | --- | --- | |  |
|  | **Explain how interactions within and among populations influence community structure. *ENE-4.B*** |  |
| Communities change over time depending on interactions between populations. |  |
| Interactions among populations determine how they access energy and matter within a community. |  |
| Relationships among interacting populations can be characterized by positive and negative effects and can be modeled. Examples include predator/prey interactions, trophic cascades, and niche partitioning. |  |
| Competition, predation, and symbioses, including parasitism, mutualism, and commensalism, can drive population dynamics. |  |
|  | **Explain how community structure is related to energy availability in the environment. *ENE-4.C*** |  |
| Cooperation or coordination between organisms, populations, and species can result in enhanced movement of, or access to, matter and energy. |  |
| **8.6** | **Biodiversity** |  |
|  | **Describe the relationship between ecosystem diversity and its resilience to changes in the environment. *SYI-3.F*** |  |
| Natural and artificial ecosystems with fewer component parts and with little diversity among the parts are often less resilient to changes in the environment. |  |
| Keystone species, producers, and essential abiotic and biotic factors contribute to maintaining the diversity of an ecosystem. |  |
|  | **Explain how the addition or removal of any component of an ecosystem will affect its overall short-term and long-term structure. *SYI-3.G*** |  |
| The diversity of species within an ecosystem may influence the organization of the ecosystem. |  |
| The effects of the 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. |  |
| **8.7** | **Disruptions to Ecosystems** |  |
|  | **Explain the interaction between the environment and random or preexisting variations in populations. *EVO-1.O*** |  |
| An adaptation is a genetic variation that is favored by selection and is manifested as a trait that provides an advantage to an organism in a particular environment. |  |
| Mutations are random and are not directed by specific environmental pressures. |  |
|  | **Explain how invasive species affect ecosystem dynamics. *SYI-2.A*** |  |
| The intentional or unintentional introduction of an invasive species to exploit a new niche free of predators or competitors or to outcompete other organisms for resources. |  |
| The availability of resources can result in uncontrolled population growth and ecological changes. |  |
|  | **Describe human activities that lead to changes in ecosystem structure and/or dynamics. *SYI-2.B*** |  |
| The distribution of local and global ecosystems changes over time. |  |
| Human impact accelerates change a local and global levels - |  |
| 1. The introduction of new diseases can devastate native species. |  |
| 1. Habitat change can occur because of human activity. |  |
|  | **Explain how geological and meteorological activity leads to changes in ecosystem structure and/or dynamics. *SYI-2.C*** |  |
| Geological and meteorological events affect habitat change and ecosystem distribution. Biogeographical studies illustrate these changes. |  |

**RESOURCES: *(Tip: Insert your (GSN) and helpful resources in the table below to a copy of this document)***

| **AP Bio Topics** | **Classroom Discussions (GSN), Labs, Activities & Assignments:** | **Additional Materials:**  [**Khan Academy: Ecology**](https://www.khanacademy.org/science/ap-biology/ecology-ap) |
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| **8.1-2, 6** | * **43:** [**Behavioral Ecology(GSN)**](https://docs.google.com/document/d/1K2u5DZJOHh78whitsQdk0_ZxUwXD_SdI59vjFywFE-k/edit?usp=sharing) **and** [**Presentation**](https://drive.google.com/file/d/1s8tuLD8fm1NkgulDa5gtIITO2ykyLSIR/view?usp=sharing) * [**Investigational/Observational Lab: Isopod Behavior (Roly-Poly Lab)**](https://docs.google.com/document/d/1DFtTkmxdPOnrVaXok5GdowxKtmpvpvWsAd9p3s-rjQw/edit?usp=sharing) | **MsLitten’s YouTube (Reviews/Classes):**   * [43: Behavioral Ecology, REVIEW](https://www.youtube.com/watch?v=4V6sZpVkYqY) * [43: Behavioral Ecology, Part 1 (class)](https://www.youtube.com/watch?v=dDcBH_JNkos) * [43: Behavioral Ecology, Part 2 (class)](https://www.youtube.com/watch?v=nDGOYWA9CWg) * [43: Behavioral Ecology, Part 1 (live-stream 2020)](https://www.youtube.com/watch?v=5xfwEJ01AB4) * [43: Behavioral Ecology, Part 2 (live-stream 2020)](https://www.youtube.com/watch?v=KzsnnYyg_cE)   **Bozeman**:   * [Behavior and Natural Selection](http://www.bozemanscience.com/026-behavior-and-natural-selection) * [Response to External Environments](http://www.bozemanscience.com/019-response-to-external-envirnoments) * [Genotype Expression](http://www.bozemanscience.com/053-genotype-expression)   **Knuffke Prezis:**   * [Behavior](https://prezi.com/wt0jgzaklumd/ap-bio-communication-3-behavior/)   **Quizizz:**   * [Behavior - Honors](https://quizizz.com/admin/quiz/5b875d7a1fd770001912dd66) |
| **8.3-4** | * **44: Population Ecology(GSN) and Presentation** * [**POGIL:**](https://classroom.google.com/) **Population Growth** * [**PRACTICE PROBLEMS Google Folder**](https://drive.google.com/open?id=0B1kdFzBe787hMEZQUHd0c1daV28) | **MsLitten’s YouTube (Reviews/Classes):**   * [44: Population Ecology, REVIEW](https://www.youtube.com/watch?v=PVR73E70H6Y) * [44: Population Ecology, Part 1 (class)](https://www.youtube.com/watch?v=eK9GITo295o) * [44: Population Ecology, Part 2 (class)](https://youtu.be/kiJ7Qhmk8CI)   **Bozeman**:   * [Exponential Growth](https://paul-andersen.squarespace.com/exponential-growth) * [Logistic Growth](http://www.bozemanscience.com/logistic-growth)   **Knuffke Prezis:**   * [Population Dynamics](https://prezi.com/mzsdxi30t8i4/ap-bio-interactions-4-population-dynamics/)   **Quizizz:**   * [Population Ecology - Honors](https://quizizz.com/admin/quiz/5b7d92a6e5dc7500190b73e4) * [Population Ecology](https://quizizz.com/admin/quiz/5bb2f2a1100319001b10d86e) * [Population Growth 1](https://quizizz.com/admin/quiz/5d813586464e0a001c0dfcf5/population-growth) * [Population Growth 2](https://quizizz.com/admin/quiz/57f51030d5a026dd036861e5) |
| **8.2, 5** | * **45: Community and Ecosystem Ecology(GSN) and Presentation** * **46.1: Major Ecosystems of the Biosphere(GSN) and Presentation** | **MsLitten’s YouTube (Reviews/Classes):**   * [45: Community Ecology, REVIEW](https://www.youtube.com/watch?v=ynRMXlkDYkY) * 45: Community Ecology, Part 1 (class) * [45: Community Ecology, Part 2 (class)](https://www.youtube.com/watch?v=js4iDvmRlAY) * [46: Major Ecosystems of the Biosphere, REVIEW](https://www.youtube.com/watch?v=VFkU9IU2S_Q) * [46: Major Ecosystems of the Biosphere (class)](https://www.youtube.com/watch?v=l-W2oZStzaY)   **Bozeman**:   * [Biotic and Abiotic Factors](http://www.bozemanscience.com/020-biotic-and-abiotic-factors) * [Communities](http://www.bozemanscience.com/046-communities) * [Cooperative Interactions](http://www.bozemanscience.com/049-cooperative-interactions) * [Populations](http://www.bozemanscience.com/050-populations) * [Environmental Matter Exchange](https://youtu.be/9b_95wj3wyg) * [Ecosystems](https://youtu.be/Ot_KmOTYfRA)   **Knuffke Prezis:**   * [Community Interactions](https://prezi.com/emdcmgiwz8lh/ap-bio-interactions-3-community-interactions/) * [Ecosystem Structure](https://prezi.com/zpbl9ugz1mks/ap-bio-interactions-5-ecosystem-structure/)   **Quizizz:**   * [Community Ecology](https://quizizz.com/admin/quiz/5ad72bb29466240019e7a203) * [Ecology Review](https://quizizz.com/admin/quiz/58eb90e34ef9130202ab7668) |
| **8.7** | * **47: Conservation Biology(GSN) and Presentation** | **MsLitten’s YouTube (Reviews/Classes):**   * 47: Conservation Biology, REVIEW * [47: Conservation Biology (class)](https://youtu.be/NitiwY8klDM)   **Bozeman**:   * [Population Variation](http://www.bozemanscience.com/054-population-variation) * [Biodiversity](http://www.bozemanscience.com/055-biodiversity)   **Knuffke Prezis:**   * [Conservation Biology](https://prezi.com/m8hki5xp0emb/ap-bio-interactions-6-conservation-biology/)   **Quizizz:**   * [Biodiversity](https://quizizz.com/admin/quiz/5cd19670b0f83f001ab67676) |

**CONNECTIONS: *A Step Further (Choose one connection below and take a step further for assessment)***

| **Sustainability** | * [UN agency sounds alarm: Dwindling agrobiodiversity ‘severe threat’ to food security](https://news.un.org/en/story/2019/11/1051411) * [Shrinking biodiversity poses major risk to the future of global food and agriculture, landmark UN report shows](https://news.un.org/en/story/2019/02/1033331) * [Coral reefs can’t wait for world to take action](https://news.un.org/en/story/2018/11/1025731) |
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| **NGSS** | [HS-LS2-1](https://www.nextgenscience.org/pe/hs-ls2-1-ecosystems-interactions-energy-and-dynamics)  [HS-LS2-6](https://www.nextgenscience.org/pe/hs-ls2-6-ecosystems-interactions-energy-and-dynamics)  [HS-LS2-8](https://www.nextgenscience.org/pe/hs-ls2-8-ecosystems-interactions-energy-and-dynamics)  Identify which [Science Practices](https://ngss.nsta.org/PracticesFull.aspx) you have “practiced” this unit - provide evidence |
| **Careers** | [Ecological Society of America](https://www.esa.org/career-development/explore-ecology-as-a-career/)  [Museum careers - so much more than curating collections!](https://esajournals.onlinelibrary.wiley.com/doi/10.1002/fee.1524)  [Ecological consulting as a career option](https://esajournals.onlinelibrary.wiley.com/doi/10.1002/fee.1800)  [Conservation Careers](https://www.conservation-careers.com/career-stories/biodiversity-for-life-careers-that-link-conservation-and-health/) |
| **Interesting Information** | [**TedTalk**: E.O. Wilson ~ “My Wish: Build the Encyclopedia of Life”](https://www.ted.com/talks/e_o_wilson_my_wish_build_the_encyclopedia_of_life#t-51451) |

| **Big Idea** | **Enduring Understandings:** | **Topic** |
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| ENE-3 | **Timing and coordination of biological mechanisms involved in growth, reproduction, and homeostasis depend on organisms responding to environmental cues.** | 8.1 |
| IST-5 | **Transmission of information results in changes within and between biological systems.** | 8.1 |
| ENE-1 | **The highly complex organization of living systems requires constant input of energy and the exchange of macromolecules.** | 8.2 |
| SYI-1 | **Living systems are organized in a hierarchy of structural levels that interact.** | 8.3-4 |
| ENE-4 | **Communities and ecosystems change on the basis of interactions among populations and disruptions to the environment.** | 8.5 |
| SYI-3 | **Naturally occuring diversity among and between components within biological systems affects interactions with the environment.** | 8.6 |
| EVO-1 | **Evolution is characterized by change in the genetic make-up of a population over time and is supported by multiple lines of evidence.** | 8.7 |
| SYI-2 | **Competition and cooperation are important aspects of biological systems.** | 8.7 |