**AP Biology**

**Ecology Unit**

**AP Bio Big Ideas**

BIG IDEA 1: The process of evolution drives the diversity and unity of life.  
BIG IDEA 2: Biological systems utilize energy and molecular building blocks to grow, to reproduce, and to maintain homeostasis.  
BIG IDEA 3: Living systems store, retrieve, transmit, and respond to information essential to life processes.  
BIG IDEA 4: Biological systems interact, and these interactions possess complex properties.

**Essential Question**

* How is life dependent on the interactions of organisms and resources in an ecosystem?

**Learning Objectives**

The AP Biology curriculum is a complicated affair. The objectives listed below are our attempt to simplify the AP curriculum and make it more compatible with using your text and for class work.  
Each objective listed below represents a major focus for the AP Biology curriculum. These are not the very specific objectives that you did in Bio last year. They are more a topic for an essay than for a paragraph. Please pay attention to the sentence, especially the leading verb. We expect that you will be able to do what the objective sentence says, incorporating the key concepts. The key concepts are concepts, not vocabulary words. To understand the concept will require more elaboration.  
Following our learning objectives are the specific AP objectives that correlate with this unit. If you want to do well, you'll have to be able to do these things so check them out!

1. **Use models to explain how populations, communities and ecosystems are affected by complex biotic and abiotic interactions involving the exchange of matter and free energy.**

**Key Concepts**

* Food webs and chains
* Trophic levels
* Energy, biomass and population pyramids
* Nutrient cycles

1. **Conduct an experiment and use the data to illustrate how levels of primary productivity can change and affect an ecosystem’s community.**

**Key Concepts**

* Primary Productivity
* Gross Productivity
* Net Productivity
* Carbon fixation
* Limiting nutrients

**3. Use graphical analysis and explain how populations change over time due to characteristics of the species and interactions with other species.**

**Key Concepts**

* Population growth curve
* Population growth equation
* R-strategy
* K-strategy
* Density dependent limiting factors
* Density independent limiting factors
* Age structure diagrams
* Life strategy data and graphs

**4A. Analyze and explain how organisms in a community interact in complex ways to affect the flow of energy and matter.**

**4B. Use examples to describe how the variation of individuals in a population and the diversity of species in an ecosystem affect the ecosystem’s stability.**

**Key Concepts**

* Symbiotic relationships (mutualism, commensalism, parasitism, competition, predation)
* Decomposition
* Keystone species
* Examples of population reduction endangering communities
* Invasive species

**5. Explain how organisms within populations and within communities, interact through communication and behaviors.**

**Key Concepts**

* Innate behavior
* Learning
* Coloration and camouflage
* Mimicry
* Vocalizations and warning
* Altruistic behavior

**6. Analyze data and use examples to explain how disruptions to ecosystems impact the dynamic homeostasis or balance of** **the ecosystem.**

**Key Concepts**

* Invasive species
* Primary succession
* Secondary succession
* Various forms of pollution
* Habitat loss
* Water and nutrient availability
* Disease
* Climate change

**AP Bio Specific Learning Objectives**

LO 2.1 The student is able to explain how biological systems use free energy based on empirical data that all organisms require constant energy input to maintain organization, to grow and to reproduce.  
LO 2.2 The student is able to justify a scientific claim that free energy is required for living systems to maintain organization, to grow or to reproduce, but that multiple strategies exist in different living systems.  
LO 2.3 The student is able to predict how changes in free energy availability affect organisms, populations and ecosystems.  
LO 2.22 The student is able to refine scientific models and questions about the effect of complex biotic and abiotic interactions on all biological systems, from cells and organisms to populations, communities and ecosystems.  
LO 2.23 The student is able to design a plan for collecting data to show that all biological systems (cells, organisms, populations, communities and ecosystems) are affected by complex biotic and abiotic interactions.  
LO 2.24 The student is able to analyze data to identify possible patterns and relationships between a biotic or abiotic factor and a biological system (cells, organisms, populations, communities or ecosystems).  
LO 2.38 The student is able to analyze data to support the claim that responses to information and communication of information affect natural selection.  
LO 2.39 The student is able to justify scientific claims, using evidence, to describe how timing and coordination of behavioral events in organisms are regulated by several mechanisms.  
LO 2.40 The student is able to connect concepts in and across domain(s) to predict how environmental factors affect responses to information and change behavior.  
LO 3.40 The student is able to analyze data that indicate how organisms exchange information in response to internal changes and external cues, and which can change behavior.  
LO 3.41 The student is able to create a representation that describes how organisms exchange information in response to internal changes and external cues, and which can result in changes in behavior.  
LO 3.42 The student is able to describe how organisms exchange information in response to internal changes or environmental cues.  
LO 4.11 The student is able to justify the selection of the kind of data needed to answer scientific questions about the interaction of populations within communities.  
LO 4.12 The student is able to apply mathematical routines to quantities that describe communities composed of populations of organisms that interact in complex ways.  
LO 4.13 The student is able to predict the effects of a change in the community’s populations on the community.  
LO 4.14 The student is able to apply mathematical routines to quantities that describe interactions among living systems and their environment, which result in the movement of matter and energy.  
LO 4.15 The student is able to use visual representations to analyze situations or solve problems qualitatively to illustrate how interactions among living systems and with their environment result in the movement of matter and energy. [See  
LO 4.16 The student is able to predict the effects of a change of matter or energy availability on communities.  
LO 4.18 The student is able to use representations and models to analyze how cooperative interactions within organisms promote efficiency in the use of energy and matter.  
LO 4.19 The student is able to use data analysis to refine observations and measurements regarding the effect of population interactions on patterns of species distribution and abundance.  
LO 4.20 The student is able to explain how the distribution of ecosystems changes over time by identifying large-scale events that have resulted in these changes in the past.  
LO 4.21 The student is able to predict consequences of human actions on both local and global ecosystems.  
LO 4.23 The student is able to construct explanations of the influence of environmental factors on the phenotype of an organism.  
LO 4.24 The student is able to predict the effects of a change in an environmental factor on the genotypic expression of the phenotype.  
LO 4.25 The student is able to use evidence to justify a claim that a variety of phenotypic responses to a single environmental factor can result from different genotypes within the population.  
LO 4.26 The student is able to use theories and models to make scientific claims and/or predictions about the effects of variation within populations on survival and fitness.  
LO 4.27 The student is able to make scientific claims and predictions about how species diversity within an ecosystem influences ecosystem stability.