

Bio 6 Tropical Biology

Dr. Jessica Pratt

Learning Goals by Topic

Lessons 1-4 are focused generally on the location, geography, and physical environment of the tropics.

Lessons 5-6 introduce tropical biota, species interactions, and evolution.

Lessons 7-8 present a “latitudinal transect” of biomes as you move north or south away from the equator.

Lessons 9-11 provide an “altitudinal transect” of biomes as you move from the seafloor to tropical mountain peaks.

Lessons 12-14 focus on human dimensions of the tropics, threats to biodiversity, human disease, and efforts to conserve and restore tropical biodiversity, including indigenous communities and cultures.

Lesson	Topic	Learning Goals
1	What and where are the tropics?	<ol style="list-style-type: none"> 1. Understand the extent of Earth included in the Tropics and appreciate the diversity of challenges faced by tropical countries. 2. Relate defining environmental characteristics of the Tropics to human societies (i.e. through socioeconomic challenges, infrastructure, disease, etc.). 3. Describe ways that you interact with and impact the Tropics as a global consumer. 4. Define the Tropics geographically and explain their location in relation to the Earth’s tilt and orientation to the sun.
2	Tropical geography, continents, countries	<ol style="list-style-type: none"> 1. Describe how the geographic extent of the Tropics has changed through Earth’s history and explain the consequences of this for species divergence 2. Explain how tropical fossils exist in now temperate regions. 3. Diagram the Species-Area (S-A) relationship and relate this to patterns of diversity and extinction rates. 4. Apply S-A and isolation by distance to compare patterns of diversity on continents and islands
3	Tropical climate	<ol style="list-style-type: none"> 1. Explain how tropical heating drives the Earth’s climate via Hadley Cells, including prevailing winds, temperature, and precipitation patterns. 2. Associate annual temperature and precipitation patterns to the occurrence of major biomes. 3. Compare seasonality in the tropics to temperate regions and between biomes. 4. Describe the patterns in data that give conclusive evidence of anthropogenic global warming. 5. Give examples of the effects of climate change on species, ecosystems, and human populations.
4	Tropical soils	<ol style="list-style-type: none"> 1. Explain how temperature and rainfall influence the <u>rates</u> of nutrient cycling and microbial processes. 2. Describe why tropical soils lack thick layers of organic material and are generally nutrient poor. 3. Relate these characteristics of tropical soil to challenges with and approaches to agriculture.
5	Overview of tropical ecosystems and flora	<ol style="list-style-type: none"> 1. Relate the divergence and similarity of tropical floras to continental drift. 2. Recognize distinguishing characteristics of flora from different tropical ecosystems. 3. Understand how gradients in temperature and precipitation across latitudes and elevations determine the locations of tropical ecosystems.
6	Tropical fauna – diversity & evolution	<ol style="list-style-type: none"> 1. Read an evolutionary tree (phylogeny) in order to determine relatedness among groups of organisms, identify common ancestors, and appreciate the time scale of evolution. 2. Define and give examples of speciation by isolation, adaptive radiation, and convergent evolution. 3. Apply evolutionary concepts (speciation, extinction, adaptive radiation) to explain the high diversity of species in the tropics.
7	Wet and dry tropical forests	<ol style="list-style-type: none"> 1. Explain the primary role of decomposers in tropical systems. 2. Relate rates of nutrient cycling, climate, and soil quality to productivity of tropical forests. 3. Describe the relationship between forest structure/strata and biodiversity.

Bio 6 Tropical Biology
Learning Goals by Topic

Dr. Jessica Pratt

		<ol style="list-style-type: none"> 4. Describe adaptations of plants to competition for light and pollinators. 5. Identify adaptations of tropical fauna for effective locomotion, communication, and resource acquisition in tropical forests.
8	Tropical savannas and deserts	<ol style="list-style-type: none"> 1. Identify how physical and environmental characteristics of savanna's differ from forests. 2. Describe defenses of plants against herbivores and herbivores' adaptations to eating plants. 3. Understand the role that fire and water play in shaping the savanna ecosystem. 4. List three reasons why termites are cool.
9	Tropical seas and coral reefs	<ol style="list-style-type: none"> 1. Understand the processes (5 features of oceans) that result in a dynamic ocean floor. 2. Explain the physical forces that cause volcanic islands at subduction zones and hotspots. 3. List main groups in an oceanic food web. 4. Understand the concept of "fishing down the food chain" in relation to human activity and the future of global fisheries. 5. Describe what a coral is and how reefs form. 6. List several important services that coral reefs provide to humans.
10	Coral reefs (con't) and mangroves	<ol style="list-style-type: none"> 1. Identify the main threats to corals. 2. Explain how climate change affects coral reefs via changes in ocean temperature, pH, and sea level rise. 3. Understand why mangroves occur where they do. 4. Explain adaptations of mangrove trees for dealing with the three main environmental stresses in mangrove habitat. 5. Describe the role of mangroves in global fisheries production and coastline protection.
11	Tropical mountains	<ol style="list-style-type: none"> 1. Explore the characteristics that make tropical montane cloud forests (TMCF) different from lowland forests. 2. Understand why these forests are so important even though they cover only a small percentage of the planet. 3. Explain how climate change is affecting TMCF with specific focus on soils.
12	Tropical diseases	<ol style="list-style-type: none"> 1. Match the pathogen and vector organisms with the 7 tropical diseases discussed. 2. Describe how the water hyacinth invasion of Lake Victoria influenced disease transmission. 3. Explain why new approaches to manage NTD transmission have been more successful than previous approaches. 4. Describe how global warming will influence the prevalence of NTDs (and why).
13	Threats to the tropics	<ol style="list-style-type: none"> 1. Describe broad patterns of population and economic growth (~consumption) globally. 2. Understand the impacts of land use change and overexploitation on biodiversity in the tropics. 3. Give examples of the indirect effects of population and economic growth. 4. Summarize "The Story of Stuff" and our role as global consumers in driving these patterns.
14	Conservation and restoration in the tropics	<ol style="list-style-type: none"> 1. Name the most trafficked animal on the planet and where the demand comes from. 2. Define and give examples of the different categories of ecosystem services. 3. Describe some results of tropical restoration studies that can give us hope for the future of tropical forests. 4. Name some major challenges to tropical restoration. 5. List ways you can be involved in the conservation of biodiversity in the tropics and locally.