
Ecology Syllabus

UNIT 1: AN INTRODUCTION TO ECOLOGY (17 days). What is ecology and why is it important? This unit defines ecology as the study of the interactions of living things with each other and with their environment. All such interactions fall into one of three broad categories: The abiotic environment can affect living things, living things can affect each other, and, less intuitively obvious, living things can affect the abiotic environment. Students study competition, predator-prey interactions, and symbioses such as mutualism, commensalism, parasitism, and endosymbiosis.

Lesson 1-1: Introduction and First Day Activities

Lesson 1-2: Class Notes - Introduction to Ecology

Lesson 1-3: Observing the Invisible and Class Notes - The Abiotic Environment

Lesson 1-4: The Immiscibility Bottle and Class Notes – Interactions Among Living Things

Lesson 1-5: Reading Activity and rft Worksheet 1:4

Lesson 1-6: Class Notes – The Power and Fragility of Living Systems

Lesson 1-7: A Summer Stratification and Class Notes – Living Things and the Environment

Lesson 1-8: Measuring the Invisible and Reading Activity

Lesson 1-9: Review Activity - rft Worksheets 1:8, 1:9

Lesson 1-10: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity

Lesson 1-11: Class Notes – The Role of Buffers and Feedback Loops

Lesson 1-12: Class Notes – Mathematical Analysis and Scientific Notation

Lesson 1-13: Reading Activity and rft Worksheets 1:10, 1:11

Lesson 1-14: Student Lab – Building a Density Stratification in an Aqueous System

Lesson 1-15: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity

Lesson 1-16: Student Lab – Core Sampling and Methods of Dendrochronology

Lesson 1-17: Unit One Exam

UNIT 2: TROPHIC LEVELS, PYRAMIDS, AND ENERGETICS (18 days). This two-week unit introduces students to ecological energetics. Almost all the energy that fuels the metabolism of living things arrives each day as light energy from the sun. A portion of this "incident solar radiation" is captured by photosynthetic organisms. A plant (or other "photoautotroph") *typically uses a portion of this energy to fuel its life activities* such as fighting parasites, transporting materials from the leaves to the roots, activating quiescent genes and molecules as needed, etc. After such needs are met, the remainder of the captured energy is typically stored as molecules of glucose, starch, amino acids, etc., making the organism larger by adding to its "biomass."

Lesson 2-1: Class Notes - Introduction to Niche, Habitat, and Ecological Energetics

Lesson 2-2: Class Notes - Energy Pyramids, Pathways, Food-chains, and Trophic Levels

Lesson 2-3: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity

Lesson 2-4: Class Notes - The Ecological Efficiency of Energy Transfers

Ecology Syllabus

- Lesson 2-5: Class Notes - Energy Strategies, Budgets, and the Principle of Allocation
- Lesson 2-6: Polar Squares Demonstration and rft Worksheets 2:1, 2:2
- Lesson 2-7: Reading Activity and Measuring Atmospheric O₂ as a Percent by Volume
- Lesson 2-8: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity
- Lesson 2-9: Class Notes – Quantifying Biological Productivity: GPP and NPP
- Lesson 2-10: Plant Pigment Extracts and rft Worksheets 2:5, 2:6
- Lesson 2-11: PowerPoint Activity – Photoperiods, and rft Worksheet 2:9
- Lesson 2-12: Student Lab – O₂ Production as an Index of Gross Primary Productivity
- Lesson 2-13: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity
- Lesson 2-14: Review Activity – rft Worksheets 2:7 and 2:10
- Lesson 2-15: Student Microscope Lab – Ecological Activity in a Drop of Water
- Lesson 2-16: Pending Demo, Reading Activity, and Crossword 2:9
- Lesson 2-17: Unit Two Exam
- Lesson 2-18: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity

UNIT 3: CLIMATE, WINDS, ATMOSPHERE, AND SEAS (10 days). In this unit, students will examine assorted characteristics of earth's hydrosphere, biosphere, and atmosphere. They learn how the tilt of earth's axis helps produce our seasons and why there are often foggy forests on one side of a mountain range and dry desert and sagebrush on the other side. Why are some places (and seasons) so hot and others so cold? Living things respond to climate, but how does unequal solar radiation help drive climatic systems? And finally, students will discover the process of transpiration by which rainforests "make their own rain" each day.

- Lesson 3-1: Class Notes – The Blue Planet Earth: Its Atmosphere and Hydrosphere
- Lesson 3-2: Class Notes – Seasons, Climate, and Differential Solar Heating
- Lesson 3-3: PowerPoint Activity – Transpiration, plus Q-10 Demonstration 1
- Lesson 3-4: Evapotranspiration Demonstration and rft Worksheets 3:1, 3:2
- Lesson 3-5: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity
- Lesson 3-6: Class Notes – Mountains, Rain Shadows, and Oceanic Influences
- Lesson 3-7: The Q-10 Effect in Fermenting Yeast and rft Worksheet 3:5
- Lesson 3-8: Reading Activity and Demonstration – The Effects of Unequal Heating
- Lesson 3-9: Student Lab – Extracting Ecological Information from Owl Pellets
- Lesson 3-10: Unit Three Exam

UNIT 4: ECOLOGICAL SERVICES (12 days). This unit introduces students to such ecological services as pollination, recycling wastes, generating food and atmospheric O₂, fertilizing earth's soils, controlling pests, evapotranspiration, colonization, succession, recovery, and the biogeochemical cycling of carbon, nitrogen, and water.

- Lesson 4-1: Class Notes – Ecological Services: Their Biological and Economic Impacts
- Lesson 4-2: Class Notes – Disturbance and Succession
- Lesson 4-3: Review Activity – rft Worksheets 4:1, 4:2 and Demonstration
- Lesson 4-4: Reading Activity and Sodium Polyacrylate Demonstration
- Lesson 4-5: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity

Ecology Syllabus

- Lesson 4-6: Class Notes – Keystone Species and Ecological Release
- Lesson 4-7: Class Notes – The Biogeochemical Cycling of Carbon
- Lesson 4-8: Student Lab – Extracting DNA from a Banana and rft Worksheet 4:6
- Lesson 4-9: Lithospheric Deposition of Carbon and rft Worksheets 4:3, 4:4
- Lesson 4-10: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity
- Lesson 4-11: Student Lab – Separation Technologies: Lab 1
- Lesson 4-12: Unit Four Exam

UNIT 5: HUMAN ECOLOGY AND POPULATION BIOLOGY (15 days). During this unit, students will develop demographic and numeric literacy, and increased understandings of population biology. They will learn about J-curves, S-curves, limiting factors, delayed feedbacks, and overshoot. And since we currently add one billion people to our population every twelve to fifteen years, in the second presentation in this unit students will calculate how long it would take to complete one billion homework questions.

- Lesson 5-1: Class Notes – Survivorship Curves and Demographics
- Lesson 5-2: Class Notes – Compare and Contrast: A Million Versus A Billion
- Lesson 5-3: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity
- Lesson 5-4: Class Notes – The Best Scholarship There Ever Was (Exponential Mathematics)
- Lesson 5-5: Class Notes – Ecological Carrying Capacities and Limiting Factors
- Lesson 5-6: Student Graphing Activity 1
- Lesson 5-7: Reading Activity and rft Worksheets 5:1 and 5:2
- Lesson 5-8: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity
- Lesson 5-9: SKBL Presentation Kit – Riddles of the Dinoflagellates
- Lesson 5-10: Review Activity – rft Worksheets 5:3, 5:4 and Demonstration
- Lesson 5-11: Student Graphing Activity 2 and Crossword 5:8
- Lesson 5-12: Worksheets 5:6, 5:9 – Interpreting Graphs and Population Pyramids
- Lesson 5-13: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity
- Lesson 5-14: Reading Activity, Project Assignments, and Dissolved O₂ Demonstration
- Lesson 5-15: Unit Five Exam

UNIT 6: BIOMES AND CONSERVATION BIOLOGY (13-15 days). This unit introduces students to endangered species, major biogeographic regions called biomes, and the principles of conservation biology. In their studies of island biogeography, Robert MacArthur and E.O. Wilson showed that the smaller an island, the fewer the species that it supports. Thus, if we are to use parks, zoos, and nature reserves to help save earth's spectacular variety of living things, conservation biology can apply some of principles of biogeography to the establishment of critical parks and reserves.

- Lesson 6-1: Class Notes – Endangered Species and Causes of Extinction
- Lesson 6-2: Class Notes – Biomes: An Introduction to Biogeography
- Lesson 6-3: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity
- Lesson 6-4: Class Notes – Biodiversity Hot-spots
- Lesson 6-5: Class Notes – Bioremediation and Conservation Biology

Ecology Syllabus

Lesson 6-6: Student Graphing Activity 3

Lesson 6-7: Review Activity – rft Worksheets 6:1 and 6:2

Lesson 6-8: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity

Lesson 6-9: Review Activity – rft Worksheets 6:3 and 6:4

Lesson 6-10: Student Project Presentations and Reading Activity

Lesson 6-11: Student Project Presentations and Word Scramble Activity

Lesson 6-12: Student Project Presentations and Crossword

Lesson 6-13: Flexibility: Reading, Testing, Video Presentation, and/or Enrichment Activity

Lesson 1-14: Student Notebooks, Project Presentations, and Crossword Activity

Lesson 1-15: Unit Six Exam

Lesson 1-16: Flexibility Activities and Review for Final Exam

Lesson 1-17: Flexibility Activities and Review for Final Exam

Lesson 1-18: Flexibility Activities and Review for Final Exam

Lesson 1-19: Flexibility Activities and Review for Final Exam

Lesson 1-20: Final Course Exam