Unit 4 Ecological Services

Unit Overview:

"Living things perform a host of indispensable ecological services for us – a kind of 'free work' that has virtually irreplaceable economic and ecological value. Some such services provide us with food and oxygen, while others moderate our climate, generate our rainfall, fertilize our soils, and pollinate our crops. Still others help break down, cleanse, and recycle wastes. These processes have taken place for so long and are so ubiquitous that most of us simply take them for granted. Like many important things in our lives, however, we will miss them most when they are gone." (*What Every Citizen Should Know About Our Planet, 2005.)*

This unit will introduce students to such ecological services as pollination, recycling wastes, generating food and atmospheric O_2, fertilizing earth's soils, controlling pests, transpiration, colonization, succession, recovery, and biogeochemical cycling.

Lesson 4-1 Ecological Services

Class Notes 4:1

Goal(s): This lesson will introduce examples of the many biologically crucial and economically important "ecological services" that are performed, free of charge, by earth's living things.

Objective(s): By the end of this lesson, students will be able to

- cite five or more ecological services accomplished by the activities of living things
- explain that pollinators such as butterflies, bees, and hummingbirds pollinate most of our crops and help most plants on earth reproduce
- point out that plants help generate earth's rainfall through the process of transpiration
- explain that living things called decomposers help recycle molecules and the other raw materials of life
- point out that plants help remove CO_2 from earth's atmosphere and help generate and maintain atmospheric concentrations of O_2
- cite the role of nitrogen-fixing bacteria in fertilizing our soils
- give examples of medicines and pharmaceuticals derived from forest marine, and rainforest organisms
- cite one or more examples of organisms that help prevent population explosions of pests

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- explain that these ecological services amount to a kind of "free work" that has essential environmental, social, and economic value

Vocabulary: pharmaceuticals pollination transpiration genetic vigor genetic library

Lecture Procedure: Use an overhead projector or PowerPoint software to present class notes 4:1. If using overhead transparencies, use a piece of paper to cover all information on each overhead except for the single detail, principle, or example being discussed. As the class copies each item, be sure to read each fact or example two or three times aloud as they write (sometimes this works well by inviting student volunteers to read some items). Also add your own comments and examples. *Notice that this methodology introduces today's ecology information to the brain by visual, auditory, verbal, and kinesthetic pathways*. If you happen to finish early, have students summarize one or more diagrams or graphs in your course text.

Background: Read over class notes 4:1 before presenting them in class. Also find and read over associated information in your district's adopted text.

Assessment: Award each student participation points and/or notebook points for their good efforts exhibited during today's presentation.

Lesson 4-2 Disturbance and Succession

Class Notes 4:2

Goal(s): This lesson introduces the processes by which damaged or disturbed habitats sometimes recover, or by which new habitats are first colonized by pioneering species.

Objective(s): By the end of this lesson, students will be able to

- define succession
- identify r-strategist species as typical pioneers or colonists
- identify the stages of an ecological succession as seres
- identify the final, stable, self-perpetuating stage of an ecological succession as a "stable climax community"
- explain that adjacent or nearby undisturbed natural areas must be present to act as a source of pioneers and colonists
- explain that such natural areas are becoming fewer, increasingly isolated, and smaller in size

Vocabulary: disturbance succession colonists
r-strategists pioneers seres
stable climax community old field succession

Lecture Procedure: Use an overhead projector or PowerPoint software to present class notes 4:2. If using overhead transparencies, use a piece of paper to cover all information on each overhead except for the single detail, principle, or example being discussed. As the class copies each item, be sure to read each fact or example two or three times aloud as they write (sometimes this works well by inviting student volunteers to read some items). Also add your own comments and examples. *Notice that this methodology introduces today's ecology information to the brain by visual, auditory, verbal, and kinesthetic pathways*. If you happen to finish early, have students summarize the information presented in a graph in your course text.

Background: Read over class notes 4:2 before presenting them in class. Also read and review additional "succession" information presented in your district adopted text.

Assessment: Award each student participation points and/or notebook points for their good efforts exhibited during today's presentation.

Lesson 4-3 Review for Test Worksheet

"rft" Worksheets 4:1 and 4:2
Demonstration - How to Measure Something by Weighing It

Goal(s): In this lesson, we will use "rft" Worksheets 4:1 and 4:2 to review key ideas and vocabulary involving ecological services and the process of succession. In addition, students will use a triple-beam or other laboratory balance to measure the surface area of assorted plant leaves – objects for which there is no "formula for the surface area of a pandanus leaf" to be found in the back of any math book, anywhere.

Objective(s): By the end of today's lesson students will

- have written correct answers to 100% of the items on "rft" worksheets 4:1 and 4:2
- be able to describe a means of measuring the surface area of a leaf using a simple laboratory balance
- recognize that in plants, rates of photosynthesis and water loss are both affected by the total surface area of a plant's leaves

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