Lesson Plan: 4-6.3
Grade Levels: Grades 5 & 6

California State Framework: Grade 5 Standard Set 1. Physical Science
Grade 6 Standard Set 5. Ecology

Biogeochemical Cycles

Background

Another lesson plan in this book, called Climbing the Energy Pyramid (6-8.3), is about the movement of energy through the ecosystem. Students should realize that energy is finally dispersed into the atmosphere (and space) as heat and does not get recycled; that is why we say "energy flows." Matter, however, is a different matter!

All matter moves in cycles through the ecosystem, spending time in geological form (bodies of water, the atmosphere, rock) and in biotic form in the tissues of organisms. Decomposers are central to the process because they work to free up inorganic compounds as they break down wastes and dead organisms.

This mnemonic may help students remember the elements commonly found in living things —

> If a tourist asks you to recommend a restaurant, you might give the following response: "C. Hopkins Cafe; mighty good!"
>
> Which translates to: 'C HOPKiNS CaFe Mg' (or, carbon, hydrogen, oxygen, phosphorous, potassium, nitrogen, sulfur, calcium, iron, magnesium)

Ask students to name the elements represented by the chemical symbols. Note that N (nitrogen) is one. Remind students that N is present in all organisms in both proteins and nucleic acids. If you bring an empty fertilizer bag for students to inspect, they can see from the label that we provide extra N, P and K (nitrogen, phosphorous, potassium) for our plants when we garden or grow crops. Of course we are only supplementing nature's cycles.

The nitrogen cycle is an especially good one to use as a classroom example of a biogeochemical cycle; not only because of its importance, but because students will appreciate help deciphering its complexity, and because it is facilitated by helpful bacteria not just in decomposition, but at every step of the cycle.

Goal

Students will be able to explain that matter cycles through living and non-living things in the ecosystem.

Before Your Visit

Using the nitrogen cycle diagram in your science textbook or an overhead transparency, talk the students through the steps, pointing out that there is a smaller cycle (soil to plants to animals to decomposers to soil) within the larger cycle (atmosphere to soil to atmosphere). Remind them that, although the atmosphere is composed largely of nitrogen gas, most living things cannot use it in that form. Only certain kinds of bacteria can trap it and change it into chemicals that can enter the food chain (nitrogen-fixation and nitrification).

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Biogeochemical Cycles continued...

Before Your Visit continued	Have students play the Traveling Nitrogen Game from the Windows to the Universe web site (www.windows.ucar.edu/tour/link=/teacher_resources/teach_nitrogen.html). The grade level in the game is stated as 5-9. If Einstein imagined himself traveling on a photon to help him formulate his theories, surely it could be helpful for students to imagine themselves as nitrogen atoms in order to understand the nitrogen cycle. Further activity: Have students demonstrate their understanding of the cycling concept by making a board game, skit or poster to show another biogeochemical cycle such as the carbon cycle or water cycle.
Materials to Bring	Students should bring pencils and notebooks or clipboards with paper.
At Safari West	Have students observe and list evidence of the nitrogen cycle in action while at Safari West.
Back in the Classroom	When you return to your classroom, observations that students noted at the park can be used to make a mural illustrating both energy flow and nitrogen cycling at Safari West. In sub-Saharan Africa, where desertification is a problem, people increasingly rely on animal dung as a fuel for their cooking fires. Research this and create a skit to explain to the class the problem this presents and how it ties to the nitrogen cycle. Questions for discussion: • How do humans interfere with the nitrogen cycle? • What are some problems associated with production and overuse of fertilizer? • What is eutrophication? • How is it tied to the nitrogen cycle? How does it affect our waterways?

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