

LIVING SYSTEMS FIELD TRIP CURRICULUM: LIFE CYCLES AND STRUCTURES

Grade Levels: Elementary School

2016 Massachusetts Science and Technology/Engineering Standards Achieved:

Grade 1: LS1. From Molecules to Organisms: Structures and Processes

Grade 2: LS2. Ecosystems: Interactions, Energy, and Dynamics

Grade 3, 4 & 5: LS1. From Molecules to Organisms: Structures and Processes

Grade 5: LS2. Ecosystems: Interactions, Energy, and Dynamics

Topics covered: plant, bacterial and fungal lifecycles, resources needed for growth and development, how organisms interact with their environment to obtain resources

ABOUT THE LIVING SYSTEMS LABORATORY

The Blackstone River Corridor Living Systems Laboratory (LSL) is a nonprofit organization that seeks to engage people in the socioecological history of the Blackstone River and create effective solutions to environmental contamination. The purpose of the LSL is to connect people with the River, help them to appreciate the benefits of a healthy ecosystem on society in the context of development, and be a part of the restoration of the Blackstone through education, research, and community outreach. Understanding how humans and nature interact depends in part on understanding the resources needed for organisms to thrive and reproduce, and the ways that they obtain them. The LSL provides an opportunity for students to learn about the processes by which plants, fungi and bacteria interact with their environment to obtain these resources by creating microcosms in which the functioning of these organisms as part of an ecosystem is clearly seen. This novel perspective allows students an up close view of the structures and lifecycles of plants and animals, and allows them to consider how these organisms in turn help humans to survive

DURING THE TRIP, students will experience an engineered ecosystem in which various strands of the food web are showcased. Student will see up close the ways in which fungi, plants and bacteria interact with their environment, the structures they use to obtain resources, and how they reproduce. The unique setup of the Eco Machine allows students to identify various stages of organismal life cycle, and discern how different biotic and abiotic factors affect organismal growth and reproduction.



AFTER THE TRIP, students will have a better understanding of how organisms obtain resources to grow and reproduce, as well as identify their structures in nature. More so, they will see how excesses or a lack of these resources can affect an organism's ability to survive and prosper, and the resources that they provide for humans and each other. Finally they begin to think about how humans affect an organisms ability to obtain necessary resources.



BACKGROUND

The Blackstone River, birthplace of the American Industrial Revolution, is also assumed to be one of the largest sources of nutrient and pathogen pollution in the watershed. The long history of development along the river has left a legacy of antiquated infrastructure and development practices that continue to discharge nutrient laden stormwater and pathogens as well as inadequately treated sewage into the river and ultimately the Narragansett Bay. This area of the canal and river has been further degraded by oil and other toxins from the area's industrial past.

The Eco Machine and Canal Restorers were built in 2012 by John Todd Ecological Design, LLC in Grafton, MA, on the banks of the Blackstone Canal. They utilize the theories of ecological design and induced biodiversity to harness the abilities of native plants, animals, fungi and bacteria and other microorganisms to metabolize waterborne contaminants. By creating engineered microenvironments that induce biodiversity and amplify surface area, a diverse ecosystem of organisms metabolize nutrients and contaminants at higher rates than the compromised ecology of the canal and river.

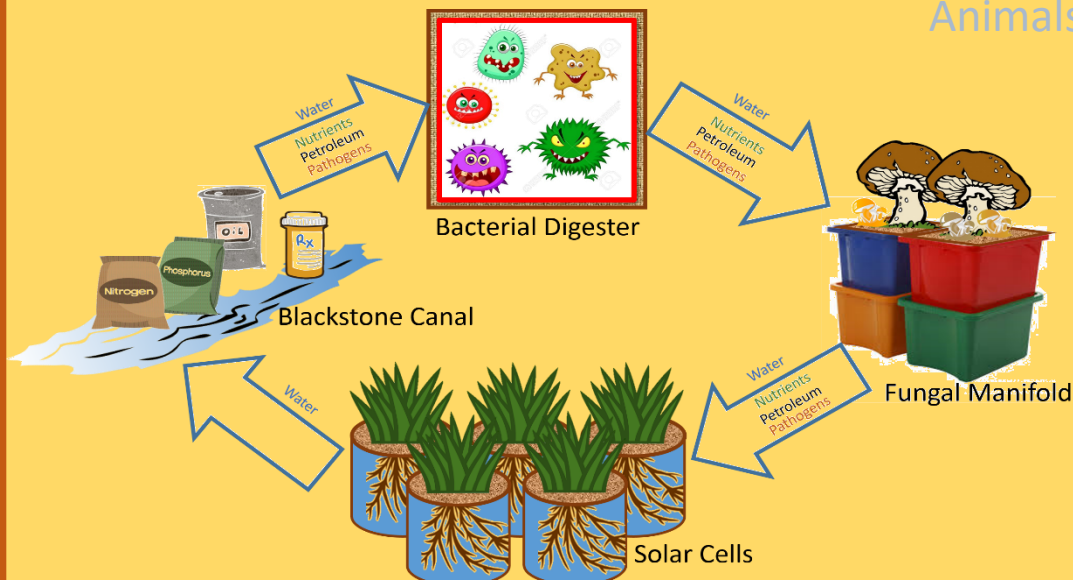


BASIC PRINCIPLES OF LIFE CYCLES AND STRUCTURES. Students will get the most out of a trip to the LSL if they have had exposure to the tenants of the subject of Lifecycles and body structures prior to the excursion. Topics that they should be familiar with include:

Resources that Organisms Depend On

How plants, animals, bacteria and fungi obtain food, minerals, air and water
How temperature can affect an organism's ability to survive
The role of light

Life Cycles of Plants, Fungi, Animals and Bacteria



How organisms begin
(seeds, eggs)

How organisms grow
(increase in size, weight, grow new parts)

Reproduction
(develop seeds, root runners, mate, lay eggs)

Death (length of life)

NAVIGATING THE LEARNING LANDSCAPE. Now that students have a background in the principles of organismal structure and life cycles, they can use the Blackstone Canal, Eco Machine and nursery to evaluate these processes in motion. The questions below are a tool for teachers and are meant to guide the learning of students before and during their tour of the LSL.

Before the Tour

Ecology of the Blackstone River

What different kinds of organisms do you see?

What kinds of organisms are there below the water? Below the ground?

From where do these organisms obtain water? Food?

During the Tour

Bacteria

Why can't we see the bacteria in the digester?

If we had a microscope, what would the shapes of bacteria be?

How do bacteria move throughout the Eco Machine?

How and what are the bacteria eating?

How do bacteria reproduce?

What happens to the bacteria when the temperature gets really cold outside?

Fungi

Which parts of the fungi can you see in the bins? Can you name them?

What are the filaments for?

What is the fruiting body/mushroom for?

How do fungi reproduce?

Why can the fungi grow even when the covers are on the bins?

How do the fungi obtain energy? Water?

What happens after the fruiting body releases spores? How else do they reproduce?

Plants

Can you name the parts of the plants you see in the tanks?

How are the plants obtaining energy? How are they obtaining nutrients and minerals?

Where do the nutrients go after they are taken in from the environment?

How do the plants reproduce?

Why do the plants in the greenhouse have more leaves or are bigger than the same plants outside?

How do plants die?

After the Tour/Reflection

The role of Temperature

What happens to animals when it gets cold out? To plants? To fungi and bacteria?

How do hot temperatures affect an animal's ability to get water? How about plants and fungi?

Why is it worrying when we are told that the temperature keeps on rising?

Excess Resources

What happens to bacteria when there are lots of nutrients in the water?

What does that mean for animals? For humans?

Where do nutrients come from?

What happens to plants when there are lots of nutrients in the water?

What does that mean for humans?

RESOURCES ON LIFE CYCLES AND STRUCTURE:

Fungi: http://www.namyco.org/fungus_files.php

Plant Life Cycle Activity: http://www.pbslearningmedia.org/resource/tdc02.sci.life.colt.lp_plantcycle/plant-life-cycles/

Bacteria and Bioremediation: <http://www.nap.edu/read/2131/chapter/4>

RESOURCES ON THE BLACKSTONE RIVER:

Map of the Blackstone Watershed: <http://www.thebrwa.org/map.htm>

River History: <http://www.nps.gov/blac/index.htm>

Be sure to check out our guide *"LSL Field Trip Prep Tips"*



Help us make the experience better for you!

WE ALWAYS LOOK TO IMPROVE. Let us know how we can help you achieve your teaching goals on this trip. Email us with any questions or concerns at livingsystemsintern@gmail.com.

