Why Forests Matter

Merry Ostheimer | 2nd Grade

Unit Description

This science and social studies unit is designed for second grade but would be appropriate for other primary students. Lessons focus on understanding what a forest is and discovering how humans are connected to them. Employing the National Geographic Certified Educator strategies of Developing an Explorer's Mindset, students will use their curiosity to steer their exploration of trees and forests.

"Leave No Child Indoors!" is the message that prevails throughout this unit, as constant connection with nature is encouraged. In the pursuit to understand how trees are gigantic carbon dioxide vacuum cleaners, students will enjoy nature walks and examine native plants as sources of medicine and how they are essential to their local ecosystems. Movement activities will lead students to experience how the parts of trees work and live out their life cycle. By the conclusion of the unit, students will have embraced the enduring understanding that their connection with nature is powerful and that trees are vital to our human world.

Content Standards

1. Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (**MS-LS2-4**).

2. There are many different kinds of living things in any area, and they exist in different places on land and in water. **(2-LS4-1**).

Objectives and Outcomes

Students will:

1. Develop an explorer's mindset by being curious, asking questions, observing nature, and collaborating to solve problems.

2. Understand what forests are and how forests are important to humans.

3. Study how trees are hosts to many organisms.

Supporting Material

1. **DTI 2022 Unit**

Thank you to the Longwood Foundation for their support.

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Delaware *Teachers* Institute

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Merry Ostheimer

Introduction

I am an elementary teacher at West Park Place School in Christina School District in Delaware. Located about a mile from the heart of University of Delaware (UD) in Newark, Delaware, West Park Place has a wonderfully diverse population of under 340 students that represents ten countries and eleven different languages. West Park Place hosts several programs that include English Language Learner (ELL), Delaware Autistic Program, REACH (Realistic Educational Alternatives for Children with Disabilities), and Accelerated Academic. Ninety percent of our ELL students met their goals on the ACCESS (Assessing Comprehension and Communication in English State-to-State for English Language Learners) test.

According to the annual report generated by the Christina School District, out of our total student body, we have about 12% English Language Learners, 56% Eligible for free/ reduced meals, and 13% Students with Disabilities. I am a second grade, self-contained teacher and teach multiple subjects that include English Language Arts, Math, Science, and Social Studies. Last school year, 72% of students were proficient in English language arts (ELA) and 77% of students were proficient in Math. This year, my second grade class has twenty students, seven of whom speak English as a second language. They hail from Pakistan, India, Saudi Arabia, China, and Mexico and truly infuse a multi-cultural presence in our class.

Many students at West Park Place have parents who work for UD or are visiting from other countries to teach or attend higher education UD programs, which creates a bustling hub where education is highly valued. Our instruction is aligned with Common Core State Standards and Next Generation Science Standards. My fellow teachers work with our administrators collaboratively in Professional Learning Communities to analyze student data, set goals, monitor progress, and plan meaningful learning activities. We meet in Professional Learning Communities (PLC’s) to look at beginning year data derived from iReady testing to respond to students' needs. Based on the Christina School District's annual report, West Park Place teachers are predominantly Highly Effective and Highly Qualified. Our teaching staff has many years of experience with most carrying at least one master's degree. West Park Place Elementary School launched the Leader in Me program which empowers students to practice habits that lead to leadership and positive

life skills. West Park has a strong Parent Teacher Association which supports curriculum nights, Scholastic Book Fairs, the 500 Book Challenge, and extracurricular programs.

Delaware Teachers Institute (DTI) has been well-represented here at West Park Place Elementary School. Since 2014, at least at least one, and up to five teachers have taken part in seminars in a given cohort. Students have been the true benefactors of this partnership between the University of Delaware and Christina School District. In fact, according to the 2021 U.S. News and World Report, West Park Place Elementary School earned an overall score 95.37 out of 100 and earned the rank of #6 in Delaware Elementary Schools and #1 in Christina School District Elementary Schools.[1]

Rationale

As a National Geographic Certified Educator, I use the National Geographic Learning Framework to nurture an explorer's mindset in my students. My teaching mission is to cultivate a curious attitude in my students and inspire them to want to be responsible to make a change in their own habits and to make their world a better place. I will teach them observation, communication, problem solving, and collaboration skills. Together, we will discover the wildlife in our schoolyards and learn how to sustain wildlife. For this unit, we will understand what forests are and how they are important to humans. We will examine and identify the parts of trees and study how trees are hosts to many organisms. Most importantly, we will experience the awe of forests and how being outside makes us feel.

Content Objectives

Traditional Ecological Knowledge and Taking Care of the Land

It would be hard to write this unit without mentioning Traditional Ecological Knowledge or TEK, which refers to the knowledge, beliefs, value systems, and practices in Indigenous communities that relate to the natural world and implies cultural elements tied to Indigenous communities.[2] Indigenous communities lived or currently live in almost every place in the world. In our local area, our Indigenous people are the Lenni Lenape, whose name means "the real people." During our ACEER Foundation Summer Institute, we learned about Lenape history from Chief Dennis Coker and Ruth Purchase and what it means to acknowledge the Indigenous presence and land rights of the Lenape people. In

order to support our Indigenous people, we need to give respect to nature and understand that our actions have an impact on the land and cultures.

In consideration of TEK, we talk about the local animals, plants, animal habitats, plant and animal life cycles. Our deciduous forests are dominated by oak, hickory, tulip poplar, beech, maple, basswood, eastern hemlock, and eastern white pine trees. These trees are host plants for insects, spiders, reptiles, birds, and mammals. These animals need to adapt to changing seasons in order to cope with cold winters and hot summers. Some hibernate or migrate, while others grow thick fur or add layers of fat to survive the winter. TEK can help add information to scientific data to understand these biomes over long periods of time.

Since TEK is place-based, it is specific to a locale's climate, weather, seasonal changes in the environment, and seasonal changes in animal behavior. For example, if a wetland area dries up due to changing weather patterns, the habitats of its plants and animals are affected. Traditional Ecological Knowledge can identify environmental changes attributable to climate change at the local and regional level. Through this understanding of the potential impacts of climate change, Federal managers can carry out mandates for which the various conservation units were established and to build flexibility into formal management structures to address a changing environment.[3]

TEK includes the Indigenous peoples knowledge of how and where to hunt, how to use animal parts for clothing and food, cooking techniques, plants that can be used for medicine, how to make shelter, boats, and tools from natural materials. Medicines that we can gather from our local deciduous forests include poultice from plantain that can treat abrasions or scrapes with its antimicrobial properties. Other medicines from plants include tea from witch hazel which can serve as an astringent for toxins or treat sore throats and tea from northern red oak tea which is a strong astringent for diarrhea or indigestion.

TEK helps to obtain and combine information about ways individual communities use science ideas to protect the earth's resources and environment. Forests are a source of food and medicine. About 600 years ago, 95% of Delaware was covered by forests. Over 140 plants were used for Lenape medicine, but today, many of these plants are gone due to Europeans cutting down trees to settle the land and draining land to farm. When the forests were destroyed, there was a significant loss of insect, fish, reptile, bird, mussel, and woodland plant populations. This next section will help explain how forests clean up our air.

Forests as Gigantic Carbon Dioxide Vacuums

The forest is really a gigantic carbon dioxide vacuum that constantly filters out and stores this component of the air[4].

Can you get through a day without using something from trees? Paper, pencils, lumber, and a lot of food comes to my mind right away. But there is so much more that we get from trees. Already some of my second graders know that trees clean the air by taking out carbon dioxide. Here is a brief explanation of why forests are important to our environment.

Carbon: Sinks & Sources

Carbon is the fourth most common element in the universe and the building block for all life on Earth. Carbon dioxide is made up of carbon and is in the air we breathe. In the carbon cycle, carbon continually flows in and out of the atmosphere and living things. "As plants photosynthesize, they absorb carbon dioxide from the atmosphere and when they die, the carbon goes into the soil, and microbes can release the carbon back into the atmosphere through decomposition."[5] Trees sequester carbon dioxide and store it, making the carbon into wood. In this way, many trees are extremely valuable to our environment.

Carbon sinks are natural or artificial reservoirs that absorb and store carbon through the process of carbon sequestration. These are places that absorb more carbon than they release. Carbon sinks for atmospheric carbon dioxide include photosynthesis, forests, soil, fossil fuels, freshwater bodies, and oceans.

Carbon sources are any natural or artificial processes that release more carbon dioxide into the atmosphere than they absorb. Sources of carbon production include the burning of fossil fuels, forest fires, animal respiration, plant degradation, and large livestock operations.

The carbon cycle gets out of balance when there is more carbon dioxide in the atmosphere than carbon sinks can store. One remedy is to plant more trees and protect forests. During one year, a mature tree will absorb more than 48 pounds of carbon dioxide from the atmosphere and release oxygen in exchange.[6] Just imagine the amount of carbon dioxide a forest can absorb! What would happen if those trees were destroyed?

What is a Forest Anyway?

What is a forest anyway? Forests are carbon sinks! According to the National Geographic encyclopedia, a forest is defined as an environment that is covered by trees at least 16 feet high over an area of at least 1.2 acres which is smaller than an American football field.[7] Forests provide human resources such as lumber, food, energy, shelter, and medicine. Trees in forests help purify water by filtering pollutants from water in the soil before it reaches a waterway. Trees store carbon dioxide from the atmosphere and provide supportive environments for plants and animals.

Types of Forests

Forests are one of five biomes that are characterized by its vegetation, soil, climate, and wildlife. Forests are full of trees and home to insects, plants, birds, mammals, and fungi. This biodiverse landscape can be found all over the world at different latitudes and altitudes, so there are three major forest biomes. Tropical forests are close to the equator so they are hot and humid. Temperate forests can be found in higher latitudes and have four seasons. Boreal forests are found at higher latitudes so they are cold and dry.

Temperate forests are found across North America and Eurasia. Temperatures vary due to the four distinct seasons at these latitudes. Precipitation is abundant leading to fertile soil that is able to support diverse flora like oak, maple, and birch trees as well as fauna such as deer, squirrels, and bears. Delaware has three state forests which are temperate forests: Blackbird Forest (near Smyrna), Taber Forest (near Harrington), and Redden Forest (near Georgetown).

Tropical rainforests are found around the equator and have a range of temperature between 68 and 88 degrees Fahrenheit. According to National Geographic teachers' resources, “rain forests’ rich biodiversity is incredibly important to our well-being and the well-being of our planet. Rainforests help regulate our climate and provide us with everyday products.”[8] Rainforests are not just found in tropical regions. I visited southeast Alaska this summer and was surprised to discover that we hiked in Tongass National Forest, a temperate rainforest! Hiking through the green wilderness was joyful. We passed downed trees covered with moss, heard a grizzly bear huffing at her cubs, and watched salmon flip out of the water to get lice off their bodies. At one point, we could actually hear banana slugs munching on the forest floor!

Boreal forests are characterized by coniferous forests consisting mostly of pines, spruces, and larches. You can find these subarctic forests in the high latitudes between the tundra and temperate forests.

Forest Layers, Biodiversity, and the Race to the Top

In a race for sunlight, forest trees grow tall and create pockets of habitats for flora and fauna to flourish. There are four basic layers to forests.

The Emergent layer is made up of the very tallest trees that grow so tall to allow trees to reach more sunlight. In his book, *The Hidden Life of Trees*, Wohlleben points out "of all the plants, trees have the largest surface area covered in leaves. For every square yard of forest, 27 square yards of leaves and needles blanket the crowns."[9] The crown of tree tops helps slow down rainfall and in this way every surface of every leaf gets water.

The Canopy is below the Emergent layer and is made up of shorter trees and is crowded with branches, leaves, and vines. Because of the abundant supply of light, canopy plants are able to photosynthesize quickly. The canopy also shelters against strong winds and storms. Animals and plants that love sunlight dwell in this forest layer.

The Understory is a layer of shorter trees, bushes, and ferns that don't need as much sunlight, so they are shade tolerant. The animals of the understory such as amphibians, mammals, and reptiles like the darkness.

The Forest Floor is where water collects. Trees live, die, and decay as they are a vital part of the food web. Falling trees fuel ecosystems in the stream habitat where "woodland tea" contains animal droppings, leaves, and natural matter. Tree roots and mollusks filter debris and hold the soil in place and this is why trees are recommended to be within 100 feet of streams to act as a restoration buffers. The Forest Floor is also where decaying wood provides habitat for many macroinvertebrates as well as algae, fungi, lichen, bacteria, insects, and worms. Integral to the life cycle of a forest, this team of decomposers break down decaying matter and feed the carbon sink.

Take a Walk in a Forest and Identify a Tree

What do you think about when you take a walk in the forest? You may wonder what kinds of trees are standing around you. I went to one of Delaware's state forests to have a walk in the woods with a Blackbird Forester and a Master Naturalist. We started by learning how to use Tree Finder, a compact manual for identifying trees by their leaves. With a bunch of tree samples from the forest, we followed the guide step by step to see what tree we were looking at. Here is a recap of how we used Tree Finder to identify a specimen.

This specimen had leaves, not needles so we went to page 14. In doing so, we eliminated larch, pine, spruce, fir, and cedar trees.

Next, we looked at the branch and determined that our sample had alternating, not opposite growing leaves or buds so we skipped to page 21, thus eliminating chestnut, ash, and maple.

Then we examined whether our leaf was compound (composed of several leaflets) or simple. Our leaf had no bud at its base so we determined that it was simple and went to page 28, skipping dogwood, sumac, coffee-tree, tree of heaven, mountain-ash, walnut, and hickory.

The dichotomous key directed us to inspect the edge or margin of the leaf to decide if it had teeth or lobes, which are projections of the blade with gaps between them (these gaps, however, do not reach the middle vein).[10] Our leaf had lobes so we went to page 33, so we eliminated magnolia, sweet gum, persimmon, paw-paw, redbud, sassafras, and some types of oak.

Now, we needed to decide whether the leaf is evergreen, typed with stiff, sharp spines, or not evergreen. It was evergreen, so we skipped holly. Then we determined that it had no thorns or thorn-like twigs. We looked again at the margins and decided they were not toothed, but rather deeply lobed so we skipped to page 51, eliminating beech, chestnut, poplar, cottonwood, aspen, hackberry, basswood, mulberry, willow, elm, Shadbush, fruit trees (plum, apple, and cherry), hawthorn, alder, birch, hornbeam, several oak, and ironwood.

On page 51, we again examined the margins of the leaf to decide whether they were merely hardly indented or had lobes which it did so we skipped to page 53, skipping more oaks and ginkgo.

On page 53, we counted the four lobes so we eliminated other oaks.

Now we decided that our leaf was not fan-shaped so we eliminated sweetgum and sycamore.

Finally, we reached our final choice- we looked at the branch of our sample to see if it had some lobed leaves and unlobed leaves. Our sample did not so we needed to inspect the main vein. We saw that the main vein of the leaf ends in a notch and the tip looks cut

off. The drawing below is exactly how it looked! We determined that the leaf came from a tulip tree!

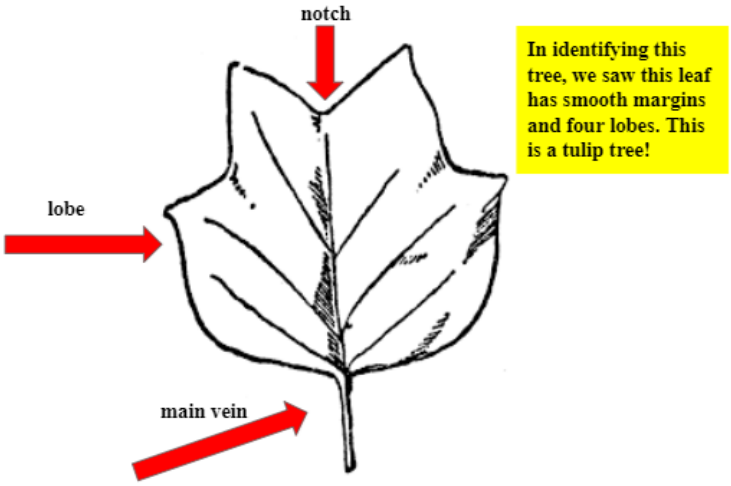

Figure 1: Identifying a tulip leaf. Image credit: Merry Ostheimer

Why Forests Matter

From Blackbird State Forest to the Amazon Rainforest, forests provide an endless supply of treasures, whether it is clean air or a biodiverse ecosystem. Both Blackbird and the Amazon biomes provide global cycling of carbon, oxygen, and water as well as regulating climate change. Trees and plants use photosynthesis to take in carbon dioxide and release oxygen. Cutting down trees will reduce the amount of carbon dioxide that is in the atmosphere. Forests have been lost to natural phenomena such as climate change, wildfires, insect damage, and disease. Forests have been exploited by loggers who cut down trees for lumber and people clearing land for agriculture.

So how can we help protect forests? Planting new and replanting trees where there were human or natural disturbances. We can be proactive and protect forests so they can replenish naturally. We can urge our government to prevent timber harvesting. We can develop effective forest management plans that strike the balance between environmental protection and the economic needs of humans. But perhaps the most important thing we can do is connect with nature. Taking my students out for a walk around our school and property has done wonders for bonding us as a team of explorers. We wonder about trees and their little ecosystems and food chains. Each day at recess, my students check in the trees and look for evidence of the change in leaf color. They rally around the trees and

play hide and seek or use their tree as base. Getting outside to enjoy nature and trees can build a mindset for forest protection.

Teaching Strategies

National Geographic Certified Educator and Developing an Explorer's Mindset

An Explorer remains curious about how the world works throughout his or her life and is adventurous, seeking out new and challenging experiences.[11]

As a National Geographic Certified Educator, I encourage my students to think like explorers and treat learning as an expedition not just a lesson. First, I nurture attitudes that embody scientists by encouraging curiosity and engaging students' imagination and have them wonder about the world. We exercise respect and responsibility and push for making a positive impact.

Then, I build observation, communication, collaboration, and problem solving skills. We use a "Wonder Wall" to reflect on questions such as "Do plants need soil to grow?" Post-it notes are available for explorers to write answers, predictions, or observations. Outside my classroom, we made a little garden with native ground covers, a variety of milkweed plants, a rose mallow hibiscus shrub, and basil. We took several pinches of the basil plant and put it in a bottle of water to use for this Wonder Wall question. We have been noticing over the course of weeks, there are roots sprouting at the bottom of the basil stems so we can answer affirmatively that yes, plants can grow without soil. A new question has emerged: what are the blossoms that have sprouted at the top of the basil? What will happen if we pinch it off? Now we have one basil plant that has been pinched back and two others that we agreed to leave alone so we could compare how the plant grows.

Lastly, at the end of each day, I target National Geographic's three knowledge areas by discussing what we learned today and what we wish to learn tomorrow. The three knowledge areas that Nat Geo targets are The Human Journey, Wildlife and Wild Places, and Our Changing World. It has been inspiring to hear some student responses like when one student made the connections upon hearing the story *All are Welcome* by Alexandra Penfold, which showed a school with kids from all different cultures. My student pointed out that seeing kids from all over the world tells us about The Human Journey. When we examined trees during our bark rubbings, one student considered the insects he saw,

jumped to his interest in scorpion beetles, and connected this revelation to Wildlife and Wild Places.

Reframing learning and nurturing an explorer's mindset encourages my learners to use their senses, take notice of what they experience, and wonder about the world in different ways. Perhaps the most profound impact of this teaching strategy is that I call my students "explorers." By referring to them as "explorers," their mindset evolves and they think like scientists. This level of student engagement is transformative and tremendously rewarding.

Gear up with Explorer's Backpacks!

Every explorer needs gear and the most important tool of all is the Explorer's Nature Journal! Students can use any notebook or composition book for a journal, but I love using grid paper composition books. The squares are non-obtrusive so you can write as you will without worrying about staying on a line. We can place an object on the paper and trace it so we can find the area. The lines also guide us if we want to make graphs.

Other tools in our pack include pencils and crayons. Pencil marks will not run off the page if it gets wet. Crayons will be very important to capture colors and other details of our investigation. We need to also pack magnifying lenses so that we are ready to examine the very tiny things we encounter. Once we have our Explorer's Backpack, we're ready to go on some expeditions.

Using Movement to Make Learning Concrete

Dr. Lynnett Overby is a Professor of Theatre at University of Delaware and encourages teachers to integrate dance into instruction to help students discover the joy in learning. In her book, *Interdisciplinary Learning Through Dance- 101 MOVEntures*, Dr. Overby states that "dance is uniquely suited to support conceptual learning because the dance vocabulary is expressed in terms of the body, space, time, and force--concepts also fundamental to understanding the universe."[12] There are locomotor and non-locomotor movements that can be adjusted to various levels of speed, height, and force.

Explorer's Reading Library

I motivate my explorers by having a collection of literature and informative texts about the human and natural world connection. Reading about nature encourages curiosity and helps build research skills. I have included books in the Sources section.

Classroom Activities

Leave No Child Inside!

Shinrin-Yoku is the Japanese practice for "forest bathing" or when you take a walk in the woods and relax. According to the Forest Bathing Finder, there are major health benefits for soaking "in the beauty of nature and the forest." Taking time in nature reduces stress, improves mood, frees up creativity, reduces high blood pressure, and accelerates recovery from illnesses.[13] For our Social Emotional Learning classroom environment, it is vital for our children to learn self-awareness skills and we can target this by going outside and developing a love of nature. By taking walks and exercising our observations we can fall in love with nature!

Five Senses Walk

Before going on this walk, I will explain to my explorers that we will use this draw or write whatever they see, hear, smell, touch, and taste. We will prepare our Explorer's Journal to do that. After reviewing our five senses, we will draw icons at the top left corner of pages in our journal: eye, ear, nose, mouth, and hand. Then we will head outside and practice using our senses to experience nature.

Seeing: What do you see? Why do you think it's there? What would happen if it was not there anymore? Go down low and look in the soil and grass. What do you see?

Hearing: Listening to the sounds of nature leads to looking up and out. What is making that sound? Where is the sound coming from? Can you get down low and listen for sounds from the ground?

Smelling: Take a sniff. What do you smell? What could be making it smell that way? Go down low and smell. Can you smell something different?

Tasting: Open your mouth and taste the air. Can you taste anything? What about if you waft some air to your mouth? Can you go down low and try?

Feeling: Stand still and feel the air around you. What does it feel like? Raise your hands. Does it feel different? Go down low and compare.

Leaf Rubbings

Connecting with nature may lead us to love nature. What we love, we want to protect. What we want to protect, we want to learn about. We can go for a walk and collect some leaves. We can observe the shapes of leaves by noting some characteristics of deciduous tree leaves. First we can notice whether the leaves grow on the branch opposite each other on the stem or grow on the stem in an alternating pattern.

Leaves contain two main parts which are the lamina, or leaf blade, and the petiole, or the stalk that connects it to the stem. If the lamina is undivided, it is a simple leaf, from a red maple, sycamore, oak, or elm tree. If it is divided and forms a collection of leaflets, it is a compound leaf.[14] Examples of trees with compound leaves are black locust, ash, walnut, elder, hickory, and buckeye.

Making leaf rubbings is a fun activity once we find leaves on our nature walk. First write the date at the top of the next page in our Explorer's Journal. Now, we can take one of the leaves and create a leaf rubbing by putting the leaf upside down on the dated page of our journal. Then we will cover the leaf with the next page of our journal and use the side of a crayon to rub across the leaf. When we finish, we can compare our rubbings and decide whether the leaves we collect are simple or compound. Putting the date on the page is important for our investigation so we know when our observation took place.

Bark Rubbings

We can build on our knowledge of trees by studying their bark. A tree's bark is its protective outer coating. Bark has various textures, patterns, and other characteristics that can help in tree identification. According to Treehugger, young trees sometimes have smooth bark that is unbroken by ridges. American beech and the red maple trees have smooth, unbroken bark throughout their lifespans.[15]

Sometimes a tree's wood is growing faster than the bark surrounding it, so it pushes outward against the bark resulting in peels of horizontal strips.[16] This happens to the paper birch tree.

All trees have lenticels, pores that move the carbon dioxide and oxygen through a tree's bark, but some lenticels are prominent than others. The dark, horizontal lines in yellow birch are lenticels.

Northern red oak trees have deep ridges and furrows in their rhytidome, the bark's outer layers. Pine and spruce trees have breaks in their rhytidome and they look like plates or scales.

For this bark rubbing activity, it is better for explorers to use a separate sheet of paper. Later, they can tape this rubbing to a page in their Explorer's journal.

First we will choose a tree and then we will use our hands to feel the bark. Next we will hold our sheet of paper against the tree and use a crayon on its side to rub an impression. We will compare each other's rubbings and discuss what we see. We will talk about how our initial touch compares to how our rubbings came out.

Medicine in the Forest

Some of the plants in our deciduous forest have healing qualities. The Lenape people used these medicinal plants to make medicines and other remedies. Through the strategies of observing, trial and error, and watching animals, the Lenape discovered that plant roots, leaves, stems, and flowers could be used to heal. Black willow bark was used to relieve pain and reduce fever before aspirin was manufactured in a laboratory.

One activity for teaching students about medicinal plants is to go outside and observe the plants in our school-yard. We can take paper and crayons outside to sketch out plants we see and wonder about their parts- roots, stem, leaves, flowers, and seeds. A predominant plant that we encounter in our yard is plantain, a broadleaf ground cover with little beaded stalks. Plantain is also known as "white man's foot." because it seemed to have arrived with the very first white settlers to North America. The Lenape made a plantain poultice which went straight onto the skin to relieve insect bites. They also used plantain tea to help with gastrointestinal ailments. We can pull up plantain, roots and all, to investigate the parts and contemplate their usefulness.

We can also send our students on a scavenger hunt to they find parts of plants on a list. We can include plantain roots, clover leaves, acorns, dandelion stems, maple leaves, and pine cones. After collecting the items, we can discuss how these plant parts could be used.

Dancing and Movement Activities

I love using dancing and movement to make learning concrete. Here are some activities to keep your explorers engaged.

Parts of Trees

All trees are unique because they make their own food, provide energy to other living things in the form of food, and clean the air by taking out carbon dioxide. The tree's leaves absorb sunlight and gas from the air, while its roots absorb water from the soil. In their leaves, trees combine the sunlight and carbon dioxide to make sugar which helps the plant live and grow. Then the tree's leaves release oxygen into the air. Each part of the plant has a role to play: roots absorb water and minerals from the soil, the trunk carries water, minerals, and sugar throughout the tree, the flowers make fruit and seeds, and the leaves absorb sunlight and carbon dioxide and then release the oxygen.

Anytime there are "roles to play," I think of having my students use movement to act out the roles. Some children can lay low on the floor in a star-shape and act as roots. Others can stand tall with arms straight down at their sides and act as the trunk. Others can stand tall with arms outstretched and act as leaves. Finally others can start low with their fingers behind their ears and elbows in, then rise up opening their elbows like they are a blooming flower. I will teach the tree parts with the actions first and then call out the parts for the children to act it out.

Forest Life Cycle and Log Hotel

Log Hotel is written by Anne Schreiber and illustrated by Debbie Pinkney. It tells what happens to an old oak tree that stood for hundreds of years in a forest until one day it was knocked down by a strong wind. The story can be read aloud and have your explorers perform the actions of what happens in this story. Everyone can start standing tall with arms outstretched. Then wave their arms while keeping their feet stuck to the ground, as they pantomime being blown about. Creativity will take over as you read and when the organisms of the forest come to help decompose the tree. By the end of this story, your explorers will understand that when trees die, they provide a habitat for insects and animals as well as nourishing the ground.

Yoga and Trees

Using the metaphor of a vacuum cleaner is such an effective way to help explorers understand how trees purify our air. Our explorers can become trees through yoga. They can exercise their lungs while visualizing themselves as a tree in the forest. Flow & Grow Kids Yoga website describes the Tree Pose in a delightful way and gives more tree-centric activities.[17]

Appendix A

Content Standards

Next Generation Science Standards Disciplinary Core Ideas

LS2.C: Ecosystem Dynamics, Functioning, and Resilience
Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)

LS2.A: Interdependent Relationships in Ecosystems
Plants depend on water and light to grow. (2-LS2-1)
Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

LS4.D: Biodiversity and Humans
There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

English Language Arts
RL.2.2 Key Ideas and Details
I can recount stories from diverse cultures and determine their central message, lesson, or moral.

RL.2.6 Craft and Structure
I can acknowledge differences in the points of view of characters.
I can speak in a different voice for each character.

SL.2.4 Presentation of Knowledge/Ideas
I can tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences.

Appendix B

Multi-Media Resources

There are slideshows to enhance instruction for teaching about Traditional Ecological Knowledge and how the Maijuna community builds a more sustainable life. The Chambira Palm and Stingless Bee slideshows include an introduction, vocabulary words, content standards, and media to support how the Amazon rainforest provides natural resources for the indigenous people. I have used photographs, gifs, and video clips to illustrate life in the rainforest.

Magic Tree House is a children's book series by Mary Pope Osborne. She believes that "Every child is capable of using imagination. Every child has a hunger to know things." I created a slideshow to accompany her sixth book, *Afternoon on the Amazon.* In my slideshow, I have images that correspond to the various places Jack and Annie visit while they are on their adventure.

A Canoe for Ellie is a movie about our partner Ellie from One Planet. Ellie lives among the Maijuna people and she commissioned a team to build her a canoe. This movie documents the crew's process of burning the underside of a log, stretching the opening, and removing the char from the burn.

A slideshow called *Amazon Rainforest Wonderings* was created to encourage thoughtful discussions about the phenomena of the human-natural world connections. This slideshow can be used for project-based learning activities.

There is a list of useful books for read alouds to provide background information about the human and natural world connections.

Valuable Read Alouds

title	author
Greta and the Giants	Zoe Tucker
Listen to the Wind	Dr. Greg Mortenson
Lost and Found Cat: The True Story of Kunkush's Incredible Journey	Doug Kuntz

My First Day	Phung Nguyen Quang
We Are Water Protectors	Carole Lindstrom
What a Waste: Trash, Recycling, and Protecting our Planet	Jess Frency
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