Unit 3: The Earth, Forests, and Trees

Communities: The natural world is characterized by diverse populations of individuals that form communities, which provide important resources for people and have important ecological functions.

Lesson Plan 1 "Abundance of the Forest"

Summary: Students will learn the uses of forest products by Natives of the Chugach region and their value as food, medicine, shelter, and ceremonial objects. Students will also learn about the process of photosynthesis and the ecological role of forests.

Grade Level:
K-4 / 5-8 / 9-12

Time Required:
Ten class periods of 45-60 minutes

Materials Needed:

- Photographs of plants, animals and forests from the Chugach Region
- Products made from forest materials such as an Alutiiq wooden mask that's been colored with berries and other "natural" colors
- Science Journals
- Drawing Paper, 9x12
- Digital cameras
- Plant presses

Learning Objectives:

- Students will describe the ecological definition of community.
- Students will identify products made from local forest materials by Native and non-native people.
- Students will understand the importance of photosynthesis in the Chugach Region.
- Students will learn how the decomposition of salmon within rivers impacts forest ecosystems.

Vocabulary introduced:

Community, population, photosynthesis, ecology, subsistence, harvest, organisms, ecosystem, nitrogen cycle, decomposition, macronutrients,

National Science Education Standards:

Life Science

Content Standard C: As a result of their activities in grades K-4, all students should develop understanding of the following:

- Characteristics of organisms
- Life cycles of organisms
- Organisms and environments

Content Standard C: As a result of their activities in grades 5-8, all students should develop understanding of the following:

- Structure and function in living systems
- Reproduction and heredity
- Regulation and behavior
- Populations and ecosystems
- Diversity and adaptations of organisms

Content Standard C: As a result of their activities in grades 9-12, all students should develop understanding of the following:

- The cell
- Molecular basis of heredity
- Biological evolution
- Interdependence of organisms
- Matter, energy, an organization in living systems
- Behavior of organisms

Alaska State Standards:

Concepts of Life Science

A student should understand and be able to apply the concepts, models, theories, facts, evidence, systems, and processes of life science.

A student who meets the content standard should be able to develop the following:

- An understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution;
- An understanding of the structure function, behavior, development, life cycles, and diversity of living organisms; and

- An understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy.

Background Information:

Become familiar with the local forests and what grows there, including what the local community harvests and uses for artwork, ceremonies, and medicines.

Invite a community member to guide the students on a nature walk to identify and gather materials, teaching students traditional uses of the local forest.

Meet the community members prior to their visit to the classroom so they understand what you would like them to share and let them become familiar with the classroom.

Have water or tea for the nature guide to drink during their visit to the forest with the class.

Review social expectations with the class prior to the guest speaker (sitting respectfully listening, waiting until the speaker has finished talking before asking questions, offering assistance/escorting when the speaker is leaving).

Have a small gift of thanks for the guest (something made by the class, or a card, and follow with a letter from the students).

Local Story

SKUNK CABBAGE AND WATER-LILY / Chief Makari
(from the Chugach Legends, 1984, p. 81)

"There was a village below Nunaqtyuk called Nanuaranarait. In the summer a great many children came over there. They were skunk cabbages and water lilies. They were friendly to each other, and every summer many children were coming. When they grew up and were old enough they said to each other: "I suppose it would be better if we were married." So they intermarried.

The people of Nanuaranarait were all kinds of bushes. Skunk Cabbage was a man, Water Lily a woman. Skunk Cabbage died, but Water Lily lived until the ice came. The roots of Skunk Cabbage and Water Lily were their parents. Water Lily's father and mother said: "We do not like that your husband dies right away." He did not really die, his roots were still alive, but they did not like the idea. They told Water Lily to leave her husband. When the winter comes, Skunk Cabbage dies entirely, but Water Lily lives on. Her roots are far down. But Skunk Cabbage always dies, even in the swamps."

Listen to the Audio: Interview with Karen and Herman Moonin about traditional plant use (trees, edible plants, etc), 2011

Listen to the Audio: Water Lily and Skunk Cabbage story from the Chugach Legends, recorded with Nick Tanape, 2010

Elders Observations

"I haven't noticed any changes in the berries. In fact, we've noticed new places for berry picking." (Barbara Olsen, Cordova. From ANSC Western Region Report on Changes, 2002)

"Lillian and I walked to church and our dad would pick us a chewing stick, some kind of black stick medicine, for sore throats." (Lydia Robart, Port Graham. From ANSC Western Region Report on Changes, 2002)

*"They used to bark from the alder, boiled it and gargled it. They used alder leaves to draw infection out of a boil. We have alders growing all over the place." (*Mary Kompkoff, Chenega Bay. From ANSC Western Region Report on Changes, 2002)

Resources: Alutiiq Words

Plants, Berries and Related Terms

Alder	uqgwik
Chopped up alder	kenerkiurat, kenerkiu'at (check correct word)
Dead alder	tuqulineq (check correct word)
Balsam Poplar/ Cottonwood	ciquq
Blackberry	pakik
Blueberry (lowbush)	curaq
Blueberry (highbush)	atsaq
Birch	elnguq
Branches	cuyat (check correct word)
Red Cedar	qar'usik
Yellow Cedar	teptuliq
Cloudberry	aqagwik
Salmonberry	alagnaq
Cow parsnip/ Wild Celery	ugyuuteq (the whole plant)
Cranberry (low bush)/Lingonberry	kenegtaq
Cranberry (high bush)	qalakuaq
Crowberry	pakik
Currant	qunisiq
Dandelion	saalalraaq
Devil's club	cukilanarpak
Driftwood	pukilaaq
Elderberry	sanuuliiq
Pacific red elder	qaruckaq
Fern	kun'aqutaq
Licorice fern	tuquyuilnuq
Lady fern	kun'aquataq
Fern root	kun'aq
Flowers (in general)	suitkaaq
Fireweed	cillqaq
Grass	weg'et
Hemlock parsley	cingkaq
Horsetail	naparuaqutaq

Huckleberry	atsaq
Chocolate Lily/ Wild rice	arpaayak
(below ground part of the plant)	laagaq
Labrador Tea	caa'uq, nunallaq caa'yuq
Leaf	pelluq
Lupine (Nootka)	akataqutaq
(stalk)	akataq
Moss	uruq
Nettle	uuqaayanaq
Onion	luk
(wild onion, wild chive)	luuguaq
Pineapple weed	alam'aaskaaq
Pine cone	ahm'akuuq
Raspberry	alagnaa'aq
(Trailing raspberry)	malruukegtaaq
Tree	napaq
(fallen tree)	iquneq
Root (in general)	nukek
Rosehips	qelempaq
Seed (in general)	sim'inaq
Shrub (in general)	uqriiyanguaq
Single delight/ Bethlehem star	ikignganaq
Sitka Mountain Ash	esqunaq
Sitka spruce	napaq, naparpiaq
Skunk cabbage	tuqunaq
Rose	shnipiishniik
(rose hip)	qelempaq
Watermelon berry	meruaqutaq, muuguaq
Western hemlock	quntarraaliq
Mountain hemlock	allciq
Western Red Cedar	qar'usiq
Yellow Cedar	teptuliq
Wild celery/Angelica	uriisaaq, ugyuuteq
Wild rhubarb/Sour dock	quunarliq
Willow	nim'uyaq
Nagoon berry	puyurnaq
Wood (firewood)	kenerkaq
(piece of wood, stick)	qupurraq
Yellow pond lily	qaltuutesaaq

(From *Nanwalegmiut Paluwigmiut-llu Nupugnerit – Conversational Alutiiq Dictionary, Kenai Peninsula Alutiiq* by Jeff Leer, 1978 and *English Bay and Port Graham Alutiiq Plantlore – An Ethnobotany of the Peoples of English Bay and Port Graham, Kenai Peninsula, Alaska* by Priscilla N. Russell/Chugach Heritage Foundation/Pratt Museum/Alaska Native Plant Society, 1991.)

Resources: Literature, audio, video, other curriculum

Literature

- Alaska Department of Fish and Game. *Native Alaskan end Exotic Plants Used by Wildlife.* Available online: http://www.adfg.alaska.gov/index.cfm?adfg=wildlifelandscaping.planttable
- Alaska Geographic Society. *Alaska's Forest Resources.* 1985. Alaska Northwest Books.
- Biggs, Carol R. *Wild Edible and Medicinal Plants Vol 1 and 2, Alaska, Canada and Pacific North West Rainforest.* 1999. Alaska Nature Connection.
- Chugach Regional Resources Commission. *Alutiiq Pride Newsletter: Stewardship of the Land and Waters by Kate McLaughlin.* Fall Issue, 2011.
- Dick, Alan. *Alaska Science Camps, Fairs and Experiments: Spruce & Other Roots, p. 105.* 2004. Alaska Native Knowledge Network.
- Garibaldi, Ann. *Medicinal Flora of the Alaska Natives.* 1999. Available online: http://accs.uaa.alaska.edu/files/botany/publications/1999/Medicinal_Flora_Alaska_Natives.pdf
- Russell, Priscilla N. *English Bay and Port Graham Alutiiq Plantlore – An Ethnobotany of the Peoples of English Bay and Port Graham, Kenai Peninsula, Alaska*. 1991. Chugach Heritage Foundation/Pratt Museum/Alaska Native Plant Society. New edition available!
- Schofield, Janice. *Alaska's Wild Plants: A Guide to Alaska's Edible Harvest*.2003. Alaska Northwest Books.

Audio

- *Project Jukebox/Nanwalek/Medicinal plants.* Interviews with Irene Tanape and Malania Anahonak. University of Alaska Fairbanks. Available online: http://jukebox.uaf.edu/NanPG/nanwalek/html/Topics.html
- *Water Lily and Skunk Cabbage* story from the Chugach Legends, recording with Nick Tanape, 2010. Available from CRRC office and from www.iqsak.com.

Other curriculum

- Chugachmiut Healing Plants Heritage Kit (ask Chugachmiut for the kit: 907-334-0149)
- Culture, History and Heritage of the Chugachmiut: *Our Resources, Level 2, Grades 1-3, Subsistence. Edible Plants: Part 1, p. 140*.
- *AK Wildlife Curriculum – Forests and Wildlife, p. 21 – 22 and 59, (Tree identification and forest products), p. 67 ("Breath of Life" photosynthesis experiment).* 2005. Alaska Department of Fish and Game, Division of Wildlife Conservation.

SmartBoard

- Photosynthesis. Great visuals on photosynthesis for students. (K-12). http://exchange.smarttech.com/details.html?id=8fbb8e6f-3f46-4eb9-859f-f2abaab7bebb
- Photosynthesis Animation. (4-9). http://exchange.smarttech.com/details.html?id=482b535a-73e1-4447-b9b9-909cde859e49

Procedure:

Engagement

- Have an assortment of food items that has been harvested from the local forests and spread them out on a table for the students to view and identify (what the item is and where it came from).
- Have students share their experiences about gathering/harvesting the food items on display.

- On another table have items that have been created from materials that would be found in the forests of the local area (baskets, masks, jewelry, boxes, etc). Have also some industrial forest products on display (e.g. different kinds of papers).
- Ask students to identify the items, the artist, and the materials used to create the pieces.
- Ask students to think about what a forest is before having them give their answer. Allow students time to discuss what characteristics are unique to forests in small groups.
- Ask students to consider why forests grow in the places that they do and what they need to survive.
- Tell students that you want them to consider what would happen to a forest that had no water available and discuss this in small groups. Each group should share their answers with the entire class.
- Now tell students to consider what would happen to a forest that received no sun and again have students share their answers with the class.
- Explain to the class that all plants including trees have special organs called organelles in the leaves that convert sunlight in to sugar for the plant to use as food. These organelles called chloroplasts are directly involved in this process.
- Now tell students that this process is known as photosynthesis and they will learn more about this on the field trip.
- Introduce the term community to students and have them share their definitions with each other in small groups before telling them that in biological terms, a community is a group of interacting species sharing an environment.

Exploration

- Invite a community member (artist and/or subsistence user) to guide the students on a nature walk through the local forest identifying plants and their uses (food, art, medicine, shelter), giving both the English and the Alutiiq names.
- Demonstrate how to harvest the plants depending on what it will be used for. Allow time for students to practice with caution about leaving some there to grow and continue to provide for use in the future.
- Ask leading questions on the walk to start the thinking process, where does the plant get water from, minerals, food, etc.
- Remind students to be keen observers, pay attention to what is seen, smelled, touched, tasted (with extreme caution), and heard.
- Direct students to take notes in their science journals, include drawings or photograph with a digital camera.
- Once back in the classroom direct the students to share their items collected, restating how they collected the item.
- Ask what the item collected is normally used for.
- Allow time for students to make something with the items they harvested; baskets, masks, food, jewelry, etc.
- Have students show their creations and explain how they made it and what will be used for.
- Allow students to collect various green leaves throughout the forest to bring back to the classroom for further study**.** Explain to students that the leaves are green due to the chlorophyll within their leaves.

- Ask students to consider how the decomposition of salmon within rivers can affect where forests grow reminding them that trees require many different nutrients to survive.
- Help students to identify some of the nutrients that healthy forest communities require in order to survive. Students should identify carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur which are referred to as macronutrients.

Explanation

- Explain to students that the ecological definition of a community is a group of interdependent organisms inhabiting the same region and interacting with each other. That means that a community is a bunch of living things that live in the same place and need one another to survive.
- Give students examples of communities other than the forest community such as oceans or tidal zones and human communities or villages. Explain that certain environmental conditions in different areas create these unique communities.
- Continue explaining to students that within each ecosystem there are communities that provide specific materials that have helped ancient cultures as well as modern cultures to survive and again revisit the objects made by natives of the region - fishing poles, line, hooks, foods, ceremonial objects, bird feathers.
- Students should be each given a 9 x 12 sheet of paper to begin to classify some of the objects that they collected or observed into four distinct categories.
- Have students create a category for food, medicine, shelter, and ceremonial uses in large letters at the top of their sheets.
- Allow students ample time to begin to classify materials that they observed on the field trip into those categories. Materials should include roots, leaves, berries, twigs, sticks, and any other objects that may have been observed. Remind students that a material can fall in two or more categories.
- If students lack an object in any particular category assist them by refreshing their memory or referring them to a classmate who has completed that category of use.
- In the classroom write the formula for photosynthesis on the board so all students can see it clearly: $6CO2+6H20-\rightarrow chlorophyll\rightarrow C6H12O6+6CO2$.
- Rewrite that same formula using words: carbon dioxide+water+light energy-----chlorophyll---> sugar and oxygen.
- Explain the formulas to the students.
- In the classroom review the term macronutrients with students reminding them that the major macronutrients are carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.
- Now ask students to consider the sources of those nutrients and how they impact the growth of forest communities. Give students time to discuss the sources amongst themselves.
- Now tell students to explain what happens to salmon when they die within rivers upon completion of their spawning. Allow students a few minutes to discuss.
- Tell students that once salmon spawn, die, and begin decomposing, nutrients contained within their bodies are released into the water causing an increase in nitrogen.
- Explain that as a result of nitrogen inputs from decaying salmon, Sitka spruce forest communities grow better in areas near rivers where salmon spawn and die.

Elaboration

- Take another field trip with the class and have them identify and collect samples of the plants to make their own identification books, teaching them how to press and preserve live samples.
- Discuss photosynthesis and how it works for the section of the forest you are in.
- Have students observe the plant life for plants that are living on another plant, i.e. moss on trees and explain the interdependence of such organisms.
- Have students write a paragraph explaining the ecology of the area, including illustrations.
- Have students design a poster that traces nitrogen from salmon to healthy Sitka spruce forest communities.
- Write thank you letters to the nature walk guides.

Evaluation

- Student participation
- Student journals
- Written paragraphs on the ecology of the area
- Presentations to classmates on their favorite forest product
- Rewritten Elder stories about the changes in the forests
- Letters to the nature walk guides

Follow Up Activities:

- Continue to do art projects in the class using forest products reminding students of the many uses for those products beyond art.
- If the season allows, pick berries and preserve them in traditional ways. Ask an elder to help with this. See *Forests for the Future*, Unit 2, Lesson 4, for an example of Tsimshian Berry Harvesting, Preservation and Storage: http://www.ecoknow.ca/curriculum.html
- Firewood – learn from an elder the differences in tree species when used as firewood. How do they burn? What do they smell like? What are used in smoking fish/meat? See "Alaska Science Camps, Fairs & Experiments: Firestarting and Traditional Firemaking. Pages 71 and 75. Alaska Native Knowledge Network/Alan Dick. 2004.
- Interview a forest biologist/ecologist about temperate rainforest ecosystems.
- Play the "Abundance of the forest" word search (you can find the activity sheet in the Document Library and print them out, or use SmartBoard).

ABUNDANCE OF THE FOREST WORD SEARCH

H O R S E T A I L D W Q F Y K
T S K U N K C A B B A G E R I
Q A A A N G A L A T R E E R I
T C I L L Q A Q U P B F S E N
U W F Q M N A Q S E L A R B H
Q Z E A B O A A O L A E E W S
U A R N N U N P B L C L D O I
N E N G R U F B A U K W L R I
A I T A U Q G L E Q B N A C P
Q M P L Y R R E B R E D L E I
R A I A R A S P B E R R Y R N
N I W V A P A K I K R Y O S H
Q N P Q D N D Q W A Y D Y S S
E L N G U Q A T U Q A N U K E
D A N D E L I O N U Q G W I K

ALAGNAAAQ
ALAGNAQ
ALDER
BLACKBERRY
CILLQAQ
CROWBERRY
DANDELION
ELDERBERRY
ELNGUQ
FERN
HORSETAIL
KUNAQUTAQ
LEAF
NAPAQ
NAPARUAQUTAQ
PAKIK
PELLUQ
RASPBERRY
ROSE
SAALALRAAQ
SALMONBERRY
SANUULIIQ
SHNIPIISHNIIK
SKUNKCABBAGE
TREE
TUQUNAQ
UQGWIK
UUQAAYANAQ

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