

Theme 3: Changing Lifestyles
Unit 8: Natural Resources

Table of Contents

Introduction	<u>Page</u>
Whole Picture	2
Vocabulary	5
 Activity MS.8.1: Ask an Expert	
MS.8.1 Lesson Plan	6
Worksheet: Ask an Expert about Natural Resources	9
 Activity MS.8.2: Natural Resources Vocabulary	
MS.8.2 Lesson Plan	11
Template: Vocabulary Cards	14
Information Sheet: Word Games Instructions	18
Worksheet: Natural Resources Vocabulary	19
Answer Key: Natural Resources Vocabulary	21
 Activity MS.8.3: Build a Generator	
MS.8.3 Lesson Plan	23

CHANGING LIFESTYLES

Natural Resources

Introduction

Thank you for using this Raising Educational Achievement through Cultural Heritage Up (REACH Up) unit in your classroom! The lessons are designed to address the Alaska Science Standards and Grade Level Expectations, Alaska Cultural Standards, and the Bering Strait School District Scope and Sequence goals. All of the activities focus on natural resources from Alaska Native cultural, physical and earth science perspectives. This supplemental unit addresses the place-based question: how does our community utilize natural resources and how can we minimize the environmental impact of our resource use?

The REACH Up Natural Resources unit consists of three activities. Each activity will require a 45-minute class period; discussion could easily be extended into multiple class periods. You may also want to repeat sections of an activity during subsequent class meetings, such as reviewing the Impact on Energy video or having your students practice the vocabulary card games multiple times. If you are utilizing the entire Natural Resources unit, you should introduce the activities in the order they are presented. However, if time is short, any of the activities could be presented independently.

The accompanying student guide is intended for use with multiple groups of students and you should not allow students to write in them. You can either have students record their work on a separate sheet of paper, or create copies of the corresponding worksheets that are included in this teacher's guide.

Whole Picture

Every day, people use natural resources for a variety of purposes. One main use is for energy. People need energy to power their homes, fuel their vehicles, grow their food, make the textiles for their clothing, and to provide heat when the weather turns cold.

Energy sources can be split into two main groups: renewable and nonrenewable. Those that are renewable can be used conservatively again and again without fear that they will disappear. These include solar, wind, geothermal, hydropower, and biomass energy. Nonrenewable sources are those that take millions of years to replenish, and as such, once today's humans have exhausted them, they will disappear. These include oil, coal, and natural gas.

Modern society relies heavily on nonrenewable resources to provide electricity, heat, and fuel for travel. Scientists and elders alike know that the extraction and use of these energy sources are contributing to climate change (Fienup-Riordan and Rearden, 2012; Krupnik and Jolly, 2002). As a result, people around the globe are beginning to develop renewable resources for energy — including in the expansive state of Alaska! Many villages are experimenting with renewable resources, such as biomass, wind, geothermal, and solar, as a way to reduce their dependence on pricey fossil fuels.



CHANGING LIFESTYLES

Natural Resources



Biomass is carbon-rich material from living, or recently living organisms, that is (typically) burned for energy. While the plants are growing, they take carbon out of the atmosphere, and when they are burned, the carbon is released back into the atmosphere. Sometimes, materials used for biomass energy are grown specifically for that purpose, such as grasses and hemp. Other times, biomass energy materials come from the waste products of other sources. For example, waste wood can be used for wood burning boilers, though it is prudent to know how the wood has been treated, so as to avoid toxic off-gassing and ash (Biomass Energy Centre, 2011). In several rural Alaska villages, wood-burning boiler systems are being installed to ease the high cost of using heating fuel — though many of these villages are in interior and southeast Alaska, where wood is a plentiful resource.

The sun is also a source of renewable energy. Solar arrays, designed to capture the sun's energy, are becoming more popular around the globe. Because Alaska is "The Land of the Midnight Sun," many believe that solar energy would be a profitable alternative energy resource. However, due to the long periods of darkness during winter, and the difficulty in storing solar energy long term, "utility-scale solar power plants are uneconomical in Alaska" (REAP, 2015). Nevertheless, stand-alone solar grids in remote areas are useful, and much of the solar development in the state is being done on small scales. In Nome, for example, the Bering Straits Native Corporation has a solar array on their office building, and they are able to offset about "1,000 gallons of diesel fuel annually" (REAP, 2015).

Another useful renewable energy resource in Alaska is wind. Turbines placed in strategic locations can harness the power of the wind, which is then used for electricity, heat generation, and therefore displacement of diesel fuel use. The first wind program in Alaska was installed in Kotzebue in 1997. Since then, additional turbines have been added, and "the wind farm displaces 80,000 gallons of diesel every year" (REAP, 2015). Wind turbines have also been installed in Gambell, Savoonga, Shaktoolik, and Unalakleet, in addition to other villages in the state. These turbines help reduce the price of electricity for villagers, help villages meet their electric demands, and provide the heat for water treatment and drinking water plants.

Other renewable resources, like geothermal and hydropower, are also being developed in Alaska (and are already in use in many parts of the world). Geothermal energy is the heat energy that comes from the earth itself. Steam and hot water reservoirs can be used directly for electric generation, direct heating, and for carbon dioxide for greenhouses, as is the case at Chena Hot Springs, near Fairbanks (REAP, 2015). Hydropower is the energy produced by moving water — rivers and the ocean. As in other instances, this energy is captured and used to generate electricity and heat. Most of the hydropower in Alaska comes from projects in Southeast.

Traditional uses of solar and wind energy include much more than power. In addition to the ways mentioned above, Alaska Native people have for millennia been using energy sources in ways that some westerners might consider uncommon. "According to oral tradition, the sun is a transformed woman who fled to the skyland while being chased by her brother, who became the moon and continues to pursue her" (Fienup-Riordan and Rearden, 2012, p. 61). Like all other things, people



CHANGING LIFESTYLES

Natural Resources

believe that the sun and the wind have animate spirits, and which tell us what to expect from the landscape.

For example, the sun plays an important role in helping people know what to expect from the weather. John Phillip, from Kongiganak, and Paul Kiunya, from Kipnuk, agreed that “dawn shows what the weather will be like during the entire day ... They tell us that when the sun rises causing the clouds to turn red, even though the weather is good, it will get bad before day’s end. But when the horizon is bright in the morning, the weather might be good all day” (Fienup-Riordan and Rearden, 2012, p. 62–63). Too, when it is going to be very cold, people say that the sun puts on its mittens, as a warning to people of coming temperatures.

Similarly, the winds have the power to indicate what to expect from the ocean and sea ice, as well as the arrival of subsistence animals. If the wind continues for two or three days, people on St. Lawrence Island know to expect sea ice to be blown in. This can be dangerous for hunting, and can make it difficult to bring harvested animals to shore (Krupnik and Jolly, 2002). In the winter, an easterly wind can herald the coming of spring sea mammals; and summer winds might mean that fish are being blown into the rivers (Fienup-Riordan and Rearden, 2012). The wind is also important for knowing whether the weather will be good or bad for fishing. A story told by elders of Tununak recounts how Edward Hooper’s grandmother bequeathed a southerly wind to the villagers before she died, “so they could fish during good weather” (Fienup-Riordan and Rearden, 2012, p. 84).

Traditional ways of using energy resources compliment more contemporary uses. While the sun and the wind continue to be faithful companions in indicating what to expect from the weather, they also provide important ways to power our lives. We depend on energy sources for electricity, for heat, and for fuel, as well as for shelter and protection from the elements.

References

- Biomass Energy Centre. (2011). “What is BIOMASS?” Accessed from:
http://www.biomassenergycentre.org.uk/portal/page?_pageid=76,15049&_dad=portal
- Fienup-Riordan, Ann, and Alice Rearden. (2012). *Ellavut: Our Yup’ik World and Weather. Continuity and Change on the Bering Sea Coast*. Seattle and London: University of Washington Press.
- Krupnik, Igor, and Daynna Jolly. (2002). *The Earth is Faster Now: Indigenous Observations of Arctic Environmental Change*. Arctic Research Consortium of the United States and Smithsonian Institution Presses.
- REAP (Renewable Energy Alaska Project). (2015). Accessed from:
<http://alaskarenewableenergy.org/why-renewable-energy-is-important/>.



CHANGING LIFESTYLES

Natural Resources

Unit Vocabulary

Science Terms to Define	
natural resource	anything in the environment that humans use
nonrenewable resource	a natural resource that is being used up faster than it can be replaced by natural processes
renewable resource	a natural resource that can be replenished by natural processes at least as quickly as it is being used

Terms for Incorporating Local Indigenous Language				
English	Iñupiaq	Yup'ik	Siberian Yupik	Local Translation
coal	itniwium uquqsautaq	qetek	puyuq	
fuel oil	uqsruq	uqurkaq	mesiiq	
gasoline	igliktuat uqsruat	uquq	mesiiq	
nonrenewable resource	atunᅇnaittuat	atunqiggnailnguq cat	navyaghqaq	
renewable resource	atunᅇnaqtuat	atunqiggluki cat	nutaghquq	
water	imiq	meq	meq	
wind	anuᅇi	anuqa	anuuqa	
wood	qirriuq	equk	quuk	
woodstove	itniᅇwik	kenervik	eglluk	

CHANGING LIFESTYLES

Natural Resources

Activity MS.8.1: Ask an Expert

Overview

In this activity, students will interview an elder or cultural knowledge bearer.

Objectives

On successful completion of the lesson, students will be able to:

- demonstrate effective interviewing techniques
- interpret qualitative data from interviews
- explain how people use natural resources to meet their needs and wants

Alaska Standards

Alaska Science Standards / Grade Level Expectations

SA1 The student demonstrates an understanding of the processes of science by:

- [6-8] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

Alaska Cultural Standards

[B] Culturally-knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life. Students who meet this cultural standard are able to:

[B3] make appropriate choices regarding the long-term consequences of their actions.

[B4] identify appropriate forms of technology and anticipate the consequences of their use for improving the quality of life in the community.

[D] Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. Students who meet this cultural standard are able to:

[D.4] gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance.

[E] Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. Students who meet this cultural standard are able to:

[E.4] determine how ideas and concepts from one knowledge system relate to those derived from other knowledge systems.



CHANGING LIFESTYLES

Natural Resources

Activity MS.8.1

TEACHER GUIDE



Bering Strait School District Scope & Sequence

- 7.10A Compare and contrast renewable and nonrenewable resources.
- 7.10B List viable forms of useable energy and energy production.
- 7.10C Compare and contrast risks and benefits involved in a variety of types of energy production.

Materials

- REACH Up Middle School Student Guide: *Natural Resources*
- Student Worksheet: *Ask an Expert about Natural Resources*
- Internet access and projector

Activity Preparations

1. Identify adults within your school who have lived year-round in the community for many years. This might include teachers, administrators, secretaries, teacher aides, lunchroom/kitchen staff, recess duties, maintenance and custodial staff, etc. Ask these local knowledge bearers if they would be willing to speak with a group of your students about how infrastructure in the area has changed, and how those changes have affected the community. Make sure that the volunteers you have identified will be available during the time that your class will be completing this activity.
2. Ask the volunteers if they speak an Alaska Native Language, and if so, which language(s) and dialect(s) they are familiar with. If applicable, have them translate the written words on the student worksheet, so you have an answer key. Also, ask them to teach you the pronunciation of the terms.

Activity Procedure

1. Distribute the REACH Up Middle School Student Guide: *Natural Resources* and ask students to work with a partner to read pages 1-4.
2. Show the video, *Impact on Energy*, available at www.k12reach.org/videos.php. Videos are located under the Multimedia tab. Allow time for students to share comments and ask questions.
3. Explain that students will interview a few community members about local natural resources. Separate students into small groups according to how many knowledge bearers are available to share information with your class. Explain if the appointed interviewees speak an Alaska Native Language, so students know whether or not they should pursue that portion of the interview.



CHANGING LIFESTYLES

Natural Resources

Activity MS.8.1

TEACHER GUIDE



4. Review expectations for student behavior while conducting the interview, including introductions and thanking the interviewee at the end of the interview. Discuss suggestions for effective interviewing techniques, such as allowing ample time for the interviewee to answer, and asking follow-up questions.
5. Distribute one Student Worksheet: *Ask an Expert about Natural Resources* to each group and assign each group one local knowledge bearer to interview. Provide 15-20 minutes for students to locate and interview the knowledge bearer.
6. Reconvene in the classroom and ask groups to share their findings. How have the natural resources that are available to the community changed? What changes have people made regarding their use of natural resources?



CHANGING LIFESTYLES

Natural Resources

Activity MS.8.1

WORKSHEET



STUDENT WORKSHEET: *Ask an Expert about Natural Resources*

Names of Group Members: _____

Interview a long-term community member to learn more about infrastructure in your area. Take notes about what you learn.

Who did you interview? _____

Ask:

How did people heat their homes in the past compared to today?

What kind of food did people eat in the past and where did it come from?

What types of clothing did people wear in the past compared to today? Where did the materials come from?

How did people reuse materials in the past compared to today?

What natural resources did people in our community use in the past? What natural resources do people in our community use today?

How did people travel in the past compared to today? How often did barges and airplanes come to the village in the past compared to today?

Other notes:



CHANGING LIFESTYLES

Natural Resources

Activity MS.8.1

WORKSHEET



For Alaska Native Language Speakers:

What language(s) do you speak? _____

What dialect(s)? _____

Could you translate the following words?

coal: _____

fuel oil: _____

gasoline: _____

nonrenewable resource: _____

renewable resource: _____

water: _____

wind: _____

wood: _____

woodstove: _____



CHANGING LIFESTYLES

Natural Resources

Activity MS.8.2: Natural Resources Vocabulary

Overview

In this activity, students will learn key infrastructure terminology in English and their local Alaska Native language by playing vocabulary games with peers.

Objectives

On successful completion of this lesson, students will be able to:

- read and speak indigenous terms related to climate and natural resources
- illustrate and define terms related to renewable and nonrenewable resources

Alaska Standards:

Alaska Cultural Standards / Grade Level Expectations

[6-8] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

[6] SA3.1 The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by gathering data to build a knowledge base that contributes to the development of questions about the local environment (e.g., moose browsing, trail usage, river erosion).

Bering Strait School District Scope & Sequence:

7.10A Compare and contrast renewable and nonrenewable resources.

7.10B List viable forms of useable energy and energy production.

Materials

- REACH Up High Middle Student Guide: *Natural Resources*
- Vocabulary card sets (1 per group of 4-6 students)
- Student Information Sheet: *Word Games Instructions* (1 per group)
- Student Worksheet: *Natural Resources Vocabulary*
- Dry Erase Markers (1 per group)
- Timers (optional)



Activity Preparations

1. If your students completed Activity MS.8.1 Ask an Expert, refer to their completed worksheets for the terms you will have them use for the vocabulary word card games.
2. If your students did not conduct interviews with Native language speakers, consult with a local knowledge bearer or language expert to determine which language/dialect translation provided on page 4 of the Student Guide would be most appropriate for your students to practice. The following chart is provided for reference.

Alaska Native Languages in the Bering Strait Region					
Language	Dialect Group	Dialect	Subdialect	Community	
Iñupiaq	Seward Peninsula Inupiaq	Bering Strait		Brevig Mission	
			Diomedede	Little Diomedede	
				Shishmaref	
			Wales (Kinikmiu)	Wales	
		Qawariaq	Teller	Teller	
				Unalakleet	
				Shaktoolik	
	Fish River		Golovin*		
			White Mountain		
		Northern Alaskan Iñupiaq	Malimiut		Koyuk
Siberian Yupik		St. Lawrence Island Yupik		Gambell	
				Savoonga	
Yup'ik		Norton Sound (Unaliq-Pastuliq)	Unaliq	Elim	
					Golovin*
					St. Michael
		General Central Yup'ik	Nelson Island and Stebbins		Stebbins

* It is very common for more than one language/dialect, or a combination of dialects, to be spoken in a community. It should also be noted that Inupiaq-Yup'ik bilingualism was common throughout the 1900s in the Norton Sound villages of White Mountain, Golovin, Elim, and Unalakleet. Golovin is listed twice on our chart because specific subdialects were cited in the research found on the Alaska Native Language Center website: <http://www.uaf.edu/anlc/languages/>.

3. Keep in mind that different individuals may translate certain terms differently. For example, some languages may not have a separate term for "fuel" and "gasoline". Or, distinct terms may exist, but the individual speaker does not know the term for "gasoline", and uses the

CHANGING LIFESTYLES

Natural Resources

Activity MS.8.2

TEACHER GUIDE



- term for “fuel” in both instances. It’s fine to have different student groups working with various translations, or you can choose a set list of words for your whole class to practice. Highlight the diversity and do not attempt to offer an authoritative translation; the goal is to practice an Alaska Native language while discussing climate change topics.
4. If using the Vocabulary Cards provided by REACH Up, label a sample set of cards with local indigenous words using a dry erase marker. If needed, create your own sets of the vocabulary cards from the template provided.
 5. Make copies of the Word Games Instruction Sheet (one per group) and the Natural Resources Vocabulary worksheet (one per student).

Activity Procedure

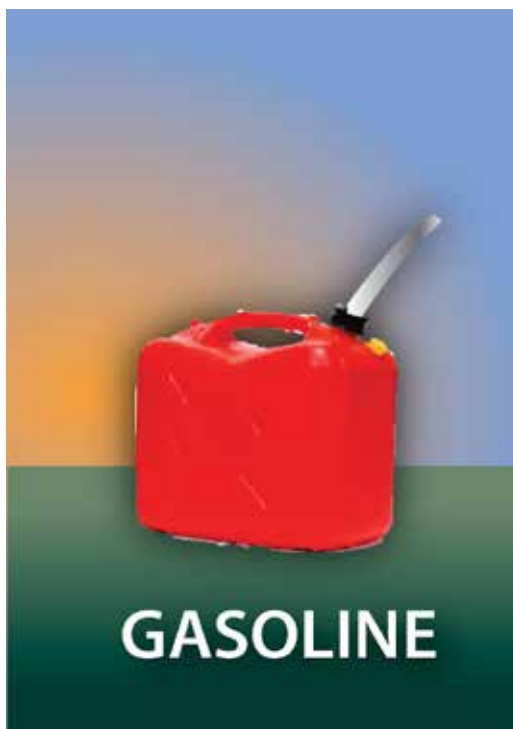
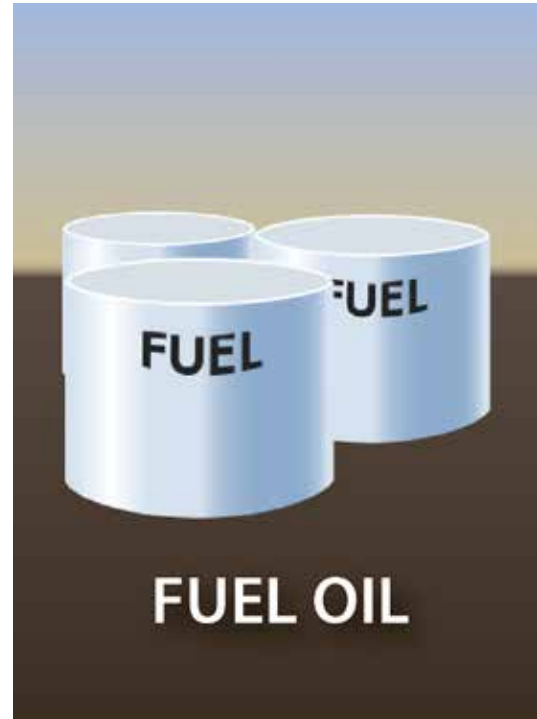
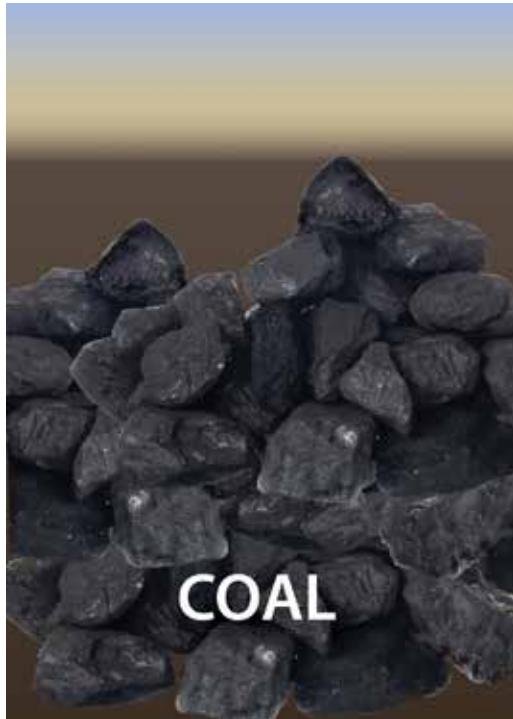
6. Distribute the REACH Up High School Student Guide: *Natural Resources* and review pages 1-5.
7. Show students the vocabulary cards. Hold up each card. Discuss what each card depicts. How do these terms relate to natural resources in their region?
8. Say the English and local Alaska Native Language word for the illustration depicted on the card. Ask students to repeat the words. Repeat this once or twice, then ask students to call out the correct words as you hold up each card.
9. Divide the class into four groups.
10. Provide each group with the Word Games Instruction sheet, a set of Vocabulary Cards, dry erase marker, and a timer (optional).
11. Instruct students to label their cards with the local indigenous words. Groups can select one student from the group for this task, or take turns.
12. Direct students’ attention to the Word Games Instruction sheet. Students can commit to one game for a period of time or mix and match.
13. Encourage students to play the vocabulary games and practice the vocabulary words during free time throughout the duration of the Natural Resources unit. If possible, schedule 10-15 minutes twice per week to practice the vocabulary terms.
14. Write the following terms on the board: natural resource, nonrenewable resource, renewable resource. Ask students to share definitions for these terms. Refer back to the REACH Up Middle School Student Guide: *Natural Resources* as necessary.
15. Distribute the *Natural Resources Vocabulary Worksheet* and ask students to complete it.



CHANGING LIFESTYLES

Natural Resources

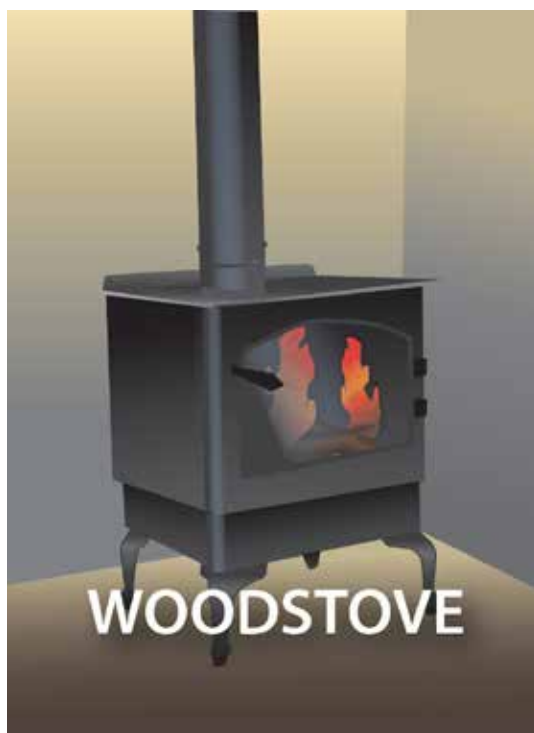
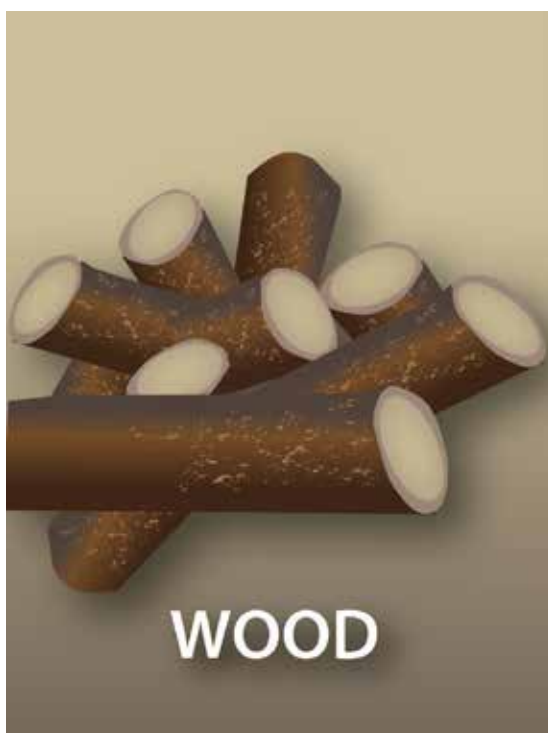
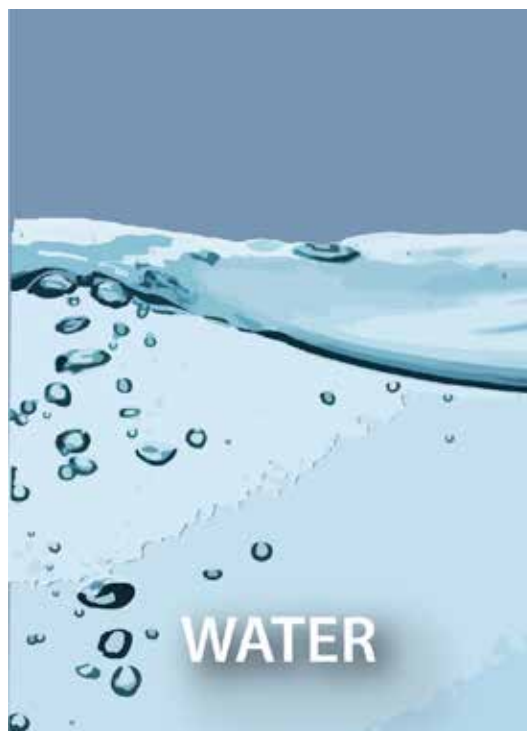
Vocabulary Cards



CHANGING LIFESTYLES

Natural Resources

Vocabulary Cards



CHANGING LIFESTYLES

Natural Resources

Vocabulary Cards



CHANGING LIFESTYLES

Natural Resources

Activity MS.8.2
TEMPLATE



Vocabulary Cards

Local Indigenous Word

Local Indigenous Word

Local Indigenous Word

Local Indigenous Word

CHANGING LIFESTYLES

Natural Resources

STUDENT INFORMATION SHEET: *Word Games Instructions*

VOCABULARY SWAP:

1. Distribute one card to each person.
2. Practice the word on your card, then find a classmate. Teach them the word on your card and learn the word on their card. Trade cards.
3. Find another classmate and repeat.

FIND THE CARD:

1. Divide into small groups. Each group will need a set of vocabulary cards. Spread the cards in front of you so that everyone in your group can see the pictures.
2. Listen as your teacher says a word aloud from one of the cards.
3. Work with your group to find and hold up the correct card.

VOCABULARY SLAP:

1. Select one student to serve as the “caller” for this game. That student should make a list of the vocabulary words on a separate sheet of paper. The words can be found on the back of the cards.
2. Place the cards in a circle, picture-side-up, in the middle of the playing area.
3. The caller should call out a word from their list. Everyone else should quickly place their hand on the picture that they believe represents that word.
4. Turn over the card or cards that students selected to see who chose correctly. Each student who placed his or her hand on the correct card earns a point.
5. Put the card(s) back in the circle and play again.
6. Play for a designated period of time. At the end of the time, the person with the most points wins.

TEAMWORK:

1. Divide your group into two teams. Each team will need a pencil and paper.
2. Shuffle the vocabulary cards and stack them picture-side up in the middle of the table.
3. Work with your team to write down the local Alaska Native Language terms for the picture on the card.
4. After both teams have written answers for the top card, turn the card over to check. Teams get 1 point for the correct Alaska Native Language word.
5. Repeat until all cards are gone. The team with the most points wins.



CHANGING LIFESTYLES

Natural Resources

STUDENT WORKSHEET: *Impact on Infrastructure Vocabulary*

Name: _____

1. Draw a line connecting each definition to the term that it represents.

natural resource	a natural resource that is being used up faster than it can be replaced by natural processes
nonrenewable resource	a natural resource that can be replenished by natural processes at least as quickly as it is being used
renewable resource	anything in the environment that humans use

CHANGING LIFESTYLES

Natural Resources

2. Complete the chart by writing the local Alaska Native Language terminology and illustrating the missing terms.

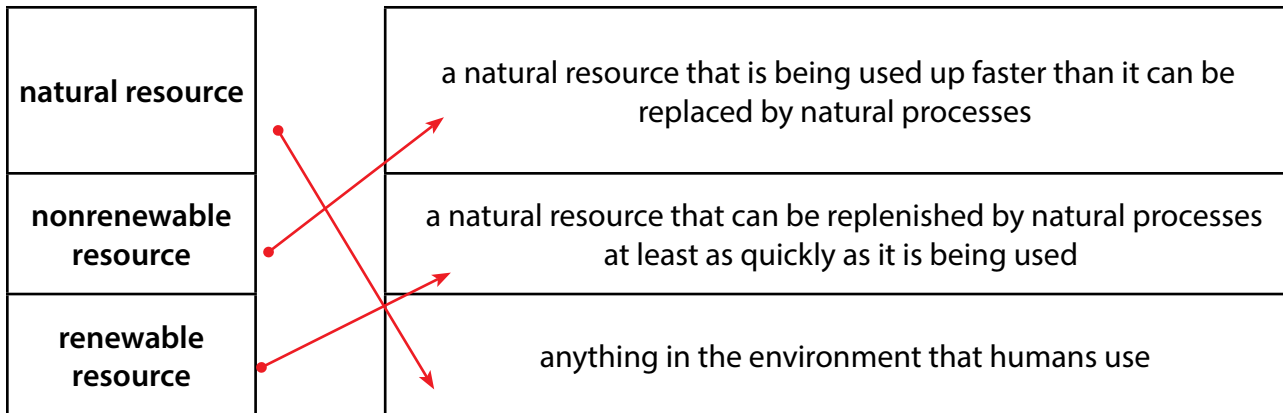
My Community: _____		
English Word	Local Alaska Native Language Word	Illustration
coal		
fuel oil		
gasoline		
nonrenewable resource		
renewable resource		
water		
wind		
wood		
woodstove		

CHANGING LIFESTYLES

Natural Resources

Answer Key: *Natural Resources Vocabulary*

1. Draw a line connecting each definition to the term that it represents.



CHANGING LIFESTYLES

Natural Resources



2. Complete the chart by writing the local Alaska Native Language terminology and illustrating the missing terms.

My Community: _____		
English Word	Local Alaska Native Language Word	Illustration
coal	Answers will vary depending on language and dialect spoken in this community.	Sketch should illustrate word at left.
fuel oil	Answers will vary depending on language and dialect spoken in this community.	Sketch should illustrate word at left.
gasoline	Answers will vary depending on language and dialect spoken in this community.	Sketch should illustrate word at left.
nonrenewable resource	Answers will vary depending on language and dialect spoken in this community.	Sketch should illustrate word at left.
renewable resource	Answers will vary depending on language and dialect spoken in this community.	Sketch should illustrate word at left.
water	Answers will vary depending on language and dialect spoken in this community.	Sketch should illustrate word at left.
wind	Answers will vary depending on language and dialect spoken in this community.	Sketch should illustrate word at left.
wood	Answers will vary depending on language and dialect spoken in this community.	Sketch should illustrate word at left.
woodstove	Answers will vary depending on language and dialect spoken in this community.	Sketch should illustrate word at left.



CHANGING LIFESTYLES

Natural Resources

Activity MS.8.3: Build a Generator

Overview

In this activity, students will design and build a model wind turbine.

Objectives

On successful completion of this lesson, students will be able to:

- explain how electricity is generated
- list nonrenewable resources that communities use to generate electricity
- list renewable resources that communities use to generate electricity
- demonstrate how wind can be used to generate electricity

Next Generation Science Standards

Standards by Disciplinary Core Ideas:

Energy
Earth and Human Activity

Standards by Topic:

Energy
Human Impacts

Performance Expectations

The activity is just one step toward reaching the performance expectations listed below:

MS-PS3-5: Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Dimension:

Science & Engineering Practices

Connection to Nature of Science: Science Knowledge is Based on Empirical Evidence

Disciplinary Core Ideas

PS3.B: Conservation of Energy and Energy Transfer

- When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5)

CHANGING LIFESTYLES

Natural Resources

Activity MS.8.3

TEACHER GUIDE



ESS3.C: Human Impacts on Earth Systems

- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earthy unless the activities and technologies involved are engineered otherwise. (MS-ESS3-4)

Crosscutting Concepts

Energy and Matter

Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World

Connections to Nature of Science: Science Addresses Questions About the Natural and Material World

Alaska Standards

Alaska Science Standards and Grade Level Expectations

SA1: The student demonstrates an understanding of the processes of science by

[6-8] **SA1.1** asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating

[6] **SA1.2** collaborating to design and conduct simple repeatable investigations

[7] **SA1.2** collaborating to design and conduct simple repeatable investigations, in order to record, analyze (i.e., range, mean, median, mode), interpret data, and present findings.

[8] **SA1.2** collaborating to design and conduct repeatable investigations, in order to record, analyze (i.e., range, mean, median, mode), interpret data, and present findings.

SB2: The student demonstrates an understanding of how the energy can be transformed, transferred, and conserved by

[7] **SB2.1** explaining that energy (i.e., heat, light, chemical, electrical, mechanical) can change form

[8] **SB2.1** identifying the initial source and resulting change in forms of energy in common phenomena (e.g., sun to tree to wood to stove to cabin heat).

Alaska Cultural Standards

[B] Culturally- knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life. Students who meet this cultural standard are able to:

[B3] make appropriate choices regarding the long-term consequences of their actions.

[B4] identify appropriate forms of technology and anticipate the consequences of their use for improving the quality of life in the community.



CHANGING LIFESTYLES

Natural Resources

[D] Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning. Students who meet this cultural standard are able to:

[D.5] identify and utilize appropriate sources of cultural knowledge to find solutions to everyday problems.

[E] Culturally-knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. Students who meet this cultural standard are able to:

[E.4] determine how ideas and concepts from one knowledge system relate to those derived from other knowledge systems.

Bering Strait School District Scope and Sequence

7.10A Compare and contrast renewable and nonrenewable resources.

7.10B List viable forms of useable energy and energy production.

7.10C Compare and contrast risks and benefits involved in a variety of types of energy production

8.3B Recognizes that energy can exist in many forms (heat, light, chemical, electrical, mechanical) and can change form. (SB2.1)

8.3C Understands the energy sources (the transfer of energy from one source to work in another) through conservation, conversion and transfer.

8.3D Identify the initial source and resulting change in forms of energy in common phenomena (sun to tree to wood to stove to cabin heat). (SB2.1, SF)

8.7A Understands that electricity can be generated, both in nature and by technology, in a variety of ways.

Materials

- Small hobby motor, 6+ volts (one per group)
- High-intensity LED (one per group)
- Alligator clips (optional, two per group)
- Large craft sticks (two per group)
- Small craft sticks (two per student)
- Paper cups of various sizes (at least one per student)
- Large plastic cup (one per group)
- Hot-glue gun and glue (one per group)
- Scissors (one per student)
- Fan (one)



CHANGING LIFESTYLES

Natural Resources

- Drill and 5/64 drill bit
- Single battery holder (one) Double battery holder (two)
- AA batteries (two)
- Multimeter (optional)

Activity Preparations

1. Optional: Preassemble the craft stick frames. You could also have students do this step. (In REACH Up pilot-testing kits, we have done this step for you.)
 - a. Use hot glue to attach two small craft sticks together at the middle so they make a plus sign.
 - b. Once the glue is dry, drill a small hole in the center of the craft sticks. Use a drill bit that is the same size of the motor shaft. This will serve as the frame for your blades.
2. Organize all materials. Each group should receive a hot-glue gun, hot glue stick, hobby motor, alligator clips, LED, large cup, and two large craft sticks. Each student can make their own blade frame and take turns testing their fan on their group's turbine. Each student will need a paper cup, scissors, and two small craft sticks (or a preassembled craft stick frame.) You can allow students to choose which size cup to use for the fan blades.

Activity Procedure

1. As a class, review the introductory information in the Natural Resources Middle School Student Guide on pages 1-3.
2. Next read and discuss the Understanding Electricity section on pages 6-7 of the student guide.
3. Introduce the activity by previewing the directions on pages 8-10 of the student guide.
4. Demonstrate lighting the LED, first with one AA battery and then with two AA batteries. The battery holders and alligator clips are helpful for holding the pieces still while you touch the wires together. This will show the students what to expect to see if their wind turbines are successful. (One AA battery produces 1.5 volts. With one AA battery, the LED bulb should glow red, but very dimly. The light is easier to see viewed from the top of the bulb rather than the side; viewing against a white background will also help. With two AA batteries, or 3 volts, the LED should produce a bright red glow.)
5. Divide students into groups and distribute materials. Give directions for how you want students to share materials.
6. Instruct students to follow the directions in the student guide for assembling their wind turbines. Circulate and assist.



CHANGING LIFESTYLES

Natural Resources

Activity MS.8.3

TEACHER GUIDE



7. Students may first test their turbines by hand. Direct groups to take turns testing their turbines with the fan. (Or head outside if it's a windy day!) You can also use the multimeter to determine the voltage each wind turbine is capable of producing.
8. Lead the class in a closing discussion, including the questions listed in the student guide.

