



Theme 3: Changing Lifestyles
Unit 9: Impact on Subsistence

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Impact on Subsistence

MIDDLE SCHOOL
TEACHER GUIDE



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 changes to subsistence resources as a result of climate change. Activities incorporate Alaska Native cultural, earth and life science perspectives. This supplemental unit addresses the place-based question: How is climate change impacting subsistence resources in our area and why are these changes important to our community?

The REACH Up Subsistence unit consists of four 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 Changing Subsistence Resources video or asking students to practice the vocabulary card games multiple times. If you are utilizing the entire Subsistence unit, please introduce the activities in the order they are presented. If time is short, any of the activities can be presented independently.

The accompanying student guide is intended for use with multiple groups of students. Do not allow students to write in the student guides. Ask students to 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

Subsistence describes a lifestyle emphasizing the cultural, economic, and social practice of harvesting local wild resources for food and other uses. Hunting is a very important part of Alaska Native culture. It is important for hunters to make careful observations about which species are increasing in population and which are declining in the area. It is also important for hunters to know about the habitats and adaptations of their prey.

The plants and wildlife in the Bering Strait region are uniquely adapted for its harsh weather. Many animals deal with the extreme temperatures through behavioral adaptations such as migration and hibernation. Animals also have physical adaptations for the cold, such as the insulating layer of fat boasted by marine mammals including whales, seals, and walrus. Adaptations that make an organism more successful will survive to pass the new characteristics on to its offspring. Changes in the structures of an entire species take place gradually, over many generations.

Walrus are well known for another physical adaptation: their tusks. Both males and females have tusks that can be used for defense and for hauling out on to the sea ice. Walrus hunt in shallow waters; their prey are bottom dwelling invertebrates. They use their broad, flat muzzles to brush the sea floor looking for food. Major food items include several different kinds of clams, of which, only the fleshy parts are eaten. It is believed that these parts are torn away from the



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rest of the clam by strong suction, a method of feeding for which the mouth of the walrus is ideally designed. The mouth of a walrus is “narrow, with an unusually high roof, strong thick lips which are not deeply cleft along the side of the face (the gape is extremely limited), and a thick piston-like tongue” (Burns 1994). To take breaks from all the swimming they do while feeding, walrus use their tusks to pull themselves onto the sea ice to rest. So, it follows that disappearing sea ice affects the way they live and survive.

Walrus in Alaska made national headlines in September 2014, when large groups were photographed in the National Oceanic Atmospheric Administration (NOAA) annual arctic marine mammal aerial survey. According to NOAA, “nearly 35,000 walrus were discovered... on a northwest Alaskan shore as result of being unable to find sea ice to rest upon, a problem aggravated by climate change” (Linshi 2014).

Savoonga is known as the “walrus capital of the world”. With the changes in sea ice, hunters have to travel further to hunt walrus and other marine mammals. Kenneth Kingeekuk related, “We never used to go out too far when we’d go walrus hunting... five, six, seven miles out and we’d come back and unload our skin boats and go back out again for another trip... But nowadays we have to go a hundred-plus miles to get our prey, walrus or bearded seals or other marine mammals out there.” Other hunters interviewed for the Aksik documentaries also commented on the way sea ice melt has impacted hunting. Traveling farther out in the ocean is more dangerous, and sometimes on the return trip game meat must be thrown overboard to save weight. Also, they spend more money on gasoline to travel farther (Kingeekuk 2010).

As climate changes and some animals relocate out of the area, new animals, more suited to the changed conditions, also move in to the area. Perry Pungowiyi recounted the story of a young boy who saw a snowshoe hare and told his uncles (who initially said, “there’s no rabbits around here”). When it turned out the boy was right, they were “excited to see that snowshoe hare, they’d never seen one before” (Pungowiyi 2010).

Students may be particularly interested in birds, especially shorebirds; it is traditional for young people to hunt birds with pellet guns and bring them home to their parents and grandparents to cook (BSSD 2011). Birds and eggs commonly harvested in substantial numbers within this region include: mergansers, geese, kittiwake, gulls, curlews, plovers, turnstones, phalaropes, and grouse (ADF&G 2015).



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Unit Vocabulary

Science Terms to Define	
behavioral adaptation	something an animal does to survive
blubber	a thick, insulating layer of fat beneath an animal's skin
migration	seasonal movement of animals from one region to another
physical adaptation	feature of an organism's body that helps it survive
subsistence	a lifestyle emphasizing the cultural, economic, and social practice of harvesting local wild resources for food and other uses

Terms for Incorporating Local Indigenous Language				
English	Iñupiaq	Yup'ik	Siberian Yupik	Local Translation
bird	tiŋmiaq	tengmiaq	qawak	
blubber	uqsruq	uquq	uquk	
egg	mannik	kayanguq	manik	
goose	liġlia	yaqulek	leglhleghpak	
migration	niutuat tiŋmiat	tumet	esluq	
nest	uglu	ungluq	mangtaaġ	
seal	ugruk	nayiq	qazigyaq	
walrus	aiviq	kaugpak	ayveq	
whale	situaq	cetuaq	aghveq	

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Activity MS.9.1

TEACHER GUIDE



Activity MS.9.1 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
- identify local subsistence resources
- explain how climate change is impacting a local subsistence resource
- describe how a local subsistence practice is changing as a result of climate changes.

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.

SA3: The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:

[6] **SA3.1** 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).

[8] **SA3.1** conducting research to learn how the local environment is used by a variety of competing interests (e.g., competition for habitat/resources, tourism, oil and mining companies, hunting groups).

SC1: The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection and biological evolution by:

[6] **SC1.2** recognizing that species survive by adapting to changes in their environment.

SF: Students develop an understanding of the dynamic relationships among scientific, cultural and personal perspectives.



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Activity MS.9.1

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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:

[B.2] make effective use of the knowledge, skills, and ways of knowing from their own cultural traditions to learn about the larger world in which they live.

[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.2] understand the ecology and geography of the bioregion they inhabit.

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

Bering Strait School District Scope & Sequence

6.6B Understand the feature of adaptation that helps an organism to survive in its surroundings. (SC1.2)

6.9D Explain how an organism's adaptation helps it to survive (SC1.1)

6.9G Understand how ecosystems change over time.

Materials

- REACH Up Middle School Student Guide: Impact on Subsistence
- Student Worksheet: Ask an Expert about Subsistence Resources
- Internet access and projector

Activity Preparations

1. Identify adults within your school or community who have lived year-round in the community for many years. People in the school might include teachers, administrators, secretaries, teacher aides, lunchroom/kitchen staff, recess duties, maintenance and custodial staff, etc. People in the community might include parents, grandparents, tribal administrators etc. Ask several of these local knowledge bearers if they would be willing to speak with a group of your students about how climate changes are impacting



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subsistence resources in and around the community. Make sure that the volunteers you have identified will be available (in person or via telephone) 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 Impact on Subsistence student guide and ask students to work with a partner to read pages 1-4.
2. Show the video, Impact on Subsistence, available at www.k12reach.org/videos.php. Videos are located under the Multimedia tab. Allow time for students to share comments and ask questions. You may also want to watch the videos Changing Subsistence Resources: Sea Mammals and Changing Subsistence Resources: Birds.
3. Ask students what sorts of subsistence resources their community relies upon (students may identify sea mammals, fish, birds, plants, land mammals, etc. from the local environment). Explain that students will interview a few community members to learn about how these resources are adapted to the local environment and how climate change is impacting subsistence resources and subsistence practices.
4. Separate students into small groups according to how many knowledge bearers are available to share subsistence 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.
5. 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.
6. Distribute one Student Worksheet: Ask an Expert about Changes to Subsistence Resources to each group and assign each group one local knowledge bearer to interview. Provide 15-20 minutes for students to locate or call via telephone and interview the knowledge bearer.
7. Reconvene in the classroom and ask groups to share their findings. What subsistence resources does our community rely on? How are the animal resources we rely on specially adapted to our climate or environment? How is climate change affecting subsistence resources? How are people in our community adapting subsistence practices because of climate change?



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Activity MS.9.1

WORKSHEET



Student Worksheet: *Ask an Expert about Subsistence Resources*

Names of Group

Members: _____

Interview a long-term community member to learn how local subsistence resources are adapted to the environment and how climate change is impacting subsistence resources and subsistence practices. Take notes about what you learn.

Who did you interview? _____

Ask:

What subsistence resources do people in our community rely on?

How are the animals we rely on adapted to our climate or environment?

How is climate change affecting subsistence resources?

Have you or others you know of had to adapt or change subsistence practices because of climate change? If so, how?



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Activity MS.9.1

WORKSHEET



For Alaska Native Language Speakers:

What language(s) do you speak? _____

What dialect(s)? _____

Could you translate the following words?

bird: _____

blubber: _____

egg: _____

goose: _____

migration: _____

nest: _____

seal: _____

walrus: _____

whale: _____



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Activity MS.9.2

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Activity MS.9.2 Subsistence Vocabulary

What terminology do we need to know to discuss climate-related changes to subsistence resources and practices?

Overview

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

Background Information

Based on the Visual Iñupiaq Vocabulary Acquisition (VIVA) Program of the North Slope Borough School District, the vocabulary cards provided for this activity have Alaska Native Language and English terms and an associated image. The games suggested are meant to promote fluency through repeated practice. Other vocabulary cards can be easily integrated into the games. This will extend potential length of the games and add a greater challenge. By working with the words through different games, students can develop greater fluency with the vocabulary.

Objectives

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

- read and speak indigenous terms related to subsistence and animal adaptations
- illustrate and define terms related to subsistence and animal adaptations

Alaska Standards

Alaska Science Standards/Grade Level Expectations:

[6]SC1.2 The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection and biological evolution by recognizing that species survive by adapting to changes in their environment.

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:

[B2] make effective use of the knowledge, skills, and ways of knowing from their own cultural traditions to learn about the larger world in which they live.



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[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:

[E2] understand the ecology and geography of the bioregion they inhabit.

Bering Strait School District Scope & Sequence

6.6B: Understands the feature of adaptation that helps an organism to survive in its surroundings. (SC1.2)

Materials

- Impact on Subsistence Middle School Student Guide
- Vocabulary card sets (1 set per group of 4-6 students)
- Student Information Sheet: Word Games Instructions (1 per group)
- Student Worksheet: Subsistence Vocabulary (1 per student)
- Timers (optional)

Activity Preparations

1. If your students completed Activity MS.9.1 Ask an Expert, refer to their completed worksheets to 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 5 of the Student Guide would be most appropriate for your students to practice. The following chart is provided for reference.



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Activity MS.9.2

TEACHER GUIDE



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	
		Teller	Teller	
			Unalakleet	
			Shaktoolik	
	Fish River	Golovin*		
		White Mountain		
		Northern Alaskan Iñupiaq	Malimiut	
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/>.

- Keep in mind that different individuals may translate certain terms differently. For example, "frozen ground" and "ground that is frozen" will both work when communicating about "permafrost". 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.
- 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.
- Make copies of the Word Games Instruction Sheet (one per group) and the Impact on Infrastructure Vocabulary worksheet (one per student).

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Activity MS.9.2

TEACHER GUIDE



Activity Procedure

1. Distribute the Impact on Subsistence Student Guide and review pages 1-6.
2. Show students the vocabulary cards. Hold up each card. Discuss what each card depicts. How do these terms relate to subsistence in their region? Ask students to share definitions for terms such as subsistence, migration, behavioral adaptation, and physical adaptation.
3. Say the English and local Alaska Native Language word for the illustration depicted on each 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.
4. Divide the class into four groups.
5. Provide each group with the Word Games Instruction sheet, a set of Vocabulary Cards, and a timer (optional).
6. Students can commit to one game for a period of time or mix and match.
7. Encourage students to play the vocabulary games and practice the vocabulary words during free time throughout the duration of the Impact on Subsistence unit. If possible, schedule 10-15 minutes twice per week to practice the vocabulary terms.
8. Distribute the Subsistence Vocabulary Worksheet and ask students to complete it. Provide review as needed.



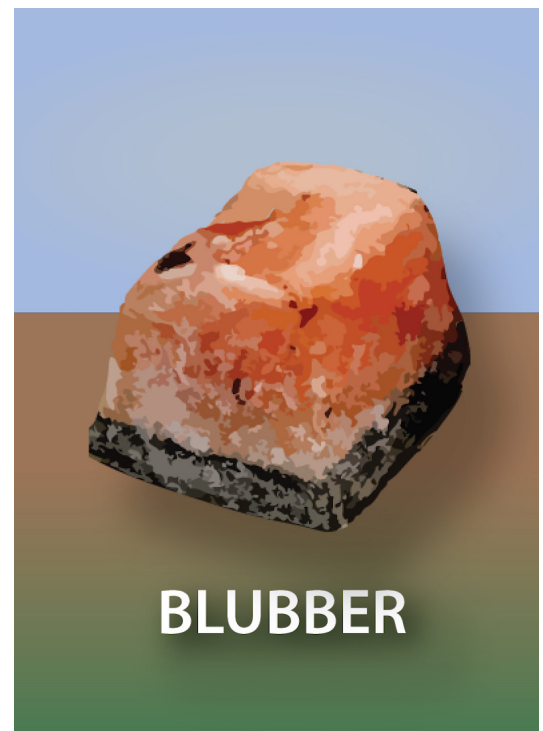
CHANGING LIFESTYLES

Impact on Subsistence

Activity MS.9.2
TEMPLATE



Vocabulary Cards



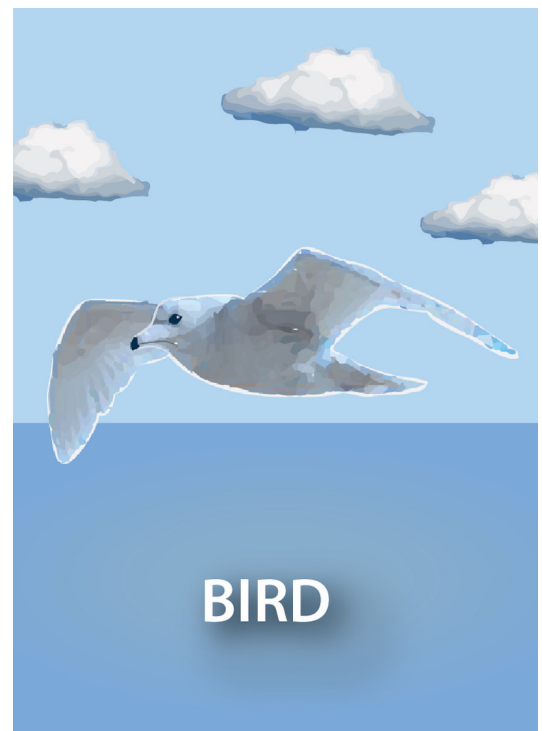
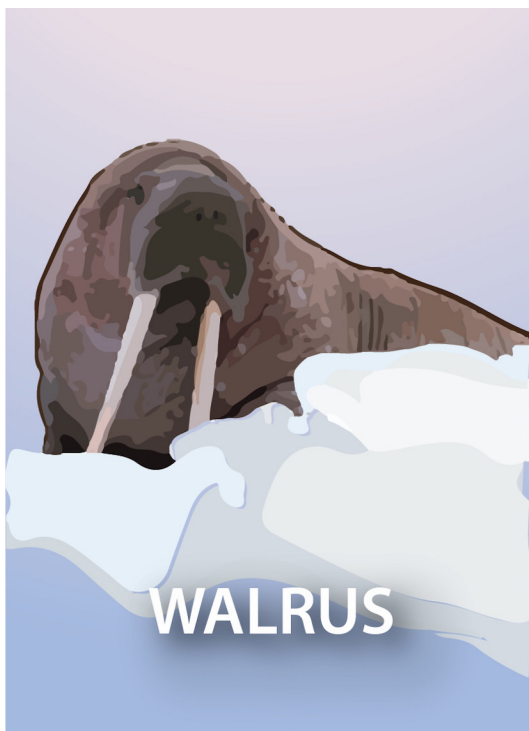
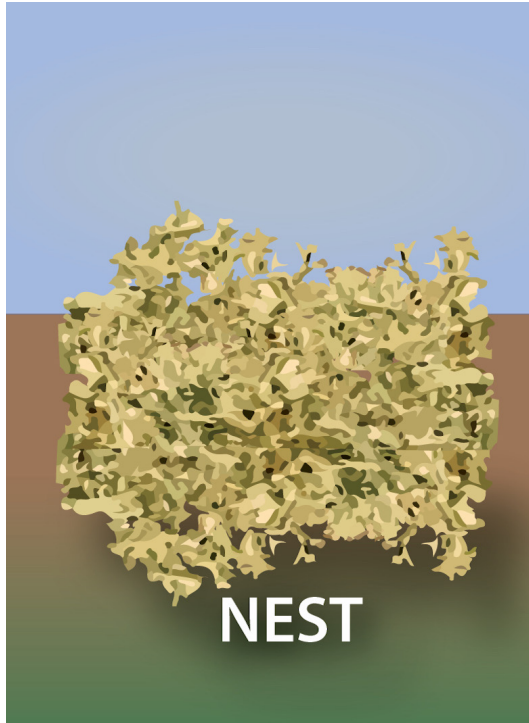
CHANGING LIFESTYLES

Impact on Subsistence

Activity MS.9.2
TEMPLATE



Vocabulary Cards



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Activity MS.9.2
TEMPLATE



Vocabulary Cards



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Activity MS.9.2

TEMPLATE



Vocabulary Cards

Local Indigenous Word

Local Indigenous Word

Local Indigenous Word

Local Indigenous Word

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Activity MS.9.2

INFORMATION SHEET



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 term and English words 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 and 1 point for the correct English word.
5. Repeat until all cards are gone. The team with the most points wins.



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Activity MS.9.2

WORKSHEET



Student Worksheet: *Subsistence Vocabulary*

Name: _____

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

Behavioral adaptation	A lifestyle emphasizing the cultural, economic and social practice of harvesting local wild resources for food and other uses
Subsistence	Seasonal movement of animals from one region to another
Physical adaption	Something an animal does to survive
Migration	Feature of an organism's body that helps it survive

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
blubber		
walrus		
nest		
egg		



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Answer Key: Subsistence Vocabulary

1)

Behavioral adaptation	A lifestyle emphasizing the cultural, economic and social practice of harvesting local wild resources for food and other uses
Subsistence	Seasonal movement of animals from one region to another
Physical adaption	Something an animal does to survive
Migration	Feature of an organism's body that helps it survive

2)

My Community: _____		
English Word	Local Alaska Native Language Word	Illustration
blubber	Answers will vary depending on language and dialect spoken in this community	Sketch should illustrate word at left.
walrus	Answers will vary depending on language and dialect spoken in this community	Sketch should illustrate word at left.
nest	Answers will vary depending on language and dialect spoken in this community	Sketch should illustrate word at left.
egg	Answers will vary depending on language and dialect spoken in this community	Sketch should illustrate word at left.

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Activity MS.9.3

TEACHER GUIDE



Activity MS.9.3: Physical Adaptations: Blubber

Overview

In this lesson, students will explore how blubber serves as an insulator for arctic sea mammals.

Objectives

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

- conduct a scientific inquiry
- collect and compare temperature data from multiple trials
- explain how an animal's physical adaptation (blubber) helps it survive

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.

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

[7-8] **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.

SA3: The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by:

[7] **SA3.1** designing and conducting a simple investigation about the local environment.

SC1: The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection and biological evolution by:

[6]**SC1.2** recognizing that species survive by adapting to changes in their environment.

Alaska Cultural Standards

[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.2] understand the ecology and geography of the bioregion they inhabit.

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



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Activity MS.9.3

TEACHER GUIDE



Bering Strait School District Scope & Sequence

6.6B: Understand the feature of adaptation that helps an organism to survive in its surroundings. (SC1.2)

6.9D: Explain how an organism's adaptation helps it to survive (SC1.1)

6.9G: Understand how ecosystems change over time. (SF)

Materials

- Impacts on Subsistence Middle School Student Guide
- Student Worksheet: Physical Adaptations: Blubber!
- 4 quart size re-sealable plastic bags (per group of 4 students)
- shortening (approximately 2 cups per group of 4 students)
- Duct tape (1 roll per group of 4 students)
- Spoon (to scoop shortening)
- Ice water
- Plastic tub
- 2 thermometers (per group of 4 students)
- Timer (1 per group of 4 students)

Activity Preparations

If your school does not have an icemaker, prepare ice for the ice water needed for this activity.

Activity Procedure

1. Distribute the Impacts on Subsistence student guide. Review the information on pages 1-5. Then ask students to work with a partner to read pages 6-10.
2. Discuss: What is an adaptation? What is the difference between a physical adaptation and a behavioral adaptation? What are some physical adaptations of animals, plants, fish and birds in the Bering Strait region?
3. Explain that students will model a physical adaptation (blubber) to discover how it helps animals survive in cold water.
4. Place students in groups of 4 and distribute the Student Worksheet: Physical Adaptations: Blubber! to each student. Distribute the modeling supplies to each group.
5. Ask students to look at the instructions for creating a blubber mitten and a skin mitten (in the student guide) and predict which will stay warmer in cold water: a hand in a blubber mitten or a hand in a skin mitten. Why? Ask students to write their predictions on the student worksheet.

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Activity MS.9.3

TEACHER GUIDE



6. Ask students to work with their group to create the models illustrated in the student guide, and then test their models and record their results on their worksheet.
7. Discuss conclusions as a class: Which mitten kept your hands the warmest? Why? What role do you think that blubber plays in helping sea mammals survive in your climate? How might more or less blubber affect survival?

Extension Activity

- Would there be a noticeable difference in temperature if you put shortening directly on your skin and put your hand in the ice water? Test it out!





Student Worksheet: Physical Adaptations: Blubber!

Name: _____

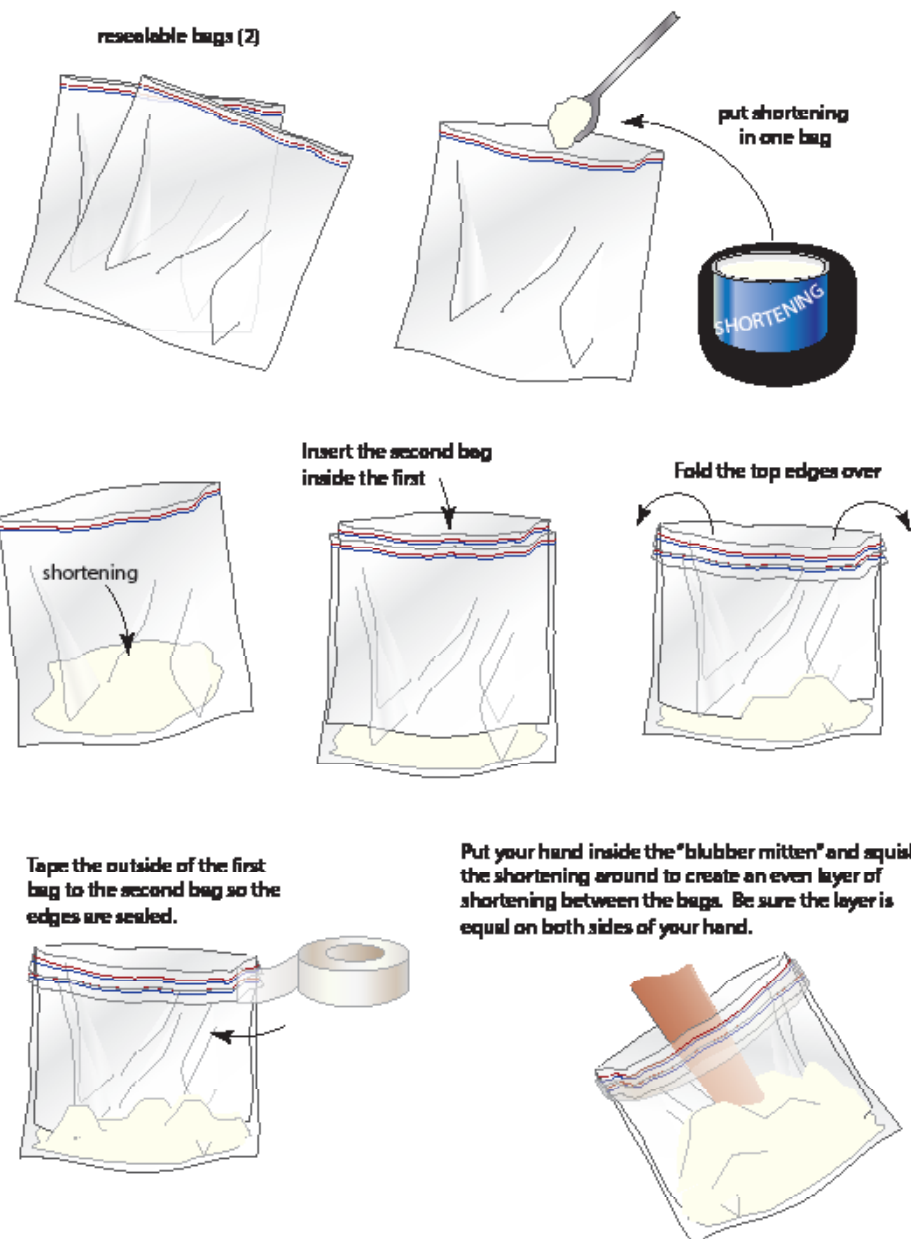
Directions: Work with classmates to model blubber and discover how it helps animals survive in cold ocean water. Answer the questions below.

Predict

1. Which will stay warmer in cold water: A hand encased in blubber and skin, or a hand with only skin? Why?

Model it!

- Make a “blubber mitten” by following the steps in the illustration below. The shortening will represent blubber in your model, and the outer plastic bag will represent skin.



CHANGING LIFESTYLES

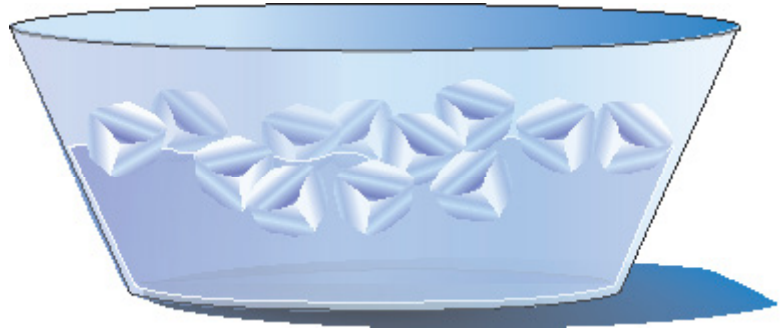
Impact on Subsistence

Activity MS.9.3

WORKSHEET



- Make a “skin mitten” using the same procedure as above, but without the shortening.
- Model the ocean during winter by pouring ice and water into a plastic tub. Fill the tub about 2/3 of the way to the top.



Test your prediction!

- Work with a group to test your prediction. Each person in the group should perform the following test:
 - Put the blubber mitten on one hand, and the skin mitten on the other hand. Keep your hands open.
 - Slide a thermometer into each mitten so that it is resting against your open hand.
 - Place both mittened hands into the ice water at the same time. Ask another person in your group to set the timer for 30 seconds. Make sure that no water gets inside the mittens.
 - After 30 seconds has elapsed (OR if either of your hands becomes uncomfortable at any point) remove both hands from the water and immediately read the temperatures recorded on each thermometer.
2. Record your findings in the chart:

Name	Blubber mitten temperature	Skin mitten temperature
Average:		

- Repeat this process for each person in your group.
- Find the average (mean) temperatures for the blubber mitten and the skin mitten for your group.



CHANGING LIFESTYLES

Impact on Subsistence

Activity MS.9.3

WORKSHEET



Conclusions

3. Which mitten kept your hands the warmest? Why?
4. What role do you think that blubber plays in helping sea mammals survive in your climate?
5. How might more or less blubber affect survival?



CHANGING LIFESTYLES

Impact on Subsistence

Activity MS.9.3

ANSWER KEY



Answer Key: Physical Adaptations: Blubber!

1. Which will stay warmer in cold water: A hand encased in blubber and skin, or a hand with only skin? Why?

Answers will vary. Should include a hypothesis with supporting information.

2.

Name	Blubber mitten Temperature	Skin mitten temperature
Answers will vary. Blubber mitten temps should be higher than skin mitten temps.		
Average:		

4. Which mitten kept your hands the warmest? Why?

The blubber mitten kept hands the warmest because the blubber serves as insulation between the hand and the icy water.

5. What role do you think that blubber plays in helping sea mammals survive in your climate?

Blubber helps sea mammals to stay warm in cold climates by insulating them from the cold.

6. How might more or less blubber affect survival?

Answers will vary. Students should understand that less blubber means less insulation and animals might have more difficulty maintaining their body temperature. More blubber means more insulation.



CHANGING LIFESTYLES

Impact on Subsistence

Activity MS.9.4

TEACHER GUIDE



Activity MS.9.4: Goose Gamble

Overview

In this lesson, students will explore some of the ways climate change and other factors can impact migratory geese.

Objectives

- On successful completion of this lesson, students will be able to:
- differentiate between physical and behavioral adaptations
- explain how migration helps geese survive
- describe ways in which climate change can impact migratory geese and the ecosystems in which they thrive
- describe other factors, not related to climate, that impact the survival of migratory geese in their region

Alaska Standards

Alaska Science Standards / Grade Level Expectations

SA1.1: 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.

SC1.2: The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection and biological evolution by:

[6] SC1.2 recognizing that species survive by adapting to changes in their environment.

SF: Students develop an understanding of the dynamic relationships among scientific, cultural, social and personal perspectives.

Alaska Cultural Standards

[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.2] understand the ecology and geography of the bioregion they inhabit.

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



CHANGING LIFESTYLES

Impact on Subsistence

Activity MS.9.4

TEACHER GUIDE



Bering Strait School District Scope & Sequence

- 6.6B Understand the feature of adaptation that helps an organism to survive in its surroundings. (SC1.2)
- 6.9D Explain how an organism's adaptation helps it to survive (SC1.1)
- 6.9G Understand how ecosystems change over time. (SF)

Materials

- Impacts on Subsistence Middle School Student Guide
- Student Worksheet: Goose Gamble
- Goose Gamble Game Board (1 per group of 4 students)
- Playing pawns (one per player)
- Game counters such as paperclips, coins, or chips to represent birds (approximately 100 per group of 4 players)
- Four-sided die (1 per group of 4 students)



CHANGING LIFESTYLES

Impact on Subsistence

Activity MS.9.4

WORKSHEET



Activity Procedure

1. Distribute the Impacts on Subsistence student guide. Review the information on pages 6-8. Ask students to work with a partner to read pages 11-14.
2. Discuss: What is an adaptation? What is the difference between a physical adaptation and a behavioral adaptation? What are some behavioral adaptations of animals, plants, fish, and birds in the Bering Strait region?
3. Explain that students will play a game to learn how climate change and other factors might impact the survival of geese that migrate to Western Alaska to nest. Migration is an important behavioral adaptation.
4. Place students in groups of 4 and distribute the Student Worksheet: Goose Gamble to each student. Distribute the game supplies to each group.
5. Read and explain the game play instructions (also found in the Student Guide):
 - a. This game is for 2-4 players.
 - b. Each player selects a playing pawn and places it on the word "Start" on the game board.
 - c. Each player takes 6 game counters (geese) and places them on the part of the game board labeled "Flock". All players' geese are part of the same flock and it does not matter which geese each player contributed.
 - d. Choose a player to go first. Play proceeds clockwise.
 - e. On your turn, roll the die and move your pawn ahead that number of spaces. For the space you land on, read the instructions aloud to your teammates and then follow the instructions. When you reach a stop sign, you must stop and following the directions beneath the sign before you can proceed.
 - f. This is a team game. Your flock is trying to survive migration and nesting. Good luck!
6. Ask students to play Goose Gamble, paying special attention to the things that affect their flock as they migrate north, nest, and migrate south again. As the team's players move around the game board, answer the questions on the worksheet.
7. Discuss:
 - How many geese were in your flock when you started?
 - How many did you end up with?
 - What are some of the ways climate impacted your flock?
 - Were these impacts helpful or harmful?
 - What other factors impacted your flock?



CHANGING LIFESTYLES

Impact on Subsistence

Activity MS.9.4

WORKSHEET



Student Worksheet: Goose Gamble

Name: _____

1. Write P for “physical adaptation” or B for “behavioral adaptation” next to each of the adaptations below.

_____ Bears have thick fur to stay warm during winter.

_____ Geese migrate south as the weather turns colder each fall and return in the spring as the weather gets warmer.

_____ Plants flower quickly at the beginning of short arctic summers.

_____ Whales have a thick layer of blubber beneath their skin. It insulates them from the cold water.

2. How many geese were in your team’s flock when you started?

3. How many geese were in your team’s flock when you finished the game?

4. What are two ways that climate change impacted your flock?

5. Were the climate change impacts you identified helpful or harmful?

6. What factors that were not related to climate impacted your flock?



CHANGING LIFESTYLES

Impact on Subsistence

Activity MS.9.4

ANSWER KEY



Answer Key: Goose Gamble

1. Write P for “physical adaptation” or B for “behavioral adaptation” next to each of the adaptations below.

 P Bears have thick fur to stay warm during winter.

 B Geese migrate south as the weather turns colder each fall and return in the spring as the weather gets warmer.

 B Plants flower quickly at the beginning of short arctic summers.

 P Whales have a thick layer of blubber beneath their skin. It insulates them from the cold water.

2. How many geese were in your team’s flock when you started?

Answers will vary. Should be 6 per player.

3. How many geese were in your team’s flock when you finished the game?

Answers will vary. Most teams will experience a moderate growth in their flock.

4. What are two ways that climate change impacted your flock?

- *Answers will vary but may include two of the following:*
- *Physical changes to nesting grounds such as lakes draining or expanding, saltwater inundation*
- *changes to the prevalence of plants relied upon for food*
- *improved breeding conditions*
- *increased vulnerability to predation*
- *increased predation*
- *increased number of eggs/hatchlings*
- *changes to seasons resulting in food scarcity at hatching time*
- *delayed migration*
- *shorter migration*



CHANGING LIFESTYLES

Impact on Subsistence

Activity MS.9.4

ANSWER KEY



5. Explain how the climate change impacts you identified were helpful or harmful to your flock.

Answers will vary.

- Lakes draining means geese may need to find new nesting grounds.
- Expanding lakes could mean more food is available in the larger habitat.
- Saltwater inundation can mean a temporary die-off of plants that geese eat, as freshwater species recover or are replaced by saltwater species.
- Seasonal shifts or warming climate can result in abundance of plants that geese rely on, but also could result in earlier maturation of those plants. If the plants have passed their peak by the time the eggs hatch, the goslings have less access to peak nutrition.
- Improved breeding conditions resulting from warmer weather can increase the number of eggs, but also increases the number of nesting birds, which makes them more vulnerable to predation, and can result in a later fall migration as the geese wait for new hatchlings to mature.
- Climate change related increased predation can be harmful to geese.
- Warmer climates can result in shorter migration, which is helpful to geese because they do not have to travel as far to reach a hospitable region to winter over.

6. What factors that were not related to climate impacted your flock?

Answers will vary but may include:

- Urban development
- Agriculture
- Hunting
- Wildlife refuges
- Predation
- Deformity
- Pollution

