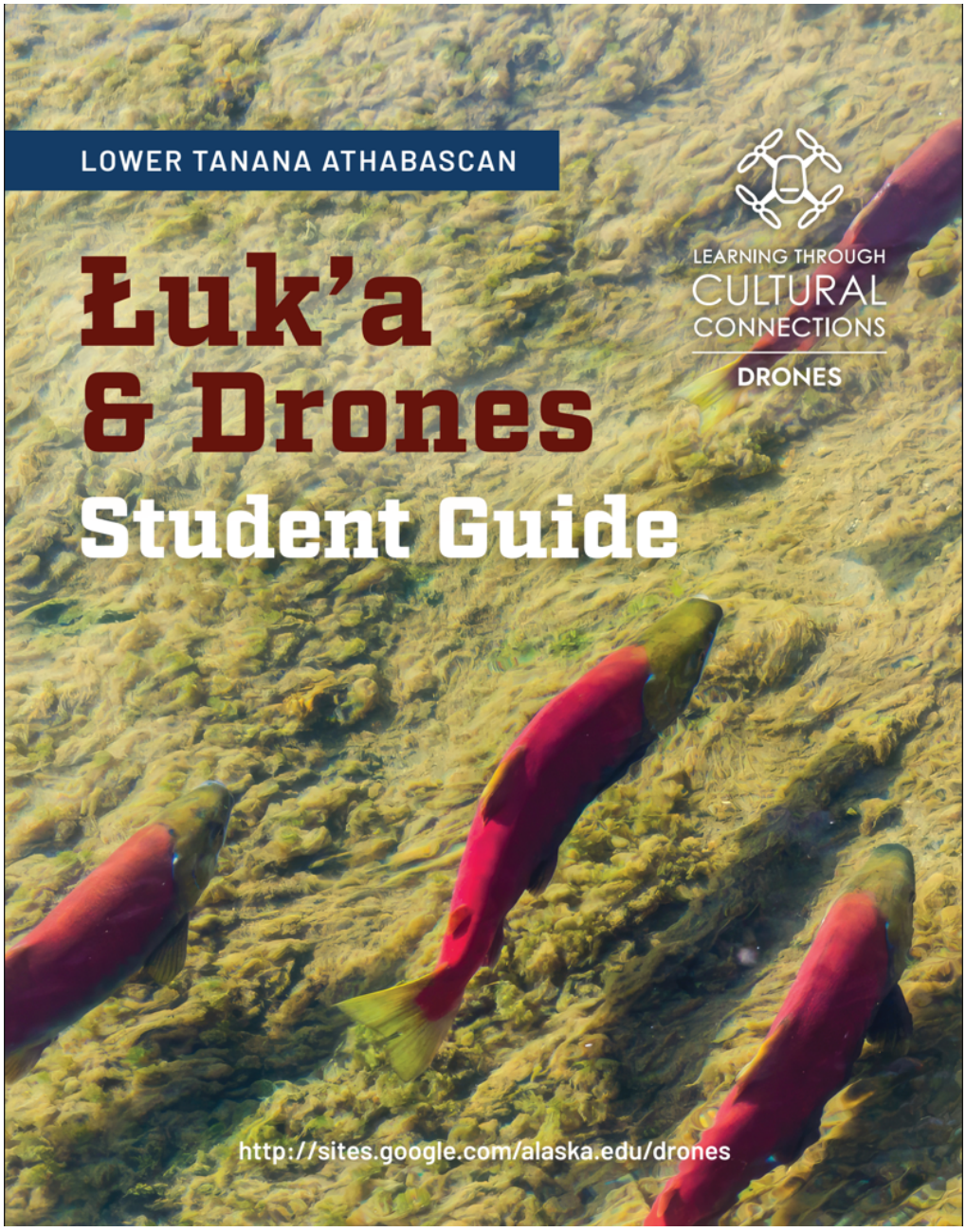
Łuk’a & Drones
Teacher’s Manual



https://sites.google.com/alaska.edu/drones

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Mark Hornberger, Nenana City School

Credits:
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DRONES: Drone Research and Opportunities for Native Elementary Students

Dear Elementary Teacher,

Thank you for using the DRONES Łuk'a & Drones activity kit in your classroom! This kit should be taught after students have completed the Drones in Alaska activity kit. The Łuk'a & Drones kit is designed to address Minto Flats Athabascan Values and Alaska Native Values for the Curriculum as well as Science Standards for Alaska, Alaska Cultural Standards, Next Generation Science Standards, 21st Century Competencies, and International Society for Technology in Education Standards for Students. Teaching this kit in full will provide 4th-6th grade students with an understanding of salmon life cycles, migration and role in the ecosystem and community, as well as how drones can be used to monitor and study salmon. This Teacher's Manual includes key vocabulary in Lower Tanana Athabascan, the Alaska Native Language spoken in Nenana. Activity-based assessments are provided for your convenience. This kit is best taught when a local subsistence area is accessible so that students can visit the subsistence area and learn about the processes there from an Elder. We encourage you to work collaboratively with the bilingual educator in your school to teach these lessons, as all include Alaska Native language.

Established Goals:

- Students understand what migration is.
- Students notice patterns of migration.
- Students understand salmon migrate from streams to the ocean and back again.
- Students observe, collect, analyze and share drone data about migration in their region
- Students read, speak and write Indigenous language terms related to migration and salmon
- Students perceive how humans impact fish and animal migration
- Students understand the importance of salmon in their community

Standards and Values Addressed:

Minto Flats Athabascan Values

- Knowledge of Language
- Sharing
- Cooperation
- Respect for Elders
- Respect for Nature
- Hunter Success
- Domestic Skills
- Responsibility to Tribe

Alaska Native Values for the Curriculum:

3. Know Who You Are - You Are a Reflection on Your Family
8. Honor Your Elders - They Show You the Way in Life
10. See Connections - All Things Are Related

Science Standards for Alaska (2019)

Earth and Human Activity

- 5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment
- 5-LS2-1 Develop and describe a model that describes the movement of matter among plants, animals, decomposers, and the environment.
- 3-LS1-1 Students who demonstrate understanding can: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

MS. Matter and Energy in Organisms and Ecosystems

- MS-LS-2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem

Alaska Cultural Standards

A) Culturally-knowledgeable students are well grounded in the cultural heritage and traditions of their community. Students who meet this cultural standard are able to:
   1: assume responsibilities for their role in relation to the well-being of the cultural community and their lifelong obligations as a community member;
   5: reflect through their own actions the critical role that the local heritage language plays in fostering a sense of who they are and how they understand the world around them;

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:
   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;
   4: 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:
   1: acquire in-depth cultural knowledge through active participation and meaningful interaction with Elders;
   3: interact with Elders in a loving and respectful way that demonstrates an appreciation of their role as culture-bearers and educators in the community;

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:
   2: understand the ecology and geography of the bioregion they inhabit;
   4: determine how ideas and concepts from one knowledge system relate to those derived from other knowledge systems;

Next Generation Science Standards

Earth and Human Activity

5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment

5-LS2-1 Develop and describe a model that describes the movement of matter among plants, animals, decomposers, and the environment.

3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

MS. Ecosystems: Interactions, Energy and Dynamics

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the number of organisms in ecosystems during periods of abundant and scarce resources]

21st Century Competencies

1. Innovative and Practical Problem Solver
   - As I continue to strengthen my ability to create and innovate, I:
     - create new and worthwhile ideas (both incremental and radical concepts);
     - elaborate, refine, analyze and evaluate my ideas in order to improve and maximize creative efforts;
     - develop, implement and communicate new ideas to others effectively;
     - am open and responsive to new and diverse perspectives; incorporate group input and feedback into my work.
   - As I continue to strengthen my ability to become a practical problem solver, I:
     - brainstorm solution strategies using reasoning, prior knowledge, common sense and creativity;
     - identify and gather relevant information to support solution strategies;
     - apply the steps necessary to carry out the solution strategy (such as effectively analyze and evaluate evidence, arguments, claims and beliefs; analyze and evaluate major alternative points of view);
     - interpret information and draw conclusions based on the best analyses that apply to the solution(s) of the problem;
     - solve different kinds of non-familiar problems in both conventional and innovative ways;
     - reflect critically on learning experiences and processes;
     - extend and/or transfer the learning to new situations.

2. Effective Communicator
   - As I continue to strengthen my ability to communicate with others verbally, I:
     - express my thoughts, ideas and opinions clearly in front of a group.
   - As others communicate with me and I continue to strengthen my ability to be a good listener, I:
     - listen effectively to decipher meaning, including knowledge, values, attitudes and intentions and actively respond to what I am hearing;
     - develop listening strategies such as: asking relevant question, taking notes, and making predictions to understand what is heard;
     - follow oral directions.
   - As I continue to strengthen my ability to be a good reader, I:
     - read for meaning and demonstrate understanding through personal response;
     - respond to text by showing understanding, making connections and making judgements.
   - As I continue to strengthen my ability to be a critical viewer, I:
     - utilize a variety of media to gain information;
     - glean information from charts, graphs and diagrams;

- respond to visuals by showing understanding, making connections, and making judgments.

3. Collaborative Team Member
   - As I continue to strengthen my ability to collaborate with others, I:
     - understand and commit to the goal of the group;
     - share ideas with others;
     - accept ideas/opinions from others;
     - actively participate in brainstorming sessions;
     - demonstrate respect for myself and others;
     - positively interact with group members;
     - demonstrate flexibility in group decisions (compromise).
   - As I continue to strengthen my ability to cooperate with others, I:
     - follow directions;
     - accept responsibility for my role in the task at hand;
     - demonstrate dependability and reliability;
     - contribute to accomplishing the goal in a timely manner.
   - As I continue to strengthen my ability to develop interpersonal skills, I:
     - respect cultural differences and work effectively with people from a range of social and cultural backgrounds;
     - respond open-mindedly to different ideas and values;
     - am knowledgeable about individual roles of group members;
     - actively listen to others;
     - provide constructive feedback to others;
     - utilize feedback from others.
   - As I continue to strengthen my ability to develop leadership skills, I:
     - use interpersonal problem-solving skills to influence and guide others toward a goal.

4. The Flexible and Self Directed Learner
   - As I continue to become a responsible, self-directed learner, I:
     - attend to and follow directions;
     - contribute positively to the learning environment;
     - prioritize, plan and manage work to achieve the intended result.
   - As I continue to become a resourceful, self-directed learner, I:
     - ask a variety of questions in order to clarify my understanding;
     - find and use information from a variety of sources;
     - use reasoning strategies, knowledge and common sense to solve problems;
     - apply prior knowledge to new situations.
   - As I continue to become a flexible, adaptable learner, I:
     - adapt to varied roles, job responsibilities, schedules and contexts;
     - incorporate feedback effectively.
   - As I continue to become a reflective, life-long learner, I:
     - assess my work in order to identify areas of strength and weakness;
     - recognize and capitalize on strengths;
     - listen to and respect the contributions of others.

International Society for Technology in Education (ISTE) Standards for Students

4. Innovative Designer: Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions. Students:
   a. know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

d. exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

7. Global Collaborator: Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally. Students:
   c. contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.

Activity 1: Łuk'a Vocabulary

Overview:

In this activity, students will learn salmon terminology in the Alaska Native language and dialect of their region.

Time: 1 class period (45 min-1 hour)

Materials:

- Vocabulary card set (1 per group)
- Stopwatch (optional)
- Language pronunciation guide
- Computers or tablets with internet access
- Łuk'a & Drones Student Guide
- Instruction Sheet: Word Games (1 per group)
- Student Worksheet: Łuk'a Vocabulary

Standards Addressed:

Alaska Native Values for Curriculum: See Connections, Know Who You Are

Minto Flats Athabascan Values: Knowledge of language, Cooperation, Sharing

Alaska Cultural Standards: A.5, B.2

21st Century Competencies: 2, 3, & 4

International Society for Technology in Education: 7

Objectives:

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

- use vocabulary terms appropriately;
- read and speak Alaska Native terms related to salmon, landscapes, and migration;
- work with peers.

Background Information:

Based on the Visual Iñupiaq Vocabulary Acquisition (VIVA) Program of the North Slope Borough School District, these vocabulary cards have both Alaska Native and English terms. 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 Alaska Native language vocabulary. The cards are provided in the Lower Tanana Athabascan dialect.

Assessments:

Vocabulary fluency game observations and the student worksheet responses provide a means of assessing student ability to:

- use local heritage language to help them understand salmon life cycle and migration;
- make effective use of the knowledge, skills and ways of knowing embedded in the local heritage language to learn about the larger world in which they live by associating Alaska Native words with their English counterparts;
- hear, read and speak Alaska Native language terms and sentences;
- share and cooperate with peer group members.

Student use of online pronunciation guide provides a means of assessing student ability to:

- find and use information from media sources.

Student engagement with families provides a mean of assessing student ability to:

- apply their local heritage language in learning about wildlife and migration in their communities.

Activity Preparation:

Pronunciation and spelling of Alaska Native terms can vary depending upon the dialect spoken within a community. Ask your local Alaska Native language teacher to check the vocabulary cards and multimedia to ensure they are accurate for your community. If possible, collaborate with the Alaska Native language teacher in your school to teach this activity.

Activity Instructions:

1. Distribute the Łuk'a & Drones Student Guide and work together as a class to read pages 1-4. Discuss the questions within the text as they arise.
2. Ask students to try the online Alaska Native Vocabulary Pronunciation Guide at (https://sites.google.com/alaska.edu/drones/) to learn how to pronounce Alaska Native words related to salmon.
3. Show students the vocabulary cards. Hold up each card. Discuss what each card represents.
4. Say the Lower Tanana Athabascan word on the card. Ask students to repeat the word. Repeat, then ask students to call out the correct word as you hold up each card.
5. Divide the class into groups of four.
6. Provide each group with a printout of the Word Games Instruction sheet, a stack of vocabulary cards, and a timer (optional).
7. Students can commit to one game for a period of time or mix and match.
8. Provide time for each group to play through the games.
9. Discuss as a class: Which games were hard to do with only a few Athabascan words in your vocabulary? What games did you enjoy most? What words were difficult to guess, no matter what game you played?
10. Distribute the Student Worksheet: Łuk'a Vocabulary and ask students to complete it. Please note: If the local dialect is different than that provided on the cards, please revise the cards, worksheet and answer key accordingly. Provide review as needed.
11. Ask students to share the words they learned with their families/parents, and find out if families have other words to share that are related to salmon or migration.
12. Consider asking students to practice the vocabulary words or play a vocabulary game for 10-15 minutes each day while teaching the migration unit.

Connections and Extensions:

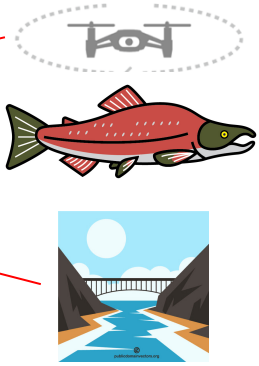
- Ask students to create their own word games to help each other learn new Alaska Native words. Using whiteboard slates and markers, have students write an Alaska Native word on their slate after prompting with the word's associated image or English term. Have students show what they wrote to see who is retaining the vocabulary and who might need more practice.
- Create a Focus Wall in your classroom by printing the vocabulary terms and posting them on the wall, along with salmon images and other key concepts and ideas from the activity kit.
- Use Kahoot to help students learn and practice vocabulary words.

Answer Key:

1. łuk'a

   Tth'itu'

   yots'enodzida



2. Illustration should show a fishing place, eddy.
3. ocean
4. nulaghi

Vocabulary List:

Nenana (Lower Tanana Athabascan)	**English term or phrase**
kha'ał tr'ekhwneyi	subsistence (what we live on)
no'idelakh	they come back (salmon)
yots'enodzida	drone
Tth'itu'	Tanana River
notu'	ocean (salt water)
łuk'a	salmon
k'eddhet	fishing place, eddy
k'un' tendeyosrde	spawning stream
gath	king salmon (Chinook salmon)
nulaghi	chum salmon (dog salmon)
sanh łuk'a	silver salmon (coho salmon)
sanh	summer
dęy'	spring
khwyhts'en'	fall
ch'etena	animal trail
denigi	moose

Local Language and Dialect	**English term or phrase**
	subsistence
	migration
	drone
	Tanana River (or similar river)
	ocean (salt water
	salmon

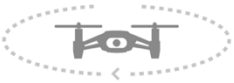
	fishing place, eddy
	spawning stream
	king salmon (Chinook salmon)
	chum salmon (dog salmon)
	coho salmon (silver salmon)
	summer
	spring
	fall
	animal trail
	moose

Activity 1 Student Worksheet: Łuk'a Vocabulary

NAME _____

1. Draw a line to connect each Lower Tanana Athabascan word to the correct image:

łuk'a



Tth'itu'

yots'enodzida

2. In the space below, illustrate the term: k'eddhet

3. Translate this term into English: notu'

_____

4. Translate this term into Lower Tanana Athabascan: chum salmon

_____

Instruction Sheet: Word Games

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 English word.
2. Listen as your teacher says an Athabascan word aloud from one of the cards.
3. Work with your group to find and hold up the correct card.
4. *Variation* Turn student cards English-side down and have the teacher hold up an Athabascan word and students hold up and say the corresponding word.

VOCABULARY SLAP

1. Select one student to serve as the "caller" for this game. That student should make a list of the Lower Tanana Athabascan vocabulary words on a separate sheet of paper. The words can be found on the cards.
2. Place the cards in a circle, English-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 translation 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 place them English-side up in the middle of the table.
3. Work with your team to write down the Athabascan word for the card.
4. After both teams have written answers, turn the card over to check. Teams get 1 point for the correct Lower Tanana Athabascan word.
5. Repeat until all cards are gone. The team with the most points wins.
6. Variation: Place the cards Lower Tanana Athabascan side-up and write down the matching English word.

ACT IT OUT

1. Shuffle the vocabulary cards and deal them out to each player. Keep your cards a secret!
2. Take turns acting out your cards using motions and sound effects, but no words.
3. Whoever guesses the Lower Tanana Athabascan word first takes the card as a point.
4. The game is over after all cards have been acted out.
5. Optional: Add a timer to the mix! See if you can get your classmates to guess the word in 30 or 60 seconds.

Activity 2: The Life of a Łuk'a

Overview:

In this activity, students will investigate the life cycle of the **łuk'a** (salmon) as it travels from freshwater to the ocean and back. Students will also think about the importance of salmon to the environment and the community.

Time: 2 class periods

Materials:

- Łuk'a & Drones student guide
- Student Worksheet: Łuk'a Life Cycle
- Łuk'a Life Cycle cards
- Clipboards
- White paper
- Scissors

Standards Addressed:

Minto Flats Athabascan Values: Knowledge of language, Responsibility to Tribe, Respect for Nature, Respect for Elders, Hunter success, Domestic skills

Alaska Cultural Standards: A.1, B.2, B.4, D.1, D.3, E.2, E.4

Alaska Native Values for Curriculum: Honor Your Elders, See Connections, Know Who You Are

Science Standards for Alaska: 5-LS2-1, 3-LS1-1, MS-LS-2-1

Next Generation Science Standards: 5-LS2-1, 3-LS1-1, MS-LS-2-1

21st Century Competencies: 2, 3

International Society for Technology in Education Standards for Students: 7

Objectives:

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

- describe/define a life cycle;
- identify the stages of the salmon life cycle and explain the journey of a salmon from hatching to death;
- discuss forms of subsistence in the community shared by Elders or culture bearers;
- explain how changes in salmon affect local subsistence practices;
- describe how a local subsistence practice is changing as a result of climate changes; and
- use local Alaska Native language to describe the features and processes of the world around them.

Background Information:

A life cycle is the pattern of typical stages and changes an organism goes through, from the beginning to end of life, including reproduction. **Łuk'a** (salmon) have a unique life cycle that takes them from the rivers and streams, to the ocean, and back again to the place they were born. The specific life cycle stages a salmon goes through are all very different from one another and unique from other animals. While most fish can live in only saltwater or freshwater, salmon go through

internal changes to survive in both environments. This unit focuses on six stages of a salmon life cycle: egg, alevin, fry, smolt, adult, and spawner. Visit the following website for in-depth descriptions of each stage of the salmon life cycle: https://fishex.com/salmon/alaska/salmon-life-cycles.

Salmon are a key resource for subsistence communities. They are important to the local ecosystem and provide nutrients to numerous plants, animals, and people. Because of the many ways they impact other species in their environment, they are described as a keystone species for some ecosystems. Salmon eggs serve as a food source for insects and other small predators in river environments. Small fry are eaten by larger fish and birds. Adults are food for larger predators like bears, wolves, and humans. Upon death, decaying salmon bodies return nutrients to streams and rivers that plants growing along the banks use to grow.

Assessment:

Classroom discussion provides a means of assessing student ability to:

- understand the components of an organism's life cycle;
- describe local subsistence activities;
- relate the importance of environmental health to health of the community;
- witness and describe the local importance of salmon;
- make effective use of the knowledge, skills and ways of knowing embedded in the local heritage language to learn about the larger world in which they live by learning and using Alaska Native words related to the local environment;
- observe and comment on local photographs of salmon and rivers;
- track the movement of matter from salmon through a food web.

Engagement and interaction with Elders during their classroom visit provides a means of assessing student ability to:

- listen attentively and seek guidance and advice from Elders;
- interact in a loving and respectful way with Elders;
- engage in meaningful, in-depth conversations with Elders;
- connect shared experiences within the community to individual self.

Student worksheet provides a means of assessing student ability to:

- understand the six stages of the salmon life cycle;
- explain similarities and differences in the salmon life cycle;
- understand the stages of salmon that shift between freshwater and saltwater as part of the life cycle.

Activity Preparation:

1. If health conditions allow, work with students to identify local Elders or other culture bearers who know about local subsistence and might be willing to speak to your class. If students don't have a strong list of recommendations, ask the local school administrative assistant, bilingual teacher, the local Elder's council, or tribal administration.
2. Invite the Alaska Native Elders/culture bearers to come to the classroom. An invitation written by the students, or a phone call from one of the students with your assistance is a good way to issue the invitation. An invitation template is provided on the last page of this activity.
3. Arrange to have beverages such as coffee, tea, and water available to Elder/s or culture bearer/s on the day of their visit. Snacks are nice also, but not essential. Make sure you have comfortable chairs for the guests to sit in and review respectful listening and hosting skills with students prior to the guests' arrival. Plan to have students move close to the Elder/s or

culture bearer/s for the discussion (either by gathering on the floor in front of the guests, or by placing their chairs in a circle that includes the guests' chairs.) Always remain in the classroom with the students to support the Elder/s or culture bearer/s in their presentation as needed. After the visit, thank them and see them out. Follow up with a student-created and signed thank you card for each Elder or culture bearer.

4. Use the Alaska Native Vocabulary terms that students have learned in the vocabulary section of the student guide as the students are asked questions.
5. This activity includes a worksheet and flash cards. Print worksheet and life cycle cards prior to teaching lesson. Students may cut out cards for the life cycle activity.
6. This activity involves a possible field trip. Follow the guidelines for your school with appropriate permission slips, chaperones, and/or bus transportation. Reach out to the tribal organization in your community to identify a possible subsistence site such as a fish camp for the students to visit. For the visit to the subsistence area, bring materials listed above, particularly clipboards and pencils. If a field trip is not possible, conduct the activities and discussions with an Elder or culture bearer visiting the classroom.

Activity Instructions:

1. **Day 1:** Ask students: What is a life cycle? Discuss what the human life cycle looks like. Ask students: What are some plants or animals that have a unique life cycle? Discuss what other life cycles students can think of. Link plant and animal life cycles to the human life cycle by explaining there are specific stages in a life cycle. Introduce to students the idea that **łuk'a** (salmon) go through a life cycle: they are born, they grow and develop, they reproduce, and then they die. Have students compare this life cycle with a human's life cycle – humans are born, they grow, they reproduce, and they die.
2. Gather paper and drawing utensils for the class. Ask students to create a poster of a life cycle they are familiar with. (This could be the life cycle of a local animal, etc.) Remind students there are "stages" within a life cycle. Ask students to number the stages of life in order on their drawings. Please note this activity can be conducted in the classroom or as a homework exercise.
3. Introduce the life cycle of a salmon. Distribute the Łuk'a & Drones Student Guide. As a class, read pages 5-6 in the Łuk'a & Drones student guide. Mention that salmon have a unique life cycle because they live in two different environments throughout their life: freshwater and saltwater. Ask students to look at the life cycle of a salmon displayed on page 8 of their student guide. Explain life cycles like a salmon's are often shown in a circle because it is continuous.
4. Place students in groups of 2. Distribute the Student Worksheet: Łuk'a Life Cycle and Łuk'a Life Cycle cards, and scissors to each group. Ask students to cut out life stages cards then shuffle them and arrange in order of hatching to adulthood. Prompt students to raise their hand when their partner group thinks they have correctly placed the life cycle in order. Circulate the room checking the students' life cycles. After placing the cards in the correct order once, prompt students to answer question 1-3 on their student worksheet.
5. Join three groups together and ask students to shuffle one set of life cycle cards then pass them out so each student in the group has one card. Using their cards, ask student groups to rearrange themselves to order the cards in the salmon life cycle.
6. Close the class by reading pages 9-12 of the student guide. Discuss how salmon can continue to benefit their environments after death. Ask students to refer to the food web on page 12. Explain the structure of the food web, differentiating between arrows that run from salmon

to predator/prey and other ways salmon benefit the ecosystem. Discuss with students: How do the salmon bodies, after their death, help the ecosystem? What type of organisms outside of predators benefit from salmon nutrients?

7. Ask students to place their worksheets and cards in a designated space. They will answer question 4 on the worksheet after meeting with the Elder or culture bearer the next class meeting.
8. **Day 2:** Invite one or more Elder/s or culture bearer/s to come with the class to visit a fish camp/traditional area in the community. Bring Łuk'a Life Cycle cards, worksheets, pencils and clipboards on the field trip.
9. At the traditional area, ask the Elder/s or culture bearer/s to talk or demonstrate about how salmon are harvested and preserved at the site. What tools and processes are used?
10. Discuss the uses of salmon in the community. Ask the Elder/s or culture bearer/s about some of the subsistence practices around the community that involve salmon. Ask students: Within your families, what are some ways salmon are used?
11. Invite students to share what they know about salmon life cycles by placing the students into 6 equal groups – and assigning each group a stage of the life cycle to tell the Elder/s or culture bearer/s about. Give students a few minutes to discuss how they would describe their stage of the life cycle. Ask students to arrange their groups in the order of the life cycle from hatching to death. One by one, go down the line of student groups offering them time to share with their Elder/s or culture bearer/s what they have learned about their designated stage of the life cycle.
12. Ask students to join their partner and get out their worksheets, clipboards and pencils. Ask one student to read question 4 aloud. Ask students to answer question 4 based on the discussion with the Elder or culture bearer. Allow 10-15 minutes for students to discuss and write an answer.
13. Allow students time to share with the class. After a few pairs have shared, give students time to explore the subsistence place with the Elder/s or culture bearer/s before class closes. Give students additional time to say goodbye to the Elder/s or culture bearer/s and thank them for their time.

Connections & Extensions:

- Ask students to interview a parent, grandparent, or other adult in the community about the changes they have seen with salmon and any problems they have observed. Discuss interview strategies with the students:
  - Be friendly, respectful, and polite.
  - Explain the purpose of the interview, about how long the interview will take and how the information will be used.
  - Be a good listener.
- Show a video of salmon embarking on the journey from the ocean to their spawning grounds like the National Geographic video found here: https://www.youtube.com/watch?v=ZR4_LhPCgbo
- Lead a discussion about wild salmon vs. farmed salmon. Explore how the species are different from one another and the carbon footprint left by the fish industry. As a class, read an article about how salmon get from the ocean to the grocery store such as the one linked here: https://www.worldwildlife.org/stories/from-ocean-to-plate

Answer Key:

1. 5,2,1,3,4,6

_____ _____ _____ _____ _____ _____

2. alevin, egg, fry
3. adult, spawner, smolt
4. Answers will vary but may include smoking fish, curing fish eggs, salmon strips, etc. and should provide a description of the practice and its importance.

Activity 2 Student Worksheet: Łuk'a Life Cycle

NAMES _____

_____

1. Order the life stages of **łuk'a** from 1-6:

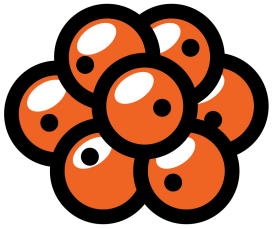
_____ _____ _____ _____ _____ _____

2. Write down two stages from the **łuk'a** life cycle that live in freshwater.

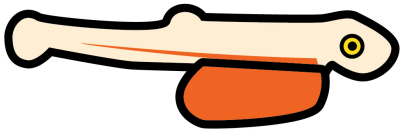
3. Write down two stages from the **łuk'a** life cycle that can live in saltwater.

4. What are subsistence practices in your community that include **łuk'a**? Pick one and write a sentence explaining what the practice is and why it is important.

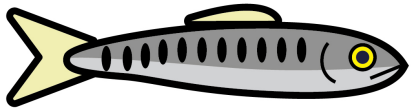
Łuk'a Life Cycle cards:



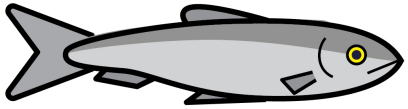
eggs



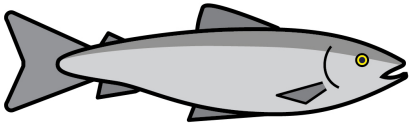
alevin



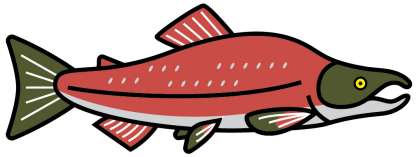
fry



smolt



adult



spawner

You are invited!

We are learning about salmon in class. Please will you come share with us about how salmon are harvested and used?

Where: _____

Date: _____

Time: _____

Activity 3: Łuk'a & Drones

Overview:

In this activity, students learn about the migration journey of **łuk'a** (salmon) from oceans to rivers. Students will propose ways a **yots'enodzida** (drone) can be used to monitor/learn about salmon by analyzing drone photos.

Time: 1 class period (45-60 min)

Materials:

- Drones in Nenana: Łuk'a & Drones video: https://sites.google.com/alaska.edu/drones/home/educational-digital-videos
- Łuk'a & Drones Student Guide
- Student Worksheet: Łuk'a & Drones
- Clipboards
- Paper
- Pencils

Standards Addressed:

Minto Flats Athabascan Values: Responsibility to Tribe, Respect for Nature,

Alaska Native Values for Curriculum: See Connections, Know Who You Are

Alaska Cultural Standards: A.1, B.2, B.4, D.3, E.2, E.4

Science Standards for Alaska: 5-ESS3-1, 3-LS1-1, MS-LS-2-1

Next Generation Science Standards: 5-ESS3-1, 3-LS1-1, MS-LS2-1

21st Century Competencies: 1, 2, 3

International Society for Technology in Education Standards for Students: 4

Objectives:

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

- explain the process of salmon migration between streams/rivers and the ocean;
- distinguish between phases of a salmon's life based on their migration patterns;
- use local Alaska Native language to describe the features and processes of the world around them;
- discuss changes in subsistence at a local level and for Alaska as a whole;
- hypothesize how drones could be used to address needs concerning salmon and river habitat;
- analyze drone data used for understanding changes in fish populations;
- present a solution to a local problem by evaluating how a drone could assist.

Background Information:

Animals migrate for a variety of reasons. Migration is a behavioral adaptation that helps animals and fish survive. Reasons to migrate include a search for food, better conditions, or reproductive needs. Creatures like **łuk'a** (salmon) migrate from stream to ocean and then back to the stream where they were born to spawn and lay their eggs.

Every year, salmon migrate great distances between streams or rivers and the ocean. This is a long and challenging journey for the fish and part of the unique salmon life cycle. During the warmer seasons, adult salmon swim from the ocean to the river or stream in which they were

born to lay eggs. In Nenana, the king salmon arrive in late spring or early summer while chum salmon arrive during the summer and fall.

A **yots'enodzida** (drone) can be used to learn about salmon. A drone can provide a bird's eye view to count salmon in a stream or river. It can be used to spot channels for salmon, and to record video of places on the river that may need to be restored to create healthy spawning habitat. Years after hatching, salmon spawn in the same streams they are born. During the time away, spawning streams can change or be blocked. While large streams provide highways for returning salmon, some of the most important salmon streams are small enough to step across. Thus, even the smallest change can have great impacts on returning fish. A drone can be helpful for tracking where salmon are migrating and how that path is changing.

With a fast-changing climate, landscapes can also change quickly. Landslides or flooding can alter salmon streams in a short amount of time. Flying a drone over a landscape can help spot areas where landslides or erosion has happened. Erosion can also add debris to streams and make waters cloudy which may harm growing salmon. A drone can spot places in streams which may be concerning because of extra sediment and cloudy waters.

Assessment:

Classroom discussion provides a means of assessing student ability to:

- explain the path of migration for salmon from river to ocean and back;
- relate the importance of environmental health to health of the community;
- make effective use of the knowledge, skills and ways of knowing embedded in the local heritage language to learn about the larger world in which they live by using Alaska Native terms to describe the local environment;
- observe and analyze drone data;
- identify ways drones are used to collect information about salmon;
- design/propose a drone mission to monitor local salmon habitat or populations.

Student worksheet provides a means of assessing student ability to:

- identify drones as a modern tool and describe how they can be applied to local inquiries;
- analyze drone data as it applies to salmon population counting;
- design and propose a drone mission to learn about salmon migration, spawning, population, etc.;
- present a reasonable argument for why a drone could help with a community problem.

Activity Preparation:

1. Use the Alaska Native Vocabulary terms that students have learned in the vocabulary section of the student guide as the students are asked questions.

Activity Instructions:

1. Watch Drones in Nenana: Łuk'a & Drones video available here: https://sites.google.com/alaska.edu/drones/home/educational-digital-videos.
2. Introduce the concept of migration. Ask students what creatures migrate. Ask: Do humans migrate? Discuss the migration journey of a salmon. Walk through the salmon life cycle from Activity 2. Salmon are unique in that they can live in both freshwater and saltwater. *Note: After this discussion, consider showing the Drones in Nenana video again for the class to retain the content.
3. As a class, read pages 13, 14, & 15 in Łuk'a & Drones Student Guide.

4. Distribute white paper, pencils and life cycle cards to students. Ask students to draw a line down the middle of the page, creating a table with two columns. Ask students to label the left column "**notu'** (ocean)" and the right column "**Tth'itu'** " (Tanana River)".
5. Ask students to refer to the life cycle cards and write the stages of salmon that live in freshwater in the **Tth'itu'** column and the stages that live in salt water in the **notu'** column.
6. Place students in pairs. Distribute the Student Worksheet: Łuk'a & Drones. Discuss the idea of traditional tools vs. modern tools as mentioned in the Drones in Nenana: Łuk'a & Drones video. Walk through questions 1-3 on the worksheet as a class.
    a. Is a **yots'enodzida** (drone) a traditional or modern tool?
    b. What are some other examples of modern tools? What tools are used for **maahaa hots' edelyaaye** (subsistence)? Which of these tools are traditional? Which are modern? How do both support **maahaa hots' edelyaaye** needs?
7. Discuss ways a drone can monitor salmon. Read pages 16 & 17 in Łuk'a & Drones student guide. Ask students to look at the drone image on page 19. Ask students to discuss with their partner what types of data a drone pilot collected by taking this photo.
8. Give students a few minutes to complete question 4 of their worksheet with their partners. While the students work, make a table with two columns on the board. Ask students to take turns listing the ways a drone was recommended to help salmon. In column one, write the ideas students heard from the video. In column number two, ask students to come up with any other ideas for how a drone can help. Make sure to note drones used for hunting and fishing purposes are illegal.
9. Read question 5 with students. Ask them to work with their partners to circle and count all the salmon shown in the drone photo on their worksheet. The photo is also available in the Łuk'a & Drones student guide on pg. 19. Explain drone pilots conducting research look at photos like this and analyze the image to collect information on the fish.
10. Once students are finished with question 5, collect worksheets and ask students to turn back to pg. 13 of the Łuk'a & Drones student guide. Review the topic of migration. Discuss: What major life events lead salmon to migrate? How do you think salmon migration changes are impacting the community? What ideas do you have for addressing the impacts of salmon migration changes in your community?

Connections & Extensions:

- In addition to the migration discussion, watch this animation from NOAA which details the lifecycle of a salmon from birth in the spawning stream to the ocean and back: https://www.youtube.com/watch?v=2xG6waimZnI
- Discuss how salmon migration and spawning is changing due to climate change. How are salmon populations changing and how does this affect communities like Nenana that depend on the salmon to return? This discussion may need an introduction to the concept of climate change and how it is affecting Alaska, its wildlife and environment.
- Use the NOAA video linked above to lead a further discussion about the specific journey salmon make to Nenana. As a class, use the following link to identify the path a salmon may take to Nenana: https://www.weather.gov/aprfc/AK_RiverSearch. ex. Salmon swim along the Yukon River to the Tanana River and finally to the Nenana River before swimming up offshoot spawning steams to where they were born. Ask students to estimate the salmon swim.

Answer Key:

1. Answers will vary but might include computer, lightbulb, cell phone etc.
2. Modern
3. Answers will vary but might include knife, drying rack, fishing net, etc.
4. Answers will vary but may include counting fish populations, studying erosion, looking at salmon spawning grounds, timing when the fish travel up the river, etc.
5. Answers will vary. Students should notice approximately 60 fish in the photo. A much high number means the student likely counted shadows as fish.

Activity 3 Student Worksheet: Łuk'a & Drones

NAMES _____

_____

1. Give an example of a modern tool.

2. Is a **yots'enodzida** (drone) a modern or a traditional tool?

3. Give an example of a traditional tool.

4. Write down one method of studying **łuk'a** that you learned from the **Łuk'a & Drones** video.

5. Look at the **yots'enodzida** image below:
   a. Circle all the **łuk'a** you can find.
   b. How many fish did you circle?
   c. Why do you think this image was taken? Share your idea with a partner.