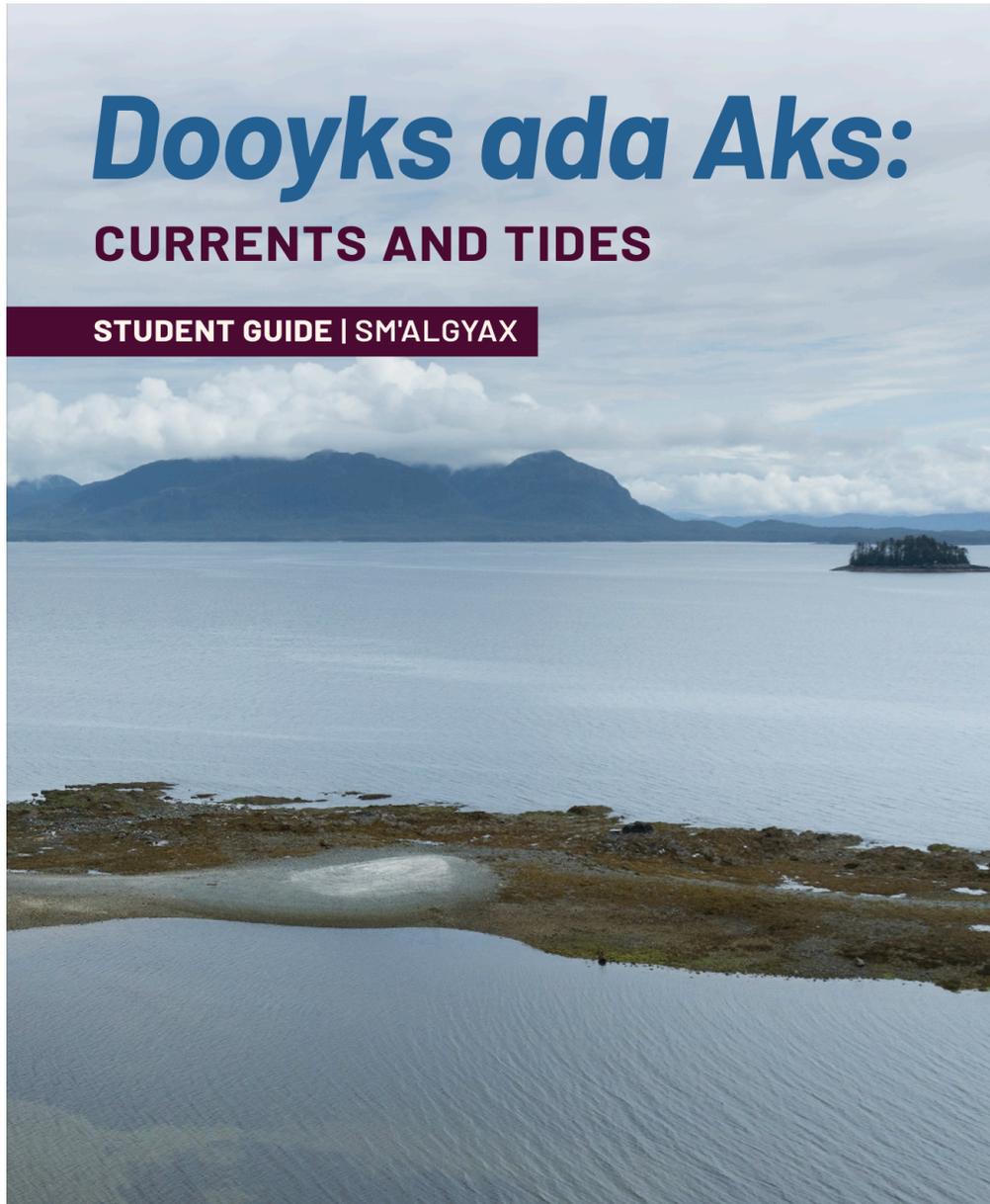


Dooyks ada Aks: Currents and Tides

Teacher's Manual



<https://sites.google.com/alaska.edu/ccas>

T'oyaxsut 'nüüsm (Thank you):

Special thanks to the Metlakatla Indian Community, the Ts'msyen people and to the team of Ts'msyen Knowledge Bearers Matthew Bergtold, Gyibaawm Laxha (David R. Boxley), Mary Haldane-Kennedy, Mangyepsa Gyipaayg (Kandi McGilton), and Elder Debbie Schoolcraft guided development of these resources. High School Science Teacher Brian Leask and Indigenous Language Teacher Ggoadm 'Teebn (Victoria McKoy) pilot tested and advised revision of these materials. And to all of the Metlakatla Community Members, Elders, Educators, Scientists, Translators, and others who contributed interviews, data, language expertise and more to this project.

Credits:

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Authors: Doreen Hayward, Lori Schoening, Metlakatla CCAS Team: Matthew Bergtold, Gyibaawm Laxha (David R. Boxley), Mary Haldane-Kennedy, Mangyepsa Gyipaayg (Kandi McGilton), and Elder Debbie Schoolcraft

Sm'algyax Translators: Gyibaawm Laxha (David R. Boxley) and Mangyepsa Gyipaayg (Kandi McGilton)

Design, Graphics and Layout: Katherine Bendall

Graphics: n/a

Science Editor: Josianne Haag

English Language Editor: Doreen Hayward

Sm'algyax Language Editors: Mangyepsa Gyipaayg (Kandi McGilton) and Gyibaawm Laxha (David R. Boxley)

Researcher: Sean Asikluk Topkok

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CCAS: Cultural Connections to Alaska Science - Dooyks ada Aks: Currents and Tides

Dear High School Teacher,

T'oyaxsut 'nüün (Thank you) for using the Cultural Connections to Alaska Science: Dooyks ada Aks (Currents and Tides) resources in your classroom! Metlakatla community members guiding the development of the materials in this Teacher's Manual identified topics related to dooyks ada aks they felt were important for youth to understand. The topics include, but are not limited to:

- * *Safety and Hazards In and Around the Water* * *Appropriate Fish Net Size* *
- * *Sm'algyax Language* * *Harvesting Resources* *
- * *Traditional Use of Resources* *

The topics are woven into the videos, hands-on exploration, research, discussions and readings associated with the activities in this Teacher's Manual. Resources are designed to address *Metlakatla Ts'msyen Values/Lepquinum Values*, Cultural Standards for Alaska Students, Science Standards for Alaska and Next Generation Science Standards. You can teach all lessons, or pick and choose which activities fit your classroom needs. The activities focus on dooyks ada aks (current and tides) and include Ts'msyen cultural and physical science perspectives as well as Sm'algyax language. Activity-based assessments are provided for your convenience. We encourage you to work collaboratively with the Sm'algyax bilingual educator in your school to teach these lessons.

Established Goals:

- Students read, speak and write Sm'algyax language terms related to dooyks ada aks (currents and tides).
- Students research and share findings related to masgm aks (red tide)
- Students discover the specific lax süülda (ocean) amawaal (resources) harvested near Metlakatla and how this can be accomplished safely.
- Students calculate dimensions of a aadm hoon (fishnet) for local application.
- Students hear maalsk (modern personal stories) from Elders/Culture Bearers related to dooyks ada aks (currents and tides)

Targeted Frameworks, Values and Standards:

Ts'msyen Ayaawx

- Łoomsk (Respect)
- Łoodis lip 'nüün (Respect Yourself)
- Łooda sila gyedn (Respect Others)

- Łooda txanii goo (Respect All Things)
- Gyilks ama niisgn (Take Care of Yourself)
- Ada łgwisgüün (And Be Happy)

Science Standards for Alaska

HS-ESS1-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

[Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust decreasing with distance away from a central ancient core of the continental plate (a result of past plate interactions).]

HS-ESS2-4. Students who demonstrate understanding can: Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate. [Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.]

HS-ESS2-5. Students who demonstrate understanding can: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

HS-ESS2-6. Students who demonstrate understanding can: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals, wildlife, fish, trees, and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting, and soil erosion), and severe weather (such as hurricanes, floods, storm surge, lightning strike fires, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, changes in stream or ocean water temperatures and/or chemistry, and the types of food that can be raised, hunted, fished, harvested, or gathered.]

HS-ESS3-4. Students who demonstrate understanding can: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* Clarification Statement: Examples of data on the impacts of human activities could include the quantities

and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).

HS-LS2-6 Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on environment and biodiversity.

HS-LS2-6. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

Alaska Math Standards

N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Cultural Standards for Alaska Students

- 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:
 - 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;
 - 6) live a life in accordance with the cultural values and traditions of the local community and integrate them into their everyday behavior.
- 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.
- C.** Culturally-knowledgeable students are able to actively participate in various cultural environments. Students who meet this cultural standard are able to:
 - 1) perform subsistence activities in ways that are appropriate to local cultural traditions.
- 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;
- 4) gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance;
- 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:

- 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

HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

HS-ESS2-6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on environment and biodiversity.

HS-LS2-6 Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

Activity 1: Dooyks ada Aks Vocabulary

Overview/Summary: Students will learn to pronounce Sm’algyax language terms and phrases related to **dooyks ada aks** (currents and tides).

Time: 30-45 minutes or 1 class period

Materials:

- Sm’algyax terms can be found in the student guide and online with the accompanying pronunciation guide at: <https://sites.google.com/alaska.edu/ccas/district/annette-island>

Standards Addressed:

Ts’msyen Ayaawx: Loomsk (Respect)
Alaska Cultural Standards: A.5

Lesson Objectives:

On successful completion of this lesson students will:

- be able to learn words and phrases in Sm’algyax related to **dooyks ada aks** (currents and tides) by listening to the online pronunciation guide, practicing the Sm’algyax vocabulary out loud and viewing the written vocabulary in the student guide.

Background Information:

Regarding the importance of Indigenous language: “We have a responsibility to break the chain of trauma and shame,” said David R. Boxley, one of the three co-founders of the Haayk Foundation, an organization founded to promote the Sm’algyax language. “The kids will have an opportunity to view the world in a different way. If the language dies, then we will just be a community of people who aren’t white,” Boxley continued. “We will just be a community of Indians but without the things that make us that.” (Retrieved on 7/8/2024 from LanguageMagazine.com; The True Tongue of the Tsimshian Tribe, May 12, 2016)

The following 12:18 minute video on the importance of Alaska Native Languages developed for the Alaska Native Language Center helps in understanding what grounds a culture. Not mandatory for guiding this vocabulary lesson, however very impactful. If time permits, this video can also be viewed with the students.

<https://vimeo.com/758905941>

Assessment:

Using both the student guide and online pronunciation guide allows a means of assessing the student’s ability to:

- hear, read, and speak Sm’algyax terms and phrases;
- use Sm’algyax language to help them understand dooyks ada aks (currents and tides);
- identify traditional resources harvested from the ocean

- make effective use of the knowledge, skills and ways of knowing embedded in the Sm'alyax language to learn about the larger world in which they live by associating Sm'alyax terms with their English counterparts

Activity Preparation:

1. Pronunciation and spelling of Sm'alyax terms can vary depending on the dialect spoken within a community. Ask your local Sm'alyax language teacher to review the online vocabulary to ensure the accuracy for your community. If possible, collaborate with the Sm'alyax language teacher in your school to teach this activity.
2. Invite the Indigenous Language Educator within your school to assist with this activity.

Activity Instructions:

1. Ask students to navigate to the online Sm'alyax Vocabulary Pronunciation Guide at <https://sites.google.com/alaska.edu/ccas/district/annette-island> to learn how to pronounce Sm'alyax words related to **dooyks ada aks** (currents and tides).
2. As a class, click and play each word/term so students can see and hear how the Sm'alyax word, along with the English counterpart, is pronounced. Repeat a couple of times.
3. Ask students if they have heard the vocabulary words being used by Elders or members of the community.
4. As a class, practice pronouncing the Sm'alyax vocabulary words.
5. Inform students the vocabulary words will be used throughout the balance of the Dooyks ada Aks student guide.

Connections and Extensions:

- Create a focus wall in your classroom by printing the vocabulary terms and posting them on the wall, along with ocean images and key concepts involving dooyks ada aks.
- Develop a set of **dooyks ada aks** vocabulary cards (using available paper) with the Sm'alyax word on one side and the English word on the other side. Have students work in pairs or small groups to practice the words. After a few times of practicing the words (or a set time limit), have the groups come back together as a class. Hold up one vocabulary card and see how quickly students can come up with the Sm'alyax word pronunciation as the English form of the word is displayed. Continue through the rest of the vocabulary cards. Reverse. See how fast students can come up with the English word pronunciation as the Sm'alyax form of the word is displayed. If time allows, have students draw a picture of the word on the side of the card displaying the Sm'alyax word.
- Relay Race: Divide students into two equal groups. Equally divide the previously made vocabulary cards (with a Sm'alyax word on one side and English translation on the other side) into two separate stacks and put them on a table near the front of the class. On your mark, get set, go! Have one student from each group race to the table from a designated starting spot and retrieve the top vocabulary card to show the Sm'alyax word to the rest of their team. Once one of their teammates shouts out the correct English word the next student on the team races to the front to grab another card from their stack while the first person returns to the team to help guess the rest of the words. Whichever team finishes their stack first wins!

- Have students work in pairs or small groups to illustrate/draw the Sm'alyax word on one side of the card and then print the Sm'alyax word on the other side. Again, hold up one vocabulary card and see how quickly students can come up with the Sm'alyax word pronunciation for the illustration/drawing being shown.
- Hot Potato: Supplies needed: vocabulary cards, a soft ball and a timer (or use the 15-second Mission Impossible timer <https://www.youtube.com/shorts/J5PBubaHu0U>) Have students sit or stand in a circle. Start a 15-second timer and have students toss the ball randomly to each other. When the timer goes off, the student who is holding the ball says the Sm'alyax word on the vocabulary card the teacher holds up.

Answer Key:

Sm'alyax Vocabulary Pronunciation Guide:

<https://sites.google.com/alaska.edu/ccas/district/annette-island>

Activity 2: Researching the Masgm Aks (Red Tide)

Overview/Summary: Students will interview culture bearers, local fishers and conduct Internet research to learn about the processes and climate changes that lead to **masgm aks** (red tide), as well as the impacts. Students also determine what caution should be taken in regards to activities and harvesting in and around the **lax süülda** (ocean) when **masgm aks** occurs. Students will use what they learn to develop a report or online brochure/poster.

Time: 2-4 class periods

Materials:

- Sm'algax terms can be found in the student guide and online with the accompanying pronunciation guide at: <https://sites.google.com/alaska.edu/ccas/district/annette-island>
- Student Note Sheet and device to capture stories and quotes from Elders/fishers
- Computer with Word or Google Docs for report or online poster/brochure creation

Standards Addressed:

Ts'msyen Ayaawx: Looda sila gyedn (Respect Others), and Gyilks ama niisgn (Take Care of Yourself)

Alaska Cultural Standards: D.1, D.3, D.4, D.5, E.2

Science Standards for Alaska: HS-ESS2-4, HS-ESS2-5

Next Generation Science Standards: HS-ESS2-4, HS-ESS2-5

Lesson Objectives:

Upon successful completion of this lesson students will:

- use visual models of the greenhouse effect and **lax süülda** (ocean) circulation to explain how human activity impacts **lax süülda** temperature.
- connect changes in **lax süülda** temperature to changing algae blooms
- identify local impacts of the **masgm aks** (red tide) based on research from multiple sources and local interviews
- interact respectfully with local Elders or fishers during interviews
- develop a report, brochure or poster to share their understandings regarding the causes and impacts of the **masgm aks**; and
- propose solutions to keep themselves and others safe from the impacts of the **masgm aks**.

Background Information:

The Department of Environmental Conservation defines **masgm aks** (red tide):

The term 'red tide' is often used to describe toxic blooms; however, red is only one of many colors algae blooms may produce. The color of a bloom is not an indicator if Paralytic Shellfish Toxin (PST) is present, which may or not be present. PST can be present even if the water looks clear. Shellfish feed by filtering food particles, including algae, from ingested water. When they filter and eat biotoxin-producing algae, the PST accumulates in their tissue. (Department of Environmental Conservation)

Shellfish such as cockles, clams, and abalone are traditionally harvested around Annette Island and are part of the local diet. When shellfish cannot be harvested due to **masgm aks**, it impacts both a healthy diet and the local economy.

Several factors contribute to the increasing frequency and size of red tide events. Climate change plays a crucial role, with warmer ocean temperatures creating a more favorable environment for algal blooms. Additionally, nutrient pollution from wastewater discharge and [other factors] provides the necessary food for algae to thrive. As human activities continue to increase nutrient levels in coastal waters, red tides become more frequent and intense. (Department of Environmental Conservation)

Algae Blooms:

Biotoxin-producing algae are common in marine water. The toxin produced is normally very low. However, in certain water conditions (not completely understood yet), the algae “blooms” and produces high concentrations of Paralytic Shellfish Toxin (PST).

“Climate change pressures will influence marine planktonic systems globally, and it is conceivable that harmful algal blooms may increase in frequency and severity. These pressures will be manifest as alterations in temperature, stratification, light, ocean acidification...” (Science Direct)

Additional resource regarding Cyanobacteria Harmful Algal Blooms:

<https://pubs.usgs.gov/of/2015/1164/ofr20151164.pdf>

Assessment:

Class discussions regarding **masgm aks** and knowledge gained from Elder/**aadit** (fisher) interviews provides an opportunity for assessing student understanding of:

- models that illustrate energy transfer relating to climate change

Student brochures, reports, or posters provide an opportunity for assessing student understanding of:

- local impact of the **masgm aks**
- propose solutions for ensuring the safety of themselves and others with regard to the **masgm aks**

Activity Preparation:

1. Watch the following YouTube video at <https://www.youtube.com/watch?v=eZZSzq3WvSs> to learn how climate change affects the oceans and how increasing ocean temperatures affect marine life and ecosystems. Additionally, browse the <https://ahab.aos.org> website and learn how the Alaska Harmful Algal Bloom Network (AHAB) was formed in 2017 to provide a statewide approach to HAB awareness, research, monitoring, and response in Alaska. Search out other reputable websites on **masgm aks**.
2. Think of possible community members knowledgeable about **masgm aks** if students have difficulty identifying interviewees.

Activity Instructions:

1. Ask students if they have seen **masgm aks** in the local area.
2. Ask students to work with a partner to read pages 4-7 of the Student Guide and discuss the questions in the text. As a class have students share what they have heard or know about **masgm aks**.
 - a. What causes the **masgm aks**?
 - b. How is it connected to climate change?
 - c. How does it impact our community?
3. Show students the ~5-minute YouTube video at <https://www.youtube.com/watch?v=eZZSzq3WvSs> and discuss how energy transfer via the greenhouse effect is impacting ocean temperature.
4. Have students navigate to the following reputable website <https://ahab.aooos.org>. The acronym HAB is used on the website. Ask students what the acronym stands for. (**Answer: Harmful Algal Bloom**)
5. Allow time (~10-15 minutes) for students to explore the different aspects (tabs) of the website.
6. Distribute Student Note Sheet: As homework, or via telephone during class time, ask students to speak with a local Elder or **aadit** to learn:
When have **masgm aks** locally occurred?
Are **masgm aks** becoming more common? Why?
What should or should not be harvested during this time?
What are the signs or symptoms of shellfish poisoning?
If a person exhibits signs or symptoms of shellfish poisoning, what should I do?
Are there steps that can be taken to mitigate **masgm aks**?
Other appropriate question(s) students would like to ask related to **masgm aks**.
7. Have students write down the date when the Alaska Harmful Algal Bloom Network and other reputable websites* were accessed for their information. Write down the date they speak with an Elder or **aadit**. The information of date and Elder/**aadit** name will need to be cited in the report or online brochure.
(*Reputable websites are trustworthy sources and often end in .edu, .org, or .gov as well as from research or journal databases such as Science Direct, JSTOR, etc.)
8. Distribute and explain the Student Note Sheet. Ask students to work in pairs to complete the two-part assignment. Part I: Interview Elders/fishers and research reputable websites or journals Part II: Write a report, create an online brochure or poster on what they learned about HAB/**masgm aks** from Elder/**aadit** interviews and website/journal research.
9. Allow students time (~10 minutes for each pair) to present findings to the class. (**Adaptation:** If students seem too timid or if this is their first time providing a presentation, ask students if they prefer to present from their desks.)
10. As a class, discuss what students collectively learned from local Elders/fishers.

Connections and Extensions:

- Have upper high school students interview an employee at the local Department of Fish & Wildlife to gain a better understanding of what, if any, data is collected during a **masgm aks** and how aquatic organisms are affected.

Answer Key:

Answers will vary, but student report or online poster/brochure should include insight and knowledge including direct quotes from Elders or local fishers and information from reputable websites/journals regarding **masgm aks**. The source or cited material should be listed including the date of interview or date when material was accessed along with the URL.

Activity 2: Researching the Masgm Aks (Red Tide)
STUDENT NOTE SHEET

Student Names: _____

For this *two-part* activity, you and a partner will research the cause and risks of harmful algal blooms (HAB).

Part I: 1) Interview at least two Elders and/or fishers in your community who are familiar with **masgm aks**. Interviews can be completed in-person or via telephone. Remember to introduce yourself to the Elder or **aadit** fisher and ask for permission to use the shared information in a school project. Take detailed notes. If you have a smart device, ask the Elder/**aadit** if you can record their responses. Recording the interview will allow you to extract exact quotes for use in Part II of the project. Use the blank lines below to write down notes and quotes from Elders/fishers you speak with. At the conclusion of your conversation, remember to thank the Elder/**aadit** for sharing their knowledge with you. Please use additional paper for additional interviews or supplementary notes, if needed. 2) Research reputable websites or journals for additional information about **masgm aks**. Take note of the website name, the URL identifier, and the date you accessed the information.

Part II: Use the information received from interviews and websites/journals to create an online report, poster, or brochure. The report/poster/brochure should include the following:

1. Title of report, poster or brochure with researchers names (student names) listed.
2. Information collected from personal interviews with Elders/fishers and trustworthy websites/journals. Inserting a few direct quotes into your report/poster or brochure is empowering and adds credibility to your research.
3. Cite sources used either at the bottom of the poster/brochure or as the last page of your report.
4. Work with your partner to practice a short (~10 minute) presentation to be delivered to the rest of the class at a time determined by the teacher.

Interview #1

Name of Elder or **aadit**: _____ Date of Interview: _____

Questions to politely ask:

When have **masgm aks** locally occurred? _____

Are **masgm aks** becoming more common? Why? _____

What should or should not be harvested during this time? _____

What are the signs or symptoms of shellfish poisoning? _____

If a person exhibits signs or symptoms of shellfish poisoning what should I do? _____

Are there steps that can be taken to mitigate **masgm aks**? _____

Other question(s) you would like to ask regarding **masgm aks**?

Other NOTES:

Interview #2

Name of Elder or **aadit**: _____ Date of Interview: _____

Questions to politely ask:

When have **masgm aks** locally occurred? _____

Are **masgm aks** becoming more common? Why? _____

What should or should not be harvested during this time? _____

What are the signs or symptoms of shellfish poisoning? _____

If a person exhibits signs or symptoms of shellfish poisoning what should I do? _____

Are there steps that can be taken to mitigate **masgm aks**? _____

Other question(s) you would like to ask regarding **masgm aks**?

Other NOTES:

Resource #1

Name of Website or Journal: _____

URL or Website _____ Date Accessed:

Notes/Quotes: _____

Resource #2

Name of Website or Journal: _____

URL or Website _____

Date Accessed: _____

Activity 3: Aadm Hoon (Fishnet) Math

Overview/Summary: Students mathematically figure out the appropriate size **aadm hoon** (fishnet) (meshes and fathoms) needed to catch various species of **hoon** (fish) caught off Annette Island.

Time: 45 minutes or 1 class period

Materials:

- Ten **hoon** (salmon) of one species (fresh, frozen or sample measurements listed below.)
Sample Measurements: 8.25", 8.5", 8.0", 8.5", 8.5", 8.75", 9.0", 9.0", 8.25" and 8.50"
- Flexible measuring tape (also known as tailor's tape) or string and ruler. Note: please do not use an elastic tape measure as these can stretch with each use and will not provide accurate measurements.
- Calculator (optional)
- Disposable tablecloth or plastic sheathing
- Student Worksheet: **Aadm Hoon** (Fishnet) Math

Standards Addressed:

Ts'msyen Ayaawx: Łooda txanii goo (Respect All Things)

Alaska Cultural Standards: B.2, C.1

Science Standards for Alaska: HS-ESS3-4, HS-ETS1-1, HS-LS2-7

Next Generation Science Standards: HS-ESS3-4, HS-ETS1-1, HS-LS2-7

Alaska Math Standards: N-Q.1

Lesson Objectives:

On successful completion of this lesson students will:

- Measure and calculate the average circumference (at the gills) of locally harvested **hoon** species in inches.
- Analyze quantitative data related to various sizes of local **hoon**.
- Determine proper **aat** (net) size for respectful and sustainable **hoon** harvest to meet the needs of the local community.
- Apply appropriate units of measurement in calculating and communicating mesh size, length and depth of **aadm hoon**.

- **Background Information:**

Metlakatla is a fishing community. From a very young age, many youth in the community assist their family in harvesting a variety of **hoon** (fish) from the **lax süülda** (ocean).

Youth may also assist in making and mending an **aadm hoon** (fishnet). Fishers in the community want to catch enough **hoon** to feed their families and friends, but also to earn money from selling **hoon** to processors. In 2015, the Council adopted the following goals for management of the Reserve's **hoon** and wildlife **amawaal** (resources):

- Maximize the economic benefit of **hoon** and wildlife **amawaal** to the Metlakatla Indian Community (MIC)
- Ensure the sustainability of **hoon** and wildlife **amawaal**; and,

- Minimize adverse environmental consequences and adverse impacts to **hoon** and wildlife **amawaal**.

Chart below shows average harvest by gear and species. (2012-2021)

| Gear Type | King | Sockeye | Coho | Pink | Chum | Totals |
|-------------|-------|---------|--------|-----------|---------|-----------|
| Gillnet | 978 | 5,712 | 26,491 | 239,730 | 167,248 | 440,159 |
| Purse Seine | 378 | 10,868 | 6,270 | 1,059,918 | 64,706 | 1,142,139 |
| Troll | 256 | 1 | 389 | 339 | 28 | 1,012 |
| Total | 1,612 | 16,581 | 33,150 | 1,299,987 | 231,981 | 1,583,310 |

Annette Islands Reserve Management Plan 2022 Salmon Fishery Report by Dept. of Fish and Wildlife

Make sure students are familiar with Alaska Fish & Game Regulations for the local area. Note: This lesson was adapted from the Fishing Nets lesson in Alan Dick’s “Village Math” guide with permission from the Alaska Native Knowledge Network.

Assessment:

Students’ responses during class discussion will be used to evaluate their understanding of the significance of:

- healthy **hoon** (fish) populations;
- subsistence activities that are both important and appropriate to local cultural traditions; and
- the different parts of a **aat** (net) and *why* those ratios are important.

Students’ responses to questions in the lesson are used to determine their ability to:

- accurately apply units of measure to make an environment-friendly **aadm hoon** (fishnet);
- show respect to all things by using the appropriate **aat**.

Activity Preparation:

1. If you choose to measure real **hoon** in the class for this lesson, students will need to be reminded the day before to bring in **hoon** from home.
2. Make enough copies of the Student Worksheet: **Aadm Hoon** (Fishnet) Math for all students.

Activity Instructions:

1. Discuss with students how one of the major global challenges is the preservation of healthy **hoon** populations. Ensuring **hoon** stock stays hearty is important so the **hoon** population can thrive in a sustainable way and be able to feed people who depend on **hoon** for both diet and livelihood. Making sure the **aat** (net) being used to catch **hoon** is of appropriate mesh size and length can play a role in sustainability.

2. As a class read the information on **Goo mdm Wila uum Hoon** (How to Catch Fish) in the Student Guide. *(Have one or two students read the information aloud to the rest of the class. This will also help students to learn key vocabulary.)*
3. Discuss the following questions with the entire class:
 - Why is fishing important to your community?
 - Who are the experienced **aadit** (fisherman/woman) you know?
 - Why is it important to sustainably harvest **hoon** (fish) in your community and elsewhere?
 - If you are fishing with a **aat**, what aspects of the net do you need to think about to ensure a sustainable harvest? (for example, mesh size, net length, net depth etc)
 - How can selecting the proper size of mesh help to sustainably harvest **hoon**?
4. Pass out the Student Worksheet: **Aadm Hoon** (Fishnet) Math.
5. Explain to students that they will work with a partner (or small group) and will be fishers for the day. They will need to figure out what size **aadm hoon** (fishnet) will be needed to catch **hoon** (fish).
6. Go through “**Parts of a Aat** (Net)” with the students. Ask students to share how each part of a **aat** helps to ensure sustainable catch of the appropriate species.
7. Either have fresh/frozen **hoon** available or use the following sample **hoon** measurements: 8.25”, 8.5”, 8.0”, 8.5”, 8.5”, 8.75”, 9.0”, 9.0”, 8.25” and 8.50”.
8. Guide students through Activity 3 worksheet.

Connections and Extensions:

- Have students reflect on how different sizes of fishnets could either help sustain marine populations or contribute to overfishing. (local application and global application.)
- Bring in a real **aat** (or part of a **aat**) and have students visualize how each different **aat** works at targeting different types of **hoon**. If possible, invite a local **aadit** to join in the class discussion to share their experience with an **aadm hoon**, what type of **hoon** they normally catch, and what they do if the **aat** gets damaged.

Answer Key:

How big should the mesh be? Measure around the gills of at least ten **hoon** of a single species used in the community, whether **üüg** (silver salmon), **misoo** (red salmon), **gayniis** (chum salmon), etc. The best way to do this is to wrap a string around the **hoon** at the gills, then measure the string.

MESH SIZE:

Answers 1-10 will vary based on actual **hoon** measurements. Once you have the measurements of at least ten **hoon**, average them. If it is 10 ½” around the **hoon**, one stretched mesh will be 5 ¼”.

11. If the measurement around a **Yee** (King salmon) is 17” one stretched mesh will be 8 ½”. If you can’t measure around ten **hoon**, use the following sample **hoon** measurements: 8.25”, 8.5”, 8.0”, 8.5”, 8.75”, 9.0”, 9.0”, 8.25”, and 8.5”

$$\text{total} = \frac{8525}{10} = 8.525 \text{ average}$$

12. Average them, then divide by two to get the length of one stretched mesh. What is the length?

$$\frac{8.525''}{2} = 4.25'' = 4 \frac{1}{4}'' \text{ stretched mesh}$$

13. A **aadm hoon** (fishnet) 28 meshes deep is 8’. Compute the depth of an **aat** 36 meshes deep.

Set up the ratio $\frac{\text{meshes}}{\text{depth}} = \frac{\text{meshes}}{\text{depth}}$

$$\frac{8'}{28 \text{ meshes}} = \frac{x}{36 \text{ meshes}}$$

$$28x = 288$$
$$=x = 10.28' \text{ deep}$$

14. If a **Yee aat** 20 meshes deep is 110” deep, how deep is a **aat** 32 meshes deep?

$$\frac{20 \text{ mesh}}{110'' \text{ deep}} = \frac{32 \text{ meshes}}{x \text{ deep}}$$

$$20x = 3520$$
$$x = 176'' \text{ deep}$$

AAT (NET) LENGTH:

One fathom equals 6’.

15. How long is a 150 fm **aat** in feet?

$$150 \text{ fm} \cdot \frac{6'}{1 \text{ fm}} = 900'$$

16. How long is a 350 fm **aat** in feet?

$$350 \text{ fm} \cdot \frac{6'}{1 \text{ fm}} = 2100'$$

17. How long is a 20 fm **aat** in feet?

$$20 \text{ fm} \cdot \frac{6'}{1 \text{ fm}} = 120'$$

18. How many fms is a 150' **aat**?

$$150' \cdot \frac{1 \text{ fm}}{6'} = 25 \text{ fm}$$

19. How many fms is a 250' **aat**?

$$250' \cdot \frac{1 \text{ fm}}{6'} = 41.66 \text{ fm}$$

20. How many fms is a 100' **aat**?

$$100' \cdot \frac{1 \text{ fm}}{6'} = 16.66 \text{ fm}$$

To measure the length of stretched mesh needed to hang a **aat**, hangers figure double the length of the **aat**.

How many fms or feet of stretched mesh will the following **aat** require?

21. 240 fm?

$$240 \text{ fm} \cdot 2 = 480 \text{ fm stretched mesh}$$

22. 325 fm?

$$325 \text{ fm} \cdot 2 = 650 \text{ fm stretched mesh}$$

23. 65'?

$$65' \cdot 2 = 130'$$

24. 200'?

$$200' \cdot 2 = 400'$$

Student Names: _____

MESH SIZE:

Work with a partner to measure around the gills of at least ten **hoon** (fish) of a single species your family or community uses, whether **üüg** (silver salmon), **misoo** (red salmon), **gayniis** (chum salmon), etc. The best way to do this is to wrap a string around the **hoon** at the gills, then measure the string.

Write down your ten **hoon** measurements below:

- | | |
|----------|-----------|
| 1. _____ | 6. _____ |
| 2. _____ | 7. _____ |
| 3. _____ | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

Once you have the measurements of at least ten **hoon**, average them.

11. What is the average? _____

If it is 10 ½” around the **hoon**, one stretched mesh will be 5 ¼”. If the measurement around a **Yee** (King salmon) is 17”, one stretched mesh will be 8 ½”.

If you can’t measure around ten **hoon**, use the following hoon measurements: 8.25”, 8.5”, 8.0”, 8.5”, 8.75”, 9.0”, 9.0”, 8.25”, and 8.5”.

Average them, then divide by two to get the length of one stretched mesh. What is the length?

12. Answer: _____

Aat makers and **aat** hangers talk about nets in terms of stretched mesh. One mesh stretched tight makes a stretched mesh.

5 ¼” stretched mesh is common mesh for **misoo**, **gayniis** and **üüg**.

8 ½” stretched mesh is common for **Yee**.

All of these differ with each location and type of **hoon**. what size **aat** are generally used in your area for **Yee**, **misoo**, and **üüg**? You might want to do different measurements for male and female of each type of **hoon** too. Female **gayniis**, **misoo**, and **üüg** are typically smaller than the males. For centuries people have measured around the gills of **hoon** and made **aadm hoon** (fishnets) accordingly.

You will also have to decide how deep the **aat** will be. A **aat** too deep tangles on the bottom of the river, lake or **lax süülda** (ocean). A **aat** that is not deep enough allows **hoon** to escape underneath. **Aat** depth is measured in meshes, whether 25 meshes deep, 28, 35, etc. As the **aat**,

when it is hung, doesn't hang with the meshes perfectly square, it's impossible to determine the length by calculating. You just have to measure a **aat**.

If a **hoon aat** measuring 28 meshes deep is 8', what would be the depth of a **aat** 36 meshes deep?

13. Answer: _____

If a **Yee aat** 20 meshes deep is 110'' deep, how deep is a **aat** 32 meshes deep?

14. Answer: _____

AAT (NET) LENGTH:

A **aat** is measured in fathoms (fms). A fathom is supposedly the length of a man's outstretched arms. One fathom (fm) equals 6'.

15. How long is a 150 fm **aat** in feet? Answer: _____

16. How long is a 350 fm **aat** in feet ? Answer: _____

17. How long is a 20 fm **aat** in feet? Answer: _____

18. How many fms is a 150' **aat**? Answer: _____

19. How many fms is a 250' **aat**? Answer: _____

20. How many fms is a 100' **aat**? Answer: _____

To measure the length of a mesh needed to hang a **aat**, hangers figure double the length of the **aat**. That is, a 200' **aat** will use 400' of stretched mesh; a 150 fm **aat** will hang 300 fm of mesh.

How many fms or feet of stretched mesh will the following **att** require?

21. 240 fm? Answer: _____

22. 325 fm? Answer: _____

23. 65'? Answer: _____

24. 200'? Answer: _____

Now that we have an efficient **aat**, let's go catch some **hoon**!

Activity 4: Lu’waa Luwaalm ts’m aks (Discovering Resources)

Overview/Summary: Students work with a partner or small group to speak with Elders and/or Culture bearers to learn *how* and *when* local **lax süülda** (ocean) resources are safely harvested. Students will choose one or two **lax süülda amawaal** (resources) to research and learn if any changes such as availability or sea level rise are happening to **luwaalm ts’m aks** (sea life). Research findings, cultural knowledge including quotes from community members, and images (photos taken by students or borrowed with permission of community members) are gathered. Students create and share a slide presentation.

Time: 120 minutes (1-2 class periods and additional outside class/homework time)

Materials:

- Student Information Sheet
- Notepad or electronic device to capture stories and quotes from Elders/Culture bearers
- Computer with PowerPoint or Google Slides software
- **Dooyks ada Aks** (Currents and Tides) video available here: <https://sites.google.com/alaska.edu/ccas/district/annette-island>

Standards Addressed:

Ts’msyen Ayaawx: Looda txanii goo (Respect All Things)

Alaska Cultural Standards: A.6, B.2, C.1, D.1, D.3, D.4

Science Standards for Alaska: HS-LS2-6, HS-ESS3-1

Next Generation Science Standards: HS-LS2-6, HS-ESS3-1

Lesson Objectives:

On successful completion of this lesson students will:

- acquire knowledge and understand local traditions from Elders/Culture bearers about harvesting **luwaalm ts’m aks** (sea life) for both local and global application.
- learn how to respectfully and safely engage in subsistence **lax süülda** (ocean) activities according to local customs.
- respectfully interact and have meaningful conversations with Elders/Culture Bearers to acquire in-depth cultural knowledge regarding **amawaal** (resources); and
- gather oral and historical information to create an engaging and informative slide presentation.

Background Information:

“Our shared heritage, collective future and a sense of responsibility for each other and our planet guide our way. With this comes the understanding that we *must* rely upon each other — all we achieve is made possible by working together.” (Sealaska.com)

“As one of the primary sources of traditional cultural knowledge, Native Elders bear the responsibility to share and pass on that knowledge in ways that are compatible with traditional teachings and practices.” (ANKN)

Learning in-depth traditional knowledge from meaningful engagement with Elders and local Culture bearers is important for many reasons. *First*, learning and applying traditional knowledge from these longtime educators of the community can help students integrate practices into everyday behavior and learn if any changes to **luwaalm ts'm aks** are occurring. *Second*, students learn how to perform subsistence activities in an appropriate manner and according to local cultural traditions. *Thirdly*, respectfully gathering this wealth of knowledge in oral and written form preserves the knowledge for future generations while showing appreciation for ancestral traditions.

Assessment:

Class discussions, knowledge gained from Elder/Culture bearers, and student slide presentation regarding local **luwaalm ts'm aks** (sea life) and other **amawaal** (resources) provides an opportunity for assessing student understanding of:

- local and global marine ecosystems;
- availability and stability of **luwaalm ts'm aks** around Annette Island;
- cultural knowledge on how to safely **güüdisk** (harvest) and use/preserve **luwaalm ts'm aks**; and
- design solutions for reducing the impacts of human activities on the environment.

Activity Instructions:

1. View the Dooyks ada Aks video with the class. Video is located here: <https://sites.google.com/alaska.edu/ccas/district/annette-island>
2. Have a general discussion about the video with students. Ask if students recognize or know any of the people speaking in the video? Have the students visited any of the places showcased in the video?
3. Discuss the following questions with the entire class:
 - What are the various **luwaalm ts'm aks** (sea life) in the local area? Which **luwaalm ts'm aks** do you like to **güüdisk** (harvest)?
 - Why is safety important while harvesting in the ocean or gathering near the shoreline?
 - Are there any specific **s'yaan** (ocean floor) hazards that boaters or fishers need to know about?
 - Why is a minus **aks** (tide) advantageous, but also dangerous at the same time?
 - What does being a “steward of our land and waters” mean and how can all be involved in being a steward?
4. Hand out the Student Information Sheet and give the students a few minutes to read over the information. Ask students if they have any questions regarding the assignment.
5. Have students choose an assignment partner (or choose one for them) or a small group and allow them time to *rewatch* the Dooyks ada Aks video or provide it as homework.

Connections and Extensions:

- If time permits after student presentations, ask the class if they have knowledge of how the tribe preserves cultural documents and photographs.
- Invite a local community member in to show how to fillet a **hoon** and talk about ways to prepare and preserve **hoon**.

Activity 4: Lu'waa Luwaalm ts'm aks (Discovering Resources) STUDENT INFORMATION SHEET

Work with a partner or in a small group and watch the **Dooyks ada Aks** (Currents and Tides) video found here: <https://sites.google.com/alaska.edu/ccas/district/annette-island>

While watching the video, pay close attention to the **luwaalm ts'm aks** (sea life) community members talked about. Use a notepad to write down information.

Choose one or two local **luwaalm ts'm aks** you and your assignment partner would like to learn more about. These can be ones mentioned in the video or other **luwaalm ts'm aks** you know exist in your local community.

With your notepad or recording device in hand respectfully ask Elders or Culture bearers if you can record them discussing the **luwaalm ts'm aks** you and your partner have chosen to research:

- Where are these particular **luwaalm ts'm aks** found? (Specific *location*? Is there an Indigenous *place-name* for the area?)
- How do you **güüdisk** (harvest/collect) the **luwaalm ts'm aks** in a safe manner?
- Are there any specific **s'yaan** (ocean floor) hazards that boaters or fishermen need to be aware of?
- Has the *availability* of the particular **luwaalm ts'm aks** become more or less in their lifetime? Why?
- Has the *prevalence* of the **luwaalm ts'm aks** increased or decreased? What do you think could be the cause?
- Are there any changes in the *size* of the **luwaalm ts'm aks**? If yes, ask why they think changes are occurring?
- Has the *taste* of the **luwaalm ts'm aks** changed? (bitter?, sweeter?, saltier? not as flavorful?) What could be a possible reason for the change in taste?
- Is there a *traditional recipe* or way to use the **luwaalm ts'm aks**? (If the Elder is willing to share the recipe, ask if you can take a picture or copy down the recipe to share with the class.)
- Do you have any *photographs* of the **luwaalm ts'm aks** you are willing to share? (Please let the person know they will be credited by name for the use of their photo.)
- What is the *Sm'algyax word(s)* for the **luwaalm ts'm aks**? (If the Elder/Culture bearer doesn't know, research and find the appropriate Sm'algyax word(s). You can always ask a local language teacher or expert for assistance.)
- Ask the Elder/Culture bearer if they have any *additional advice or knowledge* relating to **luwaalm ts'm aks** they would like to share with you.
- Any other question you feel would be appropriate to ask regarding your chosen **luwaalm ts'm aks**.

Thank the Elder/Culture bearer for their time in sharing important information with you.

After conducting your own research and in speaking with Elders and/or culture bearers, create a 6-8 slide presentation about the **luwaalm ts'm aks** that includes:

- Introduction slide with title and date
- A diagram or map showing where the **luwaalm ts'm aks** are found on or near Annette island
- How to **güüdisk** (harvest/collect) the **luwaalm ts'm aks** in a safe manner.
- Information about what makes the **luwaalm ts'm aks** thrive in this area.
- A traditional recipe or way the **luwaalm ts'm aks** are used.
- **Sm'algyax** words for the **luwaalm ts'm aks**.
- Credit the photographer on each individual photo or graphic being used.
- “References” slide (including personal conversation(s), photographs, and other cited material).
- Final “**t'oyaxsut 'nüüsm**” (thank you) slide.

Present your slide presentation to your class and ask to share it during a community event. Invite Elders and culture bearers who shared information and/or pictures to your presentation.

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