Sense of Place: ShoreZone in the Classroom Curriculum Implementation
Final Report

(NOAA AB133F13CQ0038 T0006)

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I. Executive Summary

The *ShoreZone in the Classroom Curriculum Implementation* project built upon the *ShoreZone in the Classroom Pilot Networking Trip*. Educational Consultant Marie Acemah liaised over email and in-person at the North Slope School District (NSBSD) Curriculum Camp in Barrow to develop Curricular Units that make *ShoreZone* available as an educational tool in NSBSD classrooms. This project resulted in two Units, specifically: 1) Coastal Ecosystems Unit; and 2) Documentary Filmmaking Summer Intensive Proposal. The *ShoreZone* tool is now available and accessible throughout the NSBSD district. The District and the Ilusagvik College are interested in partnering with *ShoreZone* to lead for-credit summer documentary film camps in 2015.

II. Timeline

The *ShoreZone* Curriculum project consisted of three phases corresponding to the following timeline (Table 1):

Table 1 Project Timeline

Phase	Timeline
Meetings / correspondence with stakeholders and North Slope Borough School District (NSBSD) teachers and curriculum administrators	April 15th – May 17th, 2014
Participation in the NSBSD post-service Curriculum Camp in Barrow, Alaska	May 18 – 24th, 2014
NSBSD Curriculum Camp follow up communications	May 25th – June 15th , 2014

III. Acronyms and Key Terminology

There are dozens of acronyms and terms utilized by the NSBSD staff, some of which are critical in order to liaise with teachers regarding implementation of *ShoreZone* in their curricula. A complete listing of acronyms can be viewed at the following link: **http://www.nsbsd.org/Page/491**, but several acronyms and terms are particularly critical:

- *CAIM*: Curriculum Alignment, Integration, and Mapping. This is the process that the NSBSD is currently undergoing in order to integrate the Inupiaq Learning Framework (ILF) with traditional Educational Standards. Teachers, administrators, and community stakeholders have been involved in this multi-year process. Teachers are required to write new units under CAIM. *ShoreZone* can support them CAIM process by providing curricular support in a variety of ways.
- *ILF*: Inupiaq Learning Framework. Teachers are required to align their units to the ILF, which has been developed in conjunction with Elders to be consistent with Inupiat values. Being a localized tool, *ShoreZone* is consistent with ILF (e.g. can be used to study local erosion, cultural stories, etc.).

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- *RUBICON ATLAS*: This is the digital mapping tool used by teachers to develop their units. Marie was designated her own personal login information so that she could work with teachers remotely on their units.
- UNIT: Unit of Study. Teachers prepare *units* which last from one week to several weeks of dedicated classroom time.
- VTC: Video Tele-Conferencing. VTC allows teachers in different communities within the same district to communicate, and allows remote-delivery classes in distant communities.

IV. Meetings Overview

While the goal of the previous project "*ShoreZone in the Classrooms: Pilot Networking Trip*" was to meet as many potential partners/stakeholders as possible, the goal of this trip was to work closely with a smaller group to develop *Units* for utilization in the NSBSD. The following stakeholders participated/collaborated with Marie Acemah during the Curriculum Camp in Barrow:

- *Kevin Neyhard, NSBSD Middle School Science Teacher*: Kevin developed the idea to create a *Unit* around the idea of teaching students how to mine information from a database (the *ShoreZone* Coastal Mapping site), and Marie developed his idea into the *Unit*. Kevin then reviewed and approved the completed *Unit*.
- *Dr. Caitlin Winebarger, NSBSD Coordinator of Curriculum and Instruction*: Caitlin helped oversee the Curriculum Camp and provided instruction to Marie on developing summer classes/*Units*, as well as provided consultation regarding Rubicon Atlas.
- *Pamella Wilson, NSBSD Literary Coach*: Pamella helped Dr. Weinbarger oversee the Curriculum Camp, facilitated the logistics of Marie's stay, consulted on Rubicon Atlas questions and made introductions where appropriate.
- *Erin Hollingsworth, Director, Tuzzy Consortium Library, Barrow*: Marie met with Erin to explore collaborative possibilities with the Library and Consortium of Libraries on the North Slope. Erin shared the Online With Libraries (OWL) that could be utilized by the project for any future meetings / collaborative possibilities. She also provided introductions at the Barrow Ilisagvik College, specifically Rob Carrillo.
- *Rob Carrillo, Lead Distance Learning Coordinator, Ilisagvik College*: The College has a pre-existing summer film workshop for high school students, and collaborative possibilities between *ShoreZone*/Ilisagvik College/NSBSD were discussed. Rob was very positive about the idea of a summer film intensive course that explored culture along the shoreline, and suggested that the College could consider funding such a class, and potentially purchasing drones to film the shoreline and landscape as part of the class.

V. Hard Drives with ShoreZone Imagery and Footage

Hard Drives prepared by Coastal and Ocean Resources with coastal videography were provided to three individuals:

- *Kevin Neyhard, NSBSD Middle School Science Teacher*: Kevin will use the *ShoreZone* imagery as he implements the *Coastal Ecosystems Unit*. Kevin can also share the footage with his fellow teachers as he sees fit.
- *Dr. Caitlin Winebarger, NSBSD Coordinator of Curriculum and Instruction:* As Curriculum Coordinator, Caitlin has a comprehensive-view of the curriculum teachers are developing district-wide. Dr. Winebarger will distribute the imagery to teachers to support other learning objectives as she see needs develop.
- *Sherry McKenzie, NSBSD Incoming High School Principal*: Sherry has a science background and is enthusiastic about enhancing the NSBSD science program, and as incoming HS Principal will also

have a district-wide-view of the various curricular efforts, and can share the ShoreZone imagery on an as-needed basis.

VI. ShoreZone Units Developed

Two *Units* were collaboratively developed during the NSBSD Curriculum Camp. Both *Units* and their accompanying worksheets and materials are summarized below and included in full in Appendix A and B.

- *Summer Intensive in Documentary Filmmaking Unit*: This proposed two-week summer intensive was developed in collaboration with Dr. Caitlin Winebarger, NSBSD Coordinator of Curriculum and Instruction, and Rob Carrillo, Lead Distance Education Coordinator at the Barrow Ilisagvik College. This two-week cultural documentary filmmaking intensive *Unit* would be available for rising 7^{th} – 12^{th} graders and hosted in two villages in the NSBSD during July of 2015 in partnership with *ShoreZone* Coastal Mapping and the Ilisagvik College. The Ilisagvik College would provide camera equipment, and *ShoreZone* would provide the coastal mapping imagery and web-portal. Students would learn how to operate camera equipment and navigate the *ShoreZone* Coastal Mapping website, as well as how to conduct ethnographic interviews with community members and elders. Each student would create a mini-documentary (under 5 minutes) on a topic of their choice (please see the following film produced by Kaktovik teenager Tracy Burns as an example: **http://vimeo.com/48033247**). The class could host 4 – 12 students, and would be advertised through the Ilisagvik College Summer Camp Program. The course would be instructed by Marie Acemah, Rural Alaska Digital Storytelling Consultant (please see Appendix A).
- *Coastal Ecosystems Unit for NSBSD Middle School Science Teachers*: This 3 week Unit was developed collaboratively with Middle School teacher Kevin Neyhard (**http://www.nsbsd.org/Domain/733**) for students to explore the interdependency between animals and fish and their food and environment. Students will learn to use the *ShoreZone* coastal mapping data and imagery to search for good potential sites for subsistence hunting/fishing/gathering based upon their knowledge of environmental dependencies. After using Kachemak Bay subsistence as an example, students will apply their skills by using the database to find hunting /fishing grounds in and around their own coastal community. After using the database based upon their knowledge of connection between environment and living creatures, they will share their findings with an Elder / Knowledge Bearer to get feedback about the Inupiaq language, knowledge about their chosen animal/fish, and ways to respect that animal / fish when engaged in subsistence activities. Throughout the Unit, students will maintain a Science Notebook that will help them track their observations and questions. The Unit culminates in students writing explanatory text and giving a presentation that integrates their scientific process, findings and the knowledge shared by an Elder / Knowledge Bearer. While the Unit was designed for middle school science teachers, it can be adapted for high school teachers as well, and is live on the Rubicon Atlas curriculum site for all teachers to access. Kevin Neyhard will pilot the Unit during the 2014 – 15 academic school year, and all NSBSD teachers can also participate in that implementation. Please find the Unit overview attached as Appendix B, and then also find the Unit and accompanying materials separately attached to this report.

VII. Lessons Learned, Next Steps and Recommendations

- Lessons Learned
    - Teachers are enthusiastic to utilize *ShoreZone* in their classrooms and curricula, but they generally do not have the time to familiarize themselves with the website and build the

lesson plans around it. A curriculum specialist needs to be hired to be the primary curriculum writer, and that person can liaise with teachers.
    - The actual travel to the NSBSD is critical; the majority of work and connections made are in-person, and communication over email without face-to-face communication is not effective.
- Next Steps and Recommendations
    - The NSBSD curriculum re-design process is ongoing, with several curriculum camps are scheduled throughout the year (for at least the 2014-15 school year, and potentially beyond that). *ShoreZone* can continue to engage in this process by sending a curriculum specialist to represent *ShoreZone* as a tool at Curriculum Camps.
    - The Ilisagvik College is highly interested in funding and supporting a partnership with *ShoreZone* and the NSBSD by hosting for-credit summer classes for teens. Marie will continue to follow up with the College regarding this possibility, which would come to fruition in the summer of 2015.

APPENDIX A

New Course Proposal 2013
North Slope Borough School District

New Course Proposal 2012
North Slope Borough School District
Deadline to submit: March 11, 2013

Course Title: Summer Documentary Filmmaking Intensive

Length of course: 2 weeks
Credit: .5
Other: n/a

Part I: Please provide the following information:

Course Number: (will be assigned by curriculum dept. following Board approval)

Department: Elective Credit

Prerequisites: N/A

Course Description: This two-week cultural documentary filmmaking intensive would be available for rising 7th – 12th graders and hosted in two villages in the NSBSD during July of 2015 in partnership with ShoreZone Coastal Mapping and the Ilisagvik College. The Ilisagvik College would provide camera equipment, and ShoreZone would provide the coastal mapping imagery and web-portal. Students would learn how to operate camera equipment and navigate the ShoreZone Coastal Mapping website, as well as how to conduct ethnographic interviews with community members and elders. Each student would create a mini-documentary (under 5 minutes) on a topic of their choice (please see the following film produced by Kaktovik teenager Tracy Burns as an example: http://vimeo.com/48033247). The class could host 4 – 12 students, and would be advertised through the Ilisagvik College Summer Camp Program. The course would be instructed by Marie Acemah, Rural Alaska Digital Storytelling Consultant.

Part IIA: Please list which Alaska Performance Standards and or Grade Level Expectations apply.

CS: Technology, K-12, Technology
A: A student should be able to operate technology-based tools.
2. Use technological tools for learning, communications, and productivity.

Culture Standards, All Students
Culturally knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning.

1. Acquire in-depth cultural knowledge through active participation and meaningful interaction with Elders
2. Gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance

Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them.

8. Identify and appreciate who they are and their place in the world

6 – 12 English/Language Arts Standards (2012), Grades 9 – 10, Writing
Text Types and Purposes
b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

ILF: Community Realm, K2-12, Elders

OU: Culture is embedded in language; different languages uniquely express cultural understandings and beliefs. [C.e.1]
EQ: How do Elders' knowledge and use of the Iñupiaq language enrich our understanding of the Iñupiaq way of life? [C.e.1.a]
OU: Elders are highly regarded for the specialized knowledge they have and share. [C.e.3]
EQ: What contributions do Elders make and what specialized knowledge do they have? [C.e.3.a]
ILF Performance Expectations: Community Realm, Novice, Elders
Elders: Language C.e.1
The students uses the Iñupiaq and English languages to…
[N]C.e.1.2. Demonstrate proper protocols when interacting with Elders.
Elders: Specialized knowledge C.e.3
The student uses traditional knowledge about the roles of Elders to…
[N]C.e.3.4 Listen to and learn from Elders

Part IIB: Please detail the assessments that will be used in the course to evaluate student progress.

While there will be mini-assessments utilized throughout the course as illustrated in the syllabus section (Part VI), the primary and over-arching assessment will be through the following GRASP task. Please find the rubric for assessing the GRASP Task attached.

GRASP Task: Create a 3 – 5 minute documentary on a cultural topic of your choice to present to your community in a film screening.

Goal: Explore a topic relevant to your community through film to share with your community.

Role: Student is a documentary filmmaker and an agent of cultural exploration.

Audience: The community is the audience for the film through the community-wide film screening. Additionally, films may be submitted to film competitions and festivals and posted online for a wider audience.

Situation: The students in the class are trusted as authorities on what cultural topics are relevant for their communities and their changing coastlines, and empowered to explore those topics through film.

Product: The final product will be a 3-5 minute documentary film composed by each student.

Standards: The standards utilized in this GRASP Task are listed above in section IIA.

Part III: Please provide enrollment information (i.e. projected, maximum enrollment the course can accommodate, and any special restriction on enrollment).

The projected enrollment in each NSBSD village that hosts the course would range between 4 – 12. Due to the small population size of many of the NSBDS rural communities, there could be as few as 4 participants, but 12 would be the maximum so that each student would get maximal feedback on their documentary work.

Part IV: Please provide justification for this course, i.e. college prep, employment need, prerequisite for other programs/classes.

The Summer Documentary Filmmaking Intensive would support students in a variety of ways, particularly the following:

- Class would provide technical skills to students relevant for both college and employment prep,

particularly how to operate a variety of camera equipment and how to navigate computer editing software
- While the class would revolve around technical skills, it would simultaneously connect students to their culture and heritage
- The class would provide an excellent platform for continued collaboration between the NSBSD and the Ilisagvik College

Part V: Please provide list of instructional materials, resources, facility needs, media materials, equipment, and texts needed to implement this course.

The following materials and facility needs have been pledged by the ShoreZone Coastal Mapping partnership and the Ilusagvik College:

- Access and trainings in the ShoreZone Coastal Mapping website to support films focused on coastal issues (https://alaskafisheries.noaa.gov/shorezone/)
- Camera equipment and accessories (to be provided by the Ilisagvik College)
- Computers for editing (these would need to be provided by the NSBSD, one for each students – the computers would remain at school)
- Housing for 2 – 3 instructors (instructors could stay at the schools in the villages hosting the class, and can be considered a cost-share provided by NSBSD)
- A projector for the final film screening (either the school or village council generally has the appropriate project equipment, which can be obtained during the class)

Part VI: PLEASE ATTACH A SYLLABUS FOR THE COURSE.
THE SYLLABUS MUST INCLUDE:

- A schedule of class topics and assignments. Please be specific so that it is clear that the instructor has thought this through (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). Once the course is implemented, if modifications are needed to the syllabus, please submit the modified syllabus to C&I.
- Course textbook title, author, edition/publisher.
- Supplementary readings (indicate whether required or recommended) and any supplies required.

Instructor Marie Acemah has developed a series of lesson plans that she will utilize to teach the Summer Documentary Film Intensive. Please find these lesson plans attached in the order that they will be taught.

Principal Signature: _____

___ approved by DILT date _____

___ not approved by DILT date_____

___ approved by Board date_____

Ethnography and Digital Storytelling Curriculum Module:
Lesson Plans Adaptable for 7 - 12th Grades for Rural Alaskan Educators

Lesson: Choosing a Topic for Your Ethnographic Film

Vocabulary: *Ethnography* (Study of Cultures), *Documentary* (Film Based Upon a Factual Record), *Narrative Filmmaking* (Fictional Film), *Unstructured Interview* (Interview without Predetermined Questions)

Alaska State Standards: Cultural Standards A.1

Activity	Objective	Assessment Tool
Option 1: Predetermine a list of topics for your students, and have each student rank the topics from most wanted to least wanted. Assign topics based upon their rankings. This method is helpful if students need to study something very specific and if you need to do background research on their topics beforehand.	Align film topics both with 1) Student interests and 2) Topics that need to be covered based upon your curriculum.	An option to assess student choices could be to require them to write a sentence about their top three topics explaining why they chose that topic.
Option 2, Part 1: Write down the words “ethnography,” “documentary” and “narrative film” on the board, and ask the students if they can define the terms. Tell the students that they each get to make a 5 minute movie about something that's important to them in their community, and that it will be their “ethnographic documentary.” You can show them a sample of other student documentaries from the InterAK web portal to provide examples.	Students understand concept of ethnographic documentary as juxtaposed to narrative filmmaking.	Have students write definitions in their own words for new vocabulary terms in their journals.

Option 2, Part 2: Students write a personal brainstorm in their journal about the topics they might like to explore (e.g. pike fishing, whaling, traditional medicine, language, traditional dances, an elder, etc.). Write their ideas on the board.	Student apply their knowledge of ethnographic documentary filmmaking to their own lives and communities through a topic brainstorm.	Review student brainstorms in journal to ensure student has firm grasp of the concept of ethnographic documentary.
Option 2, Part 3: Have students share their ideas with the class, write ideas on the board. Students can brainstorm additional ideas as a group.	Students grasp the wide range of topics that they could choose for their ethnographic documentary.	Check brainstorm on the board to make sure that students' understand new concepts.
Option 2, Part 4: Students finalize their choice of documentary out of the list of topics. Encourage them to choose something that personally interests them. At this point students could also begin to storyboard (please see lesson: Story-Boarding).	Student finalize their choice of topic.	Students write topic and paragraph about why they chose that topic based upon the individual and class brainstorm.
Option 3: If a student has a particularly hard time choosing a topic, have them participate in 1 – 3 elder / community interviews (please see "Interview Techniques" lesson plan), and then ask them afterwards what part of the interview was most fascinating to them. They can base their film on the topic that "naturally" emerges. Explain to student that this is the "unstructured interview" approach, where you have a conversation with an interview subject and then analyze it later for important themes.	Students understand concept of "unstructured interview" and how a film topic can emerge after the first interview(s).	Students write topic and paragraph about why they chose that topic based upon an unstructured interview(s).

Special Note: This lesson involves several activities and options that can help your students to choose a topic for their ethnographic documentary. Choose the activity(s) that best suits your group of students and your school curricula; this is not a sequential lesson plan.

Teacher Follow Up Activity: You or the students could each create a physical as well as a computer file to collect all the research information found on each topic.

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Ethnography and Digital Storytelling Curriculum Module:
Lesson Plans Adaptable for 7 - 12th Grades for Rural Alaskan Educators

Lesson: Ethnographic Interview Techniques

Vocabulary: *Ethnography* (Study of Cultures), *Structured Interview* (Interview with Pre-determined Questions), *Unstructured Interview* (Interview Without Predetermined Questions), *Interview Subject* (The Person Being Interviewed)

Alaska State Standards: English / Language Arts A.1; Culture A.3

Activity	Objective	Assessment Tool
Write a topic for an interview on the board (please see "Choosing a Story" lesson plan). Students **in pairs write down at least three questions** about that topic.	Students think critically and creatively about interview questions.	Collect students' journals to see their written questions and write feedback.
Students share their questions; write them on the board as a brainstorm. **Entire class brainstorms additional questions** relating to the interview topic, and questions are written on the board.	Class engages in non-judgmental brainstorm and dialogue on potential interview questions. This is a good opportunity for the teacher to provide constructive feedback.	Have students write at least three of their favorite questions from the group brainstorm down in their journals for review later.
Each student chooses / is assigned one question from the list to ask the interview subject.	Students are clear about their role in the interview.	Each student writes their chosen question down in their journal.
Explain to students that they are about to conduct an **ethnographic interview**, that the interview is **structured**, but that some interview subjects change the topic and that it is okay to let the interview become **unstructured** to respect the **interview subject.**	Students grasp the two main types of ethnographic interviews.	After lecture ask class to define the new terms (ethnographic interview, interview subject, structured interview, unstructured interview), and write down the definitions on the board. Have each student write down the definitions in their journals.

Students conduct interview (please see "recording equipment" and "how to shoot" lesson plans) with interview subject. An elder can visit the school, students can visit the elder, or students can interview one another or a faculty member. Students lead the interview, and the teacher can facilitate. Make sure that the subject signs a release form, and that the students thank the subject.	Students practice ethnographic interview methodologies.	Take notes during the interview about the strengths you observed in the students (Who asked an off-the-cuff question that was just perfect? Which student was courageous enough to ask a question even while feeling shy? Who was thoughtful about how to compose the shot?) to share with them during the debrief.
Watch the footage (or highlighted portions) to **debrief interview**. Discussion questions can include: 1) How does the shot look? Was the interview structured or unstructured? What was challenging about the interview? What was your favorite part, and why? What would you do differently next time?	Students reflect upon and analyze their interview techniques from a visual and ethnographic perspective.	Students demonstrate understanding of new vocabulary and concepts through their discussion and review of the footage.
Homework: Students write paragraph including 1) one additional question they wished they would have asked, 2) their favorite part of the interview and why, 3) what they would do differently next time.	Student individually reflect upon and analyze the strengths and weaknesses of the interview.	Students demonstrate understanding of best practices during an interview through their written analysis of the interview.

Teacher Follow Up Activity: Load interview footage onto the computers of students who will use that interview for a film, or transcribe that interview at a later date.

Ethnography and Digital Storytelling Curriculum Module:
Lesson Plans Adaptable for 7 - 12th Grades for Rural Alaskan Educators

Lesson: Composition for Filmmaking

Vocabulary: *B-Roll* (Footage Secondary to Primary Source Interviews), *Wide-Shot, Medium Shot, Close-Up* (Depending on How Close You Are to Your Subject), *Panorama* (Moving the Camera Horizontally), *Tilt* (Moving the Camera Vertically), *Following the Action* (Moving the Camera with a Moving Object), *Fade-in/out* (When an object goes in or out of focus).

Alaska State Standards: Technology A.2 & 4

Activity	Objective	Assessment Tool
Explain to students that they will watch a short film and look at the different kinds of shots used (A good film to use is "Portrait of Nikolai" http://vimeo.com/14854233). Frequently pause the film so that the screen is frozen, and ask the class what they notice on the screen. After students make their observations say what the shot is (e.g. if it's an old photo, explain that it's an archival photo used for B-roll, if the camera is both following the action and doing a panorama, explain that, etc.). Write the terms down on the board. This exercise can happen with or without the volume, and you can go through the same short film twice.	Students understand composition concepts through the application of different compositional models in a film. Students grasp emotional and intellectual impact of different kinds of shots.	While students discuss different types of composition, assess for creative thought rather than correct answers, as composition is an aesthetic matter with a variety of interpretations. Promote participation rather than correctness at this point in the process.

Connect the camera to the TV so that students can see on the TV screen the camera footage in real time. Have students individually practice different shots (pan, tilt, Wide, Medium, and Close-Up Shots, Following the Action, Fade-in/out) while the rest of the class watches the screen. Prepare for giggles as students film each other, and an active, learning class. Provide feedback to students to make sure they have a clear understanding of each shot.	Students apply and practice their knowledge of compositional concepts.	Watch student composition and listen to the comments of students watching the composition. Provide immediate feedback to students who have an incorrect understanding, and also to students who are grasping the concepts accurately.
Have each student write in their journal a definition of each term in their own words. If they are confused that can ask you for assistance.	Students practice their knowledge of composition through defining terms in their own words.	Assess student definitions after class for accuracy.
Students go in pairs or as a whole group (depending on group size and camera equipment) to go get footage either around the school or around the community, making at least one shot according to each of the new terms.	Students practice their compositional knowledge and simultaneously gather B-Roll for their films.	Circulate among students and observe the shots they are getting, the conversations they are having, and how their shots connect to their films. Provide immediate verbal feedback.
Upon return, watch footage either at the end of class time or at the beginning of the next day to review the different types of shots obtained. Students should upload footage that they want to use for their final films immediately to their computer.	Students test their knowledge of composition by reviewing footage for feedback with classmates.	Watch student composition and listen to the comments of students watching the composition. Provide immediate feedback to students who have an incorrect understanding, and also to students who are grasping the concepts accurately.

Teacher Follow Up Activity: Make sure students uploaded footage they want to use onto their computers for the editing process. Optional: Have a test for students to define each term, or to match up the terms with their correct definitions.

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Ethnography and Digital Storytelling Curriculum Module:
Lesson Plans Adaptable for 7 - 12th Grades for Rural Alaskan Educators

Lesson: How to use B-Roll to support your documentary

Vocabulary: *A-Roll* (Primary interview footage used in a documentary), *B-Roll* (Footage Secondary to Primary Source Interviews or back-up footage), *Cutaway* (interruption of continuous footage with an insertion of other footage)

Alaska State Standards: English/Language Arts B.2, Arts C.2, Technology D.2

Activity	Objective	Assessment Tool
Choose a short (~5 min) documentary film (e.g. Kodiak student film http://www.youtube.com/watch?v=jBr6rvPdoNA) and explain to students that they will look to see how the filmmaker does a "cutaway" from the a-roll, to create b-roll. **Watch the film one time without pause, and watch a second time to have students say "b-roll" every time they see "b-roll." Ask the class why they think the filmmaker chose the b-roll that they chose. How does the b-roll support the script, or interview?**	Introduce students to the idea of a-roll and b-roll.	Watch for whether or not students correctly identify b-roll in the film. Verbally guide them if they have a difficult time understanding.
Have students work in pairs to create a short storyboard (refer to the "Storyboard" lesson plan) on flip chart paper. Their storyboards should have multiple text boxes that alternate between A-roll and B-roll (e.g. the first storyboard box could include an a-roll interview about fishing, and the second box could include b-roll of a fish).	Students apply their understanding of a-roll and b-roll in their own storyboard.	Walk around to support partners in their discussion and storyboard creation and to assess student understanding.
Have each pair present their storyboard to the group and explain which sections are a-roll and which b-roll, and why they chose the b-roll to support the a-roll. The b-roll should always connect to the a-roll so that the film audience (or the class) understands why the b-roll was chosen.	Students verbalize their vision of how a-roll and b-roll can work together.	Observe students to ensure that they understand not only the difference between a-roll and b-roll, but also how the two work together.

Optional: **Have students collect b-roll for their specific film topics.** They can stay in the classroom, the school, or go outside. You can **ask them to collect panoramas, tilts, and stable shots,** and remind them to always use a tripod or a stable surface. Remind them they can also use archival photographs and film for b-roll (please see "Archives" lesson plan. Oftentimes schools have archival photos on record or display, and this can be a great resource for student films. **Have students upload their footage immediately.**	Student practice the new concept of b-roll and collect footage for their films.	Have students write down the b-roll that they collected, and explain in writing how their b-roll connect to their topic.
Gather the class, and watch some of the b-roll they collected to discuss as a class. Alternatively, watch Kaktovik youth film "Weather or Not" at: https://vimeo.com/48033247 and pause on the b-roll to discuss the ways that she used b-roll to strengthen her film.	Students consolidate knowledge through a review session.	Assign students the b-roll worksheet attached below.

Teacher Follow Up Activity: If students can use camera equipment, have them collect b-roll that relates to their film. Students can use built-in computer cameras, phone cameras, or still cameras if video recorders are not available.

B-Roll Handout Name_____

This is an excerpt from a real, anonymous interview with an elder.

Instructions: Choose B-roll that you would use if this script were part of your own film. Describe the B-roll you would choose by answering the following questions:

- **Would you use a photograph or film?**
- **What would you include in the image / film?**
- **What kind of shot would you use (e.g. panorama, tilt, long shot, close up, etc.)?**
- **Would it be black and white, or color?**
- **Would you use stock footage or your own footage? Why?**

Interview Statement: This is what they used to do here a long time ago, around the village.

B-Roll:

They stayed home in the summer-time while they were catching fish.

B-Roll:

They dried the fish they caught. All the people that stayed here were doing that.

B-Roll:

After the fish were dried, some of the men would travel upriver towards the mountains.

B-Roll:

But the young women and people who had small children would stay home while the men and only some of the women went upriver to the mountains.

B-Roll:

Ethnography and Digital Storytelling Curriculum Module:
Lesson Plans Adaptable for 7 - 12th Grades for Rural Alaskan Educators

Lesson: Working with Archival Photographs

Vocabulary: *Archive* (Historical Photos and Documents), *Archivist* (someone who manages and Archive), *B-Roll* (Secondary Footage in a Film), *Primary Source* (An Original Work)

Alaska State Standards: History C.2, Library/Information Literacy B.6

Activity	Objective	Assessment Tool
Explain concept of "Archive" as a primary source to students and ask them to **brainstorm examples of where they could find archives in their community** while you write them on the board (e.g. Village Council photographs, Photos around the school, Family photos, Family letters, etc.).	Students understand the concept and importance of archives, and the various ways that archives are stored in their own community.	Assess student understanding of archives based upon the list written on the board.
Send students in pairs for 15 – 20 minutes with cameras (even if they are just i-phone cameras, etc.) **to take images of archival material from around the school** (e.g. photos hanging in the main office or in classroom, old maps from the library, etc.).	Students practice and test their knowledge of archives to collect archival material from their school.	Based upon the archival items photographed by students, assess if their understanding of archives is correct. Provide immediate feedback to students.

In whole group **students share what they found** and photographed in the school. Write list on board. **Explain that these items could fit as "B-Roll" in their films** (e.g. if someone is making a film about fish camp, an old photo of someone fishing could fit into their film). If students photographed something they would like to use, have them upload it onto the computer they will be using.	Students verify whether their photographed objects are classified as "archives"	Based upon the archival items photographed by students, assess if their understanding of archives is correct. Provide immediate feedback to students.
Each student **writes a list of at least three places they could look to find archival photos** and documents to use for B-Roll for their film. **Students share their ideas in pairs** while instructor walks around to support class.	Students explore how archival material connects thematically to their film, and how they can use archives in their B-roll.	Look at what each student wrote in their journal and provide them immediate feedback, as they will base their homework assignment upon this list.
Homework: Students photograph / scan at least three archival photos / material to use in their final film.	Students engage community in their practice of collecting archives, and obtain material for their films.	Assess student archival photos / material by judging 1) does it fall in the category of "archive" and 2) is it B-roll that fits with each student's film.

Teacher Follow Up Activity: If students want to use their photographs and did not have a chance to upload them, upload them to their computer for use in their final film.

Ethnography and Digital Storytelling Curriculum Module:
Lesson Plans Adaptable for 7 - 12th Grades for Rural Alaskan Educators

Lesson: Creating a Storyboard to Support Your Film

Vocabulary: *Storyboard* (graphic organizer in the form of illustrations), *Narrative Arc* (the Storyline Progression), *Introduction* (the beginning of a film that sets the groundwork for exploring the topic), *Body* (main content of the film), *Conclusion* (the end of a film that summarizes and wraps up the topic)

Alaska State Standards: English / Language Arts A.4; Arts A.3;

Activity	Objective	Assessment Tool
Draw a series of squares on the board, and explain to the class that they will "fill in" the storyboard all together (it will look something like a cartoon series). Choose a topic relevant for the class (e.g. fishing, whaling, berry picking, etc.). Each box in the storyboard can have a variety of elements, including a title, landscape, interview, credits, and other scenes. **Have the students decide altogether what each storyboard box will contain, supporting them to make a clear introduction, body, and conclusion.**	Students grasp the concept and purpose of a storyboard, and how a storyboard communicates a narrative arc.	Observe how students are engaged, and whether their ideas for the storyboard fit within a narrative arc.
After the class' storyboard is on the board, **explain that they have created a *Narrative Arc***. Ask them to **identify the introduction, body, and conclusion** in their own storyboard.		After collecting students' ideas on the board, ask class about which boxes include the introduction, body, and conclusion to ensure understanding.

Have each student create their own storyboard for their own film topic on flip-chart paper (this lesson applies for both documentary and narrative filmmaking). If students are making films in pairs they can work in pairs on their storyboard. Emphasize that their storyboard should have a narrative arc, and include people to interview, locations, summaries of narration, titles, etc.		Keep each student's storyboard or take a photograph to compare to their final film, not to make sure they match exactly but to see how much the film changed through the production process. Check storyboard for quality, and provide personal feedback about strengths and weaknesses.
Have students present their storyboards to their peers for discussion and clarification. Students can make changes to their storyboards based upon class feedback. Tell students that their final films will not exactly match their storyboards, but that their storyboard is like a map or a guide to help them structure their process.		Have students do a silent peer review using sticky notes. Each student can leave sticky notes with comments, questions, and ideas on their peers' storyboards before discussing as a class.

Teacher Follow Up Activity: Have students refine their storyboard for homework.

Ethnography and Digital Storytelling Curriculum Module:
Lesson Plans Adaptable for 7 - 12th Grades for Rural Alaskan Educators

Lesson: Creating an animation

Vocabulary: *Animation* (successive photographs of drawings that creates an illusion of movement), *Stop-Motion Animation* (an animation technique that makes an object appear to move on its own)

Alaska State Standards: Arts C.1, Technology D.2

Activity	Objective	Assessment Tool
Write the definition for animation and stop-motion animation on the board. Tell the class they will learn how to create their own animation. Show student film "We are Here" to the class and have them identify the animated parts: http://www.youtube.com/watch?v=L_Xc45WboDQ. **After watching the film, discuss the following questions with the class:** • Why did the filmmaker choose to animate certain scenes from her film? • How did the animation change the mood of the film? • Does anyone have a guess about how Kyla created her animation?	Students understand animation and why it can be useful techniques to support their films.	Have each student write a definition for animation in their own words.
Show the class the following clip as an example of stop-motion animation, and **ask the class to put into their own words the difference between animation and stop-motion animation:** http://www.youtube.com/watch?v=eJlqQSMifqk Remind students that they can use either tool to express an idea in their film.	Students understand the difference between animation and stop-motion animation.	Have each student write a definition for stop-motion animation in their own words.

Have animation stations pre-set for students (animation station consists of a camera, tripod, paper, and drawing / painting supplies). **Students can work individually or in groups of 3-4 to create an animation.** Have them choose a piece from their film that they would like to convey using animation. Have students draw a background and then cut out people / objects that they can move on the background to create their animation. Their animation must fit within the context of their film. Students will take ~70 still photographs, each time moving their drawings slightly so that when the photos are strung together, it looks like they are moving gradually, like a flip book.	Students practice creating their own animations that support their film topics.	Use students' final animations to see how effectively they use the tool to express an idea in their film.
Watch student animations as a class and critique. Discussion questions can include: • Does the animation make sense? • Does the animation support the film topic? • Are they too jerky, or do they flow? • Is it clear to the audience what is going on in the animation? **Have students upload their animations onto their computers / editing stations**	Students learn to effectively critique animation.	Have students each write down a critique of their own or a classmates work, particularly the strengths and weaknesses of their animation.

Teacher Follow Up Activity: Have students further develop their animations if applicable for their films.

MediaAction

Ethnography and Digital Storytelling Curriculum Module:
Lesson Plans Adaptable for 7 - 12th Grades for Rural Alaskan Educators

Lesson: Transcribing Interviews

Vocabulary: *Transcription* (written version of interview / film), *Index* (abbreviated transcription that includes the themes discussed in an interview rather than a word-for-word account), *Subtitles* (captions at the bottom of the screen that translate or show what is being said), *Lower Third* (text overlaying video) *Time-Code* (marking the time of the footage on your transcription)

Alaska State Standards: Library / Information Literacy A.3 & B.5, English / Language Arts A.1,

Activity	Objective	Assessment Tool
Pass each student the handout attached below of a sample transcription. Let students look at the handouts, and **ask students to try to define transcription, index, and time-code** based upon the samples that they see. **Write the definition of transcription and time-code on the board.**	Introduce students to the concept of transcribing, index, and time-code.	Listen for how students define the terms based upon the samples.
Have **students brainstorm what the purpose of a transcription of their film or interviews** could be (possible answers: to create a research tool, to help with the editing process, to create a storyboard, to create an archive, to create a document for translation). Explain that some people are professional transcriptionists, and that every court hearing has a transcriptionist taking record of what is said.	Students understand professional application of transcription.	For homework or in class: have students write down three professional applications of transcription (e.g. court transcriber, documentary transcriber, creating a record of a public meeting, creating an archive at a museum or library, etc.).
Have **students create their own transcription of a short interview statement** for practice. Each student could have their headphones on with their own audio recording, but if this is not possible, you can play audio for the whole class. Make sure they include a time-code when they transcribe, as on the samples. If there is time, **students can also take the time to create an index** so that they can practice the difference between a transcription and an index.	Students practice transcribing and creating an index, including use of time-code.	Have students turn in their sample transcriptions / indices and write individual feedback to them.

Explain that transcriptions can help with inserting subtitles into your film, which is important throughout Alaska as we have diverse accents and languages throughout the state. **Explain the idea of lower thirds**, in which text is used on screen (e.g. to introduce someone's name and / or title). Watch five minutes of "Portrait of Nikolai" (https://vimeo.com/14854233) and **have students identify when subtitles and lower thirds are utilized by the youth filmmakers.**	Students gain skills in how to use transcription to insert subtitles into their films.	Have students individually write definitions in their own words for the following terms: • Transcription • Index • Lower Third • Time Code • Subtitles
Have students create an index for at least one of their interviews, and let them know that their indices will become a part of the school archives.	Students practice their transcribing and indexing skills, and contribute to the school's archives.	Have student turn in their index.

Transcription vs. Index Handout: What is the Difference?

Read the following selections from an index and a transcription, and identify the difference between the two. Write down what you think a transcription is, and what you think an index is.

Section of a Sample Index

Interviewee: Anonymous
Interviewer: Anonymous
Date of interview: 6/9/13
Location: Anonymous (Kodiak, Alaska)
Length of interview: 17:56
Indexer: Anonymous The interviewee is an experienced lion that has a wealth of stories on just about everything including anything to do with the lions club so he was a perfect person to interview about the founding of port lions

0:03 Q: can you start by introducing yourself
0:06 A: interviewee introduces himself

0:22 Q: could you tell your experience with the earth quake/tsunami
0:22 A: interviewee tells what happened to him and his family during the earth quake.
1:55 Q: could you describe the damage in the village of Afognak
1:59 A: interviewee describes the damage done by the tsunami to Afognak

3:19 Q: How would you describe the efforts to rebuild Afognak
3:25 A: interviewee tells the story of lions club international proposing the off to move and rebuild there town

Section of a Sample Transcription

Name of Interviewee: Anonymous
Name of Interviewer: Anonymous
Date: June 7, 2013
Location: Kodiak Public Library
Length of Interview: 11:26

Background Information: Molly has been living in the state of Alaska for almost 50 years. She was residing in Anchorage with her family at the tie of the earthquake. At the time of the earthquake, her cousins were actually living in Seward, during the quake. Molly now currently works at the Kodiak Public Library.

0:30 We had small earthquakes when we were little, so when my mom started screaming we kind of laughed at her, It just got worst and worst. Get under the table! Two of my sisters were down stairs, so she had to wiggle her way down the stairs. Every step you took, the ground wasn't there or it came up to meet you. The stairs led down to cement floor (floor was rolling like waves) my sister would get knocked against the wall, she would let go, and she rode that wave back down the hall way.
2:00 No communication, finally the radio came back on, we didn't know that Anchorage couldn't be hurt by the tidal wave, because the inlet is so small. We heard terrible thing about our cousins in Seward.
2:26 For days we would go down to the Red Cross, to try and contact our cousins. Family in states could not be contacted.

Film Vocabulary List

Animation: Successive photographs of drawings that creates an illusion of movement

A*rchive:* Historical Photos and Documents

Archivist: Someone who manages an Archive

A-Roll: Primary interview footage used in a documentary

Body: Main content of the film

B-Roll: Footage Secondary to Primary Source Interviews or back-up footage

Conclusion: The end of a film that summarizes and wraps up the topic

Cutaway: Interruption of continuous footage with an insertion of other footage

Documentary: Film Based Upon a Factual Record

Ethnography: Study of Cultures

Fade-in/out: When an object goes in or out of focus

Following the Action: Moving the Camera with a Moving Object

Index: Abbreviated transcription that includes the themes discussed in an interview rather than a word-for-word account

Interview Subject: The Person Being Interviewed

Introduction: The beginning of a film that sets the groundwork for exploring the topic

Lower Third: Text overlaying video

Narrative Arc: The storyline progression

Narrative Filmmaking: Fictional Film

Panorama: Moving the Camera Horizontally

Primary Source: An original work

Stop-Motion Animation: An animation technique that makes an object appear to move on its own

Storyboard: Graphic organizer in the form of illustrations

Structured Interview: Interview with predetermined questions

Subtitles: Captions at the bottom of the screen that translate or show what is being said

Tilt: Moving the Camera Vertically

Time-Code: marking the time of the footage on your transcription

Transcription: Written version of interview / film

Unstructured Interview: Interview without predetermined questions

Wide-Shot, Medium Shot, Close-Up: Depending on How Close You Are to Your Subject

APPENDIX B

Unit for Coastal Ecosystems Middle School Science

Coastal Ecosystems *D

Collaboration Physical Science MS (Unit)Middle School|Science|North Slope Borough School District|2014-2015

Wednesday, July 2, 2014, 10:04AM

Coastal Ecosystems *D (Week 24, 3 Weeks)

Unit Review

Unit Description

Type Author Name: Marie Acemah and Kevin Neyhard, with a special thank you to Sara Skin at the Inupiat Heritage Center and Qaiyaan Harcharek of the Bureau of Wildlife Management for consulting about Coastal subsistence practices in communities on the North Slope.

Unit Description: In this unit students explore the interdependency between animals and fish and their food and environment. They will learn to use the ShoreZone coastal mapping database to search for ideal places for subsistence hunting / fishing / gathering based upon their knowledge of environmental dependencies. After using Kachemak Bay subsistence as an example, they will apply their skills by using the database to find hunting / fishing grounds in and around their own coastal community. After using the database based upon their knowledge of connection between environment and living creatures, they will share their findings with an Elder / Knowledge Bearer to get feedback about the Inupiaq language, knowledge about their chosen animal / fish, and ways to respect that animal / fish when engaged in subsistence activities. Throughout the unit, students will maintain a Science Notebook that will help them track their observations and questions. The unit culminates in students writing an explanatory text and giving a presentation that integrates their scientific process, findings, and the knowledge shared by an Elder / Knowledge Bearer.

Stage 1: Desired Results

ILF Overarching Understandings/Essential Questions	ILF Performance Expectations
ILF: Environmental Realm, K3-12, Hunting and Survival OU: Culture is embedded in language; different languages uniquely express cultural understandings and beliefs. [E.hs.1] ▪ EQ: What understandings about the nature of the food quest are clarified through the Iñupiaq language? [E.hs.1.a] OU: In the Iñupiaq worldview, the spiritual dimension is an integral part of and not separate from all aspects of a person's awareness. [E.hs.2] ▪ EQ: What do respect for the environment and respect for animals entail? [E.hs.2.b]	ILF: Performance Expectations: Environmental Realm, Novice, Hunting and Survival Hunting: Language E.hs.1 The student demonstrates an understanding of the relationship between hunting and the Iñupiaq language by . . . ▪ [N] E.hs.1.2 Using the names of various animals in phrases. Hunting: Spirituality E.hs.2 The student uses knowledge of traditional Iñupiaq culture to . . . ▪ [N] E.hs.2.2 Articulate the meaning of respect as it relates to animals that are hunted.

Alaska State Standards

State Standards & GLEs

Cultural Standards, All, Students
Culturally-knowledgeable students are able to engage effectively in learning activities that are based on traditional ways of knowing and learning.

- 1. acquire in-depth cultural knowledge through active participation and meaningful interaction with Elders;
- 4. gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance;

NGSS: Science Performance Expectations(2013), NGSS: MS Life Science, MS.Matter and Energy in Organisms and

Ecosystems
Performance Expectations

- 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.

2012 ELA and Math Standards

6-12 Literacy in History/Social Studies, Science, and Technical Subjects (2012), Grades 6-8 , Writing
TEXT TYPES AND PURPOSES

- WHST.6-7-8.2.a-f Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Content Area Understandings & Essential Questions

Content Area OUs & EQs	Topical Understandings & Essential Questions
NSBSD: Science, K3-12, Life Science NSLS.2 OU: Matter and energy are transferred. ▪ NSLS.2d EQ: How are organisms part of a global food web?	OU 1: Organisms are dependent on their environmental interactions with other living things and with non-living factors EQ 1: How can we identify where an organism might live based upon its living and non-living environment? OU 2: The food chain, or connection between living creatures, is integral to Inupiat respect for animals. EQ 2: How do changes in the food chain and environment affect subsistence activities?
Knowledge *Student will know...*	Skills *Students will be able to...*
▪ Inupiaq words for several coastal organisms ▪ The food and environment that coastal organisms require, and how to find a fish or an animal based upon the environment and food available in a place ▪ The interdependency of organisms in an environment	▪ Analyze and interpret data through running queries on NOAA's ShoreZone Alaska Shoreline mapping website (see attached link) ▪ Determine appropriate ShoreZone mapping queries based upon understanding of food chain and environmental dependencies ▪ Use aerial imagery to identify ideal coastal hunting and fishing grounds in their community and along the entire Alaskan coastline ▪ Integrate their research data with statements from Elders ▪ Use the Inupiaq names of animals verbally and in writing ▪ Maintain a "science notebook" http://alaskafisheries.noaa.gov/mapping/szflex_video/index.html?T=SZ@L=B

Stage 2: Assessment Evidence

Transfer Task(s) (Performance Assessments)
At least one assessment in GRASPS form.

Using an Online Database to Support Subsistence Hunting
Summative: Performance: Authentic Task

The Department of Wildlife Management has tasked you (the student) to give a presentation to them about

subsistence hunting / gathering / fishing. They want to know good places to hunt / fish / gather along the coast, and why they are good places. How does that environment support that animal / fish? What is the animal / fish eating in that environment that makes it stay there? How is that animal in an interdependent relationship with the living and non-living environment? They also want to know the Inupiaq words for the animals and fish you will target, and ways to respect them when hunting or fishing. They are going to use this information to write a report about why those areas should be preserved for future generations.

Product 1: Student pairs photograph (downloaded from ShoreZone's website) with 7 - 10 sentence explanatory text that explains why it is a good habitat for their animal / fish based upon the food chain and environmental interdependency, what the Inupiaq name of the animal / fish is, and how one can be respectful while hunting or fishing that specific animal / fish (additional information about this product is listed under Learning Experience 5).

Product 1 DOK: 3

Product 2: Student presents in front of the class (or the Department of Fish and Wildlife Management) their animal / fish, and why their photograph captures an ideal habitat for their animal / fish based upon the food chain and environmental factors.

Product 2 DOK: 3

Evaluative Criteria	Other Evidence (Graded)
Find grading rubric for the GRASP task attached. GRASP rubric.pdf	▪ Quiz students on the Inupiaq names of the animals / fish that the class studied (as part of Learning Experience 5).

Stage 3: Learning Plan

Learning Experiences (in order of implementation)	Checking for Understanding (Ungraded)
Learning Experience 1: Deduce what foods and environments Katchemak Bay coastal creatures require ▪ Distribute printed or e-copies of the Alaska Department of Fish and Game (ADF&G) Alaska Wildlife Notebook Series Descriptions of the Razor Clam, Steller Sea Lion, Common Eider, and River Otter (links attached). ▪ In groups of 2 - 3, students read descriptions and highlight sections that describe 1) What the creature eats and 2) The environment the creature lives / nests in (find example of descriptions with highlights attached saved as "Kachemak Wildlife Notebook Series Descriptions with highlights"). ▪ Students write for 15 minutes in their science notebook (which could also be a science blog) to address the following questions: *What creatures and environment would you look for along the Kachemak Bay Coastline to find a Razor Clam? Steller Sea Lion? Common Eider? River Otter?* (e.g.	**Learning Experience 1** ▪ Walk around from group to group to check in with them as they highlight their handouts to make sure they understand the task. ▪ Read students' "science notebook"* entries and write a response. **Learning Experience 2** ▪ Go over the answers to the "Kachemak Living Creature Dependency Worksheet" to make sure that the entire class is on the same page. ▪ Check in on the pairs as they work to make sure that they are correctly following the instructions; answer their questions as needed and make sure they can show their picture and explain it to the class. ▪ Read students' "science notebook" entries and write a response.

razor clams prefer semi-protected sandy beaches, and eat plankton, or Common Eiders nest around driftwood and clumps of grass on sandy beaches and tundra ponds).
- Ask students how they would define "interdependence" (e.g. living creatures need to eat other living creatures to survive, every living creature depends on a specific environment to survive). Ask them to give examples from their journal (e.g. "River Otters eat Razor Clams, and Razor Clams eat Plankton," or "Common Eiders and Razor Clams both need different parts of a sandy beach to live / breed").
- Students write in their science notebook a definition of interdependence in their own words, and at least one example of interdependence from the living creatures they just journaled about.

Learning Experience 2: Use the ShoreZone Coastal Mapping Website to find potential Razor Clam, Steller Sea Lion, Common Eider, and River Otter habitats

- Show students the following ShoreZone video, and explain to them that they will learn step-by-step how to do a search for either Razor Clams, Steller Sea Lions, Common Eiders, or River Otters: https://www.youtube.com/watch?v=qGM84_BkmsM.
- Give students the "Kachemak Living Creature Dependency Worksheet" (attached). Have them fill it out, again based upon the Alaska Wildlife Notebook Series Descriptions and their journal entries (also attached is the worksheet with answers).
- Explain to students that they will do a search through an online database (databased is attached, or go to the following link: http://alaskafisheries.noaa.gov/mapping/szflex_video/index.html?T=SZ@L=B) for either Razor Clams, Steller Sea Lions, Common Eiders, or River Otters by looking for the environments that they depend upon. At first they will follow the step-by-step guide (attached), but later they will generate their own search.
- Have class work in pairs. Give each pair one of the four instructional handouts for how to run a search for either Razor Clams, Steller Sea Lions, Common Eiders, or River Otters (see attached).
- Have each student glue / tape the picture that they printed out from their online search and write one sentence below it about why it might be a good habitat for the creature they searched for (remind them of the idea of interdependency of creatures and environment).
- Have each pair show their picture to the class and explain why it might be a good habitat for their

Learning Experience 3

- Walk around the classroom as students are choosing which animal / fish to focus on. Make sure that they choose something that inhabits the coastline, and provide support for them if they have questions.
- Walk around and check on students as they research, and also as they run their query - this will probably be the most challenging part of the unit for students so take your time to help them, and also have students support each other when possible.
- Read students' "science notebook" entries and write a response.

Learning Experience 4

- Review each student's interview questions worksheet to provide feedback on their additional question(s). Make sure they understand the questions.
- Facilitate the students' conversation with the Elder(s) / Knowledge Bearer(s).
- Read students' "science notebook" entries and write a response.

Learning Experience 5

- Coach students one-on-one as they write their explanatory text. Refer them to the rubric if they have questions about the expectations around their writing task.

*Science notebooks will *not* be graded - this is a chance for students to explore ideas freely - it is critical that you write responses to their entries after each learning experience so that they are engaged in an (ungraded) feedback loop throughout the unit.

creature.

Learning Experience 3: Use The ShoreZone Coastal Mapping Website for Subsistence Hunting in Your Community

- Distribute the GRASP transfer task handout (find above in the Transfer Task / Performance Assessment section).
- Have students choose a coastal creature (a fish, sea mammal, bird, or coastal-dwelling mammal) that is hunted / observed in their community along the coastline. If a student is unsure of what to choose, they can select from the Arctic Grayling, Bearded Seal, King Eider, or Arctic Ciscoes (find the links for ADF&G Alaska Wildlife Notebook Series Descriptions for these four attached - Ciscoes are under the "Whitefish species" link). This entire GRASP task can be done in pairs or students can work independently.
- Provide students with independent time to research the interdependencies of their selected creature. They can do this by writing in their science notebook answers to the following questions: 1) What is *below* the food chain of my creature (what does my creature eat)? and 2) What *Coastal Environment* does my creature depend upon (e.g. sandy beaches, tundra, rocky outcroppings, etc.)?
- Have each student run a query on the ShoreZone Coastal Mapping site to find places along the coastline that could be a habitat for their fish / animal. They will follow the same procedure they did for the Kachemak Bay query, only this time they will have to find their own search terms. They will be familiar with the search options through their previous learning experience - make sure the same handouts from Learning Experience 2 are available in case students forgot some of the steps.
- After they run their query, students will zoom in and locate a photograph of a possible habitat for their fish / animal. Students will then save and print the photograph for their Science Notebook. Underneath the picture they can write a sentence in their journal about why it is a good habitat for their fish / animal.

Learning Experience 4: Students interview an elder about their fish / animal

- Now that students have a photograph of the coastline that might be an ideal environment for their fish / animal, have them complete the "Interview Questions" worksheet (this is attached as "Learning Experience 4 Interview Questions). This will allow them to prepare to interview an Elder / Knowledge Bearer about the interdependency / subsistence practices around their fish / animal.
- Students can interview the same Elder / Knowledge

Bearer, or each find someone different to interview. They can do this in class, or go home and talk to one of their parents / grandparents (it's probably better to do this in class as it's an important piece of the unit). They can write down the responses on the worksheet, and put it in their science notebook.

Learning Experience 5: Write Explanatory Text and Present to Class (GRASP Task)

- Students write explanatory text that goes with their photograph (provide them with the rubric included under "evaluative criteria") that includes the following elements:
  - A description of *why* the photograph shows a place where their fish / animal might live
  - The Inupiaq name for their fish / animal
  - What their animal / fish eats (what is below it on the food chain)
  - What environment their animal / fish depends on
  - A description of *how* they found their picture (how they used the ShoreZone online database to look for ideal environments)
  - How and why they can respect the animal when subsistence hunting / fishing
  - What has changed about subsistence hunting / fishing of that creature, if any (e.g. it used to come in June but now comes in May, etc.)
- Students verbally present their findings to their class (simulating a presentation for the Department of Wildlife Management).
- Students learn the Inupiaq names of their classmates / fish animals. They can write those names in their science notebooks. Give students a quiz on the Inupiaq names.

eiders.pdf

razor_clam.pdf

river_otter.pdf

steller_sea_lion.pdf

Kachemak Wildlife Notebook Series Descriptions with Highlights.pdf

http://alaskafisheries.noaa.gov/mapping/szflex_video/index.html?T=SZ@L=B

Kachemak Living Creature Dependency Worksheet.pdf

Teachers Key Kachemak Living Creature Workheet.pdf

Search ShoreZone for Common Eider habitats.pdf Search ShoreZone for Razor Clam Habitat.pdf Search ShoreZone for River Otter Habitat.pdf Search ShoreZone for Steller Sea Lion Habitat.pdf arctic_grayling.pdf bearded_seal.pdf eiders.pdf whitefish_species.pdf Learning Experience 4 Interview Questions.pdf	

Resources and Preparation Materials

For this unit each student, or pair of students will need access to a computer, and the class will need access to at least one color printer. Additionally, each student will need a notebook to use as their "science notebook."

The following handouts, websites, and answer sheets are attached here and in the "Learning Experiences" Section:

- Alaska Department of Fish and Game (ADF&G) Alaska Wildlife Notebook Series: Razor Clam
- ADF&G Alaska Wildlife Notebook Series: Steller Sea Lion
- ADF&G Alaska Wildlife Notebook Series: Common Eider
- ADF&G Alaska Wildlife Notebook Series: River Otter
- Kachemak Bay Alaska Wildlife Notebook Series with Highlights (teacher answer key)
- Link to National Oceanic Atmospheric Association's (NOAA) ShoreZone Coastal Mapping Interactive Website
- Kachemak Living Creatures Dependency Worksheet
- Teacher's Key: Kachemak Living Creature Workheet
- Search ShoreZone for Common Eider habitats handout
- Search ShoreZone for Razor Clam habitats handout
- Search ShoreZone for River Otter habitats handout
- Search ShoreZone for Steller Sea Lion habitats handout
- ADF&G Alaska Wildlife Notebook Series: Arctic Grayling
- ADF&G Alaska Wildlife Notebook Series: Bearded Seal
- ADF&G Alaska Wildlife Notebook Series: King Eider
- ADF&G Alaska Wildlife Notebook Series: Arctic Ciscoes
- Learning Experience 4: Interview Questions Handout

eiders.pdf
razor_clam.pdf
river_otter.pdf
steller_sea_lion.pdf
Kachemak Wildlife Notebook Series Descriptions with Highlights.pdf
http://alaskafisheries.noaa.gov/mapping/szflex_video/index.html?T=SZ@L=B
Kachemak Living Creature Dependency Worksheet.pdf
Search ShoreZone for Common Eider habitats.pdf
Search ShoreZone for Razor Clam Habitat.pdf
Search ShoreZone for River Otter Habitat.pdf

Search ShoreZone for Steller Sea Lion Habitat.pdf

Teachers Key Kachemak Living Creature Workheet.pdf

arctic_grayling.pdf

bearded_seal.pdf

eiders.pdf

whitefish_species.pdf

Learning Experience 4 Interview Questions.pdf

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Last Updated: Friday, May 23, 2014, 2:02PM

Atlas Version 8.0.3L

APPENDIX C

Filmmaking Intensive GRASP Task Rubric

Coastal Ecosystems Writing and Presentation Rubric

Criteria	4 Araqhaa! (WOW!)	3 Nakuuruq (It'sgood)	2 Nakuugaluaqtuq (It's okay, but…)	1 Naamaitchuq (It's not enough)
Understanding of Inupiaq Values & Language	Student displays an excellent knowledge of 1) the Inupiat word for their animal / fish and 2) ways to respect the environment and animals when observing or subsistence hunting	Student displays a good knowledge of 1) the Inupiat word for their animal / fish and 2) ways to respect the environment and animals when observing or subsistence hunting	Student may or may not have included the Inupiat word for their animal / fish, and shows only a basic understand of ways to respect the environment and animals when observing or subsistence hunting	Student did not include the Inupiat word for their fish / animal nor write about ways of respecting the environment and animals.
Understanding of the food web / chain	Student displays an excellent knowledge of what their fish / animal eats (where it is on the food chain, and how it depends on other animals / vegetables for food)	Student displays a good knowledge of what their fish / animal eats (where it is on the food chain, and how it depends on other animals / vegetables for food)	Student displays a basic knowledge of what their fish / animal eats (where it is on the food chain, and how it depends on other animals / vegetables for food)	Student displays a minimal or nonexistent knowledge of what their fish / animal eats (where it is on the food chain, and how it depends on other animals / vegetables for food)
Ability to Use Data to Deduce Subsistence Information	Student is able to clearly explain how they used an online database to deduce important subsistence information.	Student is able to explain how they used an online database to deduce important subsistence information.	Student minimally explains how they used an online database to deduce important subsistence information.	Student is not able to explain how they used an online database to deduce important subsistence information.
Understanding of Environmental Dependency	Student displays excellent understanding of what environment their fish / animal is dependent upon, and how to find that animal through their ideal environment.	Student displays good understanding of what environment their fish / animal is dependent upon, and how to find that animal through their ideal environment.	Student displays basic understanding of what environment their fish / animal is dependent upon, and how to find that animal through their ideal environment.	Student does not display an understanding of what environment their fish / animal is dependent upon, and how to find that animal through their ideal environment.

APPENDIX D

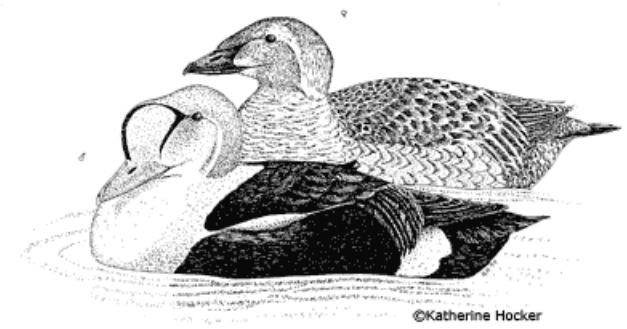
Supportive Information for Learning Experience 5 (p. 14)

eiders.pdf
razor_clam.pdf
river_otter.pdf
steller_sea_lion.pdf
Kachemak Wildlife Notebook Series Descriptions with Highlights.pdf
http://alaskafisheries.noaa.gov/mapping/szflex_video/index.html?T=SZ@L=B
Kachemak Living Creature Dependency Worksheet.pdf
Teachers Key Kachemak Living Creature Workheet.pdf
Learning Experience 4 Interview Questions.pdf

Alaska Department of Fish & Game

Eiders

The **eiders** are sea ducks found across the Arctic and subarctic zones of the northern hemisphere. All four of the world's eider species breed in Alaska, and many of these birds remain in the state's coastal waters during winter. The common, king, and spectacled eiders are among the largest ducks in North America. Steller's eiders are smaller and one of the most unique members of the duck tribe.



General description: As sea ducks, eiders have the physical characteristics of diving ducks: feet set far back on the body with a lobe of skin on the hind toe, thicker insulating plumage, and abundant body fat. Typically, male sea ducks have bold plumage patterns of black and white, with females being muted black, gray, and brown. Males of the four eider species are easy to distinguish by their black and white patterns and areas of soft vibrant color, unique to eiders. Unlike other sea duck females, eider hens are dominantly brown to rusty, with black bars and mottling that aids concealment during nesting. Females of the three large eiders are very similar, but they may be distinguished at close range by bill shape and subtle feather markings. Eider down, the fluffy underlayer of feathers, is an excellent insulator. Down is collected from nests on “eider farms” in Iceland and Scandinavia and marketed in sleeping bags and comforters.

Life history: The eiders are mostly Arctic tundra nesters that remain in northern waters during winter and move toward nesting grounds as soon as the spring sea ice breaks up. They migrate side by side in long lines only a few feet above the water, hugging coastlines or following open leads in the ice. Certain points of land on their migration routes are traditionally known as “eider passes.” One observer reported 125,000 eiders passing the Yukon Delta — 75,000 on one day in May. More than a million eiders have been recorded passing Point Barrow in the late summer on their way to molting areas. The timing of their arrival in spring is critical, and severe problems can occur if the ice has not opened up. In 1968, a reported 100,000 eiders, mostly king eiders, starved because of an unusually late breakup of the sea ice.

Like all sea ducks, eiders do not breed until they are at least two years old. Common eiders often nest in colonies along the coast, on barrier islands, and sand spits. The other three species are solitary breeders that usually nest on islands and peninsulas in tundra lakes and ponds. Pair-bonding occurs during winter, so nesting can begin as soon as the pair reaches the breeding grounds. The female builds a nest of grasses which is then filled with down shed during egg laying. The males leave shortly after incubation begins and travel to distant gathering areas where they undergo a molt.

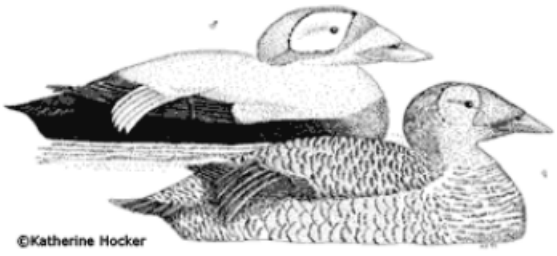
Icelanders say the hen does not feed during the incubation period, which can last from 25 to 28 days. Losses to predation by gulls, jaegers, and foxes can occur during this time and shortly after hatching. Females with young leave the breeding grounds for either intermediate staging areas or go directly to wintering grounds, where they molt about 50 days later than males. A specialized diving duck, the eider diet is largely aquatic animals gathered from bottom sediments, including mollusks such as clams and mussels, crustaceans such as crabs and shrimp, aquatic insects, and some vegetation.

The **common eider** (*Somateria mollissima*) averages 24 inches (61 cm) in length and almost 6 pounds (2.7 kg) in weight, making it the largest duck in the northern hemisphere. Although there are four races of common eiders in North America, the Pacific race is the one found in Alaska.

The common eider (male) is the only eider with a black cap extending to the forehead and around the eye and divided on the crown by a white streak originating from the hind neck. The chin, throat, neck, and cheek extending along the bill are white. The Pacific race has a sharp black line along the jaw forming a V pointing toward the yellow-orange bill. A close look reveals a pastel sea-green shading from the upper cheek to the back of the neck. The chest and back are white, and the belly, sides, and rump are black. White patches flank the rump. The wings are also black with white triangles. Because the common eider holds its head below its body when in flight, it appears to be ungainly in the air.

The common eider is the southernmost breeding eider, with a nesting range extending from Sitka in Southeast Alaska along the entire coast into Arctic Canada. Small colonies are found in the Kodiak harbor and along Homer Spit. Common eiders nest near driftwood or clumps of grass on barrier islands, sandy beaches, and on islands in tundra ponds, often in association with gull colonies. They nest later than most other ducks, usually after sea ice has melted, preventing predator access to the colony. The male leaves shortly after the 28-day incubation period begins. One to seven pale olive green eggs are laid. Common eider broods often combine to form large congregations accompanied by “aunts,” or non-breeding females. Most common eiders winter in the Bering Sea and the Aleutian Islands. Pacific common eiders are portrayed on the **2000 Alaska duck stamp**.

King eiders (*Somateria spectabilis*) are regal in appearance and average 23 inches (58.4 cm) in length. They are identified from other male eiders by the red bill and large orange frontal lobe extending from the bill up to the forehead. This lobe is outlined in black which sets off the pale blue-gray top half of the head and sea-green shaded cheeks. While the king eider has a white chest like the common eider, kings have black backs. Female king eiders have much less feathering along the sides of the bill than common eiders, but forehead plumage extends part way down the top of the bill. By late July the male king eider begins to lose his breeding plumage, and the spectacular frontal shield shrinks and becomes dull in color.



King eiders have a circumpolar distribution with about 10,000 breeding in Alaska. The center of breeding abundance in Alaska is along the eastern half of the Beaufort Sea coast, but king eiders are much more abundant in the Canadian Arctic islands. Nearly one-half million king eiders migrate through the Beaufort Sea, arriving on breeding areas as early as April 3 at Point Barrow, but most birds do not arrive until May. Nests are dispersed along the coastal zone, mostly on small islets in freshwater tundra ponds. Two to six dark olive-buff eggs are laid, and incubation lasts 23 to 24 days. By late June and through July, large flocks of males begin a westward migration to unknown molting grounds in the Bering and Chukchi seas. Females and young follow the males to the wintering grounds, which are as far north as the open sea allows. Most spend the winter around Kodiak, along the Alaska Peninsula, and in the Aleutian Chain.

Along with long-tailed ducks, the king eider is unmatched for its diving ability. There is one record of a king eider feeding in 180 feet (54.9 m) of water in the Bering Sea. Marine animals are the mainstay of the king eider's diet, except during the short breeding season when freshwater insects and crustaceans are prey. King eiders are featured on the **1997 Alaska Waterfowl Conservation Stamp**.

The **spectacled eider** (*Somateria fischeri*) averages 21 inches (53.3 cm) in length and weighs approximately 3.25 pounds (1.5 kg). Until recently, this species was perhaps the least known species of waterfowl in North America, with its distribution largely unknown.

The male spectacled eider's distinguishing marks are a black chest, unlike other eiders, and a large pale green head with black outlined white spectacle-like patches around the eyes. The white throat, neck, back, and folded wing contrast with the black rump, tail, and underparts. Females and young spectacled eiders have light brown patches around the eye. Other unique characteristics of these birds are the pale blue iris of the eye and facial plumage that extends halfway down the bill to the nostrils.

Although the breeding distribution extends from northcentral Siberia to the Yukon Territory along the Beaufort Sea coast of Alaska and south to northern Bristol Bay, spectacled eiders in Alaska historically have been most abundant on the Yukon-Kuskokwim Delta and North Slope. Spring arrival occurs in the first week of May on southern breeding areas but not until mid-June in the north. After two weeks when habitat conditions improve, nesting begins and one to eight olive green eggs are laid. The spectacled eider male remains with his mate longer than other male eiders, for one to two weeks after incubation begins, then leaves usually prior to July 1. Most males cross the Bering Sea to molt in far eastern Russia or in Ledyard Bay along the coast of northwest Alaska, remaining there from July to October. Incubation lasts 24 days, during which time predation by gulls and foxes can inflict heavy egg losses. Females with broods leave nesting areas in late summer to gather at molting sites in Ledyard Bay and Norton Sound. Until recently, there were only a few records of wintering spectacled eiders. In 1995, satellite radios implanted in birds and aerial surveys pinpointed a mass wintering area for the species in open ice leads between St. Lawrence and St. Matthew Islands. Surveys now confirm that over 360,000 spectacled eiders, the entire world population, gather in a unique zone of rich subsea mollusks from October through March.

Most spectacled eiders breed along the coast of Arctic Russia, and about 8,000-10,000 birds breed on Alaska's North Slope. However, since the early 1970s, the number of spectacled eiders in western Alaska has declined by more than 90 percent to about 8,000 birds. This severe reduction raised concern about this bird's future, and in 1993, the spectacled eider was designated a threatened species under the federal Endangered Species Act. Specific reasons for the decline are not certain, but recent studies have shown high rates of exposure to lead in Y-K Delta birds. While feeding in ponds, nesting adults and ducklings are picking up spent lead shot from hunting and are suffering health effects. Both the lead problem and the need to understand the biology of this species have stimulated an intensive research program to help their recovery. The spectacled eider was chosen as the subject for the 1987 Alaska Waterfowl Conservation Stamp.

The **Steller's eider** (*Polysticta stelleri*), the smallest of the eiders, is approximately 18 inches (45.7 cm) long and usually weighs about 2 pounds (0.9 kg). The Steller's eider is unusually colorful and has a unique plumage pattern for a sea duck. The male's white head has a black spot behind each ear and sea-green shading at the back of the head. The eye is surrounded by black and the bill is blue. The white head is offset by iridescent blue-black under the chin and in a broad collar pattern extending down the back. Large white shoulder patches and white-lined deep blue scapular plumes provide bold contrast on back and sides. The light breast, sides, and belly of males is shaded front-to-back from a tan to deep rust. Males and females share an unusual colored wing patch, not found in other diving and sea ducks, but very similar to the mallard and other dabbling ducks. The back half of the wing is iridescent blue lined above and below by white. These wing patches, blue-gray feet, and white wing linings distinguish female Steller's from the other eider species.

Most Steller's eiders nest in northeastern Siberia, with less than 5 percent of the population breeding in North America. It is the least abundant eider in Alaska with a discontinuous breeding range along the coast from the Alaska Peninsula northward, including Seward Peninsula, St. Lawrence and Nunivak islands, and the Beaufort Sea coast. During the breeding season, the species was most abundant in Alaska on the Yukon-Kuskokwim Delta where they may have been common in some areas. However, sightings are now rare and very few nests have been found in the region since the mid-1970s. The North Slope may harbor up to 5,000 breeding pairs.

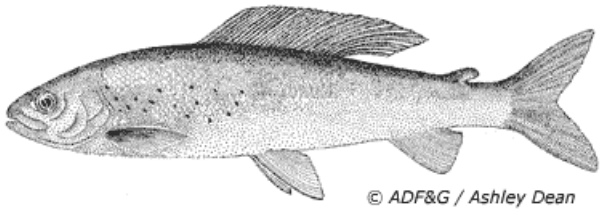
Little is known of the breeding biology of Steller's eiders. It is reported to be the latest spring migrant of the four species of eiders, arriving during the middle to end of May. Nests are located on peninsulas and shores of tundra ponds and lined with grass and black-brown down. Six to 10 olive-buff eggs are laid. Males leave breeding areas by early July to begin molt, and large flocks gather at Izembek Lagoon and other Alaska Peninsula estuaries. About 100,000-140,000 Steller's eiders, most of the world population, molts and winters along the Alaska Peninsula and the Aleutian Islands. The near disappearance of this species from the Yukon-Kuskokwim Delta stimulated the listing of Alaska- breeding Steller's eiders as a threatened species under the Endangered Species Act in 1997. A recovery plan and intensive research program have been initiated. The Steller's eider appeared on the 1986 Alaska Waterfowl Conservation Stamp.

Text: Tom Rothe and Sue Arthur
Illustrations: Katherine Hocker
Revised: April 2000

Alaska Department of Fish & Game

Arctic Grayling

For most anglers in America, the **Arctic grayling** (*Thymallus arcticus (Pallus*)) is a rare freshwater game fish symbolic of the clear, cold streams of the northern wilderness. Grayling occur throughout the arctic as far west as the Kara River in Russia and east to the western shores of Hudson Bay in Canada. Once as common as far south as Michigan and Montana, the Arctic grayling has almost disappeared from the northern United States because of overfishing, competition from introduced species, and habitat loss.


© ADF&G / Ashley Dean

General description: The Arctic grayling is an elegantly formed cousin of the trout. With its sail-like dorsal fin dotted with large iridescent red or purple spots, the grayling is one of the most unusual and beautiful fish of Alaska. Grayling are generally dark on the back and have iridescent gray sides. They have varying numbers of black spots scattered along the anterior portion of both sides. The adipose, caudal (tail), pectoral, and anal fins are gray and the pelvic fins are often marked with pink to orange stripes.

Life history: Grayling have evolved many strategies to meet the needs of life in what are often harsh and uncertain environments. Grayling can be highly migratory, using different streams for spawning, juvenile rearing, summer feeding, and overwintering. Or, in other areas, they can complete their entire life without leaving a short section of stream or lake. Winter generally finds grayling in lakes or the deeper pools of medium-sized rivers such as the Chena and Gulkana, or in large glacial rivers like the Tanana, Susitna, and Yukon. Their tolerance of low dissolved oxygen levels allows grayling to survive the long winters in areas where many other salmonids would die. With the coming of spring, grayling begin an upstream migration to spawning grounds. Some grayling faithfully return every year to the same spawning and feeding areas. Grayling spawn for the first time between age 4 and 6 years and a length of about 11 to 12 inches. Because grayling live up to 30 years in Alaska, they may spawn many times during their life.

Immediately after spawning, adult grayling begin their migration to summer feeding areas. Depending on where they have spawned, the distance traveled can be up to 100 miles. Different sizes and ages of Arctic grayling may be found throughout a whole river system; however there is a discernable pattern of grayling sizes from river mouth to the headwaters. The older, larger adults tend to be more prevalent in the upper reaches of river and stream systems, the sub-adults in the middle, and the juveniles in the lower ends. Grayling fry hatch about three weeks after spawning, and they tend to occupy the quieter waters near where they were spawned. In the early fall, grayling begin to slowly migrate to overwintering areas, which are typically downstream of feeding areas by between several to one hundred miles.

Distribution: During the Ice Age, Arctic grayling survived in unglaciated areas of Alaska in the Yukon River valley and the North Slope. From there, they have spread throughout Alaska, except Kodiak, Southeast Alaska, and the Aleutians. Grayling have since been stocked into a few lakes in southeastern Alaska and on Kodiak Island.

Food habits: Grayling are generalists in their food habits, but drifting aquatic insects, especially mayflies, stone flies, and caddis flies are their primary food items. At times grayling will gorge upon the eggs of spawning salmon, outmigrating salmon smolts, terrestrial insects that have fallen into the water, or even an occasional vole or shrew!

Fishing: The tendency of grayling to eat almost anything endears them to the angling public. Any fishing technique, including bait, lures, and flies, will work at one time or another. Grayling are especially popular because of their willingness to rise to a dry fly. Flyfishing techniques for grayling are similar to those used for any trout species.

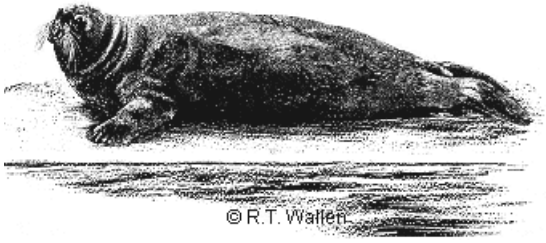
Grayling are often easy to catch, but, as with other species, the most skilled anglers with the best knowledge of grayling feeding patterns and how to fish the water will be most successful. Generalized insect imitations such as the dry fly "Adams" and the "hare's ear nymph" are usually effective patterns for grayling. However, when feeding on a specific insect, grayling can be very finicky and the angler challenged to "match the hatch."

The largest grayling fisheries occur along the road system in Interior Alaska. However, larger-size fish are generally caught in less heavily fished areas. The majority of trophy grayling (greater than 3 pounds) registered by the Alaska Department of Fish and Game have come from the Ugashik Lake and river system of Bristol Bay or river systems of the Nome area. The state record grayling, 23 inches long and weighing 4 pounds 13 ounces, was caught in the Ugashik Narrows.

Original text by Rocky Holmes (1994), revised in 2007 by Andy Gryska
Illustration: Ashley Dean
Revised and reprinted 2007

Alaska Department of Fish & Game

Bearded Seal



Bearded seals (*Erignathus barbatus*) are the largest seal in Alaskan waters and they are found in the Bering, Chukchi, and Beaufort Seas, typically in shallow water that is at least seasonally ice covered. Erignathus means deep jaw and barbatus refers to the long vibrissae or whiskers. Bearded seals have become the most important species of seal for coastal Alaska villages because they provide large quantities of meat, oil, and skins for umiaks (skin boats) and boots. Alaskan Eskimos refer to the bearded seal as ugruk in Inupiaq and maklak in Yup'ik. Skin boots are called maklaks and it is thought that long ago when someone asked for the Yup'ik name of the skin boots, the wearer thought he wanted to know what they were made of and answered bearded seal (maklak).

General description: Bearded seal belong to a group called pinnipeds, which includes other seals, sea lions, and walruses. Seals cannot walk on their hind legs and they do not have external ears. Bearded seals are one of four northern seal species that rely on ice for feeding, resting, and pupping; these four species are collectively called "ice seals." Bearded seals are the largest of the ice seals and adults can be nearly 8 feet (2.4 m) long from the nose to the tip of the tail, not including the hind flippers. They weigh up to 800 pounds (360 kg), in late winter and spring when they are heaviest. Pups are usually 4 feet (132 cm) long and weight about 74 pounds (33.6 kg). Coloration of adults range from silver-gray to dark brown and they have no distinctive markings. They have a small head in proportion to their body, long whiskers, square-shaped foreflippers, and four rather than two mammary teats as found in other ice seals. Bearded seals typically have 34 small teeth that they wear down quickly and seals older than 9 years rarely have teeth that extend above the gum line and so they appear toothless.

Food habits: Bearded seals primarily feed on the bottom, usually in water less than 650 feet (200 m). They eat a variety of benthic invertebrates (crab, shrimp, clams, and snails) and bottom fish (sculpins and flatfish).

Life history: Female bearded seals begin to reproduce at 5–6 years of age and males become sexually mature at 6–7. Females are capable of having one pup every year, but may pup less often depending upon food availability. Females usually give birth to a single pup on top of the ice in late April or early May. Pups weigh about 75 pounds (34 kg) at birth and are about 4 ft (1.3 m) long. Bearded seal pups are born with a soft grayish-brown natal coat called lanugo that is shed about one month after birth when the adult pelage is grown. Pups rapidly increase their weight to around 190 pounds (86 kg) in a nursing period that may last a month. Most of the weight gained is blubber.

Most bearded seals breed around late May or early June just after weaning their pups. Pupping, suckling, and mating occur on the seasonal sea ice within a period of a few months. The active gestation period for bearded seals is only 8.5 months. A 2.5 month delay in the implantation of the fertilized embryo corrects the timing so that the pups are born the next spring. The total gestation period, including the delay in implantation, is 11 months.

Seasonal movements: Bearded seals are thought to move south as the ice advances in winter and north as the receding ice edge from the Bering Sea into the Chukchi and Beaufort Seas. The northward migration occurs in late spring and summer when large numbers of bearded seals migrate through the Bering Strait. Juvenile bearded seals tend to be less associated with ice and are often found in ice free areas such as bays and estuaries. The Native village of Kotzebue, in cooperation with agencies, captured bearded seal pups and released them with satellite transmitters glued to their backs. Bearded seal pups tagged near Kotzebue in October ranged as far north as the village of Wainwright in October and as far south as the Pribilof Islands in December. A few went to Russia, as far south as the Kamchatka Peninsula.

Behavior: Bearded seals can create breathing holes with their claws but do not tend to maintain them in shorefast ice like ringed seals do. Bearded seals are usually solitary animals that can be very wary of their surroundings. They rest close to a hole or crack in the ice so that a quick escape is possible. Bearded seals are less wary of boats and humans in May and June when they "bask" on the ice to increase their skin temperature in order to facilitate the molt. Bearded seals have good vision and hearing, and at least a fair sense of smell. It is common for a bearded seal to surface in the vicinity of a boat, dive then resurface a safe distance away.

Male bearded seals vocalize during the spring breeding season using four types of calls: trills, ascents, sweeps, and moans. Each male has a unique call and males return to a specific breeding territory each year for mating. Scars on the males indicate that fighting may be involved in defending territories as well. Eskimo hunters follow the sound of singing bearded seals to hunt them.

Population size: There are no reliable population estimates available. Population estimates are extremely difficult to attain for ice seals due to the remoteness of their habitats and the amount of time they spend in the water where they cannot be seen to be counted. The population of the Bering and Chukchi Seas was estimated from aerial surveys in the 1970s at 250,000 to 300,000 bearded seals. Bearded seals are not currently listed as 'threatened' or 'endangered' under the Endangered Species Act, nor are they listed as 'depleted' under the Marine Mammal Protection Act.

Predators, hunting, and other mortality: Bearded seals are preyed upon by polar bears, killer whales, man, and possibly walruses. Polar bears attack bearded seals while they rest on the ice. The frequency of predation or importance of bearded seals to polar bears is unknown. Killer whales probably do not target bearded seals but prey on them opportunistically where their ranges overlap in the Bering and Chukchi Seas. Bearded seal skin has been found in walrus stomachs but it is unclear whether walruses kill bearded seals or if a dead seals are scavenged. Alaska coastal residents from Kuskokwim Bay to Kaktovik rely on bearded seals for food (meat and seal oil), skins for their umiaks (skin boats), clothing, and rope. There are no current estimates of the statewide subsistence harvest of bearded seals, but the Ice Seal Committee and the Alaska Department of Fish and Game are working toward collecting annual harvest information. The Ice Seal Committee (an Alaska Native Organization) and the National Marine Fisheries Service entered into a co-management agreement in 2006 to work together on management and research issues related to all ice seal species, including bearded seals.

Text: Mark Nelson
Illustration: J. Venable
Revised and reprinted 2008

Alaska Department of Fish & Game

Razor Clam

The **razor clam** (*Siliqua patula*) is an important bivalve mollusk harvested extensively throughout its range by commercial and sport fisheries. Its scientific name is derived from the Latin: siliqua means pod, and patula means open; thus, "resembling an open pod." The razor clam was first described in 1788 from specimens found near Coal Harbor, Alaska, which was adjacent to the present Kenai Peninsula community of Homer. Four species are currently considered to be present on the west coast of North America. The two most frequently encountered are the **Pacific** (*S. patula*) and the **northern** or **Arctic** razor clam (*S. alta*). The Arctic razor clam is found in southern Cook Inlet westward to the Bering Sea and Siberia. The Pacific razor clam is more widely distributed and is found from Pismo, California, north to the Aleutian Islands. *S. patula* is the more frequently encountered of the two species.

General description: The long, narrow shell of *S. patula* may attain a length greater than 7 inches. In very young specimens, the periostracum, or outermost tissue-like layer of the shell, is brown. It gradually becomes yellowish-brown in medium-sized animals and changes again to brown with age. The periostracum of large or old specimens is usually eroded. The inside of the shell is glossy white, sometimes with purple areas showing through and a prominent rib extends from the upper or early part of the shell to the shell edge. *S. patula* can be distinguished from *S. alta* because the latter generally has a heavier, broader, darker shell. Also, all exposed parts of the mantle (the fold or lobe that contains the shell-secreting glands, siphon (neck), and foot of *S. alta* are colored by dark brown pigment, distinguishing it from *S. patula* which lacks this coloration. The siphon of *S. patula* is less closely fused, has a distinct tendency to separate near the opening and lacks the tubercles. *S. alta* is found higher on the beach and, owing to its short siphon, stays closer to the surface. These characteristics make it easy for commercial and recreational clam diggers to tell the two species apart.

Life history: *S. patula* may become sexually mature as early as the end of its third growing season or following the formation of the third annulus ring; all are probably sexually mature by the time they enter their seventh growing season. Breeding occurs between May and September and is closely associated with rising water temperatures. A temperature of 55°F is believed to be required to trigger spawning. The sexes are separate in razor clams. In breeding, eggs and sperm are discharged onto wet sand and into sea water. Fertilization occurs by chance. Where the razor clam's reproductive cycle lacks efficiency, it compensates with numbers. Although an exact count of the number of eggs contained in a female razor clam is not possible, some researchers have estimated that number at somewhere between 300 thousand and 118.5 million. The larger the female razor clam, the greater the number of eggs produced. It goes without saying that the chance of survival for an individual egg is very, very low. The microscopic larvae bear little resemblance to parent clams. They possess short, hair-like projections called cilia with which they propel themselves. Toward the end of this free-swimming period, which may last from 5 to 16 weeks, the shells begin to form and the young start looking like clams. The young clams take up residence in the sand where their growth rate varies from area to area. Some razor clams in Alaska have attained the age of 18 years, and it's possible that older individuals exist.

Habitat: Razor clams live in surf-swept and somewhat protected sand beaches of the open ocean. They are found from approximately 4 feet above the mean low water level down to depths of 30 fathoms.

Food habits: Razor clams subsist on minute plants and animal life known as plankton filtered from the surrounding seawater.

Shellfish toxicity: Some people are naturally allergic to shellfish, or illness may result because of polluted habitat or storage of clams at too high a temperature. Another source of illness is paralytic shellfish poisoning (PSP) which is caused by the razor clams' ingestion of a one-celled organism that may pass over the clam growing area.

Parasites and commensals: Rarely, small cysts can be seen imbedded in the siphon of the razor clam. These cysts are one of the intermediate stages in the life cycle of a parasitic nematode (round worm) of the common skate. They evidently do not affect the razor clam. By thorough cleaning and cooking, this parasite can be eliminated. Occasionally, a small pink or white leach-like animal may be found attached to the inside of the siphon. This is a nemertean worm that lives commensally with the razor clam. Commensals are animals or plants that live with other organisms and reap benefit from the activities of the host but cause them no harm. The worm is easily removed and does not in any way make the clam unfit to use as food.

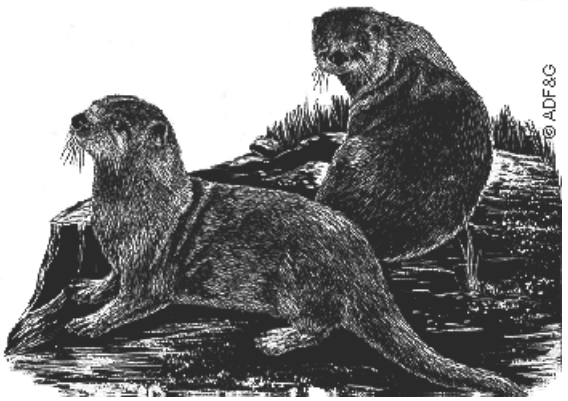
Commercial harvest: Commercial harvest of razor clams has occurred in Alaska since 1916 in the Cordova area and 1919 in the Cook Inlet area. Annual production levels have fluctuated greatly in both areas, reaching approximately 600,000 pounds in Cordova and 500,000 pounds in Cook Inlet. The 1964 earthquake adversely affected razor clam populations in the Cordova area. Swikshak Beach on the Alaska Peninsula is the only other beach certified for the human consumption market where commercial harvest has occurred since 1929.

Recreation harvest: The primary area for the personal use recreational razor clam fishery in Alaska occurs between Kasilof and Anchor River (a 50 mile area) on the east side of Cook Inlet. In this area between 30,000 and 35,000 days of effort are expended annually to harvest a million clams. Whether razor clams are dug for commercial or recreational purposes, the result is the same: good eating!

Text: Dave Nelson
Illustration: Jim Fowler
Revised and reprinted 1994

Alaska Department of Fish & Game

River Otter



The North American **river otter** (*Lutra canadensis*) ranges over most of North America north of Mexico. The river (or land) otter is found throughout Alaska with the exception of the Aleutian Islands, the offshore islands of the Bering Sea, and the area adjacent to the arctic coast east of Point Lay.

River otters, or other otter species, inhabit most of the rest of the world. All are amphibious members of the family Mustelidae along with mink and sea otter. Animals in this family produce a strong, sometimes disagreeable scent, which is discharged from a pair of anal glands.

General description: The North American river otter is a thickset mammal with short legs, a neck no smaller than its head, inconspicuous ears, and a muscular body that is broadest at the hips. Its tail is powerful and a little more than a third as long as its head and body. Only the hind feet are webbed. Adults weigh 15 to 35 pounds (6.8-15 kg) and are 40 to 60 inches (102-152 cm) in length. On the average, females are about 25 percent smaller than males.

When prime, river otter fur appears black-brown, with the belly slightly lighter in color than its back. The chin and throat are grayish. Otter fur consists of a very dense undercoat overlaid with longer guard hairs, which are usually removed by furriers.
River otters appear to have well-developed senses of smell and hearing. Their vision is not especially good but may be better underwater than above. Several sets of strong whiskers are used by the animal in hunting and avoiding obstructions.

Life history: River otters in Alaska breed in spring, usually in May. Mating can take place in or out of the water. One to six pups (usually two or three) are born the next year any time from late January to June following a gestation period of 9 to 13 months. Delayed implantation (a period of arrested embryonic growth) accounts for this variation in the length of gestation.

The pups are born toothless and blind in a den that is usually a subterranean burrow. Their eyes open 7 weeks later. When about 2 months old, they begin to leave the den and shortly thereafter start to swim and eat solid food. They are taught to swim by the female who must coax or drag them into the water. Pups are weaned when about 5 months old. They will stay with their mother until shortly before her next litter is born.

River otters are sexually mature when 2 years old. A female will then mate with the male of her choice and produce one litter each year. Otters can live and breed for more than 20 years.

Behavior: Otters are graceful swimmers and propel themselves in the water by paddling or vertically flexing their hindquarters and thick tails. They can swim at about 6 miles per hour and can go faster for short distances by “porpoising” along the surface. River otters dive to depths of at least 60 feet (18 m) and can stay submerged for more than 4 minutes. They can run as fast as a man and on hard snow or ice reach speeds of more than 15 miles per hour (24 km/hr) by alternately running and sliding.

About half of a river otter's time is spent sleeping. Both young and adults are fond of play. They manipulate rocks or sticks, play tag and hide-and-seek, dunk each other, wrestle, and slide on mud or snow.

Signs of river otter activity are seen more often than the animals themselves. They travel several miles overland between bodies of water and develop well-defined trails that are used year after year. They may flatten and dig up the vegetation or snow over an area of several square yards. Scats, twisted tufts of grass, and small piles of dirt and vegetation are commonly found in such areas. Urine and scent deposited on these piles serve as “scent posts” that are used for communication and territorial marking.

During the winter, otters dig elaborate tunnels and feeding dens within the snow over a frozen lake or bay where fluctuations in water levels leave cracks for them to come and go.

Food habits: River otters in Alaska hunt on land and in fresh and salt water. They eat snails, mussels, clams, sea urchins, insects, crabs, shrimp, octopi, frogs, a variety of fish, and occasionally birds, mammals, and vegetable matter. Aquatic organisms no bigger than a man's finger are usually eaten at the surface of the water; larger food is taken ashore.

If a fish or other animal is too big to be eaten at one meal, the remains are abandoned and become available to other flesh-eating mammals and birds. Scraps left out of the water may be a significant source of food available to some scavengers when snow and ice are present.
Social habits: River otters are often found in groups. A family unit is made up of a female and her pups, with or without an adult male. The family usually travels over an area of only a few square miles. The female appears to dominate the rest and may drive other animals away from a small area around the den where her pups are living.

Other groups may consist of an adult male and female, a litter of pups that remain together after the family separates, or a group of bachelor males. Male groups usually consist of fewer than 10 individuals. Larger numbers that are occasionally seen together may represent a temporary association of neighboring groups. The groups have no apparent leader. Otters travel together and operate as a social unit but do not cooperate in hunting or share what is caught. They travel over a wide area, and apparently there are no exclusive territories. Fighting among otters is extremely rare, although they are wary of strange individuals.

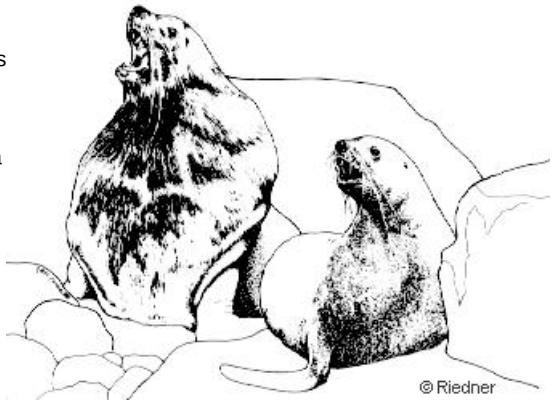
Vocalizations: River otters produce a variety of noises. They growl, caterwaul, and whine. When alarmed, individuals emit an explosive “hah!” When two or more are together, they often produce a mumbling noise that seems to be a form of conversation. A good imitation of this is made by closing the lips and rapidly uttering “hm” several times in a deep voice. A bird-like chirp apparently expresses anxiety and is most often heard when members of a group become separated.

Human uses: River otters have no significant predators except man. They are occasionally killed unintentionally when they become entangled in fish nets or trapped in crab pots. For the last 10 years, between about 1,200 and 2,400 otters have been harvested annually in Alaska for their pelts. They are usually taken in steep traps. Natives in Prince William Sound once hunted otters with the aid of dogs of a nondescript type that were small enough to enter an otter den. The dogs could usually drive out the otter without a fight.

Text: J.D. Solf and Howard Golden
Illustration: Sue Arthur

Alaska Department of Fish & Game

Steller Sea Lion



The Steller (or northern) sea lion (*Eumetopias jubatus*) is the largest member of the family Otariidae, the "eared seals," which includes all sea lions and fur seals. It is the only member of genus *Eumetopias*. Otariids differ from phocids, the "true seals," in having external ear flaps, long forearms resembling flippers used for propulsion, and rotatable hind flippers that allow quadrupedal locomotion on land.

Steller sea lions are known to several languages: in Aleut, *qawax*; in Alutiiq, *wiinaq*; in Central Yup'ik, *uginaq* (sometimes *apakcuk*) and in Siberian Yup'ik, *ulgaq*. The Russian common name translates to "sea wolf." *Eumetopias*, from the Greek, means "having a broad forehead", and *jubatus*, from Latin, means "having a mane."

Steller sea lions inhabit over 300 haulouts and rookeries along the North Pacific rim from Hokkaido, Japan, north along the Kuril Islands into Kamchatka and the Sea of Okhotsk, east along the Aleutian chain and into the central Bering Sea, through the Gulf of Alaska, south through southeastern Alaska, the Canadian Pacific coast and to the Channel Islands off California.

General Description: At birth, pups have dense, coarse, nearly black fur with a frosty appearance because the tips of the hair are colorless. Color lightens after their first molt in late summer. Most adult females are buff colored on the back. Nearly all males stay darker on the front of the neck and chest; some are even a reddish color. Adult males have prominent, broad foreheads and muscular necks.

Males and females have a marked size difference. Weight at birth is 51 pounds (23 kg), and body length is 45 inches (112 cm). Females grow rapidly during the first four years but slow by the fifth year, with little growth after age 6. Males continue to grow until the eleventh year. Although there are variations, most females reach maximum size by the seventh year, and males reach adult size by the twelfth year. The average weight of an adult male is 1,245 pounds (566 kg), and the body length averages 10 2/3 feet (282 cm). Adult females average 579 pounds (263 kg) in weight and 8 2/3 feet (228 cm) in length. Although only 20 percent longer, the average adult male weighs over twice as much as the average adult female.

Food Habits: Scientists use kitchen spoons to scrape sea lion scat off rocky haulouts throughout Alaska and Canada. This scat is examined for the presence of "hard parts," such as fish bones or squid beaks, that can be keyed to prey species eaten by sea lions. Recently, scientists are also attempting to identify the chemical signatures of prey items in the blood and blubber of sea lions.

From this work we know that Steller sea lions are generalist marine predators with a diet of fishes and cephalopods that tends to be predictable by season and region, with the occasional meal of bird or true seal for variety. Some prey are generally available year-round, such as walleye Pollock, Atka mackerel, arrowtooth founder and cephalopods, while others are targeted by sea lions when they become seasonally abundant, such as Pacific herring, Pacific salmon, Pacific cod, eulachon and capelin. Western Alaska diets are dominated by Atka mackerel and walleye pollock and eastern diets feature walleye pollock, Pacific cod, flatfish, rockfish and forage fish. Sea lions can consume prey whole while underwater.

Life History: Males may live up to 20 years and females to 30 years. Males reach sexual maturity at 3-7 years but do not hold territories on breeding rookeries until 9-13 years. Females start breeding at 3-7 years and spend the next two decades either pregnant or lactating. Females are bred in June, but the fertilized egg does not implant until October. Single pups are born the following June, with birthdates at southern rookeries earlier than births at northern rookeries. Twins are rare. Pups suckle from 1 to 3 years, with most apparently weaning after their first winter.

Seasonal movements: Sea lions do not migrate, but do move their "central-place haulout," the center of their foraging activity, to track seasonal concentrations of their many types of prey. They breed on exposed, offshore rookeries during summer and generally move to more protected haulouts in winter, especially in southeastern Alaska. Very young sea lions can swim 75 miles (120 km) non-stop between haulouts. Some sea lions make long-distance movements over long periods of time. The longest recorded movements are Forrester Island to Cape Newenham (1,600 miles / 2,500 km), Kozlof Cape, Russia to Round Island (1,400 miles / 2,300 km) and Medny Island, Russia to Round Island (1,200 miles / 2,000 km).

Behavior: Steller sea lions use rookeries and haulouts on land to rest and suckle their young. Adult females must continue foraging while nursing their pups, and the pups' bodies are well-adapted to fast while females are hunting prey during 1-2 day trips. By their first spring, pups are able to reach similar diving depths as adults but do not do so as frequently. As pups grow older, their swimming and diving patterns grow to resemble that of older sea lions. The behavior of older juveniles and adults appears to track the behavior of their prey; for example, deep diving as prey move deeper during daylight, a focus on night-time behavior while prey are shallow and the gathering of many sea lions at places with seasonal runs of forage fish. Foraging trips are usually within a few tens of miles off haulouts, but the longest recorded continuous foraging trip was 550 miles (900 km) into the Bering Sea. Older juvenile sea lions can dive to at least 1500 feet (500 meters) and stay underwater for over 16 minutes.

Population size: During the late 20th century, the western Alaska Steller sea lion population (the Gulf of Alaska and Aleutian Islands) suffered a substantial decline, but there are signs of stabilization in recent years. The first population trend counts made in 1956-1960 estimated at least 140,000 sea lions in this area. A major population decrease was first detected in the eastern Aleutians during the mid-1970s and the estimated population dropped to 110,000 by the late 1970s. The decline spread eastward into the Kodiak Archipelago during the late 1970s and early 1980s, then spread westward through the Aleutian Islands during the early to mid-1980s, with the steepest declines of 15% per year occurring during the late 1980s. By 1990 the population was 30,525, and decline continued through the 1990s at 5.4% per year. Between 2000 and 2004, surveys found increasing or stable numbers throughout the Western Stock. Meanwhile, the Eastern Stock has increased by over 3% per year since the 1970s, and likely exceeded 50,000 animals in 2007. Indeed, new breeding rookeries have become established in southeastern Alaska in the early 21st century.

In 1990, Steller sea lions were listed as "threatened" range-wide under the Endangered Species Act of 1973 due to the dramatic population decline in the western portion of their range. Meanwhile, scientists identified substantial genetic differences, regional differences in population trend and a low exchange rate of breeding animals between rookeries, indicating that Steller sea lions existed in "distinct population segments." Thus, in 1997, the population was split immediately east of Cape Suckling on the Gulf of Alaska coast (near 144º W longitude) into an "endangered" Western Stock and "threatened" Eastern Stock. Recent work suggests a third subdivision between Asian and North American populations within the Western Stock may be appropriate.

Predators, hunting, and other mortality: At the turn of the 21st century, there is substantial effort being made to identify causes for and remedies to the Western stock population decline, and these are the subject of considerable debate. The possible sources of the decline being examined are grouped into “top-down” processes, such as predation, disturbance, intentional killing and entanglements, and “bottom-up” processes, such as reduced prey quality or abundance and long-term shifts in their environment. Assessment of these threats and planning for the recovery of Steller sea lions is a long-term collaborative process involving numerous stakeholder groups. One-fifth of one percent of Steller sea lions sighted during surveys in southeastern Alaska are entangled by marine debris including packing straps and fishing gear, but the extent of mortality due to this is unknown.

Historically, Steller sea lions were used as a food source, clothing, boat coverings, meat for fox farms and craftwork. The commercial pup harvest in 1964-1972 provided fur for clothing manufacture. Contemporary use includes food, some clothing and craftwork. While the Steller sea lion population is listed as “depleted” under the Marine Mammal Protection Act of 1972, and thus subsistence takes are subject to Federal management, subsistence harvest continues because it has not been shown to contribute to the decline. Between 2000-2004, 191 were taken per year in the Western stock, and 6 per year in the East.

Revised by Michael J. Rehberg (2008)
Original text by Stephen T. Zimmerman (1994)

Alaska Department of Fish & Game

Whitefish Species

Whitefish are the most abundant group of fish north of the Alaska Range, inhabiting almost every type of river and freshwater habitat in this section of Alaska. Whitefish are important in the food chain of the aquatic community, as they are a major food item for many predatory fish. They have potential as a sport fish, and a few small commercial fishing operations exist; however, their greatest use in Alaska is as a subsistence food for Natives and their dogs. The sheefish, or inconnu (genus *Stenodus*), is the largest species of whitefish. This paper deals with the seven smaller whitefish species belonging to the genera *Prosopium* and *Coregonus*.

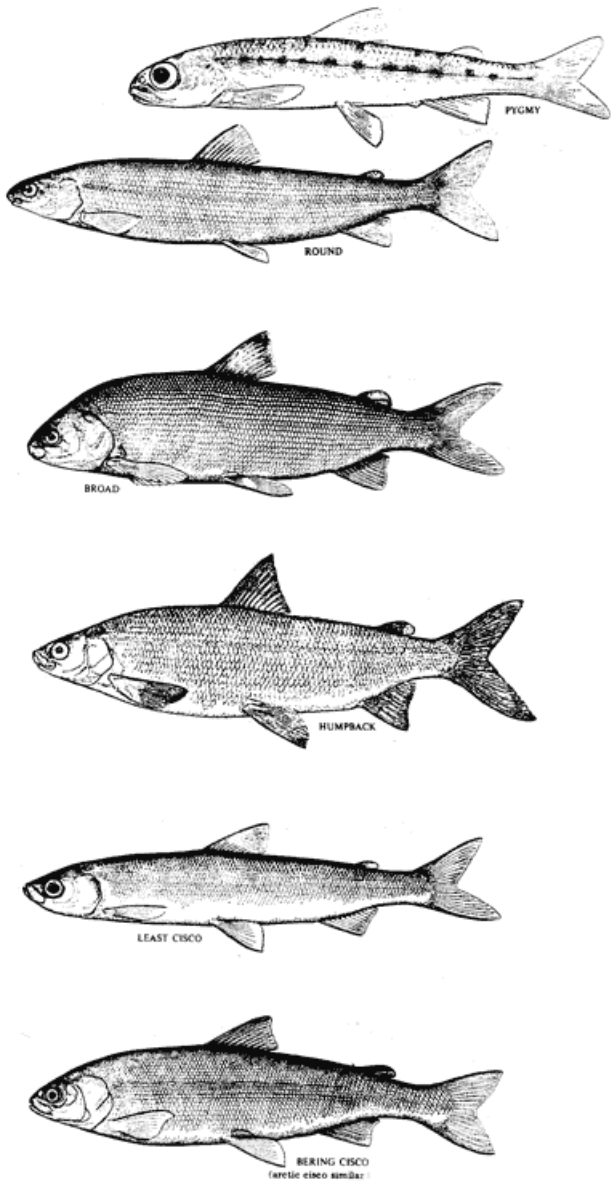
Whitefish in general are silver-colored with large scales, fleshy dorsal and adipose fins, no teeth, and a small fleshy appendage at the base of the pelvic fin called a pelvic axillary process.

Round and pygmy whitefish: Both the round whitefish (*Prosopium cylindraceum*) and the pygmy whitefish (*P. Coulteri*), have rounded cigar-like bodies with tiny, pointed snouts and single nasal flaps. In both species the upper jaw extends out over the lower so the mouth is underneath, or inferior. The young have parr marks, dark transverse bands, which disappear in the second year of life. The pygmy whitefish has a toothless mouth and large eyes. Round whitefish in most streams seldom exceed 16 inches in length, while pygmy whitefish rarely reach 8 inches.

Broad and humpback whitefish: The genus *Coregonus* contains the broad whitefish as well as three whitefish known as "ciscoes." The broad whitefish (*Coregonus nasus*) and the humpback whitefish (*C. oidschian*) are referred to as true whitefish. In both species the mouth is inferior, an adaptation for bottom feeding. Their diet consists mainly of small clams, snails, aquatic insects, larvae, and freshwater shrimp. In both species, the head is small and the body deep or wide from stomach to backbone. The broad whitefish can be distinguished from the humpback by its larger size, deeper head, shorter gillrakers, and short, blunt snout.

In Alaska the broad whitefish is found in the Yukon and Kuskokwim river drainages and in the Bering and Chukchi seas and Arctic Ocean drainages. Spawning occurs in the fall with most fish spawning over a gravel bottom. The humpback whitefish is distributed throughout all drainages north of the Alaska Range, as well as in the Copper and Susitna rivers, Bristol Bay drainages, and in isolated river systems farther south. They first spawn at 4 or 5 years of age and start their upstream migration during the summer and fall. Spawning occurs in the upper reaches of rivers in October, usually over a gravel bottom. As with other whitefish, the humpback digs no nest but broadcasts its eggs which lodge in the gravel. Growth varies from river to river, though humpback whitefish attain lengths of 22 inches and 5 pounds in eight years. Both the broad and humpback whitefish are important in the subsistence economy of Alaska Natives; they have commercial value as well as providing sport fishing opportunities.

Least cisco: The least cisco (*C. said*) sometimes erroneously called herring, is a slender herring-like fish with a superior mouth, which means a weak lower jaw projecting beyond the upper. Adults are brown to olive green and silvery below. The least cisco is found in lakes, streams, and estuaries of the Bristol Bay drainage. At the age of 4 to 6, mature least cisco migrate upstream in the fall to spawn in clear streams with gravel bottoms north of the Alaska Range. Spawning takes place in early October. Least cisco found in lakes seldom exceed 14 inches, while those in the Chatanika River in Interior Alaska reach 19 inches and 4.5 pounds. Least cisco are very important in the food chain, as they are eaten by predacious sheefish, pike, and burbot. A sport fishery on least cisco takes place in the upper Chatanika River during the fall; both spears and hook and line are used to catch them.



Courtesy of the Fisheries Research Board of Canada

Arctic and Bering Ciscoes: The Arctic cisco (*C. autumnalis*) and Bering cisco (*C. Laurettae*) are similar in appearance. They are distinguishable from the least cisco by smaller eyes and scales, more silver color, white pectoral and pelvic fins, and terminal mouths (at the tip of the body). Both ciscoes feed on invertebrates and to a lesser extent on other fish. Little is known of the biology of either fish. They are tolerant of high salinity and are often found in estuaries. The Arctic cisco is found in arctic Canada and Siberia and from the Point Barrow area eastward along the Beaufort Sea coast to the Canada border. Bering cisco are found in the Bering Sea drainages of the Seward Peninsula, Norton Sound, and Yukon and Kuskokwim rivers. The Bering cisco is a notable migrator: spawning fish have been observed 1,200 miles up the Yukon River and 600 miles up the Kuskokwim River. They spawn in the fall at an average of 6 years. Bering cisco taken at Hess Creek in the middle Yukon River reach 17 inches and 3.5 pounds. Arctic cisco from the Colville River reach 14 inches, 1. 5 pounds, and may live 10 years. Both are much sought-after commercial fish and are sold as "white trout."

Text: Kenneth Alt
Illustration: Courtesy of the Fisheries Research Board of Canada
Revised and reprinted 1994

Food and Environment of Razor Clams, Steller Sea Lions, Common Eiders, and River Otters

Circle the following foods/environments that Razor Clams are dependent upon:

Rocky Cliffs *Minnows*

Plankton *Rivers*

Semi- protected sandy beaches

Circle the following foods/environments that Steller Sea Lions are dependent upon:

Squid *Beluga Whales*

Sandy Beaches *Salmon*

Exposed Rookeries / Rocky Outcroppings

Circle the following foods/environments that Common Eiders are dependent upon:

Mountains *Driftwood / Clumps of Grass*

Tundra Ponds *Rocky Cliffs*

Semi- protected sandy beaches

Circle the following foods/environments that River Otters are dependent upon:

Salt Water *Clams*

Sea Urchins *Fresh Water*

Plankton

Interview Questions

Student's Name_____ Date_____

Animal / Fish_____ Elder's Name_____

Directions: Fill out the following worksheet with your animal / fish. Prepare your interview questions. Come up with at least one extra interview question. You can write the responses below the questions.

Question 1: Can you please share the Inupiaq word for _____?

Question 2: Do you think a _____ would live here (show photograph)? Why?

Question 3: When you are hunting / fishing _____, what do you do to respect the animal?

Question 4
What does _____ eat?

Question 5
How has hunting / fishing _____ changed in your lifetime?

Question 6
Write your own question here…