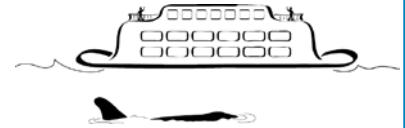


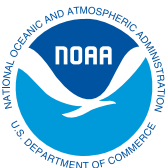
2nd-3rd Grade
Curriculum

Saving Springer:

How NOAA helped an orca go home



May 2012



U.S. Department of Commerce
National Oceanic and
Atmospheric Administration
Washington D.C.

The *Saving Springer: How NOAA helped an orca go home* curriculum for grades 2-3 and 4-6 was developed by NOAA's National Marine Fisheries Service, Alaska Fisheries Science Center. The curriculum was developed by Lisa Hiruki-Raring, Harriet Huber, Peggy Foreman and Donna Sandstrom. Graphics were developed by Wendy Carlson and Karna McKinney. Graphic layout was provided by Rebecca White and Karna McKinney. Photos were provided by Mark Sears, Bob Wood, Lynne Barre, John Durban, and Marilyn Dahlheim. Killer whale images were provided by Uko Gorter (www.ukogorter.com). OrcaLab (www.orcalab.org) donated the use of Track 7, First Contact. 1:30 am, July 14 from The Return of Springer CD, used in the Lesson 6 Comic Strip activity, with permission from Dr. Paul Spong. The Seattle Aquarium provided the J-pod trading cards, and Dyanna Lambourn (Washington Department of Fish and Wildlife) provided the images of blood samples. Funding was provided by NOAA's National Marine Fisheries Service (Headquarters office, Alaska Fisheries Science Center, and Northwest Regional Office).

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Curriculum Introduction

Purpose Statement

To introduce killer whale (orca) biology, research and management through the story of an orphaned killer whale named Springer, and illustrate how NOAA, the community, and other agencies both in the United States and Canada worked together to reunite Springer with her pod.

Objectives

The goal of this curriculum is to encourage students to become stewards of their environment by learning about the issues faced by Springer and other killer whales. Our hope is that Springer's story will inspire students to take action on these issues and others that matter to them.

This curriculum will accomplish the following objectives:

- Tell the story of how an orphaned orca was reunited with her family, under the leadership of the National Oceanic and Atmospheric Administration (NOAA) in the United States, Fisheries and Oceans Canada and the Vancouver Aquarium in Canada, and with support from the community in both countries.
- Teach core concepts in the biology, physiology, and social structure of the Pacific Northwest orca communities.
- Define current issues faced by orcas and other marine mammals in the Pacific Northwest and other regions.
- Develop awareness of NOAA and the role it plays in science, research, management, protection of species, and community involvement.
- Promote student stewardship by highlighting the community's active involvement in the Springer project.

Throughout this curriculum, the terms "killer whale" and "orca" are used interchangeably.

How to Use the "Saving Springer" Curriculum

This curriculum may be used as a stand-alone course, or as extensions integrated into other curricula. The primary theme is killer whales; science materials also address topics such as sound, social structure, decision-making, community involvement, food webs, Native American and First Nations culture, stewardship, vocational opportunities, and problem solving.

The curriculum consists of seven lessons, each with two accompanying activities. The activities were designed to:

1. Reinforce and expand the lesson themes,
2. Provide hands-on opportunities for students to investigate and integrate the information they learned, and
3. Establish a baseline of understanding for the issues that are the focus of the final lesson on stewardship.

The curriculum was designed to be flexible enough that teachers can pick and choose activities to suit their classroom and students. For example, a teacher might:

4. Do only one activity for a lesson instead of two,
5. Split the lesson into two sessions if the class period is shorter than 60 minutes,
6. Do only one or two of the lessons or activities after watching the DVD, or
7. Integrate elements of stewardship into each lesson rather than doing the seventh lesson (Stewardship) as a separate lesson.

How does this material meet Washington State Educational Standards?

This curriculum was specifically designed to meet the Washington State Essential Academic Learning Requirements for Science. The most current versions of the Science requirements are provided on the first page of each lesson. As standards are updated, the curriculum will be updated. The lessons also align with the following Ocean Literacy Principles (<http://oceanliteracy.wp2.coexploration.org>):

- **Essential Principle 5** The ocean supports a great diversity of life and ecosystems.
- **Essential Principle 6** The ocean and humans are inextricably interconnected.

How do I integrate this material?

The curriculum can be integrated into subjects other than science. Suggested links are found in the Curriculum Overview (page 5) and Integrated Matrix (page 6). The curriculum can also be taught by a team of teachers, dividing activities according to content areas.

What are the assessment methods?

Assessment methods vary with each lesson and activity. Any of these methods can be given a point value and entered into a grade book. Methods include:

- ◆ Pre- and Post-test
- ◆ Visual representations
- ◆ Data analysis
- ◆ Geographical display (maps)
- ◆ Summary of observations using technical writing
- ◆ Verbal presentations
- ◆ Creative writing
- ◆ Activity books
- ◆ KWL chart (Know, Wonder, Learn)

How much time do I need?

The Springer unit has seven lessons. Each lesson includes an introductory whole class presentation (DVD, PowerPoint presentation or overheads), followed by two hands-on activities. Each lesson is intended to be completed in 60 minutes. The whole unit can be accomplished in seven school days. The curriculum assumes no prior understanding of orcas or issues impacting them.

Materials

Provided in curriculum kit at <http://www.afsc.noaa.gov/education>

- Digital copy of lesson plans, activities, and worksheets for activity book
- Seven introductory presentations (PowerPoint format or PDF files). Overheads can be made from the PDF files.
- Digital copy of maps – blank and teacher key
- Digital picture of Springer and her mother
- Student activity books (PDF format)
- DVD “Saving Springer” (Lesson 1, Activity 1.2); contact afsc.outreach@noaa.gov if unable to download from website)
- J,K,L, and one A cards, to be laminated (Lesson 2, Activity 2.2)
- Directions for “You’re the Vet” stations, to be placed on tables (Lesson 4, Activity 4.1)
- Labels for the 35 ft string used in “You’re the Vet” activity (Lesson 4, Activity 4.1)
- Food chain cards for students and posters for teachers, (Lesson 5, Activity 5.2)
- The Return of Springer CD, track 7 (used with permission of OrcaLab) (Lesson 6, Activity 6.2)
- PDFs of J-Pod orca cards

Provided by teacher

- Butcher paper (Lesson 1, Activity 1.1; Lesson 6, Activity 6.1; Lesson 7, Activity 7.1)
- Blind folds (optional) (Lesson 2 , Activity 2.1)
- Ink pad (5-6) (Lesson 3, Activity 3.1)
- Balloons (1 per student) (Lesson 3, Activity 3.2)
- Materials for “You’re the Vet” activity stations (Lesson 4, Activity 4.1)
 - ◆ Fish sauce or water from tuna can
 - ◆ Measuring tape, yard stick or ruler (optional)
 - ◆ String (35 ft) with labels attached (labels are provided)
 - ◆ Three Petri dishes
 - ◆ Three film canisters or small containers with cotton balls
 - ◆ Two nail polish remover swabs
 - ◆ Three sandwich bags with chocolate pudding powder
 - ◆ Spaghetti broken into 2” pieces
- 4 carpet squares (or bases) (Lesson 5, Activity 5.2)
- Large white construction paper (Lesson 6, activity 6.2)

Culminating project ideas

Consider choosing a stewardship activity from Lesson 7 and making it a project to work on each week, either individually or as a class. Suggestions for culminating projects:

Raise money to adopt a whale—including Springer!

- ♦ Whale Museum, San Juan Island – <http://www.whalemuseum.org/programs/orcadoption/orcadoption.html>
- ♦ Vancouver Aquarium – <http://killerwhale.vanaqua.org>
- ♦ Orcalab/Born Free Organization – <http://www.bornfree.org.uk/give/adopt-an-animal/springer> (Windows)
<http://www.bornfree.org.uk/give/adoptan-animal/springer> (Mac)
- Make your own Springer book with all of the writing and art extension ideas from the Integrated Matrix (page 6)
- Make a picture timeline of the events in this story
- Make an ABC book with vocabulary and important events in this story
- Create a public service announcement (video, radio or poster) to raise awareness of issues faced by orcas in the wild
- Teach what you've learned to someone else (family, another class, etc.)
- Write a skit or play about Springer and act it out for students at your school
- Participate in a habitat restoration project
- Post your project or thoughts at the Springer's Story website <http://www.springerstory.org>
- Create your own stewardship activity

Culminating activities

Programs that can be used as extensions to the curriculum:

- Seattle Aquarium Orca Discovery Class – in Educator's Guide
<http://www.seattleaquarium.org/document.doc?id=1374>
- Killer Whale Tales – dynamic presentation on orcas, research techniques and stewardship (<http://www.killerwhaletales.org>). Also available through the Seattle Aquarium.
- Whale Trail – locations where students can view whales from shore in the Puget Sound area (<http://thewhaletrail.org>)

Resource station

Although not required, we strongly recommend creating a resource station to support this curriculum. The resource station provides the opportunity for students to investigate and explore the topics of this curriculum in small groups or on their own. Materials could include:

- Books and videos from the library. In each lesson of the student activity book, there are suggestions for books and websites to explore. A list is also in Appendix 3.
- Computer for students to explore websites
- Two dorsal fins traced to show the height of adult male and female fins
- Interactive bulletin board offering fun facts, jokes, cartoons, posters, coloring sheets, or any extension or integrated topic related to Springer, whales, or related subjects

Curriculum Overview

Grade Level: 2nd–3rd

Lesson	Topic	Type of Activity	Length of Time (minutes)	Materials	Assessment
1	Introduction Who is Springer? What will we learn?	Activity 1.1 Pre-Assessment	20	<ul style="list-style-type: none"> Pre-Test KWL poster paper *teacher needs to make large version PowerPoint presentation Student activity books NOAA DVD 	Pre-Test KWL
		PowerPoint presentation	10		
		Activity 1.2 NOAA DVD	30		
2	All about orcas Killer whale anatomy and natural history Family structure	PowerPoint presentation	20	<ul style="list-style-type: none"> PowerPoint presentation Classroom map (shown on document reader or overhead) Student activity books Small pieces of paper with the letters J, K, and L on them 	Map locations Participation in activity Activity pages choose culminating activity project (optional)
		Activity 2.1: Map activity and Parts of a whale	20		
		Activity 2.2: Find your orca family	20		
3	Who's that Whale? Identification Methods: Photo ID Acoustics	PowerPoint presentation and map activity	20	<ul style="list-style-type: none"> PowerPoint presentation Classroom map Student activity books ink pads (5-6) blindfolds (optional) balloons (30+) 	Map locations Participation in activity Activity pages Work on culminating activity project (optional)
		Activity 3.1: Thumbprints and Saddle Patches	20		
		Activity 3.2: Make a whale call	20		
4	What should we do? Medical assessment Rescue strategies Risks, Decision Making, and Action	PowerPoint presentation and map activity	20	<ul style="list-style-type: none"> PowerPoint presentation Classroom map Student activity books Activity 4.1 stations: 4 instruction cards 1. 32 ft. piece of string with tags 2. Measuring tape (optional) 3. Three Petri-dish blood sample photos 4. Three small containers with cotton balls, two with nail polish remover and one with fish sauce 5. Three sandwich bags filled with watered down chocolate pudding (two with cooked spaghetti added) 	Map locations Participation in activity Activity pages Work on culminating activity project (optional)
		Activity 4.1: You're the Vet	20		
		Activity 4.2: Stranding Networks	20		
5	Journey to Health Rehabilitation strategies Monitoring Behavior Medical Food	PowerPoint presentation and map activity	20	<ul style="list-style-type: none"> PowerPoint presentation Classroom map Student activity books Food chain cards for students Food chain posters for teachers 4 carpet squares (or bases) 	Map locations Participation in activity Activity pages Work on culminating activity project (optional)
		Activity 5.1: Killer whale behaviors	20		
		Activity 5.2: Food chain game: Let's Eat	20		
6	Homecoming Relocation Reintegration Culture	PowerPoint presentation and map activity	20	<ul style="list-style-type: none"> PowerPoint presentation Classroom map Student activity books Activity 6.1: 4 direction posters, 6-8 pieces of butcher paper "Return of Springer" track 7 	Map locations Participation in activity Comic strip Work on culminating activity project (optional)
		Activity 6.1: Moving a whale	20		
		Activity 6.2: Comic strip	20		
7	Stewardship Population Endangered status Stewardship	PowerPoint presentation and map activity	10	<ul style="list-style-type: none"> PowerPoint presentation Classroom map Student activity books Poster paper (3) or butcher paper KWL- already up in the class 	Map locations Activity pages Post-Test or KWL Present culminating activity project (optional)
		Activity 7.1: How can I help?	40		
		Activity 7.2: Post-Test or KWL	20		

*materials that are in bold need to be supplied by the teacher

Integrated Matrix

Grade Level: 2nd–3rd

Subject	Lesson 1 Introduction and DVD	Lesson 2 All about orcas	Lesson 3 Who's that whale?	Lesson 4 What should we do?	Lesson 5 Journey to health	Lesson 6 Homecoming	Lesson 7 Stewardship
Reading	Introduce Resource Station	Read Springer's Journey Book	Highlight the glossary	Stranding Stories	Vocabulary Hangman	Vocabulary Pictionary	Vocabulary Quiz
Science	Pre-Test and KWL	Map activity and Parts of a Whale	Thumbprints and Saddle Patches	You're the Vet	Orca behaviors: Charades or Picture game	Moving a Whale	How can I help?
	Watch DVD	Find your Orca Family	Make a Whale Call	Stranding Networks	Food chain game: Let's Eat!	Comic strip: Acoustic Recognition	Post-Test and KWL
Math	How long can you hold your breath?	Orca calf facts	Matriline math	Pen dimensions	How much do they eat?	Calculate the boat's speed from Seattle-Campbell River, and Campbell River- Dong Chong Bay	Jeopardy Game
Soc. Studies	Pre-Teach scale (large and small scale)	Map locations	Map locations	How might your classroom help if a whale was orphaned in your area?	Study more about the Whale Museum	Study the tribes who welcomed Springer	Find a Canadian pen pal your age
Writing	Journal	Journal	Journal	Journal	Journal	Journal	Journal
	What do you know about NOAA? What do you want to learn about NOAA and whales?	Have you ever seen a whale or another marine mammal? Describe what happened and how you felt.	Write an acrostic poem using either Whale, Orca, or Springer as the starting word	When whales are sick, describe how they might look different	What does Canada need to do to get ready for Springer's return?	What stories might Springer have told the orcas who welcomed her home?	Brainstorm ways you and other students can help protect our oceans
Art	Make an origami whale	Make a model of Springer, using clay or other materials	Draw a picture of Springer for the cover of your journal	Make a magnet supporting stranding networks	Draw a picture of a killer whale behavior	Mask/Totems	Design a Poster that promotes stewardship of our oceans

K-1 Teacher suggestions: Read the book, Springer's Journey, and have the students do a few activities:

Find your orca family Game (Activity 2.2); Thumbprints and Saddle Patches (Activity 3.1), and orca behavior charades (Activity 5.1)

<h1 style="margin: 0;">Lesson One</h1> <h2 style="margin: 0;">OVERVIEW</h2>	<h1 style="color: #0072bc; margin: 0;">Introduction</h1>	
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Subject Area(s)	Life science	Grade Levels: 2 nd -3 rd
Lesson Topic	Pre-Assessment, overview of Saving Springer unit, “Saving Springer: Orphan Orca” DVD	Lesson Title: Introduction
Key words:	orca, orphan, Springer, NOAA	Teaching Time: 60 minutes
Materials	<ul style="list-style-type: none"> Pre-Test or Know-Wonder-Learn (KWL) chart written on large butcher paper (small version provided) PowerPoint presentation NOAA DVD “Saving Springer: Orphan Orca” Activity books 	
WA State Standards (WA: EALRs)	Communication EALR 1: Listening and observation skills	
Ocean Literacy Principles	OLP 5 The ocean supports a great diversity of life and ecosystems. OLP 6 The ocean and humans are inextricably interconnected.	
Focus Questions	<ul style="list-style-type: none"> What is NOAA and what is its role? What will we learn in the “Saving Springer” unit? 	
Learning Objectives	At the end of this lesson students will be able to: <ul style="list-style-type: none"> Explain who Springer is Discuss how researchers and NOAA scientists helped Springer 	
Anticipatory Set (Engage)	Pre-Test and/or KWL: Give students the Pre-Test to assess what they already know, or fill in the first two columns of a KWL chart	
Explain (Encounter)	Activity Book: Hand out activity books and have students look through them. PowerPoint presentation: Introduction to the whole unit, highlighting NOAA’s role and how the agency helped an orphaned orca go home. Resource station: Highlight materials at the station and encourage students to explore and learn more about orcas.	
Guided Practice (Investigate)	Activity 1.1 Pre-test/KWL: This Pre-Test (optional) is exactly the same as the Post-Test. Place in an envelope when done. Then create a KWL chart on butcher paper, fill in first two columns with class, and keep at the front of the class for the duration of the unit. Activity 1.2 DVD “Saving Springer: Orphan Orca.” After watching the DVD, ask students to share what they learned about real scientists. Encourage students to share the story with their families.	
Assessment	<ul style="list-style-type: none"> Pre-Assessment (Pre-Test or KWL chart) Culminating project (optional, see Curriculum Introduction) 	
Integrated Extension Ideas	Reading: Books at the resource table or websites on resource page. Science: Define “cetacean” and compare toothed whales to baleen whales. Research the dolphin family and learn how dolphins and porpoises are similar and different. http://www.acsonline.org/education/curriculum Math: How long can you hold your breath? Compare to cetacean diving data http://www.acsonline.org/education/curriculum , page 14 Social Studies: Help students understand the difference between large and small scales on maps. http://rockyweb.cr.usgs.gov/outreach/articles/isntthatspatial_scale.html Writing: In journal: “What do you know about NOAA? What do you want to learn about whales?” Art: Make an origami whale http://www.enchantedlearning.com/crafts/origami/whale/	

Washington State Science Learning Standards: EALR = Essential Academic Learning Requirements

Lesson 1: Introduction

I. Whole class activity (30 minutes)

A. Activity 1.1. Pre-Assessment: Pre-Test or a Know-Wonder-Learn (KWL) Chart, and introduction of activity books. (20 minutes)

1. Hand out Pre-Test and have students complete them.
2. Have a student or adult hand out the students' activity books while you are setting up the KWL chart or PowerPoint. Students will use the activity book each day they study the Saving Springer curriculum. Have them write their name on the cover and take a look inside. Point out the glossary at the back and encourage them to use it whenever they are not familiar with a word used in the lesson.
3. If you choose to do a KWL chart, display the class KWL chart either on butcher paper or on a section of whiteboard. Keep the chart at the front of the class for the duration of the unit. 8.5x11" version included in teacher manual.
4. Ask students the questions below and write down their responses in the left column. Students also have the chart in their Activity Book.
 - a) What do you already KNOW about killer whales, Springer, and NOAA?
5. Have students fill in the middle column (what they WANT to learn about killer whales, Springer, and NOAA). Remind them that this table is a work in progress. Students can add more questions in later lessons, as new issues are introduced.

B. Resource Station (5 minutes)

1. Point out books, DVD, and CD. Encourage them to explore more. Appendix 3 gives some suggestions of books and resources. You can also create an interactive bulletin board with quotes and statistics about whales, photos, articles, and artwork.

C. PowerPoint presentation (5 minutes)

1. Show the students the Lesson 1 PowerPoint. It introduces Springer, gives an overview of what is in this unit, and introduces NOAA and its role in Springer's story.

II. Activity (30 minutes)

A. Activity 1.2: Watch DVD "Saving Springer: Orphan Orca" (30 minutes)

Background: This DVD can be used as a reference at the resource table. Set aside time to discuss the video and answer questions.

III. Assessment

A. Pre-Assessment (Test or KWL)

B. Culminating project (optional)

IV. Extension activities - see ideas in Lesson Overview

KWL

What do you KNOW about Springer or killer whales in general?	What do you WONDER about Springer or killer whales in general?	What have you LEARNED about Springer or killer whales in general?
What do you KNOW about NOAA	What do you WONDER about NOAA	What have you LEARNED about NOAA

Pre-Test

Springer and Orcas
Questionnaire

Name:

Grade:

School:

This questionnaire is to find out how much you know about orcas. Please circle the answer you think fits best.

1. An orca or killer whale is
 - a. a fish
 - b. a marine mammal
 - c. a baleen whale
 - d. the largest member of the porpoise family
 - e. none of the above
2. Orcas usually live:
 - a. in pairs
 - b. in family groups led by a female
 - c. in family groups led by a male
 - d. alone
 - e. none of the above
3. Orcas use sound to:
 - a. find food underwater
 - b. find their way around underwater
 - c. scare enemies away
 - d. a and b
 - e. none of the above

For the next questions, circle True if you think the statement is true, or False if you think it is not true.

4. Orcas can be identified by their calls.
True False
5. Orcas stay in the same place all year round.
True False
6. There are different types of orcas.
True False
7. Springer is a southern resident orca.
True False

For the next questions, fill in the spaces.

8. Name 2 things that orcas eat:
 - 1.
 - 2.
9. Name 2 ways that NOAA scientists study orcas:
 - 1.
 - 2.
10. Name one way that people can affect where orcas live:
11. Name one way that people helped Springer go home.
12. What does NOAA do to help orcas?

Thank you!

Teacher's Key

Springer and Orcas Questionnaire

Name:

Grade:

School:

This questionnaire is to find out how much you know about orcas. Please circle the answer you think fits best.

- An orca or killer whale is
 - a fish
 - X b. a marine mammal**
 - a baleen whale
 - the largest member of the porpoise family
 - none of the above
- Orcas usually live:
 - in pairs
 - X b. in family groups led by a female**
 - in family groups led by a male
 - alone
 - none of the above
- Orcas use sound to:
 - find food underwater
 - find their way around underwater
 - scare enemies away
 - X d. a and b**
 - none of the above

For the next questions, circle True if you think the statement is true, or False if you think it is not true.

- Orcas can be identified by their calls.
 True False
- Orcas stay in the same place all year round.
 True **False**
- There are different types of orcas.
 True False
- Springer is a southern resident orca.
 True **False**



For the next questions, fill in the spaces.

- Name 2 things that orcas eat:
 - Fish (salmon, schooling fish like herring)
 - Marine mammals (e.g. porpoises, other whales, seals, sea lions, otters); seabirds
- Name 2 ways that NOAA scientists study orcas:
 - by taking photographs of them and identifying them by their saddle patch and dorsal fin
 - by listening to their calls underwater
 - by watching their behavior
 - by putting instruments on them and following their movements
 - by taking skin samples and looking at their genetics
- Name one way that people impact where orcas live:
 - pollution (toxins accumulate in orcas and can get passed on to babies in the mom's milk; pollution can come from things around the water, or on land, like oil that drips from a car and gets washed into the Puget Sound; also litter like balloons and drink holders can be eaten by whales)
 - boating (if there are lots of boats around, they might hit orcas; also boats with motors give off exhaust fumes which are close to the surface where whales breathe)
 - fishing (fewer fish for orcas to eat)
 - underwater noise (affects the whales' ability to communicate and echolocate)
- Name one way that people helped in the Springer project
 - Reporting the original sighting to NOAA
 - Monitoring pre and post release
 - Fund-raising
 - Getting donations for the project
 - Welcoming her home
- What does NOAA do to help orcas?
 - studies fish and marine mammals
 - keeps track of orca populations, lists populations as endangered if they are low, manages their recovery
 - regulates fishing so that fish populations are not overfished
 - studies weather and oceanography
 - tracks hurricanes, warns about tsunamis... etc.



Thank you!

The purpose of this lesson is to provide an overview of the curriculum, and introduce the class to the topics that will be covered.

Saving Springer




How NOAA helped an orca go home




Introduction Who is Springer?

- Orphaned orca calf
- Lost near Seattle
- Rescued and returned to her pod (2002)
- Still healthy and with her pod! (2011)




See Springer’s 2011 health report at <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/upload/A73-health-2011.pdf>



Introduction Why tell Springer’s story?

- First and only successful return of an orca to the wild
- To get Springer home, people had to work together





Introduction
What will you learn?

- Who Springer is and how she went home
- All about orcas
- How people helped:
 - NOAA
 - Community
 - Kids!
- What you can do to help whales now



NOAA



Introduction
What is NOAA?

- N = National
- O = Oceanic and
- A = Atmospheric
- A = Administration

- Studies and protects the air and the oceans
- Co-led Springer project

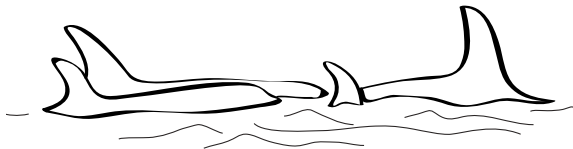


Introduction
Today's activities

- Watch DVD –
“Saving Springer:
Orphan Orca”



Mark Swartz

<h1 style="margin: 0;">Lesson Two</h1> <h2 style="margin: 0;">OVERVIEW</h2>	<h1 style="font-size: 2em; color: #0072bc;">All about orcas</h1>	
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Subject Area(s)	Life science	Grade Levels: 2nd -3rd
Lesson Topic	Killer whale natural history, anatomy, and family structures.	Lesson Title: All about orcas
Key words	orca, dorsal fin, saddle patch, rostrum, pectoral fin, flukes, blowhole, pod, range, matriarch, resident orcas, transient orcas, offshore orcas	Teaching Time: 60 minutes
Materials	<ul style="list-style-type: none"> Classroom map PowerPoint presentation Letters (J, K, L, and one A) cut up (hint: laminate if you can before you cut) Activity books (crayons) 	
WA State Standards (WA: EALRs)	Science EALR 1: Systems (SYS) Science EALR 4: Life Science, Structures and Functions of Living Organisms (LS1) Social Studies EALR 1: Civics Social Studies EALR 3: Geography	
Ocean Literacy Principles	OLP 5 The ocean supports a great diversity of life and ecosystems.	
Focus Questions	<ul style="list-style-type: none"> What is an orca? Where do orcas live? What are the different kinds of orcas in the Pacific Northwest? What is the social structure of resident orcas? 	
Learning Objectives	At the end of this lesson students will be able to: <ul style="list-style-type: none"> Identify the general body parts of a whale Explain how family pods are organized Explain how family pod members find each other 	
Anticipatory Set (Engage)	PowerPoint presentation: All about orcas. Background on social structure of orcas and where they live.	
Explain (Encounter)	Activity 2.1 Introducing map activity and Parts of a Whale: Tell students that they will start each lesson with a map activity to establish basic geographic locations. Do Lesson 2 map activity and worksheet in activity book. Use classroom map on document reader or overhead.	
Guided Practice (Investigate)	Activity 2.2 Find your orca family. Students are given a small piece of paper with one letter on it (J, K, or L) and are told not to share with anyone. Students spread out and call out their letter to find the rest of their pod. Try a second time with students’ eyes closed; add the letter A, to represent Springer (from A-pod), and add noise pollution by clapping or banging.	
Assessment	<ul style="list-style-type: none"> Color the map locations Activity book worksheets Culminating project (optional) 	
Integrated Extension Ideas	<p>Reading: Introduce the book Springer’s Journey by Naomi Black.</p> <p>Science: Compare orca society to other animal societies (e.g. wolves or elephants).</p> <p>Math: Trace an orca female on an overhead and make a life sized 2-year-old calf (11 ft long), so students can see Springer’s size. http://acsonline.org/fact-sheets/orca-killer-whale</p> <p>Social Studies: Relate locations on the map to places students are familiar with.</p> <p>Writing: In journal: “Have you ever seen a whale or another marine mammal? Describe what happened and how you felt.”</p> <p>Art: Make a clay model of Springer.</p>	

Washington State Science Learning Standards: EALR = Essential Academic Learning Requirements

Lesson Two: All about orcas

I. Whole class activity (20 minutes)

A. PowerPoint presentation (20 minutes)

Show students the Lesson 2 PowerPoint presentation, which contains background information about killer whales that will help students learn more about killer whales from the Pacific Northwest and British Columbia.

II. Activities (40 minutes)

A. Activity 2.1 Map Activity and worksheet (20 minutes)

Background: U. S. and Canadian government agencies worked closely together to bring Springer home. Students will use maps to follow Springer’s story geographically, charting her location during all phases of the project. Prompt students to discuss what they already know about Canada (e.g. winter Olympics in Vancouver, family vacations). Knowing Springer’s location can help students put the scale of the map into perspective.

1. With map activities, you can choose to do the activities exactly the way the students are doing them, or you can do several activities on the same map so that the students can see how the locations relate to each other over several lessons.
 - a) Lessons 2, 3, and 4 use the same map (west coast of North America)
 - b) The Lesson 5 map is a close-up of Puget Sound
 - c) Lessons 6 and 7 use the same map (Washington and British Columbia)
2. Show the classroom map on the document reader or overhead projector. Demonstrate how to label the map and where to color.
3. In students’ activity books (Lesson 2: Map Activity), have students color the United States turquoise blue and underline the four states Washington, Oregon, California, and Alaska.
4. Have students color Canada green, including Vancouver Island and the Queen Charlotte Islands.
5. Now turn to the Lesson 2 worksheet in the activity workbook and label the parts of a killer whale. Emphasize to students that the saddle patch on whales is different on the left and right side of every whale.

B. Activity 2.2 Find your Orca Family (20 minutes)

Background: In the ocean, visibility decreases with depth. Killer whales use sound to navigate, find food, and communicate. Though the distance between whales in a pod may change throughout the day, they can usually hear each other. Each pod has a set of unique calls. Increased underwater noise due to boat traffic can make it hard for orcas to hear each other and to echolocate.

Materials needed:

letters provided (J,K,L, and one A); cut into individual squares and laminated
Students will do two rounds of this activity.

Round 1:

1. Hand each student a paper letter (J, K, or L) and tell each student not to show it to anyone. Do not use the A paper on the first round. Because of the relative sizes of the J, K, and L pods in Puget Sound (L is the largest pod), there are more L letters. If you don't have enough letters for your class, add more L letters.
2. Ask students to spread out. Tell students to find others who have the same letter (by calling out their letter), and gather together in a group or pod. When you say "Begin," students can only say the letter on the piece of paper.
3. Give students about 1-2 minutes or until three distinct groups are formed. Tell students there are three resident pods in the Pacific Northwest and southern British Columbia region, and each pod makes certain calls specific to their pod. Whales find each other by calling underwater, in the same way that the students found others in their group.
 - a) J-pod has about 26 whales
 - b) K-pod has about 19 whales
 - c) L pod is the largest pod, with about 41 whales

To get a more up-to-date number of whales per pod visit:

<http://www.whalemuseum.org/programs/orcadoptio/whalelist.html>

4. Have students find the oldest girl in each of the pods. Tell the oldest girl she is the leader of her family group. The pods include grandmothers, mothers, their children, aunts, uncles, and cousins, but no fathers. The father whales live with their mother for their entire lives. Introduce the term **matriarch** (the oldest female in a pod or family group, who leads the group).

Round 2:

5. Hand each student a paper letter (J, K, or L) and tell each student not to show it to anyone. For the second round, have students spread back out, but this time with their eyes closed. Explain that light only reaches the upper portion of the ocean, so whales rely on sound to navigate underwater. Secretly replace the letter from one student with the A card (Springer). As students begin to call out their letters, create noise to simulate boat noise in their environment (clap hands, rustle papers, stomp feet, bang on table).

Discussion:

6. After students have found their family pods again, ask them what was challenging during the second round, compared with the first. Possible answers:
 - a) It was hard to hear their group. As the noise level increased, so did the volume of their calls.
 - b) Ask students what noises are in the oceans. How could those sounds “mask” or compete with the vocalizations of killer whales? Noise pollution from vessels, construction, research, and other sources is one of the top three issues affecting southern resident orcas.
 - c) In the first round, students could rely both on sight and sound. With their eyes closed, the students might have been moving around more slowly, causing them to take longer to form groups.
 - d) Students might also say that it was hard to decipher between J and K because they sounded more similar than J’s and L’s or K’s and L’s.
 - e) Ask the student with the A card whether any of the other students responded to his/her calls. How did it feel to not find any other family members? Was it stressful, sad, or lonely?

Explain that Springer is not a member of the Puget Sound area pods (southern residents), she is a northern resident killer whale from A pod. When Springer was in the Seattle area, southern resident killer whales did come to areas close to where she was swimming, but did not socialize with her.
7. Have the matriarch of each pod (oldest girl) collect the small pieces of paper with the letters on them and give to you.

III. Assessment

- A. *Mapping activity*
- B. *Worksheets and participation in activities*
- C. *Culminating project (optional)*

IV. Extension activities — see ideas in Lesson Overview

Saving Springer

How NOAA helped an orca go home



Lesson 2. All About Orcas



The goal of this lesson is to establish and review key concepts about orcas that are important in understanding Springer's story. This will also review and reinforce concepts that were covered in the DVD ("Saving Springer: Orphan Orca.")



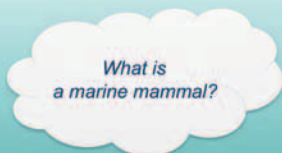
All about orcas What will you learn?

- What is an orca?
- What is a pod?
- What do orcas look like?
- Where do orcas live?
- How do orcas communicate?



All about orcas What is an orca?

- Marine mammal
- Largest member of the dolphin family
- Top hunter in the sea (nothing eats an orca!)



Characteristics of a marine mammal:

- Has live babies (does not lay eggs)
- Has fur or hair
- Warm-blooded
- Nurses its young (feeds it milk)
- Breathes air

A marine mammal is a mammal that lives in the ocean.



All about orcas
Orcas live in pods



- Orca families are called pods
- Organized around the mothers

- Orca pods are matriarchal: organized around the mother. A pod consists of a mother, her children, and her daughters' children.
- Each maternal group (a mother and her offspring) is called a subpod.
- One pod may consist of many subpods, related to each other through their mothers.



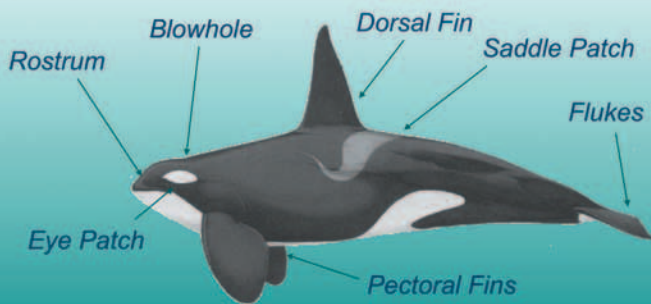
All about orcas
Orcas live in pods

*Did you know...
Orcas stay with their mothers
their whole lives!*

*If you see one member of
a pod, the other whales
are usually nearby.*



All about orcas
What does an orca look like?





All about orcas Where do orcas live?

- All oceans
- Arctic (north) and Antarctic (south)
- Coastal and deep-ocean
 - Well-studied populations in Iceland, Norway, Antarctica, Argentina, and the Pacific Northwest of the United States and Canada



All about orcas 3 kinds of orcas in the Salish Sea

- Resident
- Transient
- Offshore

What kind of orca eats mostly fish?

Salish Seas =
Puget Sound
+ Strait of Juan de Fuca
+ Strait of Georgia

Where do the offshores live?

Who eats seals?



All about orcas Resident pods of the Salish Sea

- Northern residents
 - 34 pods (A, G, R)
 - 261 whales (2011)
- Southern Residents
 - 3 pods (J, K and L)
 - 88 whales (2011)

Orca ecotypes are differentiated by their diet, range, and social structure. For example, residents are mostly fish-eating, have a relatively smaller range, and live in large pods. Transients are mostly mammal-eating, have a wider range, and live in smaller pods. Offshores are mostly fish-eating, and live in deeper waters. (see "Saving Springer: Orphan Orca" DVD)

The Salish Sea includes the Strait of Georgia, the Strait of Juan de Fuca, and Puget Sound.

- This slide should be updated each year with current data about the populations.
- The resident orcas of the Salish Sea (Pacific Northwest and British Columbia) are one of the most well-studied populations of killer whales. Most of what we know about orcas has emerged from studying these groups.
- As of July 2011, the Southern Resident population totals 88 individuals. (The Center for Whale Research, <http://www.whaleresearch.com/research.html>)
- Northern Resident numbers provided by Graeme Ellis, DFO, from the Northern Resident Photo ID catalogue, Canadian Technical Report of Fisheries and Aquatic Sciences #2942.
- More information on Southern Resident Killer Whales is available at <http://www.nwfsc.noaa.gov/publications/documents/SRKW%20Newsletter%202011.pdf>
- More information on Northern Resident Killer Whales is available at <http://killerwhale.vanaqua.org/page.aspx?pid=1346>



All about orcas

How do orcas communicate?

- Vocalizations
 - Different languages for pods and groups of pods
- Behaviors
 - Tail-slapping, pectoral fin slapping, breaching
- Orcas also use sound to hunt by echolocation

This slide is anticipatory for topics that are covered in greater depth in lessons 3, 4 and 5, respectively.



All about orcas

Today's activities

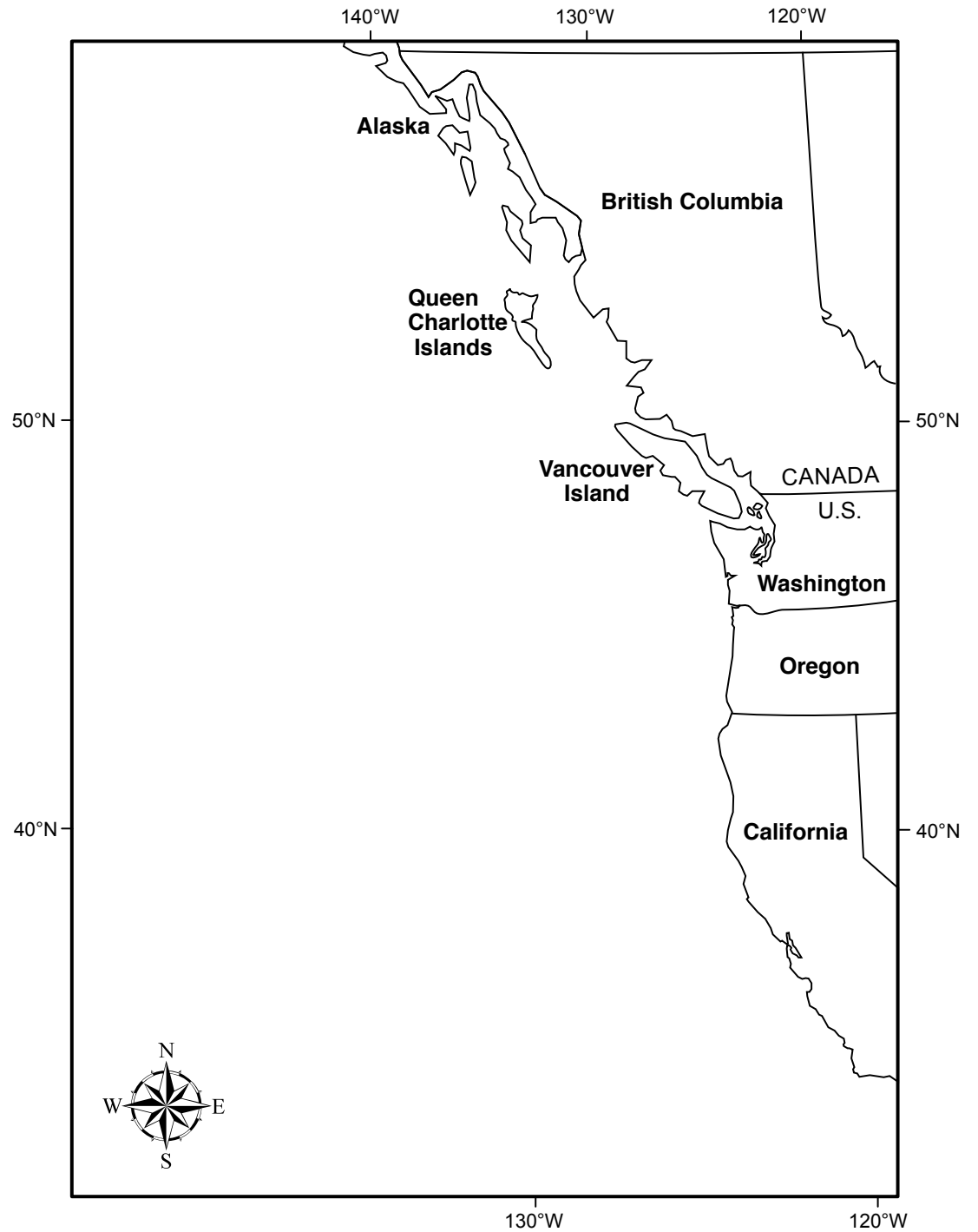
- Map/Timeline
- Find your orca family

Map activity

Color the following locations:

- Washington – blue
- Oregon – blue
- California – blue
- Alaska – blue
- British Columbia – green
- Vancouver Island – green
- Queen Charlotte Islands – green

The blue on your map shows part of the USA and the green shows part of Canada.

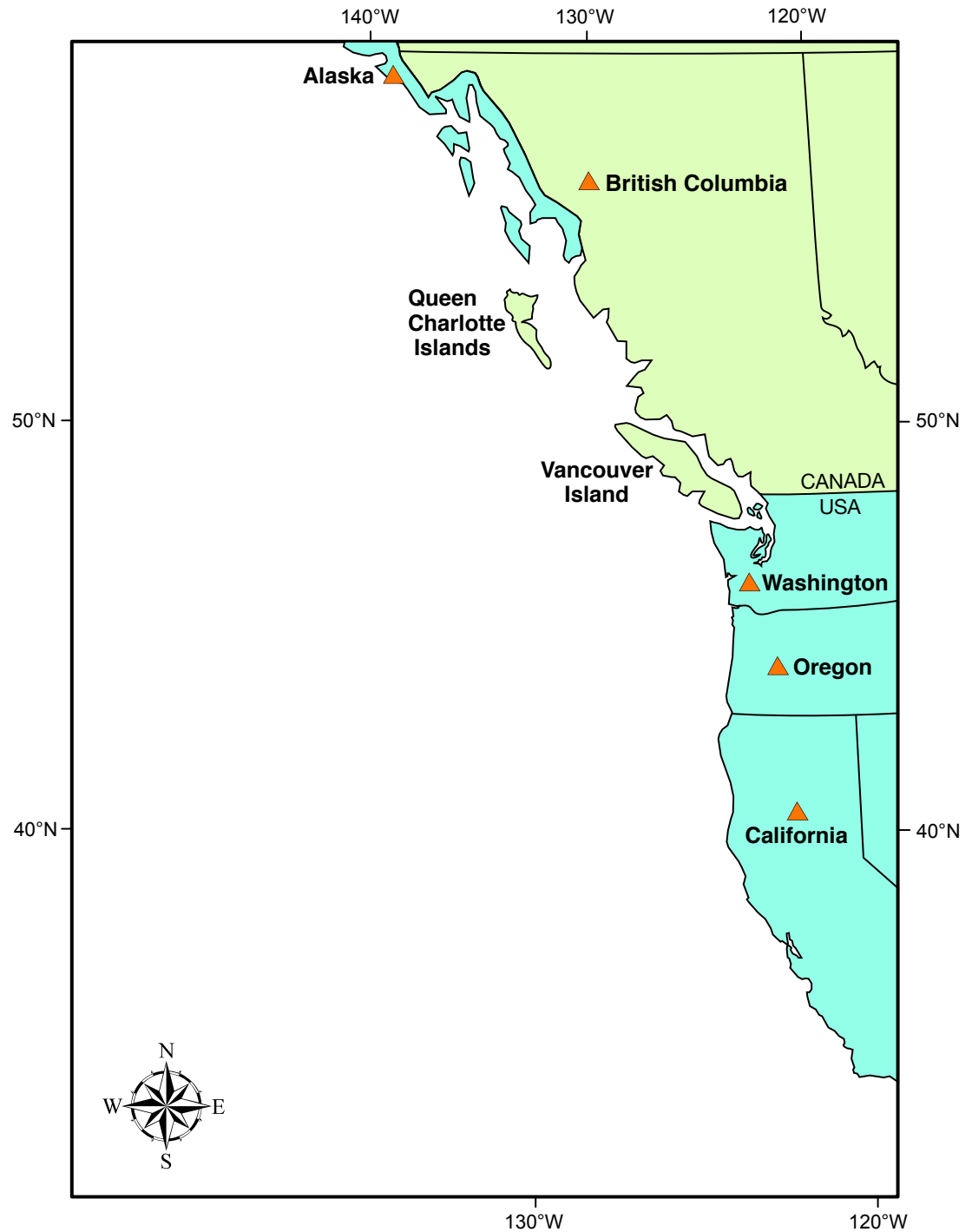


Map activity **KEY**

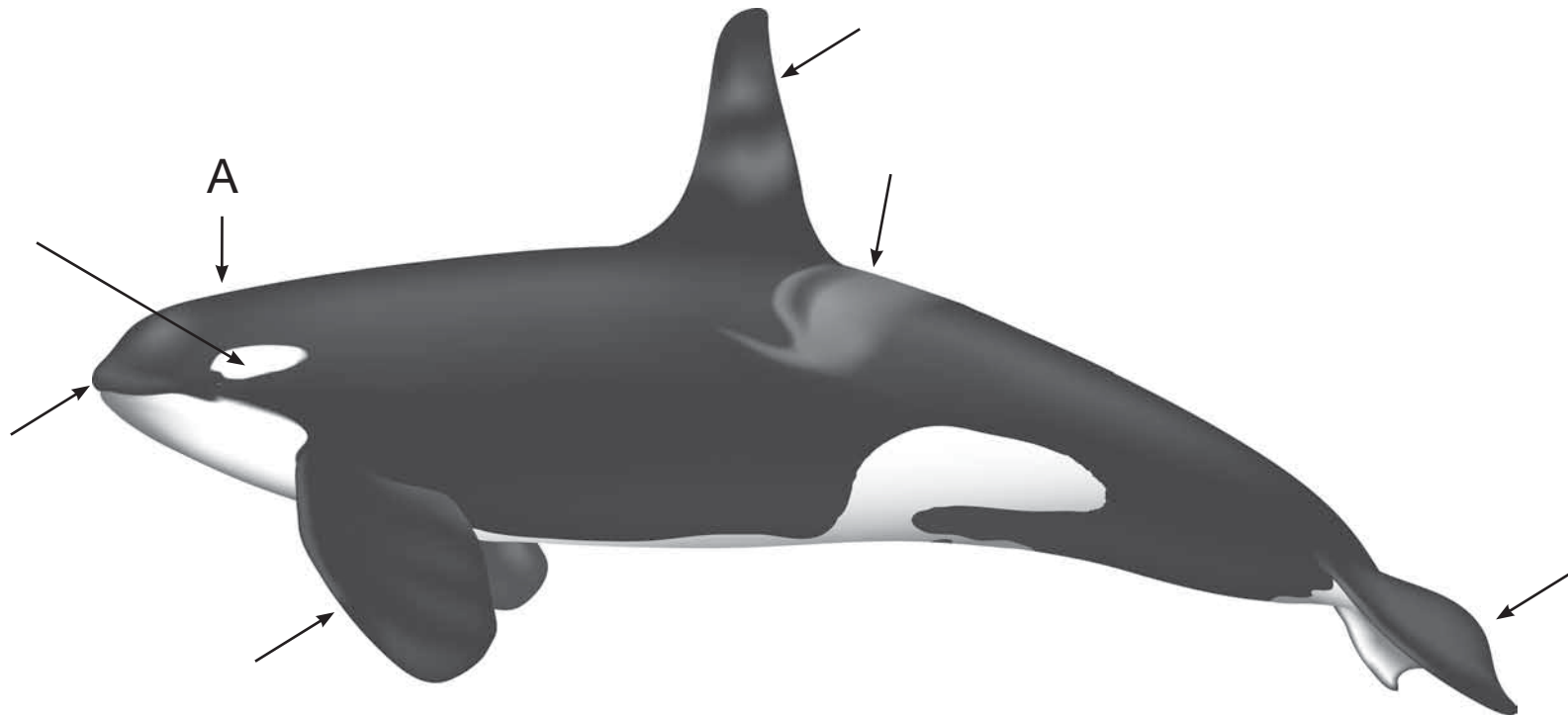
Color the following locations:

- Washington – blue
- Oregon – blue
- California – blue
- Alaska – blue
- British Columbia – green
- Vancouver Island – green
- Queen Charlotte Islands – green

The blue on your map shows part of the USA and the green shows part of Canada.



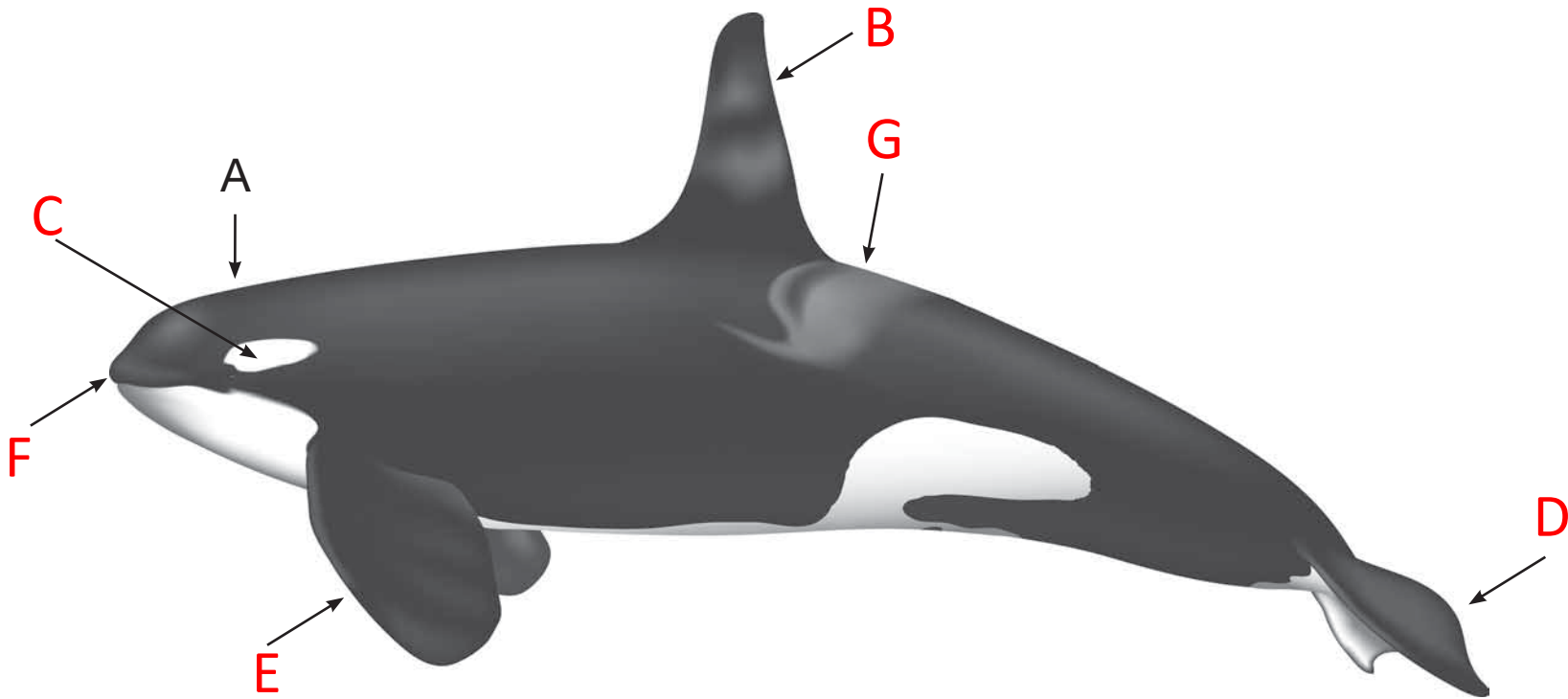
Label the parts of an orca



Put the letter of the body part next to where it belongs on the orca (see example A). For extra credit, describe how the body part is used.

- | | |
|---------------|------------------|
| A. blowhole | E. pectoral fins |
| B. dorsal fin | F. rostrum |
| C. eye patch | G. saddle patch |
| D. flukes | |

Label the parts of an orca **KEY**



Put the letter of the body part next to where it belongs on the orca (see example A). For extra credit, describe how the body part is used.

- | | |
|---------------|------------------|
| A. blowhole | E. pectoral fins |
| B. dorsal fin | F. rostrum |
| C. eye patch | G. saddle patch |
| D. flukes | |

Activity 2.2 Find your orca family

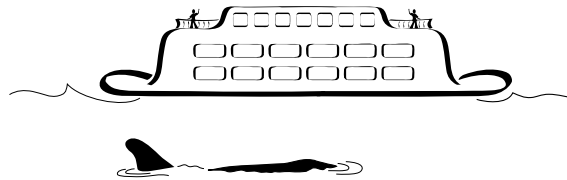
Grade Level: 2nd–3rd

Directions: If possible, laminate this page before cutting the letters. Cut the cards and mix them up. See Lesson 2 Activity 2.2 instructions. There are more whales in L pod compared to the other two pods, hence the numbers of L's compared to J's and K's. Depending on your class size you might need to add more L's or not use all of the cards; however, make sure you use the A.

J	K	L	L
J	K	L	L
J	K	L	L
J	K	L	L
J	K	L	L
J	K	L	L
J	K	L	L
J	K	L	L
J	K	L	A

Lesson Three OVERVIEW

Who's that whale?



Subject Area(s)	Life science	Grade Levels: 2nd -3rd
Lesson Topic	Identification Methods: Photo ID and acoustics	Lesson Title: Who's that whale?
Key words	identification, acoustics, vocalizations, echolocation clicks, calls, spectrogram, sonogram, saddle patch, dorsal fin	Teaching Time: 60 minutes
Materials	<ul style="list-style-type: none"> Classroom Map PowerPoint presentation Ink pads and practice paper 	<ul style="list-style-type: none"> Balloons (1 per student, with a few extras) Activity books
WA State Standards (WA: EALRs)	Science EALR 4: Life Science, Biological Evolution (LS3) Science EALR 4: Physical Science (PS2) Social Studies EALR 3: Geography	
Ocean Literacy Principles	OLP 5 The ocean supports a great diversity of life and ecosystems.	
Focus Questions	<ul style="list-style-type: none"> Who is Springer? Where is she from? 	<ul style="list-style-type: none"> How do researchers identify individuals? How do whales communicate?
Learning Objectives	At the end of this lesson students will be able to: <ul style="list-style-type: none"> Explain how to tell individual whales apart List the different sounds killer whales make Draw a visual representation of sound 	
Anticipatory Set (Engage)	Map activity: On the classroom map (shown on document reader or overhead) and the student books, plot locations and connect them, and have students color in the range of the southern resident whales in their activity books, following the teacher's example.	
Explain (Encounter)	PowerPoint presentation: Background information on Springer's arrival in the Puget Sound, methods scientists use to identify individual killer whales, and the roles of NOAA and the community in Springer's story.	
Guided Practice (Investigate)	Activity 3.1 Thumbprints and Saddle Patches: Students find that a person's thumbprint and an orca's saddle patch are both unique to an individual. Students will describe their thumbprint and compare to those of others in the class. Activity 3.2 Make a whale call: Students use balloons to create their own killer whale calls and write down each call using symbols to describe it, sort of like a spectrogram.	
Assessment	<ul style="list-style-type: none"> Map locations and participation in activities Activity book worksheets 	<ul style="list-style-type: none"> Culminating project (optional)
Integrated Extension Ideas	Reading: Highlight the Glossary and encourage students to look up unfamiliar words. Science: Look at the underside of humpback whale flukes and compare to saddle patches of killer whales. Is this photo ID method used for other whales and dolphins? Math: Matriline math- have students determine the age of whales by using the dates they were born (see http://www.whalemuseum.org/programs/orcadoptio/whalelist.html or use J-pod trading cards from curriculum PDF). Social Studies: Go into more detail about locations on classroom map. Writing: Write an acrostic poem using either Whale, Orca, or Springer as the starting word Art: Design a cover for students' journals with a picture of Springer	

Washington State Science Learning Standards: EALR = Essential Academic Learning Requirements

Lesson Three: Who’s that whale?

I. Whole class activity (20 minutes)

A. Map activity (10 minutes)

1. Highlight these two locations on the general area map:
 - a) Queen Charlotte Islands, in Canada
 - b) Monterey Bay, in California
2. The two points make up the northern- and southern-most points of the range of southern resident killer whales (J, K, and L pods).
3. Show the Teacher Key map (3A), with the red range, on the document reader or overhead. Show where the Queen Charlotte Islands and Monterey Bay are.
4. On the map in Lesson 3 of the students’ activity books, have students circle the two locations with a red crayon. Draw an oval shape range in the water, close to shore. Use a blank map on the document reader and model how to circle the locations, connect them with a line, and shade in the range.
5. Students can now fill the shape between the line and the shore. It should create a shape similar to the range on the Teacher Key.

B. PowerPoint presentation (10 minutes)

1. Show the students the Lesson 3 PowerPoint presentation, which gives background information on Springer’s arrival in the Puget Sound, describes methods used by scientists to identify individual killer whales, and outlines the roles of NOAA and the community in this part of Springer’s story.

II. Activities: 40 minutes

A. Activity 3.1 Thumbprints and Saddle Patches (20 minutes)

Background: A killer whale’s saddle patch is similar to a person’s fingerprints: each is unique to an individual. The right and left sides of a whale’s saddle patch are also different. These distinguishing characteristics help scientists tell different whales apart, which is why researchers take photographs of whales to identify them. Encourage students to compare their fingerprints with those of other students to see how they are alike or different.

Materials needed:

Ink pads (5-6 or one per group)

1. Have students their activity books to the “Thumbprints and Saddle Patches” worksheet (page 12 in activity book).
2. Tell students that every human has a different fingerprint. Have students put their thumb on an ink pad (gently) and then place it in the square labeled “Place your thumbprint here.” If they press down on the ink pad too hard, the fingerprint will not come out clearly.
3. Have a neighboring student put his or her thumbprint in the square labeled “Neighbor’s thumbprint.” Have students compare thumbprints with their classmates. Ask them to describe the patterns in the thumbprints and find characteristics that make them unique.
4. Tell students that every orca has a saddle patch that is unique (one of a kind), like a fingerprint is unique for each student. Compare and contrast the two saddle patches on the right side of the worksheet.

5. Lastly, have students observe the orca photos in the worksheet again to see if they can find other distinguishing characteristics that might help scientists tell whales apart. (There is a nick on the dorsal fin of the whale on the left, and the shapes of the dorsal fins are slightly different.)

B. Activity 3.2 Make a whale call (20 minutes)

Background: Orca calls are repeated and consistent over time. The noise is made by residual air left in the nasal cavity. Scientists listen to whale vocalizations on a hydrophone (underwater microphone) and record them for further analysis. Computer programs play back the sound and show the sound visually as a spectrogram (also called a sonogram). In this activity, students will use balloons to create whale calls. They will transcribe the sounds in their activity books, using notations similar to those used by killer whale researchers. The activity books also have links to websites with more information about sound. This activity may be done as a whole class, in pairs, or in small groups.

Materials needed:

Balloon for every student, plus a few extras

1. Instruct students to turn to Whale Calls in their activity books (page 13). Ask them to think of the sounds they heard in the PowerPoint presentation for this lesson and share with them that they will have the opportunity to create a similar noise with a balloon.
2. Demonstrate how to make the whale sounds with the balloons. Show how to stretch the balloon, blow it up, and then release the air at different intervals to make the sounds. Stretch the neck of the balloon to make different types of sounds. If you pinch the neck of the balloon and let air out at intervals, or stretch the neck of the balloon as you let air out, you can make a sound that goes up or down, or short staccato sounds.
3. Demonstrate how to make notations to represent the call (separate vertical lines, swooping line, wiggly line).
4. Pick from one of the following options:
 - a) You make the whale calls, and the students draw the notations. You could then show them two notations and make one call. Have students figure out the notation for that call.
 - b) Hand out the balloons and have students practice for 1-2 minutes. Once the students make what they think would be a good whale call, encourage them to make the call more than once, then draw notations to match the call. Students can switch drawings with a friend and have them attempt to make that sound.
 - c) Have students break into groups, create three calls with notations, demonstrate one call for the class, and have the class guess which call it is based on the group's notation for their three calls.
5. When finished, collect the balloons or have students put them away.

III. Assessment:

- A. *Map range for southern resident killer whales.*
- B. *Worksheets and participation in activities*
- C. *Culminating project (optional)*

IV. Extension activities – see ideas in Lesson Overview

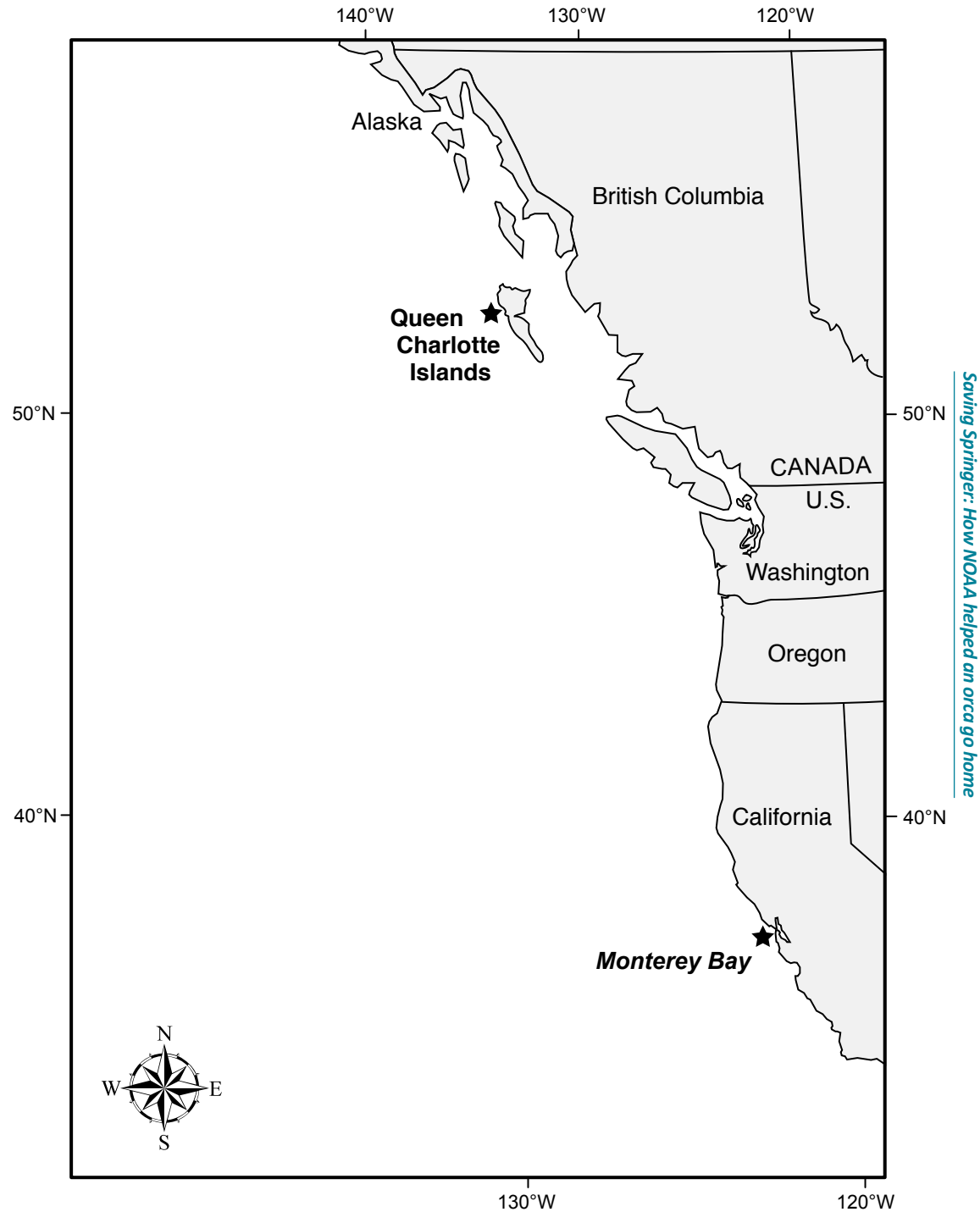
Map activity

Draw a red line between the two stars on your map. Draw your line close to the land.

★ Queen Charlotte Islands

★ Monterey Bay

Using your red crayon, color all the water between your line and the land. See the teacher's red area on the class map. This is where J, K, and L pods live. They swim, hunt, rest, and play in this large area of water. We call this area their range.

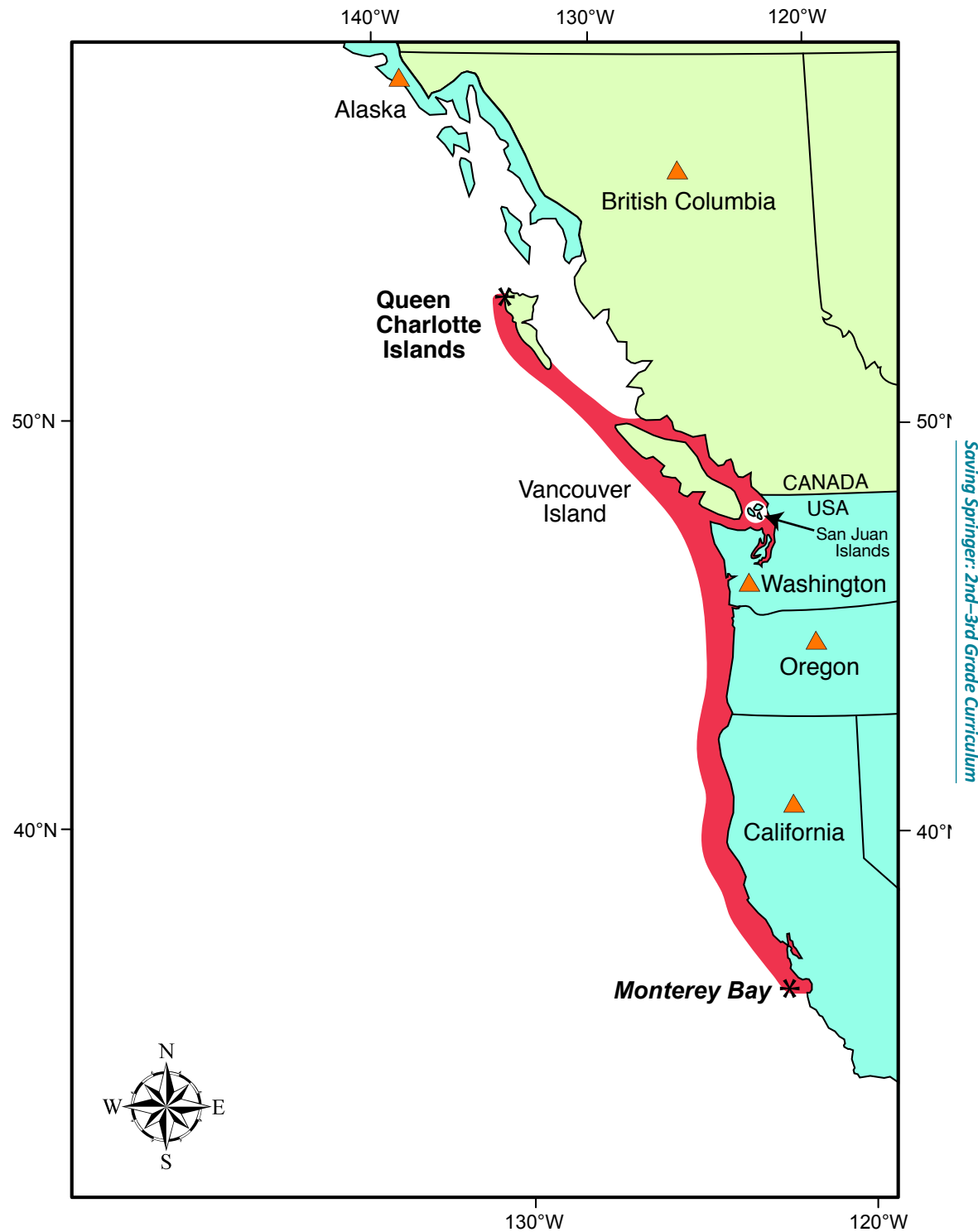


Map activity **KEY**

Draw a red line between the two stars on your map. Draw your line close to the land.


- ★ Queen Charlotte Islands
- ★ Monterey Bay

Using your red crayon, color all the water between your line and the land. See the teacher's red area on the class map. This is where J, K, and L pods live. They swim, hunt, rest, and play in this large area of water. We call this area their range.



Saving Springer

How NOAA helped an orca go home




Mark Dean


Mark Dean

Mark Dean

Lesson 3. Who's that Whale?




This lesson tells the beginning of Springer's story and describes how she was identified. The goal of this lesson is to learn about identification methods that scientists used to figure out who Springer was and which pod she was from. The material in the lesson corresponds to 0:00 - 8:00 of the "Saving Springer: Orphan Orca" DVD.




Who's that Whale? What will you learn?

- What happened when Springer arrived in Puget Sound?
- How to identify orcas
- How Springer was identified



Mark Dean



Who's that Whale? Springer shows up

- In January 2002 an orca calf appeared near Seattle
 - Observed by ferry captain
 - Very unusual for an orca to be alone



Mark Dean

Resident orcas are tightly bonded to their pods, and are typically never seen without their families. In over 30 years of orca observations in Puget Sound, this was the first time a calf had ever been seen by itself.



Who's that Whale? Early observations

- Healthy
 - except skin
- Hunting
 - catching fish
- Playing
 - with fish and logs
- Lonely



Mark Stone



Who's that Whale? Everyone wondered...

- Who's that whale?
- What pod is she from?
 - Southern resident?
 - Northern resident?
 - Transient?
- Why is she alone?
- What is she doing in Puget Sound?

What would you do if you saw a baby orca alone in Puget Sound?

Who would you call?



Mark Stone

These discussion questions provide the opportunity to introduce the concept of stranding networks and the importance of public observations. See also the “Stranding Network” activity in Lesson 4.



Who's that Whale? How do we tell orcas apart?

- Dorsal fin
- Saddle patch
- Vocalization



Mark Stone



All about orcas
How do we tell orcas apart?

■ Dorsal fin



John Dutton, NOAA
Male dorsal fin (J1)



John Dutton, NOAA
Female dorsal fin (J2)

Male dorsal fins are significantly larger than female dorsal fins. The dorsal fin of an adult female is approx. 2 ft high, and the dorsal fin of an adult male is 5 to 6 feet high. J1, shown in the picture on the left, has a dorsal fin that is approximately 6 ft high.

J2 - nicknamed "Granny," in the picture on the right - is the mother of J1, or "Ruffles," in the left picture. Granny is one of the oldest females in the southern resident pods.

The shape of the dorsal fin is also unique to each whale, though it may be harder for an untrained eye to distinguish.

Ruffles got his nickname from the distinctive, wavy shape of his dorsal fin.

Orca ecotypes (transients, residents, offshores) are also distinguished by the shape of the dorsal fin tip.

When orcas are young, their dorsal fins are approximately the same size. As they become teenagers, the males dorsal fins start growing rapidly, reaching full height when they are approximately 16. During their growth period, the young males are called "sprouters".



Who's that Whale?
How do we tell orcas apart?

■ Saddle patch



John Dutton, NOAA
Saddle patch - L7 (Male)



John Dutton, NOAA
Saddle patch - L7 (Female)

The saddle patch on an orca is like a thumbprint on a human - no two are alike. Shown here are the saddle patches of two different southern resident whales. Saddle patches are not symmetrical, so the right side of a saddle patch may look different than the left side.



All about orcas How do we tell orcas apart?

■ Vocalizations (calls)

Here is a southern resident call ..

Every pod has distinct calls

Listen to a northern resident call



Each pod has some distinct calls that identify members as belonging to that pod.

Pods also have calls that are shared with other pods. The language groupings are called clans. For example, all the A-clan whales share a set of calls. Within A clan, the A4 pod has a set of calls that are different than the A-30s.

Scientists haven't found unique calls for individual whales yet – they are currently studying that topic.



Who's that Whale? Solving the mystery

■ Can we use her saddle patch to identify her?



- **No**, her skin is in very poor condition, can't see her saddle-patch.

Though the reason was not known when she was first observed, Springer's skin was bumpy and mottled because worms in her gut did not allow her to get nourishment from the food she ate.



Who's that Whale? Solving the mystery

■ Vocalizations...

- Scientists recorded Springer's calls

■ ...a match with A4 calls!

- Northern residents



Who's that Whale? It's Springer!

- Last seen with mother - September 2000
- Traveled with G-pod - Fall 2001
- By herself in Puget Sound - January 2002



Springer was seen with her mother in Johnstone Strait, British Columbia in summer 2000, and in Ketchikan, Alaska, in September 2000.

She was seen swimming with G-pod in 2001. G-pod was seen in Fall 2001 off the coast of Oregon, far south of their usual range. At some point, Springer became separated in G-pod and ended up in Puget Sound.



Who's that Whale? Now that we know who Springer is...



Mark Davis

- Why is she here?
- What should we do?

This is anticipatory for the next lesson.



Who's that Whale? Community role

- Reported sighting to NOAA
- Participated in identification process
 - Photos
 - Acoustic recordings
- Monitoring
 - Volunteer researchers watched her every day



Who's that whale?
NOAA's role

- **Scientists**
 - Research
 - Identification
 - Monitoring
- **Management**
 - Kept Springer safe
 - Worked with community

Prompt class for discussion and provide opportunity for questions.



Who's that Whale?
Today's Activities

- Thumbprints and saddle patches
- Make a whale call using balloons

Thumbprints and Saddle Patches

Arch



Loop



Whorl



No two fingerprints are the same. Compare your thumbprint to your neighbor's thumbprint. How are they alike and how are they different?



Place your thumbprint here



Place your neighbor's thumbprint here

Describe your patterns:

J27's saddle patch



J28's saddle patch



How are they alike?

How are they different?

No two saddle patches are the same either! How might a scientist use this information? What else do you notice?

Thumbprints and Saddle Patches **KEY**

Arch



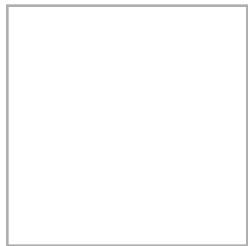
Loop



Whorl



No two fingerprints are the same. Compare your thumbprint to your neighbor's thumbprint. How are they alike and how are they different?



Place your thumbprint here



Place your neighbor's thumbprint here

Describe your patterns:



J27's saddle patch

How are they alike?

both light gray patches

both on the left side

behind the dorsal fin



J28's saddle patch

How are they different?

different coloration

different patterns

different shapes

No two saddle patches are the same either! How might a scientist use this information? What else do you notice?

Scientists can identify individual whales by looking at the saddle patch. They can study family structures and populations using this information. These pictures are of the left side of the saddle patch. The right side of the saddle patch is also unique to an individual.

Whale Calls

Killer whales produce three types of sound: echolocation clicks, whistles and calls.

Describe how these sound different.

Clicks _____

Calls _____

Whistles _____



Saving Springer: How NOAA helped an orca go home

Make your own whale call

Now it's your turn! Use balloons to make your own killer whale calls, and write them down using the following notation to "draw" a sound:

Separate vertical lines indicate distinct clicking sounds. Space between the lines can show how fast the clicks go.



Swooping upward lines indicate sounds that start low and go higher.



Swooping downward lines indicate sounds that start high and go lower.



A wiggly line indicates sound that goes up and down.



Create three whale calls with your balloon, write them down and make the sounds to your friends!

1.

2.

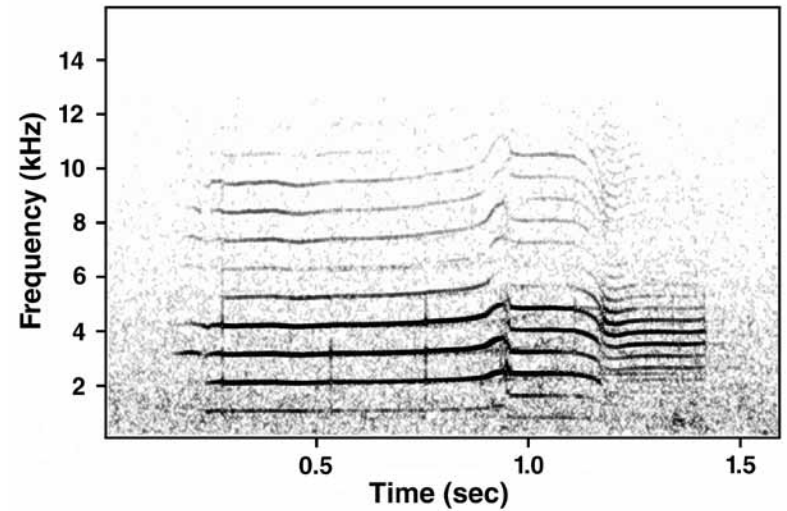
3.

Have fun and describe what each sound means!

Whale calls

Researchers used a hydrophone in the water to listen to Springer's calls. Scientists studied her calls using a spectrogram.

Springer's calls and whistles were not like the calls of killer whales in J, K, and L pods in Puget Sound. They matched the calls of killer whales from A pod, who live in Canadian waters.



Use the glossary in the back of this activity book and define the following terms:

1. hydrophone _____

2. spectrogram _____

Whale Calls **KEY**

Killer whales produce three types of sound: echolocation clicks, whistles and calls.

Describe how these sound different.

Clicks short bursts of sound, repeated in a series

Calls pulsed signals generated at high repetition rates Unique to a pod.

Whistles tonal characteristics with or without harmonics

Make your own whale call

Now it's your turn! Use balloons to make your own killer whale calls, and write them down using the following notation to "draw" a sound:

Separate vertical lines indicate distinct clicking sounds. Space between the lines can show how fast the clicks go.



Swooping upward lines indicate sounds that start low and go higher.



Swooping downward lines indicate sounds that start high and go lower.



A wiggly line indicates sound that goes up and down.



Saving Springer: How NOAA helped an orca go home

Create three whale calls with your balloon, write them down and make the sounds to your friends!

1. **Answers will vary**

2.

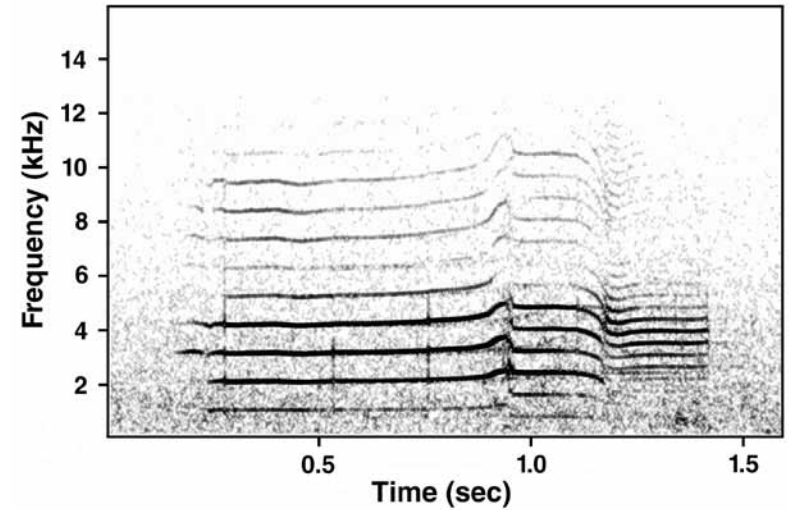
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Have fun and describe what each sound means!

Whale calls **KEY**

Researchers used a hydrophone in the water to listen to Springer's calls. Scientists studied her calls using a spectrogram.

Springer's calls and whistles were not like the calls of killer whales in J, K, and L pods in Puget Sound. They matched the calls of killer whales from A pod, who live in Canadian waters.



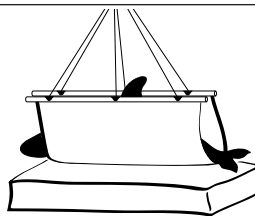
Use the glossary in the back of this activity book and define the following terms:

1. hydrophone An underwater microphone used to hear underwater sounds, such as whale calls and the many noises in the ocean

2. spectrogram A picture or visual way to look at a sound. Also called a sonogram.

Lesson Four OVERVIEW

What should we do?



Subject Area(s)	Life Science		Grade Levels: 2nd -3rd
Lesson Topic	Medical assessment, stranded animals, and community involvement		Lesson Title: What should we do?
Key words:	Stranded animal, stranding network, feces, fecal sample		Teaching Time: 60 minutes
Materials	<ul style="list-style-type: none"> Classroom Map PowerPoint presentation Activity books Activity 4.1. "You're the vet" 4 instruction cards/tents (teacher needs to supply materials below) 1 piece of string (35 ft) with labels and a measuring tape 	<ul style="list-style-type: none"> 3 blood sample pictures – print out 3 small containers or bags with cotton balls in each: nail polish remover in two, and fish sauce in one 3 sandwich bags with watered-down chocolate pudding, one with cooked spaghetti noodles (cut into 1.5" strips). Need to put noodles into hot water before class to soften 	
WA State Standards (WA: EALRs)	<ul style="list-style-type: none"> Science EALR 1: Systems (SYS) Science EALR 2: Inquiry (INQ) Science EALR 3: Application (APP) Science EALR 4: Physical Science (PS2) Social Studies EALR 1: Civics Social Studies EALR 3: Geography 	<ul style="list-style-type: none"> Integrated Environmental and Sustainability Standard 2: The natural and built environment Integrated Environmental and Sustainability Standard 3: Sustainability and civic responsibility 	
Ocean Literacy Principles	OLP 5 The ocean supports a great diversity of life and ecosystems. OLP 6 The ocean and humans are inextricably interconnected.		
Focus Questions	<ul style="list-style-type: none"> How do veterinarians decide if an animal is healthy? Was Springer healthy enough to be reintroduced to the wild? What should you do if you comes across a stranded wild animal? 		
Learning Objectives	At the end of this lesson students will be able to: <ul style="list-style-type: none"> Discuss three or more medical tests that vets do to assess an animal's health Explain what stranding networks do and how they help animals List the four steps to take when a stranded animal is found 		
Anticipatory Set (Engage)	Map activity: On classroom map and individual maps, plot two locations on map, and color in the range for northern residents.		
Explain (Encounter)	PowerPoint presentation: Information about Springer's medical health, rescue strategies, who was involved, decision making and taking action.		
Guided Practice (Investigate)	Activity 4.1 You're the Vet. Students assess Springer's health using data collected during the rescue. Activity 4.2 Stranding Networks. Students read a story that outlines the steps to take if they encounter a stranded wild animal.		
Independent Practice (Apply and Extend)	Students can learn more about local stranding networks and how they help injured animals. Make a magnet with NOAA's stranding network information on it.		
Assessment	<ul style="list-style-type: none"> Map activity Activity book worksheets 	<ul style="list-style-type: none"> Culminating project (optional) 	
Integrated Extension Ideas	Reading: Read one of the books on the Lesson 4 Resource Page in the activity book, or look up information on Nanoose: http://www.jwang.com/_nanoose/0102_ladysmith.html Humphrey the gray whale: http://en.wikipedia.org/wiki/Humphrey_the_Whale J.J. the gray whale: http://www.seaworld.org/animal-info/gray-whale/news-main.htm Science: Research Wolf Hollow on San Juan Island www.wolfhollowwildlife.org/ Math: Draw your own version of what Springer's holding pen might look like. (40ft x 40ft x 12ft) Social Studies: If your classroom just found out that a whale needed help, what could you do? Brainstorm some ways that you could help the rescue efforts. Writing: What if Springer was not healthy? What might have happened to her? Art: Make a poster or magnet of the steps to help a stranded animal and the hotline number, 1-800-853-1964.		

Lesson Four: What should we do?

I. Whole class activity (20 minutes)

A. Map activity (10 minutes)

1. Highlight the following two locations on the classroom map on the document reader. These points are the northern most and southernmost points of the northern resident killer whale range:
 - a) Juneau, Alaska
 - b) Mid-Vancouver Island
2. Show the Teacher Key map with the blue range between Juneau and the middle of Vancouver Island. This represents the range of the northern resident killer whales, including Springer's family.
3. On the map in Lesson 4 of the students' activity books, have students circle the two locations with a blue crayon. Draw an oval shape range in the water, around the islands. Use a blank map on the document reader and demonstrate how to circle the locations, connect them with a line, and shade in the range with the color blue.

B. PowerPoint presentation (10 minutes)

1. Show students the Lesson 4 PowerPoint presentation about Springer's medical health, rescue strategies, who was involved, and how decisions were made about her rescue.

II. Activities (40 minutes)

A. Activity 4.1 You're the Vet (20 minutes)

Background: Springer's health was a critical factor in determining whether she could be rescued and returned to her pod. Scientists and managers were particularly concerned about diseases she might carry that would jeopardize the resident orca populations. Collecting and analyzing data such as blood samples, breath samples, fecal samples, temperature, size and behavior determined her fitness and suitability for rehabilitation. Initial blood test results indicated that Springer did not carry any contagious diseases, and she was cleared for the next step in the rehabilitation process. The purpose of this activity is to lead students through the diagnostic process, including data collection, analysis, conclusions and recommendations.

Materials

(teacher needs to supply materials in **BOLD**)

- 4 Station instruction tents (instructions on inside)
- **Piece of string (32 ft. long) with tape tabs or marks at 0 ft, 7 ft, 23 ft, 32 ft.**
- 5 tags that can be attached to the tape on the string
- **Measuring tape (optional)**
- 3 pictures of blood samples (2 healthy #1 and "S") and 1 with diseased cells (#2)
- **3 small containers or bags with cotton balls in each**
 - ◊ **put nail polish remover swabs in #2 and "S"**
 - ◊ **put 5-6 drops of fish sauce in healthy canister, #1**
- **3 sandwich bags filled with watered-down chocolate pudding**
 - ◊ **add cooked spaghetti cut into 1.5" pieces in #2 and "S" to represent worms**

Key to sample results:			
	Samples		
Station	1	2	S = Springer
Blood samples	Healthy	Unhealthy	Healthy
Exhaled air samples	Healthy	Unhealthy	Unhealthy
Fecal samples	Healthy	Unhealthy	Unhealthy

This activity consists of four parts, beginning with a whole class activity on size, and three activities at exploratory stations. Set up each station by distributing the direction cards and materials (even though the length is not done as a station, there is still a direction card with instructions).

At each station, students will learn about a health assessment technique, and view sample test results. The results will include a healthy sample, an unhealthy sample, and Springer’s results.

At each station, students will first determine which sample is healthy and which is unhealthy. Then they will compare Springer’s samples to the healthy and unhealthy samples and discuss what her results indicate. Students will record their observations, diagnosis and treatment recommendations in a health report in the activity book.

When students have visited all three stations, they will make an overall diagnosis and recommendation for the next steps in the project. Give them about 5 minutes at each station. For more background information, visit <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/A73-Med-Rprt.cfm>

1. Ask students to think about what is checked or monitored when you visit the doctor’s office. How are these measurements an indication of health? E.g. weight (compare to an average weight), height (to monitor your growth), blood pressure or heart beat (to see if your heart is healthy).
2. Tell students that in this activity, they are going to be veterinarians who assess Springer to see if she is healthy enough for rehabilitation.
3. **Size Station:** You will need the string, tags, and measuring tape (optional). The string may be pre-measured by the teacher and marked at 0’, 7’, 11’, 23’ and 32’, or the students can measure the distances. Students will see how long Springer was when she was rescued, and compare her length to that of a newborn orca calf, an adult female and an adult male. They will attach the correct tags to the string according to length. The tags have the measurements, so students can use a measuring tape in order to place them correctly.
 - a) Have one student attach the zero tag to one end of the string. This indicates one end of a whale.
 - b) Another student will measure 7 feet to show the length of a newborn killer whale and place the appropriate tag on the string.
 - c) Measure Springer’s length at 11 feet and place her tag on string.
 - d) Measure the length of an average adult female at 23 ft. and place tag on string.
 - e) Lastly, measure 32 feet and place the adult male tag on the string.
 - f) Compare Springer to the newborn, adult female and adult male killer whale. Lead class discussion about how size can be an indicator of age and health.

Introduce the three stations, and tell students that at each station, they will first identify the healthy and the unhealthy sample, then compare the sample marked “S” (for Springer) to the other two samples to see whether Springer’s sample is healthy or unhealthy. Give them about 5 minutes per station to complete the information.

4. Blood sample station:
 - a) Instruction card
 - b) 3 photos of blood samples (2 healthy, 1 unhealthy). Healthy samples should be labeled #1 and “S” for Springer. Unhealthy sample (showing virus cells) should be labeled #2. The healthy sample shows red blood cells that all look similar (round and pink), whereas the unhealthy sample shows cells that are darker and blotchy.
 - c) Students will first look at pictures 1 and 2, and identify which sample is healthy and which sample shows the diseased blood sample. Compare Springer’s sample with the others to determine if her results indicated presence of a disease. Record observations in the health report in the activity book.
5. Exhaled breath sample station:
 - a) Instruction card
 - b) 3 small containers or bags (e.g. film canisters or plastic snack bags) containing a few cotton balls and a scent to create odors. One container will have a fishy smell, representing a healthy exhalation odor, and should be labeled #1. Two containers will smell like fingernail polish (acetone), representing an exhalation odor indicating ketosis. One “unhealthy” canister should be labeled #2, and the other with an “S” for Springer. You may choose to cover plastic bags with tape or paper so that students don’t see the samples and have to rely on smell to make their observations.
 - c) Students will sniff containers 1 and 2, and identify which smells healthy and which is unhealthy. Remind students that whales eat fish, so a fishy smell would be natural. Compare Springer’s sample with containers 1 and 2 to see if it is healthy or unhealthy, and record observations in the activity book.
6. Fecal sample station:
 - a) Instruction card
 - b) 3 sandwich bags filled with watered-down chocolate pudding. Label one bag #1. Add cooked spaghetti noodles to the other two (representing worms) and label them #2 and “S” for Springer.
 - c) Students will look in bags 1 and 2, and identify which sample is healthy and which is unhealthy. Compare Springer’s sample with samples 1 and 2 to see if it is healthy or unhealthy, and record observations in the activity book.

At the end of the activity, students will review their results from all stations and make a diagnosis about Springer’s overall health. They will then write a recommendation about whether or not they think she will be a good candidate for rehabilitation, and if the rescue should proceed. Compare students’ results with what actually happened in the project (i.e., that the rescue proceeded after Springer’s health was assessed).

Discuss what might have happened if Springer’s health results had been different (e.g. if her blood sample had been unhealthy, she might have been taken to an aquarium so that she would not spread the disease to the wild orca population).

Extension: read about Springer’s health assessment in 2009 and 2011:

- health evaluation in 2007-09
 - ◊ <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/upload/A73-health-2009.pdf>
- health assessment in 2011
 - ◊ <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/upload/A73-health-2011.pdf>

B. Activity 4.2 Stranding Networks (20 minutes)

Background: Springer was a stranded animal: alone, no mother or pod at her side, and more than 300 miles from her native waters. Her skin condition indicated that her health was questionable, and scientists were especially concerned about whether or not she was eating. Her behavior (not traveling or leaving the area, spending time near boats and interacting with humans) was not typical of wild orcas. NOAA's management team decided that intervention provided the greatest chance for Springer's long-term survival. The stranding network in the Puget Sound area responds to reports of stranded marine mammals such as harbor seals, porpoises, and whales along the Washington and Oregon coasts and is part of a nationwide network. For more information, see the NOAA website <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/A73-Rescue-Ancmnt.cfm>.

1. Read the story about the steps to take if you encounters a stranded wild animal (Activity 4.2 Stranding Story, page 96).
2. After reading the story, students will work on the Stranding Networks worksheet in their activity book (page 23). Have students write down what S.T.O.P. stands for (Stay away, Tell an adult, Observe for 1-2 days, and Phone a stranding network in your area) and create a magnet with the stranding network hotline (1-800-853-1964 in the Pacific Northwest) on it. The Lesson 4 resource page in their activity book has the following link if students want to learn more about stranding networks.
<http://www.nwr.noaa.gov/marine-mammals/stranding-information.cfm>

III. Assessment

- A. Map range for northern resident killer whales*
- B. Worksheets and participation in activities*
- C. Culminating project (optional)*

IV. Extension activities – see ideas in Lesson Overview

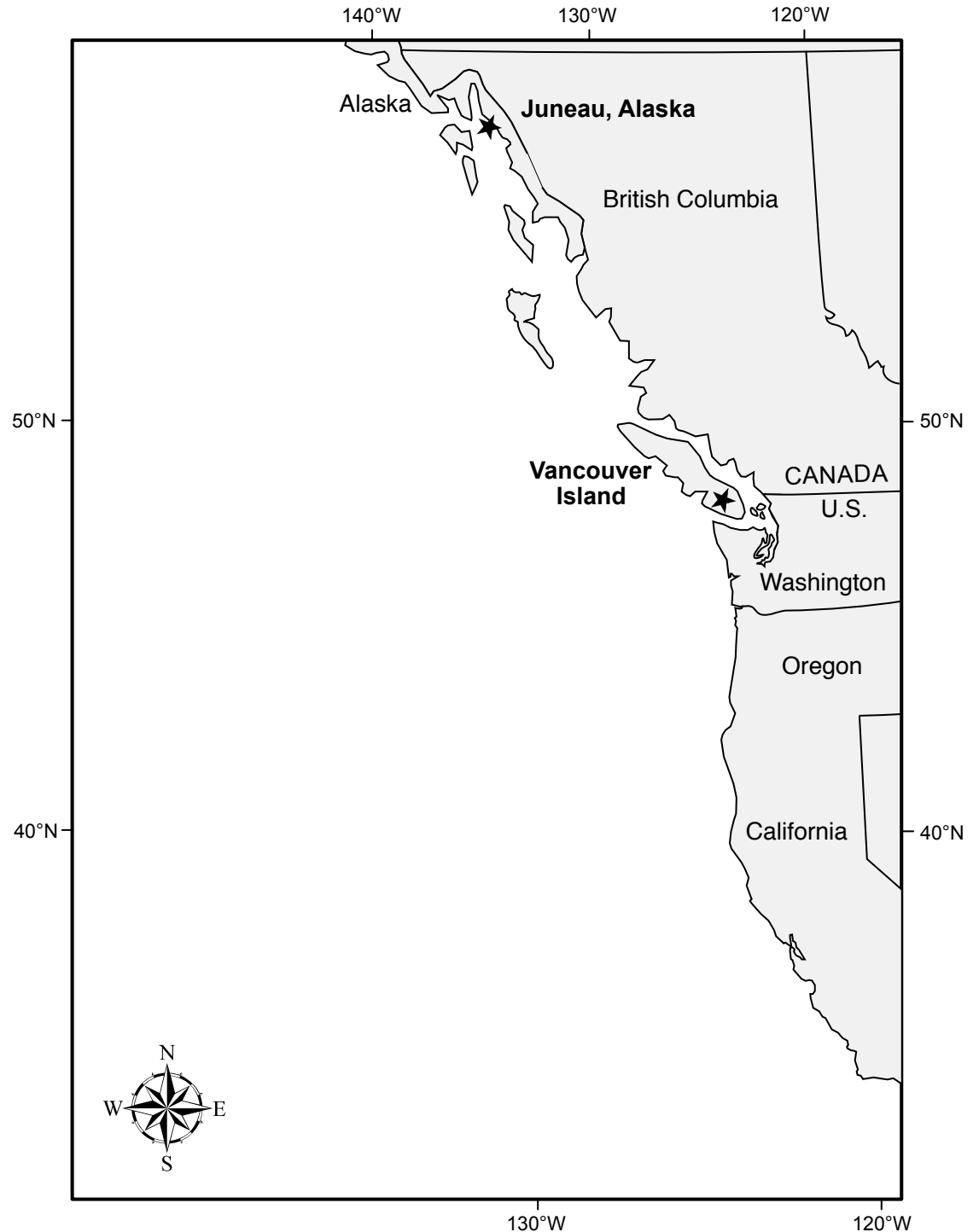
Map activity

Draw a blue line between the stars on your map. Draw on the ocean side of all the islands.

- ★ Juneau, Alaska
- ★ Vancouver Island

Using your blue crayon, color all the water between your line and the land. See the teacher's blue area on the class map.

Springer's family lives in this blue area or range.



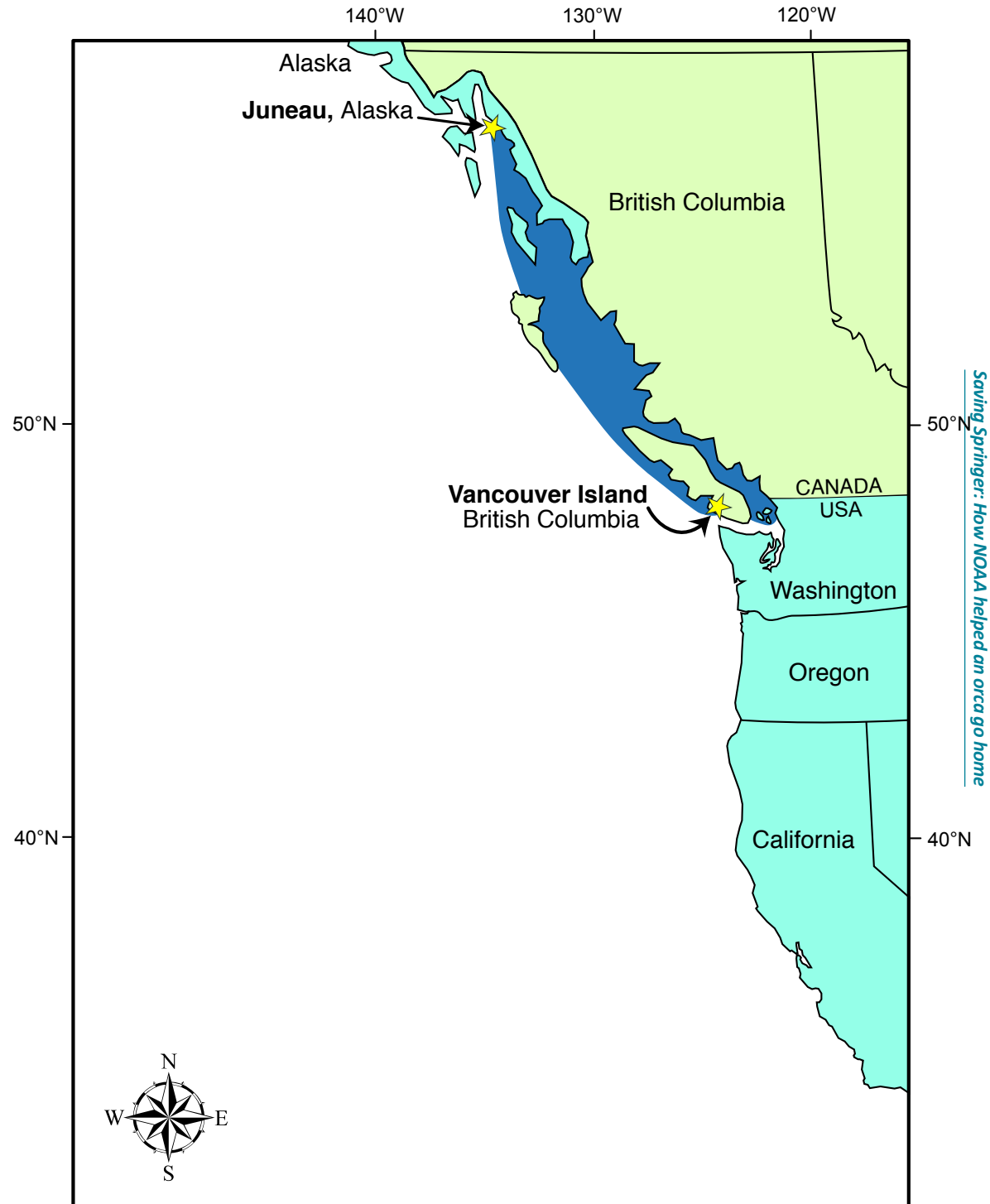
Map activity **KEY**

Draw a blue line between the stars on your map. Draw on the ocean side of all the islands.

- ★ Juneau, Alaska
- ★ Vancouver Island

Using your blue crayon, color all the water between your line and the land. See the teacher's blue area on the class map.

Springer's family lives in this blue area or range.



Saving Springer: How NOAA helped an orca go home

Saving Springer

How NOAA helped an orca go home



Lesson 4. What should we do?



This lesson covers how NOAA decided what to do for Springer: the options, the risks, the community involvement, forming the rescue team and the day of the rescue. The goal of the lesson is to learn about medical assessment of animals and about stranding networks.

The lesson corresponds to 8:00 – 9:18 (what should we do?) and 9:18-15:31 (the day of the rescue) of the “Saving Springer: Orphan Orca” DVD.



What should we do? What will you learn?

- How NOAA decided what to do about Springer
- How several groups worked together on a solution
- Springer's health assessment
- Stranding networks



What should we do? Next Steps for Springer

- Now that we know who Springer is...
- *What should we do?*
- *What are the options...*



This could be used to prompt discussion - what does the class think the options are?



What should we do?
Options



■ Leave Springer alone

- No action


■ Rehabilitate Springer

- At an aquarium
- In a Puget Sound facility

■ Return Springer to her family

Mark Stern

These are the options that NOAA considered.



What should we do?
NOAA asks community


■ Town meeting

■ Options and risks discussed

- Risk to pod
- Risk to Springer

■ Many different opinions


If you were at the town meeting, what would you say?



Mark Stern


Discussion points:

- Risk to pod: Springer may be carrying an infectious disease
- Risk to Springer: she might not survive the trauma of the capture; she may lose the ability to hunt while she is confined; she may not be accepted by the pod when she is reintroduced.



What should we do?
NOAA asks community

A young boy was the first person to say that Springer might be lost, and should be returned to her family.



Mark Stern

- At the town meeting where this was discussed, many experts believed that Springer was isolated from her pod because of health reasons and that she was a social outcast.
-
- The possibility that she was simply lost, and could be returned to her family, was first raised by a child during the public comment section of the meeting.



What should we do?
Decision: Rescue!



- While Springer's health is checked, she will stay in a pen at Manchester, WA
- If she is healthy, she will be returned to her pod at the north end of Vancouver Island

Discussion points - why did NOAA make this decision?

- Chance of success outweighs risks
- Strong community support
- The right thing to do for this specific whale, and for the orca population



What should we do?
Project Team is formed

- NOAA
- DFO (Department of Fisheries and Oceans)
 - now called Fisheries and Oceans Canada
- Vancouver Aquarium
- Strong community support

The Department of Fisheries and Oceans (DFO) changed to Fisheries and Oceans Canada in 2008.




What should we do?
Orphan Orca Fund formed




- Seven non-profit groups created one organization to help NOAA
 - Raised money
 - Got supplies

The Orphan Orca Fund raised funds and in-kind donations to assist with the rescue project. The rescue was precedent-setting in how independent groups worked cooperatively, and in how NOAA worked with the community.




What should we do?
Kids helped too!




- Students made posters and helped collect donations
- Gave money at places like the Seattle Aquarium
 - Money helped buy supplies for the project


Items donated through the Orphan Orca fund ranged from large (the foam pad that Springer rested on during the transport and the scale that was used to weigh her) to small (buckets, duct tape, flashlights), and included support items for the crew who looked after her (port-a-potties, ferry passes, food, and scuba tanks).



What should we do?
The day of the rescue



- Team loaded her onto a sling
- Moved to boat and then to holding pen
- Kept her calm
- Monitored her health



What should we do?
Is She Healthy?

- Collect information from Springer
 - Size
 - Blood samples
 - Breath
 - Fecal samples
- Compare to normal

- These are some of the indicators that were used to determine Springer’s health. This slide and the next three are anticipatory for the “You’re the Vet” activity.
- Springer underwent many other tests. Her temperature, weight, and behavior were closely monitored during and after her move to Manchester.
- Students can compare Springer’s health assessment to what gets measured when they go to the doctor for a checkup.



What should we do?
Health test - Size

■ Length

- Adult male = 30 ft
- Adult female = 23 ft
- Newborn calf = 7 ft
- Springer = ?

The goal of these slides is to present information that will be useful during the “You’re the Vet” activity.

The class will do an activity to measure Springer’s length as part of “You’re the Vet.” They will discover that she was slightly shorter than normal for her age. She was also weighed when she arrived at Manchester, and was underweight, although not emaciated.



What should we do?
Health test - Blood

■ Method: Get blood sample from tail fluke

- View blood sample under microscope
- Look at blood cell shape, size, number

■ Results: viruses or other diseases, or healthy blood

- *Morbillivirus*
- *Canine brucellis*

■ Springer’s results = ?

The goal of these slides is to present information that will be useful during the “You’re the Vet” activity.

Emphasize method of data collection (how is the information collected?), results (what was found?), analysis (what does the data tell you?) and conclusions.

During the activity, students will learn that Springer did not have any diseases in her blood sample.



What should we do?
Health test - Breath Odor

■ Method: Sniff breath exhaled from blowhole

■ Results:

- Fishy smell = normal
- “Acetone” smell = ketosis
 - Ketosis is a sign of sickness and/or starvation.

■ Springer’s results = ?

The goal of these slides is to present information that will be useful during the “You’re the Vet” activity.

During the activity, students will learn that Springer did have evidence of ketosis as discovered in the odor of her exhaled breath (smelled like nail polish remover).



What should we do?
Health test – Fecal samples

- Method: Collect fecal samples with net
- Results: Compare to normal
 - Texture (Lumpy? Smooth?)
 - Color (Brown? Green?)
 - Worms or other organisms
- Springer's results = ?

The goal of these slides is to present information that will be useful during the “You’re the Vet” activity.

During the activity, students will learn that Springer had worms in her fecal sample. After being treated for worms, her appetite and overall health improved dramatically, and her symptoms of ketosis from the previous slide went away.



What should we do?
Next steps for Springer

- Keeping her healthy
- Keeping her wild
- The journey home...

Anticipatory slide for Lesson 5.



What should we do?
NOAA's role

- Scientists
 - Monitored Springer's health
 - Identified issues and possible outcomes
 - Participated in rescue
- Managers
 - Considered options
 - Formed team
 - Involved community
 - Planned and carried out rescue
 - Collaborated with DFO (Canada) during planning



What should we do?
Community Role

- Shared opinions
 - Meetings
 - Newspaper
- Formed Orphan Orca Fund
 - Raised money
 - Got supplies
- Helped monitor Springer
 - Kept boats away



What should we do?
Activities

- You're the Vet
- Stranding Networks

You're the vet

Springer's Health Report

We need to see if Springer is healthy enough to be reunited with her family.

Health Test: Size

1. **Method** (how information was collected):

2. Length of a typical killer whale calf?

Length of an average adult female?

Length of an average adult male?

3. **Results:** Compare Springer's length to those above. Based on the test result, is Springer healthy?

Health Test: Blood

1. **Method** (how information was collected):

2. Describe the healthy blood sample.

Describe the unhealthy blood sample.

3. **Results:** Compare Springer's blood sample to the other samples. Based on the test result, is Springer healthy?

You're the vet

Springer's Health Report

Health Test: Exhaled Breath

1. **Method** (how information was collected):

2. Describe the healthy breath odor:

Describe the unhealthy breath odor:

Define ketosis:

3. **Results:** Compare Springer's breath odor to the other samples. Based on the test result, is Springer healthy?

Health Test: Fecal Sample

1. **Method** (how information was collected):

2. Describe the healthy fecal sample:

Describe the unhealthy fecal sample:

3. **Results:** Compare Springer's fecal sample to the other samples. Based on the test result, is Springer healthy?

You're the vet

Springer's Health Report

Summary		
Test	Result	Treatment Required? What should we do?
Size		
Blood		
Exhaled breath		
Fecal sample		
Based on these results, should the project to reunite Springer with her family go forward?		

You're the vet **KEY**

Springer's Health Report

We need to see if Springer is healthy enough to be reunited with her family.

Health Test: Size
<p>1. Method (how information was collected): physical observation measuring rostrum to tail</p>
<p>2. Length of a typical killer whale calf? 7 feet</p> <p>Length of an average adult female? 23 feet</p> <p>Length of an average adult male? 32 feet</p>
<p>3. Results: Compare Springer's length to those above. Based on the test result, is Springer healthy? Springer was 11 feet long when she was measured. She is healthy</p>


Health Test: Blood
<p>1. Method (how information was collected): Blood samples, collected from Springer's tail fluke with a needle. Information about sample was collected by observing the prepared sample.</p>
<p>2. Describe the healthy blood sample. Cell size, shape, color- no viruses (e.g. cells are same size, uniform color and shape)</p> <p>Describe the unhealthy blood sample. Presence of viruses, cells squeezed together (e.g. irregular shape or dark streaks in sample)</p>
<p>3. Results: Compare Springer's blood sample to the other samples. Based on the test result, is Springer healthy? Springer's sample looks like the healthy blood sample. No evidence of a contagious disease.</p>

You're the vet **KEY**

Springer's Health Report

Health Test: Exhaled Breath
<p>1. Method (how information was collected): Sample was collected with a small container from blowhole. Information about sample was collected by smelling the sample.</p>
<p>2. Describe the healthy breath odor: Fishy smelling Describe the unhealthy breath odor: Like nail polish remover (acetone) Define ketosis: The process of breaking down fat (blubber) for energy. In this process, a chemical that smells like nail polish remover can sometimes be found in the urine or on the breath.</p>
<p>3. Results: Compare Springer's breath odor to the other samples. Based on the test result, is Springer healthy? Springer has a strong smell of acetone on her breath, suggesting that she has ketosis. She is either not getting enough to eat, or is unable to metabolize food successfully.</p>

Health Test: Fecal Sample
<p>1. Method (how information was collected): Sample was scooped from water with a net. Information about sample was collected looking at the sample.</p>
<p>2. Describe the healthy fecal sample: Brown, no signs of worms Describe the unhealthy fecal sample: Brown, has worms in it</p>
<p>3. Results: Compare Springer's fecal sample to the other samples. Based on the test result, is Springer healthy? Springer's fecal sample has worms in it. She is not healthy.</p>

<p>0 ft.</p>	
<p>Newborn killer whale length (7 ft.)</p>	
<p>Springer's length at Manchester in 2002 (11 ft.)</p>	
<p>Adult female killer whale length (23 ft.)</p>	
<p>Adult male Killer whale length (32 ft.)</p>	

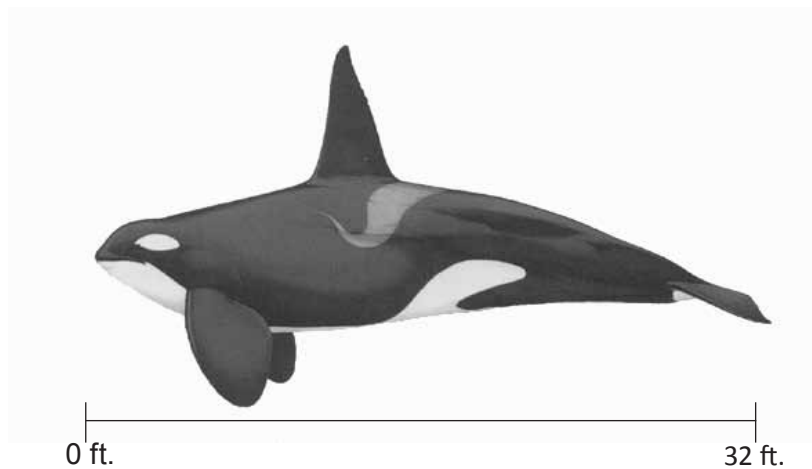
• *Measuring Tape*

• *5 tags (zero, new born, Springer, adult female, adult male)*

• *Length string 32 ft.*

Materials:

SIZE: How BIG was Springer?



This is a picture of an adult male killer whale. The piece of string at this station will help you visualize how big killer whales can grow. Compare Springer's length to the length of newborn and adult killer whales.

Instructions:

Do this as a whole class

Add the correct tags to the string according to length:

1. Place the zero tag on the one end of the string.
2. Place the newborn killer whale tag at the place on the string measured as 7ft.
3. Place the Springer tag at the place on the string measured as 11 ft.
4. Place the adult female tag at the place on the string measured as 23 ft.
5. Place the adult male tag at the place on the string measured as 32 ft.
6. Compare Springer to the newborn, adult female, and adult male killer whales. Discuss how size can be an indicator of age. How can size be an indicator of health?

Materials:

- *Petri-dish #1: Healthy*
- *Petri dish #2 Not Healthy*
- *Petri-dish #3 "S" is Springer's*

BLOOD SAMPLE:

This picture shows Springer having her temperature taken. Springer's team had to handle her sometimes, but several tests were done at the same time to minimize the impact of handling her.



Vets took a sample of Springer's blood and sent it to a lab where it was examined to determine if she had a disease.

Instructions:

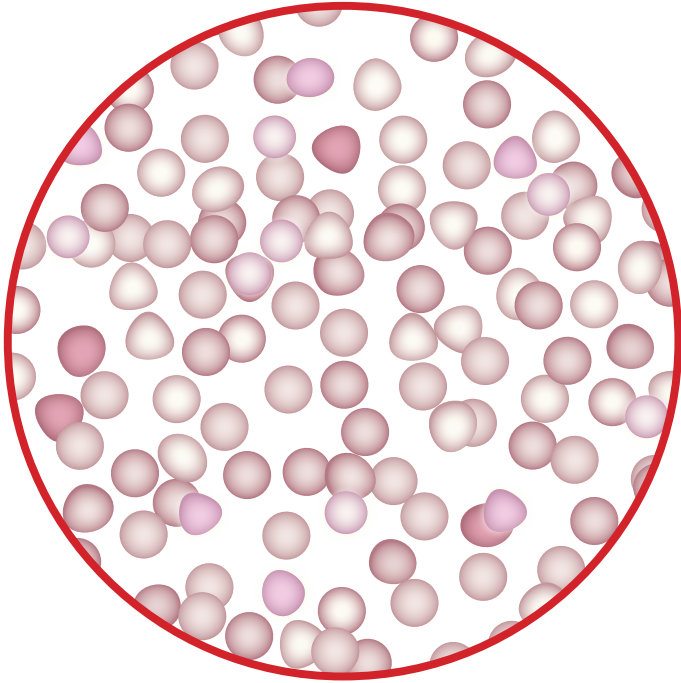
Look at the pictures at this station. The unhealthy blood sample indicates that the animal has a disease.

1. Compare Springer’s sample (marked “S”) to the other two.
 - ◆ Does she have a disease?
 - ◆ Record your observations and conclusions in the health report in your activity book.

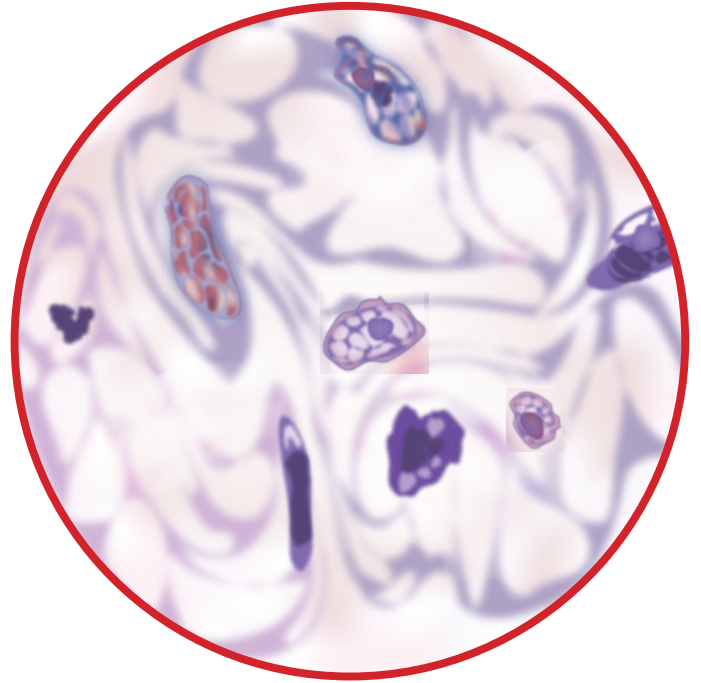
You're the vet

BLOOD SAMPLES

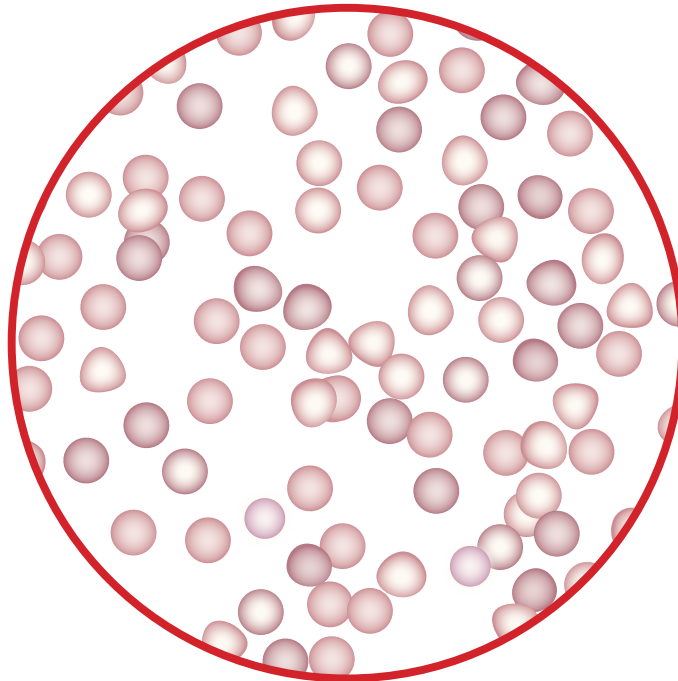
Cut out the circles marked 1, 2, and S.
These will be used at the Blood Sample station.



1



2



S

• *Canister #3 "S" is Springer's*

• *Canister #2 Not Healthy*

• *Canister #1: Healthy*

Materials:

EXHALED BREATH SAMPLE:



An orca breathes in and out through its blowhole. Springer appeared to have a “peanut head” (a depression behind the blowhole). In order to see if Springer was healthy, scientists examined her breath sample to see if she had a condition called “ketosis.”

Instructions:

Can you smell ketosis on Springer’s breath?

1. Look up “ketosis” in your glossary. Write the definition in your activity book.
2. Open containers 1 and 2 and take a good sniff. Which do you think is healthy and which is unhealthy?
3. Compare container 3 to the other two. Record your observations in Springer’s health report.
 - ♦ Did you know that toothed whales have one blowhole? Whales with baleen in their mouths have two blowholes. Why do you think they have this difference?

• Bag #3 "S" is Springer's

• Bag #2 Not Healthy

• Bag #1: Healthy

Materials:

FECAL SAMPLE:



Scientists use dip nets like the one shown in this picture to collect fecal samples from whales. These samples provide information about the whale's diet and health.

Instructions:

How does Springer’s sample look?

1. Compare the “fecal samples” in Bag 1 and Bag 2. Which do you think is healthy and which is unhealthy? The unhealthy fecal sample has worms present, indicating that something is wrong in the digestive tract or diet.
2. Compare Springer’s “fecal sample” to Bag 1 and 2. What does her sample tell you about her health? Record observations in your activity book.

2-3 Activity 4.2

Stranding Story

One sunny morning, you and your friend decide to take your dog down to the beach. Driftwood and piles of dried seaweed are scattered along the water's edge, but other than gulls, you seem to be the only ones on the beach. Suddenly, your dog pulls you to something unusual. About 100 yards away, you notice a seal pup resting on the beach. You have read that these marine mammals share the beach with people. Even though they swim, hunt and spend most of their time in the ocean, seals come out on land regularly to rest.

You remember what you had learned in school about what to do when you see wild animals: **S.T.O.P.** The letter "S" stands for **stay away**, because wild animals are not like pets. If this animal was injured or hurt, it might be aggressive in some way. The letter "T" stands for **tell an adult** so that the adult can make sure you and others are safe. The letter "O" in **S.T.O.P.** reminds you to **observe** the animal for 1-2 days to see if it goes back into the water or needs help. Lastly, the letter "P" tells you to **phone a stranding network** in your area. You and your friend leave the seal alone and head back up the beach to the trail that leads home.

After sharing the excitement with your mom, you and your friend go on the computer to learn more about seals and the Stranding Network. You find out that the seal was probably a harbor seal, which is common in your area. The next day, you and your family go back to the beach to check on the seal. Your dad takes photos and emails them to the NOAA Stranding Network. He tells them what kind of animal you saw, its location, and what you observed. This type of information can really help the people at the Stranding Network figure out if this animal is healthy or not.

Your mom shares with the neighbor that you and your friend both did all of the right things: stayed away from wild animals, told an adult, observed the seal for 1-2 days, and phoned the Stranding Network. She told the neighbor that you and your friend researched this animal and figured out (by the time of year) that this seal was old enough to be on its own without its mother. On the third day after you first saw it, the seal returned to the water.

NOAA and other Stranding Networks sometimes rescue sick and injured animals. There are Rehabilitation Centers that help animals of all kinds.

You and your friend have learned a lot about seals. The most important thing is to be respectful of them when they are resting out of the water. Sharing the shore with seals means giving them space (more than 100 yards if possible) and encouraging others to keep animals such as dogs away. More importantly, this story reminds us that people like you and your friend made a difference and took all the right steps to make sure this wild animal was going to survive.

The End

In this story the harbor seal was fine and went back into the water by itself. What would you do if YOU came across a sick or injured harbor seal? Should you:

Take a closer look?

(Pause and have students answer)...**No!**

Go up and pet this wild animal? **No!**

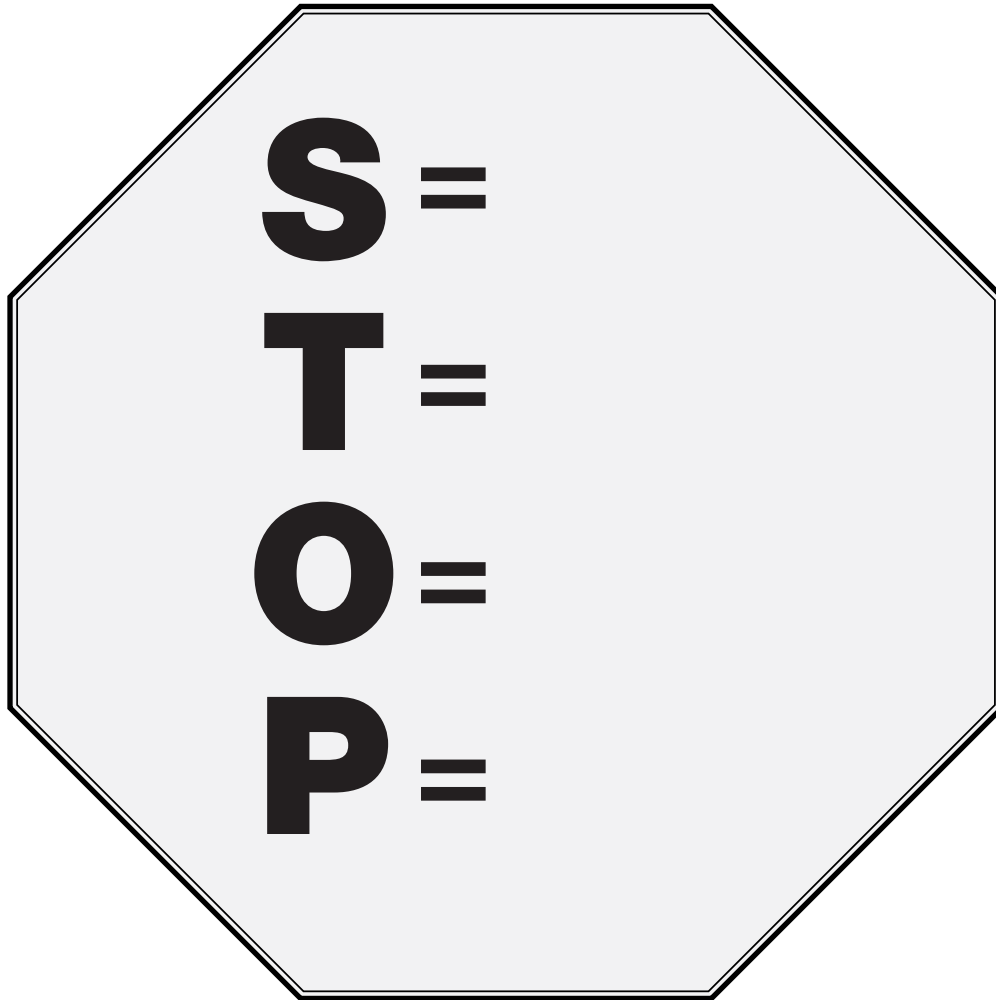
Let your dog have a closer look or sniff? **No!**

Try to take it home and care for it like a pet? **No!**

Have the students complete the "Stranding Networks" worksheet in their activity books.

Stranding networks

When you come across a wild animal that might be stranded, alone, or injured you should...

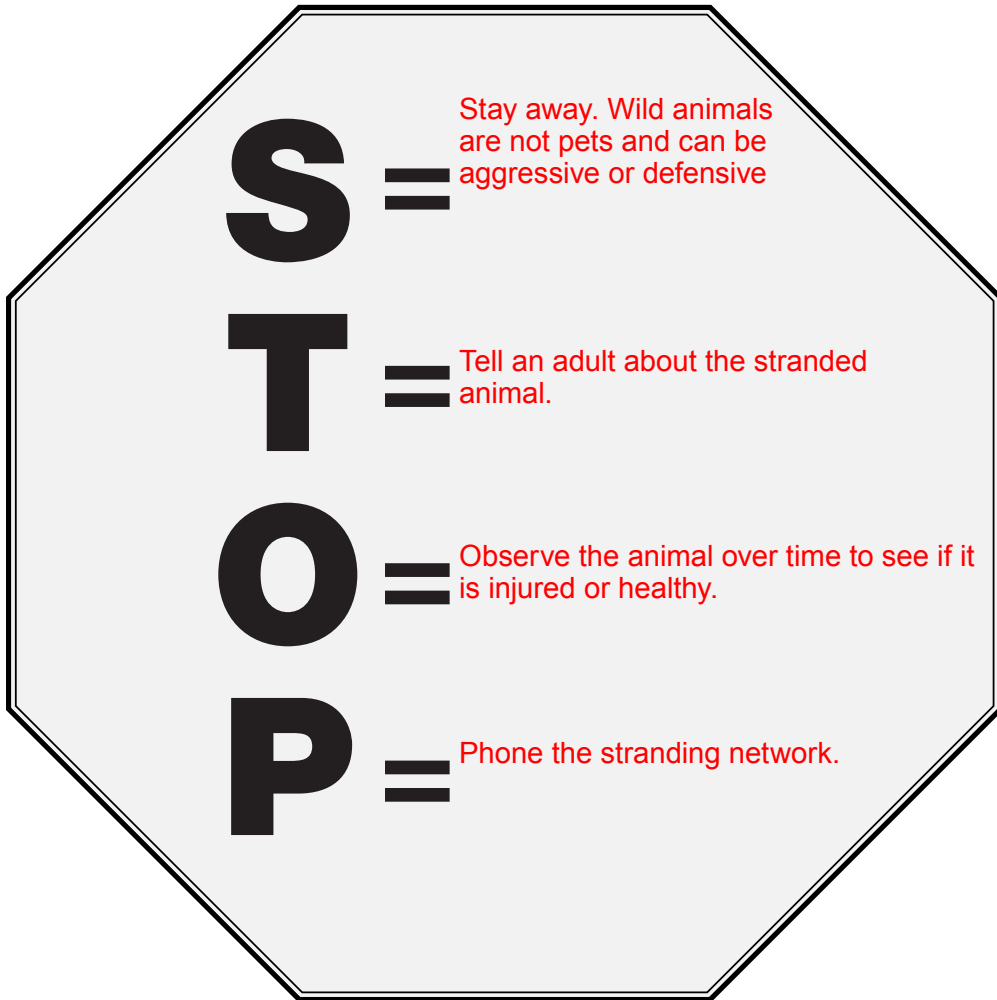


Using NOAA's stranding hotline number,
make a magnet promoting
"Sharing the Shores"
1-800-853-1964



Stranding networks **KEY**

When you come across a wild animal that might be stranded, alone, or injured you should...



Using NOAA's stranding hotline number, make a magnet promoting "Sharing the Shores" 1-800-853-1964



<h1 style="margin: 0;">Lesson Five</h1> <h2 style="margin: 0;">OVERVIEW</h2>	<h1 style="margin: 0; color: #0072bc;">Journey to Health</h1>	
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Subject Area(s)	Life science	Grade Levels: 2 nd -3 rd
Lesson Topic	Killler whale behaviors (observing Springer in the net pen, keeping her wild with enrichment objects) and food chains	Lesson Title: Journey to Health
Key words:	breaching, spy hopping, kelping, pectoral slap, tail lob, logging, porpoising, prey, food chain	Teaching Time: 60 minutes
Materials	<ul style="list-style-type: none"> Classroom Map PowerPoint presentation Activity books Activity 5.2 “Food chain game” Food chain cards for students, food chain posters for teacher (teacher needs to supply materials below) <ul style="list-style-type: none"> 4 carpet squares (or something students can use like a base) 	
WA State Standards (WA: EALRs)	Science EALR 1: Systems (SYS) Science EALR 4: Life Science, Ecosystems (LS2) Social Studies EALR 3: Geography	
Ocean Literacy Principles	OLP 5 The ocean supports a great diversity of life and ecosystems. OLP 6 The ocean and humans are inextricably interconnected.	
Focus Questions	<ul style="list-style-type: none"> How was Springer kept active and healthy while she was in the net pen at Manchester? What killer whale behaviors can scientists observe? What is a food chain? 	
Learning Objectives	At the end of this lesson students will be able to: <ul style="list-style-type: none"> Describe at least 4 different killer whale behaviors Explain a marine food chain 	
Anticipatory Set (Engage)	Map activity: On classroom map and individual maps of the Puget Sound area, highlight or circle three key locations in Springer’s story.	
Explain (Encounter)	PowerPoint presentation: Information about killer whale behaviors and how Springer was kept healthy and active in the net pen at Manchester.	
Guided Practice (Investigate)	Activity 5.1 Killer whale behaviors charades or picture game. Students either act out killer whale behaviors or draw behaviors and have the class guess which behaviors are described. Activity 5.2 Food chain game. Students form a circle around 4 carpet squares in an open space. Hand out pictures of ocean animals and discuss food chains. Students will “swim” in the ocean around the squares. When the teacher call outs a food chain, students will assemble that food chain at the nearest square. Students will explore different ocean food chains. This activity can be expanded into a discussion of food webs.	
Independent Practice (Apply and Extend)	Research how scientists study salmon populations or how scientists figure out how much killer whales eat.	
Assessment	<ul style="list-style-type: none"> Map activity Activity book worksheets Culminating project (optional) 	
Integrated Extension Ideas	Reading: Play vocabulary hangman for more practice. Math: Find out how much resident orcas eat in a day. How does that compare to how much students eat? http://www.seaworld.org/ask-shamu/faq.htm#whales Orcas eat 140-240 lbs. per day. Figure out how much a Chinook salmon weighs and see how many fish would be eaten each day. Social Studies: Study more about the Whale Museum. www.whale-museum.org Writing: Let’s say Springer is healthy. What does Canada need to do to get ready for Springer’s return to her home waters? Art: Have students draw a picture of a killer whale behavior.	

Washington State Science Learning Standards: EALR = Essential Academic Learning Requirements

Lesson Five: Journey to health

I. Whole class activity (20 minutes)

A. Map activity (5 minutes)

1. Highlight or circle the following locations on the map:

- a) Puget Sound
- b) Vashon Island (near where Springer was first seen)
- c) Manchester (where Springer’s net pen was)

These locations emphasize how close Springer was to Seattle, a city with a lot of people.

B. PowerPoint presentation (15 minutes)

1. Show the students the PowerPoint presentation that includes killer whale behaviors and what was done in Springer’s net pen to keep her healthy and active. You could do Activity 5.1 with the slides that show behaviors, and have one person or the whole class act out each of the behaviors. The presentation also highlights the roles of NOAA and the community.

II. Activities (40 minutes)

A. Activity 5.1 Killer whale behaviors charades or picture game (20 minutes)

Background: One of the challenges of holding Springer in a net pen was to ensure that, during her time in the pen, Springer didn’t forget the wild behaviors she already knew. Every aspect of Springer’s rehabilitation was focused on keeping her healthy and acting as much like a wild whale as possible. Springer’s health determined each step of this rescue effort. The veterinarians gave Springer antibiotics for some of her medical conditions, but they also wanted to keep her active while she was in the small pen (40 x 40 x 12 feet). The rescue team wanted to minimize human interactions with Springer throughout the time that she was in the pen. Screens were put up around the pen and food was introduced at random times through a tube, so that Springer wouldn’t associate humans with food or other activities. Springer’s behavior was constantly monitored to see if she was alert, lethargic, or non-responsive, and enrichment items were placed in her pen to keep her engaged and active.

Materials

- list of behaviors (see below)
 - If the students choose to do the picture game, use the classroom whiteboard or chalkboard.
1. This activity can either be done with the PowerPoint presentation or it can be done afterwards. A student will act out the behavior or draw a picture of the behavior, and the class will guess what behavior the student is portraying. Whisper the name of the behavior to the student who is acting out or drawing. No materials needed for charades (PowerPoint presentation can be used to reinforce the behaviors); pictures can be drawn on the classroom whiteboard. This activity can also be done by pairs of students, with one acting or drawing, and the other guessing. The behaviors are listed below with possible meanings. Emphasize that the meaning of many behaviors is not known.
 - a) **Breaching** – possible meaning might be play, getting another whale’s attention, communication, removing parasites, barnacles, or whale lice
 - b) **Spyhopping** – possible purpose to see what’s above the water
 - c) **Pectoral slap or pec slap** – possibly an attempt to get another whale’s attention or a form of communication
 - d) **Tail slap or lobtailing** – possibly a warning sign or a form of communication

- e) **Cartwheel** - possible play, courtship, or missed attempt to breach
 - f) **Kelping** - possible play, or it might feel good on the whale's skin
 - g) **Logging** - resting at the surface, not traveling or swimming
2. After the activity, discuss why whales might do these behaviors

B. Activity 5.2 Food chain game: Let's eat! (20 minutes)

This is a modified version of a game called Maple seed Mix-up¹.

Background: Springer's diet was a significant component in her journey to health. From her health check up results, scientists (and students, in Lesson 4) found that Springer had a skin disease, worms and ketosis. The veterinarians put antibiotics (to treat the worms) inside the fish they fed Springer. In this activity, students will explore marine food chains and learn about the importance of each link in relation to the whole chain. This activity could easily be taken one step further to connect food chains into food webs. The connectiveness of a food web is suggested when you ask the students what other animals eat herring, salmon, and other organisms. The game is best played in an open space (outside or in the gym).

Materials (teacher needs to supply materials in BOLD)

- Food chain cards for students (**teacher needs to print out pictures**)
 - ◊ One card each for transient orca, resident orca, and sea lion
 - ◊ Two cards of harbor seal, bald eagle, and Dall's porpoise
 - ◊ Five cards for salmon
 - ◊ Six cards for herring
 - ◊ Seven cards for zooplankton
 - ◊ Eight cards for phytoplankton
 - Food chain posters for teacher (**teacher needs to print out posters**)
 - **Four carpet squares (or bases)**
1. Lay four carpet squares or bases on the ground in a large square shape. Ask students to stand in a circle around the four bases. Hand each student a laminated card to hold face out so everyone can see the cards. Make sure that at least 4-5 phytoplankton and 4-5 zooplankton cards are handed out before handing out the other cards.
 2. Have students become familiar with cards:
 - Ask students to look at each others' cards and try to guess the animal that won't be eaten by another animal (the top predator – **killer whale**).
 - Next, go through the other types of organisms identified on the cards
 - **Plankton** - Plankton in general are small drifting plants and animals.
 - ◊ **Phytoplankton** (plant plankton) are some the smallest organisms in the ocean and the base/bottom of the ocean food chain. They use light from the sun to make their food (they use photosynthesis); they do not have to eat anything to get energy. When students are trying to make food chains they will always want to find a phytoplankton to start the chain.
 - ◊ **Zooplankton** (animal plankton) eat phytoplankton.
 - Ask students which animal in the circle eats zooplankton. **Herring** is one type of small fish (also called forage fish) that eat zooplankton.
 - Ask students if they know what a food chain is. A food chain shows the transfer of energy in a system ("who eats whom") with energy going from organisms to the things that eat them. A simple food chain shows phytoplankton being eaten by zooplankton, which is then eaten by herring.
 - Tell students that they will be making different food chains (2 per round). They will all walk around the bases like a cake-walk and when the teacher says "**Let's eat**" students will

¹ "Maple Seed Mix-up", P. 32 IN: Naturescope: Trees are Terrific. J. Braus, (ed). 1989. National Wildlife Federation, 1400 16th Street NW, Washington DC. 20036-2266. Adapted by Starflower Foundation, 2007, Quick and Easy Habitat Education Activities, http://www.wnps.org/education/resources/documents/Q:&E_Cover.pdf

go to the nearest base, look at the food chain poster held by the teacher, and assemble themselves into a food chain if they can. If there are 24 students, there should be about 6 students at each base.

3. **Begin game:** Tell students that they are going to begin with a food chain where the top predator eats herring. Harbor seals, bald eagles, salmon, and Dall’s porpoise eat herring. Have students begin walking.

Round 1: Say, “Let’s eat!” Show the harbor seal food chain poster:

- **#1 harbor seal food chain** - have students look at everyone in their part of the ocean and see if they can make that particular food chain. Ask which group has it. Other food chains may be present, but remind them that you are looking for this one in particular. Without moving again, ask each group to see if they could make a similar food chain with a different animal at the end of the chain (for example, show the students **#2 Dall’s porpoise food chain**)

Round 2: Tell students to do another food chain where the top predator eats herring... go! Say, “Let’s eat!” Display the following two food chain posters:

- **#3 salmon food chain**
- **#4 bald eagle food chain**

Round 3: Ask students, “What other animals eat salmon?” Have students begin walking.

- Say, “Let’s eat!” Display:
- **#5 resident killer whale food chain** - emphasize that this food chain is like Springer’s food chain.
- **#6 sea lion food chain** - remind students that they have looked at the food chains that eat herring (harbor seals, Dall’s porpoise, and salmon) and food chains that eat salmon (bald eagles, resident killer whales, and sea lions). Tell them they will do one more type of food chain, and have them begin walking.

Round 4: Say, “Let’s eat!” Display:

- **#7 transient killer whale food chain** - tell students that transient killer whales eat seals, sea lions, dolphins, porpoise, and even other whales like young humpbacks or gray whales.
- **#8 transient killer whale food chain**

After the game, have one person from each group pick up the bases and another student collect the cards.

4. Discussion:

- a) Ask students what all of the food chains had in common. *They all had phytoplankton and zooplankton at the bottom of the food chain.*
- b) Have the students think about the killer whale food chain and ask what would happen if salmon or any of the other organisms in the food chain were in trouble. In other words, if only a few salmon were left, what would happen to the food chain? You can also illustrate this with another round of the food chain game where some of the cards are withheld (e.g. only pass out 1 or 2 zooplankton or salmon cards). *If one organism in the chain becomes scarce, the animals higher on the food chain won’t have enough to eat.*

- c) Emphasize that scientists are working to save threatened and endangered species because of the roles they play in their ecosystem.
5. Have students turn to Lesson 4 in their activity book and complete the worksheet on food chains. Tell them that they are to use arrows **FROM** prey (things that are eaten) **TO** predator (animals that eat others). Think of it as giving energy from one organism to another. For example, energy from a salmon goes to a resident killer whale.

III. Assessment:

- A. *Map locations*
- B. *Worksheet and participation in activities*
- C. *Culminating project (optional)*

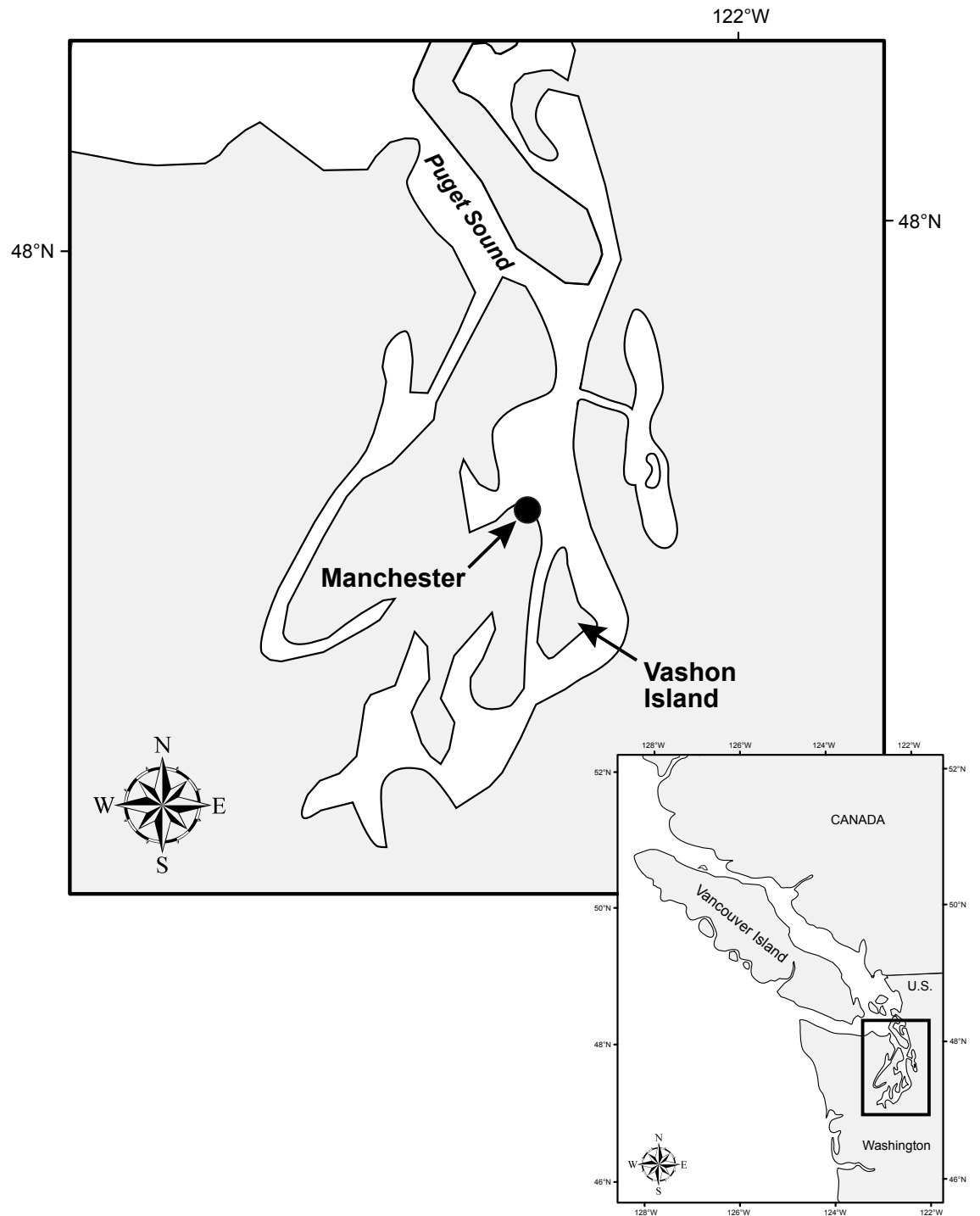
IV. IV. Extension activities – see ideas in Lesson Overview

Map activity

Circle the following places:

- Puget Sound
- Vashon Island
- Manchester (holding pen)

Springer was seen at these places. She was rescued near Vashon Island and stayed in a pen at Manchester.

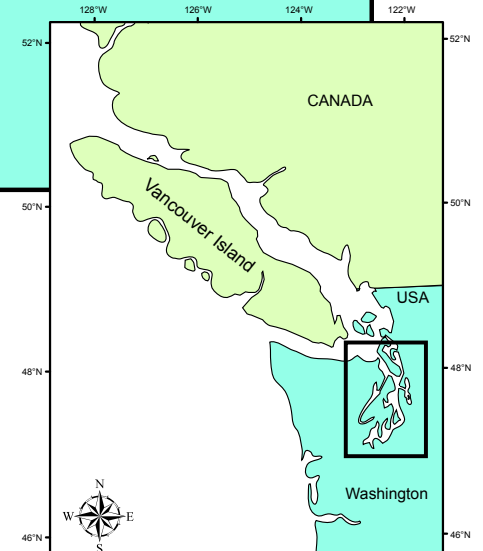
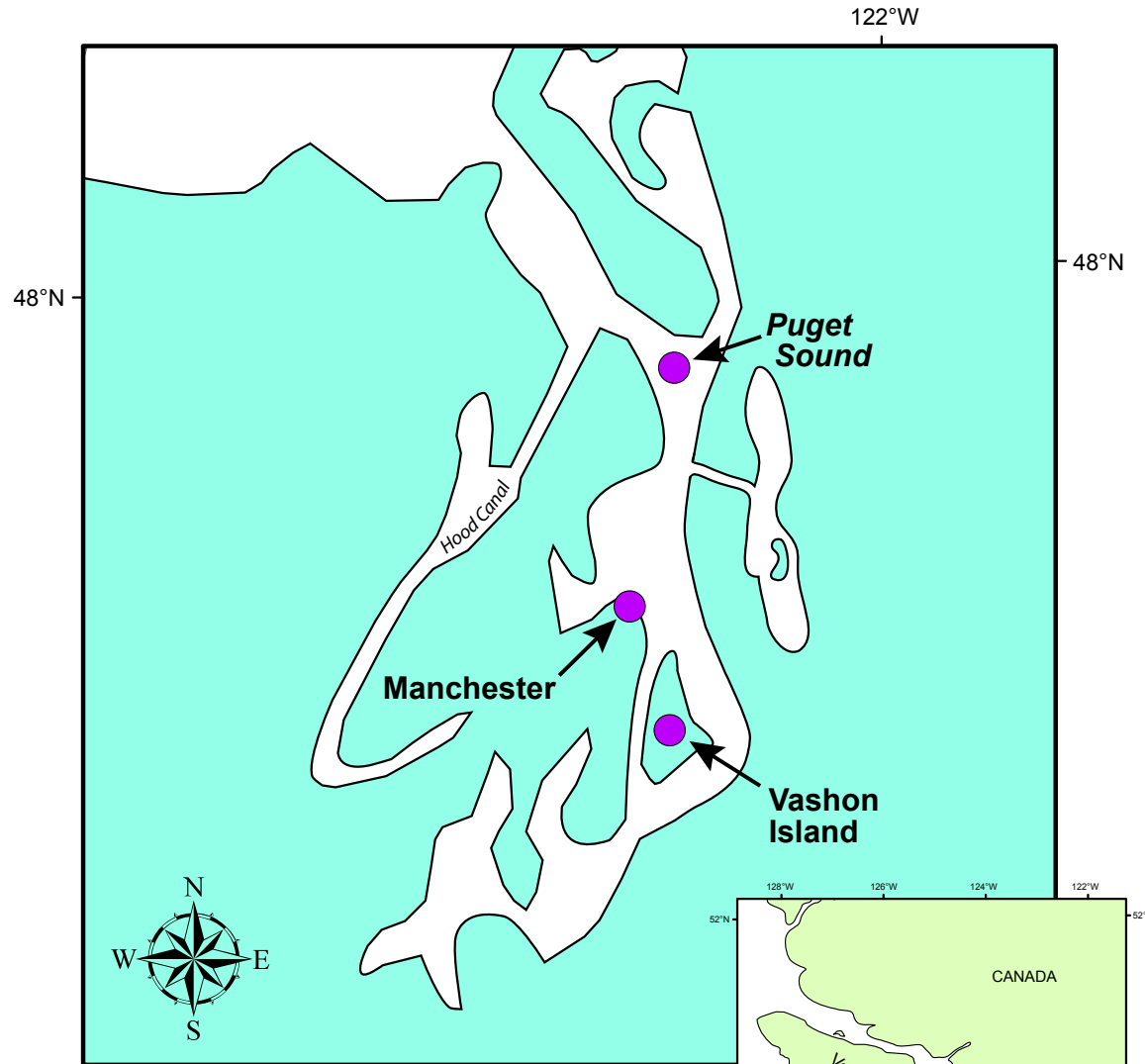


Map activity **KEY**

Circle the following places:

- Puget Sound
- Vashon Island
- Manchester (holding pen)

Springer was seen at these places. She was rescued near Vashon Island and stayed in a pen at Manchester.



Saving Springer

How NOAA helped an orca go home



Mark Shaver



NOAA



Global Research and Rescue



Lesson 5. Journey to Health

While Springer was at Manchester, it was important that she did not become too familiar with people, or lose the behaviors that she would need to survive in the wild. The project team used innovative strategies to minimize her contact with people, and to encourage natural behaviors. This lesson showcases a survey of natural orca behaviors, techniques used by the team, and donations from the community that helped make this phase of the project possible.

The goal of the lesson is to learn a variety of orca behaviors, as well as learning about marine food webs.



Journey to Health What will you learn?

- Review orca behaviors
- Taking care of Springer
 - Natural behavior
 - Keeping her healthy and wild



Journey to Health Orca Behaviors

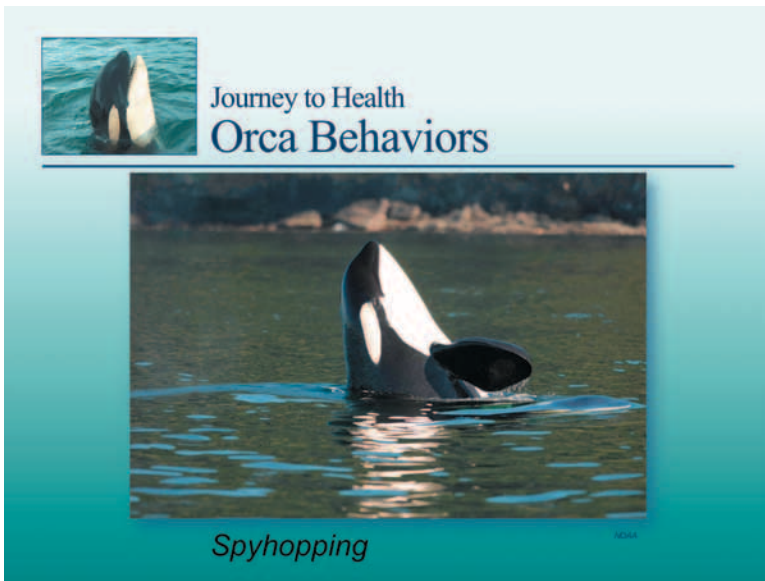


NOAA

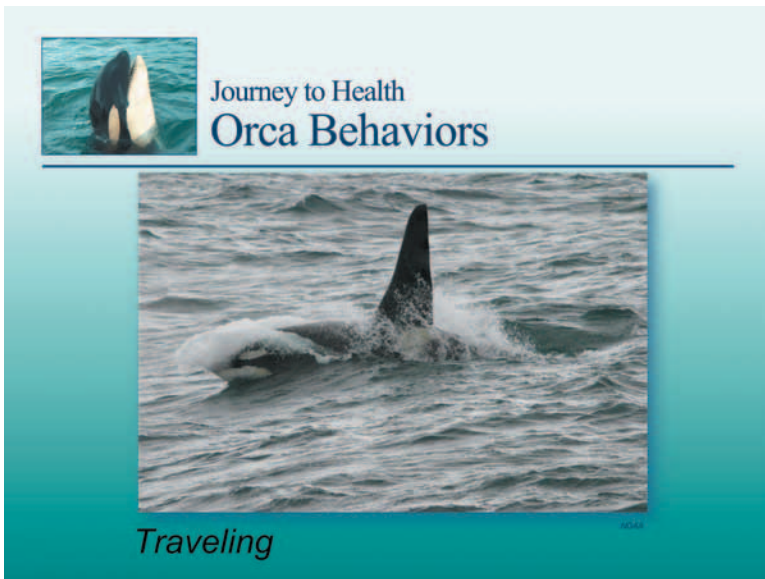
Breaching

See glossary for description of behaviors.

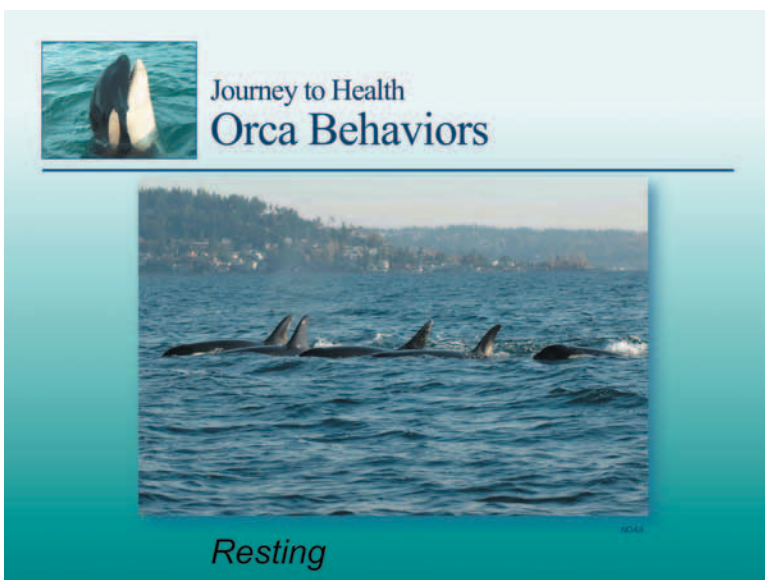
Other definitions can be found at <http://www.whaleresearch.com/facts.html#world>




See glossary for description of behaviors.




See glossary for description of behaviors.



See glossary for description of behaviors.




Journey to Health
Orca Behaviors




Kelping

See glossary for description of behaviors.




Journey to Health
Orca Behaviors




Tail lob

See glossary for description of behaviors.



Journey to Health
Orca Behaviors



Pectoral (pec) slap

See glossary for description of behaviors.

See glossary for description of behaviors.



Journey to Health Orca Behaviors



- **Hunting and Foraging**
 - Resident orcas mostly eat salmon
 - Transient orcas eat seals and other marine mammals
 - Offshore orcas eat fish, including sharks
 - Work together to hunt their prey



Journey to Health Project challenges

- While Springer was in Manchester, the team had to
 - Make sure she didn't forget how to hunt
 - Make sure she didn't get too used to people
 - Keep her healthy
 - Why was this important?



Journey to Health Keeping her wild

How would you keep Springer healthy?

How would you keep Springer hunting and acting like a wild whale?





Journey to Health How the team kept her wild...



- Reduced contact with people
 - No direct feeding
 - High borders around pen
 - Observed through camera



Journey to Health How the team kept her wild -Feeding



- Salmon put in pen through tube
- Variable feeding schedule
 - Number and size of fish
 - Time of day



Community connection

Salmon were provided by Cypress Island, Inc.



Journey to Health How the team kept her wild - remote video monitoring



- 1 overhead camera
 - 4 underwater cameras
- Community connection
- Cameras loaned by Woods Hole Oceanographic Inst. and Ocean Systems, Inc.





Journey to Health
How the team kept her wild
- natural “toys”

■ Logs



Journey to Health
How the team kept her wild
- only natural “toys”



■ Kelp



Journey to Health
How the team kept her wild
- only natural “toys”



■ Streams of water





Journey to Health NOAA's role

- **Scientists**
 - Conducted testing
 - Gave medicine and other treatments
 - Monitored Springer
 - Helped make decisions
- **Managers**
 - Managed team
 - Got supplies
 - Helped make decisions
 - Worked with community



Journey to Health Community role

- **Got supplies for team**
 - Food
 - Ferry passes
 - Scuba tanks
- **Got supplies for Springer**
 - Food
 - Medical supplies
- **Kept raising money**



Journey to Health Activities

- **Killer whale behaviors**
- **Food chain game: Let's Eat!**



Harbor Seal



Dall's Porpoise



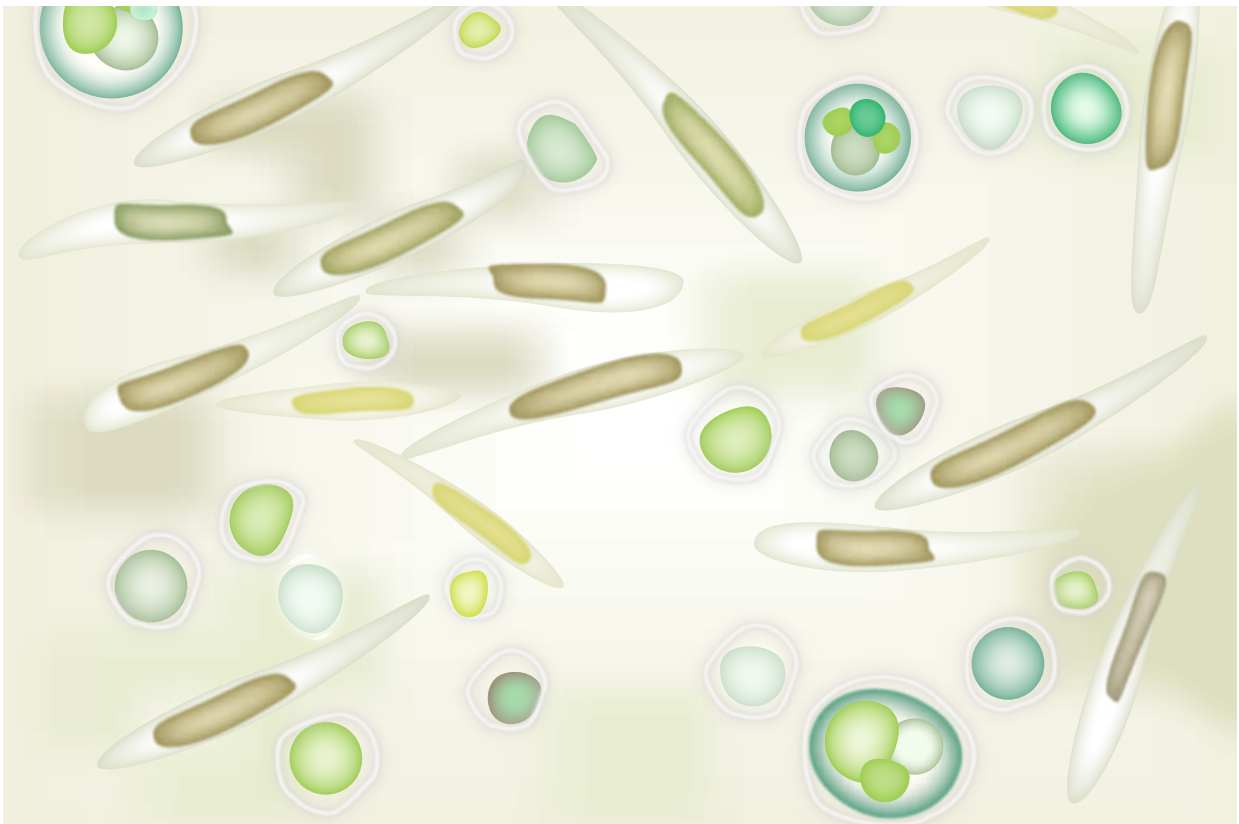
Sockeye Salmon



Herring



Zooplankton



Phytoplankton



Bald Eagle



Resident Killer Whale

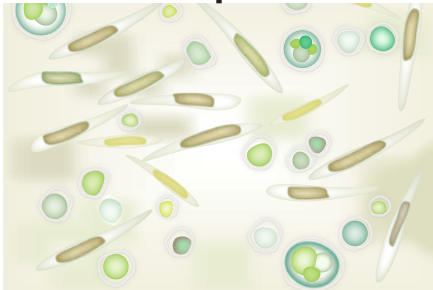


Sea Lion

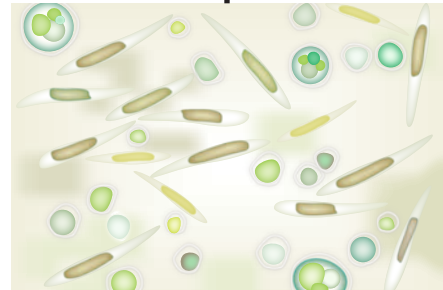


Transient Killer Whales

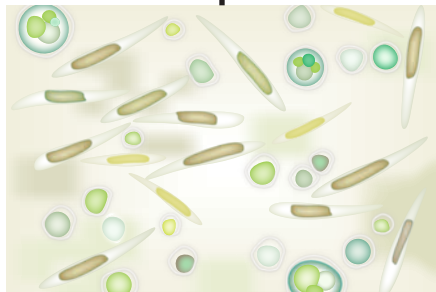
#1 Harbor seal food chain



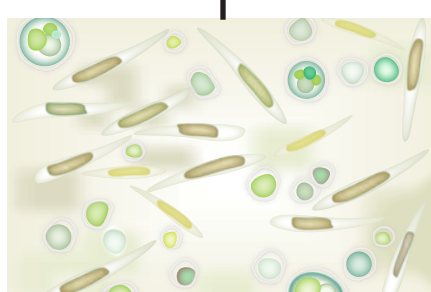
#2 Dall's porpoise food chain



#3 Salmon food chain

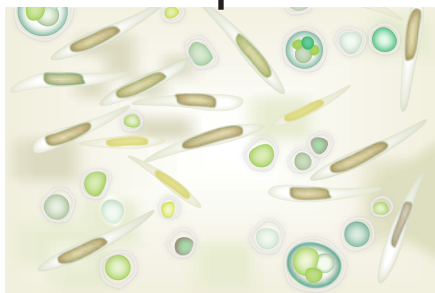
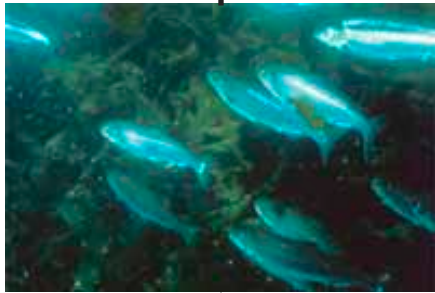


#4 Bald eagle food chain



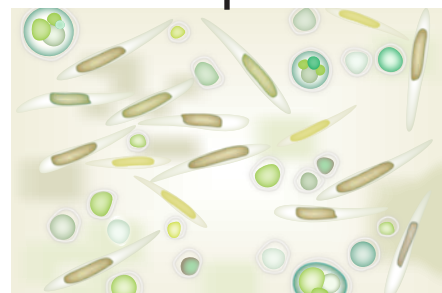
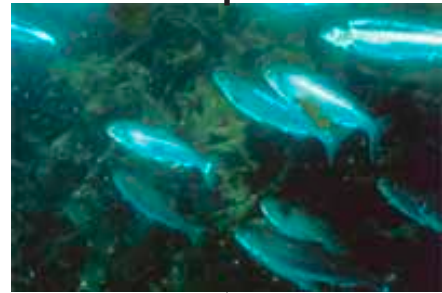
#5

Resident killer whale food chain



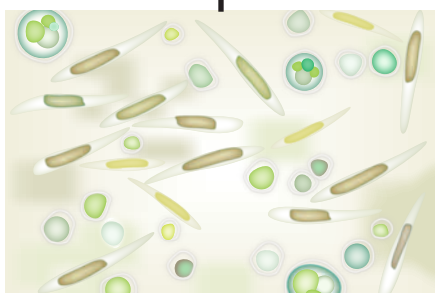
#6

Sea lion food chain



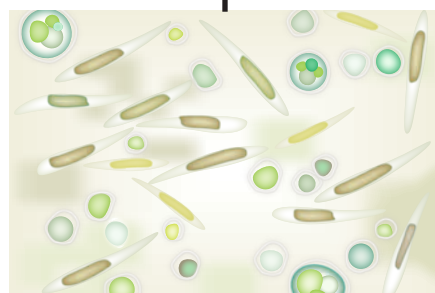
#7

Transient killer whale food chain



#8

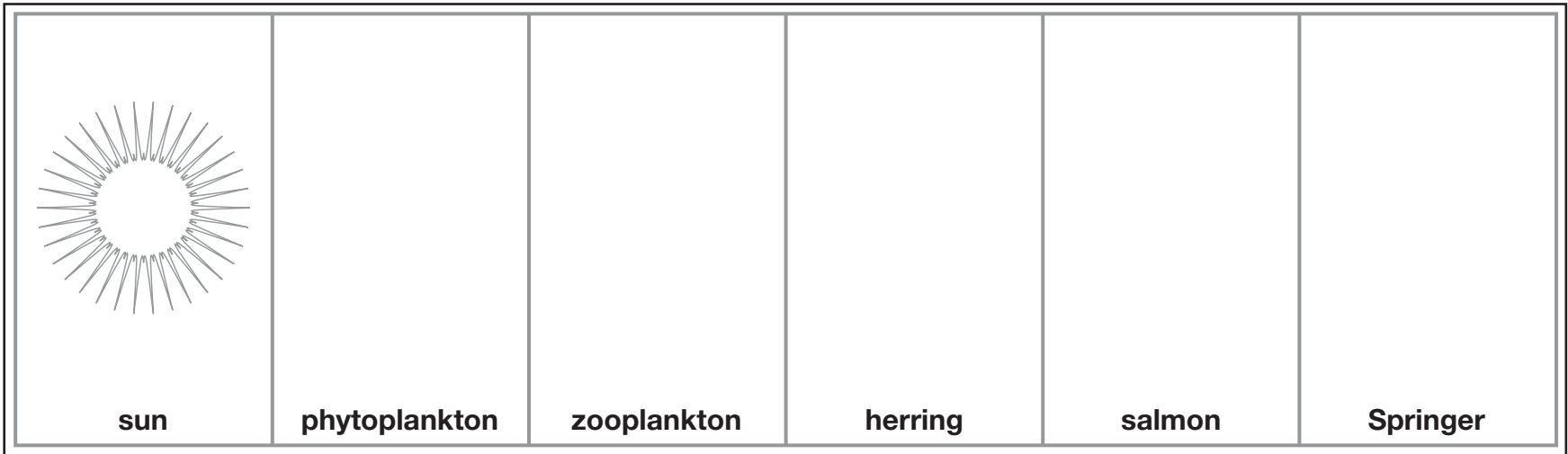
Transient killer whale food chain



Killer whale food chain

Draw arrows FROM prey (things that are eaten) TO predator (animals that eat others).

Draw a picture food chain starting from the sun and ending with Springer (a fish-eating northern resident killer whale). Look up words in your glossary if you don't know what they mean.



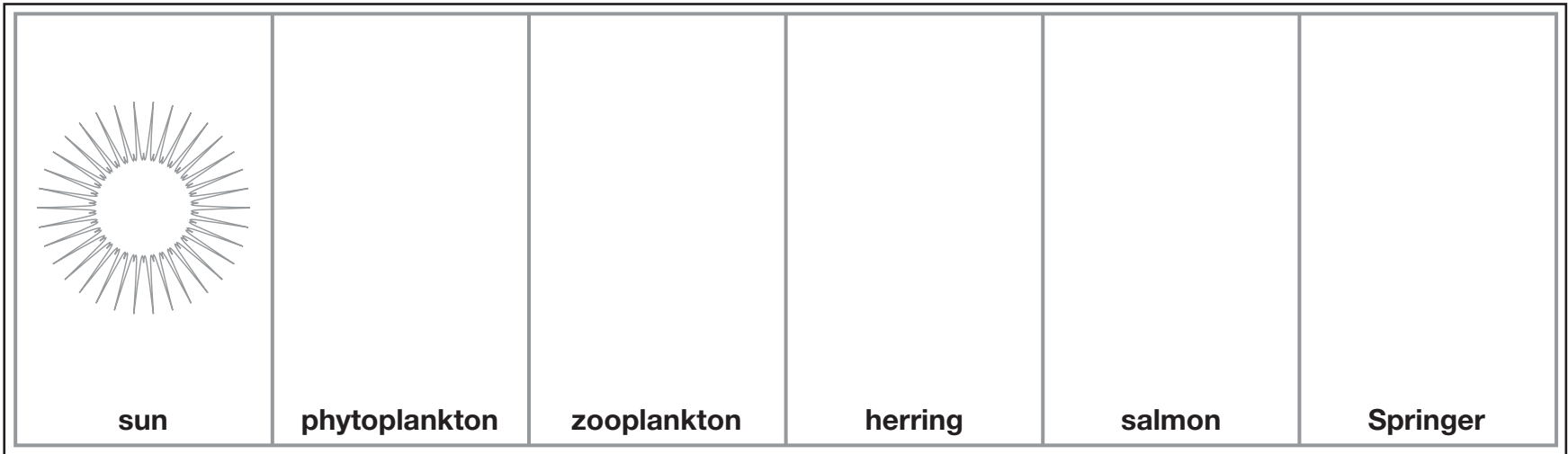
Who else eats herring besides salmon?

Who else eats salmon besides killer whales?

Killer whale food chain **KEY**

Draw arrows FROM prey (things that are eaten) TO predator (animals that eat others).

Draw a picture food chain starting from the sun and ending with Springer (a fish-eating northern resident killer whale). Look up words in your glossary if you don't know what they mean.



Who else eats herring besides salmon?

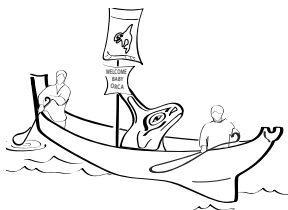
Harbor seals, bald eagles, porpoise (those were the animals mentioned in the game; however, there are many other animals that eat forage fish like herring (e.g. humans, humpback whales).

Who else eats salmon besides killer whales?

Bald eagles, harbor seals, sea lions, humans

Lesson Six OVERVIEW

Homecoming



Subject Area(s)	Life science	Grade Levels: 2 nd -3 rd
Lesson Topic	Homecoming, transporting Springer to Canada, waiting for her family, rejoining her pod	Lesson Title: Homecoming
Key words:	First Nations, Kwakwaka'wakw, Namgis, makinulth, catamaran	Teaching Time: 60 minutes
Materials	<ul style="list-style-type: none"> Classroom Map PowerPoint presentation Activity books Activity 6.1 "Moving a Whale" Butcher paper for four groups of students Activity 6.2 "Comic strip" storyboard and "Return of Springer" track 7, downloaded with curriculum 	
WA State Standards (WA: EALRs)	Communication EALR 2: Interacting and working with others Science EALR 2: Inquiry (INQ) Science EALR 4: Physical Science (PS1) Social Studies EALR 1: Civics Social Studies EALR 3: Geography	
Ocean Literacy Principles	OLP 6 The ocean and humans are inextricably interconnected.	
Focus Questions	<ul style="list-style-type: none"> What did Springer experience during the move? What happened when Springer first arrived in her home waters? Did other orcas recognize Springer? What role did the community have in Springer's homecoming? 	
Learning Objectives	At the end of this lesson students will be able to: <ul style="list-style-type: none"> Explain some of the challenges of lifting, transporting, and caring for a large whale on a boat. Create an interpretation of Springer's interactions with other orcas when she returned home Describe Springer's homecoming to someone who might not know her story 	
Anticipatory Set (Engage)	Map activity: Highlight or color the Strait of Georgia and Strait of Juan de Fuca and circle the city of Campbell River.	
Explain (Encounter)	PowerPoint presentation: Information on how Springer was lifted, moved, and transported up to Canada; stops during the journey, a homecoming welcome, and reunion with Springer's pod.	
Guided Practice (Investigate)	Activity 6.1 Moving a whale. Students will think of ways to move a whale and learn to work together as a team. They will work in 4 teams to see if they can brainstorm how to move a whale. Activity 6.2 Comic strip: Acoustic recognition. Students will listen to Springer's calls and create their own version of what Springer communicated with her pod when she arrived in her home waters in the Johnstone Strait area.	
Independent Practice (Apply and Extend)	Add more information to the comic strip, including background detail to help fill the gaps of the story. Learn more about northern and southern resident whale calls.	
Assessment	<ul style="list-style-type: none"> Map activity Activity book worksheets and comic strip Culminating project (optional) 	
Integrated Extension Ideas	Reading: Play a game such as Pictionary or charades to help with vocabulary Science: Learn about cranes and what makes them work (how are they similar to a lever?) Math: Calculate the boat's rate of travel and how long Springer was out of the water when she was transported Social Studies: Learn more about the First Nations band that greeted Springer in her native waters. http://www.alertbay.ca/ Writing: What stories might Springer have told the orcas that welcomed her home? Art: Create a killer whale mask, or design your own totem or crest	

Washington State Science Learning Standards: EALR = Essential Academic Learning Requirements

Lesson Six: Homecoming

I. Whole class activity (20 minutes)

A. Map activity (10 minutes)

1. Find the Strait of Juan de Fuca and the Strait of Georgia.
2. Tell students this is where the boat traveled after leaving the Seattle area.
3. Have students circle the city of Campbell River, where the boat stopped to get more ice for Springer. The community showed up to help, making a human conveyor belt up the dock. A First Nations mask was presented to the captain.
4. Extension: students can find Manchester on this map by looking at their map from Lesson 5, then trace a line from Manchester northwards through Puget Sound and up to Campbell River, following the route of Springer's boat.

B. Introductory PowerPoint: (10 minutes)

1. Show the students the PowerPoint presentation, which covers the details of how Springer was lifted, moved, and transported up to Canada. The stops during the journey, a homecoming welcome, and Springer's reunion with her pod are also described.

II. Activities (40 minutes)

A. Activity 6.1 Moving a Whale (20 minutes)

Background: Many people were involved in the process of lifting Springer out of the water, preparing her for the 10-hour boat ride, caring for her on the boat, setting up the net pen in Canada, and establishing protocols for her release. Have students imagine what it must have been like at each step. Remind them challenges that were involved (e.g., equipment working, boat functioning properly). The trip was postponed one day due to boat maintenance. Orcas are a significant symbol for Native Americans in the United States and First Nations communities in Canada throughout the Pacific Coast area. A native dance group performed for Springer before she left Seattle and a ceremonial homecoming of drumming and dancing by the Kwakwaka'wakw people welcomed her when she arrived home. Springer was surrounded by people who worked hard to ensure that she would be healthy and have a future that all whales deserve.

1. Ask students if they were to move themselves from Seattle to Vancouver Island, how would they do it? (e.g., drive and take a ferry, boat, plane, or train and ferry). Tell them this activity will involve thinking of ways to move Springer.
2. Split students up into teams of four students, or do the activity as a class. Hand each group a piece of butcher paper and tell them to make a concept map (a visual map of key elements and how they are related to each other) of different ways to move Springer, challenges with each type of transportation, and what factors they would have to worry about with regard to Springer's health. If you have access to Inspiration software on your computers at school, this activity can be done on computers. You could schedule more time if necessary. Give students about 7 minutes to brainstorm.
3. When the group is finished brainstorming, have each group choose the BEST option for Springer. Have them think of the limiting factors that might make other choices NOT the best choice. Then have each group present their solution to the rest of the class

B. Activity 6.2 Comic Strip-Acoustic Recognition (20 minutes)

Background: After traveling 10 hours, Springer's boat arrived in Dong Chong Bay in the early evening of July 13, 2002. Springer was greeted with a ceremonial welcome by the Namgis band chief and many supporters. She was transferred to a barge, then lowered into a holding pen where

a hydrophone was placed by Dr. Paul Spong and Helena Symonds of Orcalab. At around 1:30 AM on July 14th, the A12 pod and part of Springer's pod (A35s) were within acoustic vicinity of Springer's pen. Students will listen to the calls from both Springer and her family that night (track #7, "The Return of Springer"). The next day, Springer's pod entered Dong Chong Bay again. The team lowered the side of Springer's net pen, and she swam out, stopping just long enough to take a salmon with her. Then she was off, but she didn't stay with the whales. In a few days, Springer was adopted by her great-aunt's pod. She has been resighted each year since her reunion, swimming with whales who are close relatives.

1. Ask students if they have ever been away from home for a while and what it felt like when they returned home. Tell students to close their eyes and imagine that they are Springer, home at last. Imagine what it must be like for Springer and if it seems familiar. Tell them that in the middle of the night, Springer heard something. Guess how she responded? Listen to Track #7, "The Return of Springer." This track has Springer's calls as well as her pod responding to her.
2. Have students imagine what the whales are saying back and forth to each other. What might Springer be trying to communicate? What might her family be saying?
3. Have students draw pictures and write what the whales might be communicating in a comic strip.
4. If students are interested, listen to more orca vocalizations at the following websites:
 - a) The Center for Whale Research (http://www.whaleresearch.com/audio_video.html)
 - b) Orcasound.net (<http://orcasound.net/>)
 - c) Wild Whales – B.C. Cetacean sightings network (<http://wildwhales.org/killer-whale/>)

III. Assessment

- A. *Map activity*
- B. *Participation in "Moving a whale" activity*
- C. *Comic strip (see rubric)*
- D. *Culminating project (optional)*

IV. Extension activities – see ideas in Lesson Overview

Map activity

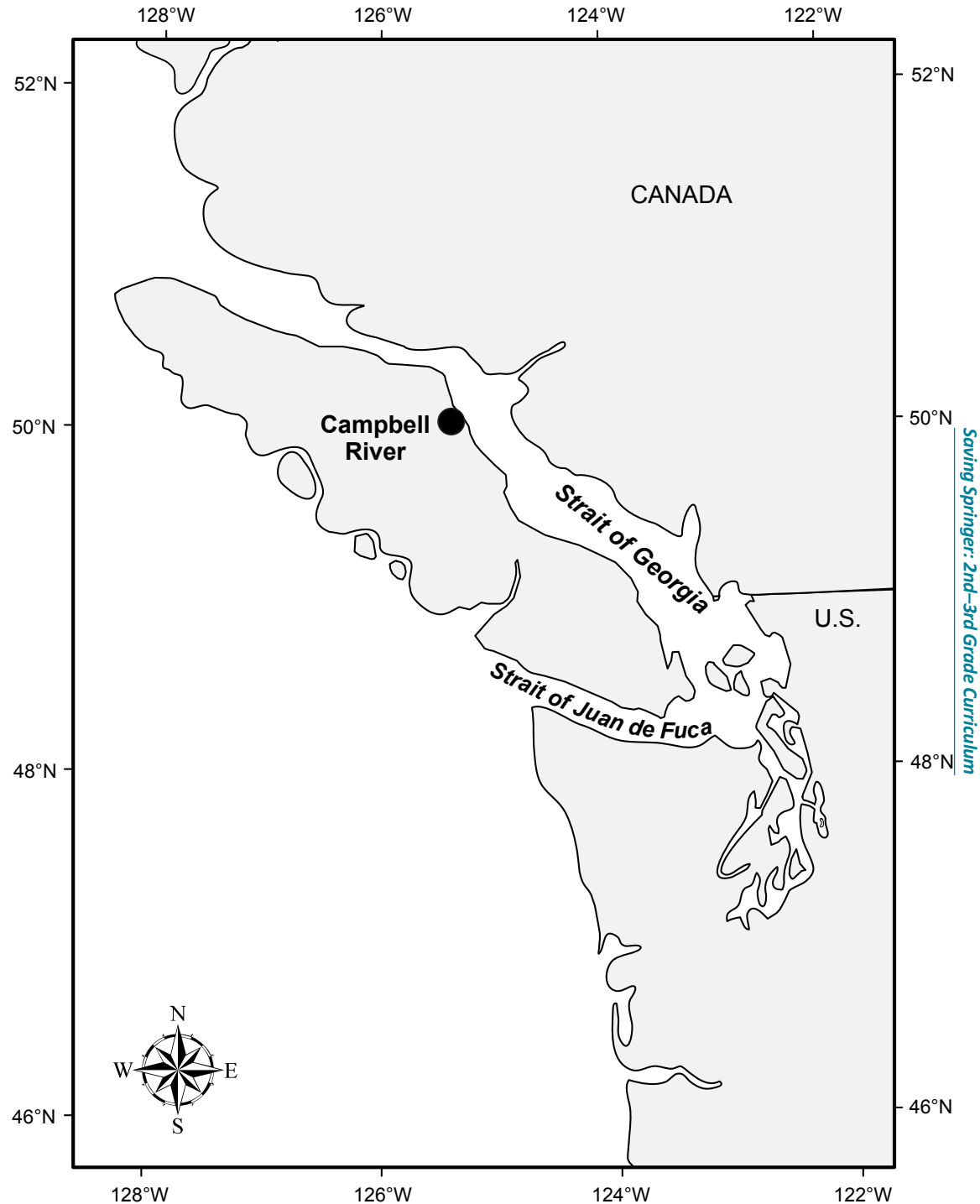
Color the following bodies of water light blue:

- Strait of Juan de Fuca
- Strait of Georgia

Circle the following city:

- Campbell River

The boat that carried Springer home stopped in Campbell River to get ice to keep her cool. A local tribe presented a ceremonial mask to the captain of the boat.



Map activity **KEY**

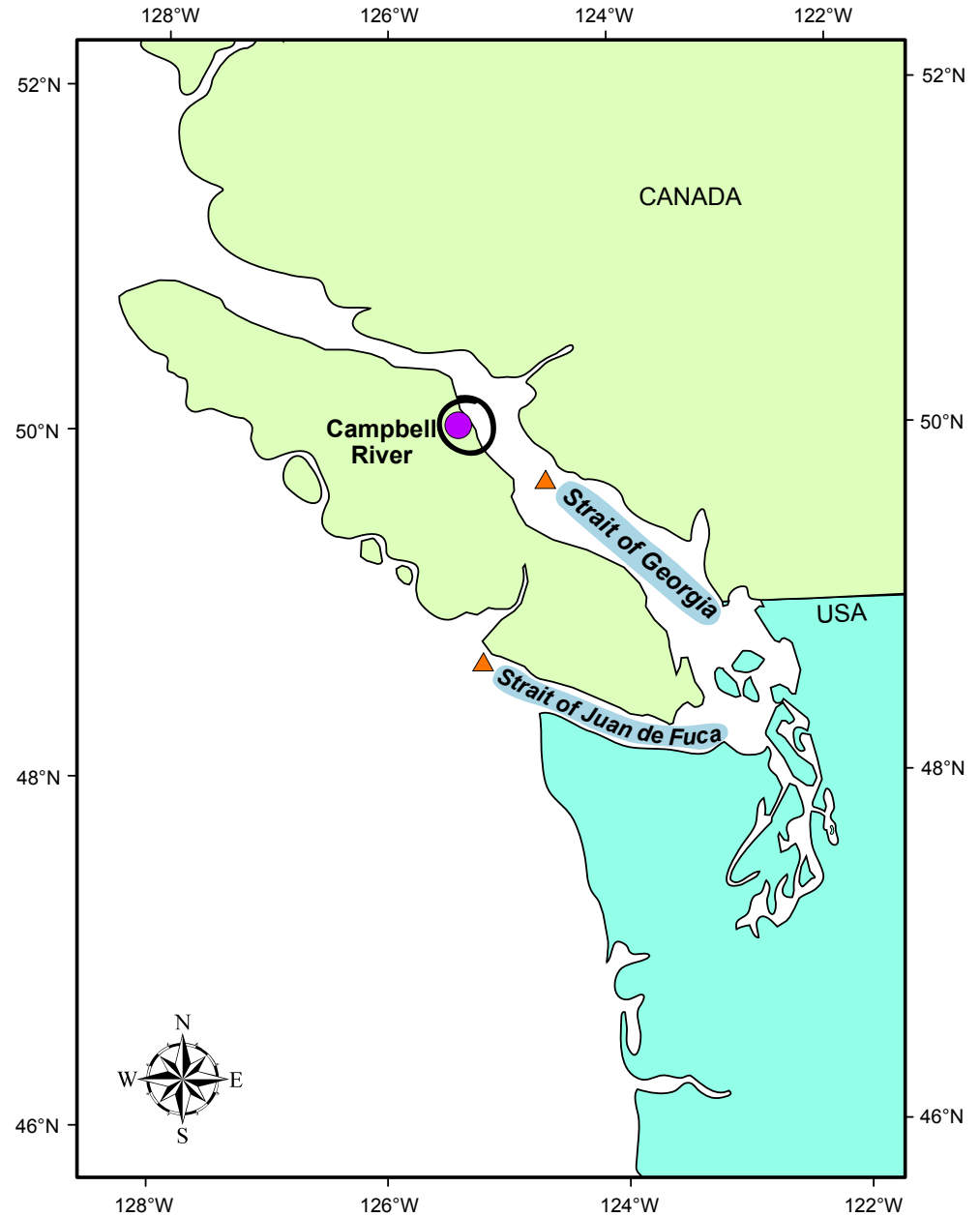
Color the following bodies of water light blue:

- Strait of Juan de Fuca
- Strait of Georgia

Circle the following city:

- Campbell River

The boat that carried Springer home stopped in Campbell River to get ice to keep her cool. A local tribe presented a ceremonial mask to the captain of the boat.



Saving Springer

How NOAA helped an orca go home



Mark Seam



NOAA



Global Research and Rescue



Lesson 6. Homecoming

Springer's homecoming was another precedent-setting event, presenting a huge set of logistical challenges for the team, and culminating in a successful reunion with her pod. This lesson covers some of the logistical challenges faced by the team, the welcome she received from the human and orca communities, and the successful reunion with her pod.

Springer was transported via a catamaran to her temporary holding pen on the northeast coast of Vancouver Island. There, she was welcomed home by local First Nations people, including the chief. The homecoming continued when orcas made acoustic contact with her later that night, and culminated with her release the next day. Less than 24 hours after she was returned to Canada, she was swimming with her pod. One year later, she returned to Johnstone Strait her pod.



Homecoming What will you learn?

- How Springer was moved to Canada
- What happened when she went home
 - Did her pod accept her?



Homecoming Canadian team prepares

- Release site selected
 - Dong Chong Bay
 - Many orcas likely to be in the area
- Holding pen built



NOAA



Homecoming The trip north

- July 13, 2002
- Springer's going home
- The whole world was watching...



Why were so many people interested in Springer's story?

Public interest in Springer was high, and every step of her journey home was closely followed by media from around the world.

The class can discuss other cases where a single whale (or a few whales) captured public attention, and why it happened – e.g., gray whales trapped in the Arctic ice, which were featured in a movie called “Big Miracle,” or Keiko, the killer whale featured in the movie “Free Willy.”



Homecoming The trip north



- Catamaran leaves early morning
- Stopped for ice in Campbell River
 - First Nations band presents captain with mask

The team stopped in Campbell River for ice to cool the water in Springer's tank.

Responsibility for project management shifted from NOAA to DFO when the catamaran crossed the Canadian border.



Homecoming Welcome home!

- Arrive in Dong Chong Bay early evening
- First Nations people greet her from a canoe
 - Wearing orca masks
 - Singing orca songs



The Kwakwaka'wakw (pronounced Kwalk-walk-ya-walk) people who welcomed Springer home are centered in Alert Bay, which is known as the Home of the Killer Whale. Orcas figure prominently in their stories, masks, totems, and songs.

More information on Alert Bay:
<http://www.alertbay.ca>

Information on pronunciation: Pronunciation Guide to First Nations in British Columbia
<http://www.aadnc-aandc.gc.ca/eng/1100100022848>



Homecoming Home again!

- Transferred from boat to pen
- Chief welcomes her home in native language (Kwakiulth)

- She starts hunting salmon in the net pen right away!

Kwakiulth – pronunciation Kwa-gulth
Pronunciation Guide for First Nations
in British Columbia
<http://www.aadnc-aandc.gc.ca/eng/1100100022848>



Homecoming Reunion

- Later that night...
- Whales approach in the distance
- She hears their calls...

- And starts calling back to them

Insert audio clips



Homecoming Reunion

- The next day her pod, the A24s, comes by
 - Much sooner than expected
- The team decides
 - It's time to let her go!



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Homecoming Reintegration

Over the next weeks...

- Scientists continue monitoring
- Springer “adopted” by A51, who is from the A5 pod
- Swims with other whales

Read NOAA’s press release about her rescue wrap-up:
<http://www.nwr.noaa.gov/Newsroom/Archives/2002/upload/07-18-2002.pdf>



Homecoming One year later...



- She returns with the A11 pod (her great-aunt’s pod)
- The project is a success!

Note the clear and distinct saddle-patch. This is a good opportunity for the class to compare the condition of her skin with how it appeared when she was in Seattle.



Homecoming Next Steps for Springer and Us



- How is Springer today?
- How are the other orcas today?
- What did we learn from the project?

Anticipatory slide for Lesson 7.



Homecoming NOAA's role

- **Scientists**
 - Monitored during and after move
 - Tested and analyzed results

- **Managers**
 - Worked with Canadian team to transfer Springer
 - Prepared for journey
 - Accompanied her on trip



Homecoming Community role

- **Orphan Orca Fund**
 - Bought salmon for her pen at Dong Chong Bay
 - Raised money

- **First Nations**
 - Presented mask
 - Caught salmon for her pen
 - Welcomed her home



Homecoming Activities

- **Moving a Whale**
- **Comic strip**

Comic strip

What do you suppose Springer was saying to these closely related whales? Were her calls recognized? How did Springer's family know it was her? What happened next? Tell your version in a comic strip.

Springer's first calls home!

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Comic strip rubric

	Content	Organization	Mechanics
4 Wow! Terrific!	Contains detailed information about the communication between Springer and the whales. Extra additions and attention to detail. Labeling easy to read and follow.	Information is organized and in the right order. The dialogs are clearly written and accurate according to the CD recordings.	All words spelled correctly and no mechanical errors. Nicely colored and outlined with a marker.
3 You've got it!	Contains detailed information about the communication between the whales. A lot of thought is given to the details of Springer's story.	Information is organized and in the right order. Information is written clearly.	Three or fewer misspellings or mechanical errors. Colored and outlined with a marker.
2 Not yet?	Contains some information about the communication between the whales, yet is not descriptive enough.	Not quite the right order or some details are left out. Information is not written clearly and is hard to read.	Four misspelled words or grammatical errors. No craftsmanship in drawing.
1 Try again	Information about the communication between the whales is not complete or realistic. Story or details are not captured.	Information is not organized, is not in the right order, or is not written clearly.	More than four errors in spelling or grammar, or drawing and tracing are not acceptable.

Lesson Seven OVERVIEW

Stewardship



Subject Area(s)	Life science		Grade Levels: 2 nd -3 rd
Lesson Topic	Endangered and threatened species, current issues and stewardship		Lesson Title: Stewardship
Key words:	Stewardship, conservation		Teaching Time: 65 minutes
Materials	<ul style="list-style-type: none"> Classroom Map PowerPoint presentation 	<ul style="list-style-type: none"> Activity books Activity 7.2 Post-Test; KWL is already up on wall 	
WA State Standards (WA: EALRs)	<ul style="list-style-type: none"> Science EALR 3: Application (APP) Science EALR 4: Life Science, Ecosystems (LS2) Social Studies EALR 1: Civics Social Studies EALR 3: Geography 	<ul style="list-style-type: none"> Integrated Environmental and Sustainability Standard 1: Ecological, social and economic systems Integrated Environmental and Sustainability Standard 2: The natural and built environment Integrated Environmental and Sustainability Standard 3: Sustainability and civic responsibility 	
Ocean Literacy Principles	OLP 6 The ocean and humans are inextricably interconnected.		
Focus Questions	<ul style="list-style-type: none"> How is Springer doing now? What is the overall health of Springer’s population? What about the southern resident orca population? 	<ul style="list-style-type: none"> How can people like me get involved and educate others about the issues facing killer whales? How can I make a difference? 	
Learning Objectives	At the end of this lesson students will be able to: <ul style="list-style-type: none"> List 3 issues that are affecting the health of killer whales in the Pacific Northwest Make a connection between themselves and protecting our oceans Determine actions that can be taken to help save water and electricity at home and school 		
Anticipatory Set (Engage)	Map activity Label Johnstone Strait and Dong Chong Bay on Hanson Island, where Springer was released. Label Seattle to show how far she had traveled. Students will make a line from Seattle to Dong Chong Bay to show Springer’s journey.		
Explain (Encounter)	PowerPoint presentation Moves the story forward from Springer’s reunion to current issues facing orcas. Introduces endangered status of southern resident killer whales, encourages students to take action, and emphasizes the importance of working together to solve common issues.		
Guided Practice (Investigate)	Activity 7.1 How can I help? List the three main threats facing the southern resident killer whale community. Split class into three groups to brainstorm ways to address those threats. Discuss ways that students can make a difference to help the whales, water, and the world we live in and have them make a pledge. Activity 7.2 Post-Test/KWL. This post-test is exactly the same as the pre-test. Have students return to the class KWL and put a check mark by the things they wanted to learn in the middle column. Have them fill in the last column to show what they learned during this unit.		
Independent Practice (Apply and Extend)	Research endangered species in more depth. Investigate ways that you can get involved and help save these animals – e.g., habitat restoration or things you can do at home (reduce/reuse/recycle, use non-toxic chemicals, etc.)		
Assessment	<ul style="list-style-type: none"> Map activity Activity book worksheets 	<ul style="list-style-type: none"> KWL or Post-Test Culminating project (optional) 	
Integrated Extension Ideas	Reading: Vocabulary quiz Science: Investigate whale and dolphin conservation organizations in your area and how students and families can get more involved Social Studies: Find a Canadian pen pal to share ways to help save killer whales Writing: In your journals: Brainstorm ways students can help save our oceans Art: Design a poster that promotes taking care of our oceans or Puget Sound		

Washington State Science Learning Standards: EALR = Essential Academic Learning Requirements

Lesson Seven: Stewardship

I. Whole class activity (15 minutes)

A. Map activity (10 minutes)

1. Circle the following locations:

- a) Johnstone Strait
- b) Dong Chong Bay on Hanson Island
- c) Seattle

Springer was released in Dong Chong Bay in the Johnstone Strait area.

2. Have students draw a line from Seattle to Dong Chong Bay to show Springer’s journey.

B. PowerPoint presentation (5 minutes)

1. This PowerPoint presentation moves the story forward from Springer’s reunion to current issues facing orcas. It introduces the endangered status of southern resident killer whales, encourages students to take action, and emphasizes the importance of working together to solve common issues.

II. Activities(50 minutes)

A. Activity 7.1 How can I help? (40 minutes)

Background: In this curriculum, students have learned how people worked together to help Springer go home. Though Springer is safely home, there are many other issues facing orcas today. In 2005, the southern resident killer whale population declared endangered. There are many issues that these whales face, but through action and positive behaviors, change can take place. It was evident that school kids, the community and local scientists both in the U.S. and Canada took risks, and cooperatively worked together for Springer’s health and well being. We want to inspire students to become stewards of the land and water around us. We hope students can promote orca awareness and encourage others to protect the waters that these whales live in.

1. Discuss with the class what the three main threats are to the southern resident community of killer whales (5 minutes):
 - a) prey availability (salmon numbers are low)
 - b) toxins
 - c) noise pollution (increased ambient noise in the oceans, more boats around the whales)
2. Split the students into three groups and give each group a large piece of poster paper or butcher paper. Put a line down the center. On the left side of the paper, have each group write one of the threats. Ask students to think of scientific questions that could be asked to learn more about these threats, and write them on the left side. (10 minutes)
3. Next, brainstorm ways to help protect killer whales in the Pacific Northwest and generate this list on the right side of the butcher paper. (10 minutes)
4. Have students open their activity books to Lesson 7 “How can I help?” Ask students what they might do to help save killer whales. (10 minutes)
5. Homework or as a class: find out what is currently being done to study the threats to southern resident killer whales. Resources to check:

- a) Southern Resident Killer Whale Recovery <http://www.fws.gov/endangered/news/bulletin-summer2009/killer-whale-recovery.html>
- b) NOAA Fisheries Northwest Regional Office <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/ESA-Status/Index.cfm>
- c) The Whale Museum <http://www.whalemuseum.org/education/library/issues.html>
- d) British Columbia Wild Killer Whale Adoption Program <http://killerwhale.vanaqua.org/kwap/take-action>

B. Activity 7.2 Post-Test/KWL (10 minutes)

1. Post-Test: Tell students that this is the same test they took at the beginning of the unit; it is to show how much they learned in this unit.
2. KWL: Now that the students are done with this unit, have them go back to the class KWL chart, put a check mark by all the items they wanted to learn in the middle column, if they learned more about those items. Have students fill in what they have learned in the last column.
3. Collect and grade activity books. When you hand them back have students share what they have learned with their family. Also encourage them to explore the websites and extension activities at home as well.

III. Assessment

- A. Map activity*
- B. Activity book worksheet*
- C. Post-test/KWL*
- D. Culminating project (optional)*

IV. Extension activities – see ideas in Lesson Overview

Saving Springer

How NOAA helped an orca home



Mark Sears



Global Research and Rescue



Lesson 7. Stewardship

The goal of this lesson is to reflect on lessons learned from Springer's story, to learn about issues facing killer whale populations, and ways in which students can help and become stewards of the environment. Corresponds to 25:00 to the end of the "Saving Springer: Orphan Orca" DVD.

Though Springer is safely home, the issues facing orcas and other marine mammals today are serious. For example, the southern resident orca pods have been listed as endangered in the U.S. In this lesson, Springer's story and the current status of the orcas is explored. Students are encouraged to consider how they can become involved and help resolve these or other issues.

Springer is home because people shared a common vision of the right thing to do for this whale, and did everything they could to make that vision a reality. We hope students are similarly inspired to work together, and make a difference on an issue that matters to them.



Stewardship What will you learn?

- How is Springer now?
- What did the team learn from the project?
- How are the orcas today? - current issues
- What can we do to help?



Global Research and Rescue



Stewardship How is Springer now?

- Still healthy!
- Still with her pod!
 - With her great-aunt (A-11s), not grandmother (A4s)



Global Research and Rescue



Stewardship
What did the team learn?

- How to work together to solve a common problem
- Orcas can go home again!



Stewardship
How are the orcas today?



- Southern resident orcas are **endangered**

Endangered - the species is experiencing a population decline and may become extinct unless the trend reverses.



Stewardship
Issues facing orcas today

- Food (not enough salmon)
- Poisons in the environment
- Boat noise and traffic





Stewardship What can we do to help?

- Your ideas go here!

-
-
-
-
-



Mark Davis



Stewardship NOAA's role



NOAA

- Study what is causing orca population to go down
- Make a plan to help the orca population get bigger
- Make sure people follow the plan



Epilogue and Stewardship Community role



NOAA

- Learn how we can help the whales
- Change what we do
- Work with NOAA to be sure the whales are protected and preserved



Stewardship Activities

- Taking Action
- Know – Wonder – Learn

Map activity

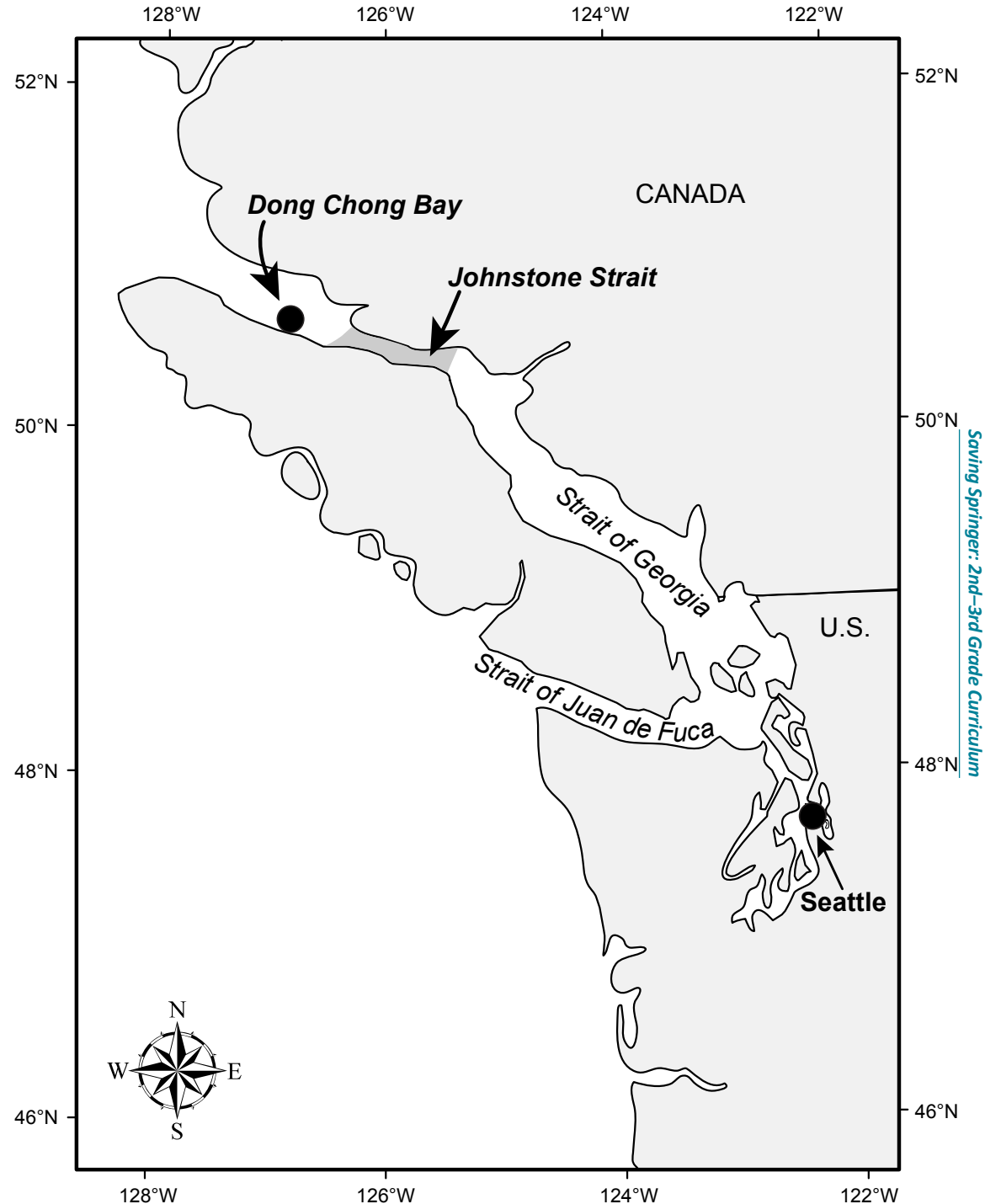
Circle the following locations:

- Johnstone Strait
- Dong Chong Bay on Hanson Island
- Seattle

Draw a line from Seattle to Dong Chong Bay to show Springer's whole journey.

Springer returned to her home waters in Johnstone Strait. First Nation leaders from Alert Bay (Springer's home) greeted her from a native canoe, draped in cedar boughs, with a ceremonial killer whale mask.

Springer's homecoming was a true success story that happened with the help of government agencies in two countries (NOAA in the U.S.A., and Fisheries and Oceans Canada), community involvement, and school kids in Washington State. We hope you share this story and inspire others to learn more too.



Map activity **KEY**

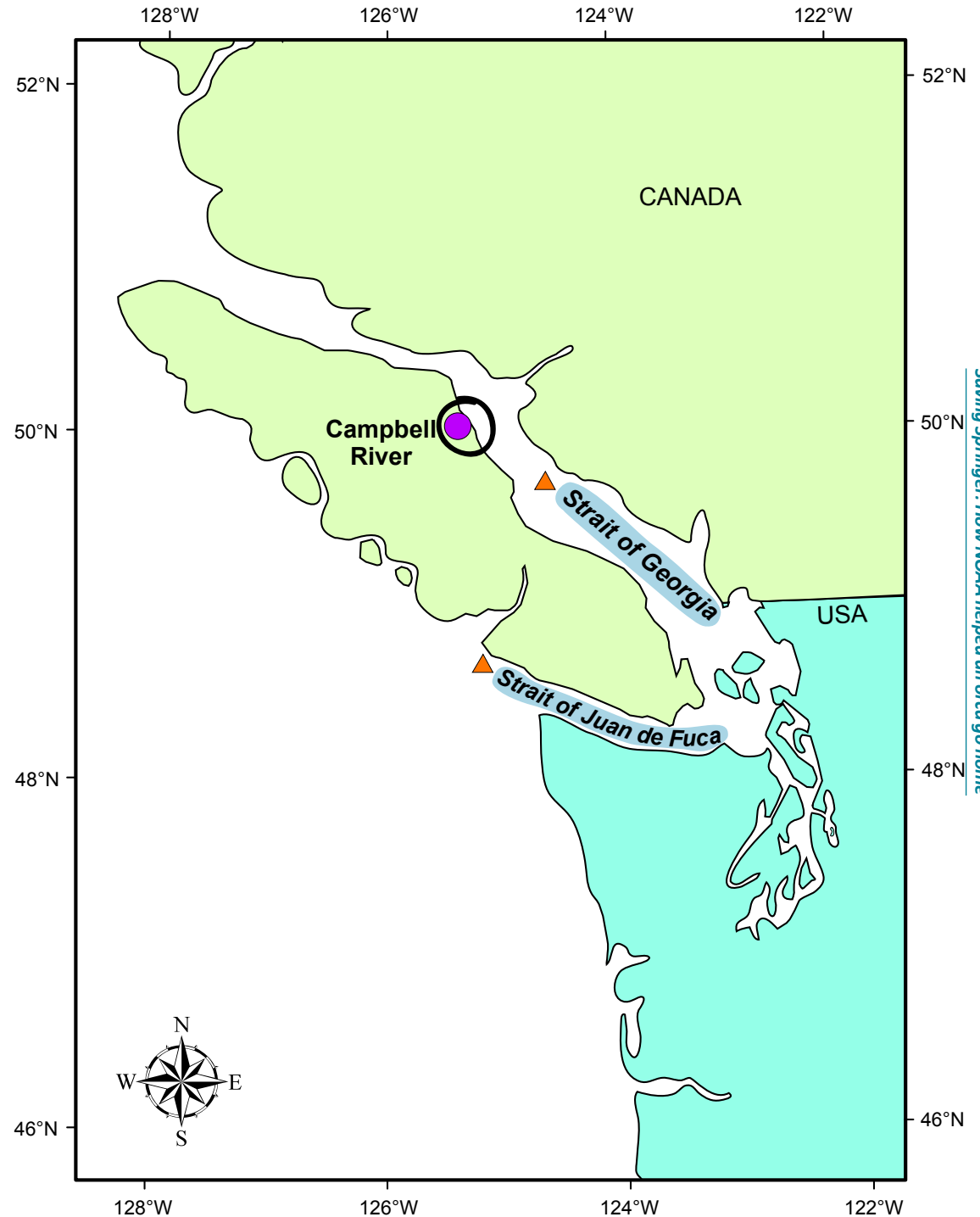
Circle the following locations:

- Johnstone Strait
- Dong Chong Bay on Hanson Island
- Seattle

Draw a line from Seattle to Dong Chong Bay to show Springer's whole journey.

Springer returned to her home waters in Johnstone Strait. First Nation leaders from Alert Bay (Springer's home) greeted her from a native canoe, draped in cedar boughs, with a ceremonial killer whale mask.

Springer's homecoming was a true success story that happened with the help of government agencies in two countries (NOAA in the U.S.A., and Fisheries and Oceans Canada), community involvement, and school kids in Washington State. We hope you share this story and inspire others to learn more too.



How can I help?

Now that you've learned how NOAA helped save one whale, let's focus on the killer whale population of the Pacific Northwest. From the activity we just did, list the things you will do at home or at school that will make a difference to the whale population. Then see how many you can do.

Things I can do at home or school...

I pledge to...

How can I help? **KEY**

Now that you've learned how NOAA helped save one whale, let's focus on the killer whale population of the Pacific Northwest. From the activity we just did, list the things you will do at home or at school that will make a difference to the whale population. Then see how many you can do.

Things I can do at home or school...

- turn off water when I brush my teeth
- turn off lights when I leave a room
- take shorter showers
- don't litter
- pick up after myself when I'm outdoors
- use reusable containers in my lunch
- reuse items, recycle paper, glass, and aluminum at home and school
- share Springer's story with family and friends
- learn more about whales and other endangered animals in my area

I pledge to...

<h1 style="margin: 0;">Post-Test</h1>	<h2 style="margin: 0;">Springer and Orcas Questionnaire</h2>	Name:
		Grade:
		School:

This questionnaire is to find out how much you know about orcas. Please circle the answer you think fits best.

1. An orca or killer whale is
 - a. a fish
 - b. a marine mammal
 - c. a baleen whale
 - d. the largest member of the porpoise family
 - e. none of the above

2. Orcas usually live:
 - a. in pairs
 - b. in family groups led by a female
 - c. in family groups led by a male
 - d. alone
 - e. none of the above

3. Orcas use sound to:
 - a. find food underwater
 - b. find their way around underwater
 - c. scare enemies away
 - d. a and b
 - e. none of the above

For the next questions, fill in the spaces.

8. Name 2 things that orcas eat:
 - 1.
 - 2.

9. Name 2 ways that NOAA scientists study orcas:
 - 1.
 - 2.

10. Name one way that people can affect where orcas live:

For the next questions, circle True if you think the statement is true, or False if you think it is not true.

4. Orcas can be identified by their calls.

True False

5. Orcas stay in the same place all year round.

True False

6. There are different types of orcas.

True False

7. Springer is a southern resident orca.

True False

11. Name one way that people helped Springer go home.

12. What does NOAA do to help orcas?

Bonus question: What was your favorite activity?

Glossary – Grades 2-3

acoustics The study of sounds. Scientists study the sounds made by killer whales (whistles, clicks, and calls).

baleen Long, flat plates that form the comb-like structure that hangs from the upper jaw of plankton-eating whales. These plates help filter food from the water.

baleen whale A whale with baleen in its mouth instead of teeth. Three examples of baleen whales are blue whale, humpback whale, and gray whale.

blowhole The nostril of a whale, located at the top of its head. Whales with teeth, like orcas, have one blowhole. Baleen whales have two blowholes.

breaching A behavior where a whale leaps out of the water.

calls Sounds made by whales to communicate with one another.

catamaran A boat with two hulls.

cetaceans The group of marine mammals that includes whales, dolphins, and porpoises.

clicks Repetitive sounds used by toothed whales to navigate and find food. Also known as echolocation clicks or sonar clicks. A whale emits clicks; when a click hits an object, the echo returns to the whale and is used to “see” underwater.

conservation The act of protecting or preserving natural resources in order to prevent depletion or loss.

DFO An abbreviation for the Department of Fisheries and Oceans (now called Fisheries and Oceans Canada), the government agency in Canada that studies and manages Canada’s oceans and freshwater areas.

dorsal fin The fin on the back of most whales, dolphins, and porpoises.

echolocation clicks Sounds, made by whales, that sound like fast taps repeating over and over. These sounds are used to “see” underwater and find food. Also known as sonar clicks.

ecosystem A community of living organisms and their environment, and the interactions between the two.

eye patch The white oval area above the eye and above the mouth of an orca. The eye patch can be one of many identifying features.

fecal sample An animal’s feces (poop), collected to help understand more about the animal’s diet and health.

feces Bodily waste discharged from animals; also called stool, scat, or poop.

First Nations The first people of Canada, like Native Americans in the U.S.A..

flukes The two flattened fins that make up a whale’s tail.

food chain A food pathway that links different plants and animals within a community or ecosystem.

food web A network of food chains in an ecosystem.

foraging The act of searching and hunting for food.

herring Small silvery fish that swim in large groups or schools. Herring are food for many types of animals (for example, larger fish, seabirds, marine mammals). Young herring feed on phytoplankton, and adult herring feed on zooplankton.

hydrophone An underwater microphone used to hear underwater sounds, such as whale calls and the many noises in the ocean.

identification Using the unique characteristics of an individual to separate it from others.

helping A behavior where whales drape kelp or seaweed over their flippers, tails, and other body parts.

ketosis The process of breaking down fat (blubber) for energy. In this process, a chemical that smells like nail polish remover can sometimes be found in the urine or on the breath.

killer whale Another name for an orca.

Kwakwaka’wakw (kwalk-walk-ya-walk) The First Nations people whose ancestral territory includes the area around Dong Chong Bay. The Kwakwak’wakw includes many tribes or bands who share a common language known as Kwakiutl or Kwak’wala (also known as Kwakiulth).

lobtailing A behavior where a whale slaps its tail flukes at the surface of the water, creating a loud sound that can be heard long distances above and below the surface. Also see tail lobe.

logging A behavior where a whale rests at the surface of the water without swimming. The motionless whale looks like a giant floating log.

makinulth The Kwakiulth word for orca.

matriarch The oldest female in a pod or family group, who leads the group.

matriline A family tree for the mother’s side of the family.

Namgis The First Nations band whose chief performed a ceremonial welcome for Springer when she returned to Dong Chong Bay.

net pen An enclosure in an open area of water that is created by using nets.

NOAA An abbreviation for the National Oceanic and Atmospheric Administration, a U. S. government agency. People who work for NOAA study the world’s oceans and atmosphere.

orca A black and white toothed whale that is actually the largest member of the dolphin family. When a whale, dolphin, or porpoise is longer than 30 feet, it is considered a whale.

orphan A young animal without its mother or father.

pectoral fins The flippers on the underside of a whale, close to the head. They are similar to arms in humans. They are used mainly for balance and steering.

pectoral slap A behavior where a whale lifts one or both pectoral flippers out of the water and slaps them against the surface of the water. This creates a loud sound that can be heard long distances.

phytoplankton Plant plankton (tiny plants) that live in the water. These small plants are at the base of the food chain, and are eaten by zooplankton and small fish.

plankton Tiny plants and animals that live in the water and float with currents. Most plankton can only be seen with a magnifying glass or microscope.

pod A group of whales. For killer whales, a pod usually includes an extended family of orca mothers and their children, usually consisting of 5-50 whales. Pods are given letter names to help scientists identify them.

porpoising A behavior where a whale, dolphin, seal, or penguin swims fast and most or all of its body breaks the surface of the water.

prey An animal hunted for food.

range The area where an animal lives.

resting A behavior where whales decrease speed, often swim close together, and breathe at the same time.

rostrum The very front end of a whale, porpoise, or dolphin. Also called the beak or snout.

saddle patch The light gray patch of skin behind the orca’s dorsal fin. Saddle patches are different on every whale, and can be used to identify individual animals.

Salish Sea The waters of Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia.

sonogram A picture or visual way to look at a sound.

spectrogram Another name for a sonogram.

Springer A fish-eating killer whale of the A4 pod and A24 matriline. Springer’s scientific name is A73.

spyhopping A behavior where a whale sticks its head up out of the water and sinks back down underwater.

stewardship To take good care of the earth and the environment.

stranded animal An animal that is out of its element and is unable to survive without help.

stranding network A group of scientists and volunteers who help stranded marine mammals.

tail lob A behavior where a whale slaps its tail flukes at the surface of the water, creating a loud sound that can be heard long distances above and below the surface. Also called lobtailing.

toothed whale A whale with teeth in its mouth, instead of baleen. Examples are killer whales, sperm whales, and pilot whales.

traveling A behavior where whales are moving from place to place.

vocalizations The sounds an animal makes. Killer whales use whistles and calls for communication, and clicks for echolocation.

zooplankton Animal plankton (tiny animals) that live in the water. Zooplankton are microscopic animals that eat other plankton (both plant and animal plankton).

Appendix 2.

Springer's history

Springer is an orphaned killer whale (orca) who was seen in central Puget Sound in January 2002. Six months later, she was rescued, rehabilitated, and returned to her pod on the northeast coast of Vancouver Island. A decade later, she is thriving and still swimming in her native waters in the company of her extended family. The project to rescue Springer and reunite her with her family was a joint undertaking of the U. S. National Oceanic and Atmospheric Administration (NOAA), Canada's Department of Fisheries and Oceans (DFO, now Fisheries and Oceans Canada), and the Vancouver Aquarium, and remains the first and only successful return of an orca to the wild.

Springer, also known as A73, is a member of the A4 pod in the northern resident orca community. She is the granddaughter of A24 (Kelsey), and daughter of A45 (Sutley). Her great-grandmother, A4, was shot and seriously injured by hunters in Johnstone Strait in 1985, in the last known incident of people shooting orcas in the Pacific Northwest and British Columbia.

Springer was born in the summer of 2000. She and her mother were last observed swimming together in September 2000 in Ketchikan, Alaska. When they did not return with the rest of the pod the following summer, they were both presumed to have died. The mortality rate for orca calves in general is 50%; when a female orca who has a young calf dies, the calf typically does not survive.

Springer was next observed swimming with G18, a female from a different northern resident pod (G-pod) in the fall of 2001, but was mistakenly identified as a calf in that pod. G-pod was observed off the Oregon Coast in the winter of 2001. A short time later, Springer appeared alone in central Puget Sound, between West Seattle and Vashon Island.

It is extremely rare for a resident orca to be observed by itself. Orcas are tightly bonded to their pods, and stay with their extended maternal families for their entire lives. It is even more rare for a calf to be seen alone; in over 40 years of observing orcas in this region, this was an unprecedented event.

Orcas are typically identified by the shape of their dorsal fin and their saddle patches. Saddle patches – the white marking behind the dorsal fin – are unique to every orca similar to fingerprints in humans. When she was first observed, Springer could not be identified from her saddle patch because her skin was in such poor condition.

Using hydrophones, researchers recorded her underwater vocalizations. Orcas have calls that are unique to their pods, and to their language group, or

clans. She began making calls that identified her as a member of the northern resident community. By listening to her calls, researchers identified her as a member of an A pod. From further analysis of photo and acoustic records, they were able to confirm her identity as A73.

Springer continued to stay in the same general area between Vashon and West Seattle. She exhibited normal behaviors such as foraging, playing, resting and breaching. She enjoyed rubbing up against logs, perhaps because of her skin condition. She was hunting successfully, and was observed catching and eating fish.

However, Springer's overall health was compromised. Her exhaled breath had a strong smell of ketosis, and though she was eating, she was underweight to the point of appearing malnourished. Her skin remained pocked and mottled.

NOAA's National Marine Fisheries Service (NOAA Fisheries) is responsible for managing populations of orcas and other marine mammals in the United States. NOAA sought community input about what should happen to Springer. Options included returning Springer to her pod off Vancouver Island, sending her to an aquarium, or leaving her alone to let nature take its course. Working with the Department of Fisheries and Oceans in Canada (DFO, now Fisheries and Oceans Canada), NOAA sought input from the top orca researchers, scientists and management teams from around the globe.

After careful consideration, NOAA determined that Springer's best chance for survival was to be returned to her pod in the waters off Vancouver Island. With the DFO and the Vancouver Aquarium, NOAA announced a plan to rescue her, rehabilitate her in situ (i.e., in the wild, not at an aquarium), and return her to her pod. Such a plan had never been undertaken before. The team also had the added pressure of carrying the project out in sufficient time to return Springer to her native waters by mid-summer, when her pod was most likely to be in the area.

Springer was rescued in mid-June 2002. For the next 30 days, she was held, fed and treated in an open-water net pen at the NOAA laboratory in Manchester, WA. Her caretakers took extreme precaution to ensure that she would not become too habituated to people, or lose the behaviors that she would need to survive in the wild. Precautions included feeding Springer salmon through a tube, observing her through underwater cameras, and providing her with natural "toys" such as crabs, kelp and logs. She was

treated for worms and went from eating two salmon a day to thirteen. She started putting on weight, and passed all her other medical tests.

In mid-July 2002, Springer was moved by high-speed catamaran to Dong Chong Bay on Hanson Island. The catamaran, like many other components of the project, was donated by a member of the community. Many members of local First Nations groups turned out to greet her in ceremonial regalia. She was transferred from the catamaran to a barge, then to her temporary holding pen at Dong Chong Bay.

Less than 12 hours later, other orcas came within acoustic vicinity of her pen. Springer and the other orcas called back and forth. The next day, her pod (A24s) came by the holding pen. The project team recognized this as the optimal release condition they had planned for, and lowered the sides of her pen. Less than 24 hours after she was brought back to the Johnston Strait area, she was with her pod again.

Though the reunion happened quickly, it took a few weeks for her to become fully integrated with her pod again. She was assisted by an orphaned brother and sister pair, A61 and A51, who appeared to help teach her to avoid boats and act more like a normal orca.

The northern resident orcas stay in the Johnstone Strait area during the summer. They leave during the fall and winter and return each summer. Springer's reunion would not be considered successful until she returned with her pod to the area the following summer.

She returned with the A11s in 2003 and has been observed every summer since then. Though a little smaller than other whales her age, by every measure she appears to be a healthy orca with typical behaviors, traveling closely with her extended family (her greataunt's pod).

In July 2007, many members of the project team and the community who worked together to bring Springer home reunited in the Johnstone Strait area to celebrate the 5th anniversary of the project. As if on cue, Springer and her pod returned to the area the same weekend. The project remains the only successful orca rehabilitation in history. A 10th anniversary celebration is planned for July 2012.

Appendix 3.

Resource station recommendations

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Appendix 4.

Springer's Rescue Supply List (as of 6/6/2002)

Item Description	Size	Quantity	Purpose
Initial Rescue			
White towels	Bath size	2 dozen	Transport
6" foam rubber mat	5' x 8'	2	Transport
Coolers	large	2	Transport
Ice		Fill coolers	Transport
A and D ointment	Tube	6	Transport
Water sprayers	3-5 gallon	4	Transport
Husbandry			
Plastic totes w/handles, no lids	Approx. 3'x2'; hard plastic	4	Fish transport/holding
Stainless buckets	3-4 gallon	4	Food prep
Heavy duty rubber gloves	2 small; 2 med.; 8 large	12 pairs	Food prep/cleaning
Digital scale	2000 lb capacity	1	Weighing fish
Scrub pads	Standard	1 case	Food prep/cleaning
Scrub brush for floor	Standard	2	Food prep/cleaning
Nolvasan	1 gallon	2	Foot bath
Dish tubs	Standard	2	Foot bath
Long-handled dip nets		3	Fish removal
Clorox bleach	1 gallon	2	Cleaning
Simple Green cleaner	1 gallon	6	Cleaning
Ajax cleaner		1 case	Cleaning
Hand soap		6	Cleaning
Stomach tube		1	Husbandry
Lubricant		2 tubes	Husbandry
Sea-Tab vitamins		3 bottles	Husbandry
Large funnel		1	Husbandry
Medical Supplies			
Centrifuge, 2000 rpm (10 ml)			Medical
Microhematocrit centrifuge			Medical
Lavender top EDTA tubes	3 ml	50	Medical
Lt. blue citrate tubes	3 ml	50	Medical
60 cc syringe			Medical
20 cc syringe			Medical
12 cc syringe			Medical
19 gau x 3/4" or 1" butterfly w/30" catheter			Medical
21 gau x 3/4" 12" tubing butterfly infusion sets for neonates			Medical
4 x 4 gauze pads			Medical
Betadine			Medical
Isopropyl alcohol			Medical
Polysporin			Medical
Cryovials (2 ml)			Medical
Pipets			Medical
Sharps containers			Medical
ESR tubes and rack			Medical
Ice maker			Medical
Coolers			Medical
10 ml tube racks			Medical
Staff Support			
Porta Potty			Staff support
Groceries			Staff support
Hotel stay near Manchester			Staff support and VIP
Hotel stay in Seattle			Housing for staff
Dollar Rental Car			Car for staff


Appendix 5.

Saving Springer Jeopardy Game




Saving Springer Jeopardy Game

Who's that whale?	What should we do?	Journey to Health	Homecoming	Stewardship
100	100	100	100	100
200	200	200	200	200
300	300	300	300	300
400	400	400	400	400
500	500	500	500	500




Who's that whale? for 300



Orcas use sound or vocalizations for many reasons.
Can you name at least two?

To navigate underwater, find food, or communicate with other whales

Push the Space Bar to check your answer.





Who's that whale? for 100




Springer, who is a northern resident killer whale, was found far away from her native waters.

Where was she spotted in Washington State?

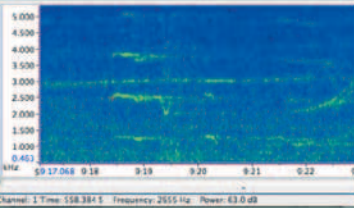
In the Seattle area, by Vashon Island in Puget Sound

Push the Space Bar to check your answer.





Who's that whale? for 400




What do you call a visual way to represent sound?

Scientists use this image to analyze killer whale sounds and calls.

A spectrogram or sonogram

Push the Space Bar to check your answer.





Who's that whale? for 200




What are two common methods of identification that help scientists tell individual whales apart?

Photo ID- taking photographs and looking at saddle patches and dorsal fin shapes


Acoustics- Listening to whale calls and vocalizations

Push the Space Bar to check your answer.






Who's that whale? for 500



What is the name that best describes how resident killer whale pods of the Pacific Northwest are organized?


Matriarchal – Family groups centered around the eldest female

Push the Space Bar to check your answer.






What should we do? for 100




What symptoms indicated that Springer was not healthy when she was first seen in Puget Sound?

Skin looked splotchy, her breath smelled (ketosis), she was alone, she was probably not eating

Push the Space Bar to check your answer.



What should we do? for 400




What is the process where the body breaks down fat for energy?


In Springer's case, her breath smelled like acetone, indicating her body was using fat for energy and that she might not be eating.

ketosis

Push the Space Bar to check your answer.



What should we do? for 200



If you were to find an isolated animal that appeared sick or injured, who should you contact?

A stranding network like NOAA's

Push the Space Bar to check your answer.



What should we do? for 500



What countries worked together during Springer's rescue effort?

***Daily Double** if you can tell the names of the government agencies

United States =NOAA Fisheries Service

Canada= DFO (Department of Fisheries and Oceans, now called Fisheries and Oceans Canada)

Push the Space Bar to check your answer.




What should we do? for 300




What does the acronym S.T.O.P. mean when you see a stranded animal on the beach?

S = Stay away
T = Tell an adult
O = Observe 1-2 days
P = Phone the stranding network

Push the Space Bar to check your answer.



Journey to Health for 100



Name at least two enrichment items that the rescue team gave Springer to play with while she was in the net pen in Manchester.

kelp, crabs, sticks or driftwood, flowing water, or ice

Push the Space Bar to check your answer.



Journey to Health for 200



Whales spend the majority of their lives underneath the water, and we only see their behaviors at the surface.

breaching, spy hopping, pectoral slap, tail lob, helping, logging, cartwheel, or traveling

Name at least three behaviors.

Push the Space Bar to check your answer.



Journey to Health for 500



Food webs are complex. List three different trophic levels one might see in an ocean food web.

producers, primary consumers, secondary consumers, tertiary consumers (herbivore, carnivore, and omnivore)

Push the Space Bar to check your answer.



Journey to Health for 300



What do we call the behavior when whales are actively searching for prey?

Foraging or hunting

Push the Space Bar to check your answer.



Homecoming for 100



Many supportive groups of people came together as a team to help save Springer.

Can you name some of them?

NOAA, Orphan Orca Fund, kids, DFO, local aquariums, and many local businesses

Push the Space Bar to check your answer.



Journey to Health for 400



Toxins increase in quantity the higher one eats on the food chain. We call this...

Bioaccumulation

Push the Space Bar to check your answer.



Homecoming for 200



A scale was borrowed from Point Defiance Zoo to weigh fish for Springer.

Name some of the other items that kids and the community helped round up to lift, move, and relocate Springer.

crane, boat, sling, foam pad, scuba tanks, towels, medical supplies. boat (see Appendix 3)

Push the Space Bar to check your answer.






Homecoming for 300




This First Nations canoe is from Alert Bay, the Home of the Killer Whales. They welcomed Springer home with song and mask. Where was she released?

Dong Chong Bay on Hanson Island, at the north end of Vancouver Island in Johnstone Strait (Canada)

Push the Space Bar to check your answer.




Stewardship for 100




What are the three main issues facing the declining population of southern resident killer whales?

**Prey availability (not enough salmon) due to environmental factors
Contaminants (toxins)
Noise pollution from vessels**

Push the Space Bar to check your answer.



Homecoming for 400




Choose two of the following groups and tell what their role was in the rescue.


**NOAA
DFO
Orphan Orca Fund
First Nations people
Community**

NOAA – monitored Springer, managed U.S. rescue
DFO – managed Canadian rescue operations
OOF – raised money, bought salmon for Springer
First Nations people – welcomed Springer, caught salmon for her
Community – donated funds, boat, and materials

Push the Space Bar to check your answer.



Stewardship for 200



Name 3 conservation steps you can take at home or school that might make a difference for whales and our planet.

Might include: turning off lights, running water when not in use, reduce, reuse, recycle, repurpose items, be a conscientious shopper

Push the Space Bar to check your answer.



Homecoming for 500



Why did scientists continue to watch Springer after she was released?

They wanted to make sure she stayed with her pod. When she returned with her pod in the summer of 2003, the reunion was considered a success!

Push the Space Bar to check your answer.



Stewardship for 300



One of many lessons learned in this story is that kids and families can make a difference in helping protect whales.

Name two ways the community helped Springer.

Helped monitor Springer, raised money, collected items, bought fish for her, groceries for rescue workers, etc.

Push the Space Bar to check your answer.



Stewardship for 400



What do we call the act of protecting or preserving natural resources in order to prevent depletion or loss?

Conservation

Push the Space Bar to check your answer.



Stewardship for 500



We want to inspire you to learn more and take action at home to protect killer whales and other marine organisms.

What do we call the act of protecting and watching over your environment?

STEWARDSHIP

Push the Space Bar to check your answer.

