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Activity 4: Threats and Solutions

The activity opens with a quick brainstorm about what animals need to survive. Students then conduct scaffolded research to dive deeper into the major threats facing the Southern Residents: starvation, contamination, and vessel noise and then research potential solutions to these threats. During a reflection, students identify the potential barriers and side benefits of implementing these solutions.

Key Student Questions

- What is the difference between surviving and thriving?
- What are the major threats facing the Southern Residents?
- What are some potential solutions to these threats?

Key National Standards

NGSS

- [LS2.A](#): Interdependent Relationships in Ecosystems
- [ESS3.C](#): Human Impacts on Earth Systems

CCSS

- CCSS.ELA-LITERACY.CCRA.[W.7](#); CCSS.ELA-LITERACY.W.[6.7](#), [7.7](#), [8.7](#)
- CCSS.ELA-LITERACY.W.[7.2.B](#), [8.2.B](#)
- CCSS.ELA-LITERACY.RST.[6-8.2](#)
- CCSS.ELA-LITERACY.WHST.[6-8.1.B](#)

Keywords

Survive—To remain alive.

Threat—Something that could cause trouble or harm.

Thrive—To grow or develop successfully.

Introduction

1. In Think-Pair-Share, free write, or popcorn format, have students respond to the following prompts:
 - a. What do living things need to survive? *Food, water, shelter, oxygen, etc.*
 - b. What do Southern Residents need to survive? *Clean water, prey/Chinook salmon, space and quiet to hunt and rear their young, etc.*
 - c. What might happen if an animal does not have everything they need to survive? *Death, disease, starvation, decreased fertility, miscarriages, decreased quality of life, shorter lifespan, etc.*
 - d. What is the difference between surviving and thriving? *Surviving is simply remaining alive. Thriving means growing or developing successfully.*



Materials

- **Handout:**
[Threats and Solutions](#)
Pg 52-53
1 per student
- **Computers with internet access** or printed copies of the articles from the [Recommended Resources for Research](#)
1 per student or group of 2-3
- **Answer Key:**
[Threats and Solutions](#)
Pg 54-55
1 copy
- **Driving Question Poster** from Activity 1

Activity

1. Share the following excerpt with the class:

Today we will be conducting research to better understand the threats facing the Southern Residents and to discover potential solutions to these challenges. Since there are only 75 Southern Residents remaining as of July 2021, it will take all kinds of people working together to protect and recover these iconic animals. The information we learn today will help shape your final product, which will raise awareness of the plight of these animals and help individuals understand how they can make a difference.

2. Give each student a copy of the [Threats and Solutions](#) handout.
3. This activity can be completed in a variety of formats (e.g., individually, in pairs, in small groups, or in jigsaw format). Instruct the class how to complete the handout.
4. Give students about 30 minutes to complete the handout.
5. Call the class back together and review the answers provided in [Threats and Solutions](#) answer key. Direct students to fill in any missing information on their worksheet.

Note: The answer key contains more information than students will be able to synthesize in a class period. If desired, this additional information can be used to guide a more robust discussion.

6. Ask students to complete Part II of the handout individually.
7. In Think-Pair-Share or popcorn format, ask for a few students to share their responses to Part II.
8. Assess how students are feeling about our ability to save the Southern

Residents by conducting a Fist to Five poll with the following prompt: Can we, as a society, save the Southern Residents?

9. Ask for a few volunteers to share their thoughts.
10. Share the following excerpt with the class:

While the Southern Residents are facing many challenges, there are still many reasons to be hopeful. Individuals, communities, industries, and governments are all working together to protect and recover the Southern Residents. In the upcoming activities, we will learn more about how groups are working together to make meaningful, long-term change.

11. Collect the [Threats and Solutions](#) handouts and save them for Activity 6.

Driving Question

Review the list of questions from Activity

1. Cross off any questions that were answered in today's activity. Add additional questions that may have arisen.

Discussion Questions

1. Even if we live far from the coast, how can our actions affect the Southern Residents?
2. How are people also affected by the threats facing the Southern Residents?
3. Many of the problems facing the Southern Residents were created before your generation existed. Does your generation have a role in fixing these issues? Why or why not?
4. Do we have a collective responsibility to ensure that species thrive? Why or why not?

5. How can we better manage common resources? Common resources belong to everyone. Examples include air, water, or ocean resources.

Public Product Option

Have students create a public service announcement, advertisement, or meme that shows how the Southern Residents might feel about not having enough food to feed their families, living in water polluted by humans, or having boats zipping through their habitat.

For examples, see:

- [Public Service Announcements \(PSA\)](#) - World Wildlife Federation
- [What Goes into the Ocean, Goes Into You](#) - Surfrider Foundation
- [Horrible vs. More Horrible](#) - DDB
- [Save the Rhino](#) - Stick

Share Your Students' Work

Help inspire Southern Resident conservation around the globe by sharing your experience with this unit. Tag photos, student work, and student quotes.

- Facebook: [@NOAAFisheriesWestCoast](#)
- Twitter: [@NOAAFish_WCRO](#)
- Instagram: [@NOAAFisheries](#)



Additional Resources



App

[Model My Watershed](#)

This app models storm-water runoff and water quality. It also compares how different conservation or development scenarios can affect runoff and water quality.

Competition

[Future City](#)

In this project-based learning challenge, middle schoolers imagine, research, design, and build cities of the future.

Lesson

[Urban Runoff](#)

This lesson introduces students to the problem of urban runoff and a variety of nature-based design ideas and solutions.

Video

[Water: The source of life](#)

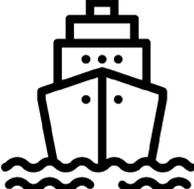
This video shows how water travels across our planet, connects all living things, and what it encounters throughout its journey.

Name: _____ Date: _____ Class: _____

Threats and Solutions - Page 1

Part I: Research

Directions: Research the causes of the major threats facing the Southern Residents and potential solutions to these threats. Then complete the table below.

Threat	Summary	Causes	Potential Solutions
 Limited Prey			
 Vessel Noise and Traffic			
 Contamination/ Pollutants			

Part II: Reflect

Directions: Reflect upon the table on Page 1 and then answer the following questions.

1. Which issue most interests you?

2. As a society, do you think we can solve this issue? Why or why not?

3. What might be some barriers to implementing the solutions?

4. What are some side benefits of implementing these solutions? In other words, how might communities or the broader ecosystems benefit from addressing this issue?

Recommended Resources for Research

- Saving the Southern Residents: Turning the Tide for the West Coast’s Beloved Killer Whales <https://arcg.is/1HzrbC>
- Southern Resident Killer Whales www.epa.gov/salish-sea/southern-resident-killer-whales
- Impossible Choices: The Complicated Task of Saving Both Orca and Salmon www.courthousenews.com/impossible-choices-the-complicated-task-of-saving-both-orca-and-salmon/
- Take Action :: Orca Action Month www.orcamonth.com/actions
- Orcas of the Pacific Northwest Are Starving and Disappearing www.nytimes.com/2018/07/09/science/orcas-whales-endangered.html

Threats and Solutions - Answer Key

Threat: Limited Prey



Since Chinook populations have dramatically declined, at times the whales may not have enough prey. Five populations of Chinook the whales depend on are listed as threatened and a sixth is endangered. Not only are there fewer fish, but they are 10% smaller since the late 1970s.

Causes

- Dams block salmon from migrating
- Chinook populations have been over-fished in the past
- Seal and sea lion populations have increased and they are eating more salmon
- Hatchery salmon outcompete wild salmon for food
- Hatchery salmon dilute the genes of wild salmon
- Habitats have been degraded by development and pollution

Potential Solutions

- Help fish get around dams; remove problem dams
- Limit Chinook fishing
- Minimize Chinook bycatch (fish caught accidentally)
- Cull (kill) problem seals and sea lions
- Restore salmon habitat
- Buy US-caught, sustainable seafood
- Manage the impact of hatchery fish
- Protect and restore habitat

Threat: Vessel Noise and Traffic



Noise from vessels can interfere with the echolocation abilities of Southern Residents as they search for food. The speed of motor-powered boats is the main factor in how much noise the whales experience, faster boats mean more noise.

When vessels are present, the whales hunt less and travel more, swim in more erratic paths, and increase surface activity with more breaches and tail slaps. They also increase the loudness of their calls when noise levels in their environment are high. The energy cost of these altered behaviors is being studied.

Causes

- Boats driving too fast near the whales
- Boats getting too close to the whales
- Too many boats near the whales
- Boats using devices like echo sounders and fish finders that interfere with echolocation

Potential Solutions

- Require boats to stop using echo sounders and fish finders when not in use
- Encourage whale watching from shore
- Support responsible whale watching companies
- Create and enforce regulations that keep boats a safe distance from the whales
- Create a sanctuary/no-go zone for boats in key Chinook and Southern Resident habitats
- Create and enforce speed limits for boats near the whales
- Suspend viewing of Southern Residents

Threat: Contamination/Pollutants

Southern Residents accumulate pollutants from the fish they eat in their blubber. If Southern Residents do not get enough prey to eat they have to survive on their fat stores, where toxins concentrate.



This can increase circulation of toxins and compromise their immunity and reproductive success, leaving them more vulnerable to disease and making it tougher for them to rebuild their population.

If a pregnant whale draws from her toxic fat stores to feed her growing fetus, the offspring will likely be born with significant problems like immunosuppression.

In some cases, the youngest whales have the highest levels of pollutants in their systems. This is because nursing moms can pass contaminants to their calves through their milk.

Southern Residents are some of the most contaminated marine mammals in the world.

Causes

Prey and water are contaminated with:

- Pesticides
- Industrial coolants and lubricants
- Flame retardants
- Motor oil
- Chemicals from household products
- Pharmaceuticals including prescription and over-the-counter drugs
- Recreational and illegal drugs

Pollutants enter waterways from many sources, such as:

- Runoff from roads and parking lots
- Wastewater treatment plants

- Sewer outfalls
- Pesticide application

Potential Solutions

- Properly dispose of hazardous waste, unused medicine, and chemicals
- Install rain gardens
- Maintain vehicles and lawnmowers; fix leaks as soon as possible
- Bike, walk, and use public transportation whenever possible
- Promote organic farming and gardening methods
- Filter urban runoff from roadways
- Support regulations that ban discharging and dumping of pollutants
- Enforce discharge and dumping laws