

COMPANION LEARNING GUIDE

NARRATED BY LIAM NEESON

RUNNING WILD

RETURN TO THE RIVER

COMMUNITIES & KEYSTONE SPECIES

FORMAL EDUCATION GUIDE:
6TH – 8TH GRADE

RUNNING WILD

RETURN TO THE RIVER

Key Concepts

- An ecosystem is a community of organisms and the places they live. Every member of an ecosystem is important, and has its own unique role to play.
- Changes to a keystone species population will always have a major effect on its ecosystems. The removal of keystone species threatens ecosystem collapse.

Setup

- Print enough “Protect the Wedge! Defending the Keystone Species” cards for each student to have one card.
- Ensure that you either have a clean whiteboard space for notetaking, OR a projector, pencil, and two sheets of paper.
- If possible, allot 5-15 minutes during which students can spend time outside in the grass to notice and enjoy nature.
- Print review worksheets and set out colored pencils.

Next Generation Science Standards MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Vocabulary

Ecosystem – a community of plants, animals, and the places they live.

Habitat – the place where a plant or animal lives.

Keystone Species – an organism that plays a vital, emphasized role in keeping an ecosystem healthy and strong.

Niche – the role a plant or animal plays in an ecosystem, often tied to a special job.

Organism – any living thing (from a tiny amoeba to a huge blue whale!).

Materials

- Printed “Protect the Wedge! Defending the Keystone Species” cards
- Clean whiteboard and markers (teacher only)

OR

- Projector, pencils, and paper (teacher only)
- Printed “Running Wild: Return to the Review” worksheets
- Colored Pencils



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Procedure

Introduction: Communities & Keystone Species

I am going to begin by asking you a few questions. Remember, you need to raise your hand if you think you know the answer!

- What is a habitat? Have you ever heard this word before? Nod your head “yes” if you have, or shake your head “no” if you have not!

- **Answer:** A habitat is the place where a plant or animal lives.

- What is an ecosystem? Raise your hand to share!

- **Answer:** An ecosystem is a community of plants, animals, and the places they live.

- Here’s a tougher question. What is the difference between a habitat and an ecosystem?

- **Answer:** A habitat is the place where a plant or animal lives, but an ecosystem includes both a place and its community. In fact, one ecosystem can include multiple different habitats.

Let’s think of an example of an ecosystem. First, we’ll imagine a woodland, or forest ecosystem.

- A forest might include many different places for a plant or animal to live, right? This could be up in a tree, down on the forest floor, in a cave, or even under a rock. The environment, or the places and physical features of that forest, is one very important part of the ecosystem.
- The other important part of an ecosystem are the organisms that live there. An organism is really just any living thing - from the tiniest amoeba, to a huge blue whale! What are a few examples of organisms that we might find within a forest ecosystem?

Let’s start with animals. Raise your hand to share!

- **Answer:** Fox, wolf, bear, squirrel, deer, raccoon, owl, woodpecker, mice, and more!

- Now, this one is tougher - let’s try to think of some plants. Raise your hand to share!

- **Answer:** Fern, oak tree, blueberries, wildflowers, ferns, and more!

- Bonus Question: Do you think any fungi might be found in a forest ecosystem? What is a very basic example of fungi? Raise your hand to share!

- **Answer:** Mushrooms! The three main types of fungi are mushrooms, molds, and yeasts.

Fun Fact: 137 species, including people, depend on salmon.

Let’s think about another ecosystem example, and take a look at our own school.

- What kinds of places and physical features help to make up this environment? Raise your hand to share!

- **Answer:** Bathrooms, classrooms, quad, cafeteria, gym, library, water fountains, tables, chairs, hallways, and more!

- Now let’s think about the organisms that live here. What are some plants and (non-human!) animals that you have seen while in this school ecosystem? Raise your hand to share!

- Great answers!

- What about the people that spend time here? Raise your hand to share!

- **Instructor Note:** Please prompt students to name not only fellow classmates, but also adults/faculty.

- Great answers!



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Something important to know about ecosystems is that all community members and places within an ecosystem are interconnected and important. When there is a change to just one piece of an ecosystem, the ripple effects might be felt by other members of the community.

This is because every member of an ecosystem fills a special need there. In other words, every organism in an ecosystem has a “niche.” A niche is the role a plant or animal plays in an ecosystem, often tied to a special job.

- Just a moment ago, you named a few adults that fill important roles here at your school. What is the niche, or special job, of the teachers? The custodian? The school nurse? The principal? Raise your hand to share!

- Great answers!

While every member of an ecosystem is important, there are some that have greater effects on the balance of the community. These are called keystone species. A keystone species is an organism that plays a vital, emphasized role in keeping an ecosystem healthy and strong. In fact, when a keystone species is removed from an ecosystem, the entire community is threatened with collapse.

- You can think of a keystone species like the center stone in an archway. When you remove that center stone, everything else collapses with it!
- Some examples of keystone species include...
 - Beavers, who help to create wetlands.
 - Sea otters, who help to protect kelp forests by eating the sea urchins that overgraze them.
 - Wolves, who help to protect forests by the eating deer that overgraze them.
 - Bees, who help to pollinate the plants that other organisms rely on for food and shelter.
- When any part of an ecosystem is changed, there may be ripple effects for other community members. When a keystone species undergoes a change, it’s more like a tidal wave! Keystone species are vital to their ecosystems, so changes to their populations always affect the rest of the community in a huge way.





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ACTIVITY

Protect the Wedge! Defending the Keystone Species

It's time for an activity! In just a moment, we are going to host a public hearing, with each of us acting as community members of our very own ecosystem. But first, I'd like a few people to help recap what we've learned so far. Raise your hand to share!

- What is an organism?
 - **Answer:** An organism is any living thing.
- What is a habitat?
 - **Answer:** A habitat is the place where a plant or animal lives.
- What is an ecosystem?
 - **Answer:** An ecosystem is a community of plants, animals, and the places they live.
- What is a keystone species?
 - **Answer:** A keystone species is an organism that plays a vital, emphasized role in keeping an ecosystem healthy and strong.

We know that a big change to a keystone species population always affects the rest of the ecosystem in a huge way. The keystone species that we will be focusing on during this activity is the pacific salmon.

- The pacific salmon is a keystone species in its ecosystems for two main reasons:
 - Other important species rely on it for their main food source
 - Salmon carcasses cycle important nutrients from the ocean into freshwater habitats when they travel upstream to spawn

Like all keystone species, when pacific salmon populations decline, their entire ecosystems are threatened with collapse.

In just a few minutes, I will be passing out plant and animal cards. Begin by reading the ways in which your special organism is connected to the pacific salmon. Read your cards quietly to yourselves, think about them, and be ready to share.

- **Instructor Note:** Pass out one plant or animal card to each student. Allow them a few minutes to read and reflect.

We are ready to host our public hearing! For this activity, let's pretend that I am someone who creates real-world change and solutions for problems facing ecosystems under threat. I might be an environmental organization, a politician or policymaker, or a city councilperson.

First, I am going to share a few of the greatest threats to pacific salmon populations on the whiteboard/projector. Then you, the members of our ecosystem, will share how these threats to the pacific salmon will threaten your own populations. Ready? Let's begin!

- **Instructor Note:** Begin by writing the header "threats to pacific salmon" on the board or piece of paper. Under the header, list the following major threats:
 - Climate change (warming waters)
 - Habitat loss (human development)
 - Overfishing
 - Pollution

The issues above are threatening pacific salmon populations right now, in the real world. In a moment, I would like to hear the ways that threats to this keystone species will affect you and your own populations.

- **Instructor Note:** On another section of the whiteboard, or on a new sheet of paper, write the header "Connected with Pacific Salmon." As students answer the following questions, create a list of species and their connection to pacific salmon underneath this new header.
- It's time to do your best to show me why removing this keystone species matters so much, and why we must protect them! First, I would like to hear from the Southern Resident orcas. How might you be affected by the threats to salmon populations? Why does this matter to you? Please share just one reason, and then let someone else have a turn.



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Protect the Wedge! Defending the Keystone Species *continued*

- **Answer:** Southern Resident orcas and Cook Inlet beluga whales are endangered and depend on Chinook salmon for survival. With populations already struggling for survival, the removal of their major food resource could drive the orcas and belugas to extinction.
- Next, I'd like to hear from the aquatic insects.
 - **Answer:** Aquatic insects often feed on the decaying carcasses of salmon, which are left behind in freshwater habitats after spawning. Aquatic insects in turn serve as important food for young salmon in the fry and parr stages of their lives.
- Next, I'd like to hear from the bears.
 - **Answer:** Grizzly bears rely on salmon for more than half of their annual protein! Without salmon, many bears will face malnutrition or starvation.
- Next, I'd like to hear from the flowers and trees.
 - **Answer:** The presence of dead pacific salmon, which are rich in nitrogen, can boost wildflower and tree growth up to 20%! Without salmon, there will be slower and less plant growth.
- Next, I'd like to hear from the eagles.
 - **Answer:** The bald eagle's diet is made up primarily of fish, but especially salmon carcasses in many areas. If this primary food resource disappears, this will force eagles to begin searching for food in other areas, including agricultural areas where the best option may be to steal chickens from farms!

Great job, and thank you for sharing! You made some convincing points, and it's clear that as a keystone species, pacific salmon have a huge impact on their ecosystems. It is important to provide the pacific salmon, and other keystone species, with the special care and protection they need in order to do their jobs!

Let's return to the list of real-world threats to pacific salmon. These factors included climate change, habitat loss, overfishing, and pollution.

Because this keystone species plays such a vital role in its ecosystems, it is important to learn the ways that we can help to protect pacific salmon in our own lives:

- To help with climate change, we can reduce our emissions. We try walking or biking to school even just one day a week, such as on a "Walk to School Wednesday!"
- To help with habitat loss, we can join local nature and science groups that are helping to restore habitat.
- To help with overfishing, we can choose to eat less fish. We can also choose to research sustainable seafood, such as uni (sea urchin)!
- To help with pollution, we can join or organize our very own river or beach cleanup!

In an ecosystem, every piece of the community is interconnected and important. However, keystone species have a little bit more responsibility than most - they play a vital, emphasized role in keeping an ecosystem healthy and strong.

- It is so important for us to work to protect our keystone species. Just like every animal has its own niche (a special job), we all have our own part to play in keeping our local ecosystems healthy and strong.

Fun Fact: Did you know that you probably have a keystone species living in your own community? Later today or when you get home, take a moment to research the keystone species that live in your city, state, or province.

“Run Wild” Time: Move the class to an outdoor area for just 5-15 minutes, ideally away from the school playground. Invite them to notice and feel curious about nature a little extra after their time watching “Running Wild.” Encourage them to touch the dirt, grass, twigs, and leaves; feel the warm/cool air on their skin; listen for birds, bugs, and the wind; smell the plants around them; and try to spot insects.

Review Questions

What is the difference between a habitat and an ecosystem?

What is the scientific name for an organism that plays a vital, emphasized role in keeping an ecosystem healthy and strong?

A “niche” is an organism’s job - the role it plays in an ecosystem. Give one example of an animal and its niche.

What happens when a keystone species is removed from an ecosystem? Use an example from the “Protect the Wedge! Defending the Keystone Species” activity.

What is one thing you saw in the Running Wild: Return to the River film that surprised or amazed you?

Name:

Date:

RUNNING WILD: COMMUNITIES & KEYSTONE SPECIES

A keystone species is...

Salmon are keystone species. One plant/animal species that relies on salmon is ----- . It relies on salmon for...

KEYSTONE SPECIES WORD SEARCH



WORD BANK:

BALD EAGLE
BEAVER
BEE

CHINOOK SALMON
COHO SALMON
GOLDENROD

OAK TREE
PURPLE SEA STAR
SEA OTTER

SOCKEYE SALMON
WOLF



Southern Resident Orca



Mayfly



Cook Inlet Beluga



Caddisfly

"Protect the Wedge!
Defending the Keystone
Species" Cards

Instructor Note:
Please print double-sided



Grizzly Bear

MAYFLY

- Feed on adult salmon carcasses, and in turn are eaten by young salmon
- Populations may grow out of balance without predator pest control

ORCA

- Endangered species, with populations already low and struggling to survive
- 80% of diet is Chinook salmon

CADDISFLY

- Feed on adult salmon carcasses, and in turn are eaten by young salmon
- Populations may grow out of balance without predator pest control

BELUGA

- Endangered species, with populations already low and struggling to survive
- 80% of diet is Chinook salmon

GRIZZLY BEAR

- More than 50% of annual protein is made up by salmon
- Salmon are a high-calorie food source. Bears need high fat reserves to reproduce and hibernate

“Protect the Wedge!
Defending the Keystone
Species” Cards

Instructor Note:

Please print double-sided



Bald Eagle



Sea Wolf



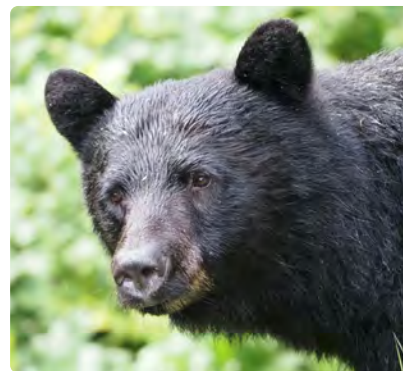
Yarrow



White Spruce

"Protect the Wedge!
Defending the Keystone
Species" Cards

Instructor Note:
Please print double-sided



Black Bear

SEA WOLF

- Threatened by hunting, as well as habitat loss due to logging and industrial development
- 25% of diet is salmon

BALD EAGLE

- In many areas, salmon carcasses are a main source of food
- When food sources disappear, some animals relocate to agricultural areas in search of food

WHITE SPRUCE

- Dead salmon, which are rich in nitrogen, boost wildflower and tree growth up to 20%
- Plants offer shading for rivers, and stabilization for riverbanks

YARROW

- Dead salmon, which are rich in nitrogen, boost wildflower and tree growth up to 20%
- Plants offer shading for rivers, and stabilization for riverbanks

BLACK BEAR

- Eats salmon as a high-calorie “bonus” option, especially when nuts and berries are scarce
- Low calories result in low fat storage and low energy levels

“Protect the Wedge!
Defending the Keystone
Species” Cards

Instructor Note:

Please print double-sided

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**RUNNING
WILD**
RETURN TO THE RIVER

A MISSION PARTNERS ENTERTAINMENT GROUP AND DORSEY PICTURES FILM PRESENTED BY THE MAX MCGRAW WILDLIFE FOUNDATION AND ULINE IN PARTNERSHIP WITH WILD SALMON CENTER AND TIMASHEV FOUNDATION
MUSIC BY ALEX HEFFES DIRECTORS OF PHOTOGRAPHY ANDY MASER TAVISH CAMPBELL EDITED BY JAMES TAGGART SUPERVISING PRODUCER DJ ROBERTS EXECUTIVE PRODUCERS CHRIS DORSEY CHARLES S. POTTER JR.
DIRECTED BY MYLES CONNOLLY NARRATED BY LIAM NEESON



www.runningwild.org

