

# TEACHER OVERVIEW

Water Conservation and Wildlife Ecosystems

6th – 8th Grade

## Nature Vision Student Packet

The materials contained within this packet for students have been created by Nature Vision, an environmental education nonprofit organization that brings programming to schools and local greenspaces for over 70,000 PreK-12th grade students each year in King and Snohomish Counties. This curriculum is designed to foster an understanding of the importance of water and its integral role in supporting life and shaping our planet. Packets can be completed by students either independently from home, or with the help of an adult caregiver. Materials for each day of the week build on the previous days' learning by offering a variety of activities that involve art, writing, and safe field exploration.

These materials are provided to you by Cascade Water Alliance (Cascade). Cascade wants everyone to understand the importance of conserving and protecting our limited water resources. Cascade supports Nature Vision in the development and delivery of water education programs and we are happy to offer these materials to our friends in the community. Learn more about Cascade at [cascadewater.org](http://cascadewater.org).

This unit supports NGSS Performance Expectations across various disciplines, as well as supporting K-12 Integrated Environmental and Sustainability Standards. These are listed at the bottom of this page. Teachers will be supplied with PDF formats of materials to be emailed to families, or printed and sent to students to complete at home.

In this packet, students will learn about salmon as a keystone species before seeing the key role salmon play in the energy transfer within complex food webs. Students then learn about riparian zones and the many adaptations various wildlife have to survive in their ecosystems. The next lesson guides students through salmon's connection to the nutrient cycle of a forest, learning how salmon release key nutrients that aid in plant growth. Students will interpret salmon population data to find solutions to detrimental issues. At the end of the week, students have the information necessary to be stewards of their local watersheds and focus on ways to actively apply water conservation habits.

If you have any further questions or concerns regarding this packet, please email our Office Coordinator at [info@naturevision.org](mailto:info@naturevision.org).

### Grades 6-8

**Supports NGSS Performance Expectations:** MS-LS2-5, MS-LS2-1, MS-LS2-3, MS-LS2-4, MS-LS1-5, MS-LS1-5.

Grades 6-8
Day 1 / Day 2 - Salmon Ecosystems and Adaptations
Day 3 / Day 4 - Salmon as a Keystone Species
Day 5 / Day 6 - The Necessity of Decomposing Salmon
Day 7 / Day 8 - Populations and Human Impact
Day 9 / Day 10 - Stewardship

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# PARENT/CAREGIVER OVERVIEW

Water Conservation and Wildlife Ecosystems

6th – 8th Grade

Welcome to Nature Vision's student packet for home use. Nature Vision is an environmental education nonprofit organization that brings programming to schools and local greenspaces for over 70,000 PreK-12th grade students each year in King and Snohomish Counties. We are excited to be offering this version of our programming directly to students at home!

This packet is designed to be completed over the course of one week, with each day focusing on a different aspect of environmental science and stewardship. The majority of these materials can be completed independently, but we thought it would be important to provide background information for any adults that may be helping to complete or answer questions. We've included the basic learning objectives for each day along with some vocabulary.

These materials are provided to you by Cascade Water Alliance (Cascade). Cascade wants everyone to understand the importance of conserving and protecting our limited water resources. Cascade supports Nature Vision in the development and delivery of water education programs and we are happy to offer these materials to our friends in the community. Learn more about Cascade at [cascadewater.org](http://cascadewater.org).

Another great resource to learn about saving water and how to help our salmon and watershed is [weneedwater.org](http://weneedwater.org). Check out the We Need Water webpage or on Instagram @WeNeedH2O to see how you can be part of this campaign! Challenge yourself to use #WeNeedWater to post all the things you are doing with your friends and family to conserve and protect water!

*Please contact [info@naturevision.org](mailto:info@naturevision.org) with any questions or concerns  
Stay connected with Nature Vision! Follow us for updates @naturevisionorg*



**NOTE: While many activities in this packet are creatively oriented and open ended, you may consult the answer key located at the back of the packet for additional assistance or guidance.**

Unless otherwise noted, images courtesy of freepik.com

# PARENT/CAREGIVER OVERVIEW: DAY 1 / DAY 2

## Salmon Ecosystems and Adaptations

**Background Information:** Ecosystems are made up of all sorts of living and non-living things. In Washington, salmon are one of the most important parts of the ecosystem and therefore must be protected. These animals have a unique life cycle that takes them on a journey from our local rivers to the ocean and back again. Along the way, they interact with countless other organisms throughout the ecosystem. We will study these unique animals and more while describing riparian river systems.

**Learning Objectives:** By learning about all of the interconnected creatures and objects in nature, students will develop a better understanding of the world around them. They will be able to identify local organisms and explain their adaptations.

### **Activity 1: Create a Riparian Ecosystem**

- **Overview:** Students are presented with an empty river scene and must fill it with complex living and non-living things that are found there
- **Parent/Caregiver Tasks:** Point students to the instructions for some ideas while guiding them to include many different varieties of living and non-living things

### **Activity 2: Adaptations in the Ecosystem**

- **Overview:** Students observe the world around them and identify several living things before identifying and explaining what special adaptations those organisms have
- **Parent/Caregiver Tasks:** (If going outside) supervise your student — (if remaining indoors) encourage the students to visualize a complex river ecosystem and all of the life that might be found there

### **Optional Activity: We Need Water Challenge**

- **Overview:** Students complete a daily task related to a water conservation habit and a challenge to spread awareness on the importance of saving water
- **Parent/Caregiver Tasks:** If possible, help the student post their #WeNeedWater challenge on social media

### **Optional Activity: Salmon Redds**

- **Overview:** Students create their own version of a salmon redd or nest using common materials, then perform an experiment to find the best possible location for a salmon to spawn
- **Parent/Caregiver Tasks:** (If going outside) supervise your student collecting materials to ensure that they are being safe and secure (and not spilling too much water!)

# PARENT/CAREGIVER OVERVIEW: DAY 3 / DAY 4

## Salmon as a Keystone Species

**Background Information:** Salmon are a keystone species in our local rivers and forests. A keystone species helps support the life of multiple different organisms. Removing a keystone species leads to the demise of other organisms in the ecosystem. Therefore, salmon are vital to a healthy ecosystem. These anadromous fish are born in freshwater streams and rivers within our watersheds, then migrate to the Pacific Ocean as adults, before later returning to their natal stream to spawn. During their journey from freshwater stream to the ocean and then back to the freshwater stream, salmon help sustain a biodiversity of life as they travel through each habitat.

**Learning Objectives:** Students will discover the five salmon species essential to our local river and forest ecosystems. They will be guided through the salmon life cycle, understanding their role as a main food source to a diversity of animals. By learning about the migration journey of salmon as juveniles to adult spawners, the students will identify the Pacific salmon as a keystone species. Students will identify salmon as an integral part of multiple food chains and an even greater food web. After completing the lesson, they will understand that the removal of these keystone species will be detrimental to the health of our watersheds.

### **Activity 1: Salmon Food Web**

- **Overview:** After learning about salmon as a keystone species, students will create a food web centering around salmon
- **Parent/Caregiver Tasks:** Assist with reading background information and instructions

### **Activity 2: The Great Salmon Survival**

- **Overview:** Students experience many challenges that salmon face throughout their life cycle
- **Parent/Caregiver Tasks:** Assist with reading background information and instructions and help cutting out the Code Cards (if needed)

### **Optional Activity: We Need Water Challenge**

- **Overview:** Students complete a daily task related to a water conservation habit and a challenge to spread awareness on the importance of saving water
- **Parent/Caregiver Tasks:** If possible, help your student post their #WeNeedWater challenge on social media

### **Optional Activity: Videos**

- **Overview:** Students watch informational videos of salmon as a keystone species and the impact human influence has on salmon
- **Parent/Caregiver Tasks:** Provide technical support

# PARENT/CAREGIVER OVERVIEW: DAY 5 / DAY 6

## The Necessity of Decomposing Salmon

**Background Information:** After returning home to freshwater streams to spawn, adult salmon die soon after and their decaying bodies help sustain the health of rivers and forests. They become fertilizer for the surrounding riparian forest, releasing necessary nitrogen and potassium from their muscle and bones. These nutrients are washed into the nearby soil and absorbed by the trees and plants in the forests. Decaying salmon are not only vital for plant growth, but they are also an essential food source for carnivores, such as black bears, bobcats, and eagles. In addition, these animals drag the dead salmon deeper into the forest, allowing the salmon to further fertilize. Larger animals are not the only consumer of the salmon, though. Smaller organisms such as aquatic invertebrates feed on the dead adult salmon and gain vital nutrients as well.

**Learning Objectives:** Students will continue to learn about salmon as a keystone species by understanding the necessity of decomposing salmon in our watersheds. They will discover how dead salmon are a key food source, but also a necessary fertilizer to our forests. Students will be introduced to the nutrient cycle salmon creates as their bodies rot and decay after spawning. These bodies dragged into the forests by predators release the nutrients nitrogen and potassium into the soil to aid in the growth of trees and plants. Students will be able to identify salmon as an integral component of healthy forest and river ecosystems.

### **Activity 1: How Do Dead Salmon Help?**

- **Overview:** After learning about salmon as an integral part of our forests' nutrient cycle, students answer questions that connect dead salmon to animals that do not rely on salmon as food
- **Parent/Caregiver Tasks:** Assist with reading background information and instructions

### **Activity 2: Nutrient Connection**

- **Overview:** Students answer questions that further their understanding of dead salmon as a necessary fertilizer for the growth of trees and plants in our forests so they can in turn provide nutritional benefits for salmon eggs in the future
- **Parent/Caregiver Tasks:** Assist with reading background information and instructions

### **Optional Activity: We Need Water Challenge**

- **Overview:** Students complete a daily task related to a water conservation habit and a challenge to spread awareness on the importance of saving water
- **Parent/Caregiver Tasks:** If possible, help your student post their #WeNeedWater challenge on social media

### **Optional Activity: Videos**

- **Overview:** Informational videos of salmon as a keystone species and their impact from human influence
- **Parent/Caregiver Tasks:** Technical support

# PARENT/CAREGIVER OVERVIEW: DAY 7 / DAY 8

## Populations and Human Impact

**Background Information:** When learning about the health of a species, one of the most important things to look at is the population as a whole. By understanding the number of living things in a given area, it is possible to create more beneficial and effective plans for protecting and conserving the natural world. It is also critical that we look at our own human impact on the environment, as well as considering the different perspectives and needs of many different groups of people.

**Learning Objectives:** Students will understand how outside factors can affect the population of a species, as well as identify ideas for making positive change. Additionally, they will be able to think about balancing the needs of different groups and local stakeholders.

### **Activity 1: Stakeholders**

- **Overview:** Students take on the role of a local city council member and make decisions that keep their community happy while also prioritizing salmon protection
- **Parent/Caregiver Tasks:** Help your student read through each scenario and assist them with any difficult vocabulary while encouraging them to explain their reasoning for each choice

### **Activity 2: Salmon Across Time**

- **Overview:** Students review 3 charts showing salmon-related data and answer questions based on what they see
- **Parent/Caregiver Tasks:** Encourage your student to think carefully about what has happened with salmon in our recent history, and explain what each chart is depicting (if needed)

### **Optional Activity: We Need Water Challenge**

- **Overview:** Students complete a daily task related to a water conservation habit and a challenge to spread awareness on the importance of saving water
- **Parent/Caregiver Tasks:** If possible, help your student post their #WeNeedWater challenge on social media

# PARENT/CAREGIVER OVERVIEW: DAY 9 / DAY 10

## Stewardship

**Background Information:** Stewardship is how we care for the natural world. It includes conserving natural resources like water that all living things need to survive, thinking and acting carefully about how we interact with the world around us, and doing our best to make sure that we have a positive impact on the environment. Specifically, these stewardship activities focus on what students and families can do to save water and keep it clean for the rest of the environment.

**Learning Objectives:** Students combine their knowledge gained throughout the week to help them think carefully about our natural resource use to come up with ways to support the environment through water conservation.

### **Activity 1: Water Habits**

- **Overview:** Students assess their knowledge of water conservation habits by interpreting an information graphic that shows smart and wasteful water habits
- **Parent/Caregiver Tasks:** Assist with reading background information and instructions

### **Activity 2: Create an Action Plan**

- **Overview:** Students organize an action plan designing a unique way of sharing all they have learned throughout the week with their family, friends, neighbors, and schools
- **Parent/Caregiver Tasks:** Assist with reading background information and instructions

### **Optional Activity: We Need Water Challenge**

- **Overview:** Students complete a daily task related to a water conservation habit and a challenge to spread awareness on the importance of saving water
- **Parent/Caregiver Tasks:** If possible, help your student post their #WeNeedWater challenge on social media

## PARENT/CAREGIVER OVERVIEW: VOCABULARY

### DAY 1 / DAY 2

**Abiotic:** Something that is not and never was alive

**Adaptation:** A specific trait or behavior that helps a living thing survive

**Anadromous:** A word to describe fish that move between fresh water and salt water

**Biotic:** Something that is alive or came from a living thing

**Ecosystem:** A community of organisms and their environment

**Estuary:** Where a freshwater river meets the salt water of the ocean

**Evolution:** The process by which groups of living things change over time

**Organism:** A living thing

**Riparian:** Relating to or near a river or stream

**Species:** A group of similar living things

### DAY 3 / DAY 4

**Consumer:** An organism that eats to gain energy, usually animals

**Food Chain:** The flow of energy from an organism to another organism, usually the energy flow is from eating

**Food Web:** Many food chains connected together

**Keystone Species:** An organism that impacts other organisms in a positive way (if a keystone species were gone from an ecosystem, then the other organisms will suffer)

**Nutrient:** A source that provides nourishment needed for animal or plant growth and life

**Predator:** An animal that preys and eats other animals

**Producer:** An organism that makes its own energy, usually plants

**Spawn:** To release, deposit, and fertilize eggs

**Watershed:** An area of land that allows water to flow off and drain into rivers, lakes, streams, and oceans

### DAY 5 / DAY 6

**Decomposition:** Process of rotting, to decay

**Fertilizer:** Material added to soil to make it healthier and to help the growth of plants

**Invertebrate:** Animals without a vertebrae, the backbone

### DAY 7 / DAY 8

**Population:** The number of one kind of organism in a given region

**Stakeholder:** Somebody involved with or affected by a decision or action

### DAY 9 / DAY 10

**Conservation:** Protecting the natural world, especially by making smart choices about our natural resource use

**Stewardship:** Taking care of something; being a protector

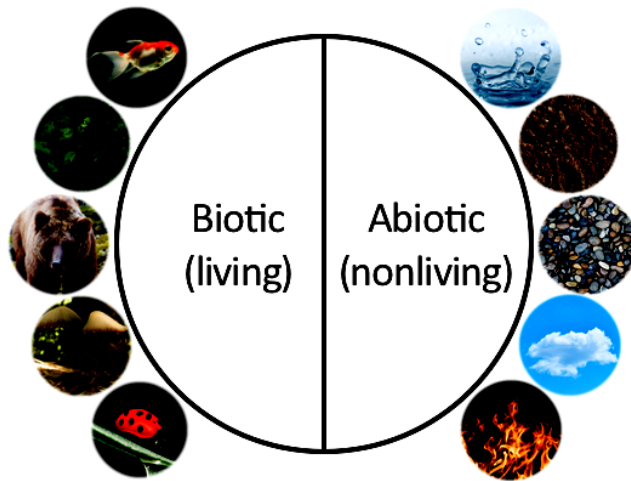


# DAY 1 / DAY 2

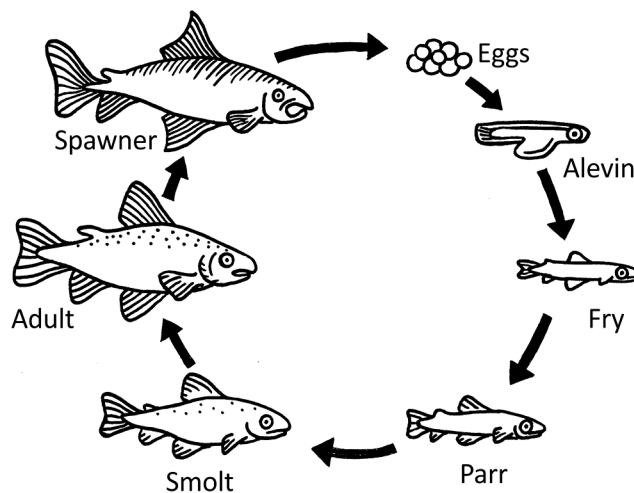
## Salmon Ecosystems and Adaptations

All living things, or **organisms**, are part of their own **ecosystem**. An ecosystem is the community of living and non-living (also referred to as **biotic** and **abiotic**) things in a particular area.

### Ecosystems:



One of the most important organisms in our area is the salmon. We will spend this week learning all about this animal and the connections they have to the rest of nature. These creatures have a unique life cycle that brings them on a journey between many different ecosystems (e.g. rivers, **estuaries**, and oceans). Take a look at all of the stages that they pass through during their life cycle:



Today, we will investigate the kind of ecosystems that salmon and other animals around us need to stay healthy. Our main focus will be **riparian** zones, which means the areas around river systems. Besides salmon, can you think of some examples of living things that might make their homes or habitats in a riparian zone? Try to list at least 5 of them below:

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Through **evolution**, each one of those organisms has acquired certain traits and behaviors that allow them to be successful. Evolution is the long, slow process by which **species**, or groups of similar organisms, change to better survive in their surroundings. These changes are called **adaptations** and are part of what makes every living thing unique and interesting. Let's take a look at salmon and some of their adaptations:

- *They are **anadromous**.* This means they spend part of their life in fresh water and part of their life in salt water.
- *They have **gills**.* Like all fish, salmon use their gills to breathe underwater.
- *They are **excellent navigators**.* Salmon have the amazing ability to find their way home even after spending years in the ocean. Scientists believe that they are able to use a combination of smells and sensing the earth's magnetic field in order to head upstream to spawn.
- *They can **camouflage**.* As young parr, salmon grow small stripes along their body to help them blend in and hide from predators in the river. Then when they grow up and move into the ocean, salmon develop light colored bellies and dark colored backs, which once again helps them to camouflage with the light shining through the water. Looking from below, the light colors blend with the sun; looking from above, the dark colors are indistinguishable from the deep water below.

Because we share our home in Washington with salmon, we also share our most important resource: water. Salmon rely on an abundant amount of clean water to survive. However, this crucial resource is impacted heavily by human use. Wasteful water consumption and pollution of our stormwater endangers the health of our waterways. Saving water and using it wisely will ensure there is enough water in our environment for both humans and salmon, as well as other living organisms that need it. As we learn more this week, continue to think about what you can do to help save water and protect creatures like salmon!

### **Vocabulary**

**Abiotic:** Something that is not and never was alive

**Adaptation:** A specific trait or behavior that helps a living thing survive

**Anadromous:** A word to describe fish that move between fresh water and salt water

**Biotic:** Something that is alive or came from a living thing

**Ecosystem:** A community of organisms and their environment

**Estuary:** Where a freshwater river meets the salt water of the ocean

**Evolution:** The process by which groups of living things change over time

**Organism:** A living thing

**Riparian:** Relating to or near a river or stream

**Species:** A group of similar living things

## Activity #1

### Create a Riparian Ecosystem

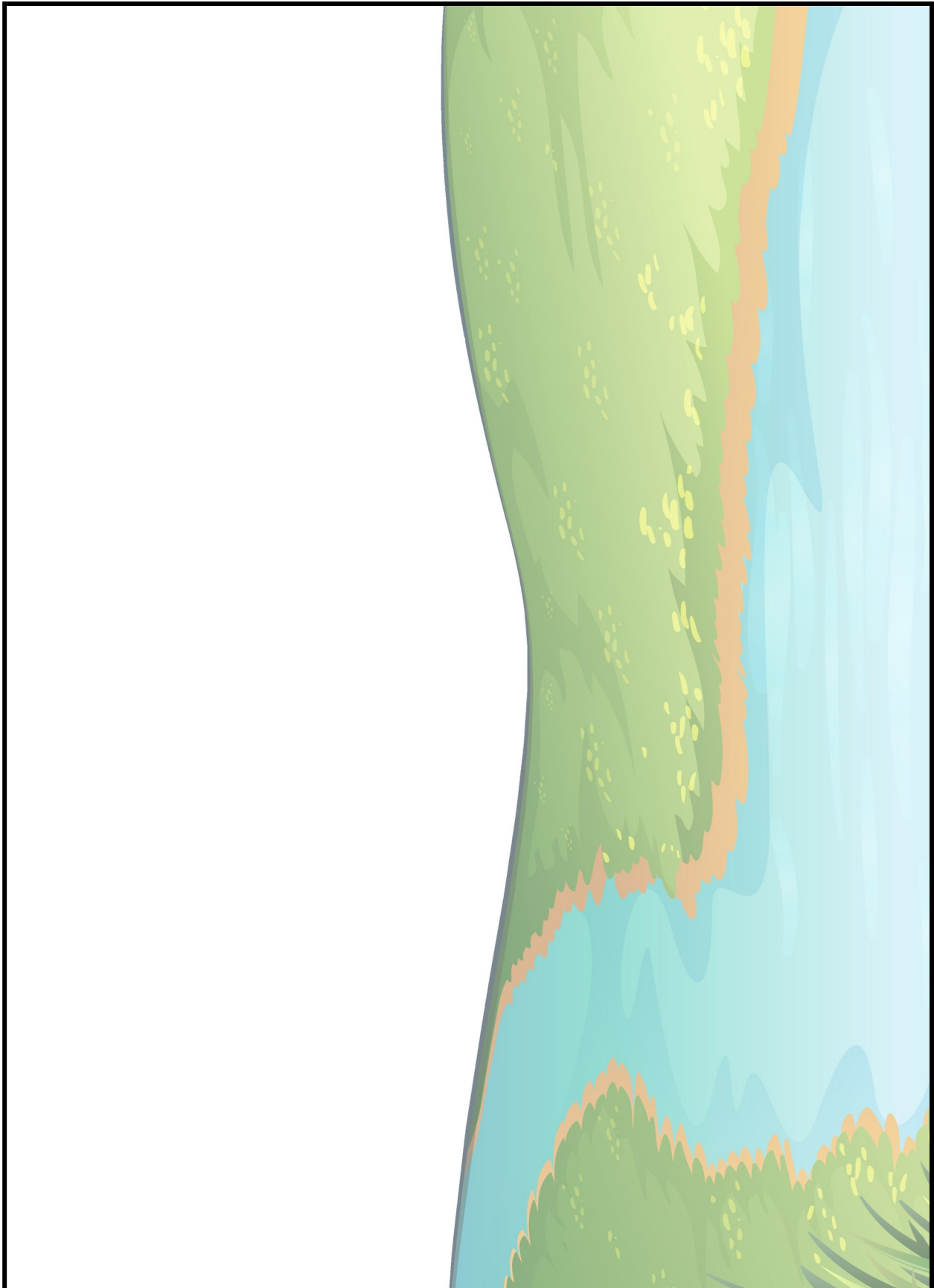
You have now learned a bit about how important salmon are, but we should not forget about all of the other amazing things in nature! For your first activity, you will design your own riparian ecosystem, making sure to include all of the different components you would find out in the real world.

**Materials:** Pencil, colored pencils (optional)

On the following page, you will find a picture of an empty river scene. It is up to you to fill it in with all the things it needs. Think about rivers and forests that you have seen before in Washington. Try to picture every single thing found in those places, living or not.

When considering what to add to the picture, be sure to follow these suggestions:

- **Animals:** Birds, fish, insects, mammals, reptiles, amphibians; riparian zones have it all!
  - Think about the connections between each of the creatures you include and try to draw some kind of interaction between at least two of them.
- **Plants:** There are so many different kinds of plants to think of! Be sure to include...
  - At least one kind of plant that loves water
  - At least one kind of low-growing plant that could be considered groundcover
  - At least two kinds of medium-height plants
  - At least two kinds of tall plants that can make up the top layer of forest, or canopy
- **Abiotic items:** An ecosystem is more than just living things! Look back to our introduction page for a reminder of some examples. Can you include...
  - An abiotic object that serves as a habitat, or home, for an organism?
  - An abiotic object that organisms are interacting with?
  - An abiotic object that might be moving?



# Activity #2

## Adaptations in the Ecosystem

You might not realize it, but there are countless habitats and ecosystems right outside your door! Today, we will explore the world around us and to see how the organisms in these nearby places are using their unique adaptations to survive.

**Materials:** Pencil, colored pencils (optional)

1. With an adult, head outside with this page and a writing utensil. If possible in your neighborhood, try to find a riparian zone near a stream or river!
  - ◆ *If you are unable to safely get outside, then skip ahead to step 4 and use the 5 organisms that you wrote down in the beginning section of this packet.*
2. Locate a safe spot where you can sit quietly for at least 5 minutes.
3. In your chosen spot, start to look around at all of the organisms in the ecosystem around you.
4. List all of the organisms you've found in the space below, then turn the page.

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5. In the boxes below, record and draw 5 of the organisms you found.
6. For each organism, record the specific adaptations they have that help them survive:
- ◆ List 1 adaptation that helps them find food
  - ◆ List 1 adaptation that helps protect them
  - ◆ List 1 adaptation that helps them move

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## Optional Activity

### We Need Water Challenge

There are so many ways to save, protect, and care for our water. At the end of every daily lesson, we will be giving a challenge to help you show off what you've learned.

**Materials:** Pencil, colors, pieces of paper or a journal, computer/phone/tablet, internet

Nature isn't somewhere far away, it's all around us! There are plants and animals everywhere if you look carefully, and they all need water to survive just like us! For today's #WeNeedWater challenge, you will begin a Neighborhood Nature Journal. Starting today, you can make observations of the world around you this week and notice how things change over time. When we pay enough attention we notice things we might not normally see. Do you have a tree or flower that is blooming? A bird building a nest? A squirrel collecting food? Where do they get their water, and how are they using it? Naturalists (scientists who make observations of nature) keep journals to record the plants and animals they see and learn more about the world around them.

If you can go outside, remember to be safe, responsible, and respectful. If you can't go outside, you can still find nature by looking out a window, or staying on your balcony, porch, or front steps. Remember that bushes, birds, trees, ants, worms are all nature, and they all need water!

To share your work, post your challenge to Facebook and/or Instagram (with an adult) so other people in your community can learn, too! Don't forget to use the hashtag #WeNeedWater and tag @weneedh20 and @naturevisionorg in your post so we can see your work!

## Optional Activity

### Salmon Redds

Spawning salmon have evolved to be very picky when it comes to choosing the right place to lay their eggs. They know that the wrong location could mean certain doom for their offspring, so they need to be able to find the perfect spot to create their nest, also known as a redd.

**Materials:** 2 plastic containers (with lids), multiple coins (pennies preferred), soil, rocks, water

In this experiment, you will take on the role of a salmon preparing to lay its eggs and complete its life cycle. Before doing so, however, you need to identify the correct place to spawn.

1. First, you will need to gather materials to simulate the contents of a river with an adult.
2. In your first container, collect 1 inch of loose soil or sand.
3. In the second container, gather an assortment of gravel, pebbles, or small rocks until it is filled to 1 inch.
4. Both containers should now be filled partially with soil or rocks. In the center of each container, dig out a small section like you are carving a bowl into the bottom. This is your redd!
5. Take 5-10 coins and place them in a loose pile in the center of each redd. Any coins will do, but pennies are preferred because they match the orange-red color of real life salmon eggs.
  - ◆ NOTE: If you happen to have marbles available, they work very well for this activity as a replacement for coins!
6. With your 'eggs' in each redd, gently fill each container halfway with water.
7. Place the lids on each container and make sure they are tight and secure.
8. With the containers resting on a flat surface, start to swirl each one around in a circular motion. Continue swirling for 1 minute.
9. Open up the containers and observe your results.
10. Answer the following questions about the results of your experiment:

What happened to the 'eggs' in the sand/soil container?

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What happened to the 'eggs' in the rocks/gravel container?

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Which one do you think would be better for salmon, and why?

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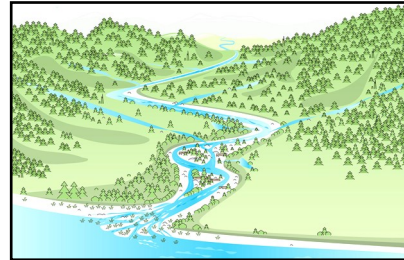
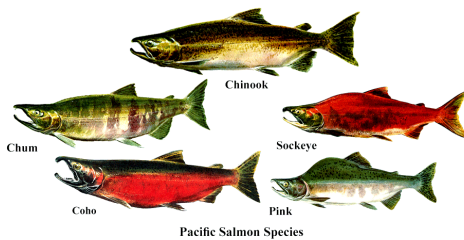
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## DAY 3 / DAY 4

### Salmon as a Keystone Species

Salmon are an iconic fish in our state. The population health of the five Pacific salmon species that swim through our streams, rivers, and the Puget Sound is a reflection of the health of our **watershed**. Our local watershed begins as snow melt from the Cascade mountains where the water shedding off this high land fills the waterways below.



Salmon begin their life cycle as eggs in the gravel beds of these freshwater streams and rivers. Depending on the species, the juvenile salmon called *fry* spend anywhere from a few months to a couple of years in freshwater before traveling out to the Puget Sound and eventually into the Pacific Ocean.

The ocean provides vital **nutrients** that freshwater lacks. However, what freshwater lacks in nutrients it makes up in suitable **spawning** grounds. Adult salmon make a second migration back to their home freshwater stream to create nests, or redds, to spawn and soon after die. On Thursday, we will dive into the importance of dead spawner adult salmon! For today, keep in mind that even after death the Pacific salmon have an integral role in sustaining both healthy river and forest ecosystems. *Remember: dead salmon are important.*

The salmon life cycle is part of a complex food web. At every point of their life, salmon are an essential food source for many different.

As baby salmon, the fry becomes food for **predators** such as larger fish and birds, just like this one!



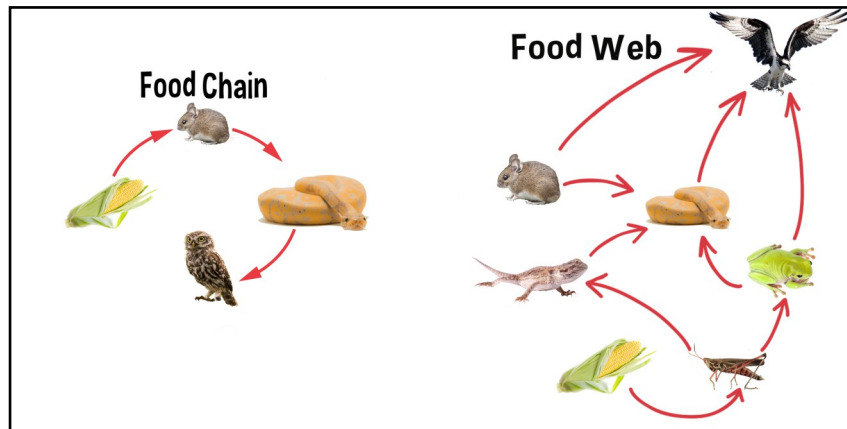
Orca whales, another iconic species in this region, feed primarily on the adult salmon in Puget Sound and the Pacific Ocean.



When adults return to spawn in freshwater, they become the main diet of black bears, bobcats, bald eagles, and river otters.



A salmon's muscles, bones, and overall body are made up of nutrients. Every time a salmon is eaten, the nutrients are transferred as energy into the animal that ate it. As you know, when you are hungry and eat food, you gain energy from what you ate. Food is energy! Salmon provide a huge source of energy to various animals living in our river, forest, and ocean ecosystems. A **food chain** describes this energy moving from one organism, to another organism, then another organism, and so forth. These food chains typically include a mix of **producers** and **consumers**. A producer is an organism that makes its own energy, so a plant. Animals eat food—or consume—to gain energy, so they are called consumers. These many salmon food chains mix together to create complex **food webs**. Food webs are many food chains combined. In a food web one species, like the salmon, could be the source of energy for multiple species.



Since Pacific salmon are the center of their food web, they are a **keystone species**. A keystone species sustains a vast assortment of life, meaning their presence is crucial to the entire ecosystem in which it belongs. Many things have an impact on the survival of a keystone species. There are abiotic factors, such as low water levels in rivers resulting in high water temperatures. Salmon are a fish that need an abundant amount of cold freshwater to spawn! A limiting biotic factor for a juvenile fry salmon may be an insufficient number of aquatic bugs in the stream. Whether it is due to biotic or abiotic factors, removing these keystone species will unravel the food webs of our river and forest ecosystems. The Pacific salmon's survival is tied with the health of our watershed. Over a 100 different species feed on the salmon throughout their life cycle!

### **Vocabulary**

**Consumer:** An organism that eats to gain energy, usually animals

**Food Chain:** The flow of energy from an organism to another organism, usually the energy flow is from eating

**Food Web:** Many food chains connected together

**Keystone Species:** An organism that impacts other organisms in a positive way (if a keystone species were gone from an ecosystem, then the other organisms will suffer)

**Nutrient:** A source that provides nourishment needed for animal or plant growth and life

**Predator:** An animal that preys and eats other animals

**Producer:** An organism that makes its own energy, usually plants

**Spawn:** To release, deposit, and fertilize eggs

**Watershed:** An area of land that allows water to flow off and drain into rivers, lakes, streams, and oceans

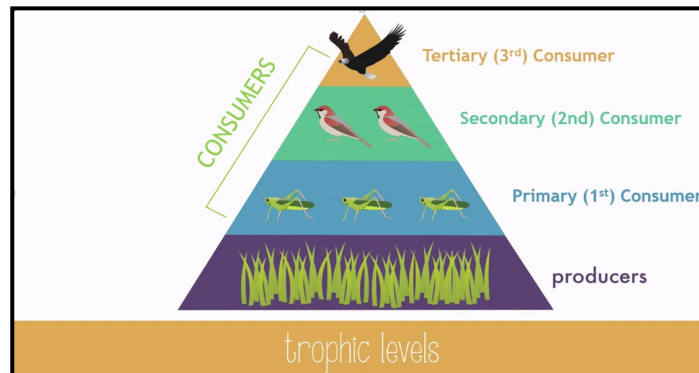
# Activity #1

## Salmon Food Web

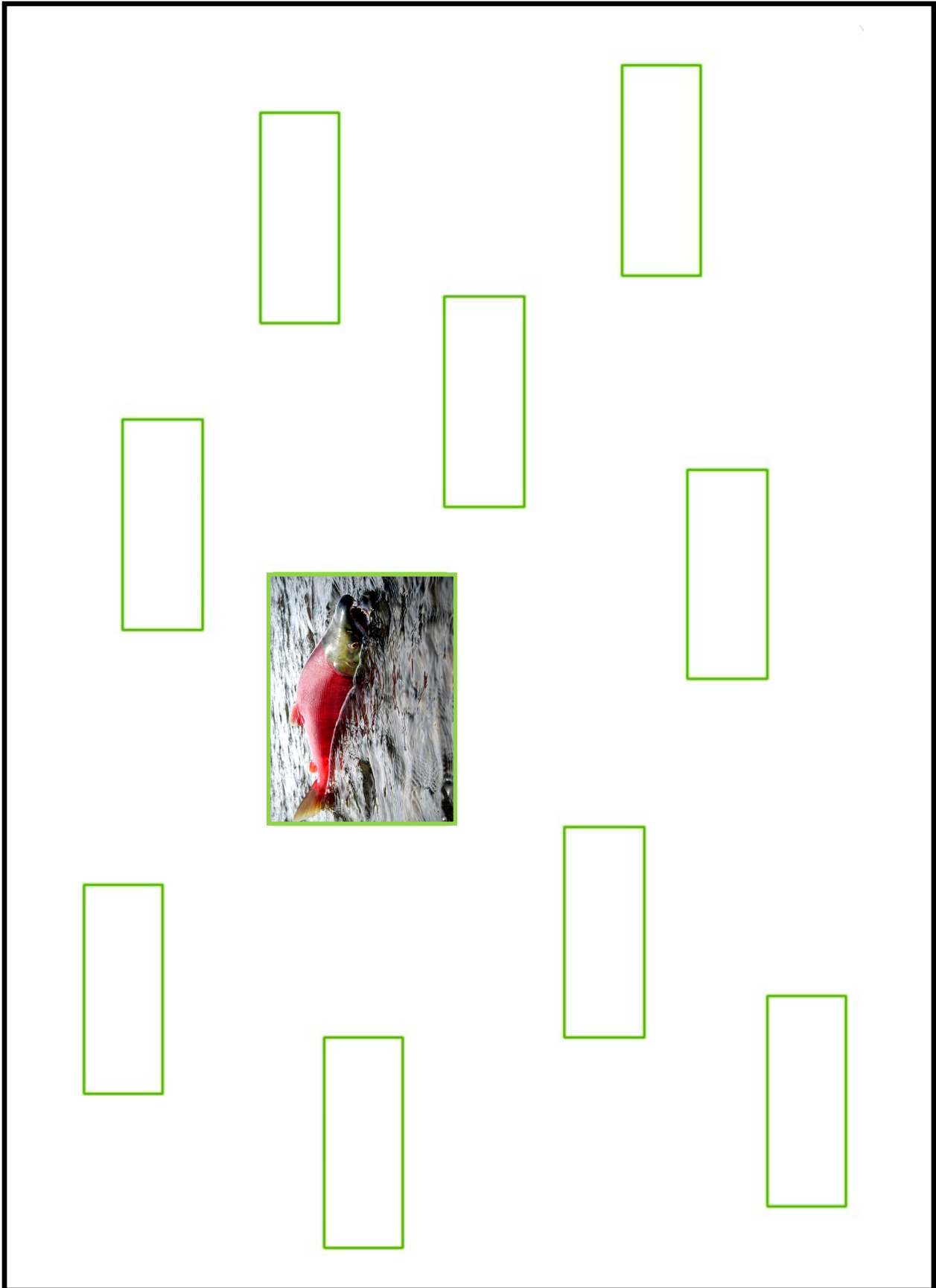
Before you make your own food web, it is important to understand the different parts that you find in one. A food web has trophic levels. Trophic levels are the organism's spot in the food web. The spots' names are producer and consumer, where the three consumer types are herbivore, omnivore, or carnivore. Remember, a producer is an organism that makes its own energy (i.e. a plant), while consumers consume food to gain energy. For a complete food web, you must include *all* trophic levels. Think of trophic levels like a pyramid. With producers making up the bottom and consumers stacking up on top. Not all consumers are the same. Consumers that eat producers, or plants, are called primary consumers. Primary consumers are stacked on top of producers. Secondary consumers are stacked on top of primary consumers. Secondary consumers eat primary consumers. Tertiary consumers are at the top! They can eat animals at every consumer level, including secondary and primary consumers. Where do you think salmon would be in a trophic level pyramid?

**Materials:** Pencil

Using the background information and the image below, start your salmon food web! Create this by following instructions 1-4:



1. Write one organism name for each box. You don't have to use all the organisms!  
**Orca** – Tertiary Consumer      **Black Bear** – Tertiary Consumer  
**Bald Eagle** – Tertiary Consumer      **Harbor Seal** – Secondary Consumer  
**Salmon** – Secondary Consumer      **River Otter** – Secondary Consumer  
**Squid** – Secondary Consumer      **Herring** – Secondary Consumer  
**Krill** – Primary Consumer      **Grasshopper** – Primary Consumer  
**Deer** – Primary Consumer      **Phytoplankton** – Producer  
**Algae** – Producer      **Grass** – Producer
2. Choose at least one of each from the organism choices: producer, primary consumer, secondary consumer, and tertiary consumer.
3. Draw arrows from a box to another box. This show the energy flow!
4. Show the correct flow of energy by pointing the arrows in the right direction! For example:
  - Salmon → River Otter – *this shows the energy of the salmon goes into the river otter because the river otter ate the salmon.*
  - Salmon ← River otter – *this shows the opposite! Salmon ate the river otter?*



## Activity #2

### The Great Salmon Survival

Salmon are a food source at every point of their life cycle. Out of the 2,000 to 4,000 eggs in salmon redds, only one or two fish survive to complete their life cycle and turn into a spawner adult. Every salmon comes across many life-threatening hurdles. A hurdle could be either biotic or abiotic, but each one defines the salmon's chances of survival!

**Materials:** Pencil

1. Find the 4 *Salmon Survival Codes Card* two-sided pages later in the packet
2. Cut out the 36 *Salmon Survival Codes* to make cards
  - *Try not to peek at the meanings on the back!*
  - *The numbers next to the two letter codes helps you remember which codes go together as pairs*
3. Stack the cards in correct order
4. Find *The Great Salmon Survival Scenarios* page
5. For each scenario:
  - Read the scenario then stop reading
  - Get the *Salmon Survival Codes Cards*
  - Find the two codes that match the scenario
  - Choose one of the two codes
  - Turn your choice card over and read the back
  - Does your salmon survive? Read the next scenario!

### Great Salmon Survival Scenarios

1. A female spawner adult builds a redd and lays 2,000 to 4,000 eggs, a male spawner comes along. **FF OR UF?**  
**STOP! LOOK AT THE CARDS FF & UF. CHOOSE ONE. READ THE BACK**
2. The adults have completed a successful spawn. They soon die not too far from the redd. **PR OR TF?**  
**STOP! LOOK AT THE CARDS PR & TF. CHOOSE ONE. READ THE BACK**
3. Alevins hatch from the eggs and stay hidden in their redds. **OW OR LO?**  
**STOP! LOOK AT THE CARDS OW & LO. CHOOSE ONE. READ THE BACK**
4. After a couple months, the Alevins grow into Fry! **YS OR MD?**  
**STOP! LOOK AT THE CARDS YS & MD. CHOOSE ONE. READ THE BACK**
5. The Frys start to emerge outside of their redds. **TC OR NP?**  
**STOP! LOOK AT THE CARDS TC & NP. CHOOSE ONE. READ THE BACK**

## Great Salmon Survival Scenarios, continued

6. The Fry defend a small feeding territory. **DN OR NF?**  
**STOP! LOOK AT THE CARDS DN & NF. CHOOSE ONE. READ THE BACK**
7. The feeding territory is close to overhanging tree branches. **GH OR PM?**  
**STOP! LOOK AT THE CARDS GH & PM. CHOOSE ONE. READ THE BACK**
8. The Fry darts quick from one spot in the stream to another, the light and shadows helping it blend in. **RO OR CC?**  
**STOP! LOOK AT THE CARDS RO & CC. CHOOSE ONE. READ THE BACK**
9. The Parr begins to recognize the scent of the home stream to prepare for when they need to return to spawn! **SB OR SC?**  
**STOP! LOOK AT THE CARDS SB & SC. CHOOSE ONE. READ THE BACK**
10. The salmon are now Smolt migrating to saltwater. On their journey they reach Lake Washington. **SR OR LW?**  
**STOP! LOOK AT THE CARDS SR OR LW. CHOOSE ONE. READ THE BACK**
11. The Smolt have reached Puget Sound! **HS OR SL?**  
**STOP! LOOK AT THE CARDS HS & SL. CHOOSE ONE. READ THE BACK**
12. Finally! The Smolt is now a full grown Adult Salmon and has reached the Pacific Ocean. **OW OR KL?**  
**STOP! LOOK AT THE CARDS OW & KL. CHOOSE ONE. READ THE BACK**
13. The Adult Salmon has been feeding for awhile now in the Pacific Ocean. **CF OR HR?**  
**STOP! LOOK AT THE CARDS CF & HR. CHOOSE ONE. READ THE BACK**
14. Time for the Adult Salmon to make the journey back to its home freshwater stream. **PS OR AO?**  
**STOP! LOOK AT THE CARDS PS & AO. CHOOSE ONE. READ THE BACK**
15. The Adult Salmon has reached Puget Sound and is now an Adult Spawner. **LF OR BL?**  
**STOP! LOOK AT THE CARDS LF & BL. CHOOSE ONE. READ THE BACK**
16. The Adult Spawner has left Puget Sound! **BC OR RW?**  
**STOP! LOOK AT THE CARDS BC & RW. CHOOSE ONE. READ THE BACK**
17. The Adult Spawner's home stream is close. **BB OR KS?**  
**STOP! LOOK AT THE CARDS BB & KS. CHOOSE ONE. READ THE BACK**
18. Found the home stream! The Adult Spawner looks for the perfect spot to spawn. **RG OR HD?**  
**STOP! LOOK AT THE CARDS RG & HD. CHOOSE ONE. READ THE BACK**

Salmon Survival Codes Page 1

UF<sub>1</sub>

FF<sub>1</sub>

TF<sub>2</sub>

PR<sub>2</sub>

LO<sub>3</sub>

OW<sub>3</sub>

MD<sub>4</sub>

YS<sub>4</sub>

TC<sub>5</sub>

Redd is disrupted by a Rainbow trout and the eggs are eaten - *Does not survive, start over*

People have been saving water at home! There is abundant cold oxygenated water that flows over the redd – *Survives, move to next scenario*

Trees were cut and less shade has made the water temperature too hot. Oxygen evaporates out of the water – *Does not survive, start over*

Fertilized egg -*Survives, move to next scenario*

People have been wasting water, the stream is too low and has little oxygen. Alevins cannot breathe – *Does not survive, start over*

The Alevins remain within the gravel red and are able to feed off their yolk sacs – *Survives, move to next scenario*

Unfertilized egg - *Does not survive, start over*

The redd is well-protected. Eggs are close to hatching! - *Survives, move to next scenario*

A Merganser duck finds the Alevin hiding in the red. Salmon is eaten – *Does not survive, start over*



NP<sup>5</sup>

NF<sup>6</sup>

DN<sup>6</sup>

GH<sup>7</sup>

PM<sup>7</sup>

RO<sup>8</sup>

FL<sup>8</sup>

SB<sup>9</sup>

SC<sup>9</sup>

Fry finds a dragonfly nymph on a gravel - *Survives, move to next scenario*

The Parr was not able to hide, a river otter eats it - *Does not survive, start over*

The stream is curved allowing the water current to be slowed down - *Survives, move to next scenario*

Fry could not find any food - *Does not survive, start over*

The Fry develops parr stripes that help it to camouflage - *Survives, move to next scenario*

The stream has a blockage that the Parr cannot pass - *Does not survive, start over*

Native plants are planted along the stream bed by volunteers to create shade and keep the stream temperature cool. More oxygen is absorbed - *Survives, move to next scenario*

A Great Blue Heron eats the Fry - *Does not survive, start over*

Parr Fry hides underneath a fallen log - *Survives, move to next scenario*

SR<sub>10</sub>

CD<sub>10</sub>

HS<sub>11</sub>

SL<sub>11</sub>

OW<sub>12</sub>

KL<sub>12</sub>

CF<sub>13</sub>

HR<sub>13</sub>

AO<sub>14</sub>

A harbor seal eats the Smolt –  
*Does not survive, start over*

The Adult Salmon swims all the way to Alaska and fattens up on Krill – *Survives, move to next scenario*

Another resident Orca pod has eaten the Adult Salmon. They love salmon! – *Does not survive, start over*

Lake Washington is healthy. Car drivers have made sure their cars are not leaking oil that could flow down stormdrains into salmon habitat – *Survives, move to next scenario*

A resident Orca whale loves Adult Salmon! The Adult Salmon is eaten – *Does not survive, start over*

The Adult Salmon has found a school of herring fish to eat – *Survives, move to next scenario*

There is too much stormwater runoff pollution flowing into Lake Washington – *Does not survive, start over*

The Smolt sticks close to Puget Sound shorelines – *Survives, move to next scenario*

A commercial fishing boat has caught the Adult Salmon – *Does not survive, start over*

PS<sub>14</sub>

LF<sub>15</sub>

BL<sub>15</sub>

BC<sub>16</sub>

RW<sub>16</sub>

BB<sub>17</sub>

KS<sub>17</sub>

HD<sub>18</sub>

RG<sub>18</sub>

The Adult Spawner has reached the Ballard Locks in Ballard, Seattle and climbs the salmon ladder – *Survives, move to next scenario*

A black bear snatches the Adult Spawner as it tries to navigate around the river bend. – *Does not survive, start over*

The Adult Spawner is a male and is able to fertilize a redd made by a female in the rocky gravel beds – *Successful Spawner, contributes to the next Salmon generation!*

A local family fishing on Puget Sound has caught the Adult Spawner – *Does not survive, start over*

The Adult Spawner has reached a freshwater river! – *Survives, move to next scenario*

Some parts of the stream banks are damaged due to human development – *Does not Spawn!*

The Adult Salmon swims down from Alaska and finds its way back to Puget Sound - *Survives, move to next scenario*

A bobcat pounces on the Adult Spawner! – *Does not survive, start over*

The Adult Spawner has not eaten since it reached freshwater and will not eat anymore. It will only keep swimming until it reaches its home stream – *Survives, move to next scenario*

## Optional Activity

### We Need Water Challenge

There are so many ways to save, protect, and care for our water. At the end of every daily lesson, we will be giving a challenge to help you show off what you've learned.

**Materials:** Pencil, colors, computer/phone/tablet, internet

You are a part of nature! Humans are just one kind of animal, and we share connections with all of the others. For today's #WeNeedWater challenge, look for signs of life either inside your home or outdoors with an adult. Once you find one living thing, then search for a second organism that shares some kind of connection with what you found. Continue that chain of connections for as many organisms as you can! List all of the connections that you find.

If you can go outside, remember to be safe, responsible, and respectful. If you can't go outside, you can still find nature by looking out a window, or staying on your balcony, porch, or front steps. Remember that bushes, birds, trees, ants, worms are all nature, and they all need water!

To share your work, post your challenge to Facebook and/or Instagram (with an adult) so other people in your community can learn, too! Don't forget to use the hashtag #WeNeedWater and tag @weneedh20 and @naturevisionorg in your post so we can see your work!

## Optional Activity

### Videos

There are lots of online resources available to learn more about salmon, the struggles they face, as well as some possible solutions for these issues.

***Please ask for an adult's permission to watch these videos.***

The first video is a TEDx Talk on salmon. This video can be found by doing a YouTube search of "TEDx Talk: Guido Rahr on Salmon Strongholds" or by clicking this link:

<https://vimeo.com/116385054>

The second video is from the Nature Conservancy. This video can be found by doing a YouTube search of "Solving Stormwater by the Nature Conservancy in WA" or by clicking this link: <https://vimeo.com/156457823>

***Materials:*** Computer/phone/tablet, internet connection



## DAY 5 / DAY 6

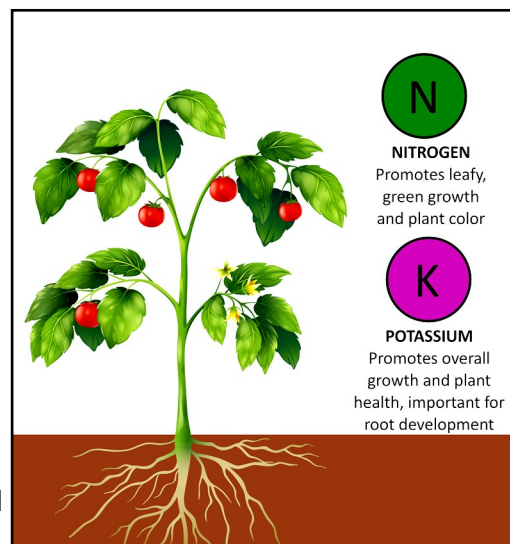
### The Necessity of Decomposing Salmon

On Monday, we were introduced to the Pacific salmon as a keystone species. We learned about their significance within a complex food web— the salmon transferring energy to a variety of consumers. If you look back at our first lesson we asked you to remember something for today, do you remember? *Dead salmon are important.* Not only are living salmon eaten - dead salmon are eaten too! Spawner adult salmon soon die after successfully spawning in their home freshwater stream and river. These dead salmon continue to be a major food source for black bears, bald eagles, and river otters. Their bodies also provide energy to aquatic bugs that become food for newly hatched baby salmon!

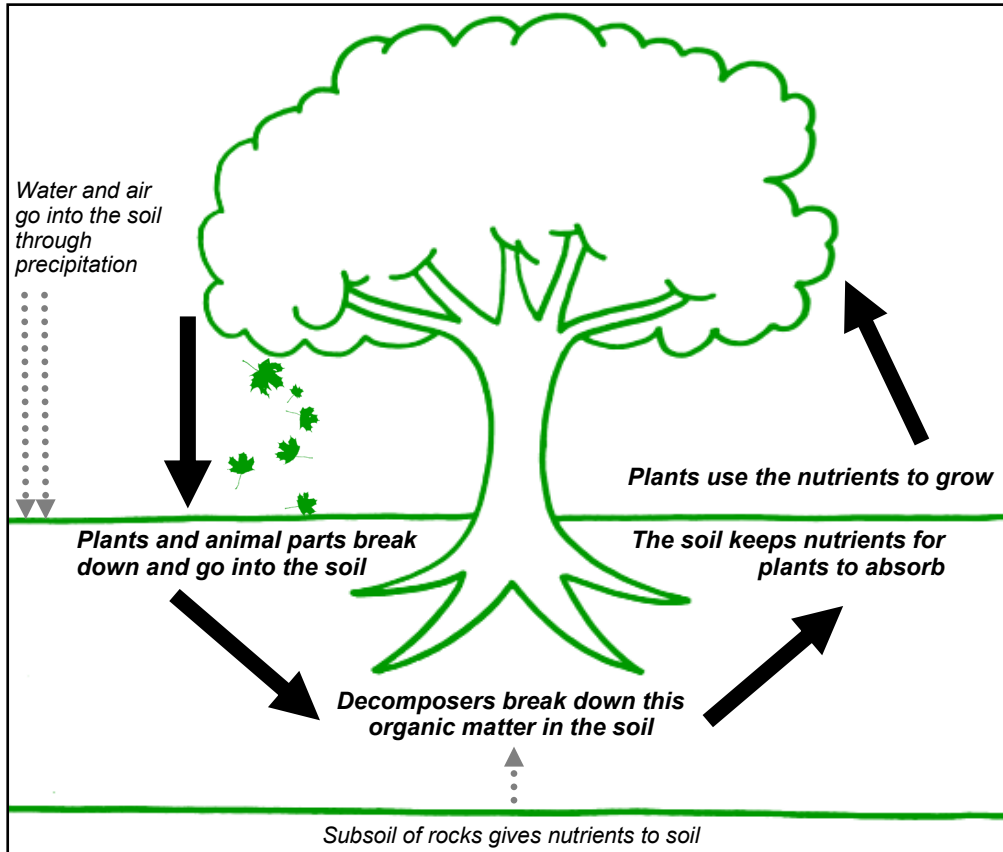


A dead spawner adult may be dragged into the forest by a black bear, and whatever the bear does not finish will remain on the forest floor. As time passes, a dead salmon's body will start to decompose. **Decomposition** is the process of rotting and decaying. The salmon carcass will break down with the help of rain and decomposers – fungi, bacteria, and **invertebrates**. The decomposition process releases all the nutrients the salmon gained through its life cycle from freshwater to saltwater and back. The nutrients spread into the soil, allowing the surrounding trees and plants to be fertilized.

Decomposing salmon are natural **fertilizers** for forests. The key nutrients they release as they decay—nitrogen and potassium—are absorbed from the soil through the plant's roots and are necessary for healthy plant growth. Nitrogen and potassium are chemicals that are found in salmon, but humans as well. For humans and salmon, nitrogen is important for building muscles, and potassium is important for building bones. Since plants do not have muscles and bones, they use these chemicals in different ways. Nitrogen is needed to grow a plant's leaves and stems, while potassium is needed for plants to have strong roots. Without the salmon to fertilize the forest with these essential nutrients, our forest's trees and plants would be smaller and would grow at a much slower rate.



These nutrients are not only from the decomposing salmon. They are also left behind by the animals that ate the dead salmon. Yes, we're talking about poop! After eating a salmon, the black bear, coyote, bald eagle, sea gull, and other predators will travel deeper into the forest. These animals will leave behind waste that is filled with nutrients! Animal waste is how a forest benefits from salmon even if the trees and plants are not close to salmon spawning streams. We have been talking about the salmon life cycle a lot but the salmon's nutrient cycle is just as significant. The nutrient cycle shows how a salmon benefits our forests and trees even after its death. Salmon are always supporting healthy rivers and forests.



Can we all agree that salmon are important – dead *and* alive? Absolutely! They are both food for animals and fertilizer for soil and plants. The animals and plants that live in our watershed need the salmon, as do we. Our watershed is not only the home to salmon, but it is our home as well. To keep our watershed healthy, we need everyone to participate in water conservation. Each time we use water, we should be thinking of how we can use it wisely. *Do you have any ideas on how to use water wisely for our watershed and the salmon?*

**Vocabulary**

**Decomposition:** Process of rotting, to decay

**Fertilizer:** Material added to soil to make it healthier and to help the growth of plants

**Invertebrate:** Animals without a vertebrae, the backbone

## Activity #1

### How Do Dead Salmon Help?

Dead salmon help animals in their ecosystems more than just as a food source. All of the animals in the activity below do not eat salmon: the Beaver, Pileated Woodpecker, and Thatching Ants. The Beaver is an herbivore and only eats plants. The Pileated Woodpecker and Thatching Ants only eat insects. These animals *do* need the dead salmon to keep their ecosystems healthy!

Answer the questions on the next page. Use the background information below and the image on the following page to help you describe how dead salmon helps the beaver, woodpecker, and thatching ants.

#### *Fun Facts on Each Animal*

**Beaver:** Beavers live in freshwater ponds, lakes, and rivers. They cut down trees with their teeth to dam up these waterways to build lodges. Their diet is made up mostly trees but they will also eat roots, bark, and leaves, too!

**Pileated Woodpecker:** The largest woodpecker found in North America! They can be found mostly living among older forests with plenty of large dead trees. They chip away the bark of dead trees to create holes. They find ants and beetles to eat in these holes. They also dig larger round holes in standing dead trees called snags for nesting.

**Thatching Ant:** These are sometimes called mound ants because some species of these ants collect sticks, leaves, and grass to build mounds. These mounds are actually their nests. Other species build their nests out of decaying logs. Thatching ants will eat other insects such as grasshoppers, beetles, caterpillars, and even other ants!

**Materials:** Pencil



Describe how dead salmon *help* beavers:

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Describe how dead salmon *help* pileated woodpeckers:

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Describe how dead salmon *help* thatching ants:

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## Activity #2

### Nutrient Connection

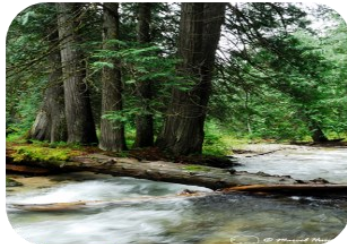
Salmon eggs need cold, well oxygenated water flowing over their gravel redds to survive. A salmon depends on surrounding vegetation in keeping water temperatures cool. Think of a hot sunny day and why you might walk under a tall tree. What does the tree provide for you to keep you cool? Just like you need a tree to cool off, the salmon need vegetation to keep cool.

On the following page, answer the questions using the background information and image below to help you describe the connection between dead salmon, trees, and salmon eggs.

**Materials:** Pencil



- BOX 1: What does dead salmon **release** for trees and plants in our forests?



- BOX 2: What would our forest's trees and plants **look** like without dead salmon?



- BOX 3: What do trees and plants **provide** salmon eggs in gravel redds?

What do dead salmon provide for trees and plants in our forests?  
*Hint: Think of the names of two important chemicals*

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What would trees and plants in our forests look like without dead salmon?

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*Feel free to draw what a tree would look like without dead salmon below!*

How do trees and plants in surrounding forests help salmon eggs in gravel redds?  
*Hint: What you need on a hot sunny day.*

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## Optional Activity

### We Need Water Challenge

There are so many ways to save, protect, and care for our water. At the end of every daily lesson, we will be giving a challenge to help you show off what you've learned.

**Materials:** Pencil, colors, computer/phone/tablet, internet

Today, take a look at the plants in your yard, around your home, or try to remember the green spaces around your school. Plan out how you could improve this space with the goal of conserving water. Consider increasing the water-absorbing plants and decreasing the amount of impervious surfaces. Have others in your home participate as well and see who has the best ideas!

If you can go outside, remember to be safe, responsible, and respectful. If you can't go outside, you can still find nature by looking out a window, or staying on your balcony, porch, or front steps. Remember that bushes, birds, trees, ants, worms are all nature, and they all need water!

To share your work, post your challenge to Facebook and/or Instagram (with an adult) so other people in your community can learn, too! Don't forget to use the hashtag #WeNeedWater and tag @weneedh20 and @naturevisionorg in your post so we can see your work!

## Optional Activity

### Videos

There are lots of resources available to learn more about salmon, the struggles they face, and some possible solutions for these issues. With an adult, check out the videos below!

***Please ask for an adult's permission to watch these videos.***

**“Salmon in the Trees”**: This short video was created in conjunction with Amy Gulick’s book of photo journalism published by Mountaineers Books titled *Salmon in the Trees*. It shows the connection between the life cycle of salmon and the forest. This sets the ground work for discussion of salmon as a really important part of the environment in addition to detailing some of the ways that salmon impact the forest beyond just being a food source for other animals.

This video can be found by following this link: <https://www.youtube.com/watch?v=8K87F2IABbE> or by a YouTube search for “Salmon in the Trees”.

**“Salmon: Healthy Dinner, Healthy Forests”**: This short video from The Nature Conservancy shows how important salmon are, not only as a food source for humans and other animals, but for helping to bring nutrients to the plants of the forest as well. What is really amazing is that salmon are connected to the environments they live in in lots of different ways, some of which are simple and some of which are complicated.

This video can be found following this link <https://binged.it/31xzAtu> or by doing a YouTube search for “Salmon: Healthy Dinner, Healthy Forests”

**Materials:** Computer/phone/tablet, internet connection



# DAY 7 / DAY 8

## Populations and Human Impact

The **population** of any organism is simply the number of that organism that are living in a particular place. Populations rise and fall naturally, and can change based on many different things. Maybe there was an unusually large amount of food available, causing populations to grow rapidly. Perhaps there was a natural disaster like a flood that destroyed large amounts of the habitat those organisms needed, making the population drop quickly. Many times, however, it is humans who are responsible for changes in plant or animal populations. Can you think of any ways that people could cause an animal's population to change? List 3 here:

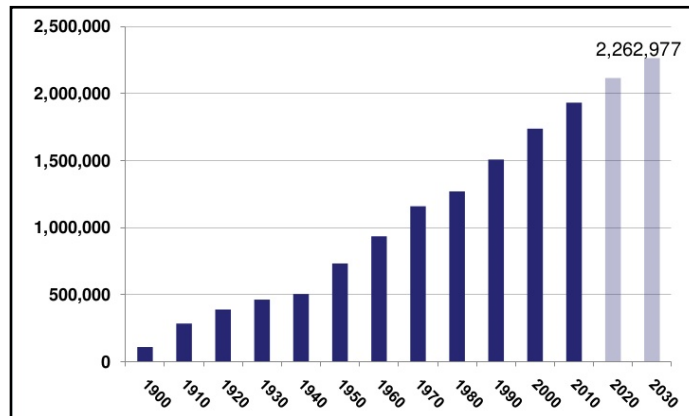
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Today, we will be looking at salmon populations and some of the ways that people can affect them, whether they mean to or not. When Washington first became a state in 1889, there were only 357,000 people living here. Today, there are over 20 times more, for a total of over 7.5 million people! That trend is speeding up, not slowing down; experts expect that our population may increase to 10 million within the next 20 years.

### Population Growth in King County, WA



To make things even more complicated, people don't always agree on how to use our natural resources like water, land, and plants. For any situation, there can be many **stakeholders** who want different results. Every one of us has an impact on the world around us every single day, so it is very important to think carefully about our actions and choices!

#### **Vocabulary:**

**Population:** The number of one kind of organism in a given region

**Stakeholder:** Somebody involved with or affected by a decision or action

# Activity #1

## Stakeholders

Today you will take on the role of a city council member, meaning it is your job to listen to the concerns and problems of people in your community and find a way to help them. You will be presented with several different scenarios and will have to make difficult decisions for your community. Can you protect salmon while keeping the people in your town happy?

**Materials:** Pencil

Read each scenario and decide on *one* course of action. Write your letter choice in the box below each scenario and then write a brief description of why you chose that option. When you are done, check the answer key on the next page to see the results of each choice. Each answer will award or remove a certain number of points. Add and subtract the points for all of your choices; the higher your final score, the more salmon friendly you are!

A local teacher has been monitoring the stream behind their school. They have discovered that over the past summer, water levels were dipping lower and lower despite the fact that there has been plenty of rain. They want to know what you plan to do with this new information.

1. Build a new dam in the river so that people can control the flow and supply of water.
2. To help save water, you decide to start taking shorter showers at home, but decide that there is nothing that the city can do about the situation.
3. Tell them that there is nothing that people can do about the problem; all that we can do is wait for rain and let the water cycle replenish the river naturally.
4. Encourage the teacher to start a campaign at his school in order to get other people to save water too.

Which option will you choose? Write the number of your choice here:

Explain your reasoning:

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A marine biologist has been studying animals in the Puget Sound. They discovered that Orca whale populations are dwindling. They demand that the government come up with a plan to help increase the numbers of these animals.

1. Request that fishermen begin to hunt sharks who might prey on young Orcas.
2. Limit the amount of Chinook salmon people are allowed to catch.
3. Reduce the amount of pesticides that people are allowed to use in their gardens.
4. Capture Orcas and keep them in aquariums until they are able to mate and have more babies.

Which option will you choose? Write the number of your choice here:

Explain your reasoning:

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A farmer is complaining about a new law that limits their ability to use certain fertilizers on their land. Since the law went into place, they were forced to stop using their preferred fertilizers. Therefore, their crops have not been producing as many fruits and vegetables. The farmer asks that you repeal the law and allow them to use whatever chemicals they need to help their crops grow.

1. Allow the farmer to use whichever fertilizers they need, without limits.
2. Suggest that the farm look into natural, organic fertilizers instead.
3. Keep the law and force the farmer to follow it. No fertilizers will be used at all.

Which option will you choose? Write the number of your choice here:

Explain your reasoning:

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Two developers have come to you seeking approval to build on a certain plot of land near a local river system. The first developer wants to build 20 new houses, meaning they will have to clear a large natural area, which means removing all plant and animal life. The second developer works with an organization that designs parks and green spaces, and wants to preserve some of the plants while converting the rest of the land into a public area with fields, paths, and playgrounds.

1. Approve the new housing development so more people can have a place to live.
2. Force the developers to work together, creating a plan to build 10 houses on the land while using the remaining area for parks and natural green spaces.
3. Approve the second developer's project, dedicating all of the space to parks and public spaces.
4. Deny any new construction and keep the land exactly as it is.

Which option will you choose? Write the number of your choice here:

Explain your reasoning:

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During an especially dry summer, two neighbors got into an argument over how to take care of their lawns. Neighbor A waters their lawn and garden every day, using lots of water to keep their plants green and healthy. Neighbor B complains that this is wasteful and unnecessary, and has let their lawn go dry and turn brown even though the first neighbor thinks that a dried, brown lawn looks ugly.

1. Side with Neighbor A, and encourage all residents to water their plants throughout the summer.
2. Side with Neighbor B, and outlaw watering your lawn throughout the summer.
3. Make a compromise, allowing people to water their lawns only on Mondays, Wednesdays, and Fridays.
4. Create a series of water-friendly gardening classes for the community, showing them how to save water and choose the right kinds of plants.

Which option will you choose? Write the number of your choice here:

Explain your reasoning:

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## Activity #1 Answers and Points

A local teacher has been monitoring the stream behind their school. They have discovered that over the past summer, water levels were dipping lower and lower despite the fact that there has been plenty of rain. They want to know what you plan to do with this new information.

1. Building more dams will not only get in the way of salmon returning up the stream to spawn, but the construction could end up causing lots of soil to wash into the river and harm salmon eggs. **Lose 3 points!**
2. Even though the city wasn't able to help, you still found a way to make a positive change in your own life. **Gain 1 point!**
3. Doing nothing is not a good idea; what if we experience a drought and don't get enough rain? We need to come up with some kind of plan. **Lose 1 point!**
4. By reaching out and teaching others how to save water, the teacher can make a really big difference! Now all the students, teachers, and even parents can help conserve water. **Gain 3 points!**

A marine biologist has been studying animals in the Puget Sound. They discovered that Orca whale populations are dwindling. They demand that the government come up with a plan to help increase the numbers of these animals.

1. While it is possible for sharks to attack young whales, it is not common enough to make a difference in their population. The solution to this issue won't come from hunting any other species. **Lose 2 points!**
2. Overfishing is a very big problem in our region. By limiting the number of salmon being caught by people, it increases the chances for these fish to grow big and healthy. This not only helps salmon populations, but also provides more of a food source for Orcas. **Gain 2 points!**
3. When pesticides enter our water, they can build up in the bodies of insects and then move up the food web until they start sickening other consumers such as salmon and Orcas. By limiting their use around town, fewer pesticides will wash into rivers and both salmon and Orca populations will improve. **Gain 2 points!**
4. Orcas are too large to keep in captivity, so capturing them could end up hurting them even more. **Lose 3 points!**

A farmer is complaining about a new law that limits their ability to use certain fertilizers on their land. Since the law went into place, they were forced to stop using their preferred fertilizers. Therefore, their crops have not been producing as many fruits and vegetables. The farmer asks that you repeal the law and allow them to use whatever chemicals they need to help their crops grow.

1. While the farmer's crops may improve, many of these chemicals will end up washing into our waters and causing health issues for many different organisms. **Lose 3 points!**
2. Not only did you keep the farmer happy by ensuring his plants have the nutrients that they need, you did so while still preventing lots of chemicals from entering the water. In addition, using compost on farms and gardens can help the soil hold onto its moisture, therefore using less water at the same time! **Gain 4 points!**
3. The farmer might not be happy, but at least salmon and other organisms will stay healthy. **Gain 2 points!**

Two developers have come to you seeking approval to build on a certain plot of land near a local river system. The first developer wants to build 20 new houses, meaning they will have to clear a large natural area, which means removing all plant and animal life. The second developer works with an organization that designs parks and green spaces, and wants to preserve some of the plants while converting the rest of the land into a public area with fields, paths, and playgrounds.

1. Although housing is important, all of the construction required will end up causing lots of soil to wash into rivers through erosion, damaging the riparian ecosystem. **Lose 3 points!**
2. The construction and development will still have a negative impact on salmon and other organisms, but it is made a little bit better by the inclusion of so many plants and natural green spaces. **Lose 1 point!**
3. It might require some construction and damage to the environment, but the parks created by this project may allow the community to protect the riparian ecosystem in the future. In addition, the plants continue to provide a healthy habitat for all kinds of organisms. **Gain 1 point!**
4. Keeping the land natural will ensure that there are no damages to the local ecosystem, and will also result in fewer people disturbing the soil around the river. **Gain 2 points!**

During an especially dry summer, two neighbors got into an argument over how to take care of their lawns. Neighbor A waters their lawn and garden every day, using lots of water to keep their plants green and healthy. Neighbor B complains that this is wasteful and unnecessary, and has let their lawn go dry and turn brown even though the first neighbor thinks that a dried, brown lawn looks ugly.

1. Even though we love keeping plants green and healthy, using so much water on a lawn is not a smart use of our natural resources. This plan will let people use far too much water, leaving very little in our streams and rivers. **Lose 2 points!**
2. By forcing the community to conserve water, you have ensured that there will be plenty of water left in the environment. The people in your town might not be too happy with, though. **Gain 1 point!**
3. You were able to save water while still keeping your community safe and happy. **Gain 2 points!**
4. A lot of the time, overwatering happens because people are not using the right methods or plants. You could suggest that they water in the evening so that the sun doesn't evaporate all of the water, or focus on promoting native plants that have spent thousands of years adapting to the local climate and therefore don't need much extra help. **Gain 3 points!**

### Salmon Scores:

- 14 to -10** Salmon and other organisms won't be happy with your choices. Are there any decisions that you would make differently, based on what you know now?
- 9 to 0** There's always room for improvement! Where could you try out a different choice?
- 1 to 9** You're making people and salmon pretty happy!
- 10 to 14** You're a salmon hero!

## Activity #2

### Salmon Across Time

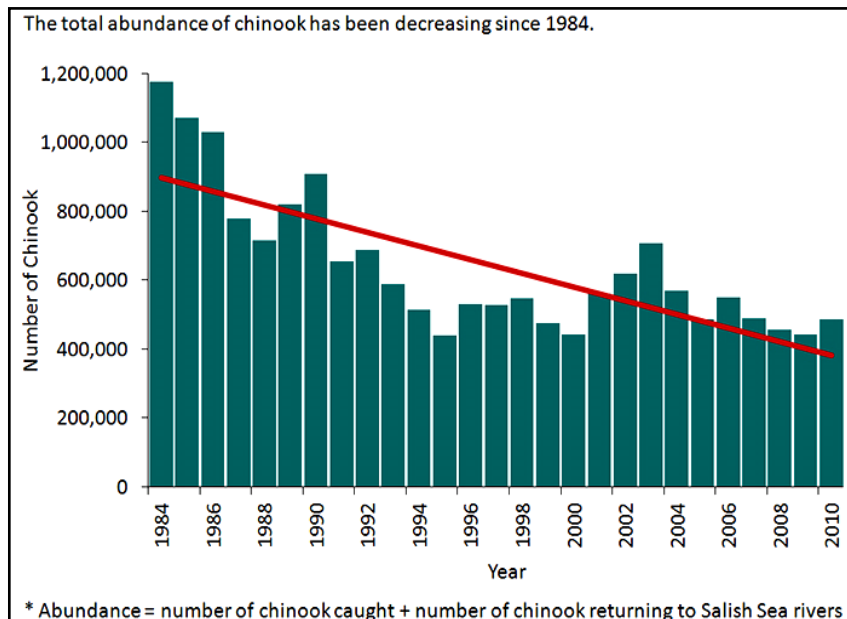
Chinook salmon are the largest of all salmon species and are a very important part of the Puget Sound ecosystem. Sadly, however, their population has been declining for a very long time. Let's take a look at some information and data collected by local scientists to see if we can figure out what the future will hold for these fish.

Below, review the information presented in each box and answer the questions that follow.

**Materials:** Pencil

### Figure 1: Chinook Population

This chart shows us the total population of Chinook salmon all throughout our region, from the Puget Sound up into Canada.



How many Chinook salmon lived in this region in 1984? \_\_\_\_\_

How many lived here in 2010? \_\_\_\_\_

In 1999, Chinook salmon were officially listed by the government as a 'Threatened Species'. What happened to their population after that happened? Why do you think that is?

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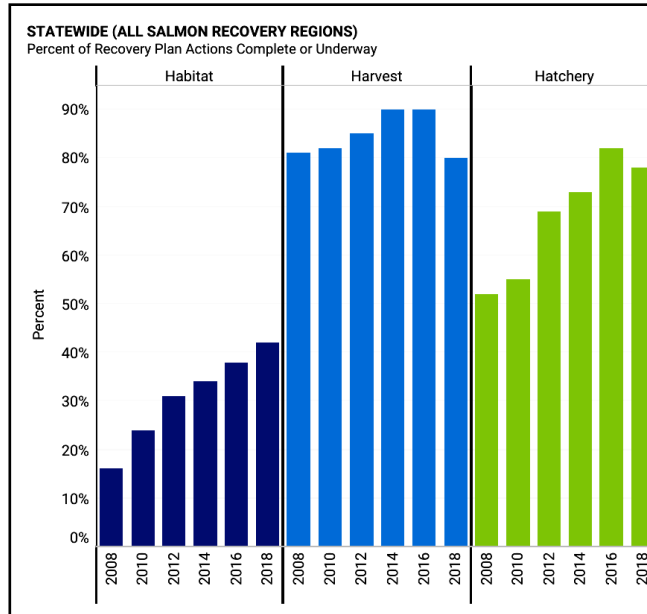
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## Figure 2: Salmon Recovery Projects

This chart shows the number of projects that people are working on to save salmon. The three categories are:

- *Habitat*: Projects that are fixing and restoring riparian ecosystems
- *Harvest*: Efforts to limit the number of salmon being caught by people that fish
- *Hatchery*: Work being done by places that raise salmon in a secure environment before releasing them into the wild to help make up for lost population



Which of the categories do you think is most important for salmon recovery? Explain why you think that.

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Are there any categories that still need a lot of work? What can people do to help improve this?

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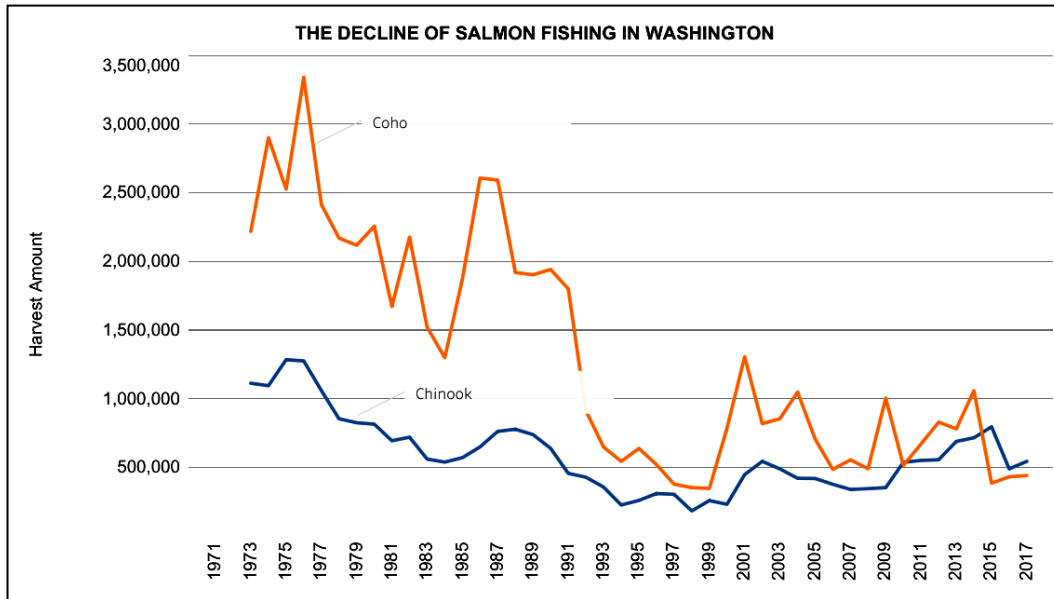


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### Figure 3: Fishing in Washington

This chart shows us the amount of Chinook and Coho salmon that have been caught in our state.



What year had the most fish caught in Washington? \_\_\_\_\_

What year had the least amount? \_\_\_\_\_

Compare this chart with the first chart, *Figure 1*. The number of Chinook being caught has gone down over time, but the population has not been able to rise as a result. What other problems could be causing the decline in population?

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Should people catch more Chinook salmon, or less? Why?

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## Optional Activity

### We Need Water Challenge

There are so many ways to save, protect, and care for our water. At the end of every daily lesson, we will be giving a challenge to help you show off what you've learned.

**Materials:** Pencil, colors, computer/phone/tablet, internet

When rainwater falls onto our cities, we call this stormwater. Stormwater mixes with pollution on our streets, sidewalks, driveways, and parking lots. This polluted stormwater goes where all stormwater goes. Into stormdrains! Anything that goes down stormdrains goes straight into the closest river, stream, lake, or the Puget Sound – without getting cleaned. This polluted stormwater makes our ecosystems very unhealthy. With an adult, go for a walk to see if there are any stormdrains in your neighborhood! Please be careful when walking through your neighborhood! Make sure you and an adult are looking for the stormdrains together. Always walk on the sidewalk or off the road to avoid cars and other forms of traffic. Be safe, responsible, and respectable when outdoors!



If you can't go looking for a stormdrain, that's okay! Here's an example of a real stormdrain that's been painted by an artist!

*You don't have to go too far! With an adult, you can also go to the edge of the front of your house or apartment. Count how many stormdrains you can see from the edge without walking away from your home. Do you see any in the parking lot? At the end of your driveway? Next to a sidewalk? How many did you find?*

### Make Your Own Stormdrain Art!

On the space around the stormdrain, draw a picture or explain where stormdrains lead!



To share your work, post your challenge to Facebook and/or Instagram (with an adult) so other people in your community can learn, too! Don't forget to use the hashtag #WeNeedWater and tag @weneedh20 and @naturevisionorg in your post so we can see your work!

## DAY 9 / DAY 10

### Stewardship

A lot has been covered this week on ecosystems! It is important to put that knowledge into action. Now is the time to combine everything that we learned and to find a way to make a difference.

Water is a shared resource. Which means it is something that humans, wildlife, plants, and all ecosystems rely on to survive. For example, our own water supply is used by salmon and we now know why it is necessary for salmon to have an abundant amount of water in their streams! When we use water wisely, it positively impacts the water in our watershed. To use water wisely we must think of stewardship and conservation.

**Stewardship** means to take care of our natural resources, such as water. A steward is someone who is responsible for the care of our natural resources.

**Conservation** is one of the many ways that we can help our environment, by limiting or lessening the impact that people have on nature.

Today, we will work on how to be responsible stewards of our ecosystems and to be mindful of water conservation in our daily habits!

#### **Vocabulary**

**Conservation:** Protecting the natural world, especially by making smart choices about our natural resource use

**Stewardship:** Taking care of something; being a protector

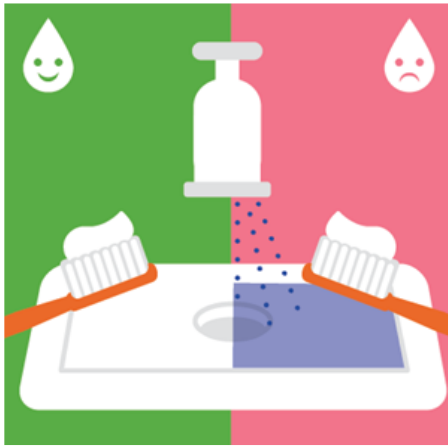
# Activity #1

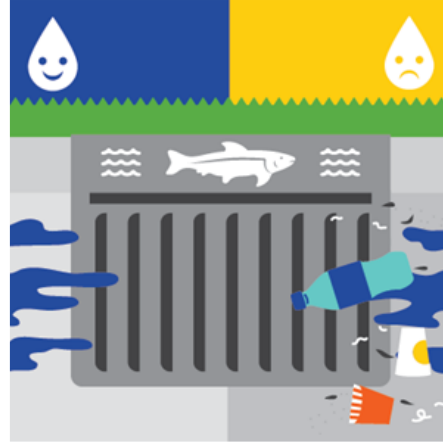
## Water Habits

Do you want to know how you and your family can help protect water today? Check out these ideas below! Each picture is split into two pieces: one side with a smiling face showing a good and smart way to use water, and one side with a frowning face showing a bad or wasteful way to use water.

In the space under each picture, write the lesson that you learned from that image. If you see any ideas that you already practice, then put a check mark next to that image.

**Materials:** Pencil





## Activity #2

### Create an Action Plan

You are capable of making great change! Water conservation is everyone's responsibility. You have learned a ton of information over the week. Let's put that knowledge into action. We challenge you to create an Action Plan to raise awareness on why it is important to save water and to use it wisely. Afterwards, you can share this with your friends and family to help explain why we need to save water for humans *and* for the ecosystems that live within our watersheds. Action plans are fun because they help you organize your thoughts in order for you to design something that will motivate and educate!

To share your work, post your challenge to Facebook and/or Instagram (with an adult) so other people in your community can learn, too! Don't forget to use the hashtag #WeNeedWater and tag @weneedh20 and @naturevisionorg in your post so we can see your work!

**Materials:** Pencil

Follow the guidelines below to help make an action plan. By combining your ideas and choices from each section, you will be able to make a complete plan and write a short summary of what you can do to help!

**WHERE? *Where do you want to put your plan into action?***

- School
- Home
- Friend's Home
- Social Media

**WHO? *Who can help you put your plan into action?***

- Parent/Caregiver
- Teacher
- Friend
- Other Family Member

**WHAT? *What topic do you want to focus on and share with others?***

- Wise Water Conservation Habits
- What Not to Do! Wasteful Water Habits
- Wildlife and Ecosystems that Rely on an Abundant Amount of Water
- Why We Need to Save Water for Salmon
- Something different related to water: \_\_\_\_\_

**Second WHAT? *What are you going to do?***

- Create posters to put up in allowed areas with permission
- Call/Email/Text 10 friends and family to ask them to commit to 10 water conservation habits
- With an adult, post a picture of video on Facebook or Instagram to show a daily water conservation habit for a week! Don't forget to use the hashtag #WeNeedWater and tag @weneedh20 and @naturevisionorg in your post so we can see your work!
- Design a presentation to share at an after school club or green team on local water conservation habits once school is open again
- Start an after school club or green team to brainstorm more water conservation habits!
- Something different: \_\_\_\_\_

**Third WHAT? *What supplies do you need for a successful action plan?***

- Art Supplies - List type of art supplies: \_\_\_\_\_
- Computer
- Blank paper(s)
- Poster(s)
- Photos - List animals, plants, waterways, maps, or photos you may need:  
\_\_\_\_\_
- Do you need anything else? \_\_\_\_\_

**WHY? *Why is this topic important to you?***

- You want to protect our Pacific salmon species
- You learned something new about water conservation and want to spread the word
- This is something you've been passionate about for a long time
- Another reason: \_\_\_\_\_

**Additional notes, details, or other helpful ideas:**

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**Brainstorming Drawings:**





## Optional Activity

### We Need Water Challenge

There are so many ways to save, protect, and care for our water. At the end of every daily lesson, we will be giving a challenge to help you show off what you've learned.

**Materials:** Pencil, colors, computer/phone/tablet, internet

Using what you've learned this week, and the other #WeNeedWater challenges you've done, it's time to get creative! Create a challenge you can pose to those in your household, to your friends, to your community, or to a broader audience on the internet through social media. Think about each topic the packet covered this week and try to incorporate at least one aspect of it in your challenge.

To share your work, post your challenge to Facebook and/or Instagram (with an adult) so other people in your community can learn, too! Don't forget to use the hashtag #WeNeedWater and tag @weneedh20 and @naturevisionorg in your post so we can see your work!

# Answer Key

## Tuesday Activity #2: Great Salmon Survival

### Key to Salmon Codes

- UF** Unfertilized egg – *Does not survive, start over* / **FF** Fertilized egg – *Survives, move to the next scenario*
- TF** Redd is disrupted by a Rainbow trout and the eggs are eaten - *Does not survive, start over* / **PR** The redd is well protected. Eggs are close to hatching! – *Survives, move to next scenario*
- LO** People have been wasting water, the stream is too low and has little oxygen. Alevins can't breathe – *Does not survive, start over* / **OW** People have been saving water at home! There is abundant cold oxygenated water that flows over the redd – *Survives, move to next scenario*
- MD** A Merganser duck finds Alevins hiding in the redd. Salmon is eaten – *Does not survive, start over* / **YS** The Alevins remain within the gravel redd and are able to feed off their yolk sacs – *Survives, move to next scenario*
- TC** Trees were cut and less shade has made the water temperature too hot. Oxygen evaporates out of the water – *Does not survive, start over* / **NP** Native plants are planted along the stream bed by volunteers to create shade and keep the stream temperature cool. More oxygen is absorbed – *Survives, move to next scenario*
- NF** Fry could not find any food – *Does not survive, start over* / **DN** Fry finds a dragonfly nymph on a gravel - - *Survives, move to next scenario*
- GH** A Great Blue Heron eats the Fry – *Does not survive, start over* / **PM** The Fry develops parr stripes that help it to camouflage – *Survives, move to next scenario*
- RO** The Parr was not able to hide, a river otter eats it – *Does not survive, start over* / **FL** Parr hides underneath a fallen log – *Survives, move to next scenario*
- SB** The stream has a blockage that the Parr can't pass – *Does not survive, start over* / **SC** The stream is curved allowing the water current to be slowed down - *Survives, move to next scenario*
- SR** There is too much stormwater runoff pollution flowing into Lake Washington – *Does not survive, start over* / **CD** Lake Washington is healthy. Car drivers have made sure their cars are not leaking oil that could flow down stormdrains into salmon habitat.– *Survives, move to next scenario*
- HS** A harbor seal eats the Smolt – *Does not survive, start over* / **SL** The Smolt sticks close to Puget Sound shorelines – *Survives, move to next scenario*
- OW** A resident Orca whale loves Adult Salmon! The Adult Salmon is eaten – *Does not survive, start over* / **KL** The Adult Salmon swims all the way to Alaska and fattens up on Krill – *Survives, move to next scenario*

# Answer Key

## Tuesday Activity #2: Great Salmon Survival

### Key to Salmon Codes, continued

- CF** A commercial fishing boat has caught the Adult Salmon – *Does not survive, start over* / **HR** The Adult Salmon has found a school of herring fish to eat – *Survives, move to next scenario*
- AO** Another resident Orca pod has eaten the Adult Salmon. They love salmon! – *Does not survive, start over* / **PS** The Adult Salmon swims down from Alaska and finds its way back to Puget Sound - *Survives, move to next scenario*
- LF** A local family fishing on Puget Sound has caught the Adult Spawner – *Does not survive, start over* / **BL** The Adult Spawner has reached the Ballard Locks in Ballard, Seattle and climbs the salmon ladder – *Survives, move to next scenario*
- BC** A bobcat pounces on the Adult Spawner! – *Does not survive, start over* / **RW** The Adult Spawner has reached a freshwater river! – *Survives, move to next scenario*
- BB** A black bear snatches the Adult Spawner as it tries to navigate around the river bend. – *Does not survive, start over* / **KS** The Adult Spawner hasn't eaten since it reached freshwater and won't eat anymore. It will only keep swimming until it reaches its home stream — *Survives, move to next scenario*
- HD** Some parts of the stream banks are damaged due to human development – *Does not Spawn!* / **RG** The Adult Spawner is a male and is able to fertilize a redd made by a female in the rocky gravel beds – *Successful Spawner, contributes to the next Salmon generation!*

## Answer Key

### Wednesday Activity #1: How do Dead Salmon Help?

- Describe how dead salmon help beavers.

Dead salmon help fertilize trees that beavers will use to cut down and make into their habitat. These trees and plants fertilized by salmon will also be eaten by beavers.

- Describe how dead salmon help pileated woodpeckers.

Dead salmon help fertilize trees year after year to grow large. These large trees will mature and die. Dead trees are where pileated woodpeckers will peck holes to find insects to eat. Dead standing trees are also nesting sites for the pileated woodpecker.

- Describe how dead salmon help thatching ants.

Dead salmon help fertilize trees and plants that become materials for the thatching ants' nest mounds. Trees and plants are also not the ants' habitat but where they find their food. Other insects can be found within trees and plants by the ants to eat.

# Answer Key

## Wednesday Activity #2: Nutrient Connection

- What do dead salmon provide for trees and plants in our forests?

As dead salmon decay they release nutrients from their bodies. The nutrients are nitrogen and potassium.

- What would trees and plants in our forests look like without dead salmon?

The nutrients released by dead salmon, Nitrogen and Potassium, help trees and plants grow their leaves, stems, and strong roots. Without these nutrients our forest's trees and plants would be smaller and not grow as fast.

- How do trees and plants in surrounding forests help salmon eggs in gravel redds?

Trees provide shade and keeps the water temperature cool. Cold water holds more oxygen. Salmon eggs in redds need cold water with lots of oxygen!

# Answer Key

## Thursday Activity #1: Salmon Across Time

### Figure #1

- How many Chinook salmon lived in this region in 1984?
  - About 1,200,000
- How many lived here in 2010?
  - About 500,000
- In 1999, Chinook salmon were officially listed by the government as a 'Threatened Species'. What happened to their population after that happened? Why do you think that is?
  - The population rose slightly, because they were protected by law. This could result in less fishing, more habitat restoration, or many other helpful projects.

### Figure #2

- Which of the categories do you think is most important for salmon recovery? Explain why you think that.
  - All 3 are important and correct, as long as you can explain your reasoning.
- Are there any categories that still need a lot of work? What can people do to help improve this?
  - Habitat recovery projects have a lot more room for growth. In 2018, only 40% of the planned projects had even started!

### Figure #3

- What year had the most fish caught in Washington?
  - 1977
- What year had the least amount?
  - 1988
- Compare this chart with the first chart, *Figure 1*. The number of Chinook being caught has gone down over time, but the population has not been able to rise as a result. What other problems could be causing the decline in population?
  - Many possible answers, including: warmer water temperatures, pollution, less water in rivers and streams, too much sediment (mud and soil) in the rivers, destruction of habitat, building dams, and many more.
- Should people catch more Chinook salmon, or less? Why?
  - Less! We need to be very careful with how much we take of any natural resource, including salmon. When we take too much, it means that there is less available for other organisms in the ecosystem.

## Answer Key

### Friday Activity #1: Stewardship Ideas

1. Turn off the faucet while brushing your teeth
2. Take shorter showers
3. Always do a full load of laundry
4. Always fill the dishwasher all the way
5. Go to a commercial carwash instead of washing your own car at home
6. Keep storm drains clear of trash and litter
7. Water your lawn or garden when the sun is low, so that the water doesn't evaporate too quickly
8. Water at the base of the plant, not the leaves. This prevents water from evaporating into the air.
9. Find and fix leaks around the house
10. Sweep or brush leaves and litter off the sidewalk or driveway, don't use a hose