TEACHER OVERVIEW

Water Conservation and Wildlife Ecosystems

9th – 12th 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.

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 teachers may print and send to students to complete at home.

Students will begin with an introduction to ecosystems and the importance of freshwater, followed by lessons focusing on human impacts on water and their effect on wildlife. Students then will explore their role in expanding scientific knowledge though community science by learning how to collect environmental data. The unit will finish with a focus on stewardship, where students will learn what we can do to support our local water supply and the incredible plants and animals they learned about over the course of two weeks.

If you have any further questions or concerns regarding this packet, please email our Office Coordinator at info@naturevision.org.

Grades 9-12
Supports NGSS Performance Expectations: HS-LS2-6, HS-LS2-7, HS-ESS3-4, HS-ETS1-1, HS-ETS1-3.

Grades 9-12
Day 1/Day 2 - Ecosystem Basics
Day 3/Day 4 - Human Water Use and Ecosystem Impacts
Day 5/Day 6 - Supporting Salmon
Day 7/Day 8- Community Science Ecology
Day 9/Day 10 - Stewardship

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CASCADE WATER ALLIANCE

Nature VISION

PARENT/CAREGIVER OVERVIEW

Water Conservation and Wildlife Ecosystems

9th-12th 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 two weeks, with each section 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.

Another great resource to learn about saving water and how to help our salmon and watershed is weneedwater.org. Check out the We Need Water webpage or on Instagram @WeNeedH20 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 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.

CASCADE WATER ALLIANCE

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PARENT/CAREGIVER OVERVIEW: DAY 1 / DAY 2

Ecosystem Basics

Background Information: Ecosystems consist of living (biotic) and non-living (abiotic) factors, and the interactions among different organisms and the air, water, and soil that support them is extremely important to understanding our role in nature. Fresh water is a vital resource for both human and natural elements of an ecosystem and we'll explore the way that we can ensure proper resources for all.

Learning Objectives: Students will consider the various components of an ecosystem and interpret real world considerations for balancing our need for fresh water for both human and natural resource use.

Activity 1: Ecosystem Creation

- ***Overview***: Students create their own ecosystems in either visual or written representations including biotic and abiotic factors, creating first a "pristine" environment, and next adding human impacts to that environment
- ***Parent/Caregiver Tasks***: None

Activity 2: Freshwater Ecosystems and Human Water Use

- ***Overview***: Students interpret data regarding the health of various streams and rivers in the region, make observations of trends overtime, and inferences about the impacts this has on total ecosystem health
- ***Parent/Caregiver Tasks***: None

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 needed and possible, help the student post their #WeNeedWater challenge on social media

Optional Activity: Video

- ***Overview***: Short video details human impacts on ecosystems
- ***Parent/Caregiver Tasks***: Provide technical support

PARENT/CAREGIVER OVERVIEW: DAY 3 / DAY 4

Human Water Use and Ecosystem Impacts

Background Information: Human water use impacts ecosystems in a big way. All of the water we use comes from nature, so tracking our water use helps us understand our impact. Humans choose to use water in a myriad of ways, but we also unintentionally use water through leaks in our household pipes.

Learning Objectives: Students will learn to measure the amount of water that utilities in their home use. They will also complete a hands-on demonstration of household leaks to understand that the amount of water generated from small leaks can add up to a significant amount over time.

Activity 1: Rate of Flow

- ***Overview***: Students measure how much water their faucets, showers, and more use and consider ways that they can save water in the future
- ***Parent/Caregiver Tasks***: None

Activity 2: Leaks!

- ***Overview***: Students create a hands-on leak model to demonstrate how small leaks add up to significant water loss over time
- ***Parent/Caregiver Tasks***: Provide material support

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 needed and possible, help the student post their #WeNeedWater challenge on social media

Optional Activity: Drop in the Bucket

- ***Overview***: Students perform a demonstration illustrating that, despite an abundance of water on our “blue planet”, relatively little water is available for ecosystem use as easily accessible fresh water
- ***Parent/Caregiver Tasks***: Provide material support

PARENT/CAREGIVER OVERVIEW: DAY 5 / DAY 6

Supporting Salmon

Background Information: Salmon are one of the most important species in our ecosystems, and they are also directly impacted by our water use. Salmon numbers have been declining over time and communities have been engaging in various efforts to help support these populations. These efforts include both water quantity and quality considerations, as well as habitat restoration efforts.

Learning Objectives: Students will explore Washington's salmon population over time, in addition to the work that communities are engaging with in order to better understand the pivotal role of salmon in our ecosystems as well as how to engage in community efforts to help protect this species.

Activity 1: Salmon Population Study

- ***Overview***: Students review salmon population data and information in order to consider the various impacts that humans have, and to explore why these populations have been declining over time
- ***Parent/Caregiver Tasks***: None

Activity 2: NOAA Salmon Recovery Report Analysis

- ***Overview***: The National Oceanic and Atmospheric Administration has released information detailing the work that communities have engaged in to support salmon populations, students will read and interpret this information
- ***Parent/Caregiver Tasks***: None

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 needed and possible, help the student post their #WeNeedWater challenge on social media

Optional Activity: Videos

- ***Overview***: Students watch two short videos that detail the importance of salmon as a keystone species in our ecosystems
- ***Parent/Caregiver Tasks***: Provide technical support

Optional Activity: Salmon Food Web

- ***Overview***: Students create their own example of a food web with salmon at the center, exploring the various direct and abstract connections of these organisms
- ***Parent/Caregiver Tasks***: None

PARENT/CAREGIVER OVERVIEW: DAY 7 / DAY 8

Community Science Ecology

Background Information: Science is something that everyone can participate in. Some of the most important work in the scientific community is done by everyday people with access to data that scientists cannot readily collect. Much of this is done through observation and the use of “random quadrat sampling”, which is a sampling of one small place in order to collect detailed data from a very specific area.

Learning Objectives: Students will engage in various activities that naturalists participate in to learn more about how ecologists collect data on the natural world.

Activity 1: Random Quadrat Sampling

- ***Overview***: Students learn about and practice using a quadrat to collect scientific data
- ***Parent/Caregiver Tasks***: Provide supervision and support

Activity 2: Sit Spots

- ***Overview***: Students practice the skills that naturalists engage in while making observations in the field
- ***Parent/Caregiver Tasks***: Provide supervision and support

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 needed and possible, help the student post their #WeNeedWater challenge on social media

Optional Activity: Investigating Community Science

- ***Overview***: Students research and investigate various organizations that help the community participate in scientific data collection
- ***Parent/Caregiver Tasks***: Provide supervision and technical support

PARENT/CAREGIVER OVERVIEW: DAY 9 / DAY 10

Stewardship

Background Information: Stewardship is the action of caring for our natural resources. Some of the most effective ways that we can engage in stewardship is at a relatively small local level, with some restoration projects taking support from governments, business or other organizations. At its core, stewardship takes both knowledge and action to address environmental issues.

Learning Objectives: Students will learn about how water resources are distributed unequally throughout the globe, measure their household water use, and consider ways that they can conserve water in the future.

Activity 1: Water as a Finite Resource/Household Water Use

- ***Overview***: Students measure the amount of water that their household uses throughout the day, extrapolate that information to calculate water use throughout the year, and consider ways that they can reduce that water use
- ***Parent/Caregiver Tasks***: None

Activity 2: Neighborhood Cleanup Planning

- ***Overview***: Students engage in planning a neighborhood restoration project to propose to the city
- ***Parent/Caregiver Tasks***: None

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 needed and possible, help the student post their #WeNeedWater challenge on social media

Optional Activity: Persuasive Writing

- ***Overview***: Students write a letter to an organization asking for support with their restoration plan
- ***Parent/Caregiver Tasks***: None

PARENT/CAREGIVER OVERVIEW: VOCABULARY

DAY 1 / DAY 2
Abiotic: Physical rather than biological; not derived from living things (e.g. light, air, water, minerals)
Biotic: Any living component that affects another organism or shapes the ecosystem
Consumer An organism that generally obtains food by feeding on other organisms or organic matter
Decomposer: An organism that decomposes, or breaks down organic material
Ecology: The branch of biology that deals with the relations of organisms to one another and to their physical surroundings
Ecosystem: A biological community of interacting organisms and their physical environment
Organism: An individual animal, plant, or single-celled life form
Producer: Organisms that make their own food using energy from the sun
Resilience: The capacity of an ecosystem to respond to a disturbance by resisting damage and recovering quickly

DAY 3 / DAY 4
Rate of Flow: The standard measurement of how much water moves through a device, measured in gallons per minute
Watershed: A region or area surrounded by a divide of hills or mountains that drains to a body of water

DAY 5 / DAY 6
Keystone Species: A species on which other species in an ecosystem largely depend, such that if it were removed the ecosystem would change drastically
Marine: Of, found in, or produced by the sea
Riparian: Relating to wetlands adjacent to rivers and streams

DAY 7 / DAY 8
Community Science: Participation in scientific projects such as online databases, wildlife monitoring, and water quality testing conducted by members of the public
Random quadrat sampling: A method of randomly selecting places to make observations in the field so that bias is removed from site selection
Sit Spot: A method of observation where a place is quietly occupied and studied over a period of time, sometimes multiple times

DAY 9 / DAY 10
Restoration: Renewing and restoring degraded, damaged, or destroyed ecosystems
Stewardship: Responsible use and protection of the natural environment

DAY 1 / DAY 2

Ecosystems Basics

Ecosystems are all of the living and non-living things that **organisms** need for survival. These interconnected systems of plants, animals, soil, air, and water ensure the health and **resilience** of species' populations and of our environment. **Ecology** is the branch of science that focuses on the various connections within our environment. Ecosystems vary in size from all life on earth to the bacteria living on the tip of your finger.

Ecosystems are composed of **biotic** and **abiotic** factors. Biotic factors are everything that is alive, was alive, or was part of a living thing like plants, animals, fungus, and bacteria. Abiotic factors are the non-living things that help support life, such light, air, and water. Organisms are grouped into three roles: Plants, which we call **producers**, because they create their own food using light, air, and water. Animals, which we call **consumers** because they must eat other things to survive. Lastly, there are **decomposers**, like bacteria, fungus, and invertebrates, which break down dead and rotting material and recycle the nutrient energy to the soil for more plant growth. Today, we will be focusing on the ways that we impact our freshwater, and how that in turn impacts other members of our ecosystem.

Vocabulary

Abiotic: Physical rather than biological; not derived from living things (e.g. light, air, water, minerals)
Biotic: Any living component that affects another organism or shapes the ecosystem
Consumer: An organism that generally obtains food by feeding on other organisms or organic matter
Decomposer: An organism that decomposes, or breaks down organic material
Ecology: The branch of biology that deals with the relations of organisms to one another and to their physical surroundings
Ecosystem A biological community of interacting organisms and their physical environment
Organism: An individual animal, plant, or single-celled life form
Producer: Organisms that make their own food using energy from the sun
Resilience: The capacity of an ecosystem to respond to a disturbance by resisting damage and recovering quickly

Activity #1

Ecosystem Creation

We will begin our exploration of ecosystems by creating one of your own. An ecosystem consists of both living (biotic) and non-living (abiotic) factors. The way these things interact affects the ecosystem as a whole. Today, you will be creating two versions of an ecosystem which you can use to consider different human impacts on the world around us. One version of this ecosystem will be "pristine" where no human intervention will take place. The other version will be the same general structure, but it will include various human-made elements (e.g. roads, cars, factories, dams). Your goal is to construct a functioning ecosystem, then to imagine the ways that humans can have an impact.

Remember: Humans can have a positive impact on the natural world by creating and implementing things that help support ecosystem functions, like fish ladders or wildlife crossings over major roadways. Humans do not always have to negatively impact the natural world through actions that contribute to things like pollution and habitat loss.

Your representation of an ecosystem can take the form of a (1) detailed drawing, (2) basic sketch, or (3) written story. Just choose whichever option works best for you. When you are describing how this community works together, be sure to include the following:

- Biotic factors (e.g. producers, consumers, decomposers)
- Abiotic factors (e.g. light, air, water, soil, minerals)
- Examples of human impact (e.g. houses, farms, cars, dams)

Use the space below in addition to the following 2 pages to display your ecosystem analysis and comparison!

Materials: Pencil/pen, writing/drawing utensils

Activity #2

Freshwater Ecosystems and Human Water Use

Along with water quantity, water quality is an important aspect of healthy ecosystems. In fact, these two things are related. Bodies of water with less water will have more concentrated contaminants and less resilient plant and animal communities as they are already facing stress from inadequate water supplies.

The environmental protection agency measure the health of rivers that flow into the Salish Sea, including many from Washington. Water quality is measured by the water quality index on a scale of 1 to 100.

- Rivers with a score of 80-100 are considered excellent.
- Rivers with a score of 70-80 are considered fair
- Rivers with a score below 69 are considered poor

Below is the data collected from 2000-2010. While this might seem like data that is outdated, it's important that we have data over time, and results are not always immediately available for the most recent years.

EPA Salish Sea Water Quality data: https://www.epa.gov/salish-sea/freshwater-quality

Freshwater Quality Index Scores for Major Salish Sea Rivers from 2000 to 2010

River	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Average
Quinsam, BC	88	94	83	82	94	94	100	88	88	82		89
Duckabush, WA	93	95	94	90	74	94	89	85	88	96	86	89
Fraser, BC					89	94	79	89	89	89		88
Skokomish, WA	95	95	94	85	70	67	92	89	89	94	86	87
Snohomish, WA	92	91	89	81	74	75	89	75	81	85	79	83
Elwha, WA	86	88	83	76	73	74	86	67	66	81	81	78
Cedar, WA	87	76	60	78	72	84	81	79	79	81	77	78
Lower Skagit, WA	89	91	71	76	61	73	77	77	75	76	74	76
Upper Skagit, WA	87	86	59	85	64	81	84	75	75	81	56	76
Deschutes, WA	62	72	70	73	61	83	88	88	83	76	74	75
Nisqually, WA	40	60	79	79	69	71	74	75	91	74	83	72
Sumas, BC					70	73	70	68	72	70		70
Green, WA	82	73	66	67	75	49	72	68	60	69	63	68
Stillaguamish, WA	81	60	44	72	55	67	71	69	75	75	71	67
Samish, WA	86	75	32	49	34	71	67	74	59	80	63	63
Nooksack, WA	65	68	58	57	52	54	61	51	60	69	56	59
Puyallup, WA	60	58	57	55	51	58	59	58	61	49	62	57

1) Which river has the highest average water quality?

2) Which river has the lowest average water quality?

3) What trends do you notice about water quality over time?

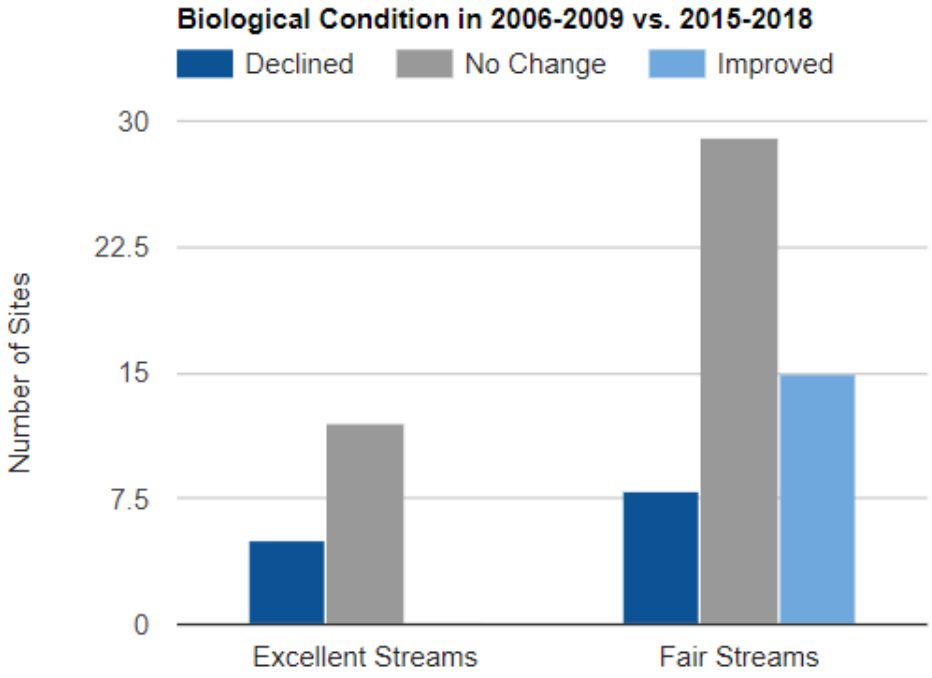
4) Are there any findings in this data that you find surprising?

5) What might explain sudden increases or decreases in quality from one year to another?

More background links to explore with adult permission:
Duckabrush River:
https://www.co.jefferson.wa.us/DocumentCenter/View/7717/Fact-Sheet-Spring-WQ-Factsheet-2019
Nisqually River:
http://nisquallyriver.org/water-quality-monitoring/
Snohomish River:
https://snohomishcountywa.gov/3355/Snohomish-County-Monitoring
Stillaguamish River:
https://snohomishcountywa.gov/2991/Water-Quality-in-the-Stillaguamish-River

The Benthic Index of Biotic Integrity (B-IBI) describes the biological condition of stream sites and their surrounding habitat based on the diversity and relative abundance of the benthic (bottom dwelling) macroinvertebrates found at the site. Essentially, by collecting data on the types of aquatic insects that can survive in a stream, we can measure the health of that stream, and by extension the health of the total ecosystem that depends on it. Ten measures of biological condition are scored and summarized as the B-IBI, which ranges from a score of 0, indicating a very poor stream condition, to 100, indicating excellent condition.

Stream quality data: https://vitalsigns.pugetsoundinfo.wa.gov/VitalSignIndicator/Detail/16



Change in the biological condition of Puget Sound streams, based on the Benthic Index of Biotic Integrity (B-IBI), that were classified as "excellent" and "fair" in 2006-2009 and resampled in 2015-2018. Source: Puget Sound Stream Benthos.

1) How many of the “Excellent” streams sampled showed:

Decline: _____ No change: _____ Improvement: _____

2) How many of the “Fair” streams sampled showed:

Decline: _____ No change: _____ Improvement: _____

3) What trends do you see over time in the quality of these streams?

4) Why might we see more improvement in one category of stream than another?

5) How will the overall health of these streams impact the ecosystems that they are a part of?

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, several 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, we'll begin a Neighborhood Nature Journal. Starting today, 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 near you 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 (i.e. scientists and people who make observations of nature) keep journals to record the plants and animals they see and learn more about the world around them and make connections. Remember, it's important for scientists to be as accurate and detailed as possible when it comes to their observations and recommendations. Make sure you record the date and time, weather conditions, and your location in your journal. This way, you can know more about how plants and animals behave at certain times, and you can compare your observations to other community scientists making their own observations. Try observing the same place at different times and in different weather conditions. You might be surprised at what you learn!

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

Video

Please ask for adult permission before watching this video.

"Crash Course Ecology": Crash Course produced a video detailing more about ecosystems and our impact on them.

This video can be found by doing a YouTube search of "Crash Course: 5 Human Impacts on the Environment: Crash Course #10" or by clicking this link: https://www.youtube.com/watch?v=5eTCZ9L834s

Materials: Computer/phone/tablet, internet access

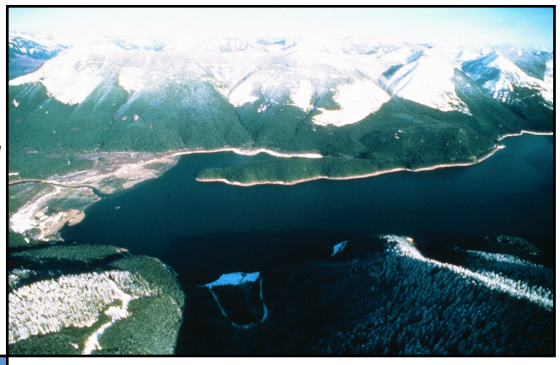
DAY 3 / DAY 4

Human Water Use and Human Impacts

Yesterday, we investigated the importance of conserving our finite fresh water resources by digging into the ways that people in our region have changed the landscape around us. Today, we are going to build on those concepts and discuss some of the ways that we use that fresh water to understand what that means for the other life that shares these resources.

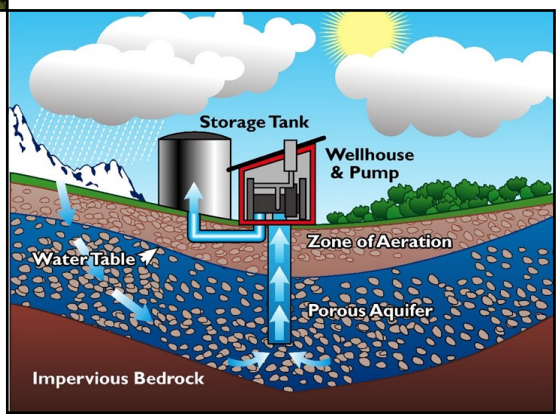
In our region, there are three main sources of fresh water:

The Tolt Watershed



The Cedar River Watershed

Local wells



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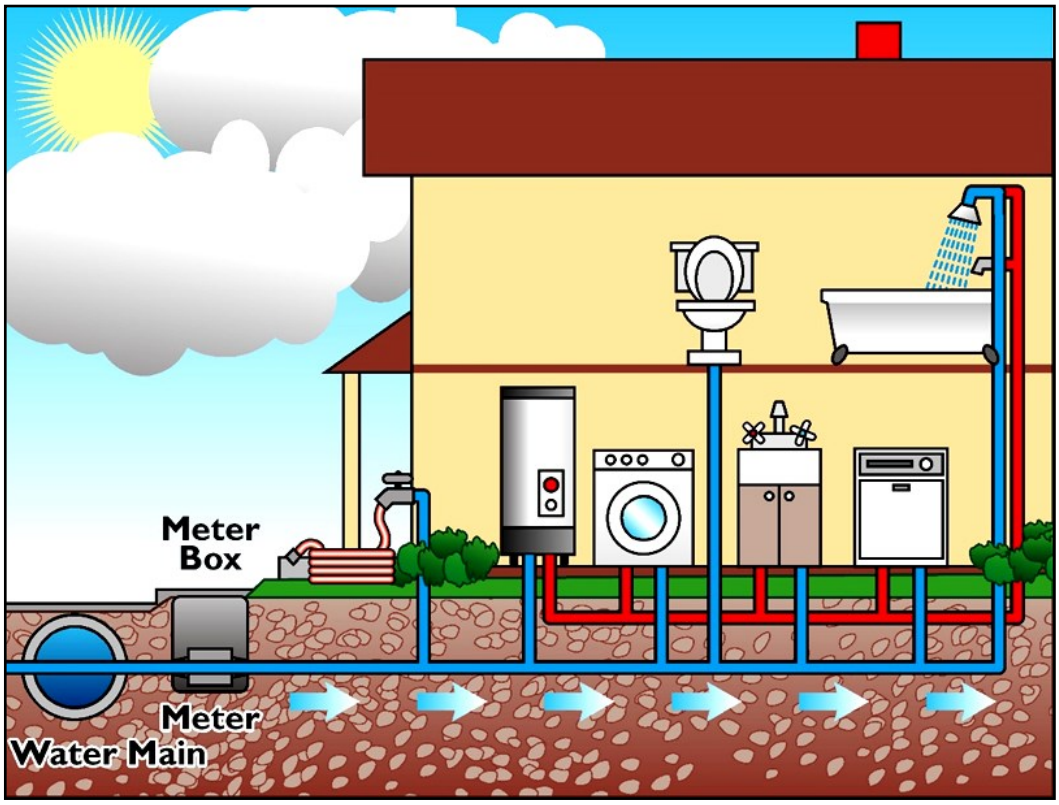
All of our fresh water comes directly from nature. It is pulled from reservoirs, like wells or these **watersheds**, then filtered and purified at water treatment facilities to be piped to all of the homes, businesses, and other places you find clean, fresh running water.

In your homes, water moves through household devices at a specific rate, which is referred to as the **rate of flow**. This rate can vary from household to household, fixture to fixture, and even sink to sink.

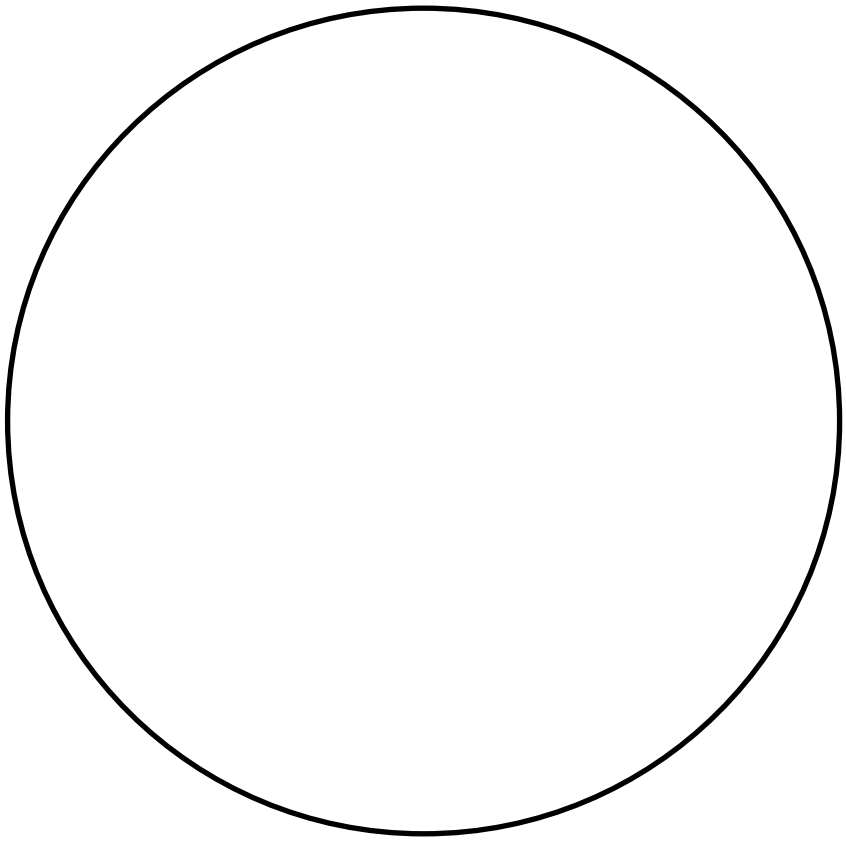


These water sources are constantly fed by rain and seasonal snowpack. Because of this, they are severely impacted by factors like pollution and climate change. Shrinking glaciers, lower rain years, and contamination from human pollution has an alarming impact on our fresh water supply.

As we already learned, our fresh water supply is essential not only to our survival as humans, but also to that of other organisms and the ecosystems around us. The population of the Puget Sound region is predicted to grow over 10% in the next several years, which will result in a constant increase in demand for a shrinking natural resource. As our summers grow hotter and drier, droughts become more common, leading us to increased water shortages each year where there is an inadequate water supply to support all living things in our region.

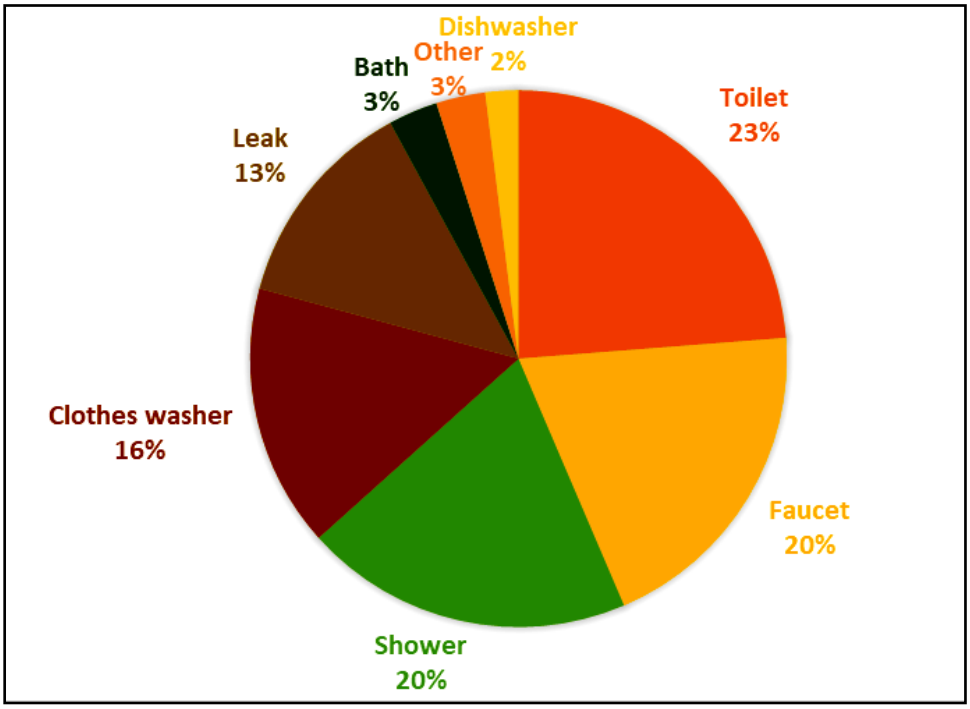
To start thinking about how we relate to this problem, brainstorm all of the different ways that you use water in your home. In the space below, create a pie chart showing what percentage of your water is used in each way.

Ways that water is used **Percentage of overall use**



Take a look at the chart below of how the average family uses their water.

Indoor Household Water Use



This chart shows us that the largest uses of water are the toilet, shower, and faucets in *most* homes. Does anything surprise you about this chart? How did your chart compare to this one?

Vocabulary:
Rate of Flow: The standard measurement of how much water moves through a device, measured in gallons per minute
Watershed: A region or area surrounded by a divide of hills or mountains that drains to a body of water

Activity #1

Rates of Flow

Today, we are going to measure the rate of flow of some of your appliances. Most toilets have the water usage already listed on them, so your first experiment will focus on measuring the rate of flow of both a showerhead and a faucet. To do so, follow the steps below.

***Materials*:** Measuring cup or jar with measurements in cups, container for holding water (e.g. pitcher, bucket, jug), timer, pencil, and paper

To measure the rate of flow, turn the faucet on full.

Use the timer and your large container to collect exactly five seconds worth of water from this source.

Turn off the tap and use your measuring cup or jar to determine how many cups of water flowed out over those five seconds. Record this value below:

Cups collected in 5 seconds: _____

Now, to convert this to how many cups per minute flow from that appliance, multiply this value by 12 below:

Cups collected in 5 seconds _____x 12 = _____ cups/minute flow rate

Finally, we need to convert this to the standard form of measurement (gallons per minute) by dividing this number by 15.7725:

Cups per minute _____ ÷ 15.7725 = _____ gallons/minute flow rate

Repeat this process for each faucet in your home and record your results:

Appliance:	Rate of Flow (in gallons/minute):
Appliance:	Rate of Flow (in gallons/minute):
Appliance:	Rate of Flow (in gallons/minute):
Appliance:	Rate of Flow (in gallons/minute):
Appliance:	Rate of Flow (in gallons/minute):

A flow rate of no more than 2 gallons per minute is a federal requirement for plumbing. List the number of your appliances you measured that meet this recommendation:

_____

Many faucets and shower heads use older, inefficient parts which lead to unnecessary water waste and increased utility expenses in a household. Fortunately, this is one problem that is easy to fix! Water-efficient fixtures that help to save water and improve your shower or faucet experience can be purchased at any hardware store. There are also several FREE options available from the Cascade Water Alliance: https://cascadewater.org/water-efficiency/free-items/

Activity #2

Leaks!

As time goes on, we are realizing that water is an essential, very fragile, and limited resource. We have discussed some of the ways that we can conserve water and use it in a more responsible manner, but we often overlook one of the biggest ways this precious resource is wasted: leaks.

The EPA estimates 10-15% of our fresh water is lost through leaky pipes and valves. This means that an average family of four will waste as much as 38 gallons of water every day. To see how a slow leak adds up, you are going to simulate a leak from a faucet or toilet!

Materials: Plastic bottle with cap, measuring cup, pin or similar sharp and pointy object, timer

Take an empty plastic bottle (e.g. an empty soda bottle) and fill it with water. Put the cap on tightly.

Position the measuring cup underneath and set a timer for five minutes.

Carefully poke a tiny hole in the bottom of the bottle so that a steady drip comes out, then start your timer. You may need to loosen or tighten the lid to help control the rate that the water is coming out.

After five minutes, remove the measuring cup and record how many ounces of water leaked out here:

_____

This formula will help you estimate how many gallons per day a leak of this size would cause:

Example: The amount from your experiment *3* x 12 = *36* ounces per hour

36 ounces per hour x 24 = *864* ounces per day

864 ounces per day ÷ 128 = *6.75* gallons of water wasted to leaks each day

The amount from your experiment _____ x 12 = _____ ounces per hour

_____ ounces per hour x 24 = _____ ounces per day

_____ ounces per day ÷ 128 = _____ gallons of water wasted to leaks each day

Try repeating the experiment with a higher or lower rate of flow!

The amount from your second experiment _____ x 12 = _____ ounces per hour

_____ ounces per hour x 24 = _____ ounces per day

_____ ounces per day ÷ 128 = _____ gallons of water wasted to leaks each day.

Now that we know how much water can be wasted with leaks, take a moment to look around where you are. Do you see any leaks that could be fixed? If you share them with the adults in your home and explain how much water could be wasted as a result, a quick fix could mean saving money and water at home!

To find more information about water saving habits, such as free tools that you can use to lower your water consumption and to test for leaks, visit this Cascade Water Alliance page: https://cascadewater.org/water-efficiency/water-efficiency-overview/

We know fresh water is a finite resource that is already very limited in many parts of the world, some places which are not that far away. For example, California already has restrictions in place for home water use due to the extended drought. We have yet to experience a drought like the one in California, but we do have other reasons to become better water stewards. As our population continues to grow, we want to make sure we are not taking more water than we need from our natural sources. By thinking about our water use today, we can help ensure the same access for future generations, as well as helping to maintain clean water levels for the plants and animals who also rely upon it in our region. Remember, the more water stewards we have in our community, the more water and money we all save, and the healthier our environment will be!

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 know just how much of an effect humans can have on their environment, especially water. Now we would like to challenge you to trace your own human actions across the ecosystem! Start by naming one way you can save or protect water, and then write down how that change might affect another organism in the environment. Then record how that organism's change might affect yet another living thing in the ecosystem, and so on! By building this chain of consequences, you will be able to follow the ripple effects of your own actions. Record your connections in the space below.

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

A Drop in the Bucket

These experiments help us to understand how we can save water at home, but to understand how much fresh water is shared by all of the plants, animals and people on earth, try this...

Materials: 2 liter bottle, Tablespoon, measuring cup, 2 drinking glasses, a spoon

Fill up the 2 liter bottle with water.

This bottle represents all of the water in all of its forms on the planet. Three quarters of the Earth's surface is covered by water. The water in this bottle represents every drop in lakes, streams, oceans, glaciers, in the air, plants, and everywhere else.

Measure ½ cup of water from the 2 liter bottle and put it into one of the drinking glasses.

The water in this drinking glass represents all of Earth's fresh water, about 5% of the total water on earth. The other 95% left in the large bottle is saltwater. While saltwater is home to a vast array of life and serves a tremendous purpose on our planet, neither we nor the other life in our watershed can drink it or use it like fresh water.

Use the Tablespoon to measure 1 ½ tablespoons out of your water glass and into the second water glass.

80% of our planet's fresh water is frozen into icecaps and glaciers. Like the saltwater, there is really no way for this water to be used in our region, though these frozen masses are very important in other ways. The 1.5 tablespoons of water in the second glass represents the fresh water on our planet that is not frozen.

Use the spoon to carefully measure one drop of water and place it on a fingertip or other surface.

This drop of water represents all of the fresh water on Earth that is above ground or close enough to the surface for us to be able to use. The rest is locked away deep underground where we are unable to access it.

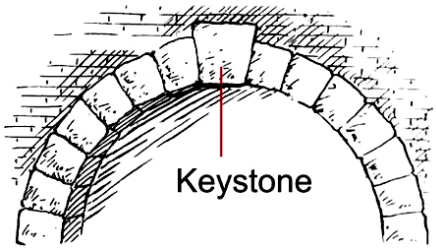
Compare this to the two liters we started with.

Earth is essentially a closed system, which means that no new water is coming to it from the outside. There may be just a bit here or there that comes in from comets, but that amount is negligible. So, all the water that is here is all the water that is going to be here. That is why we call water a finite resource. When you have a finite resource, we must use it wisely and not waste it, so as not to use it up. This is why it is so important to conserve and protect the precious fresh water that we have here in our homes.

DAY 5 / DAY 6

Supporting Salmon

One of the most important members of the ecosystem of Washington is the Pacific salmon. Salmon are what ecologists call a keystone species. Keystone species are members of a natural community that are vital to the health of the ecosystems. The term keystone refers to the “keystone” of an archway, the top stone which holds the rest of the arch in place. Without the keystone, the archway collapses. Similarly, without salmon, the ecosystems they are a part of will be far less resilient.



Because salmon migrate from mountain streams, to the ocean, and back again, they impact each of those ecosystems in a drastic way, and are an important source of food for hundreds of species, including people, during each stage of their life. Unfortunately, the Salish Sea (of which the Puget Sound is part) has seen a drastic decrease in salmon population in recent decades. However, many efforts to keep salmon populations healthy and help them recover have been executed.

Today, you will examine, analyze, and interpret population data, as well as consider the work being done in our region to counteract this trend.

Vocabulary

Keystone Species: A species on which other species in an ecosystem largely depend, such that if it were removed the ecosystem would change drastically

Marine: Of, found in, or produced by the sea

Riparian: Relating to wetlands adjacent to rivers and streams

Activity #1

Salmon Population Study

Read the following excerpt from the Environmental Protection Agency's page on Salish Sea Chinook salmon and answer the questions that follow.

Materials: Pencil

"Just over 485,000 Chinook salmon were reported to be in the Salish Sea in 2010 (source: Pacific Salmon Commission - see chart below). This is a 60% reduction in Chinook abundance since the Commission began tracking salmon data in 1984.

However, there's been a 29% reduction in the number of harvested salmon and a 30% increase in the number of spawning salmon since 1999 when Puget Sound Chinook were listed as a threatened species under the U.S. Endangered Species Act."

Figure 1

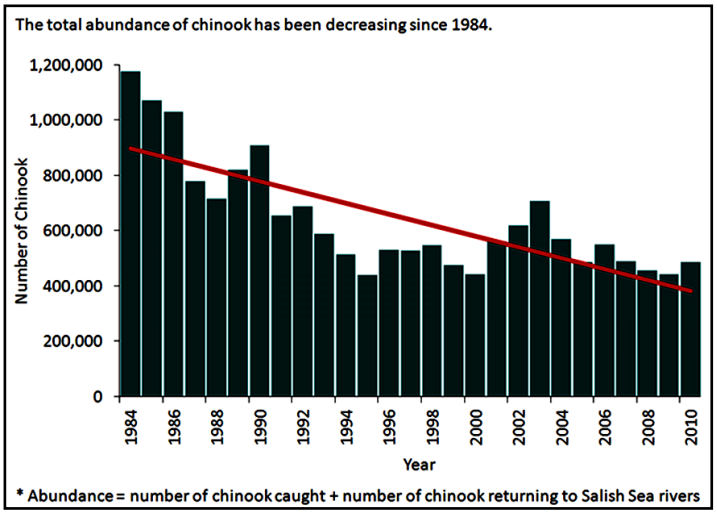
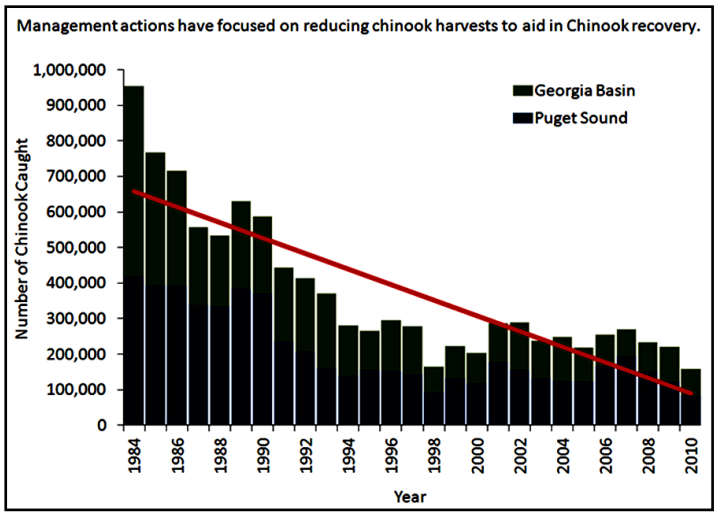


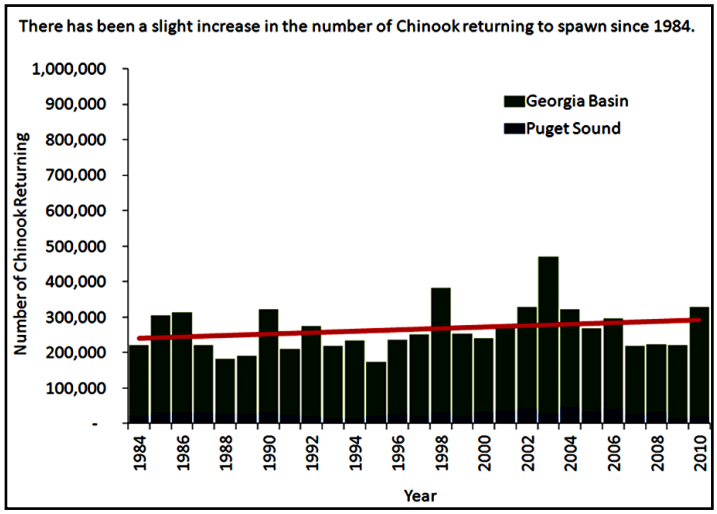
Figure 2



CASCADE WATER ALLIANCE

Nature VISION

Figure 3



What are the various causes that may be responsible for this decline?

How does this decline in salmon population impact other members of the ecosystem?

Activity #2

NOAA Salmon Recovery Report Analysis

The National Oceanic and Atmospheric Administration (NOAA) has created a report on the work that communities around the Puget sound have been doing to support salmon populations in order to help them rebound. Below are excerpts of that report which focus on different ways we can support aspects of the ecosystems that salmon rely on, and those that rely on salmon. After reading each section, answer the questions that follow regarding the proposed actions that communities are taking to support salmon populations.

Materials: Pencil

NOAA Excerpt: *A Shared Vision — Creating a Future for People and Fish*

Excerpt #1
Summary: "We have an opportunity to do something extraordinary — to save a species from expiring, not only on our watch, but on the watch of our great grandchildren." King County Executive Ron Sims (Shared Strategy Summit 2005).

"Puget Sound was once home to more populations of Chinook salmon with a greater diversity of traits than we have today. There are currently 22 Chinook populations remaining. It is hard to know precisely, but scientists believe we have lost over 15 Chinook runs and most of those losses were runs that returned in the spring to their spawning grounds. Currently, Puget Sound Chinook salmon are at only 10% of historic numbers; in some river basins that goes down to 1% and this is during favorable ocean conditions. The long-term goal is to achieve self-sustaining levels of Puget Sound Chinook numbers, distribution and diversity."

Riparian Areas: "Trees and shrubs alongside streams, rivers and marine beaches are important for salmon for a variety of reasons. Riparian vegetation helps support insects that are food for salmon, provides cover from predators, and keeps water temperatures cool. Tree roots stabilize stream banks and create habitat structure in the stream. Decaying trees form log jams that provide cover and help create pool and side channel refuges for young salmon, away from high velocity flows and predators. In most watersheds, riparian buffers have decreased in area due to clearing land to support various land uses such as agriculture, forestry, road building, and residential and urban development. Such loss impairs a river's flows and impacts habitat from the higher elevations to the estuary and out to the marine waters of the Sound. People too can benefit from keeping or restoring riparian habitat: root systems maintain bank stability and prevent erosion on property, trees and shrubs filter out chemicals from upriver sources, help control floods and provide habitat for other wildlife enjoyed by humans."

Examples of proposed actions to address this issue: "The Stillaguamish watershed has just over half (52%) of their riparian areas remaining, mostly in the middle and upper parts of the basin. Along the lower reaches, only 16% of the area still has riparian vegetation. The Stillaguamish plan calls for restoring 400 acres of riparian buffers in the next ten years with the ultimate long-term goal (~50 years) of restoring 7,600 acres. As a direct result of implementing their recovery plan, the Nisqually watershed has already protected over 67% of mainstem Nisqually River riparian habitat. The goal is to acquire, protect or restore habitat values on 90% of 84 miles of shore lands along the mainstem."

Student questions: *Riparian Vegetation*

1) List 3 ways that Riparian vegetation is beneficial for salmon.

2) How can riparian vegetation benefit people?

3) How have the Nisqually and Stillaguamish watersheds benefitted from protecting riparian vegetation?

Excerpt #2

Water quantity: "It may be obvious to say that salmon need water. What is often less obvious is that both too much water (i.e. floods) and too little water can be problems for the fish. Low flows are generally related to water withdrawals for agricultural irrigation, drinking water and other human uses. Low flows can be exacerbated in years of low snow pack or rain. Flows affect habitat processes and functions throughout a river system from the upper reaches and down through the estuary and nearshore. High water flow can be hazardous to salmon at all life stages. This condition can result in eggs being covered by silt and other materials, can cause eggs to wash out of the gravel, move juveniles downstream too quickly, and make it too difficult for spawners to return upstream. Low water can isolate eggs and juveniles in pools whose temperatures increase while the dissolved oxygen content decreases, and also causes them to be more susceptible to predation. Low water makes it difficult or impossible for out-migrating juveniles and in-migrating spawners to reach their destinations. Scientists agrees that instream flows need to remain at the top of any salmon recovery agenda, even while they also agree that more research is necessary to know what salmon need in terms of flows. More information is also needed to understand more about the current causes of flow problems. The overall plan for water quantity is in three parts: a) set instream flows, b) achieve flows, and c) conduct needed research to design suites of actions aimed at maintaining instream flows at watershed scales."

Examples of proposed actions to address this issue: "People in the Dungeness River basin have been working for over ten years to address the chronic low flow problems there. The Agricultural Water Users Association and Jamestown S'Klallam Tribe obtained federal and state funding to improve irrigation infrastructure and conveyance efficiency. In the last five years, these actions have helped reduce the amount of water used for irrigation by one third, leaving more water in the river at times when salmon most need it. Additional conservation projects to improve summer flows are proposed in the Dungeness plan. In two of the most urban watersheds, King County's Comprehensive Plan and Regional Wastewater Service Plan both support the use of reclaimed water to help meet the region's diverse water supply needs. A specific goal is to use reclaimed water to assist the region in balancing needs of the environment and people. In 2004, King County used or distributed 268 million gallons of reclaimed water in place of drawing new potable water. Through substituting reclaimed water for potable water in operations at its two wastewater treatment plants alone, King County is leaving approximately 700,000 gallons of water per day in streams and rivers. This represents only a fraction of the potential of reclaimed water to benefit instream flows for salmon in the region, and King County is embarking on a regional water supply plan to bring a larger supply of reclaimed water to the region."

Student questions: *Water Quantity*

1) List 3 ways that “water flow” can impact salmon.

2) What is one part of the “overall plan” to reduce the impact of high or low instream flows on salmon?

3) How would using less water at home or school help salmon?

Excerpt #3

Fish access: “Several major dams block access to historic Chinook salmon spawning and rearing habitat in Puget Sound. In addition, other blockages for water diversion, road culverts, and small hydro development also exist throughout the Sound. Some tributary barriers such as culverts may not block access for Chinook spawning and rearing specifically (since Chinook primarily use mainstem reaches); yet they may still generate downstream impacts to mainstem river areas by interrupting sediment transport, and large woody debris recruitment and transport Physical barriers also alter stream flow which increases salmon mortality in several ways — migration can be delayed by insufficient flows or habitat blockages; loss of usable habitat due to dewatering; stranding of fish resulting from rapid flow fluctuations; and juvenile fish becoming entrained from high velocity waters at poorly screened diversions. Reduced flows also diminish fish habitat by decreasing recruitment of new spawning gravels, and allow the encroachment of nonnative vegetation into spawning and rearing areas.”

Examples of proposed actions to address this issue: “The most significant passage barrier restoration in terms of sheer magnitude is the removal of the Glines Canyon and Elwha dams on the Elwha River. Dam removal actions are scheduled to begin in October, 2008. The removal of the two dams is the single most important step in restoring the Elwha Chinook population and will restore anadromous fish access to the upper watershed, allow for the natural habitat forming processes to occur through the accumulation and deposition of sediment and wood to the lower watershed and nearshore, and restore natural flow and temperature regimes to the river. In the Nooksack watershed, the Middle Fork Diversion Dam limits access to 16 miles of spawning and rearing habitat for the North Fork (NF) Chinook population. Removing this dam is expected to increase the NF population abundance by 30.8%, increase productivity by 12.1% and increase the diversity index by 47.6% (based on EDT analysis and estimates of future habitat use).”

Student questions: *Fish Access*

1) List 3 examples of blockages created by humans.

2) How do these blockages negatively impact salmon?

3) How did the removal of the Elwha/Glines Canyon dams positively impact salmon populations?

Excerpt #4

Puget Sound shoreline and marine areas (nearshore): "All of the above factors covered so far also affect the saltwater environment along the shorelines on either side of river mouths and out to about 30 feet of the Sound. Scientists now understand that the estuaries, Puget Sound, and the ocean have to be treated together with freshwater environments as one interconnected system that must be protected and restored. Salmon populations mix in these environments and the fish depend on each part of the ecosystem to function successfully for their survival. The marine shorelines have changed significantly over the last two hundred years affecting the natural processes that created and maintained key salmon and marine life habitat. A significant portion of shoreline trees and vegetation has been removed, which once provided shade and habitat for insects eaten by juvenile fish. Approximately thirty-three percent of Puget Sound shorelines have been filled and armored by concrete or rocks, mostly to protect single family homes. There are over 3,500 docks and piers, 29,000 small boat slips, and 700 large ship slips. These structures change how the ecosystem functions. Combined, these changes affect migration corridors, transition of the fish from fresh to salt water, their eating habitats, and their ability to forage and seek refuge from predators."

Examples of proposed actions to address this issue: "In East Kitsap, the City of Bainbridge Island passed an ordinance restricting dock construction to protect the nearshore ecosystem in a specific part of the watershed. Both Island and San Juan counties still have a significant amount of functioning nearshore habitat. For example, to date only 25% of Island County's and 5% of San Juan County's shorelines have been hardened. Both of these watersheds are focusing their initial efforts on protecting the valuable resources they still have. Protection efforts focus on marine riparian areas, forage fish spawning beaches, eelgrass meadows, features which support sediment transport and high quality freshwater inputs, and habitat connectivity."

View the full *NOAA Recovery Plan for Puget Sound Chinook Salmon*:
https://www.fisheries.noaa.gov/resource/document/recovery-plan-puget-sound-chinook-salmon

Student questions: *Puget Sound shoreline and marine areas*

1) List 3 ways that the marine shore has been impacted by people.

2) How do salmon benefit from the interaction of fresh and saltwater environments?

3) What areas are communities focusing their protection efforts on?

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

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

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 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=8K87F2lABbE 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

Optional Activity

Salmon Food Web

Beginning with “salmon” in the middle of your page, create a web or “mind map” of all the different plants, and animals that have a relationship to salmon. Consider their predators and prey, as well as the affect that human infrastructure has on salmon. How are seemingly unrelated things connected through these amazing animals? For example, a Cedar tree and an Orca whale do not seem to have a connection, but without healthy trees in the mountains, there would be less salmon available for orcas, therefore causing their population numbers to decline.

What other connections can you make? Use the space on the following page to construct your web or “mind map” that illustrates these various connections.

Materials: Pencil, colored pencils (optional)

DAY 7 / DAY 8

Community Science Ecology

We have spent a lot of time investigating broad concepts and issues that affect large parts of our region and world. Today, we will zoom in and spend some time exploring your local ecosystem.

As members of our natural communities, we are connected to vast amounts of space. We have already discussed how our actions can affect areas as small as our home or as large as an ocean. To better understand our impact and the world as a whole, we must find ways to measure and track the changes on a large scale but this is a huge challenge. It is practically impossible to accurately measure something like the number of migratory birds in a forest at once, the number of salmon eggs in a particular stream or how much snow accumulated on a mountain over the winter. No scientists are out counting or measuring all of these things. They take small samples and from those are able to make quality estimates about the larger landscape. A couple methods that field scientists employ are **random quadrat sampling** and **sit spots**.

Often, these estimates are aided by member of the community called **community scientists**. These are members of the community just like you who go out and assist in collecting data and sharing it with a local, national, or global scientific community. Many of these community science projects have helped us better understand the topics we have discussed, such as water pollution, climate change, and animal behavior. The majority of these people are not professional scientists. They are simply members of the community who enjoy being outside and are excited about helping the world. Often, they do not need special equipment, as many community scientists only use a phone or a computer with an internet connection. At the end of this packet, you will find some resources for how you can get involved and become a community scientist as well!

Vocabulary:
Community Science: Participation in scientific projects such as online databases, wildlife monitoring and water quality testing conducted by members of the public
Random quadrat sampling: A method of randomly selecting places to make observations in the field so that bias is removed from site selection
Sit Spot: A method of observation where a place is quietly occupied and studied over a period of time, sometimes multiple times

Activity #1

Random Quadrat Sampling

Scientists in the field use a wide variety of different techniques to measure their samples, some very simple, some highly rigorous. One of the most common is random quadrat sampling.

Take the prairies at Washington's Joint Base Lewis-McChord, for example. In addition to being a large military site, the base is home to a surprising array of prairie plants and insects that are extremely rare and have been federally listed as endangered. In order to track the health of these species, field biologists do not go out and try to count them all individually. Instead, they randomly select a small portion to study. With the average results of numerous samples, they can make a reasonable conclusion about the health of the populations of those animals and the prairies as a whole.

Today we are going to use a similar technique to study the ecosystem around your home!

Materials: String, tape, or other marking method, ruler or tape measure, pencil, and paper

Start by selecting a space to study. It can be a greenspace, garden, yard, open nearby park, or something similar. To the best of your ability estimate the size of the space and draw a simple map of it below:

In order to be scientifically acceptable, we need to select a spot on this map at random. You may close your eyes and point to a random spot, set the map on the floor and drop a small object onto it or use a similarly random method for picking the site of your study. Once you have it, mark the site on your map.

Now, bring your supplies with you out to that spot and mark out a one square meter. If you don't have a way to measure exactly, you can use a string that is roughly a meter long or measure out two steps for each side. For reference, most doors are about a meter wide. This is your study sample. Within your sample, try to answer the following questions and don't worry if you don't know the names of something, descriptions and sketches are perfectly fine ways to record observations.

What is the date, time and location of your site?

What are the conditions there? Is it warm or cold? What is the weather like?

How healthy does your site appear? How wet or dry is the soil?

Looking closely, describe the different species of plants you can see.

Describe the different animals you see, looking closely for tiny insects as well as larger life.

Are there any things that don't belong here like litter or pollution of other kinds?

One sample is not enough to represent the whole space, but if you were to take several of these, you could get a reasonable idea of what is going on at your site on a very small scale. According to your estimates, how many square meters do you think your site is (multiply the length and width to get square meters)? How many samples do you think you would need to take to have an accurate estimate?

You have just completed the first step of a field science study. These are being conducted all over the world and the data is shared over the web for everyone to access. One person, even working very hard, can only make a small number of studies. Alternatively, as a global community, we are generating a wealth of data and knowledge that helps us better understand our world in order to preserve it for our future generations the life we share it with.

Activity #2

Sit Spots

Even for seasoned field researchers, some animals are incredibly difficult to find and study. In some extreme cases, scientists may need to spend months in tiny camouflaged huts or "hides" in hopes of getting just a few photos of elusive creatures. Often, they will use motion-activated cameras, bait, or other means to improve their odds, but it is still a tremendous challenge.

More frequently, birds are used as a way to gauge the health of our world. Based on the migration and numbers of certain species, we are able to measure some of the impacts of climate change, habitat reductions, and other effects of human influence. Counting and observing tiny camouflaged birds in a large landscape can be nearly impossible, so observers employ a method known as the sit spot.

Like in our last activity, researchers select a random site in the area that they want to observe. Moving very quietly so as not to disturb anything in the area, they will make their way to the site to find a place where they can observe comfortably. Once there, they spend several minutes, hours, or more quietly logging observations. For those tracking hard-to-see birds, they use recording equipment to capture the various bird calls. Then, they will analyze their data and log the different species afterwards. For others, simply writing down all of the different species, behaviors, or changes in the landscape they see can be valuable.

A sit spot is a great way to pause and look closely at the way life happens all around us. We often disrupt the natural behaviors of animals as we travel through spaces, making it difficult to see how they behave when we humans are not around. By sitting still and quietly, we can see these behaviors resume after several minutes and discover a side of nature — whether in a wilderness or a city garden — that we may have not been able to see before!

Materials: Pencil, paper

For this next portion, you are going to conduct your own sit spot. Find a place where you can sit comfortably and safely for 20-30 minutes. If you are unable to go outside, you may also observe what is happening outside your window. Bring only a pencil and paper; electronics and other items may disturb the life around you and thus prevent you from making quality observations.

While conducting your sit spot, write down what you notice. Feel free to use the questions on the following page to help guide your data collection!

- What are the biotic and abiotic components of this environment?
- Where do the living things you see obtain what they need to survive?
- Which organisms are in the role of producer, consumer, or decomposer?
- Can you sketch the various plants or animals that you see?
- Can you count how many different kinds of life you see?
- Can you name the species you see?
- Can you draw a sound map of the area, recording how many different sounds you hear and approximately where they are around you?
- Can you make any observations about the weather?
- What are the smells or textures of nearby things?

Note: Almost without fail, the longer you sit quietly, the more you will see…

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 solid surfaces such as streets, sidewalks, driveways, and parking lots. This polluted stormwater goes into stormdrains. Stormdrains connects to the closest river, stream, lake, or Puget Sound. This polluted stormwater does not get filtered in the stormdrains and 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?

Create Your Own Stormdrain Art and Spread the Word!

On the space around the stormdrain below, design your own artwork.

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!

CASCADE WATER ALLIANCE

Nature VISION

Optional Activity

Investigating Community Science

Both of today's main activities are ways that anyone can practice science and data collection. If you are interested in learning how you can use methods like you did today, and if you would like to join the global community of scientists, check out some of the following web sites!

Remember, anyone can do community science. You do not need special tools or a particular training to do your part to help everyone better understand our world and protect it for all of the plants, animals, and people living now and in the future!

Please ask for an adult's permission to visit these websites.

Nature Vision: https://naturevision.org/community-science

Water Watchers: http://snokingwatershedcouncil.org/water-watchers/

Hawk Watch International: https://hawkwatch.org/participate/volunteer

Seattle Aquarium: https://www.seattleaquarium.org/sites/default/files/files/CitizenScience-1-page-Dec2015-id%3D2040.pdf

Washington Audubon Society: https://wa.audubon.org/ways-help/birds-and-community-science

COASST: https://coasst.org/

Bioblitz: https://www.nationalgeographic.org/projects/bioblitz/?edit_off=true

City Nature Challenge: https://citynaturechallenge.org/

iNaturalist: https://www.inaturalist.org/

Celebrate Urban Birds: https://celebrateurbanbirds.org/

Materials: Computer/phone/tablet, internet connection

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. 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 is how we care for the natural world. A steward is someone who is responsible for the care of our natural resources. Stewardship includes conservation of natural resources (e.g. water) that all living things need to survive, carefully considering 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 activities are focused on what students and families can do to save water and keep it clean for the rest of the environment.

One way we can be stewards for our environment is to plan, participate in, or support **restoration** projects that help restore degraded, damaged, or destroyed ecosystems.

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:
Restoration: Renewing and restoring degraded, damaged, or destroyed ecosystems
Stewardship: Responsible use and protection of the natural environment

Activity #1

Water as a Finite Resource/Household Water Use

Less than 1% of the world's water is fresh and accessible for human use. As human populations grow, so will our need for freshwater. Water is important for our ecosystems, due to humans sharing water with the natural world. If we assume a need to satisfy this ecological water requirement, water scarcity will increasingly become a problem for people.

Using what you learned throughout this week and the additional information provided below, answer the prompted questions on this page and the next.

Materials: Pencil

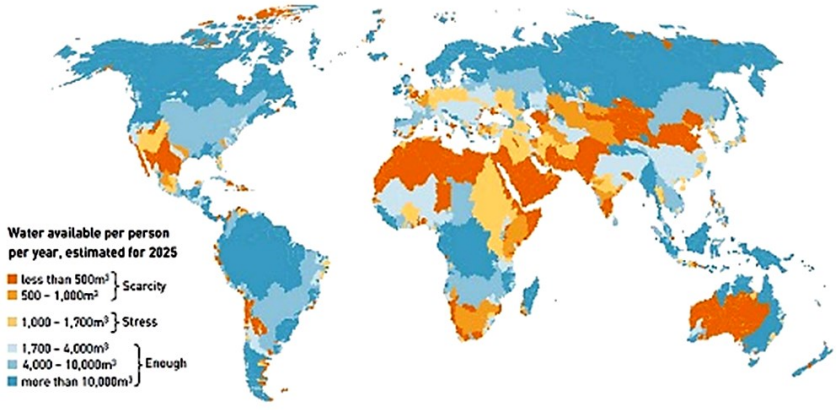
What is the relationship between human water use, and ecological needs?

Is one more important than the other?

How much water do you use now?

How can we ensure that there is plentiful water for humans and nature in the future?

Globally, we rely on less than 1% of the total fresh water to support an estimated 7 billion people worldwide. To add to this complexity, the accessible water is unequally distributed throughout the globe. Below is a map that indicates the areas of the planet estimated to be impacted water scarcity by 2025. Each continent has at least some areas that will experience water scarcity.



CASCADE WATER ALLIANCE

Nature VISION

Today, you will work to calculate how much water your household might use a year, and how you can work to conserve water for both human and environmental use.

Keep track of how much water you use for cooking and drinking, and use the following average measurements to estimate your household water use for a day. Alternatively, you can use the Rates of Flow measurements from earlier this week!

Faucet: 1 gallon per minute
Shower: 2 gallons per minute
Toilet flush: 3.5 gallons

Calculations for Yearly Water Use

Yearly faucet water use calculation:

How can you conserve water by adjusting your habits surrounding faucet use?

Yearly shower water use calculation:

How can you conserve water by adjusting your habits surrounding shower use?

Yearly toilet water use calculation:

How can you conserve water by adjusting your habits surrounding toilet use?

Activity #2

Neighborhood Cleanup Planning

One of the most effective ways to help the environment is through fairly simple local cleanup projects. Your task now is to begin planning a cleanup project to propose to your city that could happen in the future! You should consider a number of factors including but not limited to the following: goals, time, cost, materials. These materials from Community Tool Box can help you get started on what you need for a community cleanup. You can find more information at: http://ctb.ku.edu/.

Materials: Pencil

Decide what kind of neighborhood cleanup you want to conduct
Your assessment should help you with this step. Depending on the help your city will provide, the size of the neighborhood, the number of potential volunteers, and the nature and amount of what has to be cleaned, your cleanup might range from a single intersection or a single block to the whole neighborhood. It could be a public space, household, community-assisted cleanup, or all three.

Consider your resources
Neighborhood resources generally consistent of: resources from your city, money, people (volunteer time), and in-kind contributions (goods and services donated directly to the cleanup).

Pick an appropriate place, date, and time to propose to your City
Remember to pick a date and time that doesn't conflict with holidays or put volunteers out in the worst weather. You'll also want to make sure the timing allows for help and training from a city if possible. Ideally, pick a time of year when people would enjoy spending the day outside.

Choose a specific location
The place you choose should be large enough to accommodate the number of volunteers you intend to recruit and to accept the collected waste (or the dumpsters that it will be stored in) until it can be hauled away.

Recruit volunteers
Recruiting volunteers can be difficult if your neighborhood has no tradition of volunteering. Personal contact, once again, is the most effective method. The city may be able to help you spread the word and help you understand what methods work best in your area.

Organize volunteers
As people volunteer, collect their names and contact information including an email address if they have it. Make sure everyone knows where they need to be, what time on the day(s) of the cleanup, and what they need to bring to the cleanup site.

Plan the cleanup itself
Even if your city cleanup is very small – three or four volunteers sweeping up one intersection – there will be some planning to do! Use the following pages to write out your entire cleanup plan. Things to consider:

→Why should the city help with your project? Cleanups are expensive for city employees. You need to be able to show that this is a worthwhile and valuable project.

→ Where will volunteers gather and is it safe and comfortable?

→ Do you have the permission you need to work at the project site?

→ Will the project site be checked beforehand to make sure that work can proceed effectively and safely?

→ Are any other organizations working in the area that could help you with this effort?

→ What tools will be needed and how will you acquire them?

→ How will you be able to respond to problems like scrapes and bee stings?

→ Does the site have a bathroom and waste bins that can accommodate the number of people?

→ How can you work with the city to ensure that volunteers are safe while using tools or dealing with sharp, dirty or otherwise difficult materials?

→ How can you organize the project if significantly more or less people show up than planned?

→ What priorities do the city employees have and how can you meet them?

Every project will need to be carefully planned out with attention to each detail. Thorough plans are much more likely to be approved by your city. Even for small jobs this can be challenging. Take your time and try to think of everything. The city employees you partner with have a lot of experience and will be able to help you better understand how to make your project successful, but this plan will be your first interaction with them and you want to show them that this is an important, well thought out project that could positively impact your community.

While a neighborhood cleanup can improve the look of your neighborhood, it can do much more as well! A successful cleanup can be the beginning of neighborhood regeneration. Not only can it make the neighborhood more aesthetically pleasing and comfortable for its residents, but these cleanup or restoration projects can improve the self-image and confidence in the home and community of these residents as well. Neighborhood communities have a chance to bond with one another, to cross ethnic, cultural, and other lines to establish neighborhood coherence by working together towards a common goal.

Establishing a neighborhood cleanup program can be a boon for any neighborhood, simply by increasing connections among neighbors and creating community. When it brings the possibility of improving lives as well, its value can be even greater. For that to happen, someone has to take the lead in developing a cleanup structure or plan that can keep such a program going over the long term. In order to bring about long-term social change – which is what we are discussing here – you must build a structure that will survive the departure of the original cleanup planners and benefit the neighborhood indefinitely.

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 We Need Water 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 list one aspect you can take from each lesson to incorporate into a new stewardship challenge for today:

-
-
-
-

Final #WeNeedWater 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!

Optional Activity

Persuasive Writing

Sometimes we need support from organizations like local governments, non-profits, or other businesses to support restoration projects. Consider writing a letter to convince one of these stakeholders to help support your neighborhood cleanup or restoration project plan. Who would you write too? What would you say to make them care about this project? How could convince them to support you in this work?

Using the space below, construct a letter that addresses these questions and more to send to a stakeholder of your choice.

Materials: Pencil