

TEACHER OVERVIEW

Water Quality
6th — 8th Grade

Nature Vision Student Packet

The materials contained within 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 work from home curriculum materials packet 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 either independently, or with the help of an adult caregiver. Each day of the week offers materials building on previous days learning, offering a variety of activities including, art, writing, and field exploration.

These materials are provided to you by City of Auburn Utilities, City of Bothell, City of Lynnwood, and grants from King County Flood Control District, and King County Wastewater Treatment Division. Learn more by visiting:

- City of Auburn Utilities: https://www.auburnwa.gov/city_hall/public_works
- City of Bothell: <http://www.bothellwa.gov/surfacewater>
- City of Lynnwood: <https://www.lynnwoodwa.gov>
- King County Flood Control District: <https://www.kingcounty.gov/services/environment/water-and-land/flooding/flood-control-zone-district.aspx>
- King County Wastewater Treatment Division: <https://www.kingcounty.gov/depts/dnrp/wtd.aspx>

Thanks to Cascade Water Alliance for providing the accompanying series of student packets: Ecosystems, Watersheds, and Humans and Water. To learn more please visit: <https://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.

This packet begins by discussing non-point source pollution and how pollutants travel in stormwater to local bodies of water. Each topic after focuses on specific sources of non-point source pollution, starting with fertilizer, pesticides, and herbicides. Students will study the effect that pollution from cars has on stormwater, as well as contamination from animal waste such as dog poop. The packet finishes with an emphasis on stewardship and finding ways to help make a difference when it comes to stormwater and pollution.

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

Grades 6-8

Supports NGSS Performance Expectations: MS-LS1-5, MS-LS2-4, MS-LS2-5, MS-ESS3-3, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3.

Grades 6-8
Day 1 - Non-Point Source Pollution
Day 2 - Yard Pollution
Day 3 - Car and Machine Pollution
Day 4 - Animal Waste
Day 5 - Stewardship



PARENT/CAREGIVER OVERVIEW

Water Quality
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 who 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 City of Auburn Utilities, City of Bothell, City of Lynnwood, and grants from King County Flood Control District, and King County Wastewater Treatment Division. Learn more about caring for our water by visiting:

- City of Auburn Utilities: https://www.auburnwa.gov/city_hall/public_works
- City of Bothell: <http://www.bothellwa.gov/surfacewater>
- City of Lynnwood: <https://www.lynnwoodwa.gov>
- King County Flood Control District: <https://www.kingcounty.gov/services/environment/water-and-land/flooding/flood-control-zone-district.aspx>
- King County Wastewater Treatment Division: <https://www.kingcounty.gov/depts/dnrp/wtd.aspx>

Challenge yourself to post all the things you are doing with your friends and family to prevent pollution and protect our water!

- City of Auburn Utilities: Tag @auburnwa and include the hashtag #auburnwa
- City of Bothell: Tag @BothellWaUSA and include the hashtag #PugetSoundStartsHere
- City of Lynnwood: Tag @LynnwoodWA and include the hashtag #Lynnwood
- King County Flood Control District: Tag @KingCountyDNRP
- King County Wastewater Treatment Division: Tag @kingcountywtd

Thanks to Cascade Water Alliance for providing the accompanying series of student packets: Ecosystems, Watersheds, and Humans and Water. To learn more please visit: <https://cascadewater.org/>.

*Please contact info@naturevision.org with any questions or concerns
Stay connected with Nature Vision! Follow us for updates @naturevisionorg*



NOTE: Students may require support in reading directions and/or completing some tasks. 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.

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PARENT/CAREGIVER OVERVIEW: DAY 1

Non-Point Source Pollution

Background Information: Stormwater runoff pollution stems from the urban and suburban areas of our watershed but is an issue for entire ecosystems. Stormwater begins as rain and snowmelt, falling upon various surfaces such as green spaces, streets, sidewalks, driveways, parking lots, and roofs. Pervious surfaces, such as soil and forests, absorb the water and reduce stormwater runoff. Much of our cities are now covered in concrete and asphalt, which does not allow for the absorption of water, but rather increases the volume of stormwater runoff. When stormwater moves over such surfaces, it mixes with multiple pollutants that remain from human activity. Stormwater pollutants — like bacteria from dog waste, car oil leaks, metal flakes from worn car brake pads, and soaps that flow off our cars during a home car wash — all flow into storm drains, which connect directly to the closest waterways. These pollutants become non-point source pollution because the pollution stems from multiple sources and impacts water quality. Subsequently, aquatic wildlife and plants are harmed due to the poor water quality. Cities and concerned community members that seek preventative methods to reduce non-point source pollution help improve the health of our waterways and watershed as a whole.

Learning Objectives: Students will learn the difference between point source and Non-Point source pollution. They will identify the different types of stormwater runoff pollutants in their city. Students will also understand how these pollutants enter the nearest waterway through storm drains, becoming Non-Point source pollution that reduces water quality.

Main Activity: Why is it Non-Point Source Pollution?

- **Overview:** Students describe why stormwater runoff is categorized as non-point source pollution
- **Parent/Caregiver Tasks:** None

Optional Activity: Report Pollution

- **Overview:** Students submit a report to Puget Soundkeeper for a pollution incident
- **Parent/Caregiver Tasks:** Supervision of pollution report through online or through phone submittal

Optional Activity: Stormwater Stewardship Challenge

- **Overview:** Students complete a daily stewardship challenge related to pollution prevention
- **Parent/Caregiver Tasks:** If possible, help the student share their work on social media

PARENT/CAREGIVER OVERVIEW: DAY 2

Yard Pollution

Background Information: People contribute to water pollution every day, often without realizing it. One of the biggest sources of pollution in stormwater runoff is from the garden or yard. When there is too much fertilizer, it washes away into storm drains and causes nutrients to build up in local waterways, resulting in harmful algal blooms. We also need to be wary of pesticides, which kill insects not only in the garden, but also in rivers and streams as the pesticides can wash into our storm drains. Herbicides, or weed-killers, are also harmful to aquatic plants if they get into our stormwater system. All three of these pollutants combine in our stormwater, causing severe issues in nearby ecosystems.

Learning Objectives: Students will be able to identify common pollutants found in the yard and garden and explain how they cause various problems in the ecosystem. They will learn of alternatives and be able to describe ways to prevent or contain some of these pollution sources.

Main Activity: Improving Your Garden

- **Overview:** Students examine several soil samples and choose organic fertilizers to help improve them
- **Parent/Caregiver Tasks:** None

Optional Activity: Build a Compost Bin

- **Overview:** Students review how to build a compost bin at home by drawing a diagram of one and potentially building their own in the yard
- **Parent/Caregiver Tasks:** Provide supervision and assistance if choosing to build a compost bin

Optional Activity: Stormwater Stewardship Challenge

- **Overview:** Students complete a daily stewardship challenge related to pollution prevention
- **Parent/Caregiver Tasks:** If possible, help the student share their work on social media

PARENT/CAREGIVER OVERVIEW: DAY 3

Car and Machine Pollution

Background Information: Cars and other machines are a major source of pollution in the Puget Sound region. There are three main ways that our water quality is affected by cars: road construction, fluid leaks and copper from brake pads, and car washing. The storm drains collecting stormwater runoff in our region do not lead to water treatment facilities. This means that when rainstorms come, the water washes pollutants off the roads and sidewalks and straight into our wetlands and streams, leading out to Puget Sound. When the water becomes polluted, animal and plant life is disrupted, causing food chain issues for all. This includes humans! We can reduce car pollution by performing regular vehicle maintenance, fixing leaks, and properly recycling items like car batteries and used oil. Other ways to reduce car pollution are to use public transportation, consider purchasing hybrid or electric cars, walking, or riding a bike instead of taking a car trip.

Learning Objectives: Students will learn what types of pollution come from cars and how it affects our water. Students will also simulate cleaning up an oil spill using various methods.

Main Activity: Oil Spill Clean Up

- **Overview:** Students explore methods of cleaning up an oil spill in water and compare and contrast the different methods
- **Parent/Caregiver Tasks:** Provide supervision and help with gathering and cleanup of materials

Optional Activity: Pollution Solutions

- **Overview:** Students write down examples of pollutants they commonly see outside and brainstorm possible solutions to preventing these pollutants from ending up in our streams
- **Parent/Caregiver Tasks:** None

Optional Activity: Stormwater Challenge

- **Overview:** Students complete a daily stewardship challenge related to pollution prevention
- **Parent/Caregiver Tasks:** If possible, help the student share their work on social media

PARENT/CAREGIVER OVERVIEW: DAY 4

Animal Waste

Background Information: Animal waste is a big contributor to water pollution, especially pollution by bacteria. Sources of animal waste are mainly from dogs and livestock on farms. The Puget Sound region has many farms with livestock on them, which can lead to a lot of animal waste runoff when it rains, but the biggest problem in urban and suburban areas is pet waste. There are many dog owners in the cities surrounding Puget Sound, and not picking up pet waste is becoming a big problem. This waste contains high levels of organic material, excess nutrients, and harmful bacteria. When this waste gets into our rivers and lakes, it can affect the water quality, causing harm to the plants and animals that live there. The nutrients and organic material begin to break down and decompose. The nutrients lead to large algal blooms, which can harm native plant and animals. A common algal bloom in our area is from blue-green algae. These blue-green algal blooms frequently shut down beaches, parks, and lakes in our area due to the toxins the algae produces. Animal waste also contains bacteria that can cause diseases to both animals and humans, such as *E. coli*. According to experts in our area, the best way to prevent pet waste pollution is to pick up after our pets and throw it in the trash.

Learning Objectives: Students will learn how animal waste affects water quality. They will learn the main ways that animal waste pollutes water and what can be done to stop it.

Main Activity: Poop in the Park Game

- **Overview:** Students simulate a park with 3 different scenarios to understand the best solutions to various pet waste circumstances
- **Parent/Caregiver Tasks:** May need help acquiring materials (chocolate chips or other small items)

Optional Activity: Poo Haiku

- **Overview:** Students reflect on a time they saw un-scooped pet waste, remember how it made them feel, and write a haiku using this reflection
- **Parent/Caregiver Tasks:** None

Optional Activity: Stormwater Stewardship Challenge

- **Overview:** Students complete a daily stewardship challenge related to pollution prevention
- **Parent/Caregiver Tasks:** If possible, help the student share their work on social media

PARENT/CAREGIVER OVERVIEW: DAY 5

Stewardship

Background Information: Stewardship is how we care for the natural resources that all living things need to survive – such as water. Stewardship can include conservation of natural resources, and thinking and acting carefully about how we interact with the world around us. Humans impact their environment in many ways, both positive and negative. A negative impact mainly takes the form of pollution entering our environment. Stewardship remedies this impact and ensures a positive change that will keep our environment clean for all.

Learning Objectives: Students will combine their knowledge gained throughout the week to consider ways they can support the environment. They will learn to focus on pollution prevention by careful consideration of daily habits, behaviors, and usage of materials that will contribute to stormwater runoff pollution.

Main Activity: Best Management Practices

- **Overview:** Students define best management practices for local stormwater runoff pollution
- **Parent/Caregiver Tasks:** None

Optional Activity: Test Your Car for Leaks

- **Overview:** If possible, students will test an adult's car for leaks and determine potential solutions with permission
- **Parent/Caregiver Tasks:** Provide permission and supervision

Optional Activity: Stormwater Stewardship Challenge

- **Overview:** Students complete a daily stewardship challenge related to pollution prevention
- **Parent/Caregiver Tasks:** If possible, help the student share their work on social media

PARENT/CAREGIVER OVERVIEW: VOCABULARY

DAY 1

Impervious: Surface that does not allow water to pass through, impermeable

Organism: A living thing

Non-point Source Pollution: Pollution that does not originate from a precise location or source, but rather comes from a number of smaller sources that are hard to trace

Pervious: Surface that allows water to pass through, permeable

Point Source Pollution: Pollution that originates from a precise location and source

Pollution/Pollutant: Something introduced into the environment to contaminate and/or harm water, air, or land

Stormwater: Rain or snowmelt that falls onto the ground and travels over hard surfaces instead of getting absorbed

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

DAY 2

Algae: Small plant organisms

Algal bloom: A rapid growth of algae in a body of water

Decompose: To break down

Eutrophication: The process by which nutrients build up in a body of water

Fertilizer: A substance that adds nutrients to the soil; plant food

Nutrient: A substance that is necessary for life to grow

Pesticides: Substances used to kill bugs

Herbicides: Substances used to kill weeds or other plants

Organic: Material that comes from a living thing, like plants or animals

DAY 3

Erosion: The gradual destruction of a substance

DAY 4

Blue-green algae: A common toxic algal bloom found in our area

Day 5

Stewardship: Taking care of something; being a protector

DAY 1

Non-point Source Pollution

Stormwater is rainwater and snowmelt that falls and does not get absorbed by the ground. When it rains in the forest, the water is absorbed by the plants and soil like a sponge. Most of our cities are covered in surfaces that do not absorb water, unlike the forest. Non-absorbent surfaces such as streets, sidewalks, driveways, and parking lots are considered **impervious** surfaces as they do not absorb water. The rainwater or snowmelt that flows over both types of surfaces is called stormwater runoff.



Stormwater moves through our city and picks up various **pollutants** that remain on impervious surfaces. The stormwater is pulled by gravity down to lower points of the city and eventually into storm drains. Storm drains lead into the closest body of water without any filtration or treatment. Thus, our streams, rivers, lakes, wetlands, and nearby oceans can be contaminated by each rainfall.



Example of an impervious surface

Stormwater runoff is categorized as **non-point source pollution**, when the source of the pollution is not from a specific place. If the origin of the pollution is known then it is considered **point source pollution**. A helpful way to remember point source pollution is if you can *point* to exactly where that pollution is coming from (e.g. the source, or the point of beginning). For example, a factory pipe pumping out toxic waste is point source pollution. You can point to the factory and identify it as the source. non-point source pollution is more complex. You can identify it as pollution but cannot identify the exact location and source, as the pollution is generated from many different sources.

The effects of both point source and non-point source pollution are harmful to plants, wildlife, and humans. However, non-point source pollution is considered the larger problem in our **watershed**. Once it is in the water, it's nearly impossible to clean out or remove. Not only is the specific starting point of stormwater pollutants unknown, there is also so much of this type of pollution! With every rainfall, we have gallons of polluted stormwater entering our waterways — almost 1,000,000 gallons every year! Remember this stormwater is unfiltered. Remedying non-point source pollution comes down to awareness of the items we use and the things we do that could potentially become pollution. It takes a collective effort to reduce and prevent pollution from worsening.

Vocabulary

Impervious: Surface that does not allow water to pass through, impermeable

Organism: A living thing

Non-Point Source Pollution: Pollution that does not originate from a precise location or source, but rather comes from a number of smaller sources that are hard to trace

Pervious: Surface that allows water to pass through, permeable

Point Source Pollution: Pollution that originates from a precise location and source

Pollution/Pollutant: Something introduced into the environment to contaminate and/or harm water, air, or land

Stormwater: Rain or snowmelt that falls onto the ground and travels over hard surfaces instead of getting absorbed

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

Main Activity

Why is it Non-point Source Pollution?

These are common types of non-point source pollution impacting our water quality. Each of these pollutants are picked up with stormwater runoff and enter the closest waterway through storm drains. non-point source pollution impacts water quality on such a large scale! The originating cause of non-point source pollution is seemingly untraceable and much more difficult to remove from our waterways.

Materials: Writing utensil

Write the reason why each specific pollution is considered non-point source pollution and **not** point source pollution. Explain your reasoning by relating back to stormwater runoff, storm drain systems, and our watershed's water quality.

NOTE: We will discuss each of these pollutants more in detail throughout the daily lessons

⇒ **Car Oil Leaks** – You may have seen a rainbow-colored or dark-colored oil spot in a parking lot or on the street, shown in the picture below. That oil spot is from car or another type of vehicle with an oil leak.



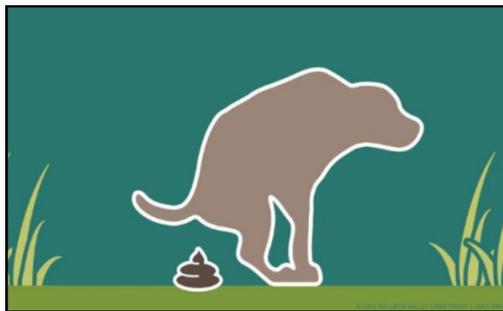
**Why are car oil leaks considered non-point source pollution?
Explain your reasoning:**

⇒ **Chemical Fertilizers** – Many farmers and home gardeners add chemical fertilizers to their gardens, yards, and crops to encourage plant growth on land. Excess amounts of chemical fertilizers enter into stormwater runoff and can stimulate toxic algae blooms.



**Why are chemical fertilizers considered non-point source pollution?
Explain your reasoning:**

⇒ **Pet Waste** – There is disease-causing fecal bacteria in pet waste. Pet waste is a common thing left behind by pet owners at many public spaces, such as parks, sport fields, and walking trails.



**Why is pet waste considered non-point source pollution?
Explain your reasoning:**

Optional Activity

Report Pollution

Concerned community members can participate in pollution prevention and removal by bringing the pollution to the attention of appropriate agencies. Puget Soundkeeper Alliance is a nonprofit organization dedicated to protecting and preserving the waters of Puget Sound. They allow for members of the public to report pollution and will take the necessary measures to address these reports.

Materials: Writing utensil, internet connection, computer/phone/tablet

When you're out walking, driving, or boating and you spot a **non-emergency** source of pollution, you can report this pollution to Puget Soundkeeper Alliance!

With an adult, fill out Puget Soundkeeper's pollution report online at pugetsoundkeeper.org/pollution-reporting-form/ or call their hotline at **1-800-42Puget**, Monday through Friday, 9AM to 5PM. The questions they ask are below. The lines with required information have an asterisk.

Puget Soundkeeper's Pollution Report Information:

- Your email address
- Date
- Time
- Name (first and last)
- Phone
- Waterway (which waterway does the incident concern?)
- Location of Pollution* *required information*
- Report what you saw* *required information*
- Pollutant (if known)
- Quantity (if known)
- Weather conditions (i.e. sunny, cloudy, raining, windy, snowing, etc.)
- Marine conditions
- Resources at risk (shoreline, birds, mammals, fish, water quality)
- Please include any photos or documents supporting your report
- Have you reported this incident to anyone else? (Yes or no)

Your city and county are required to have hotlines or online forms for reporting pollution. With an adult, visit the following city or King County webpage. A search on your city website for "spill report" can also lead you to the correct platform to report pollution.

Report Spills or Water Pollution:

City of Auburn: By calling (253) 931-3048, Option 8.

City of Bothell: By visiting <https://www.bothellwa.gov/1262/Report-Spills> or by calling (425) 806-6750.

City of Lynnwood: By visiting <https://www.lynnwoodwa.gov/Government/Departments/Public-Works/PW-Services/Reporting-a-Spill> or by calling (425) 670-5783 8AM to 5PM, outside of normal business hours call (425) 329-6205.

King County: By visiting <https://www.kingcounty.gov/services/environment/water-and-land/stormwater/problem-investigation-line.aspx> or by calling (206) 477-4811.

Optional Activity

Stormwater Stewardship Challenge for Day 1

A practical way to share information with the public is through a public service announcement, also called a PSA. A PSA contains important details like a news article but is typically shorter to quickly provide new facts to the public. A PSA has the potential to change people's opinion and behavior by raising awareness.

Materials: Writing utensil, coloring materials, paper (optional), computer/phone/tablet, internet connection

Create a public service announcement about the impact of stormwater runoff pollution on the health of our waterways. The PSA should be an educational opportunity to reach your community and raise awareness on this water quality issue. Think of a news article you might have read in class. How could it have been shortened into key information for a PSA?

Your PSA should follow these guidelines:

- Engaging title – *easy for the public to read and understand but also draws them in to care*
- Few sentences to describe the problem – *good public service announcements are simple!*
- Public service announcements are meant to be seen by the public. Post your PSA somewhere members of your community will be able to view.
- Optional: include an illustration to aid your PSA message

Use the space below or a separate piece of paper to create your PSA:

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 tag @naturevisionorg in your post! Do you live in Auburn, Bothell, Lynnwood, or King County? Use the hashtags and tag the city or county group below. They want to see all the work you are doing to keep our water clean!

- If you live in City of Auburn: Tag @auburnwa and include the hashtag #auburnwa
- If you live in City of Bothell: Tag @BothellWaUSA and include the hashtag #PugetSoundStartsHere
- If you live in City of Lynnwood: Tag @LynnwoodWA and include the hashtag #Lynnwood
- If you live in King County: Tag @KingCountyDNRP and @kingcountywtd

DAY 2

Yard Pollution

Pollution is not just found in our city streets, sidewalks, and parking lots — it can also be found at home. This week we will learn about some of the most common sources of pollution that can be found all around us. To start things off, let's think about pollution that's often found very close to home: the chemicals we use in our yards!

People love to have gardens that are full of flowers, fruits, vegetables, and more. However, gardening can be quite a challenge; you have to be able to protect the plants you care about while also providing them with essential **nutrients** so that they can grow. To help with these problems, people use many different products and items that contain chemicals. While this may be beneficial to plant growth, these items can cause some very serious problems when the rain falls and washes them away with the stormwater. Today we will investigate three common sources of pollution in our yards and gardens, exploring exactly what can go wrong when they make their way into our water.



The first source of pollution that we will discuss is **fertilizer**. Fertilizer is like food for plants as it provides nutrients to the soil, letting plants absorb exactly what they need in order to grow strong and resilient. When there is too much fertilizer, the rain can wash it away, which causes problems in local lakes and rivers. One of the biggest issues that can arise in this situation is **eutrophication**, which is when nutrients build up in a body of water and cause aquatic plants there to grow out of control. All of that extra fertilizer starts to feed microscopic plants called **algae** in the water, creating an **algal bloom** that can grow so thick that it covers the surface of a pond. Not only does this prevent any other plants from growing, but it can also deplete the oxygen levels in the water and harm animals like salmon as well.



Another kind of pollution from our yards are **pesticides**, or insect-killers. These are products that either kill insects or keep them away from your plants. These pesticides do not target just one specific insect that eats garden plants, but instead are harmful to almost every insect that comes across them. This means that when pesticides wash away with stormwater and are sent to local streams and ponds, they continue to kill insects in those ecosystems, too. While gardeners might not appreciate having many insects around, salmon absolutely love them! Without insects in the water to provide food, many salmon and other aquatic creatures could suffer or starve. In addition, pesticides are harmful to beneficial insects like bees and butterflies, which help to pollinate plants both in the garden and in ecosystems.



Finally, there are **herbicides**, or weed-killers. This is what people use to get rid of plants that they don't want in their yard. Just like pesticides, most herbicides can harm other plants around the weeds being targeted. When herbicides join with stormwater runoff and enter local waterways, they can be dangerous for both plants and animals living in the water. Both pesticides and herbicides can build up and accumulate in the bodies of aquatic animals, causing contamination for all kinds of creatures throughout the food chain.



Vocabulary

Algae: Small plant organisms

Algal bloom: A rapid growth of algae in a body of water

Decompose: To break down

Eutrophication: The process by which nutrients build up in a body of water

Fertilizer: A substance that adds nutrients to the soil; plant food

Nutrient: A substance that is necessary for life to grow

Pesticides: Substances used to kill bugs

Herbicides: Substances used to kill weeds or other plants

Organic: Material that comes from a living thing, like plants or animals

Main Activity

Improving Your Garden

There are lots of ways to work in the garden without creating problematic pollution in our stormwater. Instead of using harmful chemical fertilizers, there are a number of **organic** alternatives (i.e. made from natural materials) to provide nutrients to the soil. Can you care for your plants while keeping water clean?

Materials: Writing utensil, colored pencils (optional)

In this activity, you will be presented with several soil samples, with each one in need of certain nutrients. On the next page you will find information on several different kinds of organic fertilizers that people can use, showing exactly which nutrients each one can provide. In each of the scenarios that follow, use the information provided in order to help the gardener.

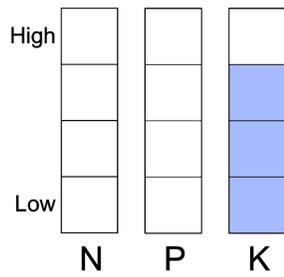
Fertilizers are measured by the amount of Nitrogen, Phosphorous, and Potassium that they contain. Each one of these nutrients is important for plants in their own way:

- **Nitrogen (N)** — Promotes leaf growth, keeping plants green and lush
- **Phosphorus (P)** — Promotes growth of roots, flowers, and fruit
- **Potassium (K)** — Promotes overall plant health

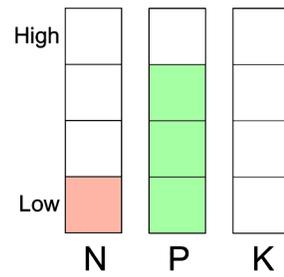
Organic Fertilizers

(Detailed nutrient info on next page)

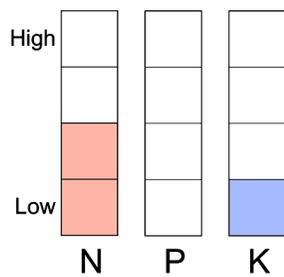
1. **Grass clippings:** These add extra nitrogen back to the soil, as well as keeping the soil moist and covered.
2. **Compost:** A well-balanced source of nutrients for the soil, although the exact levels of nutrients can vary depending on what people put in the compost. It is also useful for keeping soil moist and saving water.
3. **Coffee grounds:** A good source of nitrogen as well as potassium, but too much can be harmful to certain plants.
4. **Banana peels:** Adds potassium, but takes a long time to break down. Make sure it is buried in the soil or chopped into small pieces.
5. **Wood ashes:** Can be collected from a fireplace or outdoor fire pit. It is a good source of potassium, but too much can be harmful to certain plants.
6. **Fish fertilizer:** Made from fish, this adds nitrogen as well as small amounts of other nutrients.
7. **Bone meal:** This is a product made from ground up animal bones, usually from cattle or fish. It is rich in phosphorus.
8. **Worm castings:** The waste gathered from worms eating organic material in the soil. Good for a quick boost of various nutrients.



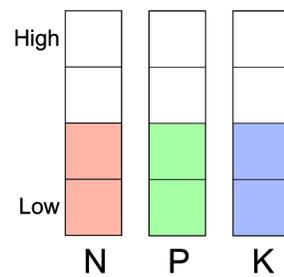
Banana Peels



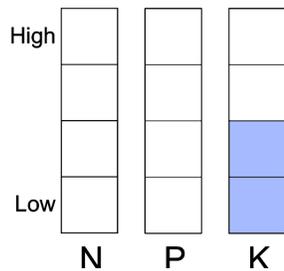
Bone Meal



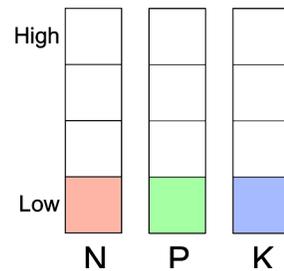
Coffee Grounds



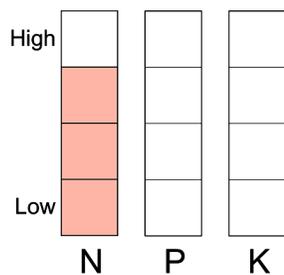
Compost



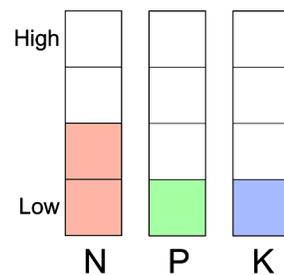
Wood Ash



Worm Castings



Grass Clippings



Fish Fertilizer

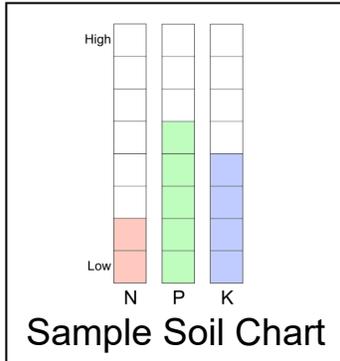
How to fill in your soil charts:

Using the information about the nutrient levels in each of the organic fertilizers, see if you can figure out a perfect combination to help each gardener make their soil ideal for their plants.

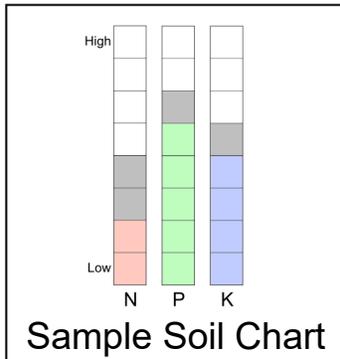
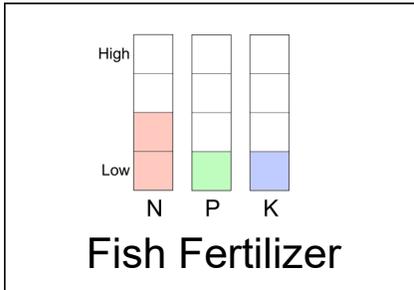
For each scenario, choose one or more natural fertilizers to use and add those nutrients to your soil chart. **You may only use each kind of fertilizer once for each soil sample.**

Let's look at an example:

Your soil starts with:
 2 levels of Nitrogen (N)
 5 levels of Phosphorus (P)
 4 levels of Potassium (K)



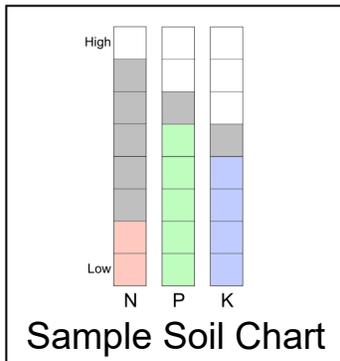
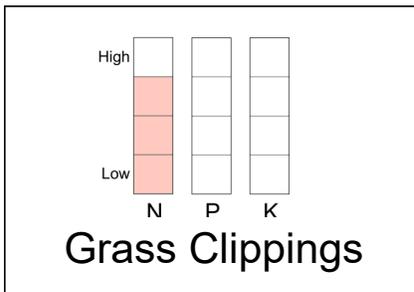
You then add Fish Fertilizer...



Add the nutrients from the Fish Fertilizer. You now have:

4 levels of Nitrogen (2+2)
 6 levels of Phosphorus (5+1)
 5 levels of Potassium (4+1)

...and Grass Clippings:



Add the nutrients from the Grass Clippings. You now have:

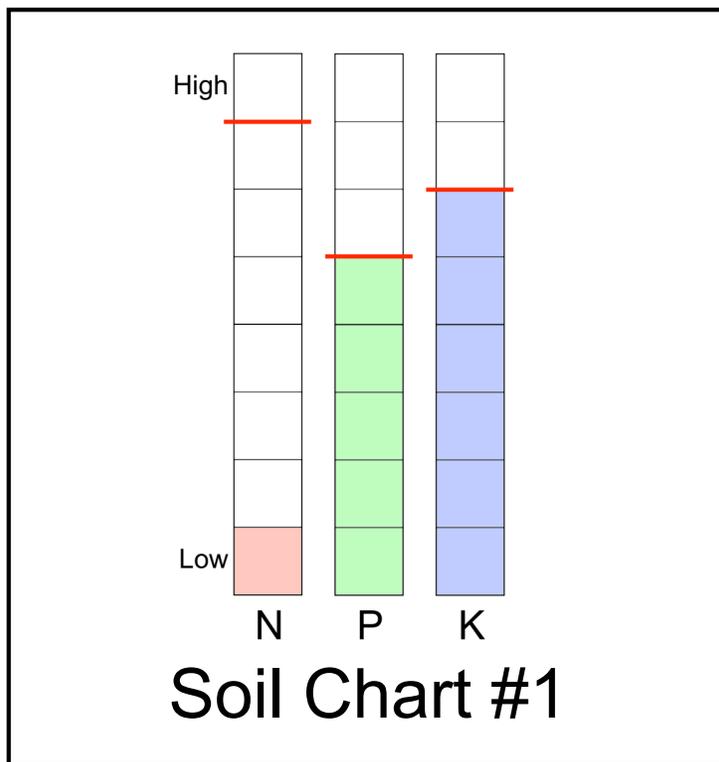
7 levels of Nitrogen (2+2+3)
 6 levels of Phosphorus (5+1+0)
 5 levels of Potassium (4+1+0)

IMPORTANT NOTE!

You will see a red line for every nutrient in your soil chart. This is your target amount. Whenever possible, try to reach this line without going over. If necessary, however, you may go above it.

Soil Sample #1:

This gardener wants to keep their grass green and thick. Their soil is high in Phosphorus (P) and Potassium (K), but low in the Nitrogen (N) that the grass needs. Give them some ideas for increasing the Nitrogen (N) levels in the soil.



Which fertilizers did you add? List them here:

- 1.
- 2.
- 3.
- 4.
- 5.

Did any of your nutrients rise above the red lines? Which ones, and how much extra was there?

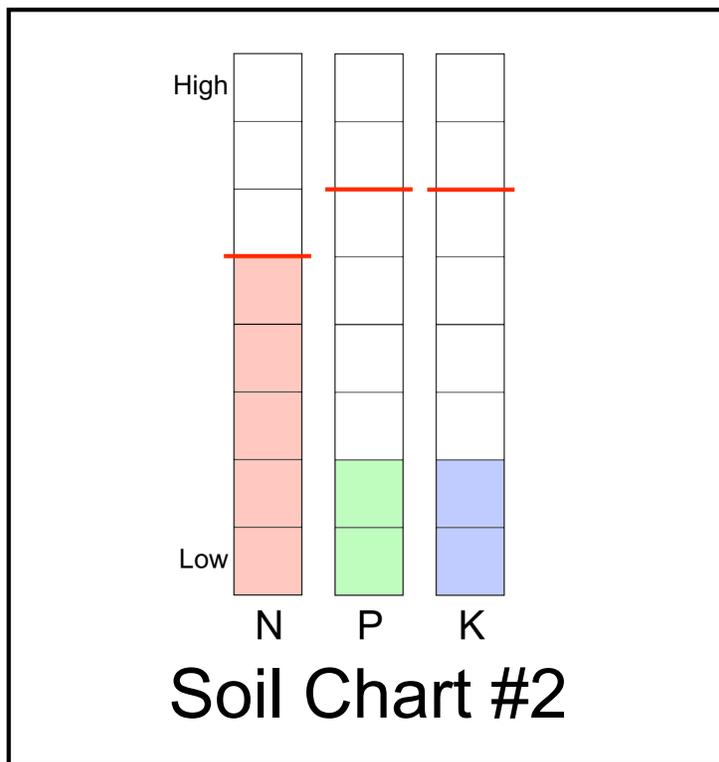
N:

P:

K:

Soil Sample #2:

A new gardener has come by, looking for help with their strawberry patch. Their soil is high in Nitrogen (N), but low in Potassium (K) and Phosphorous (P). Help this gardener increase the potassium and phosphorus levels so that they can enjoy some delicious, juicy strawberries.



Which fertilizers did you add? List them here:

- 1.
- 2.
- 3.
- 4.
- 5.

Did any of your nutrients rise above the red lines? Which ones, and how much extra was there?

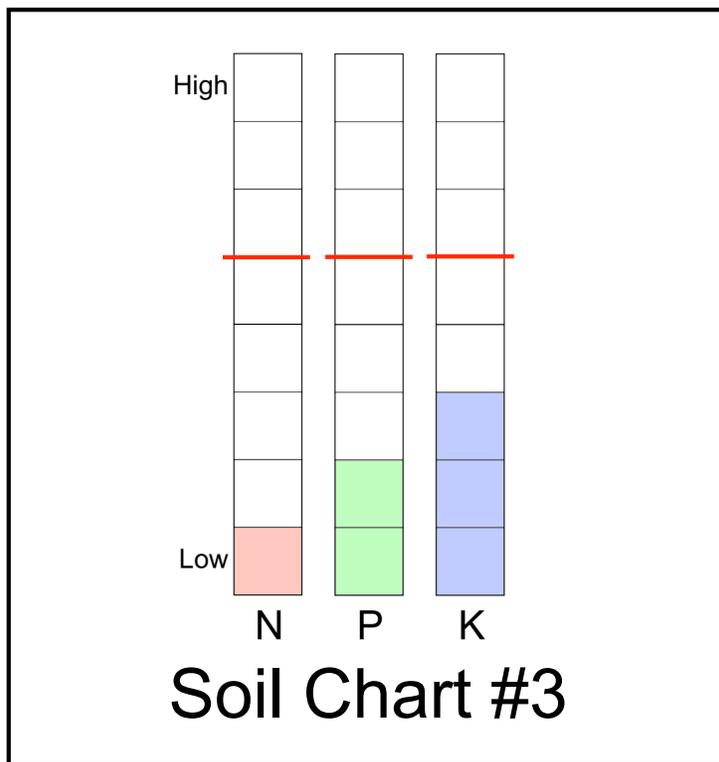
N:

P:

K:

Soil Sample #3:

Another gardener needs your help! They dream of having a massive garden, full of all different kinds of fruits, vegetables, herbs, and flowers. They are going to need an even mixture of nutrients in their soil. How can this gardener achieve a well-balanced, nutrient-rich soil?



Which fertilizers did you add? List them here:

- 1.
- 2.
- 3.
- 4.
- 5.

Did any of your nutrients rise above the red lines? Which ones, and how much extra was there?

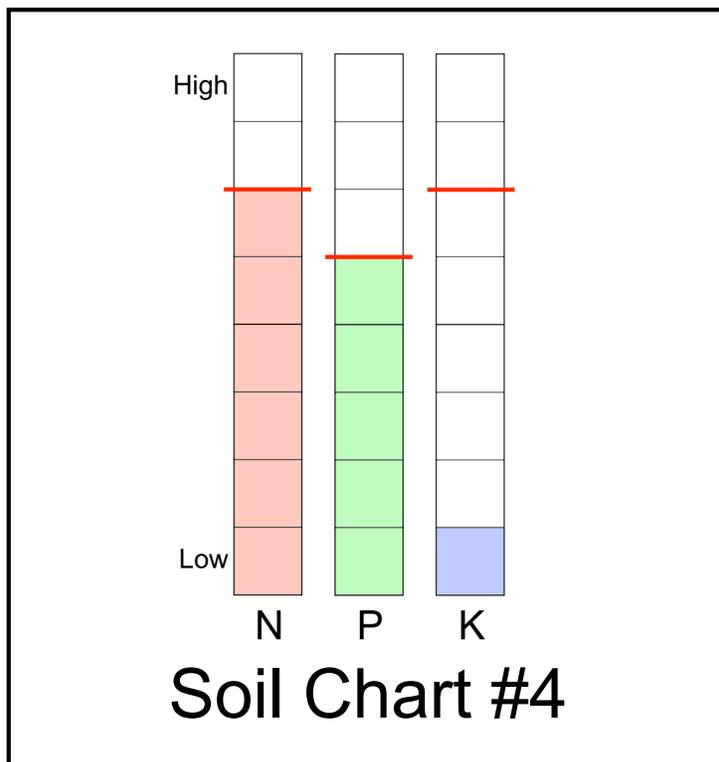
N:

P:

K:

Soil Sample #4:

This next gardener has some very uneven nutrient levels in their soil. The levels of Nitrogen (N) and Phosphorus (P) are high, but there is almost no Potassium (K) at all! What can they do to increase their Potassium levels without adding too much of any other nutrient?



Which fertilizers did you add? List them here:

- 1.
- 2.
- 3.
- 4.
- 5.

Did any of your nutrients rise above the red lines? Which ones, and how much extra was there?

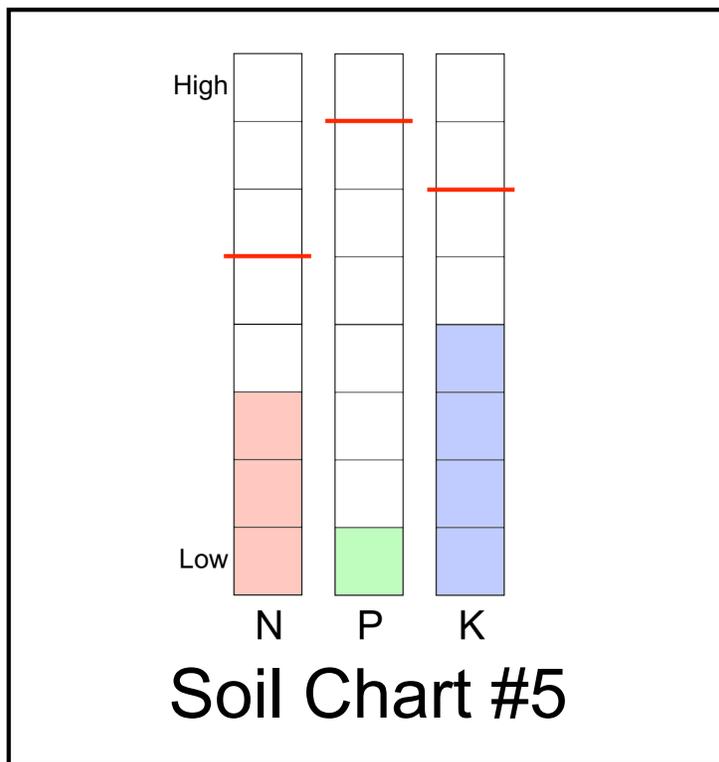
N:

P:

K:

Soil Sample #5

Our final gardener wants to grow award-winning flowers. Their soil already has a decent amount of Nitrogen (N) and Potassium (K), but it is going to need a lot of extra Phosphorous (P). Help this gardener find a way to grow the flowers that they want in their yard.



Soil Chart #5

Which fertilizers did you add? List them here:

- 1.
- 2.
- 3.
- 4.
- 5.

Did any of your nutrients rise above the red lines? Which ones, and how much extra was there?

N:

P:

K:

FINAL:

Go back to your completed soil charts for each sample and look at the red target lines. How many times did you go over the target? Count them here, adding up all of the extra from all 5 soils:

N:

P:

K:

Even with organic fertilizers, it is still possible to use too much! All of these gardeners live in the same area, meaning that their stormwater is all being sent to the same local pond. Add together all of the extra nutrients that you added to the soil (N+P+K), and write the total here:

- ⇒ If the total is less than 8, congratulations! You prevented too many extra nutrients from washing into your local waterways.
- ⇒ If the total is between 8 and 12, watch out! All of that extra fertilizer is ending up in local ponds and streams, possibly harming the plants and animals that live there.
- ⇒ If the total is more than 12, then we have created a lot of pollution! See if there is anywhere you can go back and make a change to help prevent all of these extra nutrients from washing away when it rains.

Optional Activity

Build a Compost Bin

One of the best ways to care for your garden while also protecting our water is by using compost! Compost is simply a pile of organic matter (i.e. matter that came from living things) that breaks down and **decomposes**. When added to garden soil, it is an excellent fertilizer that provides nutrients without creating excess pollution. On top of that, it can help you save water and create less garbage! Let's take a look at how to build a compost bin at home.

Materials: Writing utensil, optional materials below:

- Large plastic bucket (5 gallons is a good size)
- Plastic storage bin (Larger than 50 quarts is ideal)
- Drill
- Large cardboard box

IMPORTANT! Before building anything at home, make sure that you have adult supervision and permission. If you are unable to construct your own compost bin, simply read through these instructions and draw a diagram of one on the next page.

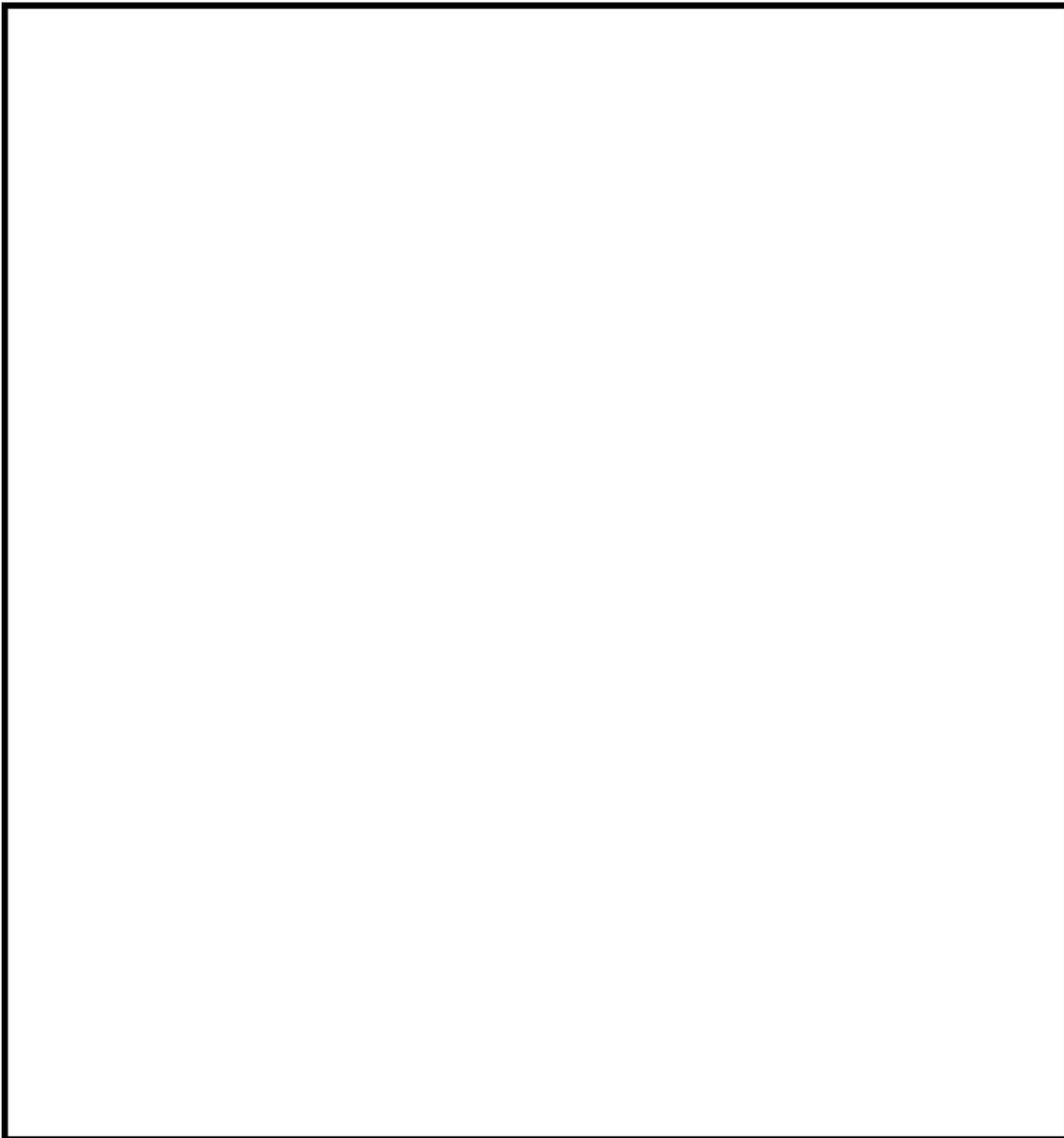
The main idea of compost is to recycle organic materials rather than throwing them out and letting them go to waste. Plants need time to decompose, however, so you will have to build something to hold them while they break down. You can make a compost bin out of almost any large container. Here are a few ideas:

- Find a spot outdoors for your compost bin, preferably in the shade (your compost will dry out if left open in the sun). The compost needs to be on top of a pervious surface like soil so it can drain.
- Find a large container, such as:
 - Large plastic bucket (5-gallon is a good size)
 - Plastic storage bin (Larger than 50 quarts is ideal)
 - Large cardboard box
- Drill several small holes in the bottom of the container – your compost will need drainage
- Drill several small holes in the lid – your compost will need air flow from above
- Place several small sticks in the bottom of the container (you don't want your compost to plug up all of the holes on the bottom of the bin)
- On top of the sticks, place 6-10 inches of damp leaves and an inch or two of soil. You can also use damp torn newspaper if you do not have enough leaves. Add water to your bucket, add leaves, take them out, and wring them out. Fluff them back into the bin.
 - NOTE: If you add too much water, your compost might start to smell!
- Now you can mix in any food scraps you find! Always bury them in with the leaves.
 - NOTE: Do not add meat, dairy, or bread products to a small-scale compost bin like this. These items will stink and attract rodents.
- Remember to keep your compost moist at all times, and stir the contents at least once a week. Eventually, your food scraps will break down and you can spread your compost in a thin layer on top of your garden soil to make it healthier!

If you are unable to build your own version, you can still make a plan to show how a compost bin should be assembled. If you are going to build your own bin, it is even more important to visualize and plan out your project! In the space below, draw and label a proper compost bin.

Make sure to include information about the following:

- The size and shape of the container
- Holes for drainage and air flow
- Contents and layers within the compost bin
- Water content
- What kind of food scraps you will add



Optional Activity

Stormwater Stewardship Challenge for Day 2

A comic strip is an entertaining way to share a narrative when words alone are not enough. A comic strip is divided into squares to communicate pieces of a story. There can be multiple squares in a comic strip, each one portraying illustrations, characters, and captions to depict specific events.

Materials: Writing utensil, coloring materials, computer/phone/tablet, internet connection, paper (optional)

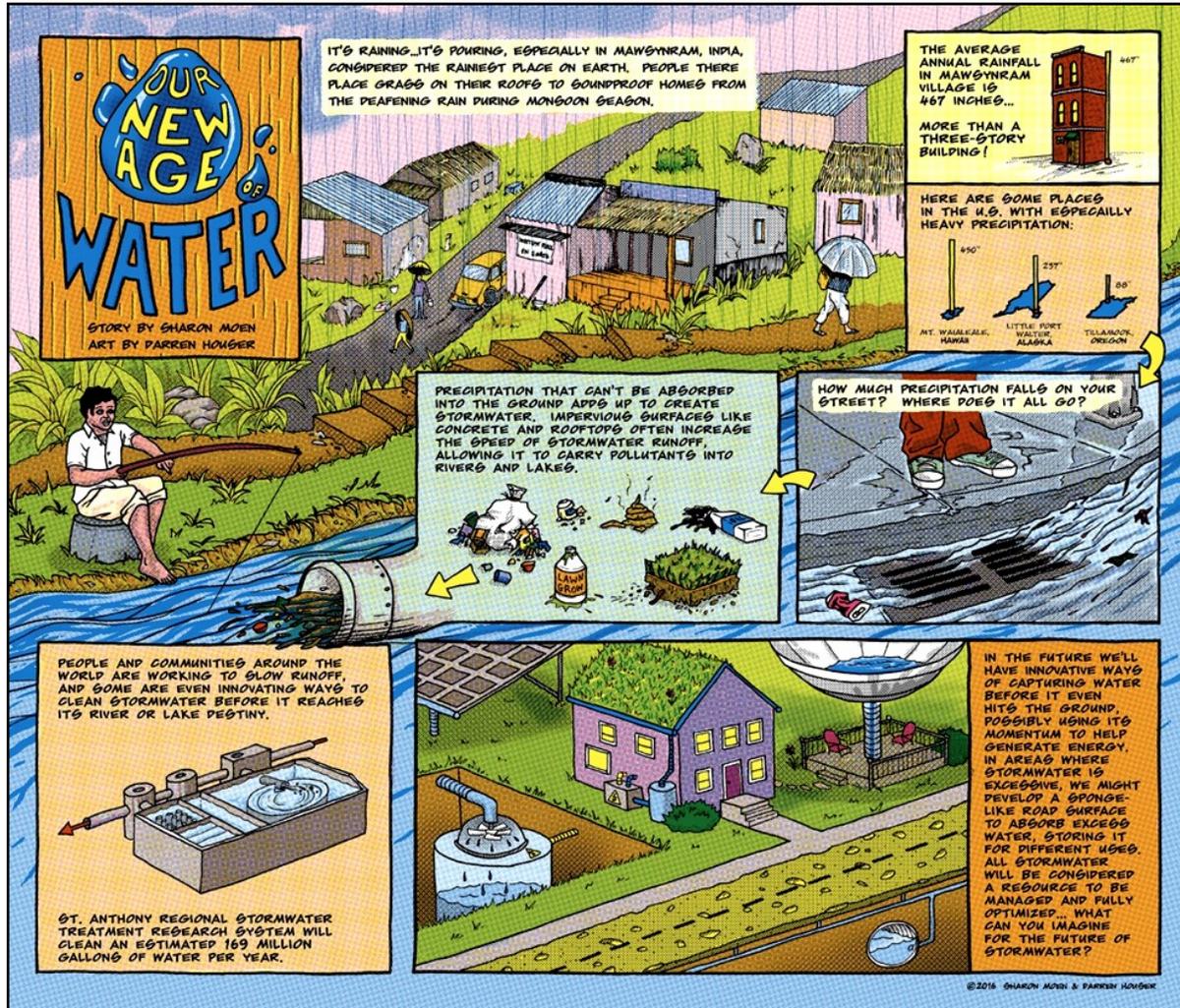
Write a story about storm drains and the stormwater pollution problem and turn it into an entertaining comic strip! The comic strip should include character illustrations and words describing the story events.

Create your own comic strip in the boxes below! Things to consider for your comic strip:

- Who or what are your main characters?
- Where is your setting?
- What will be your main storyline?
- How will you creatively bring humor into this serious topic?

There is also an example on the next page!

Example of a comic strip about stormwater runoff pollution and storm drains:



Source: NOAA

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 tag @naturevisionorg in your post! Do you live in Auburn, Bothell, Lynnwood, or King County? Use the hashtags and tag the city or county group below. They want to see all the work you are doing to keep our water clean!

- If you live in City of Auburn: Tag @auburnwa and include the hashtag #auburnwa
- If you live in City of Bothell: Tag @BothellWaUSA and include the hashtag #PugetSoundStartsHere
- If you live in City of Lynnwood: Tag @LynnwoodWA and include the hashtag #Lynnwood
- If you live in King County: Tag @KingCountyDNRP and @kingcountywtd

DAY 3

Car and Machine Pollution

Cars and other machines are the cause of much of the stormwater pollution in the Puget Sound region. These pollutants can come from leaked engine fluids, copper wear from brake pads, and improperly washed cars.

There are three main ways cars contribute to stormwater pollution:

1. Roads

- Building and maintaining roads has a variety of influences on the water quality in the Puget Sound region, from soil erosion during construction, to polluted stormwater runoff. The biggest impact is the creation of impervious surfaces that water cannot soak through. The more impervious surfaces there are, the more polluted runoff there is entering our wetlands and streams. Many cities also need to put treatments on the roads in the winter to prevent ice build-up, such as de-icer or rock salt. Although they are necessary for human safety, these treatments can harm the soil structure and affect the water quality when they wash down the storm drains.



2. Fluid leaks and copper brake pads

- Cars require a lot of different resources to function. Various fluids such as oil, gasoline, and antifreeze can leak out of the engine and onto the road, contributing to non-point source stormwater pollution. There is an estimated 7 million quarts of motor oil leaked into the Puget Sound region every year! These fluids can harm the wildlife and habitat that live in our area. When the rain comes, it washes this polluted stormwater runoff into the storm drain and directly into our streams, rivers, lakes, and oceans.
- Copper is another significant pollutant in the Puget Sound. Copper is commonly used in brake pads on cars, but when those brake pads wear down, the copper is deposited on the roadway and washed away with the stormwater. Copper affects our salmon by interfering with their sense of smell, making it difficult for them to return to their spawning grounds. Copper brake pad dust accounts for more than half the copper entering Puget Sound! New legislation is creating laws that limit the amount of copper used in brake pads. By 2025 new brake pads will contain less than .5% copper.

3. Car Washing

- Improperly washed cars are another example of non-point source stormwater pollution. The dirty water from cleaning the car can contain soap, oil, gas, metals from the wear and tear of the car and brake pads, and residue from the road. If the car is washed on an impervious surface such as a driveway or the street, the dirty water is rinsed down the storm drain and straight into our waterways!
- Soap is especially impactful to plants and animals. In plants, the soap can wash away the waxy layer plants need to retain water, causing dehydration and death. This can have wider effects on the wetlands that absorb excess stormwater. In animals, soap can strip away the protective layers and natural oils that many animals have on their skin and fur, making it difficult for them to repel water and stay warm. This can cause illness and even death. Biodegradable soap can also be harmful as it does not completely break down in the water. Biodegradable products break down best in soil. The use of biodegradable soap still allows for the various toxic car materials to wash off and become stormwater runoff.



Stormwater pollution from our cars and roadways has a large effect on our water quality. When our waterways are contaminated, this impacts the survival of many animals. Our waterways are vital ecosystems. If one species is disturbed, others are affected as well. For example, Pacific salmon are directly impacted from the contents of stormwater pollution in their spawning streams. These die-offs of salmon not only hurt the population growth of the salmon species, but it will also impact the orca whales and seals that rely on the salmon as a main food source.

We can work together to decrease this stormwater pollution by fixing leaks in cars, using a commercial car wash, self-service car wash bay, or washing your car on a pervious surface, and coming up with environmentally friendly ways to build and maintain our roadways. When it's time to replace the brake pads on your adult's car, suggest using ones that contain little or no amounts of copper in them. If you don't use a car, even better!

Vocabulary

Erosion: The gradual destruction of a substance

Main Activity

Oil Spill Clean Up

Cars and other machines require oil to keep their parts moving smoothly. Oil comes from the ground and needs special equipment to access it. Sometimes there are oil spills, which can cause devastation to the environment. Oil will stick to the fur and feathers of animals, affecting their natural ability to keep themselves warm, or coat their gills and inhibit their ability to breathe. Oil is poisonous, and when it is in our waters, most aquatic life has no choice but to live in the contaminated water.

When oil spills happen in our lakes and oceans, it's important to clean them up as soon as possible. While oil and water are both liquids, they do not mix together. This can make cleanup difficult as oil floats on top of the water, spreading quickly and becoming difficult to contain in many cleanup measures. When oil spills happen, humans can help clean them up using different tools. In this experiment, we will test and compare 2 common ways to clean oil spills: the *Scooping Method* and the *Soaking Method*.

Materials: 2 bowls (the size of a cereal bowl), 1/3 cup oil, 1 cup water, food coloring (a dark color like blue or green is best), spoon, 3-5 cotton balls (an old towel or other absorbent material will also work), dish soap

Please ask an adult for permission first to gather materials/go outdoors and for a place to do this activity. A great place to do this activity would be right outside your home with an adult since you are working with water and other materials that can spill. Neither a bathtub nor sink are good places as the drains can clog from the materials. DO NOT drink anything.

Oil and water do not mix together. We will use examples of two tools to try and remove the oil from the water.

1. Scooping Method

- Step 1: Mix some food coloring with your water in a bowl
- Step 2: Pour the oil into the colored water, see how it floats on the top of the water
- Step 3: Use the spoon and carefully start to scoop out the oil into the other empty bowl. Make sure you don't get any water in there! Once all the oil is removed, write down your observations in the table below. Pour the scooped oil back into the water bowl.

2. Soaking Method

- Step 1: Use cotton ball to soak up the oil, again being careful to not soak up the water. Squeeze oil out over the second bowl. When all the oil is removed, write down your observations in the table below. Pour the soaked oil back into the water bowl (adding more oil if needed). With an adult, carefully dispose of the soaked cotton balls by placing them in the trash.

Using hot water, mix the oil and water with soap to help break down the oil so it does not clog your sink drain, or pour your liquids outside onto soil or grass.

Observations

Scooping Method	
Soaking Method	

Conclusion: Which method was easier?

Can you come up with another way to clean up the spill?

Another common method of cleaning oil spills is using *dispersants*. Dispersants are chemicals, such as soap, that break oil down in to smaller pieces to help it biodegrade easier. You used the *dispersant method* when cleaning up the experiment above. What are the pros and cons of using the dispersant method compared to the physical methods of *scooping* and *soaking*?

Pros:

Cons:

What can we do to prevent oil spills in our region and others in the first place?

Optional Activity

Pollution Solutions

You now know of many types of pollutants that are commonly found on impervious surfaces. We will now brainstorm some solutions to common ones you find in your neighborhood.

Materials: Writing utensil

Think of 5 different pollutants you see on impervious surfaces in your neighborhood. Write them in the table below and think of possible solutions to reduce that type of pollution in your neighborhood.

Pollutant	Possible Solution
1.	
2.	
3.	
4.	
5.	

Optional Activity

Stormwater Stewardship Challenge for Day 3

Stewardship, which we'll talk more about on Day 5, can take on many different forms. Helping others to understand why certain issues matter and what role each of us plays in them is a practice of stewardship as old as humanity. Today we have powerful tools like phones, print media, and the internet that allow us to broadcast ideas worldwide in seconds. Historically, methods were much simpler. Looking back throughout human history, members of the community taught one another and created cultural norms and guidelines through stories. Every culture in humanity has relied on the passing down of oral traditions in the form of tall tales, fables, and myths that teach of that culture's customs and morality.

Materials: Writing utensil

Using what you have learned about stormwater and pollution so far, write a short fable on the following page to teach others about something they can do to help protect our waterways. Remember, this fable doesn't need to be set in ancient times or look anything like other stories and oral traditions you've heard. Feel free to have fun with this and make it unique and your own! Share your fable with someone else and use the story to help them understand stormwater and how they can help prevent pollution.

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 tag @naturevisionorg in your post! Do you live in Auburn, Bothell, Lynnwood, or King County? Use the hashtags and tag the city or county group below. They want to see all the work you are doing to keep our water clean!

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DAY 4

Animal Waste

All animals, including humans, produce waste or “poop.” This waste is made of excess organic material and nutrients that weren’t used by the body. While humans developed indoor plumbing to get rid of their waste — which then goes to water treatment plants to be cleaned — most animals still go to the bathroom outside. When pet waste is left behind, it washes away with the rain and becomes stormwater runoff pollution. The correct thing to do is to always pick up pet waste with a bag and throw it into the garbage.

Why is some animal waste so harmful to our environment? Since wild animals leave their waste outdoors, many people believe their pets can do the same. The difference is that wild animals eat food that comes directly from the environment they live in. Therefore, when wild animals leave waste, those nutrients are returned back to the same environment. In contrast, most of our pets are fed processed food that is high in nutrients. When dog waste is left on the ground, it introduces new or even excess nutrients to the environment, causing many detrimental effects to our water quality.

In the Puget Sound region, many people have dogs and frequently take them to parks or on hikes. Many owners are responsible and pick up their pet waste, but some do not. When animal waste is not picked up, it stays there until it rains and gets washed into the streams and lakes as polluted stormwater runoff. Pet waste pollution can contaminate our drinking water supply and close down beaches, parks, and other places of recreation.



Animal waste can become stormwater pollution for these two main reasons:

1. **Excess nutrients:** As mentioned above, animal waste is full of extra nutrients and organic material the body did not use, especially in dogs, as we feed them very nutrient-rich foods that they wouldn’t normally eat in the wild. These excess nutrients (e.g. nitrogen and phosphate) can cause algal blooms to form in the water. Algal blooms are the rapid and large growth of algae in a body of water. Algae are small plant organisms that can often be toxic at high levels. A common algal bloom in our area is caused by blue-green algae, which contain toxins that are harmful when ingested. Algal blooms also use a lot of oxygen, decreasing the amount available to aquatic animals and making it hard for those animals to breathe. Local parks like Green Lake and Juanita Beach Park are frequently closed in the summer due to these blue-green algal blooms.

2. **Bacteria and diseases:** Animal waste contains disease causing bacteria, which can be transmitted to humans. *E.coli* is a common example of harmful bacteria found in animals. When pet waste is not picked up, it can be washed away during rainfall, travelling straight into our waterways. Humans can be exposed to these bacteria when swimming, boating, or fishing in contaminated waters, causing severe sickness and even hospitalization. Our pets are also affected by the bacteria and parasites found in animal waste. Some, like roundworm and parvovirus, can live on the ground for months and cause major health issues for our pets.

The best way to make sure animal waste doesn't get into the water is by picking it up with a bag! If you have a dog, always carry poop bags on your walks, and clean up the yard often. The waste should be disposed of in your trash can, never in your compost or yard waste bin.



Vocabulary

Blue-green algae: A common toxic algal bloom found in our area

Main Activity

Poop in the Park Game

Dog waste is a big source of pollution in our area! In Seattle alone, there is estimated to be over 125,000 dogs. In many suburban areas, there are more dogs than children! There are many responsible owners that clean up after their pet, but there also some owners that leave the animal waste behind. Many people think that since the rain will wash it away, it's okay to not pick up their waste. As we learned, animal waste is full of unhealthy bacteria that can harm people and wildlife, as well as making parks and other areas unwelcoming.

Materials: 20 chocolate chips (or other small items: mini marshmallows, beans, pebbles, pieces of paper, etc), pencil, the board game below

Before you start, please ask an adult for permission to gather materials and to eat anything. In this game, you will simulate dog waste at a park by scattering chocolate chips or other small materials across the game board. If the dog waste lands on a shaded area, the waste will be washed away into the water when it rains. It then becomes pollution, either as stormwater runoff through a storm drain, or by directly running off into the nearby body of water.

There are 3 scenarios to work through:

1. No one picks up animal waste
2. The effects of telling a friend what you learned
3. The effects of a citywide outreach effort

Scenario 1: Pollution Problem - Not Picking Up Animal Waste

1. Take all of your chocolate chips and scatter them on the game board below. Make sure your chocolate chips are all on the picture.
2. Count how many chocolate chips landed in the shaded area and the unshaded area and tally them in the table under scenario 1.

Scenario 2: Solution - Tell a Friend

You are at this park and notice someone not scooping their dog's poop. You have just learned how this affects the environment, so you tell them what you know. The person decides to pick up their animal waste and tell a few friends as well.

1. Gather your chocolate chips up. Remove 5 and set them aside.
2. Scatter your remaining chocolate chips on the game board and count how many land in the shaded area and unshaded area, tallying them in the table under scenario 2.

Scenario 3: Solution - Citywide Outreach

The city decided to begin an outreach program to educate park users through flyers, signage, and by marking piles of unscooped poop. They also placed animal waste disposal stations at the park.

1. Gather all your chocolate chips. Remove 15 to represent the success of the outreach program.
2. Scatter all your chocolate chips across the board.
3. Count how many chocolate chips are in the shaded area and unshaded area and tally them in the table under scenario 3.



Scenario 1		Scenario 2		Scenario 3	
<i>Problem: No One Picks Up Animal Waste</i>		<i>Solution: Tell a Friend</i>		<i>Solution: Citywide Outreach</i>	
# in Unshaded Area	# in Shaded Area	# in Unshaded Area	# in Shaded Area	# in Unshaded Area	# in Shaded Area

Which scenario had the **most** poop entering the water as runoff (landed in the shaded area)?

Since our simulation involved some random chance, it's possible neither solution resulted in less poop going into the water. Which scenario would you expect to have the **least** amount of poop entering the water? Why?

The citywide outreach program solution has some examples of real strategies used by cities all over Puget Sound. Can you think of other ideas to solve the problem of pet waste pollution? List them below:

Optional Activity

Poo Haiku

Animal waste can sometimes be an awkward topic to discuss, but it's an important pollution problem to solve in our community. The solution to the pet waste pollution problem is everyone's responsibility! Regardless if you own a dog or not, you are capable of raising awareness on this issue.

Materials: Writing utensil

First, write about a time when you encountered pet waste that was left behind by a pet owner. Think about how it made you feel. What did you do about it or want to do about it? Will you do something about pet waste that is left behind in the park or the trail if you encounter again in the future? Write in the provided space below labeled: "Pet Waste Encounter."

Secondly, you will use your writing response to create a haiku on the following page. A haiku is a short form of Japanese poetry that can only be 17 syllables, traditionally written about the natural world. A haiku is a great form of art and writing to evoke feelings for the environment. A Haiku has three lines, does not rhyme, and follows the structure of: five syllables for the first line, seven syllables for the second line, five syllables for the third line.

An example of a haiku from haiku poet, Matsuo Basho:

*An old silent pond...
A frog jumps into the pond,
splash! Silence again.*

Pet Waste Encounter:

Create your own haiku:

Remember to have three lines and follow the structure of: five syllables for the first line, seven syllables for the second line, five syllables for the third line.

Use the rest of the space to create more haikus, or create your own expression of how you feel about pet waste (write a song, create an illustration, etc.).

Optional Activity

Stormwater Stewardship Challenge for Day 4

Faced with the large-scale issues that we've been learning about this week, it's easy to feel overwhelmed. Every person who learns about these situations has at least one moment where they ask themselves, "What can I really do?" After all, it can be really tough for one person to have a big impact on such large-scale events. While one person may not be able to change the course of climate change, stem the flow of pollution, or save the Puget Sound, there are many people out there who are working together to create positive change. As a community, we can accomplish far more than any individual and there are many opportunities to get involved in these efforts.

Materials: Writing utensil

We've talked a lot about environmental issues facing the Puget Sound region and later you'll have a chance to learn more about how to get involved. Today, we're going to take a step back and see how other regions are dealing with their own issues. There is a lot to be learned from seeing how other communities are dealing with both the unique and shared problems that are facing our various homes. With an adult's help, pick a state other than Washington and visit their Department of Ecology web page. Find one thing that they are doing in their state to manage stormwater and pollution that would benefit us here in Washington as well. Share this idea with at least three other people in person, via phone, or digitally through email or social media.

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 tag @naturevisionorg in your post! Do you live in Auburn, Bothell, Lynnwood, or King County? Use the hashtags and tag the city or county group below. They want to see all the work you are doing to keep our water clean!

- If you live in City of Auburn: Tag @auburnwa and include the hashtag #auburnwa
- If you live in City of Bothell: Tag @BothellWaUSA and include the hashtag #PugetSoundStartsHere
- If you live in City of Lynnwood: Tag @LynnwoodWA and include the hashtag #Lynnwood
- If you live in King County: Tag @KingCountyDNRP and @kingcountywtd

DAY 5

Stewardship

This week we dedicated our learning to the specific types of pollutants that enter our waterways as stormwater runoff. If we prevent the various types of non-point source pollution that remain in our cities, then we can make great strides in pollution prevention. It is important to combine everything we learned about these waterways and the impact of stormwater runoff pollution so we can start to make some positive changes in our communities and our environment. Now it's time to put our knowledge into action and learn about **stewardship!**

Stewardship means taking care of our natural resources. A steward is someone who is responsible for the care of natural resources, like water and the plants and animals that live in our ecosystem. If you accept the responsibility of keeping our waterways and ecosystems clean, you are a steward!

There are many actions you can take to prevent stormwater runoff pollution from going down storm drains and entering our waterways. One of the best ways is to be mindful of our daily tasks, materials we use, and habits. Ask yourself the question: "How can I make sure to not leave behind something on our streets, sidewalks, driveways, and parking lots that can become stormwater runoff pollution?"

Clean water is something that all living things need to survive. We are responsible stewards of our waterways when we work to keep our city and watershed as free of stormwater runoff pollution as possible.

Vocabulary

Stewardship: Taking care of something; being a protector

Main Activity

Best Management Practices

A Best Management Practice (BMP) is a recommended action a person can take as an effective way to prevent non-point source pollution and protect water quality.

Prevention through a specific BMP is the *best* way to ensure clean waterways. Even small amounts of material from human activity can add up to large volumes as it is picked up by stormwater throughout our cities and goes unfiltered into nearby streams, wetlands, and Puget Sound. BMPs vary for different types of stormwater pollution. Many BMPs rely upon individual choices to create a collective significant impact to improving water quality.

Materials: Writing utensil

Earlier this week, you thought about different pollutants you see on impervious surfaces in your neighborhood, and about possible solutions.

In this activity, you will learn about various Best Management Practices for specific types of pollutants that are found in our stormwater. To complete the activity, follow these instructions:

1. Read each issue regarding four common stormwater pollutants and their impact to our watershed's water quality on the next page.
2. Determine the BMP for each stormwater pollutant based on what you have learned.
3. List *at least one* BMP for each stormwater pollutant on the rows labelled "Best Management Practice #1" and "Best Management Practice #2."

Hint: write solutions that prevent each pollutant from being picked up by stormwater and entering storm drains.

Stormwater Pollutant:	Animal Waste	Chemical Fertilizer	Home Car Washes	Car Oil Leaks
Issue:	<p>Pet waste contains disease causing bacteria such as E.coli. These bacteria can make humans and animals sick if they come into contact. The presence of these bacteria in our waterways contaminates water quality and makes the water unhealthy for wildlife.</p>	<p>Fertilizers are harsh chemicals that can harm wildlife and reduce the water quality by allowing for less oxygen absorption. Excess fertilizer running off into storm drains and nearby streams and rivers can also encourage invasive plant or toxic algae growth.</p>	<p>Washing cars at home on the driveway or street introduces soaps into our storm drains. In addition to the soap, the process of washing cars releases oil, metals, and grease into storm drains.</p>	<p>Car oil, grease, antifreeze, and other fluids that can leak from cars are toxic to humans and wildlife. Cars are a main type of transportation for many people and travel to various locations. A leaking car could be spreading fluids everywhere they visit.</p>
Best Management Practice #1:				
Best Management Practice #2:				

Optional Activity

Test Your Car for Leaks

Cars function by using various chemical fluids. Sometimes our cars leak these fluids and can become stormwater runoff pollution. Car fluids are toxic and harmful to water quality. The first step to fixing car leaks is to identify a leak. Car fluids can be identified by observing the color of the leak.

Materials: A car you have permission to test, large sheet of white paper/cardboard box/poster board, computer/phone/tablet, internet connection

With an adult, if you see a spot forming underneath your adult's car and suspect it to be leaking, check the car by following these instructions when the weather is dry:

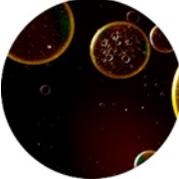
- ⇒ Take a piece of large piece of white paper or a cardboard box and place it on the ground where the car will be parked.
- ⇒ Hold the paper or poster down with rocks on each corner.
- ⇒ Wait overnight.
- ⇒ Check the color of the car fluid leak and compare the color of the fluid to the table on the following pages. Read the description to determine the fluid type. **Leave the paper and poster on the ground. Do not touch the fluid. Remove the rocks so no one drives over them.**
- ⇒ **The adult** needs to put the paper/cardboard box/poster board in a bag in the garbage.

If the leak is any fluid other than water, ask an adult to take the car to a car maintenance shop to fix the car leak. Want to learn how to fix a future car leak or receive a potential free leak check? Visit <https://fixcarleaks.org/> with an adult and find resources on car maintenance!

Don't have a car? Ask a neighbor if you can check their car for leaks and help them find a resource to fix it.

Images and Descriptions Modified from FixCarLeaks.org/Diagnose/

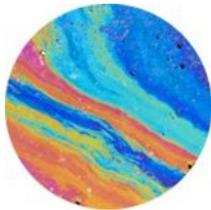
Car Location: Front/Under Engine

Fluid Leak Color	Description
	<p>Engine Oil: "Light brown to black, very greasy and slick; under front half of vehicle. Oil lubricates your engine. Engine oil leaks may hit the ground or burn off. You may notice drips on the ground under your parked car, or the smell of burning oil while driving. Check your engine oil when the engine is cool to get the most accurate reading. Keep your oil in the range shown on the dipstick. Get help from a repair shop if you are frequently low on oil."</p>
	<p>Transmission Fluid: "Reddish and thin, or brown and thick; middle and front of vehicle. Automatic transmissions are lubricated by transmission fluid, while manual transmissions are lubricated by gear oil. Check your owner's manual for vehicle specific information about checking transmission fluid. In general, automatic transmission fluid should be checked while the car is running with the transmission in park or neutral. Gear oil in a manual transmission can only be checked from underneath, with a car on a lift. Fluid leaks from your transmission are important reasons to consult a professional."</p>
	<p>Power Steering Fluid: "Amber, reddish, or light brown and thin; very front of vehicle. Like brake fluid, power steering fluid is a hydraulic fluid that helps boost power to the steering system. Check your power steering fluid level when your car is not running. A leak in power steering fluid could decrease steering function and become a safety hazard. Get low or leaking power steering fluid checked right away."</p>
	<p>Coolant (Anti-Freeze): "Yellow, green, or pink, greasy and slimy; front of vehicle near radiator or under engine. Cars use coolant to keep the engine from overheating. If your car is low on coolant or leaking coolant, you are at risk of overheating, which could ruin your engine and leave you stranded. Never remove your coolant or radiator cap when the engine is hot, as contents are under pressure and can cause extensive burns. Have your cooling system checked by a repair shop if you notice a leak or low fluid."</p>

*Images and Descriptions Modified from FixCarLeaks.org/Diagnose/
Car Location: Near Wheels*

Fluid Leak Color	Description
	<p>Brake Fluid: "Clear to brown, slightly yellow and slick; often appears near a wheel. Brake fluid conveys and amplifies the force of your foot on the brake pedal. Fluid can become low from a leak in the braking system. It is important to get low or leaking brake fluid checked right away, because brake fluid reservoirs are small. Losing even a small amount could impact how well your brakes work."</p>

Car Location: Rear Exhaust

Fluid Leak Color	Description
	<p>Water: "Most cars don't use straight water in the cooling system. If your car has air conditioning, you often see water dripping under the car on hot days."</p>
	<p>Fuel: "Gas is light gold, but will look colorless on the ground. Diesel is mostly clear but may have a bluish tint. Both will look clear when dripped on the ground. Gasoline or diesel powers your car. If you smell or see a fuel leak, get your car to a repair shop right away. Fuel leaks are a safety concern, because they can result in fires. Even though your gas tank is usually located in the rear, fuel leaks can occur pretty much anywhere as fuel lines run from the gas tank to the engine."</p>

Optional Activity

Stormwater Stewardship Challenge for Day 5

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

Materials: (Optional) writing utensil, colored pencils/markers, computer/phone/tablet, internet connection

Using what you've learned this week regarding stormwater pollution, it's time to be 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 tag @naturevisionorg in your post! Do you live in Auburn, Bothell, Lynnwood, or King County? Use the hashtags and tag the city or county group below. They want to see all the work you are doing to keep our water clean!

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ANSWER KEY

Day 1 Main Activity: Why is Non-Point Source Pollution

Why are car oil leaks considered Non-Point source pollution? Explain your reasoning:

Tracking cars with leaks is not feasible at this time as they travel throughout this region and beyond. The cars with leaks can be leaking wherever they travel. Also, this region includes millions of people and that means millions of cars as well. The amount of leaking cars is unknown.

Why are chemical fertilizers considered Non-Point source pollution? Explain your reasoning:

Fertilizers are not only an issue due to their chemical content, but because they are usually used in excess. Residential gardeners can be using more than the recommended amount and that can wash away with the rain as stormwater runoff pollution.

Why is pet waste considered Non-Point source pollution? Explain your reasoning:

The disease causing bacteria is microscopic and cannot be identified to an individual dog. This region is also home to many dogs with owners that may not always have access to a plastic bag on walks and occasionally decide to leave the waste behind.

Why is soap from home car washes considered Non-Point source pollution? Explain your reasoning:

Soaps, metals, and car fluids vary greatly and cannot be pinpointed to one car brand, model, and owner. Anytime a car is washed on the street, driveway, or parking lot it quickly flows into storm drains and becomes part of the greater stormwater pollution makeup.

ANSWER KEY

Day 5 Main Activity: Best Management Practice

Stormwater Pollutant:	Animal Waste	Chemical Fertilizer	Home Car Washes	Car Oil Leaks
Issue:	Pet waste contains disease-causing bacteria such as E.coli and Giardia. These bacteria can make humans and animals sick if they come into contact. The presence of these bacteria in our waterways contaminates water quality and makes the water unhealthy for wildlife.	Fertilizers are harsh chemicals that can harm wildlife and reduce the water quality by allowing for less oxygen absorption. Excess fertilizer running off into storm drains and nearby streams and rivers can also encourage invasive plant or toxic algae growth.	Washing cars at home introduces soaps into our storm drains. In addition to the soap, the process of washing cars on our driveway or street releases oil, metals, and grease from our cars.	Car oil, grease, antifreeze, and other fluids that can leak from cars are toxic to humans and wildlife. Cars are a main type of transportation for many families and travels to various locations. A leaking car could be spreading fluids everywhere they visit.
Best Management Practice #1:	<i>Pick up pet waste immediately with a plastic bag and throw away into trash.</i>	<i>Use less chemical fertilizers on your yard, gardens, and plants.</i>	<i>Take your car to a commercial wash where the used soapy water is recycled and released into the wastewater system and not into storm drains.</i>	<i>Fix car leaks as soon as possible by telling an adult if a leak spot is detected.</i>
Best Management Practice #2:	N/A	<i>Use compost as a natural fertilizer.</i>	<i>Wash cars on lawn or gravel at home. The lawn or gravel absorbs the water used to wash the car and prevents many of the chemicals from flowing into storm drains.</i>	<i>Test for car leaks with an adult. Place a large sheet of white paper underneath your car and use this color sheet at fixcarleaks.org/diagnose/ to determine the type of leak fluid.</i>