TEACHER OVERVIEW

Human Systems
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/Home
- 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 with an introduction to the difference between stormwater and wastewater and the effects of a combined sewer system. Students will learn how impervious and pervious surfaces affect the environment. Next, they will study wastewater more in depth and learn how used water is cleaned at the wastewater treatment plant. The week will end with activities on building green infrastructure to keep our waterways clean.

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-LS2-1, MS-LS2-5, MS-ESS3-3, MS-ESS3-4.

Grades 6-8
Day 1 - Stormwater vs. Wastewater
Day 2 - Permeable and Impermeable Surfaces
Day 3 - What is Wastewater?
Day 4 - Wastewater Treatment
Day 5 - Green Stormwater Infrastructure

Stay connected with Nature Vision! Follow us for updates @naturevision.org

PARENT/CAREGIVER OVERVIEW

Human Systems
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.

PARENT/CAREGIVER OVERVIEW: DAY 1

Stormwater vs. Wastewater

Background Information: Stormwater and wastewater play an important role in the health of our environment. When rainstorms bring excess rain to our area, storm drains remove the extra water and send it to wetlands, stormwater retention ponds, or straight into a body of water. This water is not cleaned or treated, unlike wastewater. Wastewater is what we call the used water that comes from the buildings we live and work in and is directed to wastewater treatment plants to be cleaned and filtered. After this process, it is released back into Puget Sound. In most places, storm drains and wastewater drains are separate, but some older cities in Washington have combined sewer systems where both stormwater and wastewater are treated. This causes problems during large rainstorms as the excess water in the sewer system can overflow straight into Puget Sound. Cities and counties are coming up with new solutions every day to prevent these overflows, but we can help too! It's important to make sure that only rain goes down the storm drain. Pollution or other materials on our roads and sidewalks can enter our waterways by way of the storm drains and affect the health of the plants and animals that live there.

Learning Objectives: Students will learn the difference between stormwater and wastewater. They will also learn about combined sewer systems where stormwater and wastewater are treated together, and the effects that can have on our environment.

Main Activity: Combined Sewer Overflow Solutions

- ***Overview****:* Students learn about combined sewer overflow solutions and choose one solution to promote in their community
- ***Parent/Caregiver Tasks****:* None

Optional Activity: Video

- ***Overview****:* Students watch a video from The Nature Conservancy in Washington and answer a few questions
- ***Parent/Caregiver Tasks****:* Help accessing the internet and provide 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: DAY 2

Permeable and Impermeable Surfaces

Background Information: Human-made objects have a significant impact on the flow and movement of water through different environments. In a natural area like a forest, the soil is permeable and therefore able to absorb water as it falls and flows. In cities and other paved areas, the ground is usually impermeable and water flows over the surface instead. This can result in flooding as well as the spreading of pollution.

Learning Objectives: Students will understand the difference between permeable and impermeable surfaces, finding examples of each in both developed and natural areas. They will learn how these surfaces affect the movement of stormwater and potentially pollution as well.

Main Activity: Neighborhood Mapping

- ***Overview****:* Students create a map of their own neighborhood — showing the spaces covered by both permeable and impermeable surfaces — to calculate the percentage covered by each kind of surface and answer questions about the impact that might have
- ***Parent/Caregiver Tasks****:* Provide supervision if exploring outside

Optional Activity: Testing Impermeable Surfaces

- ***Overview****:* Students conduct a simple experiment to see how permeable surfaces (e.g. a sponge) can help hold and potentially filter water
- ***Parent/Caregiver Tasks****:* Assist with gathering materials and provide supervision if conducting the experiment outside

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

What is Wastewater?

Background Information: Wastewater is the product of used water in our homes and other buildings. Water used for showering, bathing, flushing the toilet, doing laundry, washing dishes, and using a faucet becomes wastewater once the water flows down the drain. Wastewater is mainly water, but it also contains a small percentage of nutrients from human waste, FOG (i.e. fats, oils, grease), bacteria, viruses, and other chemicals found in household products. In most cases in our region, wastewater is sent to a wastewater treatment plant to be treated and disinfected before being released into Puget Sound.

Learning Objectives: Students will understand what daily habits and appliance use results in creating wastewater. They will be able to identify wastewater components and also what should not be found in wastewater. Students will discover the household items that are damaging to the wastewater systems and learn to refrain from flushing certain items down the toilets and drains.

Main Activity: What Not to Flush

- ***Overview****:* Students follow a procedure and answer questions to identify common household items that are allowed and are not allowed to be flushed down the toilet safely
- ***Parent/Caregiver Tasks****:* Provide permission, supervision, and adequate space for students to complete the procedure

Optional Activity: Wastewater Greenwashing

- ***Overview****:* Students write a letter, email, or message to companies that produce "flushable wipes" to encourage the companies to cease the greenwashing or to properly label their wipes
- ***Parent/Caregiver Tasks****:* Provide 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: DAY 4

Wastewater Treatment

Background Information: Wastewater flows to five treatment plants in King County. Wastewater is sent through a series of processes that require primary, secondary, and disinfection treatments. The primary treatment moves the wastewater slowly through sedimentation tanks. This step gives the heavier solids the time to sink to the bottom of the tank and allows for separation from the liquid. The solid is scooped out before the liquids move on to secondary treatment. Oxygen is then added to stimulate the living microorganisms that will eat the remaining organic material in the wastewater. The final treatment is disinfection of the wastewater and release into Puget Sound.

Learning Objectives: Students will learn the basic and necessary steps for wastewater treatment in King County. Students will discover that wastewater is returned to the natural environment, Puget Sound, and therefore it is important we ensure its careful treatment.

Main Activity: Model of the Primary Treatment

- ***Overview****:* Students design a model of the primary wastewater treatment process and have the option to test out their model, if desired
- ***Parent/Caregiver Tasks****:* Provide permission, supervision, and adequate space for students to complete the procedure

Optional Activity: Personal Products

- ***Overview****:* Students consider natural alternatives to personal products that typically contain chemicals harmful for Puget Sound and learn to check their product's ingredient list for harmful plastic, such as microbeads
- ***Parent/Caregiver Tasks****:* Provide permission, supervision, and adequate space for students to complete the procedure

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

Green Stormwater Infrastructure

Background Information: Stewardship means taking care of something or being a protector. In the case of stormwater, there are many projects and ideas that people can build to help handle issues that arise. We can use rain barrels to collect water, install green roofs and rain gardens to absorb and slow down flowing water, or even create permeable pavement that allows water to pass through it. These are just a few of the ideas that people have come up with to help control the flow of stormwater and pollution through our cities and towns.

Learning Objectives: Students will be able to identify some of the most common stormwater projects. They will understand what services these projects provide and will be able to spot them in their own neighborhoods.

Main Activity: City Planning

- ***Overview****:* Students take on the role of a city planner and incorporate green stormwater infrastructure into neighborhood designs
- ***Parent/Caregiver Tasks****:* None

Optional Activity: Researching GSI

- ***Overview****:* Students can explore online resources focused on green stormwater infrastructure by looking through informational handbooks, interactive maps, and more
- ***Parent/Caregiver Tasks:*** Provide supervision and assistance while student is online

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
Combined sewer overflows (CSOs): The result of heavy rains overwhelming the combined sewer system and exiting the pipes through an outflow pipe
Combined sewer systems: The combination of wastewater and stormwater drainage systems
Outflow: The relief point in a combined sewer system where water can exit in times of high flow

DAY 2
Impermeable: A word that describes anything that does not let water pass through it
Permeable: A word that describes anything that lets water pass through it

DAY 3
Wastewater: The water that has been used in homes, businesses, or buildings

DAY 4
Disinfection: The process of cleaning something to destroy bacteria
Organic: Related to or derived from something living or once living
Wastewater Treatment Plant: A facility where wastewater is sent to be treated and cleaned

DAY 5
Green stormwater infrastructure: Environmentally-friendly projects that help control, contain, or clean stormwater
Green roof: A garden or lawn that is planted on a rooftop
Permeable pavement: Pavement that is designed to let water pass through it
Rain barrel: A large container used to collect rainwater
Rain garden: A specially designed garden that helps soak up stormwater and prevent flooding
Stewardship: Taking care of something; being a protector
Wetland: An area in nature that is consistently wet and saturated with water

DAY 1

Stormwater vs. Wastewater

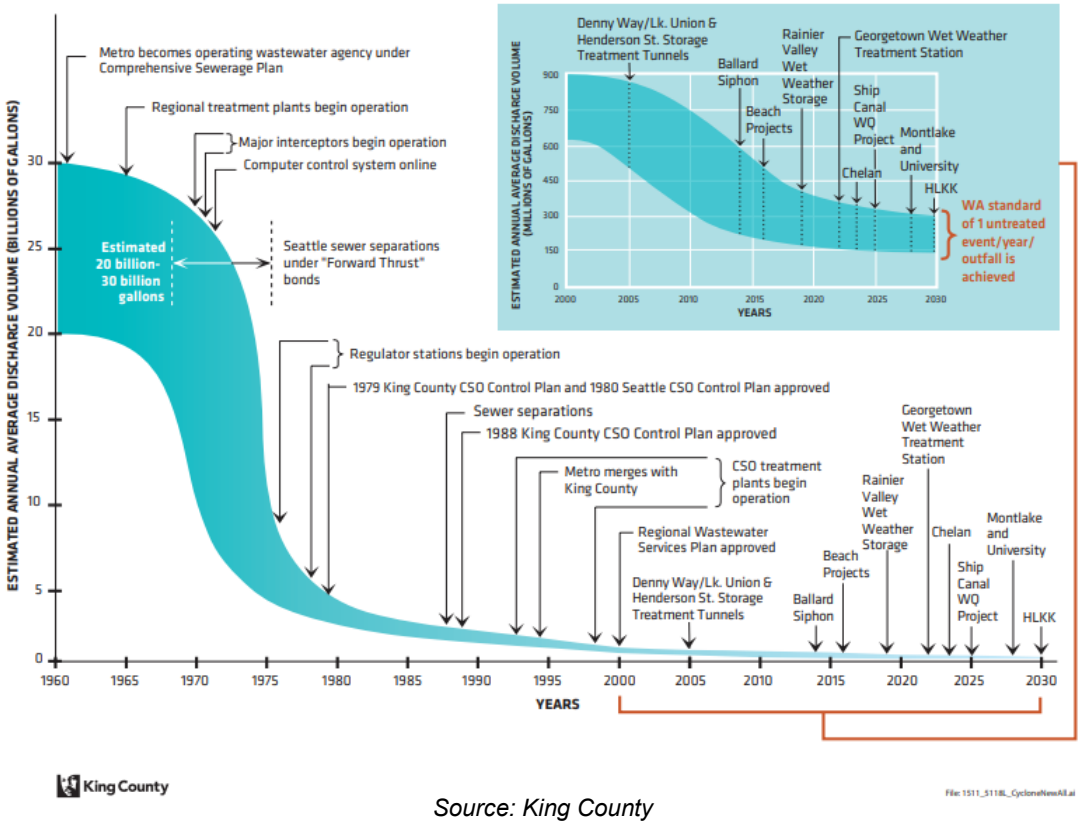
We use many types of drains to remove excess or leftover water. Storm drains on our streets collect extra stormwater from rain and send it into wetlands, stormwater retention ponds, or other bodies of water, then it eventually enters Puget Sound. Drains in our homes take our used dirty water from sinks, toilets, and dishwashers through a system of pipes to a wastewater treatment plant. There, the wastewater is filtered, cleaned, and treated before being released into Puget Sound to become part of the water cycle again.

Since stormwater should only be clean rainwater, most storm drains connect directly to a wetland or waterway instead of a wastewater treatment plant. However, this means that if stormwater mixes with pollution in the streets, there is not a chance to clean it before it ends up in the Puget Sound. Runoff from stormwater is a major contributor to pollution in the Puget Sound.

In Washington, there are some communities with an older type of wastewater collection system, called **combined sewer systems**. In these systems, stormwater is directed into wastewater pipes where it is then treated at the wastewater treatment plant. During large rainstorms, the system cannot handle the large amounts of stormwater and will overflow into Puget Sound. These events are called **combined sewer overflows (CSOs)** and can lead to untreated water entering Puget Sound which contaminates it with pollutants and bacteria. The excess water — which is composed of 90% stormwater and 10% untreated wastewater — overflows through built-in relief points called **outflows**. Outflows are an important and necessary part of combined sewer systems as they prevent wastewater from backing up and causing damage to our wastewater treatment plants, homes, and businesses.

Infographics courtesy of King County Wastewater Treatment Division

In the 1960s, over 30 billion gallons of untreated CSOs went into Puget Sound each year. In 1979, King County began a CSO control program to reduce the volume of these overflows. This program, called Protecting Our Waters, has planned out 14 projects over the next decade to decrease the volume further and expect to reach their goal of 1 CSO event per year by 2030. By investing over $300 million in many facilities and solutions, King County has reduced its CSO volumes nearly 95% to just 0.8 billion gallons per year today! You can see the effect of King County's efforts on the graph below.



Source: King County

While our communities are working hard on solutions to control CSOs, we can also do our part! By making sure that only rain goes down the storm drain, and never soap, paint, oil, or anything else, we can help prevent pollution from reaching Puget Sound.

Vocabulary

Combined sewer overflows (CSOs): The result of heavy rains overwhelming the combined sewer system and exiting the pipes through an outflow pipe

Combined sewer systems: The combination of wastewater and stormwater drainage systems

Outflow: The relief point in a combined sewer system where water can exit in times of high flow

Main Activity

Combined Sewer Overflow Solutions

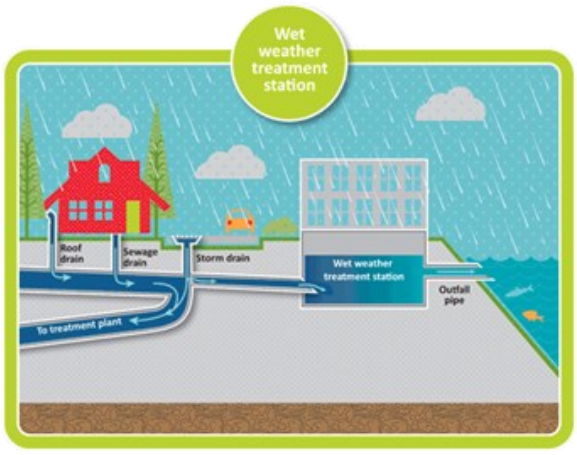
Combined sewer overflows (CSOs) can lead to millions of gallons of untreated wastewater entering Puget Sound. While these systems made sense when they were built many years ago, as communities in our region grow, there is a need for new solutions to manage our excess stormwater. Because of this growth, there is more concrete and less permeable ground for the water to soak into, leading to increased runoff that can overwhelm the wastewater treatment plants connected to these combined sewer systems and lead to more CSOs.

Materials: Writing utensil

Imagine you are on a community board deciding on a plan to control combined sewer overflows. Your options are to build a Wet Weather Treatment Facility to help treat the excess water during a CSO, build a storage tank to store the water until the CSO event is over, or separate the stormwater and wastewater pipes.

Choose one option and write an argument for why your community should choose that option. Make sure to address the benefits and constraints of your solution, including the cost, and why your solution is the best solution. Information about each option is detailed below and on the following page.

Option 1: Wet Weather Treatment Station

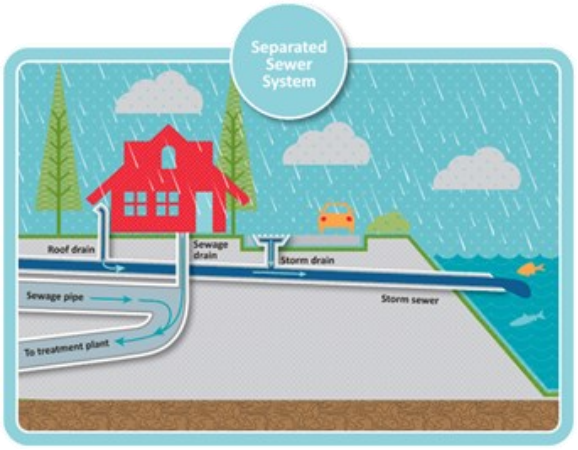


Cost	$$$$$
Benefits	• Collects overflows and treats them before entering the water • Can handle 70 million gallons of CSOs
Constraints	• Needs large, above ground space • Can be difficult to build in urban areas • High maintenance cost (only runs during storms)

Option 2: Storage Tanks

Cost	$$$
Benefits	• Provides temporary storage for combined sewage to be treated after the storm • Can be built underground
Constraints	• Can be difficult to build in urban areas • May need many tanks

Option 3: Separated Sewer and Storm Drains



Cost	$$
Benefits	• Removes stormwater from entering the wastewater treatment plant • Eliminates overflows and back-ups
Constraints	• Requires building new pipes, affecting large lengths of roads and sidewalks • Difficult to do in areas with lots of private property

Which option are you choosing?

On the next pages, write your argument for why your option should be chosen. Remember to address the constraints and cost of your choice.

Optional Activity

Video

Seattle receives nearly 40 inches of rainfall each year. This means there is a large amount of stormwater runoff, which picks up pollutants from the road as it travels into our storm drains and bodies of water. You will now watch a video from The Nature Conservancy of Washington about the effect that stormwater has in our region.

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

With an adult's permission, watch "Solving Stormwater" by The Nature Conservancy in Washington and answer the questions below. You can find this video by doing a search for "Solving Stormwater Nature Conservancy" or by clicking the following link: https://www.youtube.com/watch?v=1JDsFJJJHSY

1. Which animal is affected by urban runoff the most?

2. What was the result of the first stormwater experiment?

3. How does toxic runoff affect salmon?

4. What was the result of the second stormwater experiment (with filtration?)

5. What is green infrastructure? Give an example.

Optional Activity

Stormwater Stewardship Challenge for Day 1

A stakeholder is a person or group of people interested in or even just impacted by a problem. Stakeholders provide important opinions and information. One of the first steps in understanding a solution is to determine a list of stakeholders. Your friends, family, neighbors, teacher, classmates, city leaders, other community members, and you can be a stakeholder. Stakeholders do not have to agree on an issue! They can be different people with different thoughts.

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

Today you learned about the impacts of storm drain systems throughout our watershed. This problem can be solved by a group effort from the people living in this region. Make a list of three people that you consider stakeholders in the stormwater pollution problem. The stakeholders can have varying opinions on this issue. For example, one stakeholder may know little about storm drains but is eager to learn more. Another stakeholder could be a neighbor who disagrees with you that stormwater pollution is indeed a problem and will require some convincing!

Write the names of the stakeholder in the table below. With an adult, record the best method of communication with these individuals.

Stakeholders!	***Name***	*Best method of communication?*
Name of First Stakeholder:		
Name of Second Stakeholder:		
Name of Third Stakeholder:		

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

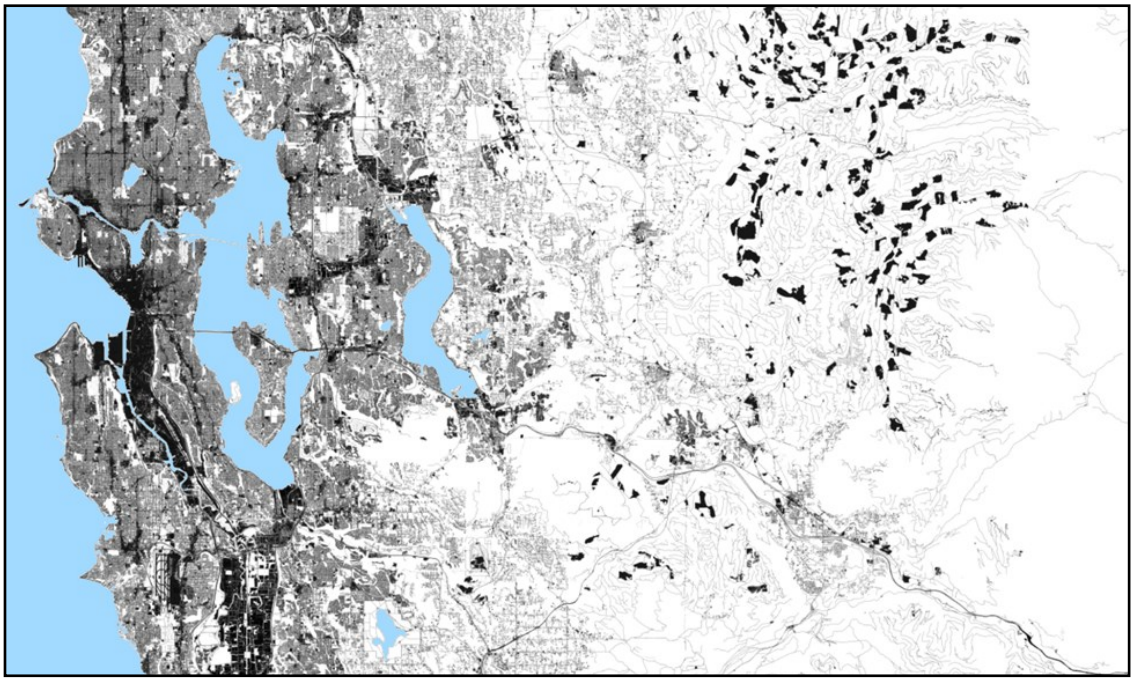
Permeable and Impermeable Surfaces

The cities and towns that people live in are obviously very different kinds of places than the rest of the natural world that surrounds them. Today we will take a look at the main differences between natural and human-made areas, with a specific focus on how each one interacts with water.

We can begin by looking at a natural area, like a forest. There are plants and animals of all kinds, from tiny insects to giant trees. When rain falls in a place like this, it immediately soaks into the ground. This is because the soil out in the forest is an example of a **permeable** surface. This means that it is able to let water and other substances slowly pass through it, just like a sponge. There are lots of other items that you interact with every day that are permeable. Paper towels, tissues, and most clothing are also considered permeable.

Cities, on the other hand, are not typically covered by natural soil on the ground. Instead we have built roads, sidewalks, parking lots, and buildings out of concrete and an assortment of other **impermeable** surfaces. These are the opposite of the spongy, water-absorbing soil in our forests. Impermeable surfaces are those that are solid and do not let water pass through. In addition to the concrete pavement all around us, some other examples of impermeable materials include glass, plastic, metal, and most rock.

As human populations rise, the amount of land used up and covered will continue to rise as well. This can have a massive impact on the water that falls and flows through the region, possibly leading to flooding and high levels of pollution. The map below shows all of the impermeable surfaces in the greater Seattle area, from the Puget Sound in the west to the Cascade Mountains in the east. Anything in black is an impermeable surface like pavement or buildings, while the white spaces indicate a permeable surface like grass or soil.



Source: https://mywater.world/

Vocabulary
Impermeable: A word that describes anything that does not let water pass through it
Permeable: A word that describes anything that lets water pass through it

Main Activity

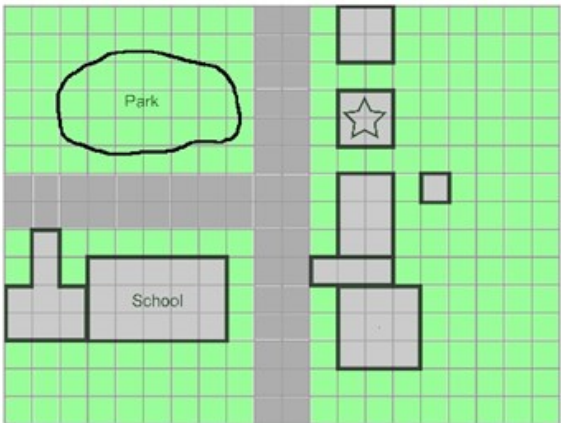
Neighborhood Mapping

You have learned about how water flows over different kinds of surfaces, and now you can put that knowledge to good use! Create a map of your own neighborhood that shows all of the permeable and impermeable surfaces that you find.

Materials: Writing utensil, colored pencils/markers, calculator

If you have an adult with you, you can explore your own area and map out all of the permeable and impermeable surfaces around your home. If you can't safely explore outside, try to do it from memory, by looking outside from the safety of your own home, or even by looking at an online map of your area.

To create your map using the grid on the following page, draw a star to mark where your home is located, and label any other unique buildings or places (e.g. schools, parks, businesses, etc.). Color in any impermeable surfaces in grey or black, and color in any permeable surfaces in green. Here is an example of what this map could look like:



When you have finished drawing your map, count up all of the squares that are colored in gray or black (i.e. impermeable surfaces). Fill in the blanks below.

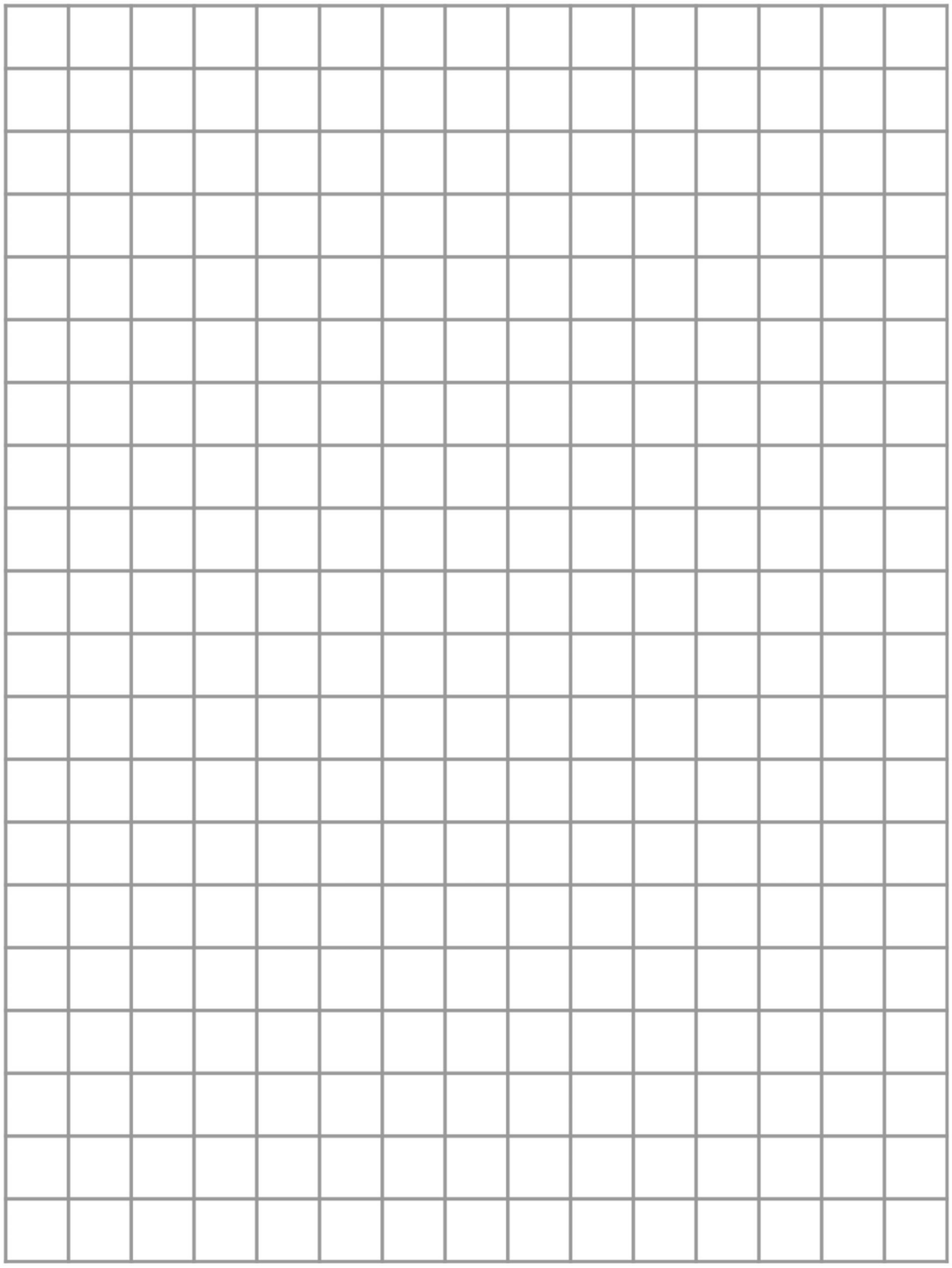
# of impermeable spaces: _____ ÷ 3 = _____ % surface covered by impermeable materials

Next, count up all of the squares that are colored in green (permeable surfaces). Fill in the blanks below.

# of permeable spaces: _____ ÷ 3 = _____ % surface covered by permeable materials

Note: If a square has both permeable and impermeable surfaces in it, count it for whichever category is taking up more than half of the square. For example, if 60% of a square is covered in impermeable surfaces and 40% is covered in permeable surfaces, you will count that square as 'impermeable.'

Finally, complete the questions following the map page.



Comprehension Questions:

Is your neighborhood covered by mostly permeable or mostly impermeable surfaces?

Do you think this is good for the environment? Why or why not?

If you had the power, what could you change in your neighborhood to increase the amount of permeable surfaces?

Would other people in your community be happy about these changes? Why or why not?

Optional Activity

Testing Impermeable Surfaces

You can run a simple experiment at home to see exactly how permeable and impermeable surfaces interact with stormwater. Let's try it out!

Materials: 1 small clear cup, 1 medium clear cup, 1 sponge, drops of oil, drops of soy sauce, water, writing utensil

Please ask an adult for permission first to gather materials and for an appropriate 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. Do not drink anything used in this experiment.

1. Place the sponge over the medium clear cup.
2. Fill the small clear cup halfway with water.
3. Make an observation: How clear is the water in the small cup?
    - Choose one: Clear Not clear Somewhat clear
4. Pour a few drops of soy sauce and oil into the small cup.
5. Make a second observation: How clear is the water now in the small cup?
    - Choose one: Clear Not clear Somewhat clear
6. Carefully mix the oil and sauce around in the small cup.
7. Slowly pour the small cup of with soy sauce, oil, and water mixture over the sponge.
8. Hold the sponge so it doesn't fall into or off the medium cup.
9. Wait for 1 minute. Some of the water should pass through the sponge. Don't squeeze the sponge!
10. After 1 minute, move the sponge off of the medium cup. Again, don't squeeze the sponge!
11. Make a third observation: How clear is the water in the medium cup?
    - Choose one: Clear Not clear Somewhat clear

Based on your three observations, answer the additional questions on the next page.

Comprehension Questions:

What did the sponge do in this experiment?

What would your final water sample look like if there was never any sponge in this experiment?

How would your final water sample look if you had two sponges? What about three or four sponges?

What does this tell you about how impermeable surfaces affect the movement and cleanliness of stormwater?

Optional Activity

Stormwater Stewardship Challenge for Day 2

Some of the most well-known environmental heroes were storytellers, artists and poets. People like Aldo Leopold, Jane Goodall and John Muir all used art as a way of inspiring the people around them to care more about nature.

Materials: Writing utensil

Poetry is a form of written art that uses devices like rhyming, rhythm, symbolism and the sounds of words to create emotions and mental images. Poems can be short and very literal or long and abstract. Like all art, there is no right or wrong way to write a poem, it is up to you as the writer!

The Grand Show is Eternal
It is always sunrise somewhere,
The dew is never dried all at once,
A shower is forever falling,
Vapor is ever rising,
Eternal sunshine, eternal sunset,
Eternal dawn and gloaming,
On sea and continent,
And islands, each in its turn,
As the round earth rolls.
-John Muir

When the night wind makes the pine trees creak,
And the pale clouds glide across the dark sky,
Go out, my child, go out and seek
Your soul: the eternal I. For all the grasses rustling at your feet,
And every flaming star that glitters high,
Above you, close up and meet,
In you: the eternal I.

Yes, my child, go out into the world; walk slow,
And silent, comprehending all, and by and by,
Your soul, the Universe, will know,
Itself: the eternal I.
-Jane Goodall

Then on a still night,
When the campfire is low and the Pleiades have climbed over rimrocks,
Sit quietly and listen for a wolf to howl,
And think hard of everything you have seen and tried to understand.
Then you may hear it — a vast pulsing harmony — its score inscribed on a thousand hills,
Its notes the lives and deaths of plants and animals,
Its rhythms spanning the seconds and the centuries.
-Aldo Leopold

Following their example, write a short poem on the next page to help inspire the people you share it with to care more about stormwater and its effect on pollution and our environment.

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 3

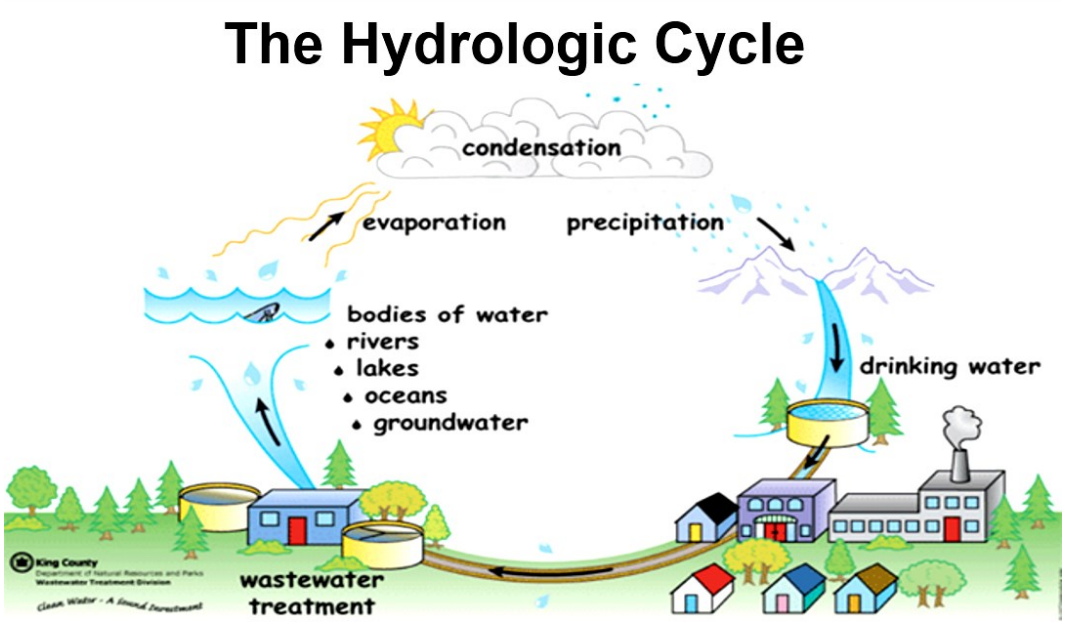
What is Wastewater?

Information and images adapted from curriculum by King County Wastewater Treatment Division

Water is used for a variety of purposes within our homes. Clean water is necessary for human consumption, and also for the many appliances that we utilize every day. The water we use indoors is considered drinking water. Water after it's been used in homes, businesses, and other buildings is called **wastewater**.

Wastewater is not clean and safe to drink as it is water that flows out of drains from our sink, toilet, shower, laundry machine, and dishwashing machine. Wastewater contains elements that make it necessary for the water to be treated before others can use it. Most of wastewater is made up of water, but a small percentage is comprised of fats, oils, disease-causing bacteria and viruses, and other solids. These components are removed at the wastewater treatment plant before the water is sent into Puget Sound.

We will learn more about his process tomorrow. Today, we will consider how wastewater is treated, released into the environment, and returned to the hydrologic cycle to eventually replenish the bodies of water that make up our drinking water supply. Wastewater is an essential part of the ongoing cycle between our natural and human systems.



Sewage and wastewater are terms that are sometimes used interchangeably. However, there is a difference! Sewage is a subset of wastewater as it's all the water that flows only from the toilet. Wastewater includes toilet water, but also all other types of water that is used in our homes. For example, the water poured down a kitchen sink drain is a part of wastewater, but not a part of sewage.

Water flushed down the toilet becomes part of wastewater as sewage!

Everything else that goes down home drains is considered wastewater, but not sewage!

You learned about the problems with combining sewage and stormwater on Day 1. Wastewater has its own list of issues. Many problems associated with wastewater derive from a lack of awareness about what should go down home drain pipes. Sometimes people do not know what can be flushed down as sewage and what can be poured down drains to become wastewater. A common issue in King County that can go unnoticed is FOG, or fats, oils, and grease that cause problems in our pipes. After cooking, FOG that is poured down the kitchen sink drain as a hot liquid will cool and harden in the pipes, potentially clogging and breaking the pipes.

Being mindful of materials that are poured down the drain and flushed down the toilet can aid in maintaining our wastewater system. Wastewater treatment plants are constantly working to ensure the wastewater we send is cleaned and sanitized properly. Community members taking the first step by not flushing or pouring anything unnecessary or harmful down the drain is a helpful step in the treatment process. We will learn more about the wastewater treatment plant and their steps to clean wastewater in the next lesson!

Vocabulary
Wastewater: The water that has been used in homes, businesses, or buildings

Main Activity

What Not to Flush

Information and images adapted from curriculum by King County Wastewater Treatment Division

Toilet paper is the only human-made material that is designed to break down in the amount of time wastewater travels from the toilet to the treatment plant. All other products retain their shape and durability after being flushed. This means there is additional work being done at the treatment plant to remove the trash. You may have heard of "the four P's," which refers to toilet paper, pee, poop, and puke. Toilet paper and human organics are the only things that should be flushed down the toilet. Everything else will be sent to the landfill, or worse, has the potential to clog the pipes at the wastewater treatment plant and require much maintenance. Below is a picture of a pipe at the Brightwater Wastewater Treatment Plant that used to clog regularly due to trash that was flushed down people's toilets. They had to install a grinder to cut up the trash into smaller pieces just to manage.

Materials: Two clear small containers with lids, water, 1 square of toilet paper, 1 piece of paper towel, flushable wipe or tissue paper, timer or clock

Ask an adult for permission to gather materials and to find an appropriate space to do this activity. This activity requires water and that always comes with the possibility of a spill. Do this over a counter space, table, or outside with an adult. The toilet paper can be flushed down the toilet but the flushable wipe should be thrown into the trash and tissue paper or paper towel can be composted. If you don't compost in your home, please throw the tissue paper and paper towel into the trash as well.

We are going to test how effective toilet paper is at breaking down in water while other commonly flushed items are ineffective. The activity procedure is described on the following page. Answer the questions on the page after the procedure pages before, during, and after your activity. They are noted in the procedure as "**What Not to Flush Questions**."

Procedure:

1. Take both small containers with lids and add water to the halfway point.
2. Add the toilet paper square to the first small container.
3. Add your piece of paper towel, flushable wipe, or tissue paper into the second small container.
4. Close both lids tight.
5. Answer the first and second question from "**What Not to Flush Questions**."
6. Get the timer ready or watch the clock. When ready, gently and slowly swirl the first container with toilet paper for one minute.
7. Stop swirling and observe the water and toilet paper's physical appearance.
8. Answer the third question from "**What Not to Flush Questions**."
9. Get the timer ready or watch the clock. When ready, gently and slowly swirl the second container with your second material for one minute.
10. Stop swirling and observe the water and second material's physical appearance.
11. Answer questions four to eight from "**What Not to Flush Questions**."
12. Dispose of the first container contents with toilet paper by pouring into the toilet.
13. <u>If your second material is the paper towel</u>, take it out of the water and wring dry with your hands. The paper towel can be hung dry to be reused, composted, or thrown into trash. Pour the leftover water down the sink or take it outside with an adult to pour over soil and plants to save water.
14. <u>If your second material is the tissue paper</u>, take it out of the water and wring dry with your hands. Tissue paper can be composted or thrown into trash. Pour the leftover water down the sink or take it outside with an adult to pour over soil and plants to save water.
15. <u>If your second material is the flushable wipe</u>, take it out of the water and wring dry with your hands. Flushable wipes must be thrown into trash. Pour the leftover water down the sink or take it outside with an adult to pour over soil and plants to save water.

⇒ <u>Optional:</u>

Do steps 1-15 again but change the swirling time to two minutes and observe if this affects your results to the questions.

Do steps 1-15 again but change the second material to another item. For example, if you used paper towel as your second material but have flushable wipes, try the activity with flushable wipes.

What Not to Flush Questions:

1. What is the physical appearance and water clarity for each container with its specific material?
   - ⇒ Container with Water and Toilet Paper:

     _____

   - ⇒ Container with Water and Second Material:

     _____

2. What do you predict will happen to the toilet paper and second material in the water?
   - ⇒ Toilet Paper Prediction:

     _____

   - ⇒ Second Material Prediction:

     _____

After answering, go back to procedure #6

3. What is the toilet paper's consistency after the minute of swirling? Describe its physical appearance and the water clarity. Compare it to the pre-swirling appearance.

   _____

After answering, go back to procedure #9

4. What is the second material's consistency after the minute of swirling? Describe its physical appearance and the water clarity. Compare it to the pre-swirling appearance.

   _____

5. What conclusion can you make about both materials and their potential to be a flushable item?

   _____

   _____

6. How does the activity encourage you to make a change in your own home on what not to flush?

   _____

   _____

7. Are there people you know that might need to hear this information?

   _____

8. How will you share this information with others?

   _____

After answering, go back to procedure #12

Optional Activity

Wastewater Greenwashing

Greenwashing is the term used to define companies or products that market themselves as environmentally-friendly, when in reality they are less than they claim, or they are not at all. Flushable wipes are an example of greenwashing. The label “flushable” is misleading to people as they assume the wipe will break down in the water like toilet paper after flushing. People may also intend to reduce personal waste by flushing the wipe rather than throwing it into the trash. Unfortunately, the wipes are caught at the wastewater treatment plant and sent to the landfill as trash.

Materials: Writing utensil, paper, envelope, stamp, computer/phone/tablet, internet connection

With an adult, research companies that create “flushable wipes.” Write a letter, email, or social media message to this company to explain that the term “flushable” is misleading, is damaging to the wastewater treatment system, and creates additional litter. Encourage the companies to remove the label of “flushable” or to properly include text on their packaging that explains how the wipes will not break down in wastewater. Specify why this issue matters to you and the environment by including details about how the wastewater system is part of the water cycle.

Send your letter, email, or social media message with the help of an adult!

Optional Activity

Stormwater Stewardship Challenge for Day 3

We learned that wastewater is made up of water that leaves our home and is sent to a treatment plant to be cleaned. Within wastewater is the water that is flushed the toilet. There are certain things that are acceptable to flush down the toilet, such as human fluids, human waste, and toilet paper. Anything else should not be flushed! Other items that need to be disposed of should be either put into the trash, properly recycled, or composted.

Materials: Writing utensil, paper, markers/colored pencils, tape, computer/phone/tablet, internet connection

Create a sign to remind people in your home of what not to flush. You can write and color a sign of your own design. The sign can highlight one or many items that should not be flushed. You can also make the sign to reflect how toilet paper should only be flushed.

When your sign is complete, ask an adult if you are allowed to tape the sign on the toilet or on the bathroom mirror for people to see.

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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- If you live in King County: Tag @KingCountyDNRP and @kingcountywtd. Include the hashtag #dontflushtrouble

DAY 4

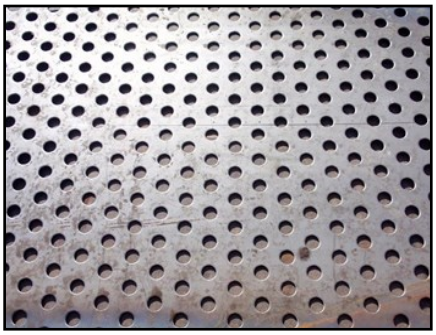
Wastewater Treatment

Information and images adapted from curriculum by King County Wastewater Treatment Division

King County operates five **wastewater treatment plants** that treat 178 million gallons of wastewater every day. As we learned yesterday, wastewater is water that comes from homes, businesses, and buildings after human use. Wastewater is sent through underground pipes that lead to the wastewater treatment plant, where the wastewater is treated through various steps to ensure proper sanitation and **disinfection**.

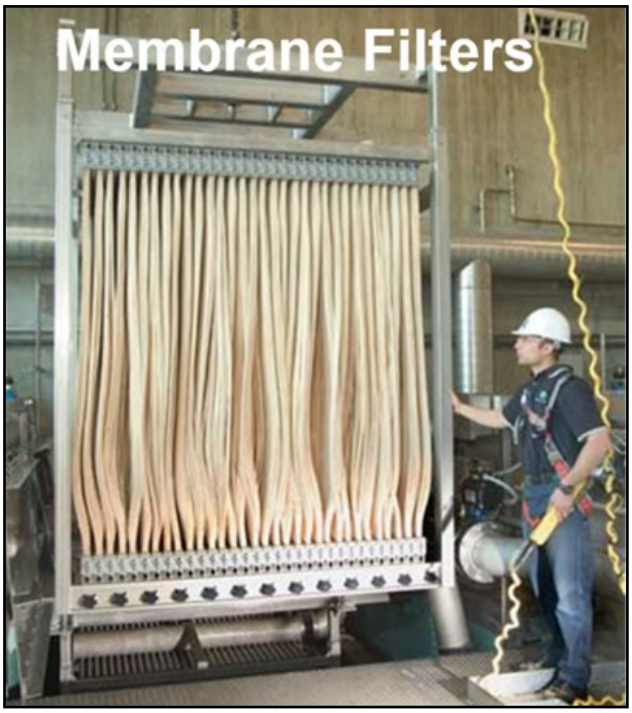
When wastewater enters the treatment plant it goes through phases called preliminary, primary, secondary, and disinfection treatment. Each phase occurs in a separate tank and provides a specific action to help clean the wastewater. The phases are described in more detail below:

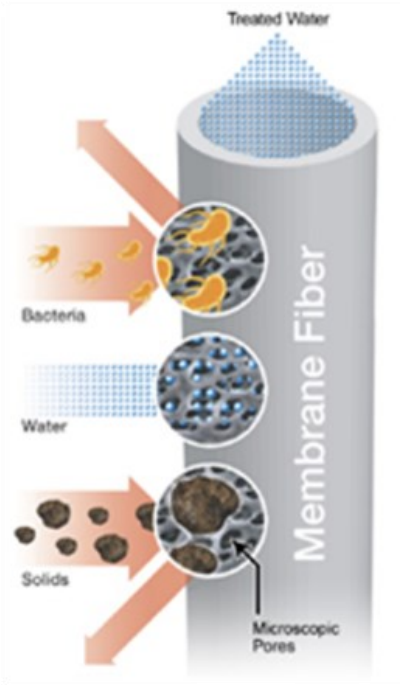
1. Preliminary treatment takes out all the trash, dirt, sand, and gravel. Metal screens filter out all the items that should not have been flushed down the toilet and did not break down in the wastewater. Things such as flushable wipes, paper towels, and tissue paper are collected and sent by trucks to a landfill.



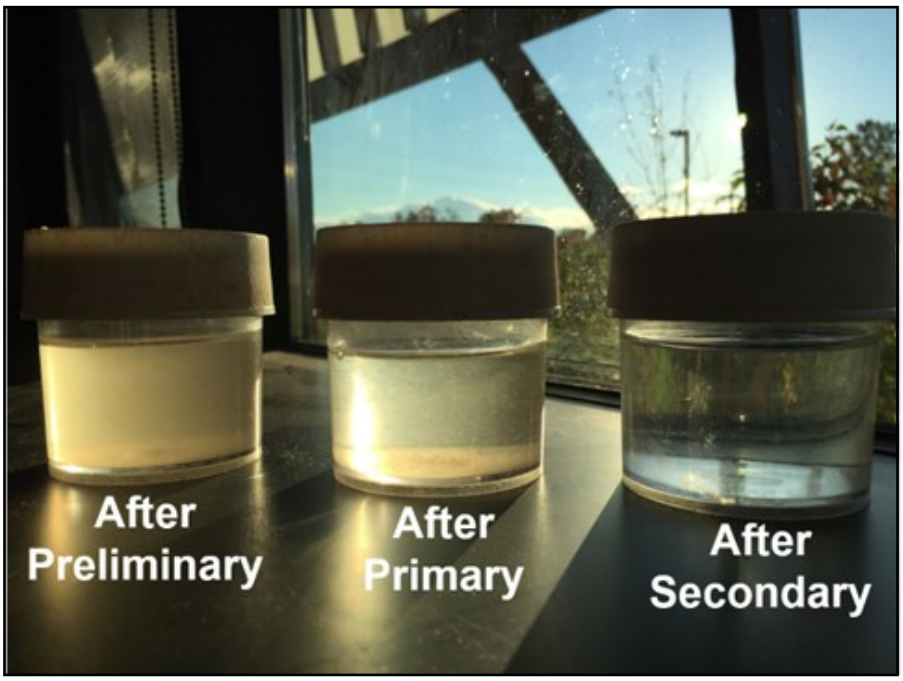
2. Primary treatment is removal of **organics**, such as human waste, hair, FOG, and food waste. The wastewater sits in large tanks, moving extremely slowly for six hours. The wastewater begins to separate, with the lighter hair and FOG rising to the top, and the heavier human and food waste sinking to the bottom. Scrapers are what is best described as a conveyer belt in the middle of the tank that scrape the lighter and heavier materials and send them to their own recycling tanks. Primary treatment cleans almost 80% of the wastewater!

3. Secondary treatment happens in two tanks. The first tank is where warm oxygen is added to activate the bacteria that will eat away any remaining human waste in the wastewater. The second tank is where there are membrane filters to trap the bacteria and any other organic material still in the wastewater. Each individual membrane filter is like a hollow tube with microscopic holes. The holes are big enough just for water to pass through, everything else get stuck on the outside of the membrane filter tube. Any bacteria that is trapped is added back to the first tank!





4. The final treatment is disinfection. To remove any remaining disease-causing bacteria and viruses, a small amount of bleach is added to the nearly clean wastewater. The bleach will naturally evaporate out of the water as it travels through pipes that leave the wastewater treatment plant. The fully treated wastewater is not up to the standard of drinking water but it is 99% cleaner than when it entered the treatment plant. The disinfected wastewater is either sent to Puget Sound or used as recycled water for irrigation of plants by farmers, golf courses, and soccer fields.



Vocabulary
Disinfection: The process of cleaning something to destroy bacteria
Organic: Related to or derived from something living or once living
Wastewater Treatment Plant: A facility where wastewater is sent to be treated and cleaned

Main Activity

Model of the Primary Treatment

Images adapted from curriculum by King County Wastewater Treatment Division

The primary treatment relies on the heavier materials of wastewater to sink and lighter material to float. This allows a rotating scraper to skim the materials from the bottom and top – the middle portion of the wastewater being much cleaner! Below is a picture of primary treatment tank with the lighter organic material floating on top of the wastewater, ready to be scraped off!

Materials: Writing utensil

Design a model of the primary wastewater treatment with organic and non-organic items found in your home. ***Do not use the four P's-toilet paper, pee, poop, and puke. You already used toilet paper in the prior experiment and the other 3 P's would not be sanitary to utilize in this activity, even if it's only a model design.*** Organic can refer to anything that is related to something living or was once living.

The questions below will help you brainstorm a model design. Each question will guide you to plan for appropriate materials and amount, and to better understand reasoning behind your choices.

Start your primary treatment model design by answering these brainstorm questions:

1. What will you use to hold the water and other material?
   - Glass jar with lid
   - Clear plastic container with lid
   - Other type of container with lid: _____

2. How much water will you add? What are the units you will use? _____

3. What will you add to represent the organic sludge that sinks to the bottom of the primary treatment tank? *Hint: it must be heavier than water.*
   - Soil
   - Sand
   - Coffee grounds
   - Other household item: _____

4. How much of this item will you add? What are the units you will use?
   _____

5. What will you add to represent the organics that float to the bottom of the primary treatment tanks? *Hint: it must be lighter than water.*
   - Oil
   - Human hair
   - Rubbing alcohol
   - Other household item: _____

6. How much of this item will you add? What are the units you will use?
   _____

7. Draw and label your model design below:

8. Optional: With the help of an adult, build your model with all items added to the water in the container of choice. With the lid tightly on, shake gently and slowly for one minute. Leave the container on a flat surface and wait for another minute. Observe the materials separating in the water. Did your model work as designed? Did the materials of differing weights separate as designed and mimic the primary wastewater treatment tank? It is alright if it did not! That happens with science experiments. Return to your brainstorm and design the model again with different materials based on what you learned!

Ask an adult for permission to gather materials and to find an appropriate space to do this activity. This activity requires water which always comes with the possibility of spilling. Do this on a counter, table, or outside with an adult. Do not pour the water down the drain! Rather take it outside with an adult and pour it over soil or plants to save water.

Optional Activity

Personal Products

Many of the personal products we use every day contain a long list of chemicals. These chemicals are not specifically targeted to be treated at the wastewater treatment plant. They rely on reducing the concentration of the chemicals being weakened when released into Puget Sound. This is called dilution, which means adding water to a solution to decrease the content of a chemical. Dilution is effective but if many people in our region use a high volume of chemicals in their daily personal products, the results can be overwhelming for Puget Sound. Checking the ingredient list of every product we use or using more natural alternatives can help limit the amount of chemicals being sent to the treatment plant as wastewater and eventually into Puget Sound!

Materials: Writing utensil, white vinegar, baking soda, essential oil, spray bottle

Here are two ways to check the ingredient list of a product to ensure it is safe for our waterways and a natural alternative to limit chemical use in our home.

1. **Check the Ingredients of your face wash or toothpaste for microbeads**:
   Microbeads are tiny, sometimes microscopic, plastic beads that are added to personal cleaning products such as face wash or toothpaste as an exfoliator. However, microbeads never break down and remain as tiny pieces of plastic in our bodies of water. Microbeads can harm not only water quality, but also wildlife that may consume the plastic after mistaking it for food.

   Products that contain microbeads may not label it on the box or bottle as microbeads or beads, but it will be listed in the ingredient list as one of the following names. These are all names for different types of plastic. Check your products for one of the following ingredients. If you do use products with microbeads, have a discussion with the members of your home about how to avoid this product in the future. Are there alternatives that do not contain microbeads that could be used instead?

   Check the product packaging for these plastic names:
   Hint: usually anything with poly contains plastic

   Polyethylene (PE) or Polypropylene (PP)
   Polyethylene terephthalate (PET)
   Polyethylene Glycol (PEG)
   Polyactic acid (PLA)
   Polymethyl methacrylate (PMMA)
   Nylon

2. **Natural Alternative**: Making your own homemade cleaner is easy and can be much more cost-effective than buying cleaners at the store. It's also helpful for keeping Puget Sound clean and healthy for all!

   Have a discussion with members of your home to ensure everyone is alright with you making a homemade all-purpose cleaner. If everyone agrees, ask an adult for permission to gather materials and an appropriate space to do this activity.

   Homemade All-Purpose Cleaner:
   Modified from keeperofthehome.org

   Ingredients:
   Clean empty spray bottle
   ½ cup of white vinegar
   2 Tablespoon of baking soda
   10 drop of tea tree, lavender, or lemon essential oil
   Water

   Procedure:
   Mix the vinegar and essential oils into a clean spray bottle with a little bit of water.
   Add baking soda into the spray bottle.
   Fill the spray bottle to the top with water.
   Put the lid on the spray bottle.
   Gently and slowly shake to mix all ingredients.
   Then use as an All-Purpose Cleaner in your home!

Optional Activity

Stormwater Stewardship Challenge for Day 4

One of the best ways to share ideas is through local news companies. Most newspapers have a “Letter to the Editor” section where readers submit their thoughts to be shared with the community. The Editor supervises the content that goes out every day in various news outlets and part of their job is publishing feedback and information from the community.

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

Using what you have learned, write a letter to the editor of a local paper and share some ways that we can protect our environment and why it matters to you.

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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- If you live in King County: Tag @KingCountyDNRP and @kingcountywtd. Include the hashtag #dontflushtrouble

DAY 5

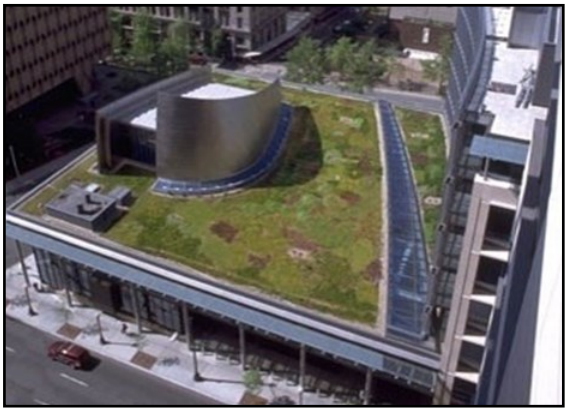
Green Stormwater Infrastructure

Now that you have learned about how water interacts with human-made systems, it is time to look at creative solutions to stormwater problems. The greater the amount of impermeable surfaces in area, the greater the risk of flooding and pollution gathering as water flows. In order to combat this, people must practice **stewardship**, meaning taking actions that help protect or care for the environment. When it comes to stormwater, humans are capable of designing some very effective projects that can make a big difference.

These sorts of projects are called **green stormwater infrastructure**, or GSI for short. Green stormwater infrastructure simply refers to a design or project that is environmentally-friendly and beneficial to stormwater. Today we will review a few common examples of green stormwater infrastructure that you might be able to find in your own neighborhoods, towns, and cities.

One of the simplest ways to help control the flow of stormwater is by installing **rain barrels**. These are exactly what they sound like: barrels that contain rainwater! They are typically attached to gutters that carry water off of a roof, pouring all of that rainwater directly into the barrel instead of letting it flow across the land. However, not every roof or building can accommodate a rain barrel. It is important to research the rules for rainwater collection in your own area before attempting to install a rain barrel.

Rain barrels aren't the only way to contain water that falls on our roofs. There are also **green roofs**, which are planted areas placed on certain rooftops. This could take the form of a vegetable garden or even a grass lawn. Because the soil holds on to the rainwater like a sponge and the plants' roots absorb and use that water, green roofs can be an excellent way to slow down our stormwater and prevent it from rushing across the roof and down to the street. In addition, green roofs have been shown to keep buildings warmer in the winter and cooler in the summer!



In addition to rain barrels and green roofs, many people build **rain gardens** to slow and filter stormwater. In nature, there are areas called **wetlands** that are filled with wet soil and water loving plants, and these rain gardens act like miniature versions of wetlands scattered throughout our towns and cities. By planting a rain garden, people are able to redirect water that would otherwise spill into the storm drains on the road. The soil and plants in the rain garden soak up as much water as possible, which can even help filter some pollution out of the water. You can often find these sorts of gardens along the side of the road, although they can also work just as well in other locations.

Finally, there are some relatively new ideas for solving stormwater issues. One of them is the construction of **permeable pavement**. This is a product that is designed to be hard and solid like regular pavement, but still has small spaces throughout that let water pass straight through it! When you have a road or parking lot made out of permeable pavement, you do not have to worry about floods or puddles because all of the water — and any pollution it may be carrying — is able to pass through the pavement and down into the earth below.

Vocabulary

Green stormwater infrastructure: Environmentally-friendly projects that help control, contain, or clean stormwater
Green roof: A garden or lawn that is planted on a rooftop
Permeable pavement: Pavement that is designed to let water pass through it
Rain barrel: A large container used to collect rainwater
Rain garden: A specially designed garden that helps soak up stormwater and prevent flooding
Stewardship: Taking care of something; being a protector
Wetland: An area in nature that is consistently wet and saturated with water

Main Activity

City Planning

Today you will take on the role of a city planner, whose job it is to organize and plan roads, houses, buildings, and more in a new area. See if you can create a neighborhood that is capable of safely handling a large amount of stormwater runoff!

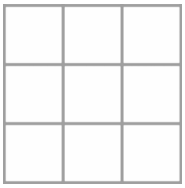
Materials: Writing utensil

As a city planner, it is your job to design the layout of buildings and streets that will be built in your area. Use your knowledge of Green Stormwater Infrastructure (GSI) to help your city control the water that flows through it.

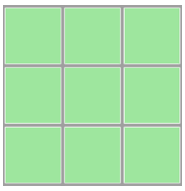
A coworker of yours has created plans for several new neighborhoods, and has come to you for advice. Your goal is to find spaces throughout these neighborhoods that could be improved by adding various forms of green stormwater infrastructure. Is there a side street that could use a rain garden? Do you see a large, flat rooftop that would benefit from a green roof? Help your town design these different neighborhoods without using too many impermeable surfaces. Sometimes this will be easy to achieve, while other situations may prove more challenging.

Remember, there are specific rules about where you can place each kind of green stormwater infrastructure. For example, it would not make sense to place a rain barrel far from a roof or to build a rain garden in the middle of a one way road! Review the rules and instructions on the next page before making any changes to each of the neighborhood maps.

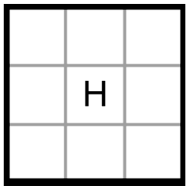
Let's review some of the structures you might find on your map:



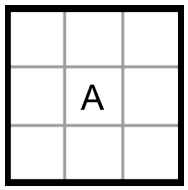
- Grey and white squares on the map indicate an ***impermeable*** surface



- Green squares on the map indicate a ***permeable*** surface

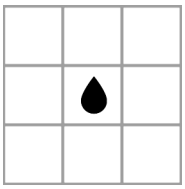


- an 'H' on the map indicates a house

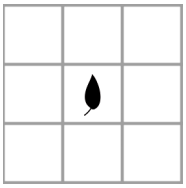


- an 'A' on the map indicates an apartment building

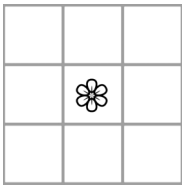
You will also be adding things to your map. Let's review the 4 kinds of green stormwater infrastructure you can add, along with the rules for placing them on your map:



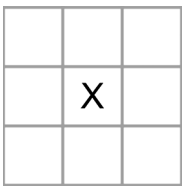
Draw a water droplet on a square to represent the addition of a ***rain barrel***.
Rules:
- You may only place a rain barrel in an empty space next to a house
- You may only place one rain barrel on each side of a house



Draw a leaf on a square to represent the addition of a ***green roof***.
Rules:
- You may only place a green roof on top of buildings that have flat roofs (No placing them on ordinary houses)



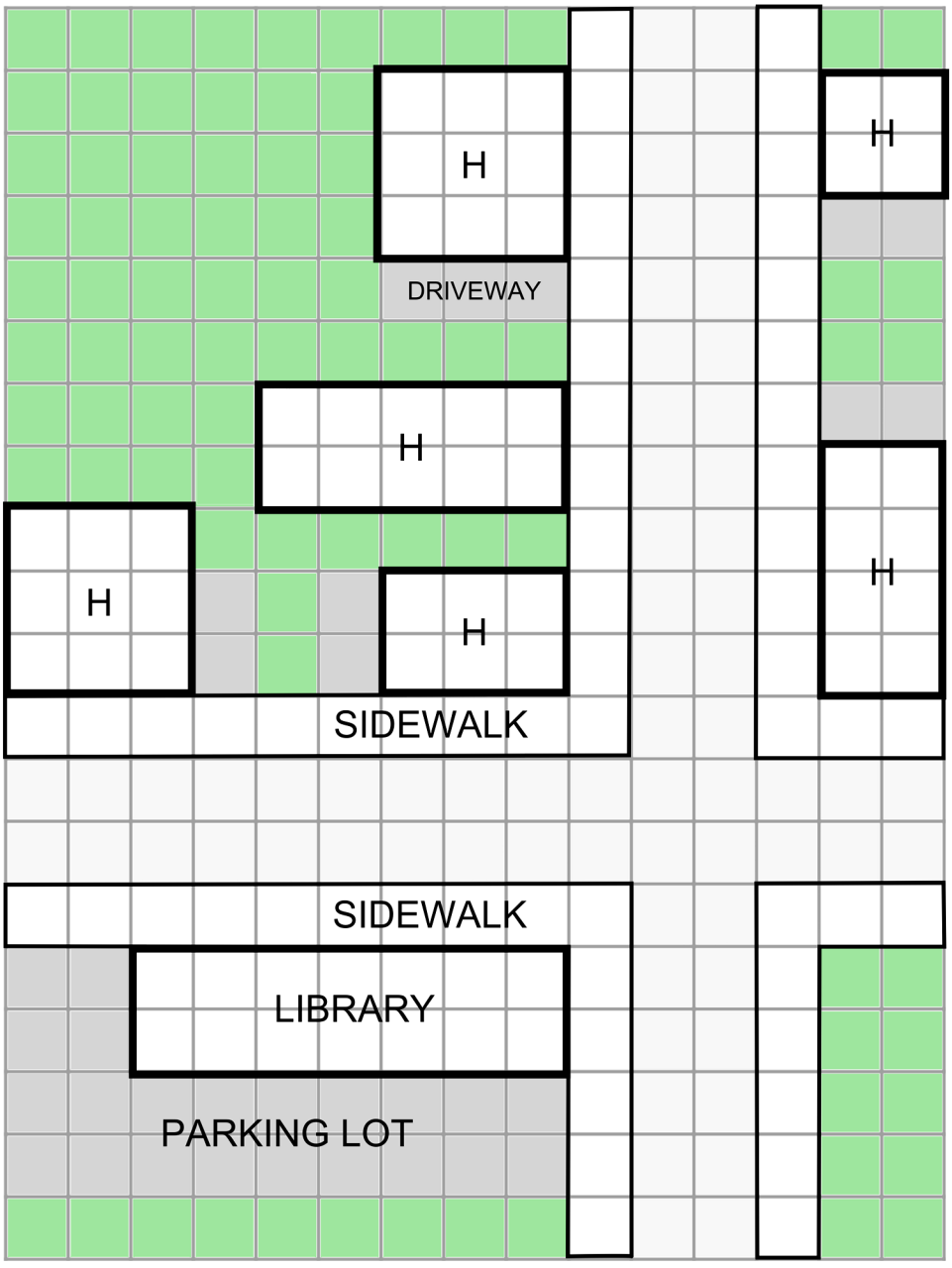
Draw a flower on a square to represent the addition of a ***rain garden***.
Rules:
- You may replace sidewalks with rain gardens, but cannot block any driveways or parking lots
- You may only replace 1 out of every 3 sidewalk squares



Draw an 'X' on a square to represent the addition of ***permeable pavement.***
Rules:
- You can use this to replace driveways and parking lots, but not roads (It is too expensive to replace all of the roads)

Neighborhood #1

This area is going to be residential, meaning it will be full of homes for families. Examine this design and add in any forms of green stormwater infrastructure that you can think of.



How many total squares did you improve using GSI?

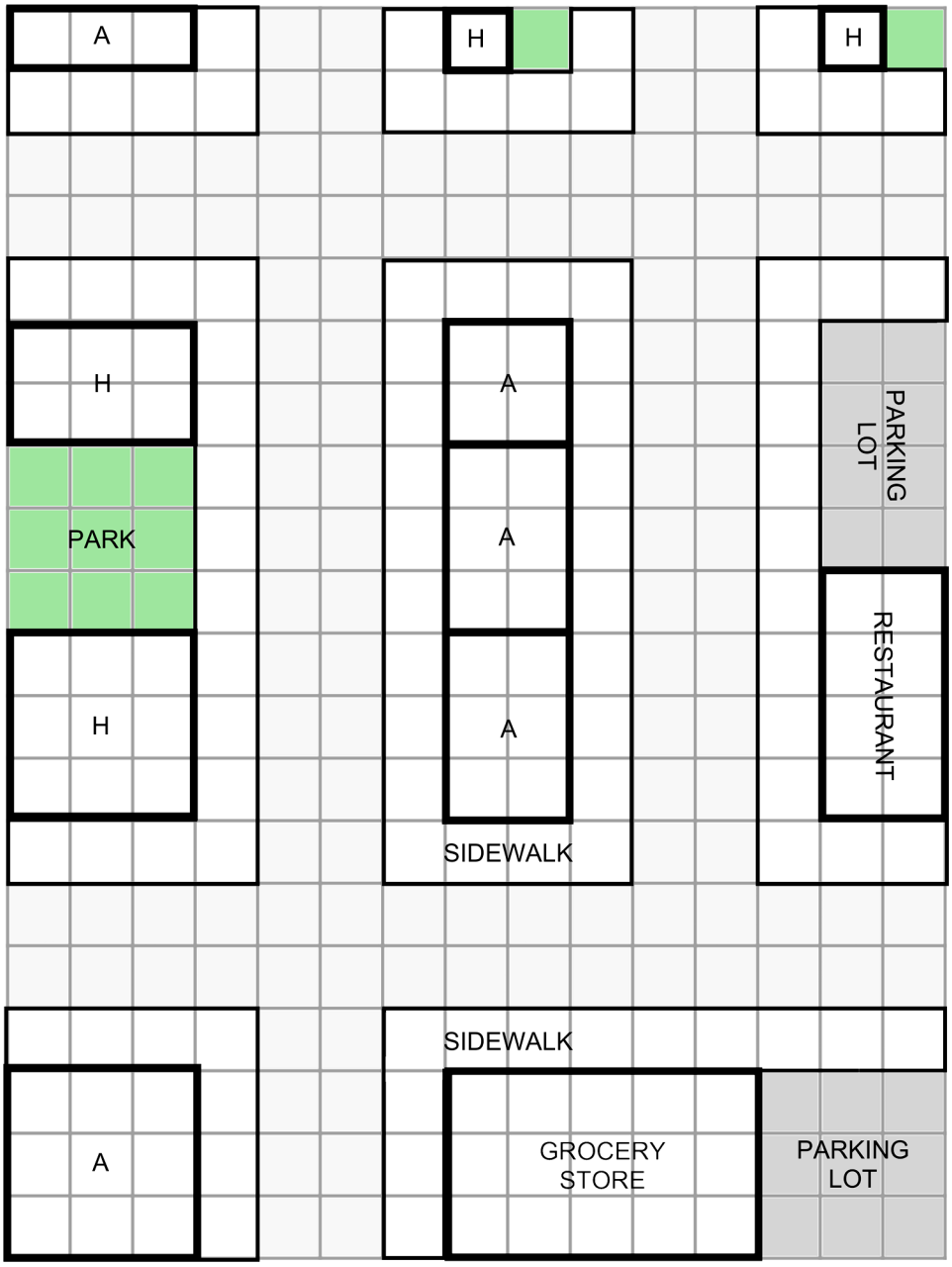
_____

What benefit will this have for the community?

Do you see any other ways that you could improve this plan?

Neighborhood #2

This neighborhood will be in the downtown area of the city, and therefore will be full of lots of businesses and buildings! Examine this design and add in any forms of green stormwater infrastructure that you can think of.



How many total squares did you improve using GSI?

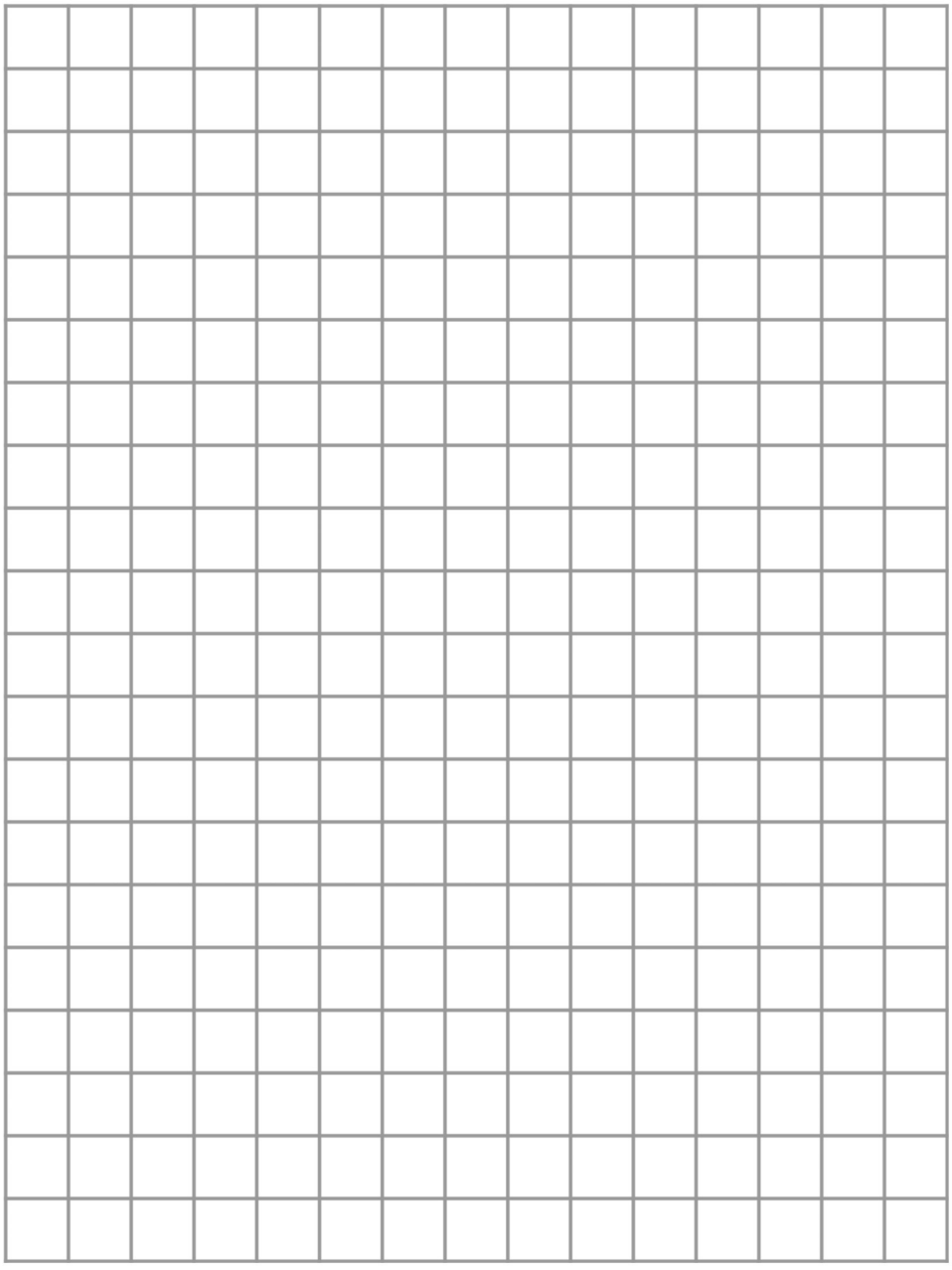
_____

What benefit will this have for the community?

Do you see any other ways that you could improve this plan?

Neighborhood #3

This is your own neighborhood! Using the map you created on Day 2 of this packet, try to find places near your home that could be improved by what you have been learning about GSI. If you did not complete this activity on Day 2, then you can draw a new map of your neighborhood in the space provided. Examine your own design and add in any forms of green stormwater infrastructure that you can think of.



How many total squares did you improve using GSI?

_____

What benefit will this have for the community?

Do you see any other ways that you could improve this plan?

Optional Activity

Researching GSI

The projects you learned about today are just a few of the amazing ideas that people have for improving the environment and controlling stormwater runoff. There are so many more ways to help make a difference, many of which are going on around you right now! You can learn a lot more about green stormwater infrastructure using these online resources, and even find ways to get involved yourself.

Materials: Computer/phone/tablet, internet access

With an adult, check out some of the resources below.

- Rain Garden Handbook for Western Washington, created by the Washington Department of Ecology and Western Washington University: https://fortress.wa.gov/ecy/publications/documents/1310027.pdf
    - This is an amazing resource that will teach you everything you need to know in order to build your own rain garden. It includes information on where to place a rain garden, how to construct it, and even a detailed list of plants that would be excellent candidates to include in your design.

- 'My Watershed' Map: https://mywater.world/
    - This interactive map can show you all kinds of information about the water and land all around you. Click on the 'Map layers' button to pull up a list of different maps that you can view. For example, you could select "Hydrography" as your base map in order to show all the rivers and other bodies of water, and then click on "Classroom Projects," "Community Projects," and "Stewardship Actions" in order to see all the ways that people are helping take care of their environment.

- '700 Million Gallons,' created by Seattle Public Utilities and King County Department of Natural Resources and Parks: https://www.700milliongallons.org/
    - This site provides Seattle residents with information about getting involved in green stormwater infrastructure, plus it also includes an interactive map that shows different kinds of GSI projects all around the area.

- Do your own research!
    - If you live in an area that is not covered by any of the resources listed above, search online for resources from your local government or companies working in GSI. You can often find excellent maps and project details like the ones listed above!

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!

- 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