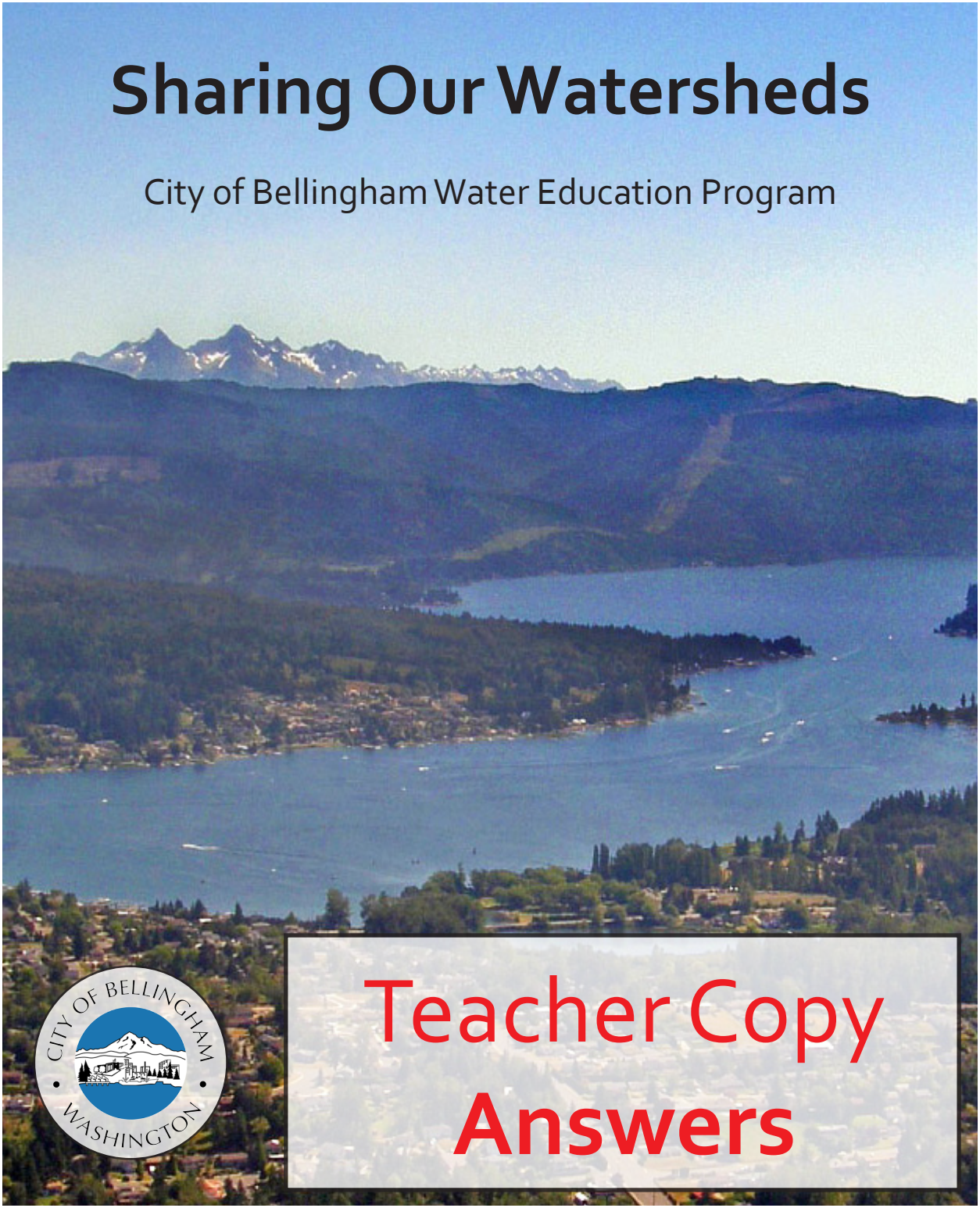
Sharing Our Watersheds

City of Bellingham Water Education Program



Teacher Copy
Answers

What to Bring on the Field Trip

TEACHERS: If you can, please have your students leave their backpacks at school. We'll be outside for an hour and a half after lunch. During that time, our lunches will be stored in locked closet. It's easiest to fit everything in without packs.

- **This notebook**
- **A sharpened pencil**

We won't have any pencil sharpeners at the park. Maybe you should bring an extra one just in case!

- **A "green" lunch**

Try to pack things that won't end up as garbage. Bring reusable containers, not disposable wrappers. You'll have to pack any trash you have back in your lunch sack to throw out at school.

- **A rain coat**

We'll be outside even if it's raining.

- **Warm clothes**

It may be cold or windy. You can bring a hat and gloves if it's a cold day.

- **Good shoes**

Wear shoes that keep your feet warm and dry. We'll be walking on trails and in wet grass. Rubber boots or sneakers would be okay. Crocs or sandles would not.

Please dress for the weather!

My Watershed Address

I go to _____ Elementary School.

My school is in the _____ Watershed,

which is part of the Bellingham Bay Watershed, the Puget Sound

Watershed, the Salish Sea Watershed and the Pacific Ocean Watershed!

Go With The Flow

City of Bellingham video

PART 1: From Mt. Baker to the Water Treatment Plant

1. Any place water runs through, over, under or in, is part of a __WATERSHED_____.

2. The water we use in Bellingham begins as giant frozen ice cubes on Mount Baker called _____GLACIERS_____ .

3. The water melting off the glaciers looks milky because it's full of ____CRUSHED ROCK_____ , which is called glacial flour.

4. In Mirror Lake, when the water slows down and the dirt, leaves, sand and glacial flour settle to the bottom, it's called _____SEDIMENTATION_____ .

5. Lake Whatcom has _____3_____ basins.

6. We get our drinking water from Basin # _____2_____ .

7. Because of all the people and industry around Basin 1, there was a lot of _____POLLUTION_____ so the intake pipe moved.

8. You're in a watershed _____EVERYWHERE_____ you go!

9. Storm drains carry rain water into _____STREAMS_____ , ____CREEKS_____ and ____RIVERS_____ .

REVIEW

10. Some of our water begins at Mt. __BAKER_____ , flows into the ____NOOKSACK_____ River, past the Diversion __DAM___ , through the Bowman Mountain Tunnel, into Mirror _LAKE_____ , down Anderson Creek and into Lake __WHATCOM_____ . Then the water goes through the wooden intake pipe, to the __SCREEN_____ House and then to the Water Treatment Plant.

Go With The Flow

City of Bellingham video

PART 2: From your house to the Wastewater Treatment Plant

12. Clean water travels to your house through ___**PIPES**_____ .

13. The water from the Water Treatment Plant gets pumped to ___**RESERVOIRS**_____ , houses, industries, and fire hydrants.

14. Bellingham has _____**14**_____ reservoirs that hold clean water.

15. List three ways people use water in their houses:

    1. _____ 2. _____ 3. _____

16. The water you use goes down the ___**DRAIN**_____ in your house, through the ___**SEWER**_____ underground and then to the ____**WASTEWATER**_____ Treatment Plant.

17. Water going to the Wastewater Treatment Plant is already ____**99.5**___ % clean!

18. Is there any new water?____**NO**_____!

19. People borrow water from the _____**WATER CYCLE**_____.

20. We must c**OLLECT**_____ , c**LEAN**_____ and r**ETURN**_____ the water we use.

21. You can help keep the watershed clean by picking up your_____**PET**_ 's waste, recycling and not littering or putting anything in a storm drain.

Down the Drain

3-2-1 Contact video

1. What are the two water problems?

   1. __QUANTITY_____

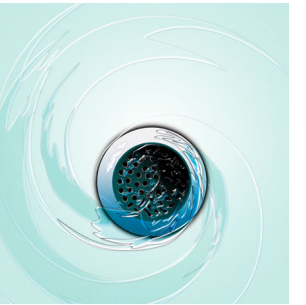
   2. __QUALITY_____

2. What are the three physical states of water?

   1. ___LIQUID_____

   2. ___GAS_____ (steam)

   3. ___SOLID_____ (ice)



3. Water keeps the planet from getting

   too __HOT_____ or

   too __COLD_____ .

4. Water helps us __DISSOLVE_____ and ____DIGEST_____ our food.

5. People become part of the water cycle when they ___USE_____ water.

6. Only ____1_ % of water is drinkable.

7. The rest is too ___SALTY_____ in the ocean or

   __FROZEN _____ in glaciers and ice caps.

8. People are making water dirty ___FASTER_____ than the earth can clean it.

9. The average individual uses more than ____120_____ gallons of water a day!

10. _____20__ % of the water supply is wasted through leaks!

Lake Whatcom Investigation

Scientist Data Sheet

Use the map "Lake Whatcom and Its Watershed" to collect the following data:

1. Looking at the profile view, find the number of basins in Lake Whatcom. __3_____

2. Looking at the bird's eye view, tell which color shows the deepest areas.
__PURPLE_____

3. How many feet deep is the lake? ____328 FEET_____

4. Using the legend, find the Bellingham city limits line. Which basin does the line cross?
_____BASIN TWO_____

5. What is the name of the island in Lake Whatcom?___REVEILLE ISLAND_____

6. Which creek takes water OUT of the lake? (Hint: It connects to Bellingham Bay.)
___WHATCOM CREEK_____

7. Name at least three creeks that put water IN to Lake Whatcom.

   1: ___ANDERSON CREEK, AUSTIN CREEK, BEAVER CREEK_____

   2: ___BRANNIAN CREEK, CARPENTER CREEK, FIR CREEK_____

   3: ___OLSEN CREEK, SMITH CREEK, SILVER BEACH CREEK_____

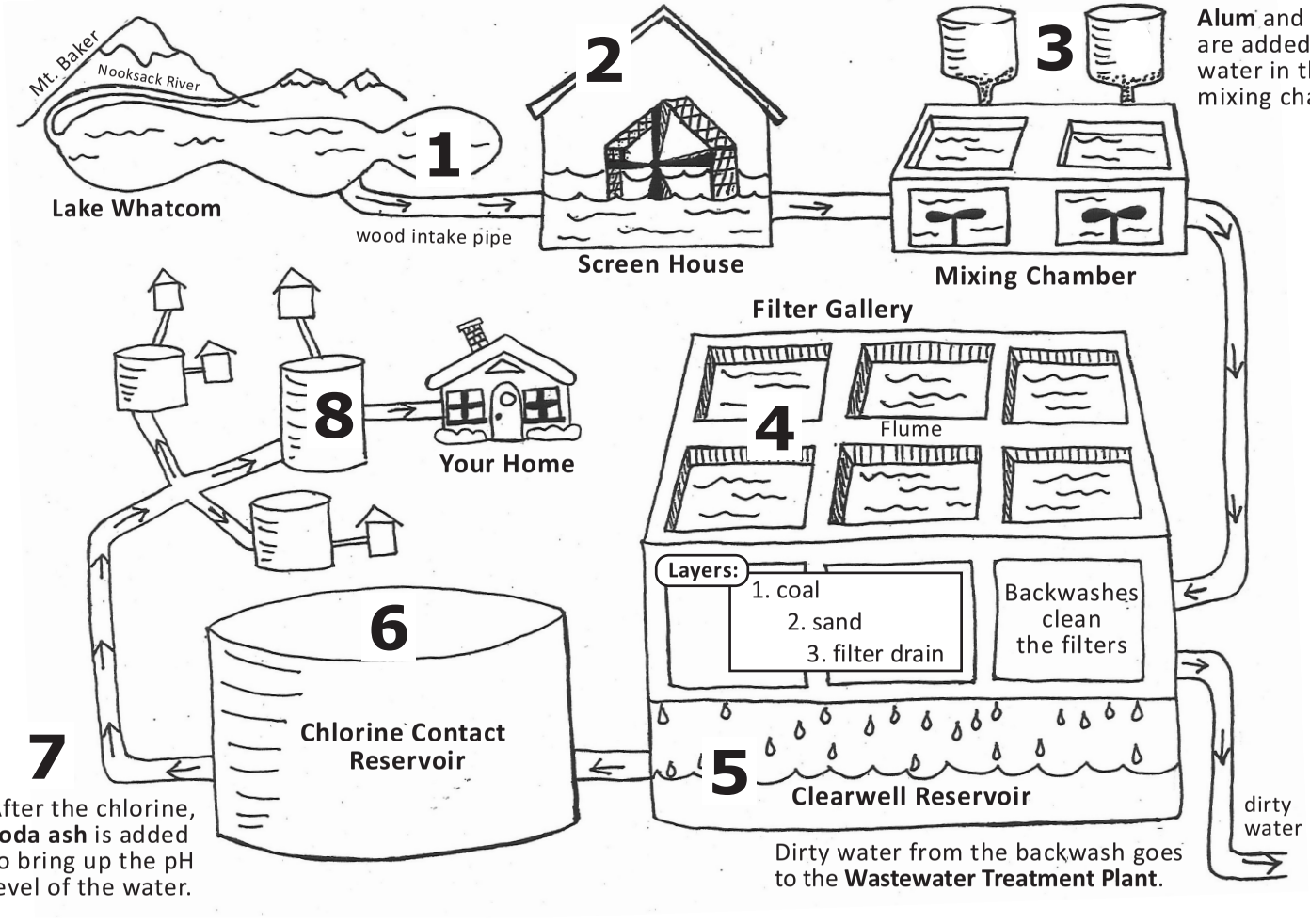
8. Looking at the aerial view, name the two watersheds outlined in yellow.

   1: ____MIDDLE FORK NOOKSACK WATERSHED_____

   2: ____LAKE WHATCOM WATERSHED_____

9. Reading "A Journey from Mountain to Tap," tell how many gallons of water all the citizens, businesses, and industries in Bellingham use in one day?
_____10 MILLION GALLONS_____

The Water Treatment Plant



Drinking Water Treatment

Record your observations here:

1. **Water Intake:** What body of water do we get our water from?

_____LAKE WHATCOM_____

2. **Screen House:** What sorts of things get trapped in the screen?

_____BIG THINGS, STICKS, LEAVES, BARK, ETC_____

3. **Mixing Chamber:** Why do we add alum and polymer to the water?

_____TO MAKE THE DIRT INTO BIGGER CLUMPS _____

4. **Filter Gallery:** What are the three layers the water passes through in the filters?

1. __COAL_____ 2. __SAND_____ 3. __FILTER DRAIN_____

5. **Clearwell Reservoir:** What is added in the clearwell reservoir?

_____CHLORINE_____

6. **Chlorine Contact Reservoir:** Why do we add chlorine to our drinking water?

____TO KILL THE MICROORGANISMS_____

7. **Soda Ash:** Why do we add soda ash?

____TO RAISE THE pH OF THE WATER/ TO PROTECT THE PIPES_____

8. **Neighborhood Reservoirs:** Name two reasons we store water in reservoirs.

____TO CREATE WATER PRESSURE & FOR FIRE EMERGENCIES_____

Six Simple Ways to Save Water

Don't leave the water running

Turn off the water while you scrub - your teeth, your hands AND the dishes - then turn it on again only to rinse.

Take shorter showers

A 20 minute shower can use around 45 gallons of water! Shortening your shower by even one minute can save thousands of gallons a year!

Only run full loads in the washing machine and diswasher

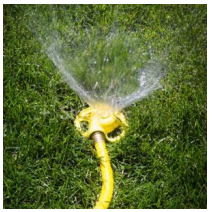
You'll use less water because you won't have to do as many loads over time. And don't put clothes in the washer unless you're sure they're dirty!

Find leaks and fix them

Leaks can waste up to 200 gallons a day! Check your faucets inside and the hose bibs outside. Check the toilet by putting food coloring in the toilet tank. If color shows up in the bowl without flushing, fix the leak!

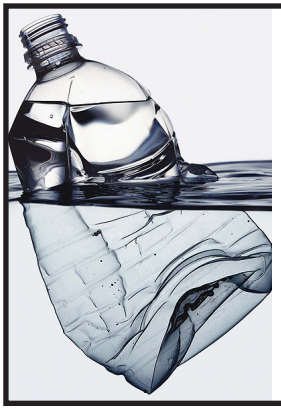
Play in water at a lake or pool instead of a sprinkler

Don't waste water by running sprinklers during hot weather. Lakes are already full of water, and pools and spray parks filter and reuse their water.



Don't waste drinking water on the grass!

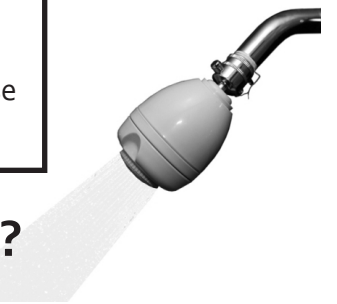
Collect rain water in a rain barrel to use on your garden or lawn. Only water outdoors in the early morning when it's cool so water isn't lost to evaporation.



DID YOU KNOW?

It takes 2 gallons of water to make one plastic bottle!

Drink fresh Lake Whatcom tap water instead! If you drink the recommended 8 glasses of water a day, that's only about a half gallon a day. If you drank bottled water, that would use about 16 gallons a day!



How much water do I use in the shower?

Take home your yellow shower worksheet to find out how much water you use each time you take a shower. Enter your average water use per shower here: _____ gallons.

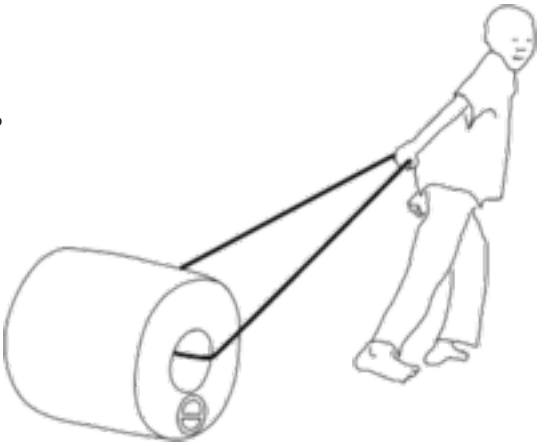
Then take home your shower timer and see if you can keep your shower under 5 minutes!

Do the calculations from your worksheet again later, and see if you've made any improvements!

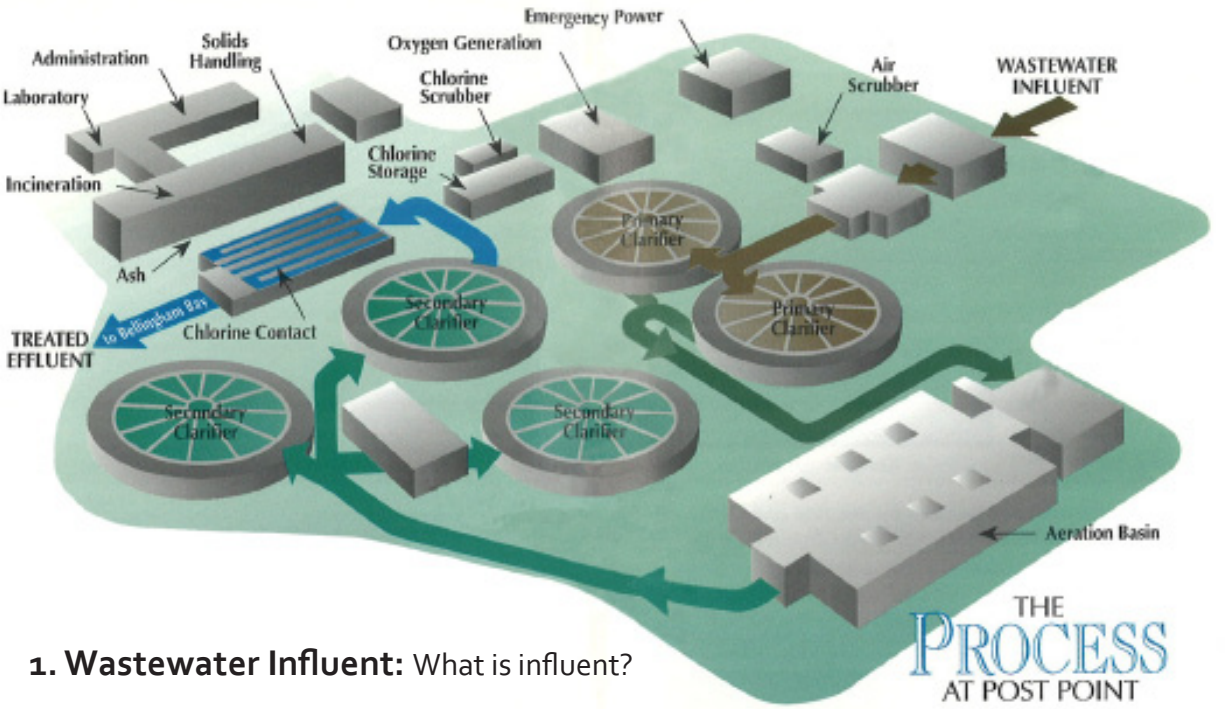
Do some water research!

How are people helping others get clean water?
Read more about these amazing inventions:
- Q-drum: www.qdrum.co.za
- LifeStraw: www.lifestraw.com

Find out how much water you're using at your house and how to save more!
- www.h2ouse.org
- www.h2oconserve.org



The Wastewater Treatment Plant



1. **Wastewater Influent:** What is influent?

___DIRTY WATER, USED WATER, WASTEWATER_____

2. **Preliminary Screening:** What is removed from the wastewater first?

___THE BIG THINGS_____

3. **Grit Removal:** What is removed from the wastewater next?

___THE HEAVY THINGS_____

4. **Primary Clarifiers:** Then the wastewater settles into three layers called:

1. ___SCUM_____
   (top)
2. ___WASTEWATER____
   (middle)
3. ___SLUDGE_____
   (bottom)

Sketch what you see in the jars:

5. Aeration Basin: What is added to the water to activate the microorganisms?

___OXYGEN_____

6. Secondary Clarifiers: How do the microorganisms make the water more clear?

___BY EATING THE WASTE AND CLUMPING IT TOGETHER_____

7. Chlorine Contact: What is mixed with the wastewater to kill the microorganisms?

___CHLORINE_____

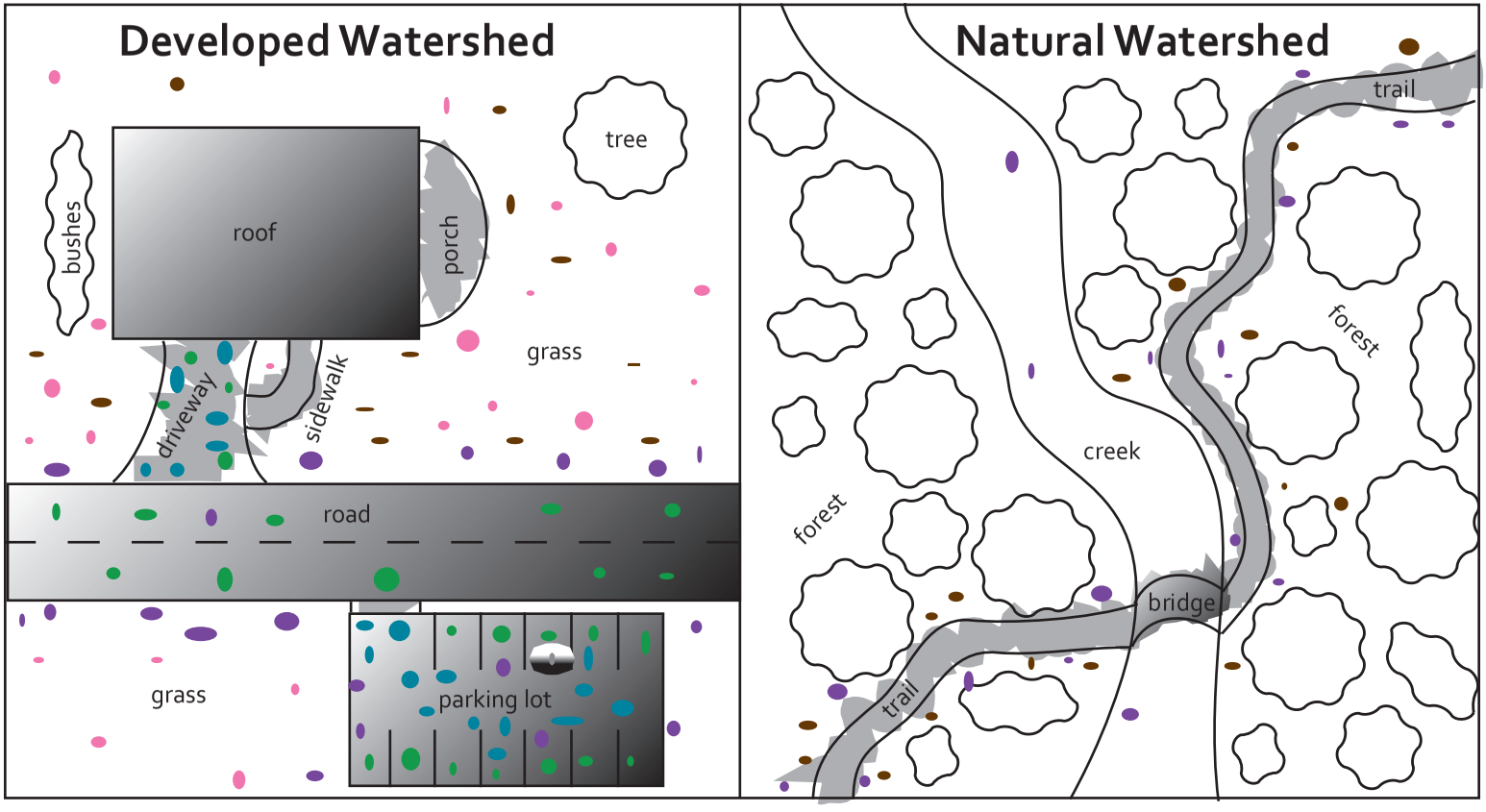
8. Wastewater Effluent: How clean is the effluent that is sent into Bellingham Bay?

___99.9% CLEAN_____

Watershed Surfaces

Pour a bottle of water on each surface. Does the water soak in or run off? Are you in a developed watershed or a natural watershed?

	Type of Surface	Pervious (soaks in)	Impervious (runs off)	Natural Watershed	Developed Watershed
1.	pavement		X		X
2.	grass	X			X
3.	mulch	X			X
4.	roof		X		X
5.	gravel (packed)	X		X	
6.	forest floor	X		X	
7.	pervious concrete	X			X
8.	gravel (loose)	X			X
9.	pavers	X			X
10.	gravel grid	X			X



Look at the different surfaces on the map. Use your pencil to shade in the impervious surfaces. Then use crayons to make dots where you think each type of pollution might be found.

Key

Surfaces

- pervious
- impervious

Pollution

- dog poop
- oil/gas
- litter
- car wash soap
- pesticides

The DRAIN RANGER Pledge

I will do my duty as a Drain Ranger to guard Puget Sound, to protect all aquatic animals large and small, to prevent pollution from going down storm drains into lakes, streams, rivers and Puget Sound. I will explain to others that car wash soap, dog poop and chemical fertilizers can end up in storm drains. I will help my family and friends stop polluting by showing them the Puget Sound Starts Here website to find a better way. I promise this on my honor as a Drain Ranger.

As a member of the Bellingham Chapter of Drain Rangers, I pledge to: (check at least one)

__ teach people about watershed-friendly car wash options

__ offer to pull weeds to stop someone from using chemicals

__ pick up litter and throw it away or recycle it

__ pick up my pet's poop and throw it away

__ ride in cars less by walking, biking, skating, scootering or busing

_____

(Sign your name here. You can use cursive if you want.)

Storm drains lead to streams

Only rain down the drain!

Anything that goes on the ground (litter, pet waste, chemicals, soap, gas and oil) will wash down storm drains into streams and then Bellingham Bay.

1. Pick up litter

Rain carries litter down storm drains and into waterways where animals might try to eat it or live in it and get hurt! Pick up litter (as long as it's not dangerous - like broken glass or needles). Sort it out and throw it in the trash or recycle bin.

2. Hand pull weeds in the yard

Chemicals pesticides can be washed away by rain or sprinklers down storm drains and into waterways where they can poison aquatic life! Instead on using chemicals, pull weeds by hand. Invite a friend to make it more fun or offer to help your neighbors to make money.

3. Be careful where you wash your car

It's not a good idea to wash cars in driveways or parking lots. Dirty wash water has soap, dirt and heavy metals in it. Take your car to a commercial car wash instead. If you want to wash at home, park the car on grass or gravel and only use biodegradable soap. If you're hosting a fundraiser, borrow a free car wash kit or sell car wash coupons instead!

4. Ride your bike, walk, or take the bus

Exhaust, break pad dust and leaky gas and oil gets onto the streets from cars. When you ride in cars, try to do everything in one trip instead of making lots of small trips. Otherwise, try walking to a friend's house, taking the bus to school or riding your bike to the park. Have fun, get exercise, and keep our water clean!

5. Scoop the poop

You wouldn't want human poop on trails or in your yard! Pet waste is just as dangerous to our health and our pets health, especially in our water! Even after dog poop looks like it has washed away, dangerous disease-causing bacteria can still be lurking in the grass or flow down stream.

Puget Sound Starts Here.org

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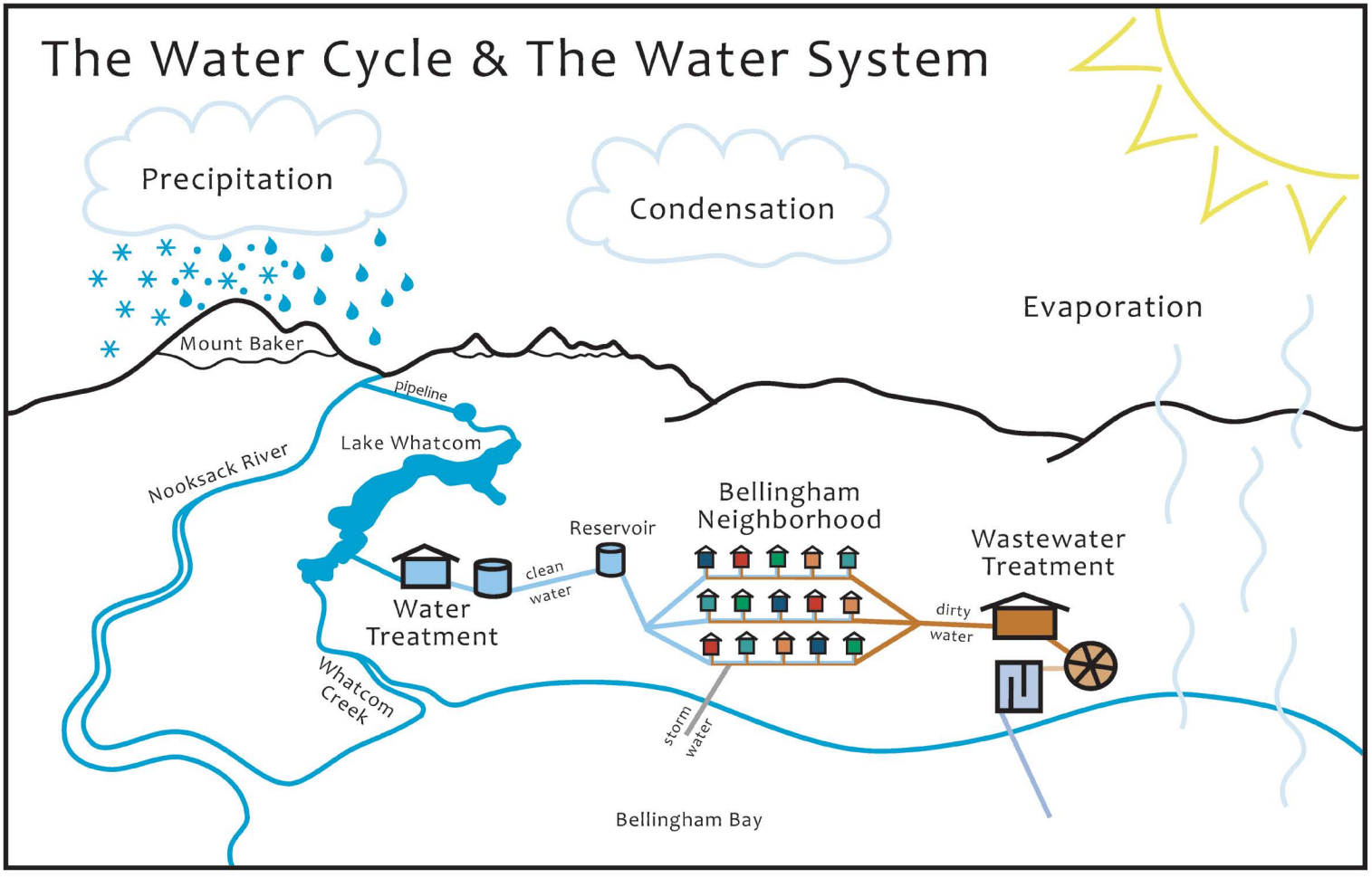

When you're done with this workbook, please take it home and share it with your family. Have more questions? Call the Environmental Educator for the City of Bellingham Public Works at (360) 778-7970 or email eejohnson@cob.org or visit www.cob.org