

Welcome teachers!

This work booklet is based on the Stormwater Partners new online tool, 'Explore Your Watershed', an ArcGIS StoryMap. This StoryMap was created by Eric Lambert of Clark County Public Works with a grant from the Lower Columbia Fish Recovery Board to be an immersive learning experience based on information about the ten major watersheds in Clark County.

These asynchronous, self-paced worksheets can be added to your Google classroom, or printed in packets for physical distribution, and can be used in lieu of the Student Watershed Monitoring Network's in class introductory presentation to prepare students to understand how watersheds function while setting the stage for collecting and interpreting their monitoring site's water quality data. These worksheets can be done in the order and/or subject matter you choose.

To explore this StoryMap, follow this link: <https://arcg.is/iGXrq>

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Chapter 1 – Clark County Watersheds!

1. What is a watershed? Hint: Watch the video in the ‘What is a watershed?’ section.
 - a. An area of land that drains to a common stream, river or lake.
 - b. A shed that holds water.
 - c. A place in the forest where water comes from.

2. How many miles of streams are in Clark County? Hint: Look in the ‘Our streams’ section.
 - a. 1,000 miles
 - b. 2,000 miles
 - c. More than 2,400 miles

3. What is the largest watershed that is entirely in Clark County? Hint: Watersheds along the border of Clark County also encompass other counties.
 - a. Burnt Bridge Creek – smaller than Salmon Creek watershed
 - b. Salmon Creek – tricky question, but Salmon Creek is the largest watershed that is entirely located within Clark County.
 - c. East Fork Lewis River – almost 25% of the East Fork Lewis watershed is in Skamania County

4. What watershed is Fifth Plain Creek a part of? Hint: This watershed drains into the Washougal River just before meeting with the Columbia River.
 - a. West Slope
 - b. Gibbons Creek
 - c. Lacamas Watershed

5. What river flows southwest through Clark County for its final 12 miles? Hint: Most of this 33-mile river is in Skamania County.
 - a. Washougal River – key was that this river flows southwest and only 12 miles of it is in Clark County
 - b. East Fork Lewis River – flows northwest
 - c. North Fork Lewis River – longer than 12 miles

6. Which creek flows directly into Vancouver Lake? Hint: This creek is in the most urbanized watershed in the county.

- a. Salmon Creek – flows into Lake River, which can flow into Vancouver Lake under certain tidal conditions
- b. Burnt Bridge Creek – it is the most urbanized and the only one to flow directly into Vancouver Lake
- c. Gee Creek – flows into an estuary around the Ridgefield Wildlife refuge

7. How many square miles is the Columbia River Drainage Basin? Hint: Look in the 'What's your watershed?' section.

- a. 193,000 square miles
- b. 258,000 square miles
- c. 312,000 square miles

10. Which is a tributary, or subwatershed, of the North Fork Lewis River?

- a. Tenny Creek
- b. Campen Creek
- c. Cedar Creek

Chapter 2 – What You Can Do

1. What is okay to put down the storm drain? Hint: You may have seen the answer on the blue and silver medallions beside some storm drains.
 - a) Leaves and grass.
 - b) Only rain down the drain – most storm drains lead directly to local streams.
 - c) Soapy water from washing a car.

2. What can dog owners do to protect the health of their watershed? Check all that apply.
 - a) Always pick up after their pets – even at home - so stormwater doesn't mix with the poop and runoff into our streams.
 - b) Keep dogs on leash in sensitive areas so their scent doesn't scare away wildlife.
 - c) Bring an extra bag on your walks to offer pet owners who forgot theirs.

All of these are things that dog owners can do to help protect the health of their watershed!

3. Which is NOT a good place to wash a car and prevent pollution?
 - a) At a car wash because they recycle their water and it gets treated to remove pollutants.
 - b) On the street or driveway - dirty wash water goes down the storm drain and into our streams. – Washing cars on the street or in the driveway is not a good place to place to prevent pollution. It just sends dirty soapy water down the storm drains and to your local stream. Try a car wash or on the grass. If you must wash on the driveway, roll up old towels and place them to guide the wash water onto a grassy area.
 - c) On the grass where wash water can soak into the ground.
4. On what website can you find a list of yard products that ranks their safety and provides safer alternatives? Hint: They're all great websites, but only one of them compares a wide variety of yard care products to help you choose the safest.
 - a) Clark Green Neighbors www.clarkgreenneighbors.org
 - b) Don't Drip and Drive www.fixthoseleaks.org
 - c) Grow Smart, Grow Safe www.growsmartgrowsafe.org – If you have questions about specific fertilizers or pesticides, this is the site to visit. Visit Clark Green Neighbors for tips on natural yard care, recycling and more.

5. What should you do if you suspect your car may be leaking? Hint: The program Don't Drip and Drive offers help to people with car leaks.

- a) Get a free leak inspection from an auto shop participating in Don't Drip and Drive or do a leak check at home and if you find one, fix that leak! – Don't waste money on a bunch of fluids that may be leaking onto streets and polluting our water. Your first step should be to find out the problem – sometimes it can be a cheap fix, which can save you money in the long run.
- b) Go to the store and buy every type of fluid your car needs and keep adding more of every type.
- c) Get an oil change.

6. On a farm, what can be a pollutant if left uncovered outside, or become a slow-release fertilizer if covered and composted? Hint: Large animals, such as horses, make about 50 pounds of this a day!

- a) Seeds
- b) Fence posts
- c) Manure – From pollutant to a sustainable fertilizer - what a difference keeping manure covered and composting can make!

7. What's the best way to clean up dirt that spilled on the driveway? Hint: Don't let that dirt get down the storm drain.

- a) Sweep it up with a broom and put on a landscaped area – When cleaning up messes on hard surfaces outdoors, always try to get the mess in the trash. Adding water often just sends to mess to your local stream and putting it in the streets does the same.
- b) Use a pressure washer to move it into the street
- c) Use a blower to blow it into the street

8. Where can Clark County residents dispose of hazardous household waste for free on weekends? Hint: Hazardous household wastes contain the words *poison*, *danger*, *warning*, *caution*, *toxic*, *explosive* or *flammable* on the label.

- a) Their regular trash can
- b) Local transfer stations – It's VERY important to dispose of these chemicals safely and that's why it's free to do at your local transfer station. Find out more at <https://clarkgreenneighbors.org/en/household-hazardous-waste>
- c) Dump it down the storm drain.

Chapter 3 – Our Pollution

1. What is the number one source of water pollution in our streams today? Hint: The Clean Water Act of 1972 targeted 'point sources' of pollution – the worst polluters that dumped directly into waterways.
 - a. Factories dumping waste
 - b. Municipal wastewater treatment plants discharging treated sewage
 - c. Stormwater – a mix of pollutants picked up by storm runoff. Many small deposits of pollutants (rubber from tires, pet waste left behind, over-fertilizing yards, etc.) that happen repeatedly over a large area are really add up! These pollutants are mostly the result of human behaviors, which is why we say “Clean Water Starts with me”.
2. Watch the video “Solving Stormwater”. In the experiment where scientists placed some salmon in stormwater and others in well water, what percent of the salmon in stormwater died?
 - a. 100% - watch [the video](#) again, all the salmon in stormwater died
 - b. 72%
 - c. 55%
3. Forested land results in less than 1% surface runoff. How much surface runoff is typical after that land is developed? Hint: Check out the diagram in the ‘How we got here’ section.
 - a. 5-10%
 - b. 10-20%
 - c. 20-30% - That’s one reason planting more trees and natural landscapes is good stormwater management practice.
4. Which is NOT an impact from nutrients pollution caused by over fertilizing, animal waste, failing septic systems and phosphate soaps and detergents? Hint: Think about how nutrients affect plants AND the entire lifecycle of those plants.
 - a. Swim beach closures from toxic algae blooms
 - b. Less turbid (i.e. clearer) and cooler water. Nutrients, mostly from over fertilizing yards, definitely do not help the water become less turbid (more clear) or cooler. They do cause toxic algae blooms and when the algae die off and decompose, they use up dissolved oxygen that fish need to live.
 - c. Less dissolved oxygen in water due to decomposing plant material

5. How does sediment pollution make survival difficult for salmon?
 - a. When sediment settles, it fills in gravel beds that salmon need to lay their eggs
 - b. Sediment pollution can make water cloudy, which makes it difficult for salmon to see and breathe
 - c. All of the above – sediment pollution really makes survival difficult for salmon.

6. Name one of the main sources of fecal coliform bacteria (poop) in urban (city) areas. Hint: Many people include one of these as a non-human family member.
 - a. Manure lagoons
 - b. People not picking up after their dogs – with over 110,00 dogs in Clark County, it's easy to see that this could add up quickly! Take the Canines for Clean Water Pledge at www.cleanwaterdogs.com
 - c. Bears

7. What is the leading source of oil pollution in our waterways? Hint: A little bit from a lot of things can really add up.
 - a. Small vehicle leaks and drips that land on hard surfaces and get carried by stormwater to waterways – A common theme of stormwater pollution is that a lot of a little can really add up and this is a perfect example. There are hundreds of thousands of cars in Clark County and it's estimated at least 5% have leaks. If someone you know has a leak have them check out www.fixthoseleaks.org for discounts on repairs.
 - b. Large oil spills from ships and large tanker trucks
 - c. Natural oil bubbling up from underground

8. What pollutant can be reduced by planting trees that create shade over waterways? Hint: This pollutant is not one that people typically think of, but it does hurt many of our important fish species.
 - a. Litter
 - b. Temperature – Trees that create shade are very important for keeping water cool in streams. Creating healthy riparian (streamside) areas can also help filter other pollutants.
 - c. Metals

9. Zinc is a metal pollutant that is toxic to fish and interferes with their gills. What is the primary source of zinc pollution? Hint: It's all over the road, but you seldom see it.
- a. Rusty cars sitting outside
 - b. It's a byproduct that factories dump
 - c. Tire residue that rubs off on the road from driving around – ever wonder where the rubber went on an old set of tires? It's difficult to see because it comes off in such small pieces, but all of that rubber, and the metals added to it, rubs off in on the road. Next time it rains, that rubber runs down the nearest storm drain and onto your local creek.
10. What river in Ohio was so polluted that it caught fire 13 times and provided an important image that helped lead to passing the Clean Water Act in 1972?
- a) Cuyahoga River
 - b) Columbia River
 - c) Rio Grande

Chapter 4 – Stream Health

1. What activity helps to identify pollutants, allocate resources for watershed improvements and measure the effectiveness of actions taken in a watershed?
 - a. Planting trees
 - b. Monitoring stream health – monitoring, or regularly testing, various parameters of stream health helps scientists and decision makers understand the best course of action that should be taken for a stream.
 - c. Inspecting stormwater facilities
2. What stream health factor looks at the creatures living in a stream to determine its health?
 - a. Water quality
 - b. Biological health – when scientists assess biological health, they're specifically interested in looking at the living creatures a stream can support. Water quality and stream flow can also be used to predict if a stream can support
 - c. Stream flow
3. A healthy stream should have_____. Hint: Check out the section on Healthy Streams.
 - a. A meandering, curvy stream channel
 - b. A direct, straight stream channel
 - c. A zig-zagging stream channel
4. How do most pollutants get into streams? Hint: Look at the graphic in the section 'Threats to Stream Health'.
 - a. People throw trash into streams
 - b. Factories dump waste from their factories
 - c. Stormwater picks up pollutants from hard surfaces and carries them to nearby streams
5. How much more runoff is generated from areas that are 75-100% impervious (hard) surface compared to natural ground cover? Hint: Look at the graphic in the section 'Threats to Stream Health'.
 - a. 25% more
 - b. 35% more
 - c. 45% more – runoff for urban areas with 75-100% impervious cover (where water cannot soak in) is 55%, but natural ground cover can still result in some runoff, about 10%. Therefore, urban areas result in 45% more runoff.

6. Look at the map in the 'Land Cover and Stream Health' section. Which statement best summarizes the information on the map?

- a. Streams in urban areas are just as healthy as streams in forested areas.
- b. Streams in forested areas are healthier than those in urban areas.
- c. Streams in urban areas are healthier than those in forested areas.

7. Which is NOT a common parameter used in monitoring water quality?

- a. Litter observation – the amount of litter observed in a stream. Sometimes, specific projects may take a litter observation, but it's not common. Turbidity and pH have standard measurements, making them good parameters for assessing water quality.
- b. Turbidity – a measurement of how cloudy or clear water is
- c. pH – a measurement of how acidic or basic the water is

8. How do macroinvertebrates help scientists assess the health of a stream?

- a. The more macroinvertebrates found, the healthier the stream.
- b. Macroinvertebrates found floating on the top of the water is a sign of good stream health.
- c. Since macroinvertebrates vary in their tolerance to pollution, the types found help indicate the health of the stream.

9. A scientist looking for macroinvertebrates finds mostly stoneflies and mayflies. The biological health of this stream is likely _____. Hint: See the graphic in the Monitoring for Biological Health section.

- a. Poor
- b. Fair
- c. Good – stonefly and mayfly macroinvertebrates are sensitive to pollution. If scientists find them, that means the water quality is good.

10. What does it mean when a stream is described as "flashy"? Hint: Look at the 'Measuring Stream Flow' section.

- a. The stream glistens in the sunlight.
- b. The stream flow rises and falls very quickly during rain events. – "Flashy", like a flash flood that happens very quickly, is a word used to describe streams that rise and fall quickly. These streams are associated with urban watersheds that have a lot of impervious surfaces which drain runoff very quickly.
- c. The stream is so packed with fish that they frequently jump out of the water.

Chapter 5 – Fish and Wildlife!

1. What is habitat?
 - a. Something animals do routinely
 - b. Areas where animals can find food, water, shelter, and space to live
 - c. A place where animals hunt

2. Which streams and rivers do spring Chinook use? Hint: Click the link to the 'map of fish' in the rivers and lakes section and look at the fish species in the legend to see which streams and rivers they use.
 - a. Columbia, East Fork Lewis, North Fork Lewis Rivers and Cedar Creek – using the map legend to click on spring Chinook and it will show these are the streams they run.
 - b. Columbia River, Burnt Bridge Creek, and Lacamas Creek
 - c. Columbia River, Whipple Creek, Salmon Creek and Lacamas Creek

3. Name one mammal that spends a significant part of their life in river habitat.

So many options!

4. Where can you see a great example of wetlands and plenty of wildlife in Clark County?
 - a. Lewisville Regional Park
 - b. Esther Short Park
 - c. Steigerwald and Ridgefield National Wildlife Refuges

5. What is a standing dead tree called? Hint: It's an important habitat feature in forests.
 - a. Nurse log – a nurse log refers to a dead, decaying tree from which other trees grow on top of.
 - b. Old leaner
 - c. Snag – valuable habitat for wildlife

6. Which animal lives mostly on the forest floor?
 - a. Pileated woodpecker
 - b. Banana slug – these creatures live on moist forest floors.
 - c. Douglas squirrel – sometime these squirrels *will* make nests on or in the ground, but more often they prefer holes in trees.

7. Which is one of Clark County's rarest habitats today? Hint: Much of this habitat was lost because it was easy to convert to farmland and urban areas.
 - a. Prairie and oak woodland – the key was in the hint, but I can see how beach also seems rare here
 - b. Forest
 - c. Beach

8. Name one type of butterfly that can be found in prairie and oak woodland habitats?
Taylor's Checkerspot butterfly, duskwing, and swallow tail butterfly are some examples.

9. Why is creating habitat in urban areas important?
 - a. So animals can come from natural habitats to form a closer bond with people
 - b. Wetlands are becoming too crowded
 - c. Urban habitats help animals connect natural habitats, which can become disconnected with man-made development

10. What program helps people create habitat in their own yards? Hint: You can contact the Watershed Alliance if you're interested in learning more about this program.
 - a. Master Composter/Recycler program
 - b. Backyard Habitat Certification program – this program is specifically designed to help homeowners create habitat, check it out [here](#)!
 - c. Watershed Stewards program

Chapter 6 - Recreation

2. Which pass do you need for some lands and parks operated by Washington State?
 - a. Discover Pass – this pass is only good for parks and lands operated by Washington State.
 - b. America the Beautiful National Parks Pass
 - c. Clark County Parks Pass

3. Which fish species is commonly stocked in Clark County lakes and ponds where fishing is permitted?
 - a. Sturgeon
 - b. Brown trout
 - c. Coho salmon

4. What is the name of the Washington State Department of Fish and Wildlife app that can show you nearby fishing locations and let you know up-to-date regulations?
 - a. iFish
 - b. Big Fish Now
 - c. Fish Washington – This is the WDFW official app, but iFish sure sounds like a good name for an app!

5. Why is it important to use a boot brush at a trailhead before setting off?
 - a. To make sure your boots have good grip on the trail.
 - b. To remove weed seeds that may be stuck on your boots.
 - c. The brushing sound alerts animals you're coming.

7. Why are greenway trails usually a good place to spot wildlife?
 - a. Greenways are typically along waterways and animals frequently use riparian areas.
 - b. City and county workers bring wildlife to greenways for viewing opportunities.
 - c. There are usually no trees along greenway trails so you can see for a long way.

8. Which of these is a floatable stream with access to launch boats?
 - a. Whipple Creek
 - b. Lake River – this stream is the only one with an official boat launch. Unlike the others, it's also wide and deep enough for boats.
 - c. Burnt Bridge Creek

9. What can you do to protect a watershed while boating?
 - a. Be careful not to spill fuel or soaps in the water.
 - b. Clean your boat to make sure you're not carrying invasive species.
 - c. Both A and B – these are both important things to protect water quality while boating.

10. Which is NOT a Clark County Public Health designated swim beach?
 - a. Battle Ground Lake State Park – Clark County Public Health monitors water quality at this location, thus making it a designated swim beach.
 - b. Washougal River – Clark County Public Health designates swim beaches and monitors them for water quality issues, and there are no designated areas on the Washougal River.
 - c. Vancouver Lake - Clark County Public Health monitors water quality at this location, thus making it a designated swim beach.