SNOHOMISH CONSERVATION DISTRICT

SOUND EDUCATION
TEACHER'S PACKET

Dear teachers, Thank you for inviting us to your classroom for a Sound Education lesson! In this Teacher's Packet, you will find much more information about our scheduled lesson and other opportunities you and your classroom may wish to take part in.

Click on the lesson below to navigate to that lesson:

Technology: Our lessons include PowerPoint presentations. Our presenter will bring a USB/flash drive to connect to your classroom computer. We will arrive several minutes before our scheduled time for set-up.

After our lessons: We will email you a link to a short online evaluation of our lesson and your presenter. Please take a few minutes to complete this survey - it helps us continue to improve our program and provide evidence of learning to our partners, which keeps our lessons free!

We look forward to visiting your classroom soon! If you have any questions or concerns, please don't hesitate to contact us at education@snohomishcd.org.

Best,

Sound Education

WHO IS THE SNOHOMISH CONCERVATION DISTRICT?

Funding for your FREE lesson was provided by the Snohomish Conservation District.

At the Snohomish Conservation District, we've been working together with locals since 1941 to make better ground for our community. We provide educational resources, technical expertise and funding for conservation projects at farms, ranches, homes, and schools - all with the goal of conserving healthy soils and waterways for our future.

Our Services

- Farm and nutrient management planning
- Home stormwater and drainage assessments
- Streamside restoration and native plantings
- Soil testing
- Sound Horsekeeping
- Lawns to Lettuce

Our Programs

- K-12 environmental education
- Classes, tours, events, workshops and speakers
- Volunteer opportunities
- Green Schoolyard support
- Rain barrel kits at low cost
- Better Ground programs

Conservation districts offer free assistance to residents to help conserve land, water, forests, wildlife and related natural resources.

Request one of our services for yourself or for your school, and learn more about our mission by visiting us at:

snohomishcd.org | betterground.org | 528 91st Ave NE, Lake Stevens, WA 98258

SOUND EDUCATION

FREE programs for teachers in Snohomish County and Camano Island available from Snohomish Conservation District and our education partners!

CLASSROOM LESSONS

ELEMENRTARY LESSONS (grades 3 to 5)

4 RAINDRIOPS PART 1 AND 2 (Grade 4-5)
Understand the problem with impervious surfaces in our watersheds and test BMPs to reduce flooding during rainstorms.

IT'S NOT FIDO'S FAULT (Grade 3-5)
Pet waste isn't your dog's problem -it's yours! Learn how pet waste affects Puget Sound and what we can do about it.

MACROMAYHEM! (Grade 3-5)
Learn how scientists study stream bugs to monitor the health of local streams

SALMON OF PUGET SOUND (Grade 3-5)
Students investigate local salmon and learn simple ways to protect their threatened habitat

WATER QUALITY TESTING CHEMICAL TEST KITS (Grade 5)
Use real scientific testing equipment to assess the health of a local lake, river, pond or stream.

WETLAND WARRIORS (Grade 5)
What makes up a wetland? Where are wetlands here in Washington? How can we protect them?

MIDDLE SCHOOL LESSONS (grades 6-8)

WATER QUALITY LESSONS PART 1 BENTHIC MACROINVERTABRATES
Learn how scientists use stream bugs to monitor water quality and then try your hand at a biological analysis using real macroinvertebrates! *This lesson pairs well with Chemical WQ Monitoring.

WATER QUALITY PART TWO CHEMICAL TEST KITS
Using real scientific tests, students complete a chemical water quality analysis of a nearby waterbody. *This lesson pairs well with Biological WQ Monitoring

FIELD TRIPS

If interesting in out field trips please contact us at education@snohomihshcd.org for information about current opportunities. Or check out our website at snohomishcd.org/field-trips

OTHER OPPORTUNITIES

Teacher Workshops
Visit our Teacher Workshop page on our website to find out about upcoming events. We feature our own workshops as well as partner workshops as they are scheduled.
https://snohomishcd.org/teacher-workshops

Service Learning
SCD is pleased to provide learning opportunities to local groups. Projects such as tree plantings or invasive species removal vary throughout the year. Check out opportunities at https://snohomishcd.org/service-learning

Green Schoolyard support
SCD can provide technical and financial support to help schools address stormwater pollution, water conservation, and habitat protection on their campuses. Contact us today about BMPs for your school!

Better ground youth awards
The Better Ground Conservation Showcase is an awards ceremony to honor outstanding conservation leaders! Learn about nominating someone under 18 for their environmental leadership by contacting us today!

SCD Education programs are provided through a partnership between Snohomish Conservation District, and the cities of Arlington, Bothell, Brier, Edmonds, Granite Falls, Mill Creek, Monroe, Mountlake Terrace, and Mukilteo.

4 RAINDROPS

A two-part watershed lesson

Part 1
Where does the water go when it rains? In this interactive lesson, students model the movement of water from cloud to stream in different environments.

Part 2
In the second class students will learn about green storm water engineering solutions that are being used to help reduce water pollution and alleviate flooding in our urban environments.

Lesson Reminders

Two-part lesson; For this lesson series, we'll need to visit your class on two separate occasions. Please make sure your second lesson is booked - our calendars may fill up quickly!

Learning Targets

Part 1: I can define a watershed.
I can describe what happens in a watershed when it rains.
I can identify several problems with surface runoff in an developed watershed.
Part 2: I can describe several run-off solutions to address surface runoff.
I explain why run-off solutions are helpful and what problems they might fix in a developed watershed.

NGSS

This lesson complements Next Generation Science Standards listed below:

3-5-ETS1-1 Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, or costs.
3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard
4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science Kits

This lessons complements the following science kits:
Landforms | Land and Water| Ecosystems| Changes | Changes of State

Resources

Want to explore more with your students? Check out our resources page for this lesson to find videos, lesson plans, and more!
www.snohomishcd.org/4-raindrops

Questions?

Contact Sound Education at the Snohomish Conservation District.:

528 91st Ave NE, Ste A,
Lake Stevens, WA 98258-2538

Phone 425-377-7021

education@snohomishcd.org

www.snohomishcd.org/sound-education

ANSWER GUIDE

A WATERSHED IS AN AREA OF LAND WHERE ALL OF THE WATER THAT FALLS IN IT DRAINS TO THE SAME WATERBODY.

MY WATERSHED IS...

ANSWERS VARY

	EVAPORATION RATE (NUMBER OF DROPS)	TRANSPIRATION RATE (NUMBER OF DROPS)	INFILTRATION RATE (NUMBER OF DROPS)	SURFACE RUN-OFF RATE (NUMBER OF DROPS)	TIME
FORESTED WATERSHED	ANSWERS VARY				
DEVELOPED WATERSHED					

WHEN LIQUID WATER TURNS INTO GAS OR VAPOR, WE CALL IT

EVAPORTATION

WHEN PLANTS SOAK UP WATER, WE CALL IT

TRANSPIRATION

WHEN WATER SOAKS INTO THE GROUNDWATER, WE CALL IT

INFLITRATION

WHEN WATER FLOWS OVER THE LAND SURFACE, WE CALL IT

SURFACE RUN-OFF

WHAT'S THE PROBLEM WITH TOO MUCH SURFACE RUN-OFF?

FLOODING

SOIL EROSION

POLLUTION

LESSGROUNDWATER

DID YOU KNOW? AN ACRE OF WETLANDS CAN STORE 1 TO 1.5 MILLION GALLONS OF WATER! WOW, THAT'S A LOT OF WATER! A BATHTUB HOLDS 50 GALLONS, SO A MILLION GALLONS WOULD BE 20,000 BATHS!

ANSWER GUIDE

SURFACE RUN-OFF HAPPENS WHEN RAIN FALLS ON A(N) IMPERVIOUS SURFACE.

INFILTRATION HAPPENS WHEN RAIN FALLS ON A(N) PERVIOUS SURFACE.

PEOPLE USE RUN-OFF SOLUTIONS TO HELP CONTROL SURFACE RUN-OFF.

LIST 5 EXAMPLES

1. RAIN BARRLES
2. RAIN CISTERNS
3. RAIN GARDENS
4.
5. RIPARIAN PLANTING

	TIME	STARTING VOLUME OF WATER	VOLUME OF SURFACE RUN-OFF	VOLUME OF INFILTRATION, EVAPORATION, & TRANSPIRATON
DEVELOPED MODEL	ANSWERS VARY		-	=
+ RUN-OFF SOLUTIONS			-	=

WHAT CHANGES DID YOU MAKE TO YOUR MODEL? DRAW A DIAGRAM IN THE BOX BELOW.

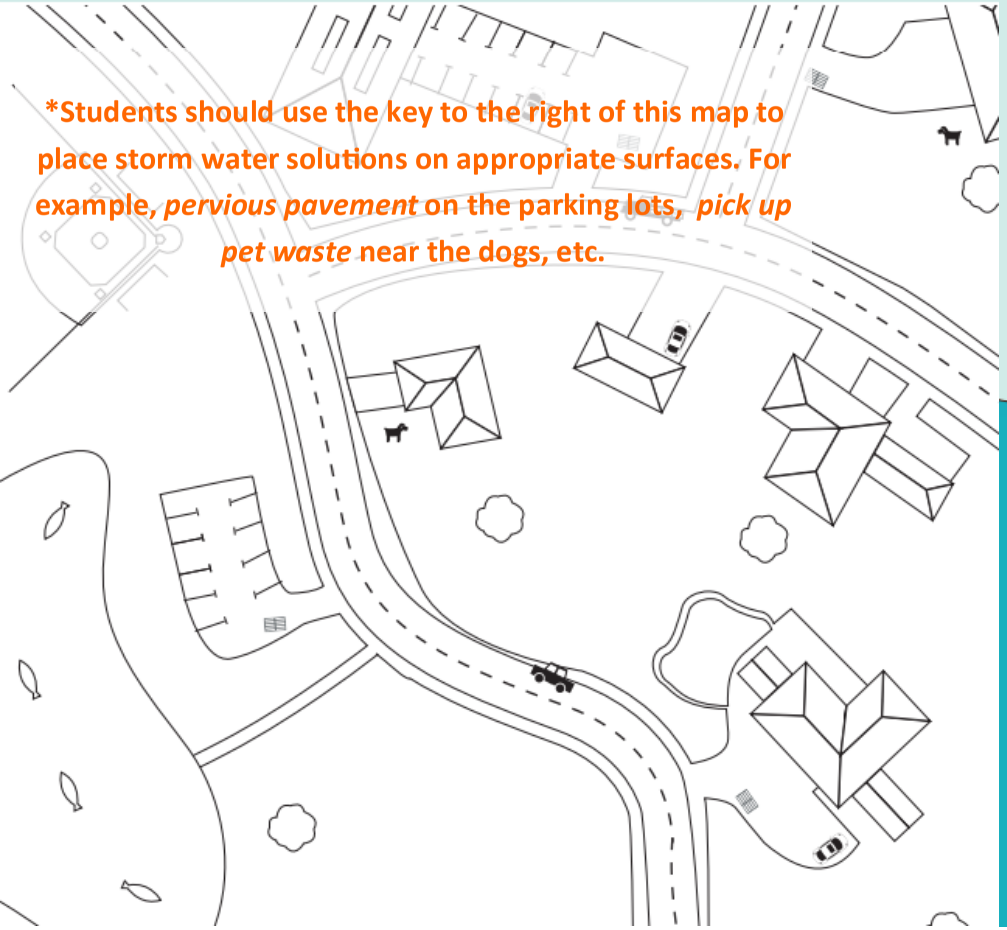
Answers may include: Pervious pavement, rain barrels, etc. plus a photo.

WHERE HAVE YOU SEEN EVIDENCE OF SURFACE RUN-OFF (PUDDLES, POLLUTION, ETC.)?

Answers will vary.

ANSWER GUIDE

NOW IT'S YOUR TURN! DESIGN A HYBRID WATERSHED. USE THE KEY TO IMPROVE SURFACE RUN-OFF IN THE NEIGHBORHOOD.



***Students should use the key to the right of this map to place storm water solutions on appropriate surfaces. For example, *pervious pavement* on the parking lots, *pick up pet waste* near the dogs, etc.**

KEY

USE THE ICONS TO MARK WHERE IN THE NEIGHBORHOOD YOU WOULD PLACE THESE STORMWATER SOLUTIONS.

DON'T FEEL LIKE DRAWING? USE THESE MARKERS INSTEAD.

PP	RG	RB	SD	PW	GC
PERVIOUS PAVEMENT	RAIN GARDEN	RAIN BARREL	CLEAN STORM DRAINS	PICK UP PET WASTE	GRASSCYCLING

BONUS ACTIVITY! NOW CALCULATE THE COST OF THE STORMWATER SOLUTIONS YOU HAVE ADDED TO YOUR NEIGHBORHOOD.

SOLUTIONS	COST	X	NUMBER ON NEIGHBORHOOD	=	TOTAL COST
PERVIOUS PAVEMENT	$325,000 parking lot	X	2 (answers vary)	=	$650,000
RAIN GARDEN	$5,000 each	X	1	=	$5,000
RAIN BARREL	$50	X	2	=	$70
CLEAN STORM DRAINS	$0	X	3	=	$0
PICK UP PET WASTE	$0	X	2	=	$0
GRASSCYCLING	$0	X	4	=	$0
			TOTAL COST FOR NEIGHBORHOOD:		$655,070

SNOHOMISH CONSERVATION DISTRICT

IT'S NOT FIDO'S FAULT!

This lesson emphasizes that pet waste pollution is not a pet problem – it's a people problem. After a discussion about what pet waste does to our rivers, lakes, and streams, students form teams to play a game and take a quiz to reinforce proper pet waste collection and disposal methods. The lesson wraps up by asking students to think of and describe (in writing or in a drawing) an engineering solution that improves proper pet waste collection using technology.

Lesson Reminders

It's Not Fido's Fault! game: This lesson includes a running game, usually the playfield or covered area. Our lesson will begin and end in your room, so don't worry about meeting us "in the field"!

Learning Targets

I know how to dispose of pet waste properly.
I can describe how pet waste pollution affects Puget Sound.
I can brainstorm and design a new technology to help people collect and dispose properly of pet waste.

NGSS

This lesson complements Next Generation Science Standards listed below:
3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Science Kits

This lessons complements the following science kits:
Environments | Ecosystems

Name:_____

Pet waste in Snohomish county is a PEOPLE problem! Can you dream up a new technology to encourage your neighbors to dispose of pet waste properly? Start by writing or by diagraming—just read the instructions for each box first!

Describe your invention! How does it help people get rid of pet waste properly?

At the end of our lesson, students are asked to design a solution to pet waste that includes technology. Students may write OR draw to describe their ideas. As students finish one side of the worksheet, encourage them to take a stab at the other.

If students describe their invention in writing, ensure that they describe each component of the system in as much detail as possible. Students should include details in their writing; for example, how big is the invention? Where does it's energy source come from?

Diagram your invention over here! Don't forget to include these important parts of a scientific drawing!

Details	Fill up this whole space with your drawing so that the details of the technology are easy to see.
Labels	Draw lines from important details in your drawing to the edges of the box. Make sure the lines touch both the label and the detail.
Scale	You drawing isn't life sized! Make sure you include the actual size of your new invention on your diagram. You can use feet, inches, miles, or some other measurement.
Title	What is your invention called? Make sure to include your name and the date too.

Title *what is your invention called?*

Invented by:

Invented on this date:

If students draw their invention, encourage students to *diagram*. They should include labels, titles, scale, etc. Check to see that the boxes on this page are filled in correctly.

Scale *how big is your invention?*

SNOHOMISH
CONSERVATION DISTRICT

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MACROMAYHEM!

Students will investigate stream bugs in the classroom. Then, using a game of tag as a model, students will begin to understand macroinvertebrate habitat and their environmental stressors.

Lesson Reminders

MacroMayhem! game: This lesson includes a running game, usually the playfield or covered area. Our lesson will begin and end in your room, so don't worry about meeting us "in the field"!

Learning Targets

I can explain specific adaptations macroinvertebrates have to help them survive.
I understand how water quality affects macroinvertebrate habitat.
I can suggest several actions to improve water quality.

NGSS

This lesson complements Next Generation Science Standards listed below:
3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.
5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science Kits

This lessons complements the following science kits:
Environments | Ecosystems | Diversity of Life | Populations and Ecosystems

SNOHOMISH CONSERVATION DISTRICT

SALMON OF PUGET SOUND!

Eggs, alevins, fry, oh my! Students will learn the life cycle of Pacific Salmon and identify natural and manmade threats to this important fish. During an action packed lesson, we'll also identify ways to protect the local ecosystems that support salmon life in Snohomish county.

Learning Targets

I can describe the life cycle of salmon.
I can name the five salmon species living in Puget Sound.
I can explain how pollution affects salmon.
I can identify several ways to limit pollution and keep Puget Sound healthy for salmon.

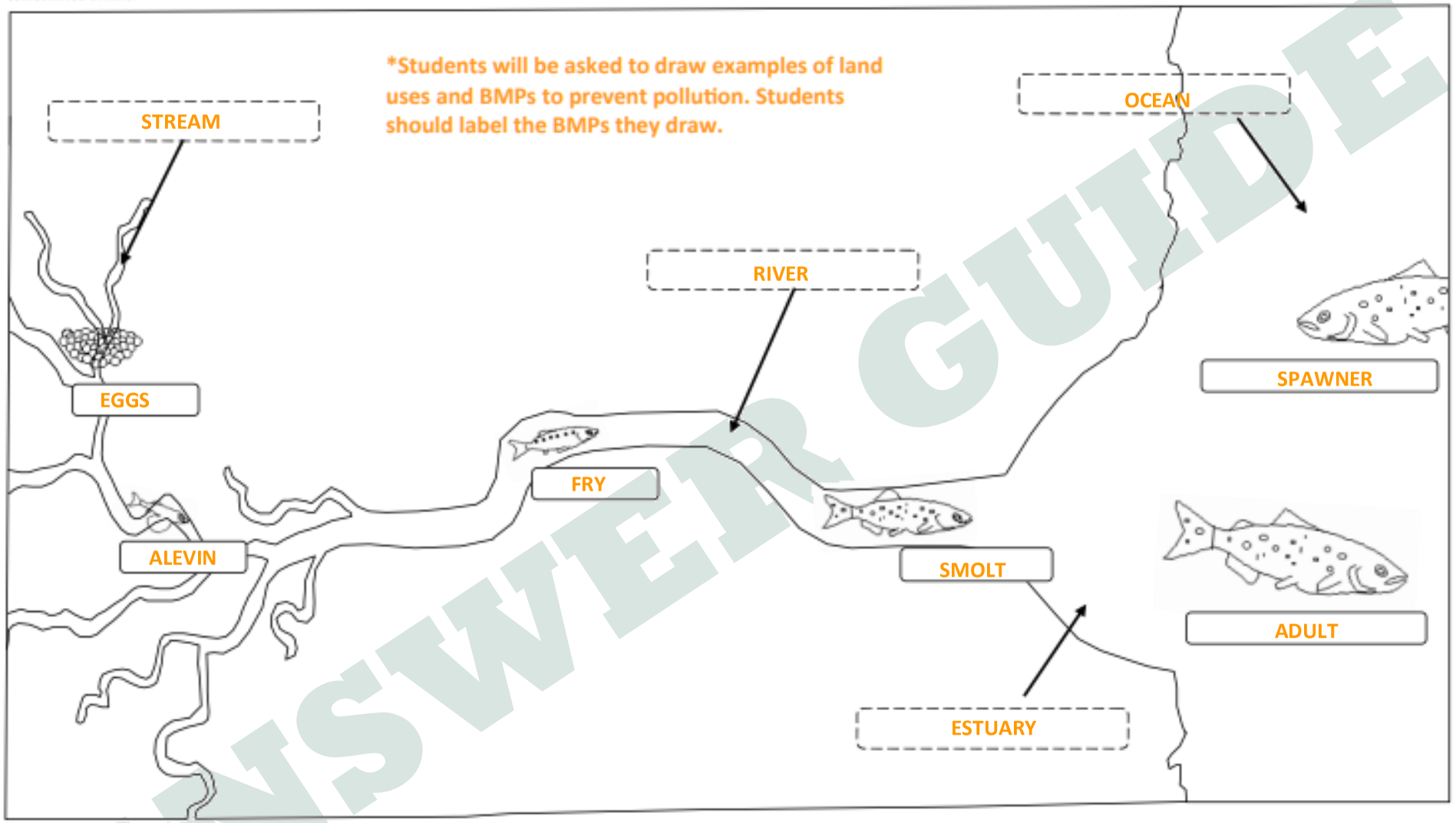
NGSS

This lesson complements Next Generation Science Standards listed below:
3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science Kits

This lessons complements the following science kits:
Structures of Life | Land and Water | Environments | Ecosystems

Name: _____



1. Label each part of the river system.

Stream	River
Estuary	Ocean

2. Label each stage of the salmon life cycle.

Eggs (Redd)	Alevin	Fry
Smolt	Adult	Spawner

3. Draw in some BMPs to protect salmon habitat.

Natural yard care	Silt fences	Native plant buffer
Rain garden	Bridges	Storm drain marking

1. Label the 5 species of Puget Sound Salmon:

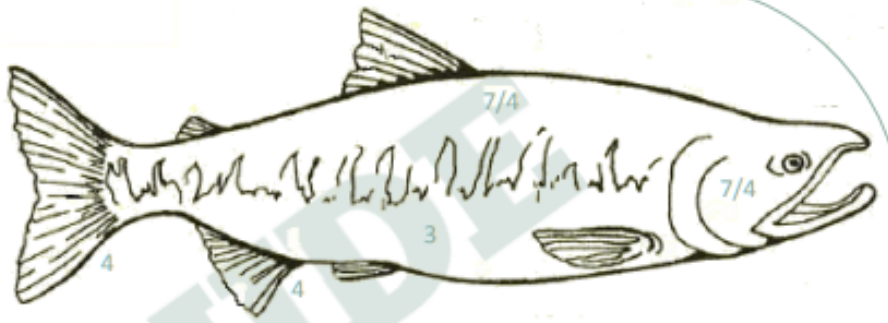
Chum Sockeye Chinook Coho Pink

Give each salmon its spawning colors! Use the code below to find the right color for each species.

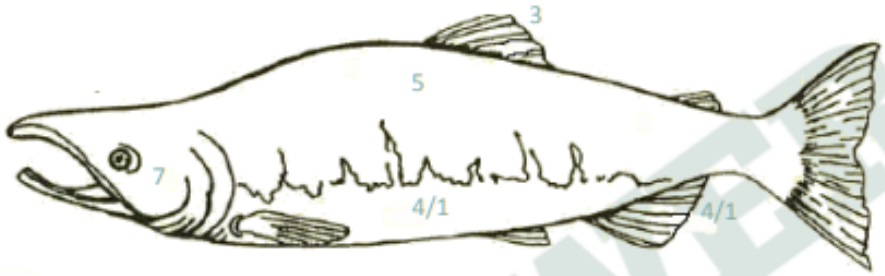
1 = White 2 = Turquoise 3 = Salmon pink 4 = Grey

5 = Red 6 = Black 7 = Olive green 8 = Brown

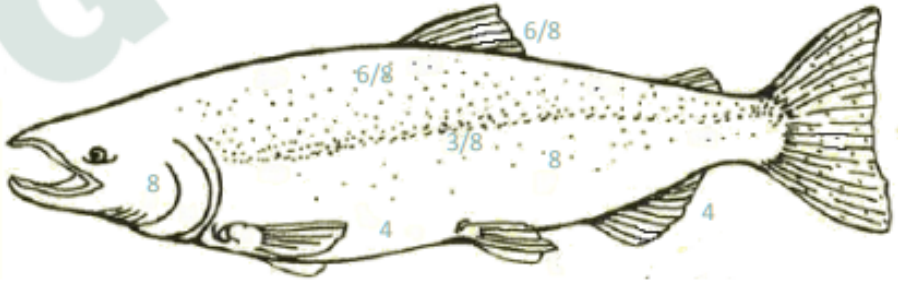
9 = Yellow 10 = Purple



Chum (aka Dog)

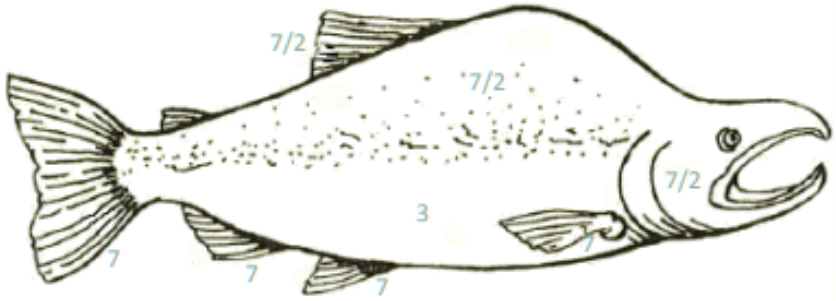


Sockeye (aka Red)



Chinook (aka King)

Coho (aka Silver)



Pink (aka Humpy or Humpback)

SNOHOMISH CONSERVATION DISTRICT

CHEMICAL WATER QUALITY TESTING

How does your local stream or lake measure up? Using a variety of real water quality testing equipment to gather current data, student scientists will evaluate the health of a local water body. Students will learn about sources of pollution and discuss steps they can take at home to maintain water quality and reduce pollution in their local watershed.

Lesson Reminders

Field experience option: This lesson is available for classroom presentations, but there is a possibility of making it an outdoor lesson if you have access to a body of water. Your presenter might be able to meet your classrooms outside near a lake, river, stream, detention pond, etc. for part of this lesson. Please email us BEFORE at **education@snohomishcd.org** for more information about Water Quality field experiences.

Learning Targets

I can use scientific testing equipment accurately.
I can interpret data to decide how healthy the water is for salmon.
I can explain several ways to improve or monitor water quality in Snohomish County.

NGSS

This lesson complements Next Generation Science Standards listed below:
3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen.
5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
5ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Science Kits

This lessons complements the following science kits:
Environments | Ecosystems | Diversity of Life | Populations and Ecosystems

Test site: _____ Date: _____

Scientist: _____ (that's you!) Weather: hot/cold sunny/cloudy dry/raining

Parameter (What you are testing)	Method used to measure	Washington State Surface Water Quality Standards	Your Reading	Does your reading meet standards?
Dissolved Oxygen units: **mg/L (ppm)**		At least 8.0 mg/L		
Temperature units: **°C**		Max. 17.5°C		
Turbidity units: **NTUs**		Max. 15 NTUs		
Phosphate units: **mg/L (ppm)**		Max. 1 mg/L		
pH units: **pH units**		6.5-8.5		

Test site: _____ Date: _____

Scientist: _____ (that's you!) Weather: hot/cold sunny/cloudy dry/raining

Parameter (What you are testing)	Method used to measure	Washington State Surface Water Quality Standards	Your Reading	Does your reading meet standards?
Dissolved Oxygen units: **mg/L (ppm)**		At least 8.0 mg/L		
Temperature units: **°C**		Max. 17.5°C		
Turbidity units: **NTUs**		Max. 15 NTUs		
Phosphate units: **mg/L (ppm)**		Max. 1 mg/L		
pH units: **pH units**		6.5-8.5		

SNOHOMISH CONSERVATION DISTRICT

WETLAND WARRIORS!

Learn about wetlands! What and where they are, how they work and why we care! Learn about the basics of wetlands then work together to discover more about a wetland near you. Investigate with the class about the importance of wetlands before playing "Hydroploy," the critical thinking board game about making choices and seeing your choices' effects on the world around you. What can you do to protect wetlands? Let's find out!
this lesson goes well after our two-part Four Rain Drops lessons

Learning Targets

I can define a wetland.
I know there are wetlands around where I live.
I know wetlands need our protection.
I know wetlands are a habitat.
I understand that what I do affects wetlands.

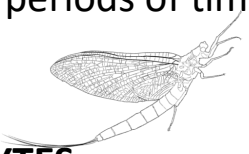
NGSS

This lesson complements Next Generation Science Standards listed below:
5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Name:_____ Date:_____

Today we are learning about _____WETLANDS_____

⇒ An area where water covers soil all year or for periods of time during the year



Hydrophytes

HYDRO means ____WATER___ and **PHYTES means** __PLANTS__

Hydric means _____WATER/ WET/etc._____

Hydrophytes are ____wetland plants/ water plants/ etc._____

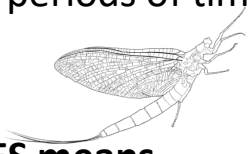
What is the name of the wetland you learned about?

_____ANSWERS VARY_____

Name:_____ Date:_____

Today we are learning about _____

⇒ An area where water covers soil all year or for periods of time during the year



Hydrophytes

HYDRO means _____ and **PHYTES means** _____

Hydric means _____

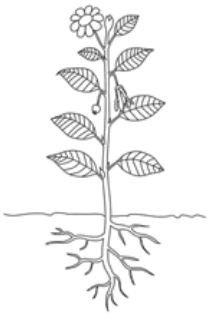
Hydrophytes are _____

What is the name of the wetland you learned about?

_____

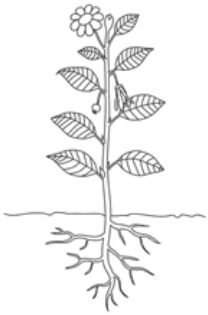
What can you do to protect this wetland?

ANSWERS VARY



What can you do to protect this wetland?

ANSWERS VARY



ANSWER GUIDE

WATER QUALITY TESTING

Part 1 and 2

Part 1: Live Benthic Macroinvertebrates

What can water bugs tell us about pollution? During this hands-on lab, students will learn how pollution affects aquatic life. Using live macroinvertebrates from a local stream, students will gather data to complete a biological analysis of water quality and discuss simple steps that they and their families can take to improve water quality.

Part 2: Chemical Test Kits

How does your local stream or lake measure up? Using a variety of real water quality testing equipment to gather current data, student scientists will evaluate the health of a local water body. Students will learn about sources of pollution and discuss steps they can take at home to maintain water quality and reduce pollution in their local watershed.

Lesson Reminders

Two-part lesson: For this lesson series, we'll need to visit your class on two separate occasions. Please make sure your second lesson is booked - our calendars may fill up quickly!

Field experience option: These lessons are available for classroom presentations, but there is a possibility of making it an outdoor lesson if you have access to a body of water. Your presenter might be able to meet your classrooms outside near a lake, river, stream, detention pond, etc. for part of this lesson. Please email us BEFORE at **education@snohomishcd.org** for more information about Water Quality field experiences.

Learning Targets

Part 1: I can explain how pollution affects the salmon food web.
I can explain how macroinvertebrates are an indicator of water quality.
I can identify macroinvertebrates using a dichotomous key.

Part 2: I can use scientific testing equipment accurately.
I can interpret data to decide how healthy the water is for salmon.
I can explain several ways to improve or monitor water quality in Snohomish County.

NGSS

This lesson complements Next Generation Science Standards listed below:

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-4 Construct an argument supported by empirical evidence that changes to a physical or biological components of an ecosystem affect populations.

MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking in to account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Science Kits

This lessons complements the following science kits:

Diversity of Life | Populations and Ecosystems | Ecosystems | Environments Microworlds | Organisms: From Macro to Micro

Questions?

Contact Sound Education at the Snohomish Conservation District.:
528 91st Ave NE, Ste A,
Lake Stevens, WA 98258-2538

Phone 425-377-7021

education@snohomishcd.org
www.snohomishcd.org/sound-education

Calculate the River's Water Quality Based on Macroinvertebrates

1. Identify the macroinvertebrates you collected. Use the picture guide in this document.
2. In the chart below, put a check next to the name of all the macroinvertebrates you found.
3. Add up the number of checks in each column. This is the number of **TAXA** (different kinds of) macroinvertebrates that belong to that group.
4. Multiply the number of taxa by the group's weighting factor. This gives you the **GROUP SCORE**.
5. Add up all the group scores. This will give you the **TOTAL GROUP SCORE**.
6. Add up the number of taxa from all the columns. This is the **TOTAL NUMBER OF TAXA**.
7. Divide the <u>total</u> group score (from step 5) by the <u>total</u> number of taxa (from step 6). This will give you the **WATER QUALITY INDEX** for your river.
8. Using the table at the bottom right of the page, find how the river's water quality index ranks.

	GROUP 1 Intolerant to pollution	GROUP 2 Moderately intolerant to pollution	GROUP 3 Fairly tolerant to pollution	GROUP 4 Very tolerant to pollution
Macro-invertebrates (check all the ones you found)	Alderfly ____ Dobsonfly ____ Snipe Fly ____ Stonefly ____	Caddisfly ____ Clam/Mussel ____ Cranefly ____ Crayfish ____ Damselfly ____ Dragonfly ____ Mayfly ____ Riffle Beetle ____ Water Penny ____	Black Fly ____ Midge ____ Right-handed or other snails ____ Scud ____ Sowbug ____	Aquatic worm ____ Blood worm midge ____ Leech ____ Left-handed snail ____
# of TAXA (add up checks)				
WEIGHTING FACTOR	x 1	x 2	x 3	x 4
GROUP SCORE (TAXA x weighting factor)	=	=	=	=

TOTAL GROUP SCORE (add up the group scores from all the columns)	
TOTAL NUMBER OF TAXA (add up the number of taxa from all columns)	
WATER QUALITY INDEX (total group score ÷ total number of taxa)	

Water Quality (circle one)	
Excellent	1.0 – 2.0
Good	2.1 – 2.5
Fair	2.6 – 3.5
Poor	greater than 3.6

Group 1 – These organisms are generally considered to be intolerant to pollution


Alderfly Larva

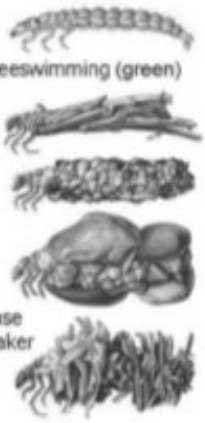

Dobsonfly Larva


Snipe Fly Larva

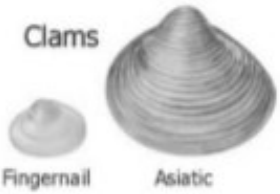

Stonefly Larva

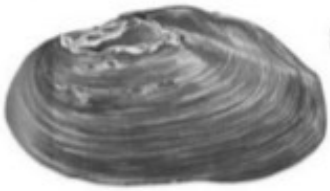
Group 2 – These organisms are generally considered to be moderately intolerant to pollution

Caddisfly Larvae



Clams

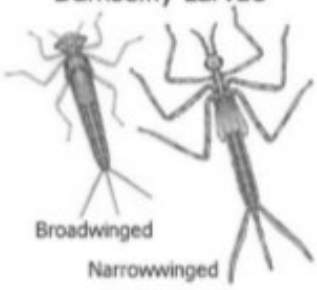



Mussels


Zebra Mussel

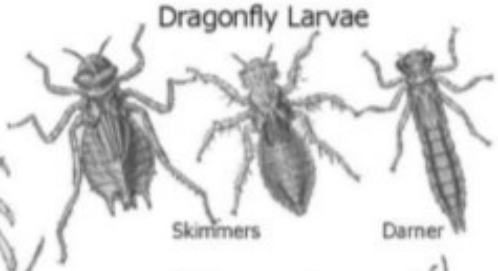

Water Penny

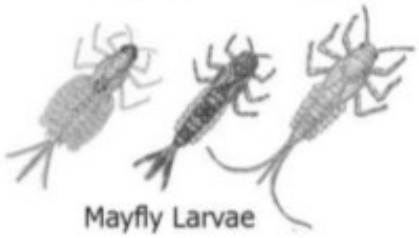
Damselfly Larvae



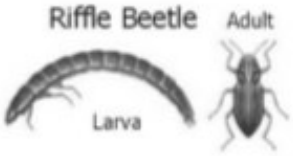

Crayfish

Dragonfly Larvae




Mayfly Larvae

Riffle Beetle



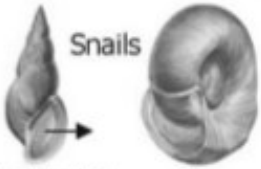

Cranefly Larva

Group 3 – These organisms are generally considered to be fairly tolerant to pollution


Black Fly Larva


Midge Larva

Snails




Scud


Sowbug

Group 4 – These organisms are generally considered to be very tolerant to pollution


Aquatic Worm


Bloodworm
Midge Larva (bright red)


Leech


Left-Handed Snail

Other Aquatic Organisms (These organisms are not used as water quality indicators)


Crawling Water Beetle


Giant Water Bug


Backswimmer

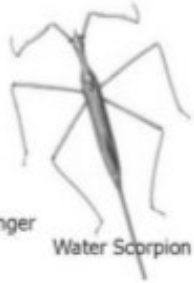

Whirligig Beetle


Water Strider


Waterboatman


Planaria


Water Scavenger Beetle


Water Scorpion

Test site: _____ Date: _____

Scientist: _____ (that's you!) Weather: hot/cold sunny/cloudy dry/raining

Parameter (What you are testing)	Method used to measure	Washington State Surface Water Quality Standards	Your Reading	Does your reading meet standards?
Dissolved Oxygen units: **mg/L (ppm)**		At least 8.0 mg/L		
Temperature units: **°C**		Max. 17.5°C		
Turbidity units: **NTUs**		Max. 15 NTUs		
Phosphate units: **mg/L (ppm)**		Max. 1 mg/L		
pH units: **pH units**		6.5-8.5		

Test site: _____ Date: _____

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Part 2: Chemical Test Kits

SNOHOMISH

CONSERVATION DISTRICT

Snohomish Conservation District provides elementary and secondary environmental science lessons to public and private schools in Snohomish County and Camano Island. Our standard aligned, hands-on lessons strengthen scientific reasoning, environmental awareness and real-world problem solving skills. Our lessons integrate local natural resource issues into the curriculum so students can become aware of the conservation issues happening in their local communities. Browse our website to learn about our various educational offerings ranging from in-classroom presentations to extracurricular service learning and teacher workshops.

snohomishcd.org/sound-education

Contact the Education Team at education@snohomishcd.org

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