OVER 20
PARTICIPATING SCHOOLS

Tacoma Salmon in the Schools Program

3RD EDITION

WHAT TO EXPECT WHEN YOU'RE EXPECTING SALMON

Designed & Edited by Maddie Snook and Laura Wagner

COMPLETELY NEW & REVISED

The salmon raising guide that answers the questions of salmon parents-to-be, from tank set up to the fry release. Featuring a week-by-week look at the growth of salmon and chapters on water quality, salmon life cycle, ideal stream habitat, and more.

By Pierce Conservation District

In partnership with

Foss Waterway Seaport
Tacoma Public Schools
Next Move
Museum Of Glass



Table of Contents

What to Expect From This Booklet..... **1**

All About Salmon

The 5 Species of Salmon **2-9**
Salmon Lifecycle **10-13**

Tacoma Stream Ecology & Special Thanks..... **14-15**

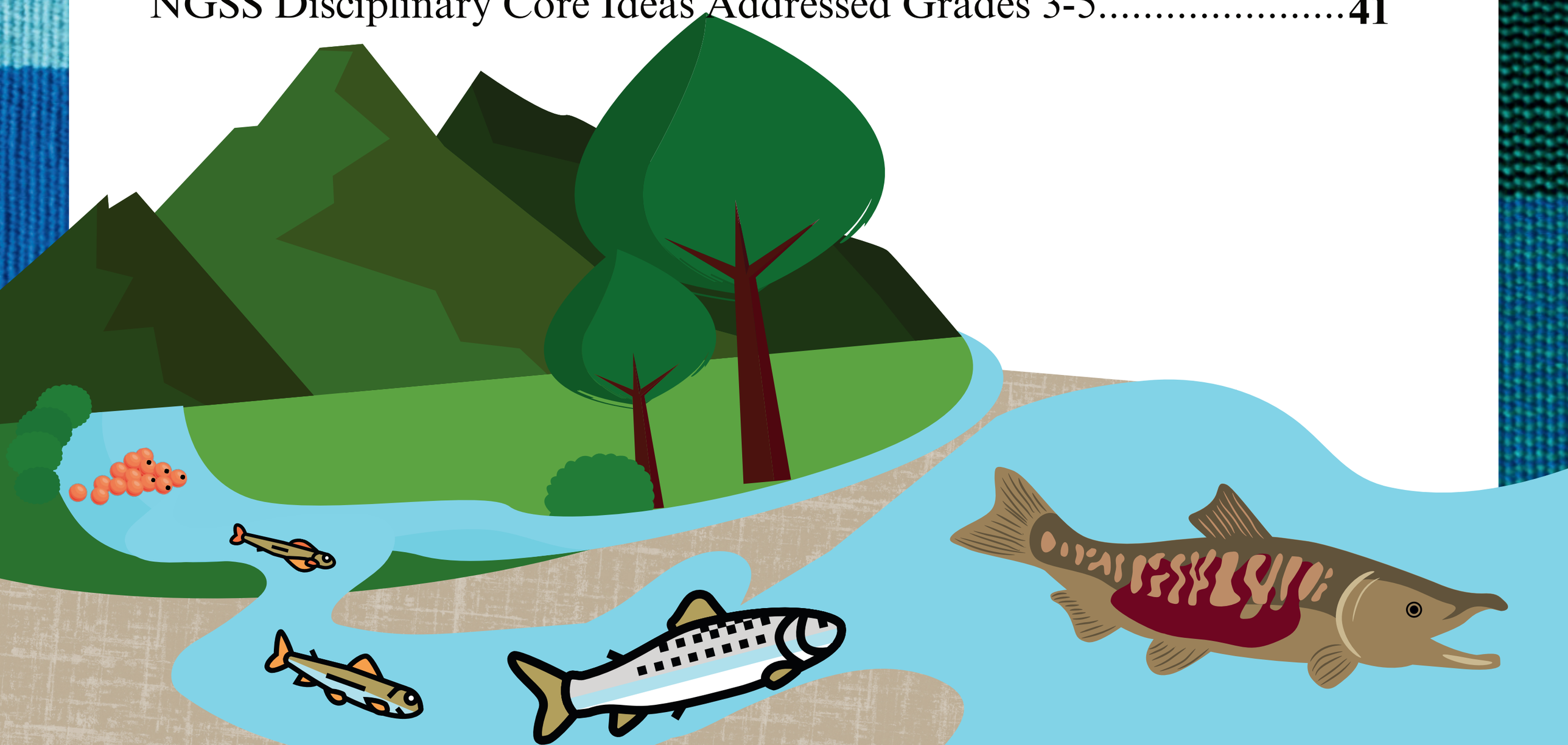
Raising Salmon

Tank Setup **16**
Egg Delivery **17-19**
Egg Observations..... **20**
Alevin Observations **21**
Water Quality **22-23**
Fry Observations..... **24**
Intro to Macroinvertebrates **25**
Tank Cleaning Day..... **26**
Healthy Stream Habitat **27-28**

Salmon Release Field Trip!

Field Trip Stations and Material learned..... **29-40**

NGSS Disciplinary Core Ideas Addressed Grades 3-5..... **41**



What to Expect from this Booklet

This booklet was written with the intention to share the joy of the Salmon in Schools Program's journey with anyone that could not or cannot experience the program. Through this booklet, you get to understand what this program is and what students learn from our salmon raising & release process!

This salmon raising experience is done with the guidance and resources of Pierce Conservation District and program partners to ensure all of the students' and salmon's health and safety.

Pacific Salmon Species

Students learn about natural selection and variation of traits in organisms in the 5 Pacific Salmon species

The Salmon High-5!

Chum

Sockeye

King

Silver

Pink



Chum Salmon

Also known as Dog Salmon



Features:

- Green with red stripes on the sides
- Big canine-like teeth

Rhymes with thumb!

Sockeye Salmon



Features:

- Red body with green head
- Some landlocked sockeye populations never go to the ocean



Careful not to sock yourself in the eye with your pointer finger!

King Salmon

Also known as Chinook Salmon



Features:

- Biggest salmon
- Black lips
- Spots all over the tail & back

The tallest finger,
the "king" finger

Silver Salmon

Also known as Coho Salmon



Features:

- Spots on upper tail
- Extremely hooked jaw
- Grey/ White "gums"
- Can have unique color: ombré red sides into spotted silvery green top

Silver is worn on the ring finger



Pink Salmon

Also known as Humpy Salmon



Features:

- Males have big humped back
- Pinkish grey sides
- Smallest salmon

Pink for the pinky finger



Students Should Be Able To:

Teach a friend the 5 salmon species hand trick.



Attempt identifying these salmon species:



Answers

Teach a friend the 5 salmon species hand trick.



Attempt identifying these salmon species:











Salmon Lifecycle

Students learn the growth and development process for salmon and how matter and energy transfer throughout their lifecycle!

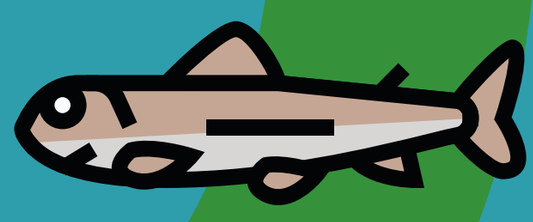
Egg



Alevin



Fry



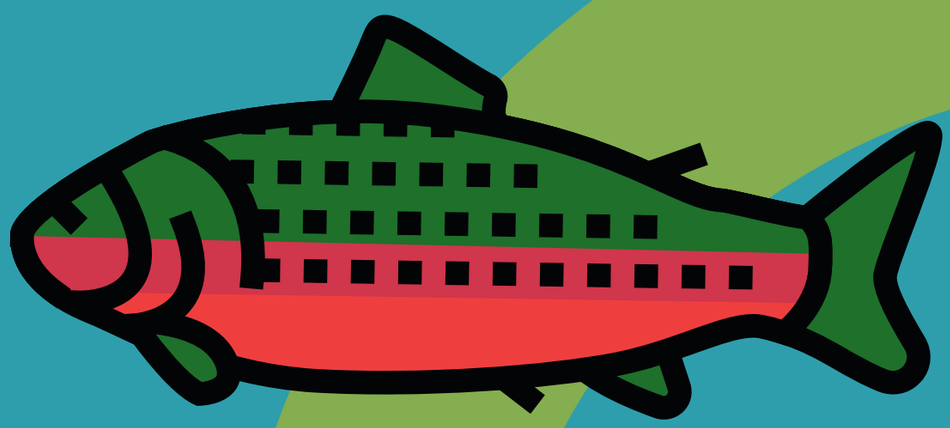
Smolt



Ocean phase adult



Spawning adult



Salmon Lifecycle



Egg

A nest of eggs is called a redd! At this point, they absorb nutrients from the stream through their egg sac.

Alevin

They still have their yolk sac and they hide in the pebbles! As alevin, they still don't have mouths, so they absorb all their food through their yolk sac stomachs.



Salmon Lifecycle

Fry

Free swimming and eating on their own. No more yolk sac! They eat increasingly larger macroinvertebrates as they grow in freshwater streams

We'll learn about these later!





Smolt

Almost to the ocean! But an estuary pit stop is next. Salmon live the first part of their lives in freshwater, so they need to switch their bodies to "saltwater mode".

They have special mechanisms inside their bodies that help prepare for the ocean.

Salmon Lifecycle



Ocean-phase Adult

Time to get big and strong in the ocean! Some salmon species spend years out there.

The ocean has lots of big hungry creatures.
They have to avoid getting eaten by hungry sea lions, orcas, and more!

Spawning Adult

They use their sense of smell to sniff their way back home to lay eggs!

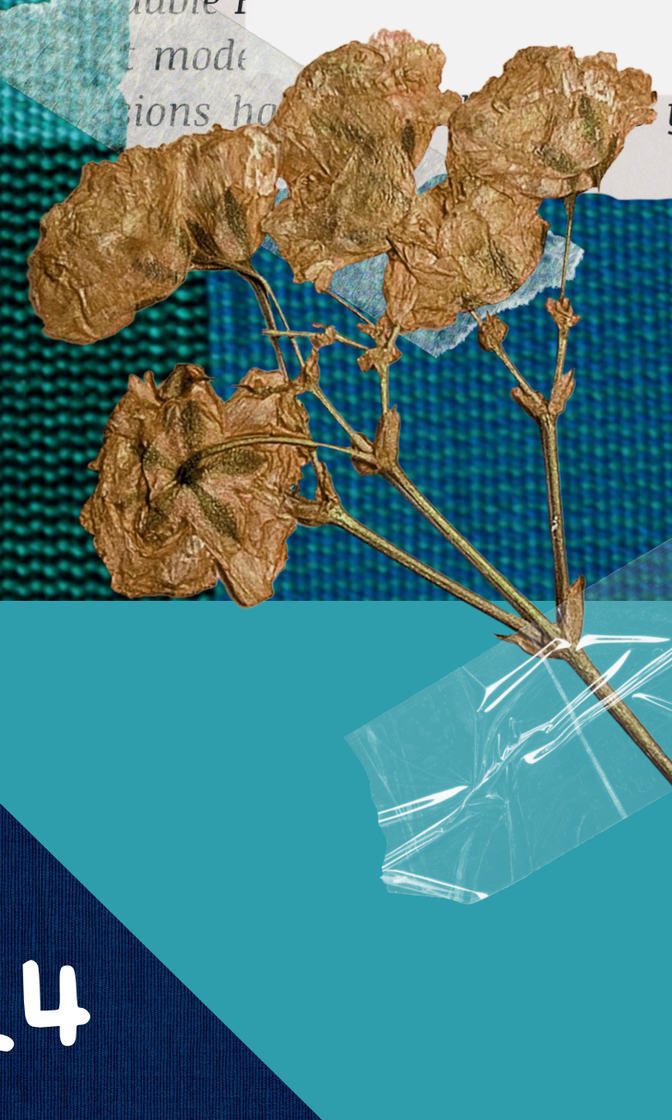




Here in Pierce County, we have lots of streams that eventually connect to the Puyallup River and lead into the Puget Sound. Some streams even start at Mount Rainier!

Of the 5 Pacific Salmon species we just learned, the Puyallup River has four: Chinook, Chum, Pink, and Coho. Some Tacoma Schools are lucky enough to raise Chum or Coho in their classroom for release.

The following pages take you through Tacoma students' process of learning about salmon while raising them!





Special Thanks To

Puyallup Tribe Fisheries Department
Foss Waterway Seaport
Tacoma Public Schools
Next Move
Museum Of Glass

Thanks to their ongoing partnership and education docent volunteers, in 2024 we were able to deliver 3,600 total eggs to 24 schools in Tacoma. Over the course of two months, more than 1,500 students experienced the joy of raising, learning about, and finally releasing salmon through a fun, educational release field trip. This program creates memories and knowledge of our PNW streams that will last these children a lifetime.

PIERCE CONSERVATION DISTRICT
Over 70 Years of Conservation

55 gallons of water!





Students begin to learn the fundamentals of water quality & healthy habitat metrics

Setting up filters and chiller!

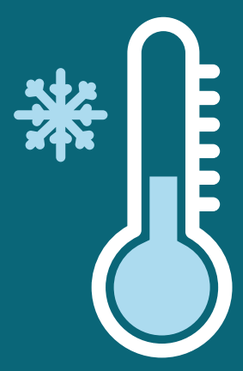


Salmon Tank Set-Up!

Keeps me cool and clean!



The 3 C's of Healthy Water



Cold

Is the water below 55º?



Clear

Is the water near see-through?

?

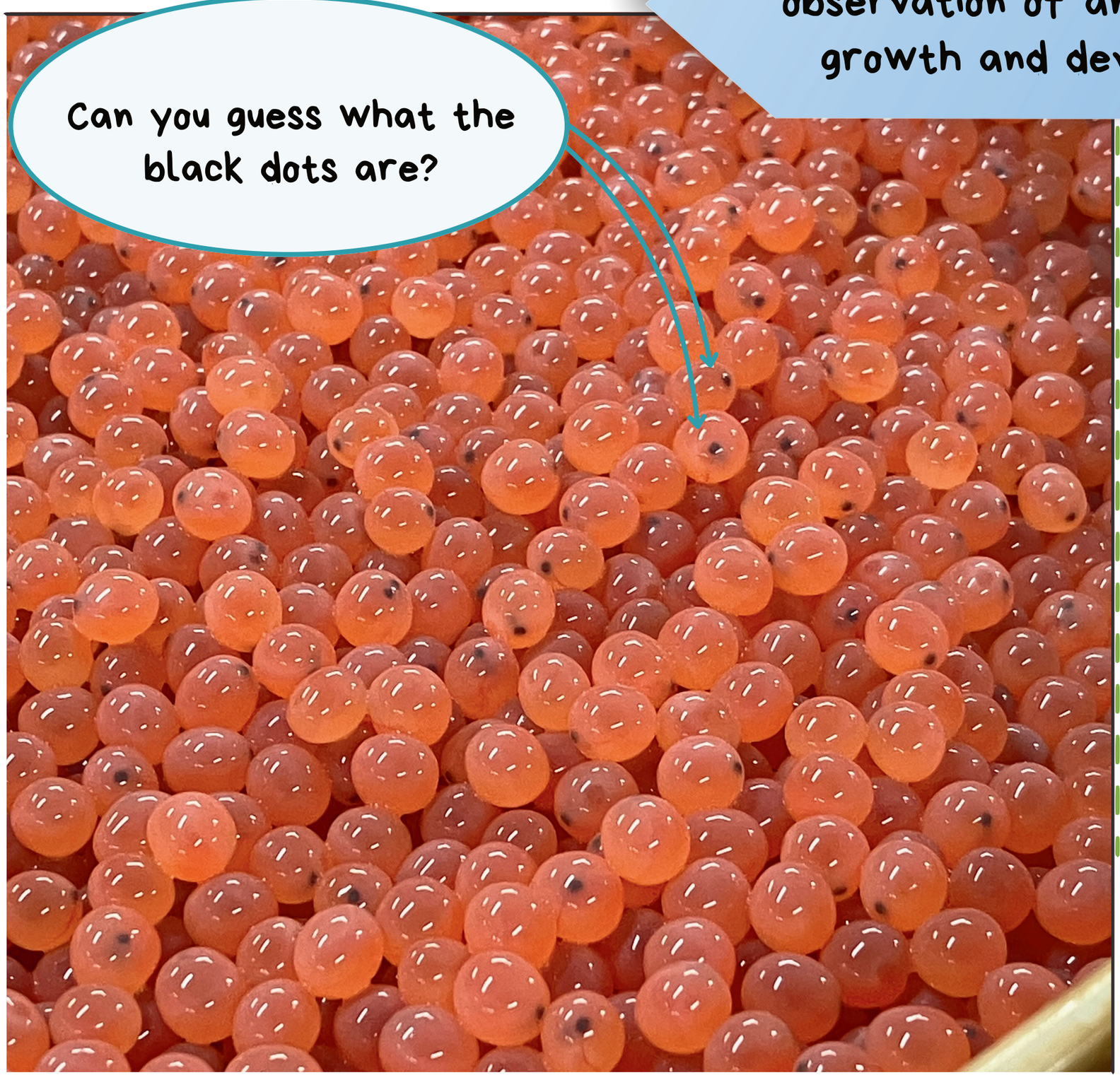
Clean

Can't tell until it's tested!

These 3 C's are true for both salmon's natural habitat and for their temporary school tanks! To make sure their little glass homes are perfect, we test the 3C's during their stay.

We can test "cold" with a thermometer and "clear" pretty well with our eyesight. In the tank cleaning section of this booklet, you'll see two examples of how we test "clean".

Students' start a weeks-long observation of an organism's growth and development



Chum babies incoming!

Egg Delivery Day!



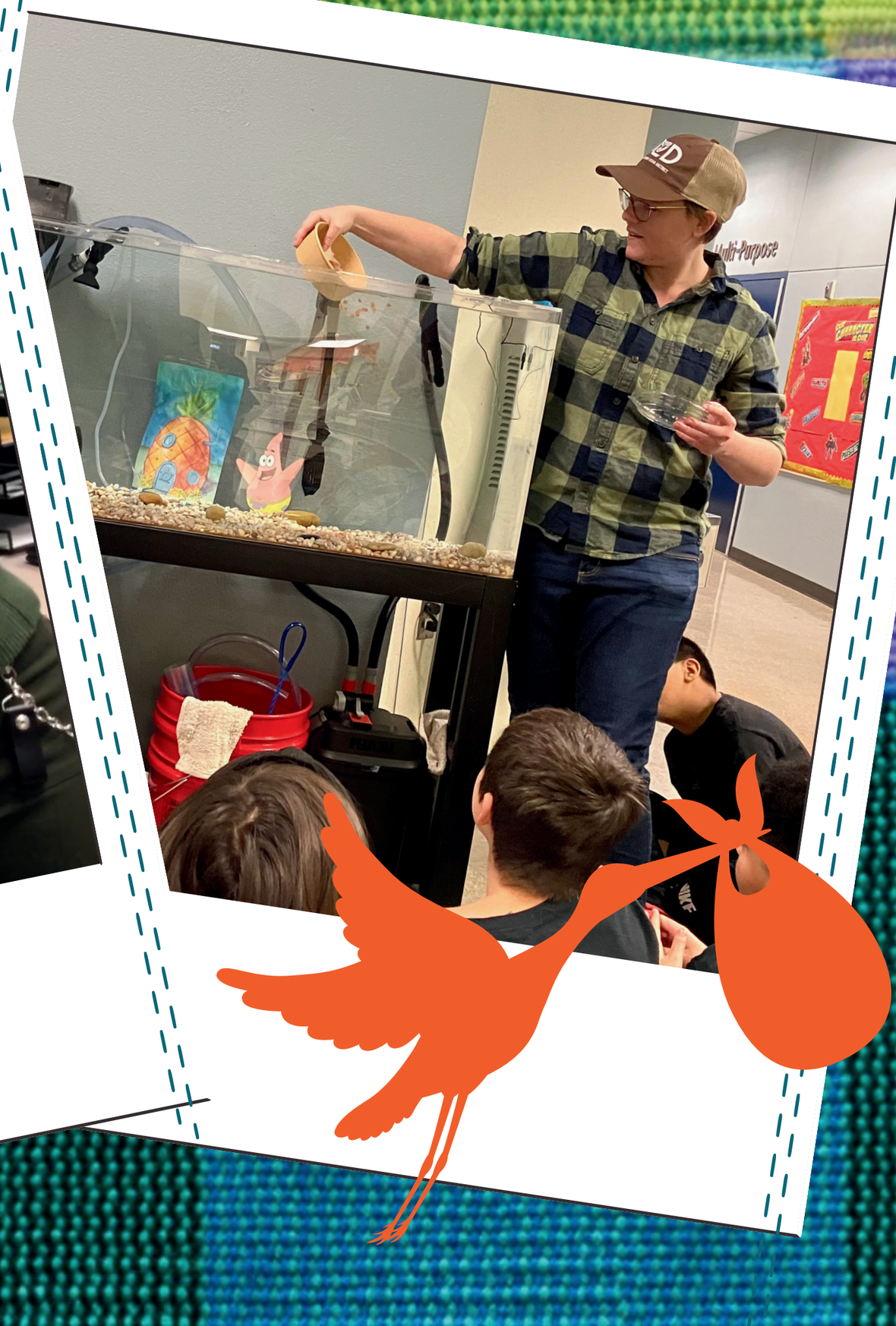
Counting 150 eggs for each school!





Eggs packed up and ready to go!





Egg drop!

The beginning of some Tacoma Public Schools' journey raising salmon starts with an "eggciting" egg drop in classrooms!

In January, AmeriCorps members from PCD and volunteers from program partners drive out to multiple schools for special chum egg deliveries. Some students even get to witness an educational demonstration with this volunteer-led egg drop.

During 2024's egg delivery week, we provided a total of 3,600 eggs across 24 Tacoma schools.

The following pages detail the types of observations students make throughout salmon raising.

Egg Observations

At the "eyed egg" part in salmon's life, they absorb all their nutrients from the stream through their egg casing. This is salmon's most vulnerable point of their life. The shallow water where the eggs lay can easily get too hot for the salmon to survive. One of their most important nutrients, Dissolved Oxygen, can be negatively impacted by warm water.







The black dots are our eyes!

Alevin Observations

Now the salmon have emerged from their egg. However, they are not officially swimming yet. They wiggle around the gravel.

How do they eat now?

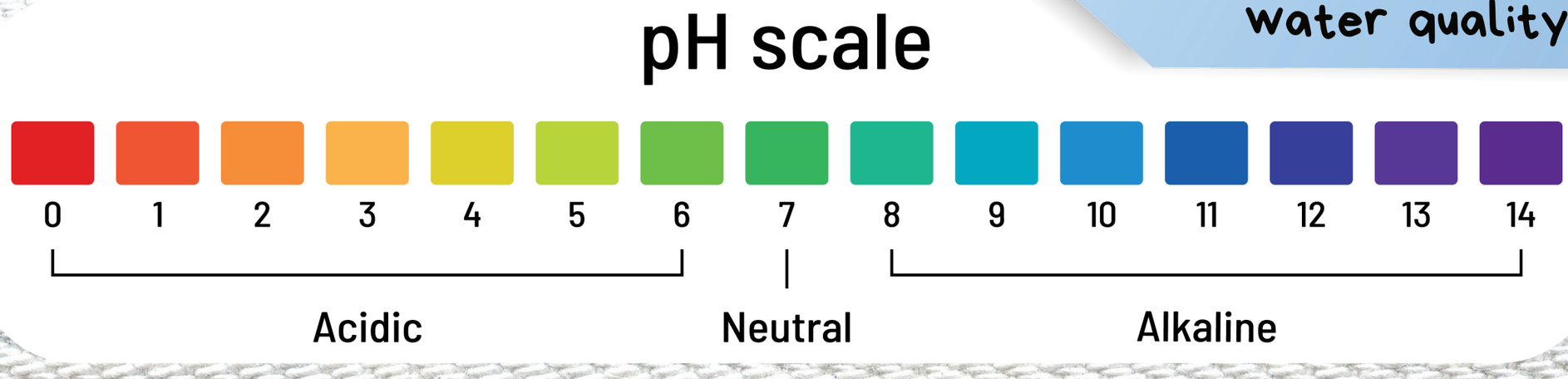
Do you see that they still have part of their egg yolk sac? Alevin still do not have mouths, so they have to absorb all their food from their yolk sac stomachs. It helps to think of their stomach as a little lunchbox!

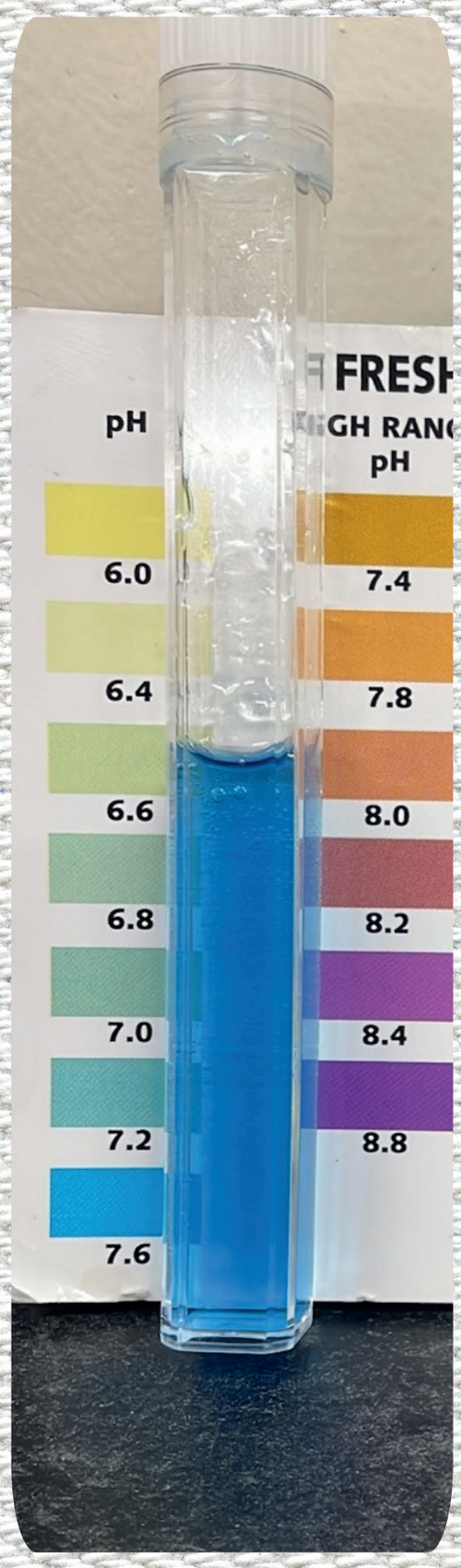




pH: Testing Water Acidity

Students collect, test, analyze water quality data



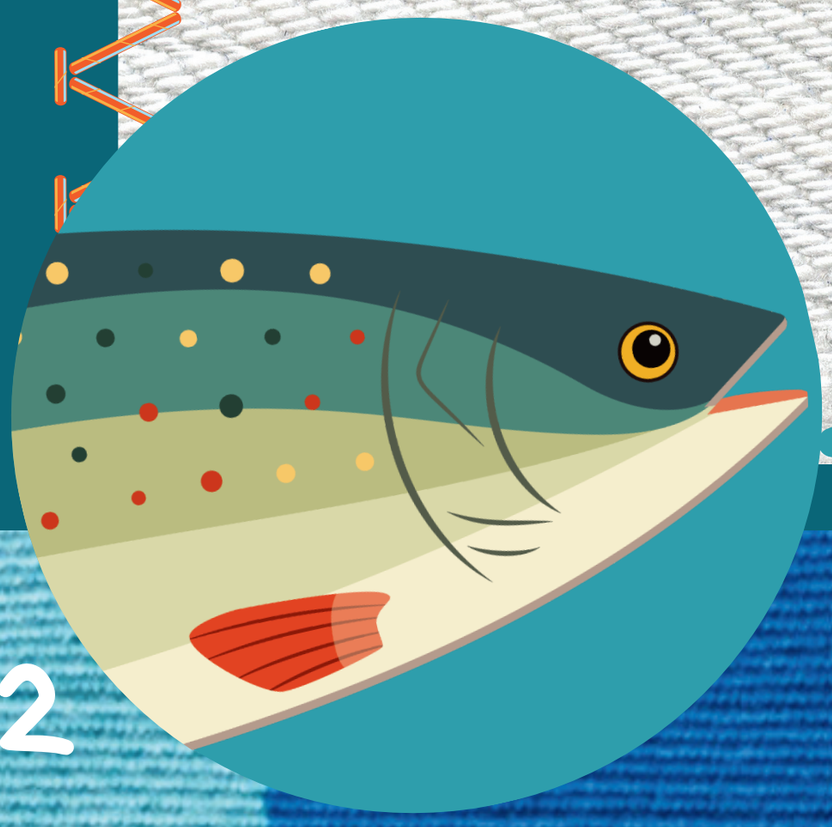




pH is a number from 0 to 14 that measures how acidic or basic a liquid is!

- The acid in your stomach is a pH of 1.
- Lemon juice and vinegar have a pH of 2.
- Water is a pH of 7
- Soapy water is a pH of 12.

Salmon need a PH of 7.0-8.0!



The test water changes color to indicate the PH level!

What is the PH of the test above?

Ammonia Testing

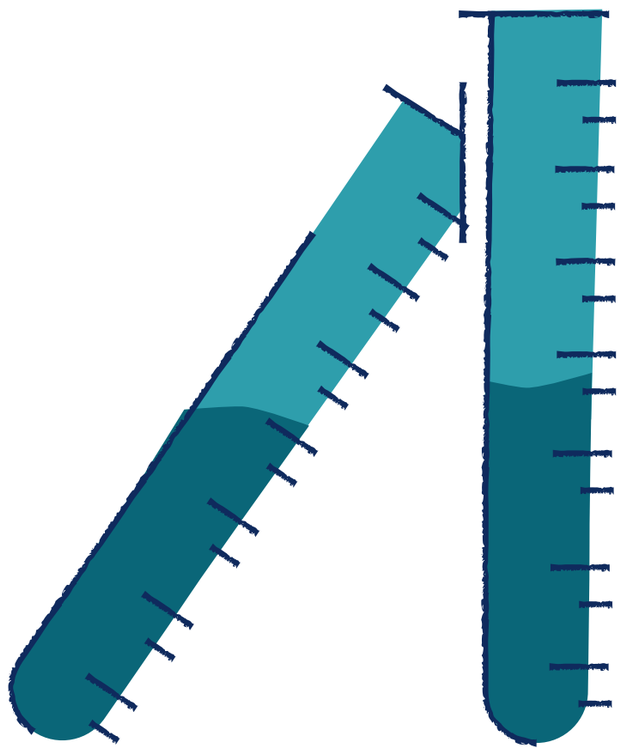
Students collect, test, analyze water quality data

NH_3

Comes from decaying organic matter. Like fish poop or leftover food!

When ammonia levels are high in water, salmon's tissue can become damaged or they get sick.

When levels rise above 2.0 milligrams per Liter, sensitive salmon are very likely to die. Many that do not die become very likely to obtain infectious diseases.



How can you help protect salmon from high ammonia?



Pick up your trash & sort it properly



Pick up your dog's poop on walks



No one likes swimming in gross water!



Swim Lessons









First Feeding!



Now the salmon are swimming on their own and can eat normally! Once they start swimming, they never stop. Being a salmon is so tiring!

Salmon are something called "opportunistic feeders". This means that they eat anything that fits in their mouths. As they and their mouths get bigger, they will eat bigger food. In nature, these fry would start eating creatures called "macroinvertebrates" in the stream.



Fry Observations

Macroinvertebrates!

Also known as salmon food!

Through our salmon release field trips, kids learn that Macroinvertebrates are spineless tiny creatures that live in salmon's streams. They are tasty little salmon treats! They also learn with hands on experience that we can use them to gauge water quality without needing testing equipment.

Students learn an example in the salmon food web

Macroinvertebrate: Pollution Tolerance Index

Group 1:


Caddisfly Larva


Water Penny


Riffle Beetle Larva


Stonefly Larva


Mayfly Larva

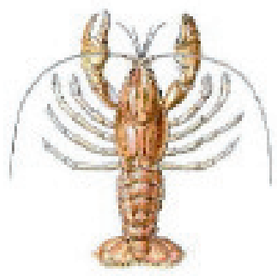

Dobsonfly Larva

Group one macroinvertebrates **CANNOT** tolerate pollutants in the water. They need **cold**, **clean** and **clear** water to survive.

Group 2:


Scuds or Amphipods


Alderfly Larva


Crayfish


Crawling water Beetles


Dragonfly Nymph


Clams and Mussels

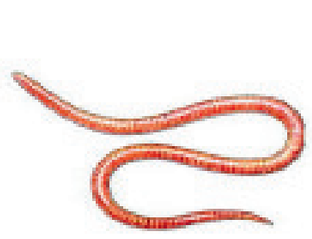

Damselfly Nymph


Water Mites

Group two macroinvertebrates can tolerate **SOME** pollutants in the water and can live in **medium** water quality conditions

---

Group 3:


Aquatic Earthworm


Tubifex Worms


Leeches


Snails


Water Boatmen


Midge Larva



Group three macroinvertebrates **CAN** tolerate pollutants in the water and **poor** water quality conditions.

Tank Cleaning Day

Now that they eat, they poop!

Gotta siphon that gravel!

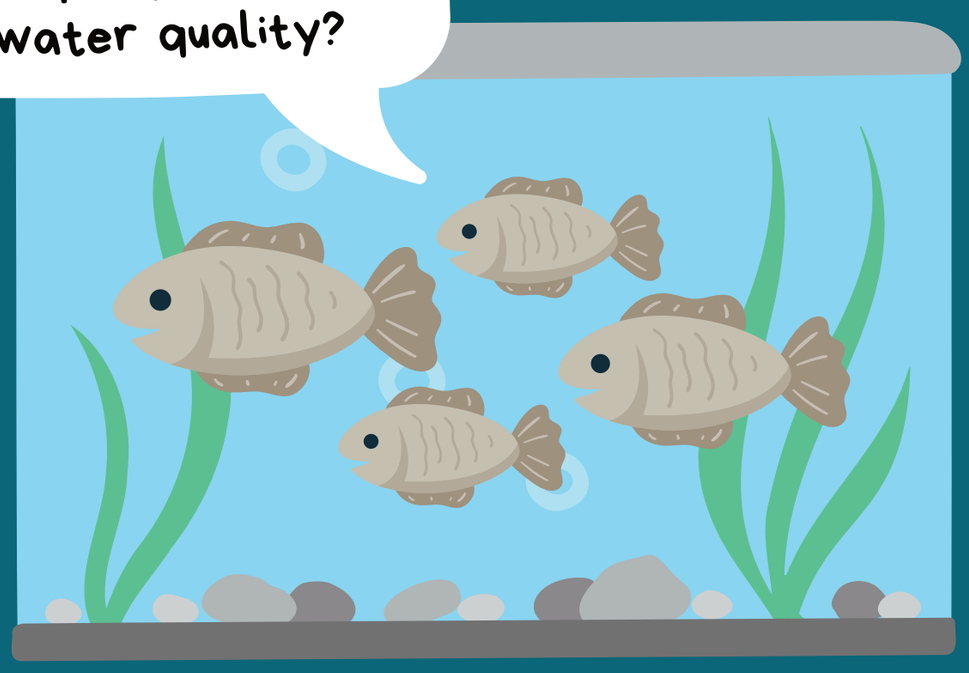


Salmon thrill ride!

Sometimes they get curious and go for a ride in the siphon



How does too much poop impact the water quality?



Don't forget to change the water!



Add back in what you take out!

Dream Stream

Students design stream habitat models



What Makes A Healthy Salmon Stream?

Anatomy of a Healthy Stream

A curvy stream

Keeps the water from flowing too fast

Fallen logs

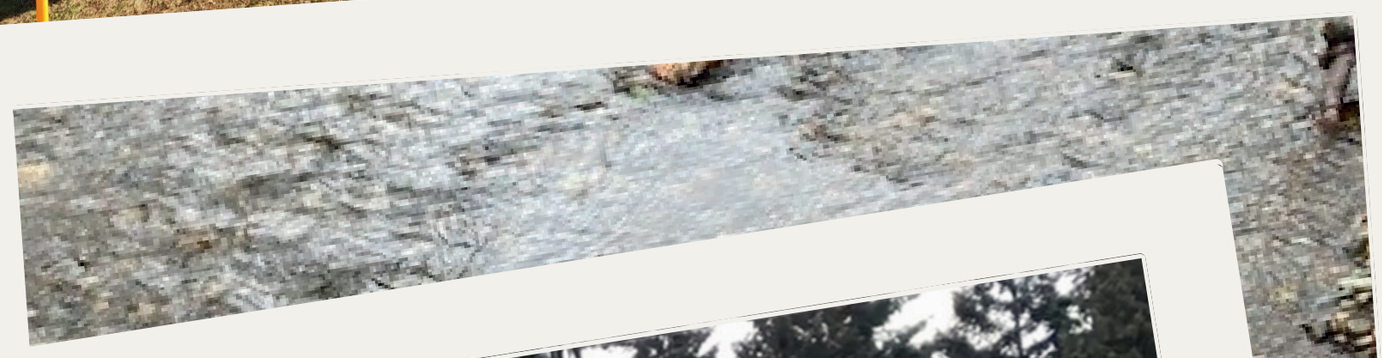
For salmon to rest and hide under

A gravel bottom

Perfect for salmon egg nests









Salmon Release Field Trip 2024!



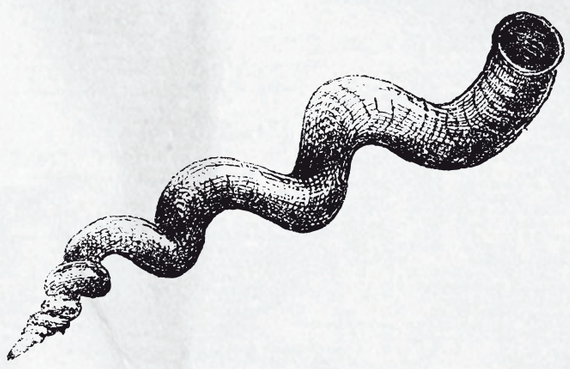
Students observe aquatic organisms

Looking at macroinvertebrates

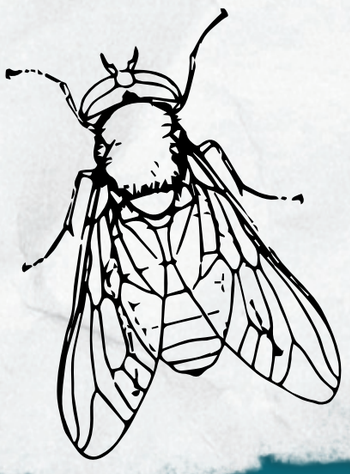




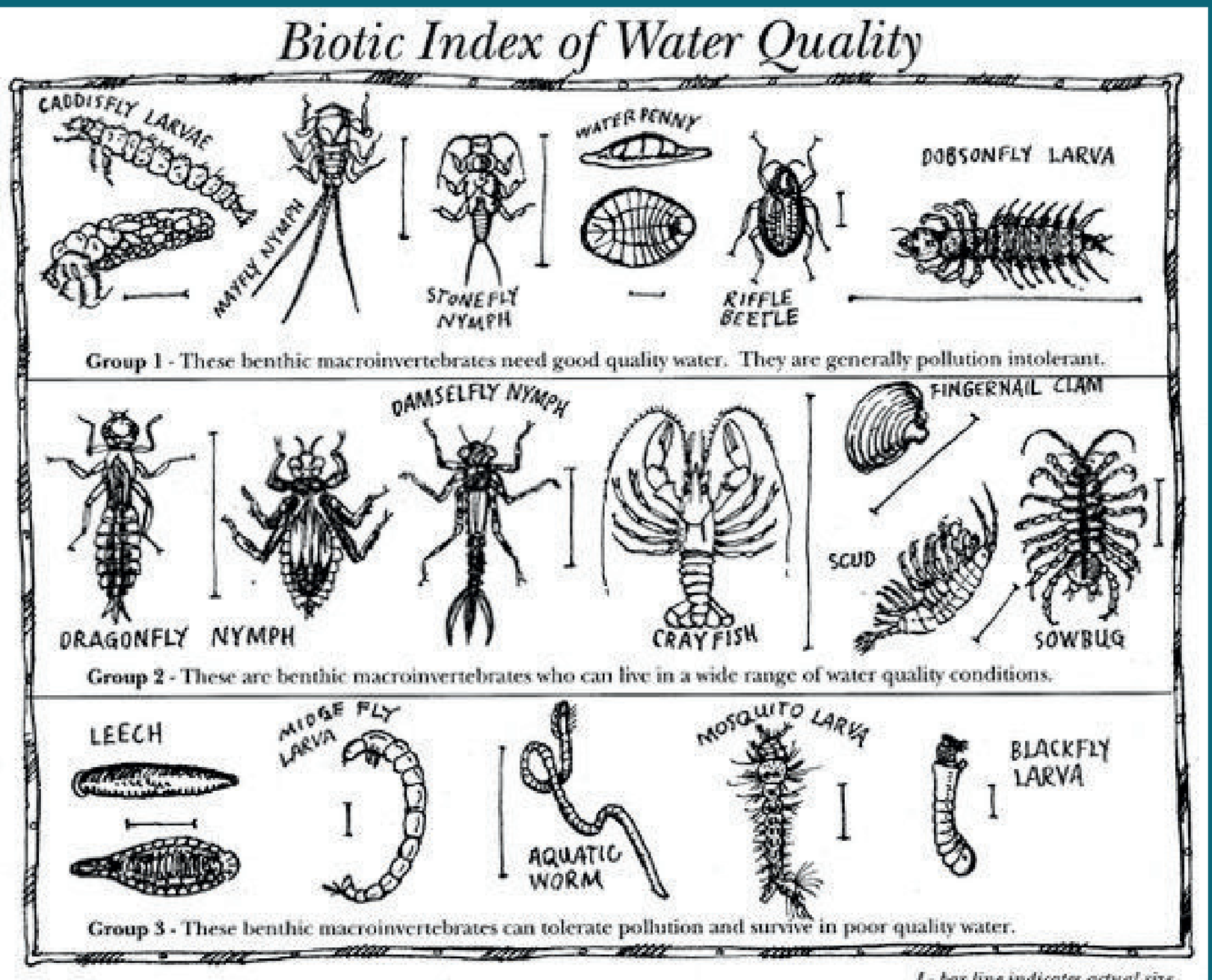








What have students learned?



If we told students that we found the below macros in a salmon bearing stream, they should be able to gauge the water quality using the above chart!

Example 1

1. High quality
2. At least medium quality
3. Very poor quality



Example 2

1. High quality
2. At least medium quality
3. Very poor quality



Students see the interdependent relationships in ecosystems and how matter and energy transfer







Nature Walk!

What have students learned?

During their nature walk, Tacoma schoolkids learn how vital plants are for salmon habitat! Nature walk guides teach the students the interconnectedness of plants with the soil health and water quality. Along the path, they also learn plant identification for some common Pacific Northwest plants.



Students analyze water quality data of a <u>real</u> salmon bearing stream site & make conclusions



Turbidity testing



Testing pH



Testing for nitrates in their new home

What have students learned?

They should be able to name the 3 C's of water quality!

Through our salmon release field trips, students get to test water temperature, pH, turbidity and nitrates level firsthand to see if the salmon stream is salmon-ready. They should also be able to answer:

1. Which of the 3 C's does nitrates testing measure?

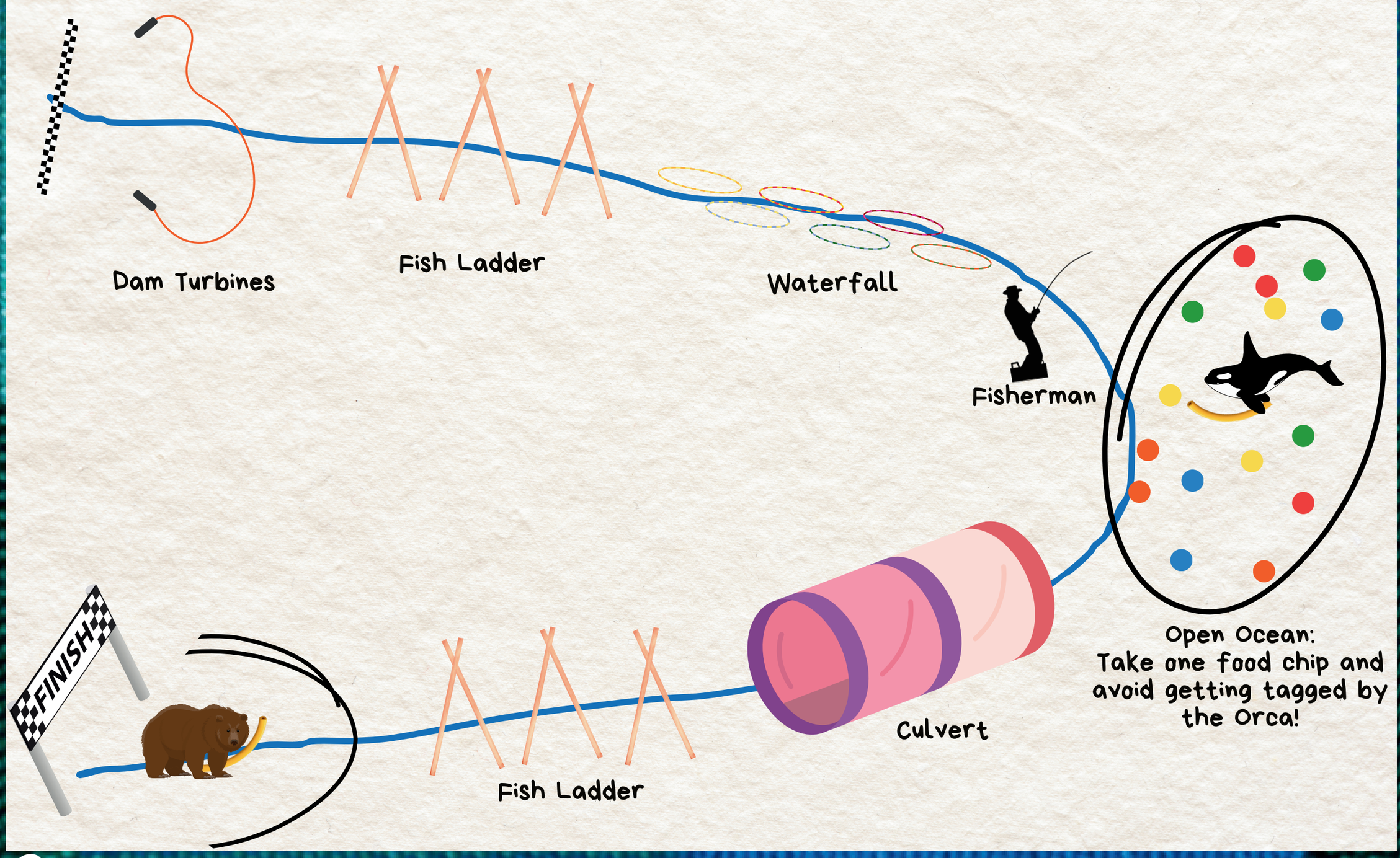
2. Which of the 3 C's does pH testing measure?

3. Which of the 3 C's does turbidity measure?

THE SALMON OLYMPICS



After months of learning the salmon migration process, students try migration themselves in a mock salmon obstacle course.



Students experience a fun, life sized model of salmon habitat and their challenges for survival



Go through the fish ladder







Who can make it past the orca and out of the ocean?

Get into the culvert!

Go for the gold!



Get past the bear and win!

Salmon Release



Be free!



Great Granddaughter

Great Grandmother

The joy of releasing salmon...

...Spans generations

THE END



See ya next year!

Summary of NGSS Disciplinary Core Ideas Addressed for grades 3-5

Life Sciences

LS2.A: Interdependent Relationships in Ecosystems

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

LS2.C: Ecosystem Dynamics, Functioning and Resilience

LS1.B: Growth and Development of Organisms

LS1.C: Organization for Matter and Energy Flow in Organisms

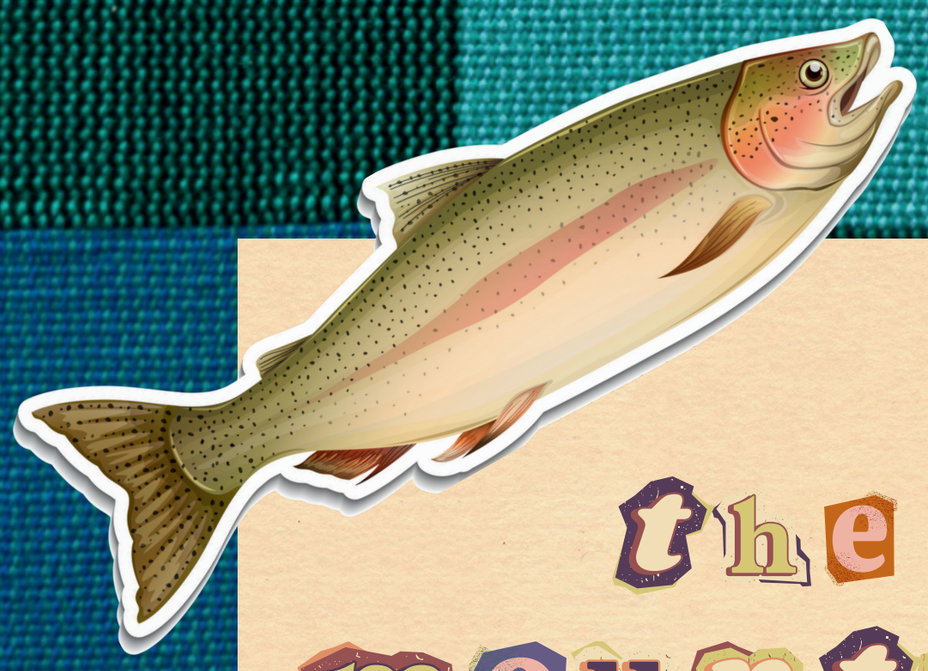
LS3.A: Inheritance of Traits

LS4.B: Natural Selection

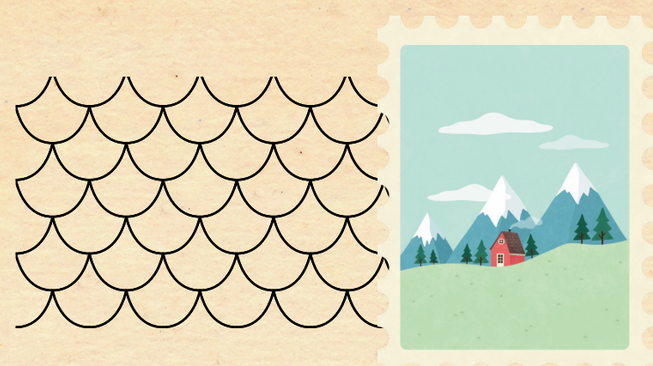
Other Sciences

PS3.D: Energy in Chemical Processes and Everyday Life

ESS3.C: Human Impacts on Earth Systems



POSTCARD



the mountain is out and so are the salmon

Pierce County

Residents

FROM: Tacoma Washington
Salmon in Schools Program



PIERCE CONSERVATION DISTRICT

Over 70 Years of Conservation