



Listening to Salmon: How EBMUD Uses Sound to Protect Fish

Andrew Musson
WOODBRIDGE ELEMENTARY SCHOOL

The East Bay Municipal Utility District (EBMUD) has recently started using a micro technology that enables researchers to track and protect salmon populations through the use of acoustic monitoring.

As part of its salmon restoration program, juvenile salmon are surgically implanted with a tiny acoustic transmitter that weighs just 0.32 grams. This is done at the Mokolumne Fish Hatchery. The transmitter sends out a pulse every 5 seconds at a very high frequency, 416 kilohertz (kHz).

These small transmissions can be heard by hydrophone receivers that

are in the water. As the fish migrate downstream, these receivers detect signals, allowing researchers to monitor their journey through the river, across the delta, and out to the ocean.

This acoustic monitoring method provides detailed data on salmon movement and survival, supporting conservation efforts.

This method helps scientists understand not only where salmon move, but also which parts of the river are safer and which pose more risks. One key monitoring location is the Golf Rotary Screw Trap, a large, rotating device installed in the river that safely captures and counts juvenile salmon as they pass by. Scientists use the trap to gather information about survival

rates and migration patterns.

Studies have shown that juvenile salmon survival below the trap is often low. Survival rates can vary from year to year, likely affected by factors such as water temperature, river flow, and the combination of environmental conditions. In addition, survival can differ depending on the route salmon take, such as the North Fork versus the South Fork.

The project takes place along a 40-mile stretch of the Mokolumne River, mainly near the Woodbridge Irrigation District Dam, where the fish ladder is located.

Since 1990, EBMUD used underwater cameras to monitor fish, but in 2024 they switched to artificial intelligence

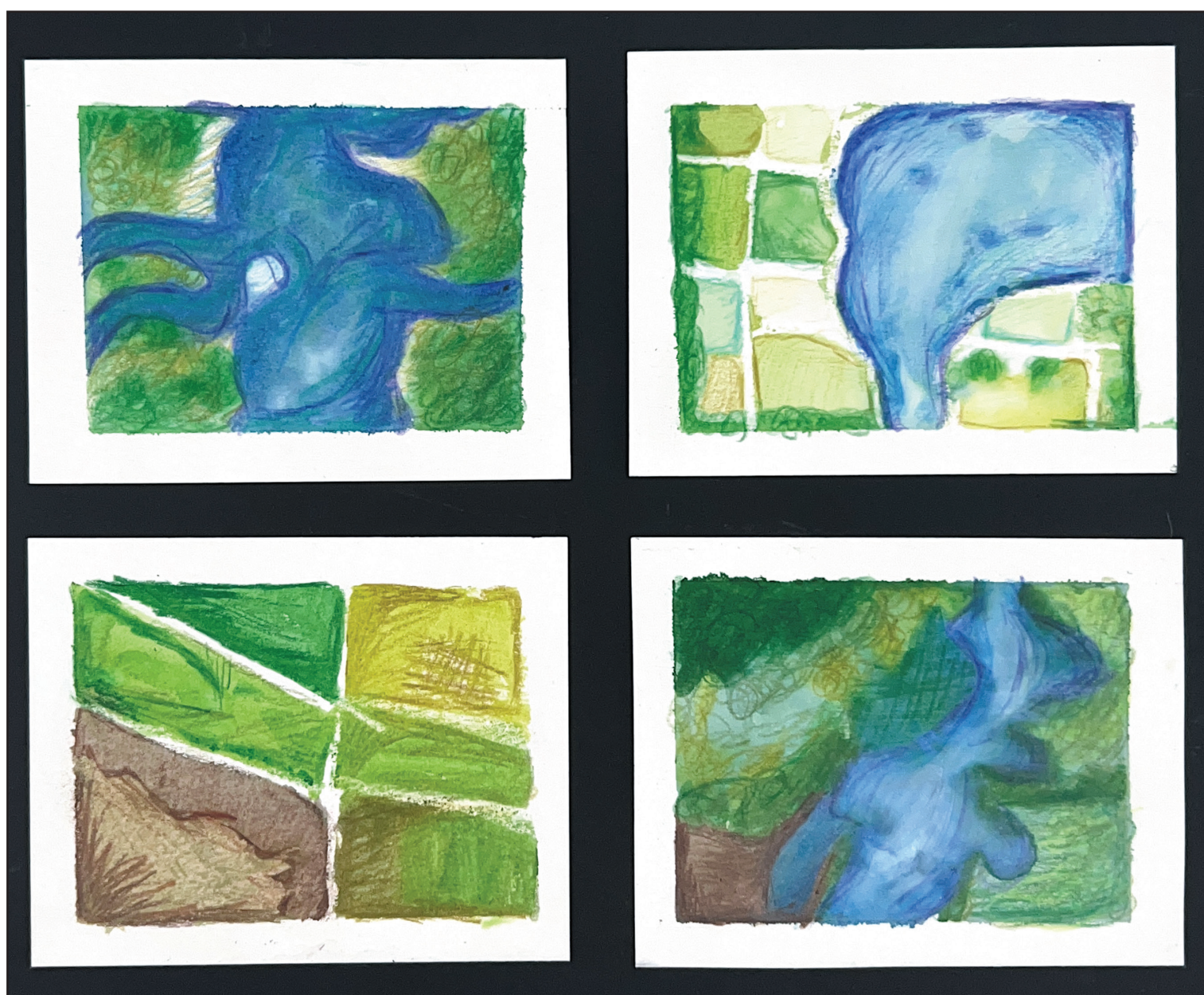
technology that can automatically detect, measure, and track salmon. This new system is faster and more accurate than ever before.

EBMUD also works with the California Department of Water Resources to improve their results.

Acoustic monitoring can identify the fish species, gender, age, life stage, swimming direction, and whether a fish has a clipped fin, showing it came from a hatchery. This information helps manage water flow from Camanche Dam, protect migrating fish, and improve river habitats.

The program's main goal is to track fall-run Chinook salmon, which in some years can number over 35,000 returning fish.

A BIRD'S EYE VIEW OF THE DELTA



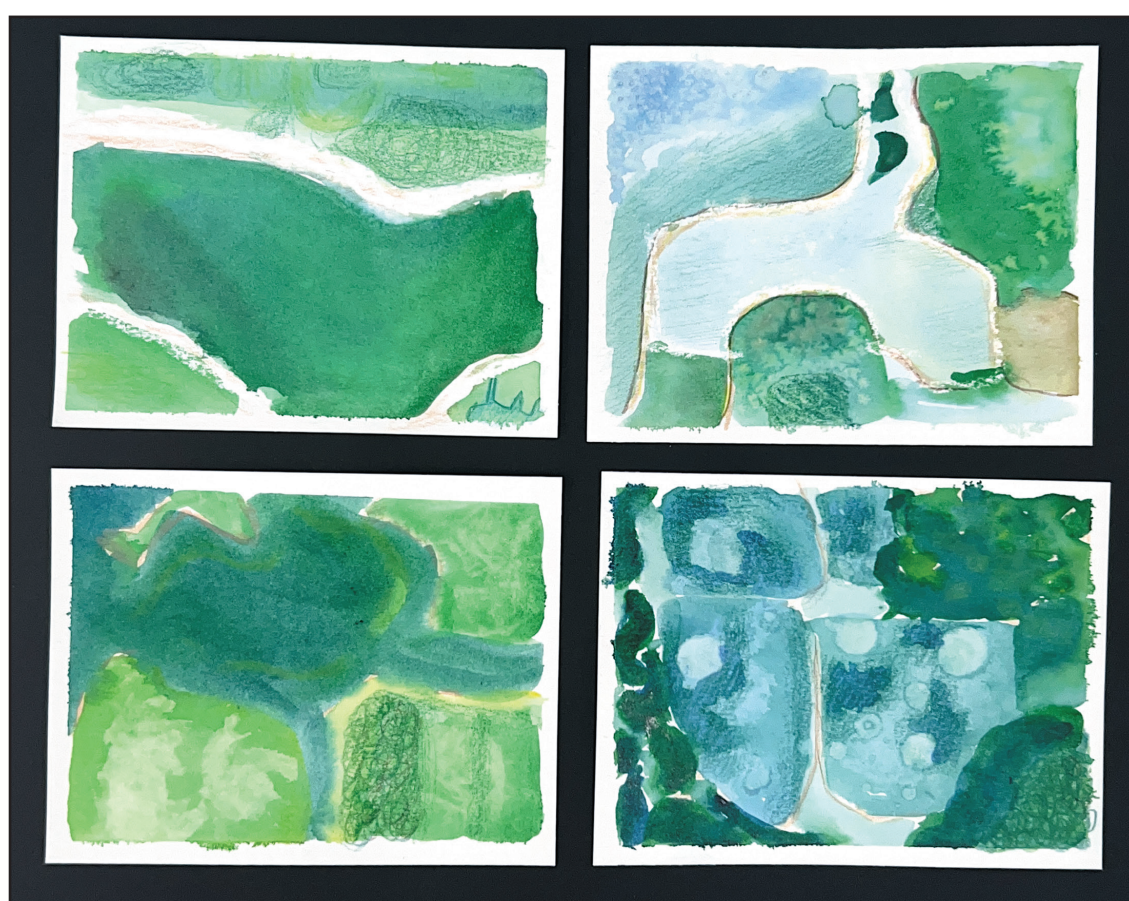
OLIVE KALLIS/VISTA OAKS CHARTER SCHOOL

Students at Vista Oaks Charter School had the chance to create unique artwork of the California Delta this year, boosting both their watercolor techniques and their knowledge of the local watershed.

"I used Google Earth to search images of the San Joaquin Valley and printed images of the Delta and fields, etc., and let each student choose their own image to recreate," teacher Kristen Hatch explained. "We talked about landscapes and how they are normally portrayed in painting and then talked about point of view."

Each of the students created four miniature compositions based on their Google Earth images, using a different technique for each painting. They then layered colored pencil on top to complete the images.

The result was a collection of stunning aerial views of the local watershed.



RO SMITH/VISTA OAKS CHARTER SCHOOL

A peek inside of the Mokolumne River Hatchery

Lyla Milan Nash
LODI ACADEMY

Did you know that 40 to 50 million fish are produced from fish hatcheries in California every year? These hatcheries are incredibly valuable to all Californians.

Genelle — my school's tour guide during our field study of the Mokolumne River Fish Hatchery — states that without the hatcheries of California, its Chinook salmon and steelhead trout populations face very possible decimation. Because humans have placed all their homes and factories smack dab in the middle of the fishes' runs, it is necessary that we make up for these losses by helping their populations yield higher reproduction rates in fish hatcheries.

The Mokolumne River Hatchery, an establishment that produces about 5.4 million Chinook salmon and 250,000 steelhead trout annually, has been operating since 1964. This is surprising to some of its visitors, who are sometimes unaware that salmon are even present in the rivers of California. A general call to awareness is especially wanted, as some of the public who are unaware unintentionally hinder the progress worked for by the hatcheries and so needed by the whole natural system of California.

So how does the hatchery work?

Well, first we need to understand the life cycles of the fish themselves. At the very beginning of their existence, the clusters of salmon and trout eggs are laid in cold, fresh water by a fertile female fish. Only three of the 5,000 eggs laid by each female usually make it to adulthood. This is because the salmon act as a major food source for predators throughout every stage of their lives.

Hatchery continues on Page 4



LILA MILAN NASH/
LODI ACADEMY

Steelhead trout are seen at the Mokolumne River Fish Hatchery on March 5.

What is a delta? And why are they so important?

Elisa Sofia Arizmendiz Patino
WOODBRIDGE ELEMENTARY SCHOOL

A delta is an important kind of landform that forms at the mouth of the river where it flows into a larger body of water such as an ocean, bay, or lake. As the river slows down, it drops sediment, which slowly builds up land over time.

Deltas are important to our

environment because they provide habitats for many types of wildlife. Fish, crabs, birds, and plankton all depend on deltas for food and shelter. These areas are full of life with plants and animals thriving in the rich environment.

Deltas also protect inland areas from flooding by slowing down the fast moving river water. When water spreads

out across the delta, it reduces the strength of floods and helps keep nearby communities safer.

Another reason why deltas are important is because they provide fertile soil that is rich in nutrients, making them excellent places for farming. Many crops grow well in delta soil, which supports local farmers and communities.

Deltas have a fan or triangle shape, with channels splitting into smaller streams called distributaries. These branching waterways help spread water and nutrients across the land.

By studying deltas, we are better able to understand how rivers shape the land and why it is important to protect these valuable ecosystems.

INSIDE:
Storm Drain Detectives help monitor local water **PAGES 2 & 7**

More fun and learning with the Marine Science Institute in San Francisco Bay **PAGE 3**

Salmon in the Classroom program gives a glimpse into the lives of fish **PAGES 4, 5 & 6**

STORM DRAIN DETECTIVES

Learning how scientists study water

Kenzie Meinecke
WOODBRIDGE ELEMENTARY SCHOOL

On February 19, student representatives from the Storm Drain Detectives had the exciting opportunity to visit Millswood Middle School to meet with John Teravkis, a local water expert who studies and works closely with storm drain systems.

Storm drains play an important role in our community because they carry rainwater from streets and neighborhoods into nearby creeks and rivers. Learning how this water moves, and whether it is clean, is an important part of protecting the environment.

During the meeting, Mr. Teravkis asked the students questions about how they monitor storm drain water and collect data. He also shared helpful advice on how to improve their methods so their results are as accurate as possible.

For example, he explained that when taking three read-

ings for each test, students should collect a new water sample each time instead of using the same sample. This helps prevent one unusual sample from affecting all of the results.

A sample might contain something that temporarily changes the reading, such as animal waste, soil washed in by rain, leaves or other plant material, or even small amounts of trash or pollution from the street. By collecting a fresh sample each time, students can compare the readings and calculate a more reliable average.

Mr. Teravkis also explained that scientists look for patterns or trends in their data over time. If one result looks very different from the others, it may be an anomaly, which means it is unusual and could have been caused by an error or a temporary change in the water. When this happens, scientists review the data carefully to decide whether the

result should be investigated further.

Students also learned that it is useful to have multiple people review the data, because different people may notice patterns or details that others might miss.

Mr. Teravkis explained that rainfall can strongly influence water data, since rain washes materials from streets into storm drains. Because of this, scientists often compare results across different seasons to see how weather and environmental changes affect the water.

The visit helped students better understand how real scientists study water quality and how careful data collection can help protect our local waterways.

The Storm Drain Detectives will use what they learned to continue improving their monitoring and learning more about the health of their community's water systems.

Catching up with former Storm Drain Detective Dylan O’Ryan

Kenzie Meinecke, Maria Alvarez and Gabriella Charles
WOODBRIDGE ELEMENTARY SCHOOL

Which school, year and watershed program did you participate in?

I participated in the City of Lodi Storm Drain Detectives Program as a high school student from 2015 to 2018. During my time as a student with the Storm Drain Detectives program, I participated in the MSI trips, Salmon in the Classroom program, and other stormwater pollution prevention efforts (for example, supporting the development of a Stormwater Pollution Prevention Plan for the Lodi Unified School District).

Through my undergraduate and graduate programs, I have returned to the Storm Drain Detective program as a volunteer and helped train students on how to monitor water quality.

Which high school did you graduate from and what year did you graduate high school?

I graduated from Lodi High School in 2018.

What college did you attend, and what was your major?

For my undergraduate studies, I attended California State University, Sacramento, majoring in environmental studies. I am currently in a master's program at CSU East Bay in Hayward, studying environmental geosciences.

What are your career goals?

I currently work at Lawrence Berkeley National Laboratory (Berkeley Lab) as a research associate. My work focuses on data management and supporting researchers to ensure the data they collect is accessible to the broader scientific community. My work also focuses on developing workflows and approaches for field researchers to ensure that the data collected is available and well-described for use by the broader scientific community.

Once I finish my master's program, I plan to continue my work at Berkeley Lab and continue my research in water quality and water resources. Looking towards the future for my career, I would be interested in merging my interests and experience in water quality and community engagement in my work at Berkeley Lab and beyond.

Did being in any of the watershed programs help you in your career choice, scholarships, or to get jobs?

Storm Drain Detectives and the work associated with the program were a catalyst for the academic and professional work I do. The Storm Drain Detectives program was critical to my interest in water quality and water science. The work that I did in the program also helped me secure internships.

What would you say to today's students about what you valued most in the program?

What I valued most about the Storm Drain Detectives program is the hands-on experience it provides students. It also provides students with an early understanding of

the impact we have on our environment.

What was your best memory from your time in the Storm Drain Detectives program?

I think the best memory is when I was able to work as a volunteer for the program. It was nice to be able to return the favor by being able to share my knowledge and passion with the students I worked with and help guide them through how to monitor the water and collect the data, like others had guided me as a student.

How did your experience as a Storm Drain Detective influence your interest in water quality or environmental work?

The Storm Drain Detectives program was the foundation and catalyst for my academic and professional career. Before joining the Storm Drain Detectives program, I was generally interested in studying environmentally related issues. However, after working hands-on with water quality monitoring with the Storm Drain Detectives program, I was particularly interested in studying water quality and water resources.

These experiences have driven my academic research interests in my undergraduate and graduate programs, and have been a central theme in my professional work.

What skills did you learn in the watershed programs that still help you in your job today? (For example: teamwork, field research, data collection, or public outreach.)

The Storm Drain Detectives program provided me with the foundational skills needed to monitor water quality, including hands-on experience working in the field and data collection.

In addition, my involvement in various Storm Drain Detective-related efforts gave me valuable opportunities to engage with the community, which helped me develop strong public speaking and outreach skills. Writing informative science-related articles for the Mokelumne Current further strengthened my written communication abilities.

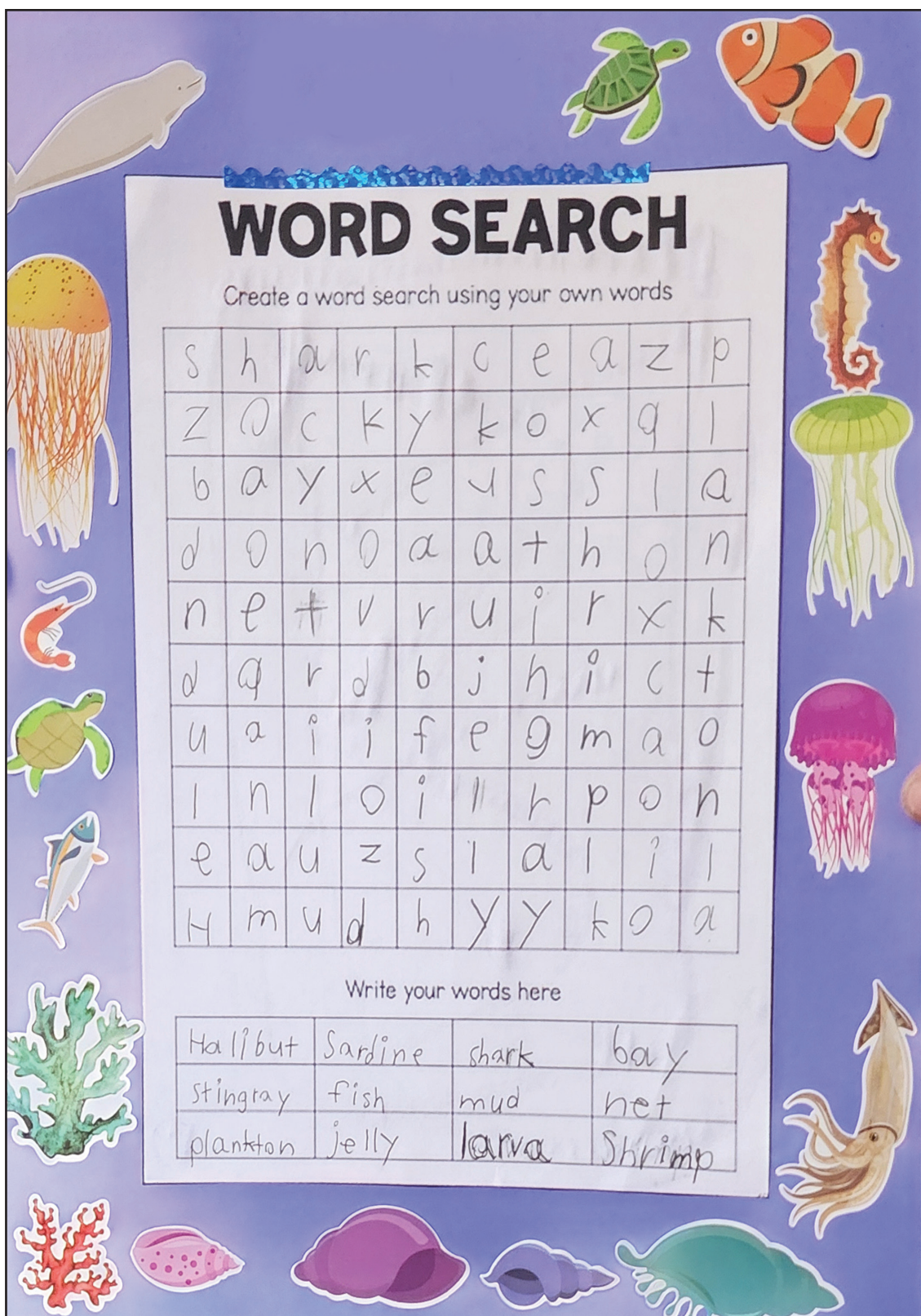
Can you describe what your current job in water monitoring involves and why it's important for the community?

For my work at Berkeley Lab, I focus on supporting researchers to ensure their data is accessible and usable for the broader scientific community. Sharing and publishing data is a crucial component of research, and ensures that the research is reproducible, accessible, and transparent.

Similarly, data collected by the Storm Drain Detectives program is shared with the community, which is an important component of the program and outreach with the Lodi community.

For my master's work, my research focuses on understanding groundwater-surface water interactions and the impact a changing climate has on water resources in Shasta County. My graduate research will be important for understanding the impacts that climate change has on water resources.

O’Ryan continues on Page 7



IGNAT VECHTOMOV/COMMON SENSE PRIVATE SCHOOL

Testing electrical conductivity to keep waterways healthy

Andrew Musson
WOODBRIDGE ELEMENTARY SCHOOL

Storm Drain Detectives test water near Storm Drain outlets around Lodi Lake which feed into the Mokelumne River. One important factor they test for is Electrical Conductivity, or EC. EC helps us measure how many dissolved salts and minerals are in the water, which can affect water quality and fish health.

Pure water cannot carry electricity on its own, but when salts and minerals such as sodium, calcium, and magnesium dissolve in water, they allow electricity to flow. The

more salts and minerals in the water, the higher the EC reading will be. If the EC is too high, it can stress or harm living organisms like fish and plants. If the EC is too low, aquatic animals may also be harmed because they need certain minerals to survive. This is why having a balanced EC level is important.

An EC reading of about 50 or lower usually shows more natural water conditions, which are healthier for most plants and animals. High EC levels can be a sign of pollution or runoff entering the water. This pollution can come from fertilizers, road salt, or even

sewage. By testing EC, we can quickly check if the water may be contaminated.

We also use EC to track changes in water quality over time. If EC levels suddenly rise or fall, it can alert us to possible environmental problems. By collecting and analyzing this data, Storm Drain Detectives help scientists and the community understand what is happening in our waterways and how we can protect them.

Testing EC allows the Storm Drain Detectives to be environmental scientists working together to keep our water clean and safe for everyone.

The students of Lois E. Borchardt Elementary, Common Sense Private, Heritage Elementary, Joe Serna Jr. Charter, John Muir, Lakewood Elementary, Lodi Academy, Lodi Christian School, Lodi High, Oak View Elementary, Turner Academy West, Vinewood Elementary, Vista Oaks Charter, and Woodbridge Elementary would like to thank the following sponsors for their support:



MARINE SCIENCE INSTITUTE

Going on a voyage of discovery with MSI

Maria Alvarez
WOODBRIDGE ELEMENTARY SCHOOL

During a recent study trip, Lodi Unified students from Woodbridge Elementary and Millswood Middle School participated in a four-hour expedition on the San Francisco Bay aboard a 90-foot research vessel called the R.V. Robert G. Brownlee.

While on the boat, students took part in a variety of hands-on science activities that helped them discover life in the estuary and understand how humans were connected to it. Some of the topics covered on the trip included scientific investigations, ecosystems, biodiversity, and human impact on the bay.

Students rotated through three interactive learning stations where they used real scientific tools and practiced the scientific method to examine

different types of marine life. The three stations were the Benthic Station, Ichthyology Station, and Hydrology & Plankton Station. Ichthyology was the study of fish, benthic referred to the bottom of the bay, and hydrology focused on the health of the water.

At these stations, students collected plankton, fish, sharks, mud samples, and water samples to learn how marine scientists studied the bay. Students carefully observed their findings, recorded data, and learned that their results were actually used by Marine Science Institute researchers to help monitor water quality and the overall health of the bay.

During the trip, students also explored ecosystems and biodiversity. They examined where freshwater mixed with ocean water and learned about the organisms that lived in this

unique environment. Students discovered how plants and animals were connected through food webs and why these relationships were important. They learned that even very different organisms could be connected through simple food chains, which helped them better understand how ecosystems worked.

Students experienced real science by participating in hands-on activities aboard the research vessel. They used scientific tools, followed scientific procedures, and collected living organisms using nets before safely returning them to the water. Students observed marine animals up close, asked questions, and developed a deeper understanding of how scientists studied and protected the environment.

Throughout the voyage, students learned how humans were connected to the bay and why it

was important to protect marine ecosystems. They saw firsthand how marine scientists worked daily to study and preserve ocean life. This experience helped students understand the importance of caring for marine animals and protecting their habitats. Learning from real researchers gave students knowledge and experiences they might not otherwise have had.

Overall, the Discovery Voyage field trip helped open students' minds to marine science through hands-on learning, real scientific investigations, and direct interaction with marine life. By connecting their learning to science standards and real-world applications, students gained a deeper understanding of ecosystems, biodiversity, and environmental responsibility, all while enjoying an unforgettable day on the San Francisco Bay.

TIGER SHARK



ADRIEL GONZALEZ/WOODBRIDGE ELEMENTARY

STING RAY



VALENEY VIRAMONTES/WOODBRIDGE ELEMENTARY

BY ELIAS HEMMOUK AND AUBREY ROMERO

RIVER-THEMED

CROSSWORD PUZZLE

- A STATE THAT THE MISSOURI RIVER RUNS THROUGH (IT STARTS WITH A D AND IS AN ALTERNATE SPELLING OF A STATE. THERE'S A NORTH AND SOUTH STATE FOR THIS).
- THE KEYSTONE SPECIES OF SALMON.
- A PRODUCER OF FRUITS AND VEGETABLES.
- THE STUDY OF WATER/BODIES OF WATER.
- THE SCIENTIFIC WAY OF SAYING "OXYGEN AND WATER".
- A FOSSIL FUEL USED TO PROPEL CARS AND OTHER VEHICLES.
- THE EXISTENCE OF PEOPLE/ANIMALS.
- A RESOURCE THAT GIVES US HEAT, LIGHT AND VITAMIN D.
- A RESOURCE THAT WE USE TO DRINK AND WASH THINGS.
- A RESOURCE THAT GIVES US WOOD TO MAKE PAPER AND FURNITURE.

ELIAS HEMMOUK AND AUBREY ROMERO/
JOHN MUIR ELEMENTARY SCHOOL

Bottom-dwelling invertebrates play an important role in the Bay

Kaylin Fritz
WOODBRIDGE ELEMENTARY SCHOOL

Most animals on Earth are invertebrates, meaning they do not have backbones. In fact, only about 5% of all animal species are vertebrates, which include animals like humans, birds, fish, reptiles, and mammals. Vertebrates have backbones that help them stand, walk, move, and protect their nervous systems. The other 95% of animals are invertebrates, which means they do not have a spine, backbone, or internal skeleton. Even though they may be small and easy to overlook, invertebrates play an extremely important role in our environment.

Many invertebrates live on or in the bottom of the San Francisco Bay. These animals are called benthic invertebrates, which means bottom

dwellers. They live in the mud, sand, and sediment at the bottom of the bay and help keep the ecosystem healthy. Benthic invertebrates are a major food source for birds, fish, and other marine animals. They also help break down dead plants and animals, which recycles nutrients back into the ecosystem. This process helps keep the water clean and supports new life.

Invertebrates are also important indicators of water quality. Some species are very sensitive to pollution, so if these organisms disappear, it can be a sign that the water is becoming unhealthy. Scientists study bottom-dwelling invertebrates to learn more about pollution levels and overall ecosystem health. A healthy bay usually has many different kinds of inver-

tebrates living in it.

Some common invertebrates found in the San Francisco Bay include clams, mussels, snails, crabs, shrimp, insect larvae, amphipods, and isopods. Clams and mussels have hard shells and often burrow into the mud or attach themselves to rocks and surfaces. Shrimp have transparent bodies and live in burrows in the sediment. Crabs walk across mudflats and dig tunnels for protection. Snails crawl through the mud using their soft bodies and carry protective shells. Amphipods and isopods are tiny, shrimp-like creatures that look similar to pill bugs and move through the sediment. Insect larvae, such as midges and other aquatic insects, also live in the mud and help recycle nutrients.

These bottom-dwelling in-

vertebrates may be small, but they have a huge impact on the bay's ecosystem. They help clean the water, support the food web, and keep the environment balanced. Without them, water quality would decline, and many animals would lose their food source. This would make rivers, lakes, and bays unsafe for both wildlife and humans.

In conclusion, invertebrates are essential to the health of the San Francisco Bay and ecosystems everywhere. They decompose dead plants and animals, recycle nutrients, and serve as food for many species. The next time you see a small invertebrate in the water or along the shore, remember how important it is and let it continue doing its job to keep our environment clean and healthy.

Exploring the benthic zone: Life at the bottom of San Francisco Bay

Dasiana Johnson
WOODBRIDGE ELEMENTARY SCHOOL

Benthic organisms are plants and animals that live in, on, or near the sandy, muddy, and rocky bottoms of oceans, bays, rivers, and lakes. This area is called the benthic zone. Some common benthic organisms include clams, mussels, crabs, worms, snails, sea stars, and tiny microscopic insects and animals. These bottom-dwelling creatures may be small, but they play a big role in keeping aquatic ecosystems healthy.

Benthic organisms are important because they help scientists understand how healthy the water is. Some benthic species can only survive in clean, unpolluted water, so their presence is a sign of good water quality. If these sensitive organisms disappear, it can warn scientists that pollution or environmental changes may be harming the ecosystem. In this way, benthic

organisms act as natural indicators of water health.

Another reason benthic organisms are important is because they are a key part of the food web. Many fish, birds, and other animals rely on them for food. Benthic organisms also help clean the water by breaking down dead plants and animals. This process recycles nutrients back into the ecosystem, which supports new life and helps maintain balance in the environment.

When students study benthic life, they learn how animals adapt to living on the bottom and how pollution can affect these organisms. Students also discover how scientists study ecosystems by observing what lives there and how different species interact. By learning about the benthic zone, students gain a deeper understanding of how aquatic ecosystems work and why it is important to protect them.

Why San Francisco Bay's salinity levels are important

Vanessa Luna Alcalá
WOODBRIDGE ELEMENTARY SCHOOL

Salinity, which means how salty the water is, is very important in the San Francisco Bay. It affects where plants and animals live and how healthy the entire ecosystem is.

Because the Bay is connected to both rivers and the ocean, the water can be fresh, salty, or somewhere in between. Keeping the right balance of salinity helps the Bay stay healthy and full of life.

One reason salinity is important is that it determines which plants and animals can survive in certain areas. Some species need fresh water, others need salty ocean water, and some can live in water that is a mix of both.

If the salinity changes too much, it can help some species but harm others. This balance is especially import-

ant in an estuary like the San Francisco Bay, where fresh river water mixes with salty ocean water to create many different habitats.

Salinity also affects the food web. Tiny organisms like plankton depend on the right level of salt to survive, and fish and other animals depend on plankton for food.

If salinity levels change because of rain, drought, tides, or snowmelt, it can impact many parts of the ecosystem. These changes can make it harder for some species to grow and reproduce.

Scientists measure salinity to track changes in the Bay. By studying salinity levels, they can better understand climate change, water use, and pollution. In simple terms, if salinity levels become too high or too low, plants and animals may struggle to survive, which can affect the entire ecosystem.

Delicacy

Zereenah Ashiru
JOHN MUIR ELEMENTARY SCHOOL

I bite the salmon
Was once a free being fish
Now in my stomach

Sandhill Cranes

Daphney Funkhouser
VINEWOOD ELEMENTARY SCHOOL

Babies soft as snow
The seasons change, sand-hills fly
Eyes shine in daylight

Population

Colleen Bunag
JOHN MUIR ELEMENTARY SCHOOL

Out of 5,000
8 might be left to spawn others
After the dangers

Salmon

Juliyana Tachera
JOHN MUIR ELEMENTARY SCHOOL

Salmon
Swim in rivers
Bathing in the sunlight
Growing as they travel upstream
So grand

Water

Anna Seraypheap
JOHN MUIR ELEMENTARY SCHOOL

Waves crash on the shore,
Far rivers and far oceans,
Little songs call loud

Bird

Rashleen Shergill
JOHN MUIR ELEMENTARY SCHOOL

A bird
Starting to fly
From a branch that they were
Standing on for a few seconds
Now shakes

Rivers

Kiyomi Nishihura-Sanchez
JOHN MUIR ELEMENTARY SCHOOL

Rivers
Something charming
Shining bright in the light
A magnificent trickling stream
Lovely

Salmon

Ethan Murti
JOHN MUIR ELEMENTARY SCHOOL

Salmon
Scales so lovely
Splashes in the river
Gleams in the sun like the moonlight
Sunshine

River Water

Lucas Murti
JOHN MUIR ELEMENTARY SCHOOL

River
Long and wiggly
Splashing, rushing, flowing
It moves past rocks and trees
Water

The cycle of salmon

Aiyana Aguda
JOHN MUIR ELEMENTARY SCHOOL

The eggs start to hatch
With beautiful salmon scales
The cycle repeats

Salmon

Jasmine Garcia Alvarado
JOHN MUIR ELEMENTARY SCHOOL

Salmon
Beautiful and
Bright, gliding through the blue
hatching and swimming as they go around.

The Glad Ocean

Veon Valerio
JOHN MUIR ELEMENTARY SCHOOL

Ocean
Containing life
Growing inside of you
Living a happy and good life,
Always.

Insects

Sophie Alexandre
JOHN MUIR ELEMENTARY SCHOOL

Many
Of these creatures
Crawling, buzzing critters.
Some friendly, some hurtful, but all
Stunning

SALMON IN THE CLASSROOM

Salty Talks: A podcast chat with a Chinook salmon

Sasha Moseti
LODI ACADEMY

Host: Welcome back to Salty Talks, the podcast where we talk about all the things happening in our salty water, and I am your host, Sasha Moseti. Today I am here at the Mokelumne Fish Hatchery with a special guest. Please introduce yourself.

Salmon: Hello, I am a Chinook salmon. I am the largest type of salmon and my life will be full of adventure. I am going to swim through rivers, streams, and even our salty waters, the ocean.

Host: It is truly such an honor to have you here. Let me start with the question the listeners want to hear. Where did your life begin?

Salmon: My life started in a tiny egg in a freshwater river. Things for me were a little different. I was raised at Lodi Academy with other salmon while kids watched us grow.

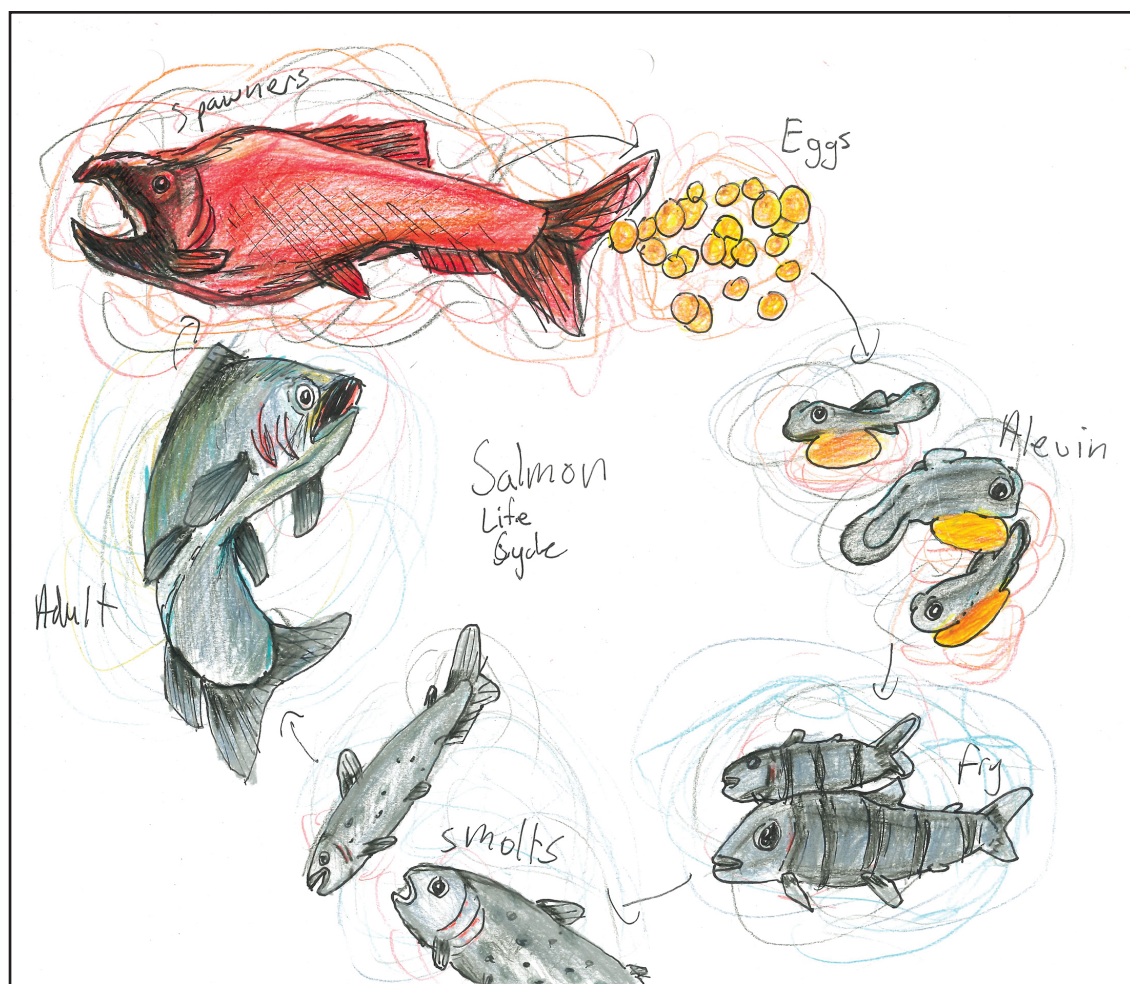
Host: Wow, that is quite interesting.

Salmon: Yes, actually when we got big enough the class brought us to the fish hatchery so we could continue growing and make our trip to the river and soon the ocean.

Host: That is an adventure alright. For our listeners at home, what exactly is a fish hatchery, and why is it special to you?

Salmon: A fish hatchery is a place where people help raise and protect young fish until we are strong enough to live in the wild. It's special to me because that's where I was before coming to Lodi Academy. I was kept safe while I grew bigger, so my trip to the salty water can start.

Host: We hope the rest of your trip goes smoothly. Everyone that was Chinook salmon we hope you enjoyed this episode. I am your host, Sasha Moseti and thank you for listening to Salty Talks.



MARKO AGUILAR/LODI ACADEMY

The life cycle of a Chinook salmon

Shawn Ivy Saunders
TURNER ACADEMY WEST

Chinook salmon are some of the most remarkable creatures. For example, salmon are a type of fish that can counter-shade. Also, salmon can grow up to 48 inches long. In addition, salmon jumps are as high as if a human jumped over a four story building.

These are some of the reasons why salmon are some of the most fascinating fish.

The first stage of the salmon life cycle is the egg stage. The salmon egg stays in the nest. The color red is the color of the salmon eggs.

All salmon eggs need clean and cool water to survive. Many salmon eggs will get eaten by birds such as ducks and fish like trout.

The salmon eggs remain in this stage for 1 to 2 months before they hatch. In order for the eggs to hatch, the eggs need thermal units (average water temperature minus 32 degrees); the amount of thermal units needed to hatch is 900 to 950 units.

Now let's talk about alevin. Have you ever seen a fish egg hatch into something that looks like an alien? If you have, it probably was an alevin.

The alevin is the second stage of the salmon life cycle. The alevin stay in this stage for 2 to 10 weeks. The alev-

in's main predators are birds and fish. The most interesting thing about the alevin is how they swim around using only their tails.

OK, moving on to the third and fourth stage of the salmon life cycle: the fry and parr. Imagine the alien-like creature called the alevin (talked about in paragraph 3) turns into something fish-like. That means they are now fry and then parr. The fry and parr start to get teeth and fins.

Fry and parr stay in schools for protection. They get spots and stripes for camouflage. The fry and parr eat plankton. They remain in this stage for 6 to 8 months. The most interesting thing about it is how they transform from alevin to the fry and parr.

It's time to move on to the fifth stage of the salmon life cycle, the smolt. Smolt are larger than the fry and parr now. The smolts' food source are insects, larvae, and small fish.

The smolt travel to an estuary for a few weeks to get used to the salt water. The smolts' skin is now silver to blend in with the ocean. The smolt remain in this stage until one year old. The most intriguing thing about this stage is how the stripes and spots fade away.

Finally, we're on the final stage of the salmon life cycle, the adult. The adults have the

hardest and most dangerous job, that is to make it to their spawning ground alive to lay up to 10,000 eggs. In the ocean, they swim in schools of other salmon for an average 3 to 5 years.

The adult salmon have bigger dangers not just in the ocean but also on the way upstream to spawn. The dangers in the ocean are orcas, dolphins, and sharks. The dangers when going to spawn are bears, birds, and otters.

While in the ocean the salmon eat herring, squid, and shrimp. The salmon don't eat when going upstream to spawn.

The chinook salmon stay in the adult stage from 1 to 7 years. Overfishing, dams, pollution and clearing land are also big problems.

After all you've learned about the salmon life cycle do you agree that salmon are remarkable fish?

Salmon are very intelligent fish. Many species depend on salmon. All kinds of fish are special, but not like salmon.

The salmon embark on a great journey of danger and spend a lot of time in the ocean. They use their sense of smell to find their way back to the river they were born in.

Just remember there's more to nature than meets the eye. Stay curious and ask questions.



PHOTOS BY LYLA MILAN NASH/LODI ACADEMY

Above: The entrance to "the Trap." Below: "The Trap," where all the salmon and steelhead are sorted.



and the dead fish are transported to establishments like local food banks.

Once hatched, the fry are transported to nursery ponds to gain the strength they otherwise would have in gentle currents of their spawning grounds. After about a year of

fish food nourishment (mostly protein, feathers, biotin, and vitamins), the fingerling fish are released into the river. From there, they swim out into the open ocean to complete the rest of their life cycles.

The return rates of these fish fluctuate primarily due

to conditional environment variables like droughts and extremely hot temperatures that affect the fishes' survival during their runs.

A number of questions occurred to me while at the hatchery, the first of which was, "How do you prevent disease with such low variety and large numbers in compact spaces?"

The answer provided was: the hatchery only turns to medical interference as a last resort. In the form of powder, medicines are poured into the waters to get rid of any disease or harmful pathogen that is burdening the fish populations. Sometimes, all it takes is vast amounts of salt to rid the fish of harmful fungi or pathogens.

The second question that occurred to me while listening to Genelle was, "Do hatchery salmon affect wild salmon in any way?"

The hatchery salmon can do nothing really but boost the wild populations.

Some very little facts I found interesting are: the biggest salmon that ever was recorded in the hatchery was 88 pounds! (The average is 40 pounds).

During the Gold Rush, a huge portion of salmon died off because the dirt of the rivers were constantly being stirred up.

And a very rare blue steelhead can be found in the Mokelumne River. These steelhead trout gain their blue hues from a very rare recessive gene. We got to see one!

Overall, our trip to the Mokelumne river hatchery was very enjoyable and extremely educational in the ecology and biology of the Chinook and steelhead of California.

Memoirs of a Chinook salmon

Fifth Grade Students
WOODBIDGE ELEMENTARY SCHOOL

Day One, January 8, 2026

Thirty-four of my best egg friends and I showed up to Room 21 at Woodbridge School today. It didn't take us long to notice that the classroom was full of wild students all so excited to see us! Imagine being the stars of the classroom, and all you are is a little egg.

The boss lady, Mrs. Willis, walked us around the classroom in our little patch of netting and all of the students just stared. Kind of creepy, if you ask us. One even tried to smell us! Fifth-graders can be so weird!

Finally, we entered our temporary home. Think of it as a Water BnB, if you will. Brrr ... the temperature was at least two degrees colder than we have been used to at the Mokelumne Fish Hatchery!

Days 2-15, January 9-24

During this time, we just did egg stuff. By egg stuff, we mean we just sat on the bottom of our tank.

Sometimes, however, the strangest thing would happen. Kids would walk by our Water BnB, and just gawk at us. We weren't sure what we were supposed to do for these little humans, so we just sat there staring back at them.

It was during this time that we started to notice little Norman who was turning pale while the rest of us were glowing pink. We were all so worried, and were optimistic that Norman would feel better with time.

Day 14, January 23

On this day, we had some good and bad news. First, the bad news. Norman wasn't getting better and he was turning more and more white. The boss lady, Mrs. Willis, scooped little Norman out from the bottom of the tank and it was soon evident that Norman was not longer a viable egg.

But wait! We also had some good news on this day ... our first friend hatched! Milo wiggled and jiggled his way right out of his egg and immediately tried to find shelter under the rocks in the aquarium.

Day 15, January 24

OH, BUBBLES!!!! Today is the day! We have all hatched. The humans were so excited for this day to get here, but the joke's on them. All we did was hatch and go under the rocks, not to be seen.

Day 16-29, January 25-February 6

We finally are brave enough to come out from under the rocks at the bottom of the tank. The first thing all of the humans noticed about us is that we have "luggage" with us. That is another clue that we are in the Alevin stage. We continue to swim around, mostly congregating in a corner in the back of the tank.

Swimming around all day is exhausting and takes a lot of energy. It's a good thing we have our nutrient sac attached to us.

Day 41, February 18

Today the boss lady took some pictures of us from outside of the tank. Then, she enlarged them on her rectangular electronic thingy and discovered that our sacs are mostly gone. She also saw that we are starting to get really shiny.

Days 42-57, February 19-March 6

We love the freedom of swimming in our tanks and interacting with all the kiddos in our room. We can hear them all talking and we understand that we will be released back into the Mokelumne River on March 6. As for now, we will enjoy playing in our water BnB and growing each day.

Day 57, March 6, 2026

Phew! We are free! Uh oh ... now what do we do? First, we must find areas in which to hide and camouflage ourselves. Not only that, but we must now find our own food! Growing up can be so hard!

SALMON IN THE CLASSROOM

A lesson learned while raising salmon: Trust, but verify

Jazman Kaur
LODI CHRISTIAN SCHOOL

For the past one month our sixth-grade class has been learning about the unique life of a salmon. We have been busy researching and creating presentations about salmon and their ecosystems.

Then, one day our teacher surprised us with 30 salmon eggs to observe and learn from. This was a very exciting opportunity.

A couple days later the unfortunate thing happened, all of our salmon eggs were turning

pale! We didn't think much of it at first, until it was too late. All of our salmon eggs died!

At first we were all confused and couldn't figure out what had happened. We then checked the water and to our surprise it was very warm. We looked at the thermometer and realized it was broken. Oh no! They had died due to the warm water.

This was our first lesson that it is very important for the salmon to live in the right environment. Another lesson we learned was to trust but always

verify.

This made our whole class very sad. We wanted to see the salmon eggs grow and develop.

To our surprise, the people at the Mokelumne River Fish Hatchery were kind enough to provide us with a new set of salmon eggs.

In order to make sure everything goes well, our teacher got two new thermometers. We created the perfect environment for our new salmon eggs. For the next couple weeks we watched our salmon eggs grow and made

sure that the water temperature was perfect.

After a couple weeks, the salmon eggs began to hatch! Most of the eggs were still hiding behind the rocks.

Several days later, the baby salmon were finally swimming! Our class was overjoyed to watch the salmon thrive. Day after day our salmon were getting bigger and bigger. Together as a class we created the perfect environment for the salmon to stay alive and healthy.

Researching and creating

presentations was a great way to learn, but the hands-on experiment with the salmon eggs was unique. We as a class took good care of the salmon eggs and had a great time watching them each day.

After unfortunate events our class became more responsible and learned how important it is to have the right environment for the species grow.

Thank you, Mokelumne River Fish Hatchery, for giving us the opportunity to learn and have this beautiful experience!

Raising and releasing the Chinook salmon in our class

Ella Murch
LODI ACADEMY

On January 8, the freshman and sophomore students at Lodi Academy took in 35 Chinook salmon eggs. Both classes helped watch and nurture the eggs until they hatched.

When the salmon hatched, the eggs stayed attached to the fry for almost a month and a half, and six fry ended up dying.

Once the salmon got big enough, the freshman and sophomores went out (with Mrs. White, the science teacher) to the Mokelumne River Fish Hatchery.

The hatchery had a guide who told us fun facts about the salmon, including how the female fish lay about 5,000 eggs and only around 3 survive. She also took us to the windows to see where they keep the eggs and the big fish.

The guide took us down to a small place in the river and we then each released a fish. We even got to go and feed some of the fish, and she taught us that we are supposed to throw the feed spread out and not all clumped together because then all the fish can get some and they can eat it one at a time.

A week later Mrs. White told us why we had six fry die. She said that one of the eggs started fungus growing on it, killing the fry.

The same guide told Mrs. White that we were super lucky that not all the fish died.

I think it was super amazing to take care of the fish and see how they live and what their habitat is like.

SPECIAL DELIVERY!



JACOB ZOROLA/JOE SERNA JR. CHARTER SCHOOL

Students from Joe Serna Jr. Charter School take a photo before releasing the salmon they raised in their classroom.



AVERY STYRON/LAKEWOOD ELEMENTARY SCHOOL

Lakewood Elementary students pose with their specially made headbands before releasing their salmon.

The amazing Chinook salmon and its life cycle

Denessah Martens
TURNER ACADEMY WEST

Chinook salmon are amazing fish. They can leap up to twelve feet high to overcome those tricky water falls. They can change color and even be multi-colored at times. When they are in the ocean, they are a silvery blue, but they change to a red/green when they are returning to fresh water to spawn. Chinook salmon can travel super far without eating — cool, right?

These are some of the reasons why I believe Chinook salmon are the best and most amazing fish.

Now let's talk about the egg stage. The egg is the first stage of the Chinook salmon life cycle. The Chinook salmon are in the egg for one or two months. While in this stage they need cool and clean water, without this they may die. They live in a nest which is called a redd that is hidden in the gravel so it is harder for predators to spot them. The part I find most interesting is how you can see the Chinook salmon's eyes when in the egg.

Wondering about the second stage, or as it is called, alevin. Well, I might have some of your answers. In this stage they still have their yolk sac attached which provides nutrients so they don't have to look for food. They get their tails, which in this stage, they use it to move around.

They're not in this stage for very long because this stage only lasts about four to six weeks. The part I find most intriguing about this stage, is how they still have their yolk sac attached.

Two more lifecycle stages to go, but for now let's get into the fry/parr stage, the third and fourth stage. Did you know that when they are in this stage they get their camouflage such as spots, stripes, and scales?

The salmon get a swim bladder. Wondering what it does? Well, I'll tell you it can either make the salmon sink down or float up.

One more to go, but second to last is the smolt stage. By this time, the Chinook salmon are one to six inches long. Now they start heading down to the ocean, but first they go through an estuary which gets them used to salt water and helps them adjust to be prepared for the ocean. Now, all their stripes and spots fade away and a new silver color comes in so they can blend into the ocean better which makes it harder for predators to see them.

Did I answer all your questions about salmon? Well if not, I might answer them here while talking about the sixth and last stage, the adult. The males form a hook shaped nose to attract the female salmon. They are in the ocean for three to seven years!

But after/up to seven years of fun, they start the salmon run heading back to freshwater to spawn. When they lay their eggs, they can lay up to 10,000 eggs.

These are some of the reasons why salmon are incredible fish, such as how they can grow over 10 times the size of when they are first born. Or how they change color, or maybe even how unlike most fish, they can be anadromous, meaning they can live in both salt and freshwater. Salmon are truly unique fish.

Our little fishes: Raising salmon

Chaldem McPherson
LODI ACADEMY

It was December, and our class just set up a fish tank, with the news we were getting baby salmon! This was a massive surprise to every freshman, as they didn't expect the event so soon, and the fish were arriving January 5!

As we all waited so impatiently, it finally happened! They were finally here, as little eggs!

As the class fawned over them, I was particularly bonded to them.

Our teacher explained that we would be checking the temperature, bubbles, and skimming the foam every day we had her class.

By the next day, she had given us a paper asking us to predict when they would hatch, and

this was surprising to me. "You could perfectly predict salmon hatching?"

Days and days passed, and before we knew it, they hatched. Two people correctly calculated the date, but that was hardly the focus. The new babies were adorable!

Soon, we were all doing our own care for the tank. One student always took part in counting the fish, making sure they were all safe.

Another took charge in skimming the foam, and one took focus on checking the temperature and pH in the water.

But before we knew it, it was March 5, and we let them out into the Mokelumne River Fish Hatchery, seeing them swimming through the current, still so small. I'll never forget that day for as long as I live.

My experiences raising salmon, learning about their life cycle and releasing them in the Mokelumne

Mamie Holley
WOODBIDGE ELEMENTARY SCHOOL

It all started when we were learning about the salmon life cycle. We created a packet about them, and we also did a project, which was a lot of fun.

We had so much fun that we decided to get baby salmon and watch them grow and grow and grow. But we can only keep them at a certain stage. We can only keep them until the fry stage.

They started as salmon eggs. We waited and waited and waited some more. I started to get impatient. But the next day, my teacher had a smile on her face. So I looked at the salmon tank and ... they hatched! They were so cute and small.

A couple of days passed, and the fish were in a new stage, the Alevin. The Alevin stage is the

stage where the baby salmon has a yolk sac. The yolk sac gives them nutrients so that they can grow.

We waited some more, and they turned into the fry stage. We were very, very sad because we had to release them. So we went to the Mokelumne River so we could release them.

We walked for about 5 minutes to a nice spot to release our salmon. We had little cups to grab them. So I gently scooped one up and slowly released the baby salmon, then the rest of the class did. We were kinda upset, but the salmon were free and happy.

We had a picnic together and went on a scavenger hunt in nature. Then we went on the bus back to school.

I will never forget that day we released our salmon.

Salmon vs. Steelhead: They have many similarities, but also many differences

Abigaill Fellion
OAK VIEW ELEMENTARY SCHOOL

Salmon and steelhead have many similarities. They both complete the same life cycle of eggs to alevin to fry to parr to smolt and finally an adult in the ocean. Salmon and steelhead both identify as anadromous.

At hatcheries, both species are fertilized in trays. After fertilization, they are distrib-

uted to classrooms as eyed-eggs. Both species are kept in tanks with gravel and extremely cold water.

In conclusion, salmon and steelhead are similar due to their habitat, growth pattern, and fertilization methods.

Even though salmon and steelhead have many similarities, they also have many differences.

Our salmon eggs come from the Mokelumne River. These

eggs are blueberry-sized and are bigger than steelhead eggs. The salmon eggs need 860 DTU (daily thermal units) to hatch, unlike steelhead.

Salmon complete the same life cycle as steelhead, but salmon only spawn once. In their tank, they are kept at 52 degrees Fahrenheit. Overall salmon and steelhead are very different.

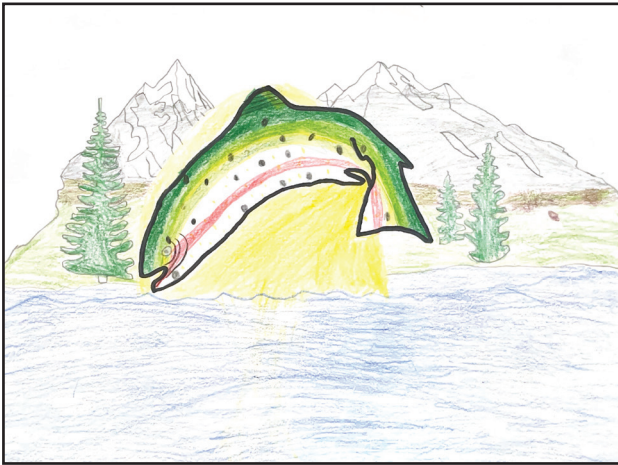
Steelhead are very different from salmon. They are kept

at a colder temperature of 48 degrees Fahrenheit. Steelhead eggs need 720 DTU to hatch, less than salmon. Unlike salmon, they are brought to us from the American River.

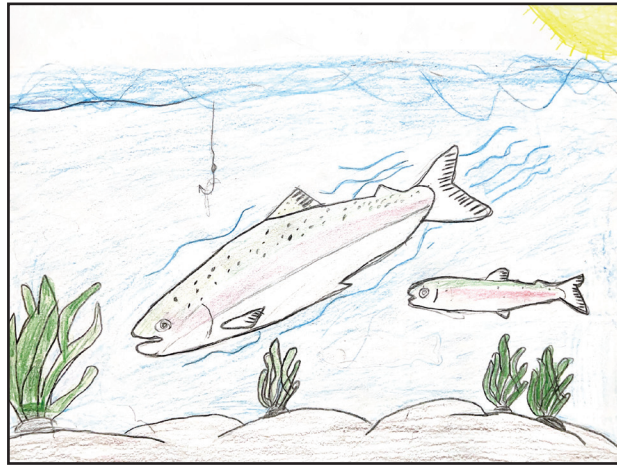
This species spawns multiple times, different from salmon as single spawners. Eggs are slightly smaller than salmon eggs due to the fact they are pea-sized. Salmon and steelhead have many differences.

SALMON IN THE CLASSROOM

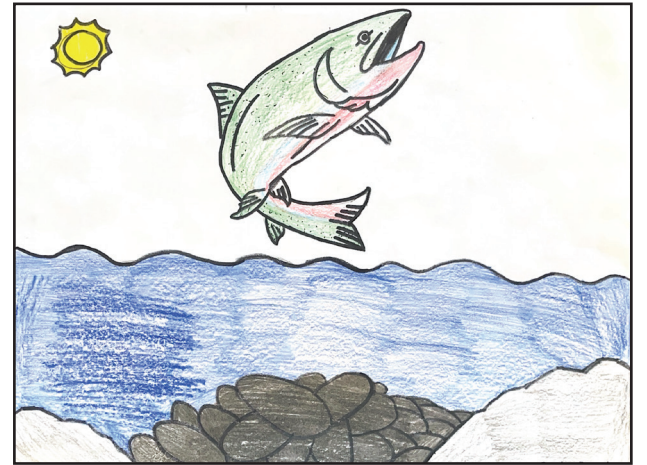
WILD ART: SALMON



CHANCE TRELOAR/LAKEWOOD ELEMENTARY



LUIS PINEDA/LAKEWOOD ELEMENTARY



ROSIE ARMSTRONG/LAKEWOOD ELEMENTARY

My experiences with raising salmon in the classroom

Averie Bedford

WOODBIDGE ELEMENTARY SCHOOL

My experience of the life cycle of salmon was a lot of fun to see the salmon go from egg to alevin to fry.

When we got the eggs, it was

fun to see the little eggs. Then the eggs were moving around. The next three days, the eggs hatched. The next day, the rest of the eggs hatched. That is my experience of the eggs in the life cycle.

This is my experience of

alevin and fry. An alevin has a yolk sac, and they eat the yolk sac. When the yolk sac is absorbed, the salmon get nutrients to develop into the next stage of the lifecycle, the fry. When the yolk sac disappears, you need to feed the fry a little

bit of fish food.

My experience of the salmon release was fun. I had to put water into my cup and then put the salmon in it. I had 2 salmon in my cup. I slowly released them into the water. I saw the salmon swimming off.

The fry is going into the parr stage next in the life cycle. It is going to camouflage itself from predators. The parr turns into a silver smolt. Finally, the salmon develops into the smolt stage and migrates into salt-water.

Raising Chinook salmon

Camryn Helton

LODI ACADEMY

Here at Lodi Academy on January 8, in our biology and ecology class, we took care of baby Chinook salmon.

For a long time I remember just seeing little red eggs that looked like boba and wondering when they were going to hatch. Gradually, the eggs started to move and you could see little tiny things moving inside of them.

Then, one day, they finally hatched. Weirdly, their egg sacs were still attached to them as they swam around. They looked as if they had full bellies from eating.

They didn't swim around a lot at first when they first hatched. A lot of them were not moving and were said to be sleeping. Then after some time they were so lively maneuvering around their rocks so much!

Then finally they lost the egg sacs and seemed to be swimming around faster than ever before! It was so fun to watch each of the phases they went through.

Of course, sadly on our journey of taking care of them, a few died. Even though losing some of them was sad, it reminded us that nature can be difficult and that not every animal survives.

Taking care of the salmon helped our classes learn responsibility and gave us a better understanding of how wildlife grows and survives in the wild.

Salmon facts

Johnathon Catron

WOODBIDGE ELEMENTARY

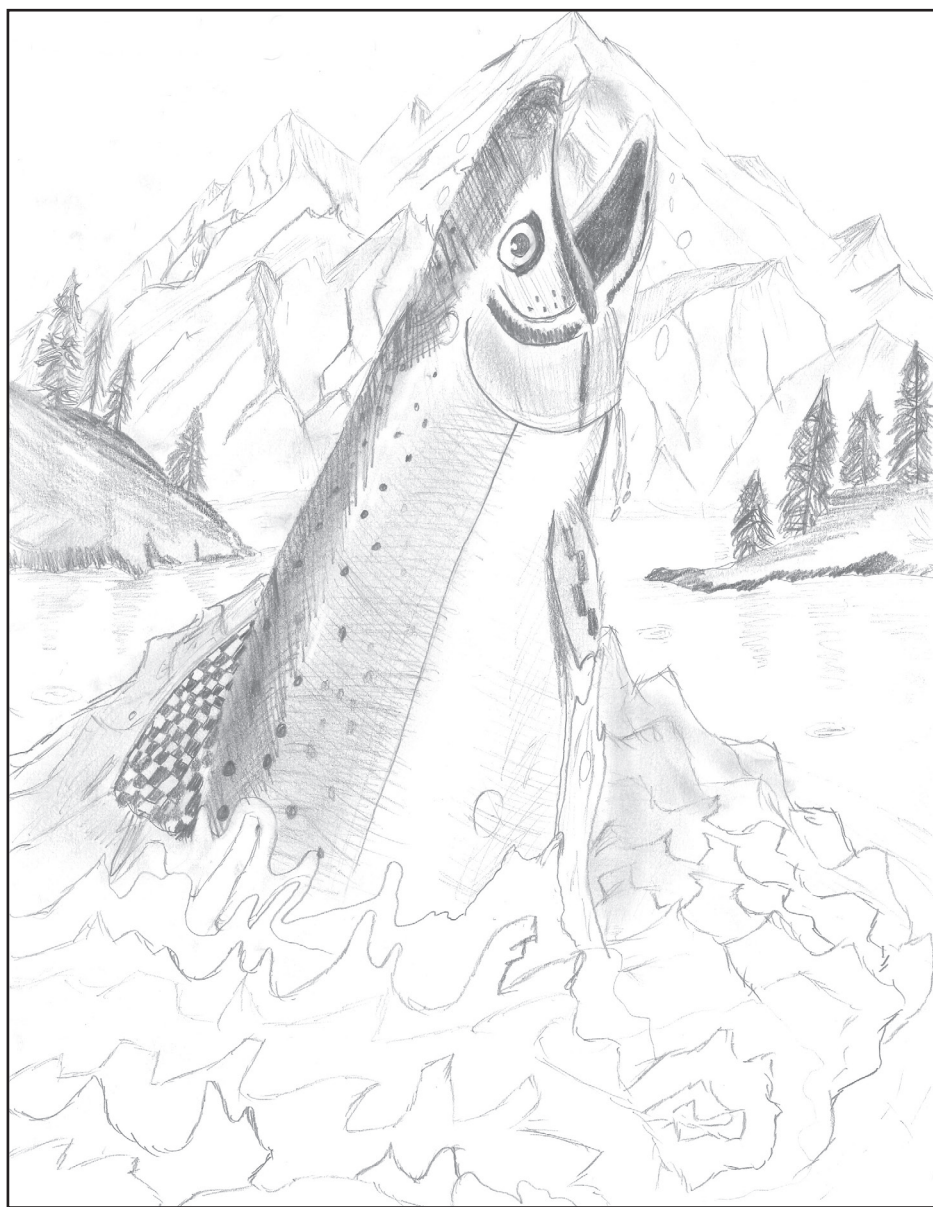
I learned about the Salmon life cycle. The first stage of the salmon life cycle is eggs, then alevin. Then fry and when they are almost parr is when we release them. The next stage is mature parr, then adult salmon. The last stage is spawning, and then they lay eggs, and they pass away.

Fun facts: Salmon are fish. A mother salmon has a lot of eggs, and then they lay the eggs, and as the eggs grow, they hatch, and alevin come out.

The alevin's belly is a yolk sac, and inside the yolk are nutrients. The nutrients help the salmon grow, and as they grow, the yolk sac is absorbed into its body. Then they are officially fry and nice and long.

Finally, they grow almost into parr, and they start swimming more, then you will have to release them.

THE CHINOOK SALMON



ABBY NARVAEZ/LODI ACADEMY

LEAPING SALMON



GENI MARTIN/LAKEWOOD ELEMENTARY

Raising salmon in the classroom at Lodi Academy

Hannah Forncrook

LODI ACADEMY

At Lodi Academy, this school year, the freshmen and sophomores, who are either in biology or ecology, got to supervise some Chinook salmon from eggs to young fry. We just recently released them on March 5 at the Mokelumne Fish Hatchery.

As a freshman, I learned a lot about these salmon (their scientific name being *Oncorhynchus tshawytscha*) and all the care we have to put into keeping them alive while they lived in our science room.

From the first day that we got these salmon, we checked on them, counted how many were alive, how many had hatched, and the temperature of their

water. We were not to feed them unless absolutely necessary, because they get their nutrients from their egg that stays attached to them for a couple weeks after hatching as they swim around.

When the salmon hatched they were this shimmery gray color and swam all around the tank pretty quickly, so it was hard to count all of them at times.

Over the weeks of watching them, we lost 6 salmon out of the 35 we had received. Having 29 out of 35 surviving so far is a pretty good ratio, considering that a female Chinook salmon lays around 5,000 eggs and only around 1% end up surviving to adulthood.

So in all I learned lots about the importance and journey these salmon take.

Releasing our salmon

Bryantt Varela

LODI ACADEMY

March 5 at Mokelumne River Fish Hatchery is the day we released our fish.

Let's start with the beginning. Getting salmon as babies is very interesting to observe because they can die at any time. We also have to keep them at a certain temperature so it is very important to take care of them.

After getting the eggs, everyone was very excited to observe them in the first stage of life.

After a couple weeks they finally hatched. They were very tiny, about as big as a pinky, maybe even smaller. It was interesting watching them swim around and after a while they were ready to get released in Mokelumne

River.

The weather was sunny but a little windy. The current was a little fast but nothing too crazy.

Observing where the class were going to release the fish, they found a nice little spot on the side of a lake. Seeing them stay close was almost like they wanted to stay with the owners but it was time for them to move on.

Now, taking a look at the other salmon they had in another section, they seemed they were in a great environment and very healthy fish. Not a single one of them seemed starved.

The place really seemed like a great place to release fish and trust them to keep them safe and redo the cycle of salmon fish.

Farewell to our fish friends

Chase Whirlow

LODI ACADEMY

Lodi Academy participated in the salmon release on March 5.

We raised the salmon in our classroom. We checked on them everyday, making sure their water was at the correct temperature.

When it was time to release the salmon it was kinda sad because we cared for them for so long. We took care of the fish like they were our babies.

But the fish hatchery was really interesting. We got to feed the fish and when you would, they would go crazy for it. Water would splash up, it was really cool.

They showed us where our fish came from and where they got

sorted out to go to different schools. They told us about how the fish get up to the hatchery, and how they get the eggs out of them.

They also talked to us about how the male salmon will not leave the female's sight or else another fish could come up and claim her as his. I thought that was very interesting.

If the salmon were not ready to take the eggs out of them they would put them in these big pipes and leave them there for a while.

They can also get mad and can break someone's nose or arm. It happened before!

We had to record data about them everyday, noting down the changes.

Salmon and steelhead trout: Similarities and differences

Aubrie Collins

OAK VIEW ELEMENTARY SCHOOL

Salmon and steelhead are actually very similar to each other.

For example, they both eat off of their yolk sacks for a couple of weeks after they hatch. They are also born in a river and then swim out to the ocean. They also both return to the river where they were born after three to four years. They return back to the same river by smelling their river.

Finally, they live the same life cycle. At first they are eggs, then hatch into alevin, turn into a fry, then a parr, then smolt, and lastly an adult.

Although salmon and steelhead have a lot of similarities, they also

have a lot of differences.

The salmon are a tiny bit bigger when they hatch. The eggs also come bigger.

Salmon have more of a red and orange color. They are also a lot more active. They swim more than steelhead. Lastly, salmon die after reproducing.

Unlike salmon, steelhead don't die after reproducing. Steelhead can reproduce multiple times. Steelhead are also a different color. They look more of a dark grayish color, while their yolk sacks are a tiny bit red.

Steelhead are not very active. They like to bury themselves under rocks. Steelhead have smaller and darker eggs.

To view past editions of the Mokelumne Current, visit www.lodi.watersavingplants.com.

STORM DRAIN DETECTIVES

Storm Drain Detectives test dissolved oxygen to protect water life

Evan Kepner
WOODBRIDGE ELEMENTARY SCHOOL

As Storm Drain Detectives, we test dissolved oxygen, or DO, in local waterways because it tells us how healthy the water is for fish, plants, and other living organisms. Dissolved oxygen is the amount of oxygen that is mixed into the water, and it is just as important for aquatic animals as air is for humans.

Fish, crabs, and other aquatic animals need oxygen to breathe. When dissolved oxygen levels are too low, these organisms can become stressed or even die. Many factors can cause dissolved oxygen levels to drop, including warmer water temperatures, decaying plants and algae, pollution, and weather changes. Sudden drops in dissolved oxygen can lead to fish

kills, which is when large numbers of fish die at once. By testing DO regularly, Storm Drain Detectives can detect problems early and help prevent these harmful events.

Dissolved oxygen levels also help scientists understand overall water quality. Low DO can be a sign that water is polluted or contains too much organic waste, such as decaying plants

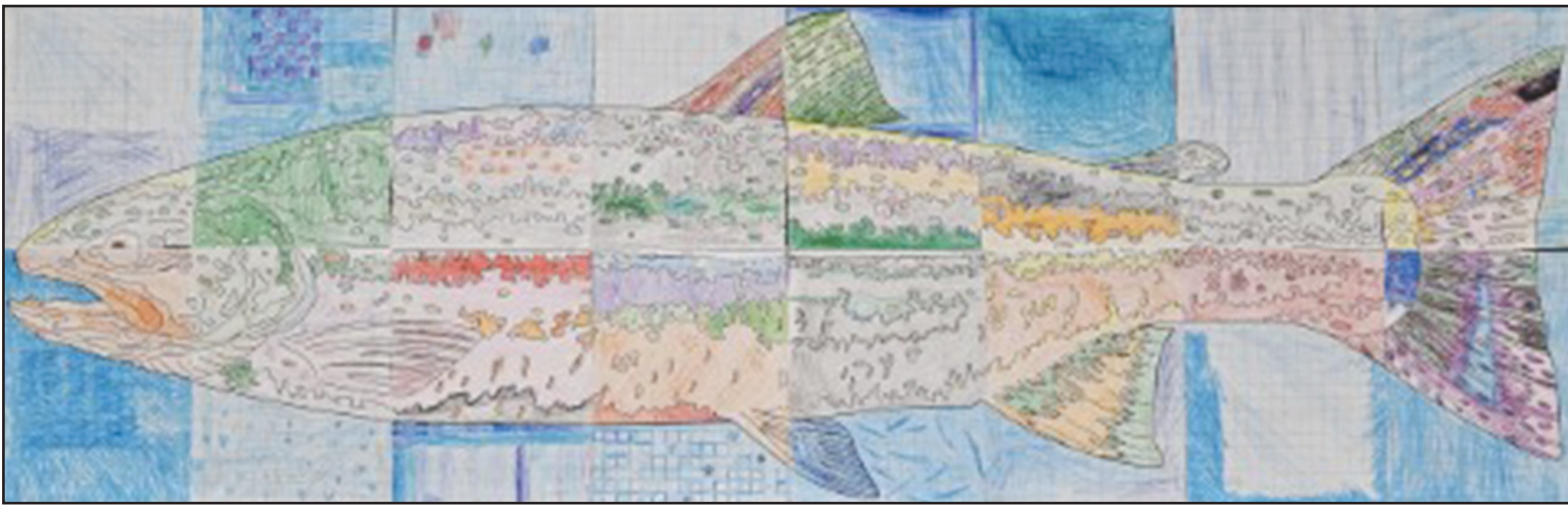
or algae. Clean and healthy water usually has higher levels of dissolved oxygen, which supports a balanced ecosystem and healthy wildlife.

In addition, testing dissolved oxygen helps monitor environmental changes over time. Scientists track DO levels to see how rivers, lakes, and bays are affected by pollution, temperature changes, and human

activities. These measurements help communities understand how their actions impact the environment.

Overall, dissolved oxygen is like air for animals living in water. By testing it, Storm Drain Detectives help make sure our waterways remain safe, clean, and healthy for fish, crabs, and other aquatic creatures.

A PUZZLING LOOK AT A FISH



LOIS E. BORCHARDT ELEMENTARY SCHOOL

Second-grade students at Borchardt Elementary School created this unique fish mural. Each student who participated colored one panel of the fish, and then they pieced the final artwork together like a puzzle.

Why pH levels matter

Ellayna Martinez
WOODBRIDGE ELEMENTARY SCHOOL

As Storm Drain Detectives, we test the pH levels of the Mokelumne River to learn how healthy the water is for the plants and animals that live there. The pH level tells how acidic or basic the water is. Most fish, insects, and other aquatic creatures can only survive in a small pH range, usually between 6.5 and 8.5. When the water stays within this range, the ecosystem can remain balanced and healthy.

If the water becomes too acidic or too basic, it can stress, harm, or even kill aquatic life. Changes in pH can damage fish gills, affect reproduction, and reduce the number of organisms that can survive in the water. Sudden changes in pH can also signal that pollution, chemicals, or stormwater runoff are entering the river from nearby streets, farms, or neighborhoods.

pH levels also affect how nutrients move through the water. When pH is not balanced, it can increase harmful algae growth or prevent plants from getting the nutrients they need. This can upset the food web and cause long-term damage to the ecosystem. By testing pH, Storm Drain Detectives can quickly check whether the water conditions are safe for living things.

Monitoring pH over time helps scientists and our community catch problems early, before they become more serious. Our work helps protect local waterways and teaches students how important it is to take care of the environment. By collecting data and sharing what we learn, Storm Drain Detectives help keep our rivers clean, safe, and healthy for everyone.

Storm Drain Detectives monitor river water for bacteria

Stella Bishop
WOODBRIDGE ELEMENTARY SCHOOL

Testing river water for bacteria is very important.

Each month, the Storm Drain Detectives, a group of local students, monitor the river water at different locations around Lodi Lake near storm drain outlets. Storm drain outlets are places where rainwater from streets, parking lots, and neighborhoods flows directly into creeks and rivers without being cleaned or filtered.

By collecting water samples near these outlets, students can test whether pollution or bacteria are entering the river.

When collecting the water samples, they use clean containers. They must be very careful to not touch the water or the inside of these containers as to not contaminate the water sample that is collected. Storm Drain Detectives are trained on how to collect the water samples properly and how to use the tools to monitor the water.

Once back at school, students "plate the bacteria," which

is where they test the water sample they collected for the presence of bacteria. Using two separate petri dishes, students mix a specific amount from the water sample with a fluid called coliscan which is a liquid used to detect bacteria, especially E. coli.

Once the water sample is mixed with the coliscan, it must sit in the petri dishes for 45 minutes. In that time period, the liquid turns into a jelly-like substance.

Once it has set up, it is time to place the petri dishes in the incubator to see if any harmful bacteria grows. The warm temperature of the incubator helps bacteria grow more rapidly if they are present.

After the incubation period, students check the petri dishes for colonies, which look like tiny dots or spots. More colonies means more bacteria is in the water. Less or no colonies means there is no bacteria and the water is cleaner. Once the bacteria counts are done, students record their counts on their data collection sheet.

The Storm Drain Detectives can then compare petri dish data from different locations. They use the amount of bacterial growth to decide if the water is clean, questionable, or polluted.

These results help identify places where bacteria or pollution may be entering the rivers. It is normal to see a spike in the bacteria right after a period of heavy rainfall due to the runoff from people's yards, which often contain fertilizers and other pollutants that are harmful to our waterways.

The purpose of all of this monitoring is to protect our rivers and keep our communities healthy. By testing river water for the presence of bacteria, Storm Drain Detectives can find out how clean or polluted the water is.

When bacteria grows on the plates, it can be a sign that pollution like waste, dirt runoff, leaks, or other pollutants have been entering the river through storm drains.

This work helps students understand and identify problem

areas where pollution may be getting into the water. It also helps students understand how storm drains connect to rivers, not treatment plants.

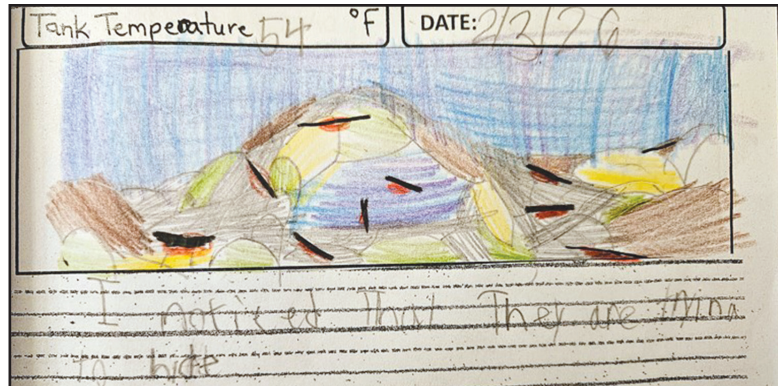
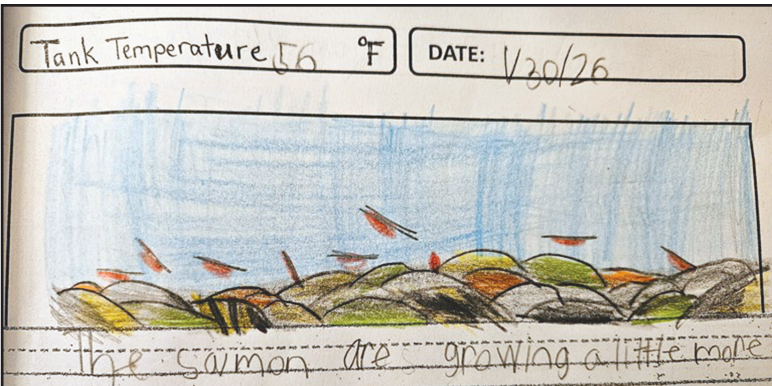
Like real scientists, Storm Drain Detectives get to use science monitoring tools and equipment, and collect data to make conclusions. It can help them to learn how human actions impact our waterways.

Most importantly, the information collected can be shared with the community and city leaders, so they can fix problems and help protect wildlife, drinking water, and people who use the river.

This Storm Drain Detectives program is a really fun way to experience science and help the community. Several elementary, middle, and high schools in Lodi participate in this program.

I would strongly encourage you to join your local club if you are interested in science and want to gain some hands-on learning experience that helps make a difference in our community.

JOURNALING A FISHY ASSIGNMENT



ALMA JAQUEZ/LOIS E. BORCHARDT ELEMENTARY SCHOOL

Cleaning Mokelumne River water at the Lodi Water Treatment Facility

Sophia Duxtader
VISTA OAKS CHARTER SCHOOL

We went on a field trip with our mom to the Lodi Treatment Facility. It was really fun! Our guide, Brian (he works as an operator at the facility) first showed us to the sediment basin.

Water from the Mokelumne River is pumped to the basin, but first it's sprayed with a chemical. This chemical makes all the bits of dirt in the water clump together,

making those bits heavier. Since they're heavier, they sink to the bottom, separated from the water.

After the sediment basin, the water is pumped into smaller tubes with things kind of like colanders (they call them strainers) in them to separate the bigger things, such as leaves, bark or sticks, from the water.

Next, the water is pumped to the heart of the facility. Here it goes into pipes that are probably about 6-8 inches in diameter.

Inside these pipes, there's lots of little tubes (or membranes) that are hollow. When the water comes into the pipes, it's outside of the membranes, but the pressure pushes the water into the membranes, leaving the tiny bits of dirt outside of the membranes. The water then goes out the top of the pipe.

By the way, there's about 3000 membranes in one pipe, 100 pipes per rack, and five racks total. That's 1,500,000 membranes in all!

After that, the water goes into a huge tank, where it's mixed with chlorine. There's a lot of walls inside the tank that the water has to go around, and it takes 4 hours! They make it take a long time so that it's in contact with the chlorine for a long time.

After the big tank, it goes to a central distribution center, from where it's distributed to all the houses, buildings, and farms in Lodi. I learned a lot!

O'Ryan

Continued from Page 2

Looking back, is there something you learned in the program that you didn't fully appreciate at the time but value now?

When I first joined the Storm Drain Detectives Program as a student, I participated because it was a requirement for my biology class. In the beginning, I didn't fully see the long-term value of the experience.

However, I'm incredibly grateful that I continued working with the program as a student and then a volunteer over the next 10 years and took every opportunity I was given to develop my academic interests in water quality.

One of the most important lessons I gained was understanding the strong connection between a community and the watershed it depends on, which is something I now deeply value in both my academic and professional career.

GYOTAKU PRINTS OF TROUT



LUNA COPRIVIZIA/LAKEWOOD ELEMENTARY SCHOOL



JACKSON LARSON/LAKEWOOD ELEMENTARY SCHOOL

LIFE IN THE WATERSHED

Lodi High student enjoys summer internship with EBMUD

Victor Meza-Reyes
LODI HIGH SCHOOL

Last summer I had the pleasure of working with the East Bay Municipal Utility District in their fisheries through their Upcounty High School Summer Internship program.

The program consisted of three weeks of hands-on work in which interns got to shadow staff and perform duties such

as checking and cleaning rotary screw traps, and cleaning the pipe and screen trap along the Woodbridge Irrigation District. Duties of the intern also included assisting in the measuring and counting of the species caught in the rotary screw traps.

The Mokelumne is home to many interesting species, which I had the chance to handle and observe,

such as the prickly sculpin, the Sacramento sucker, Sacramento pikeminnow, catfish, sunfish and a variety of bass species. The most interesting of the observable bunch were the smolt stage of the Chinook salmon and the Pacific lamprey.

The Pacific lamprey is a parasite which latches on to the sides of other species, feeding off them until they are full.

During my time of measuring and counting fish on these traps, the Pacific lamprey was definitely the creepiest species I encountered.

Ultimately, the Upcounty HSSI program was an opportunity to get to experience the world of the species along the Mokelumne River. It served as an important reminder of the species which also relied on the Mokelumne River.



ELI WISNER/HERITAGE ELEMENTARY SCHOOL

Sandhill Crane

Eli Wisner
HERITAGE ELEMENTARY SCHOOL

Tall with gangly legs,
Elegant cranes dance in motion,
Fly high with broad wings.



LILY ROBISON/HERITAGE ELEMENTARY SCHOOL

Sandhill Crane

Lily Robison
HERITAGE ELEMENTARY SCHOOL

Long, stretching neck crane
Tall, gray, long-lived — marsh beak flies
Wings flop loud to pond



FABIAN AGUILAR/HERITAGE ELEMENTARY SCHOOL

Sandhill Crane

Fabian Aguilar
HERITAGE ELEMENTARY SCHOOL

Dancing cranes eat berries,
Long legs and necks walking fast,
Living wisely, happy.



ALYSSA LEAR/HERITAGE ELEMENTARY SCHOOL

Sandhill Crane

Alyssa Lear
HERITAGE ELEMENTARY SCHOOL

The wise sandhill crane
Long legs that walk to the pond
Wings open to fly

A class field trip to the Mokelumne Fish Hatchery

Elia Boyes
WOODBRIDGE ELEMENTARY SCHOOL

When we first got to the Mokelumne River Hatchery, we were greeted by some of the staff. They were very welcoming and polite.

The body of water was so beautiful! I am so thankful for the tables because if there weren't any tables, we would have to eat on the ground.

The fish ladder is one of my favorite parts of the Mokelumne Fish Hatchery. The fish hatchery is such a great place to go on a field trip. I really recommend that you go. All of the people are so polite and sweet.

For the fish to survive in their habitat, like the river, it must be at a certain temperature; it can't be too cold or too hot. Salmon typically live for 2 to 7 years with an average lifespan of 4 to 5 years, depending on the species and environment. The salmon can die shortly after they spawn.

Go reusable: 10 reasons why you should switch away from disposable water bottles

Aedan Doxtader
VISTA OAKS CHARTER

- 1. It's environmentally friendly:** Over 10,000 water bottles are littered and thrown away every time your heart beats. Using reusable water bottles would negate this massive waste.
- 2. It's cheap:** Tap water is over one hundred times cheaper than bottled water, and it's free if you fill up your water bottle in your office or school.
- 3. It pays off:** A typical \$30 disposable water bottle pays itself off in one month, and saves over \$1000 in three years, a hefty sum.
- 4. It's good for your**

health: Microplastics and phthalates seep water contained in plastic water bottles, creating a serious risk of cancer and hormone disruption.

5. It's water conservative: Manufacturing disposable water bottles typically require three times the amount of water needed to fill them, wasting valuable water.

6. It's stylish: Reusable water bottles come in all sorts of colors and designs and are well suited for travel decals.

7. It tastes the same: In countless reliable blind-tasting studies, subjects could not tell the difference between tap water and bottled water,

even though they nearly all thought that they liked bottled water better beforehand.

8. It stays cold: Nearly all reusable water bottles are insulated and remain ice-cold for an entire workday, for a fresh taste.

9. It's convenient: Typical reusable water bottles hold 2x the amount of water in a disposable water bottle, halving the number of refills and/or buys each day.

10. It's clean: Filtered tap water, which is regulated by the EPA, follows higher quality standards than bottled water, regulated by the FDA, which has much more lenient policies.

The graceful river

Aiyana Aguda
JOHN MUIR ELEMENTARY SCHOOL

While the river shines
It flows very gracefully
It's shallow, but cold

Safe Salmon

Veon Valerio
JOHN MUIR ELEMENTARY SCHOOL

Salmon
Always changing,
In a flowing River
To an ocean of fearful
depth,
Be safe.

Waiting to Hatch

Rashleen Shergill
JOHN MUIR ELEMENTARY SCHOOL

Salmon eggs will lay,
Sitting and waiting to
hatch.
Orange shell glistens.

River

Kaylee Robbins
JOHN MUIR ELEMENTARY SCHOOL

River,
Water running
Salmon swimming to
the
Ocean, brackish waters
on
fish scales

Salmon

Aubrey Romero
JOHN MUIR ELEMENTARY SCHOOL

Salmon,
in the river
starting to rot and mate
kicking gravel to spawn
more eggs
so red

Sunny Day

Jules Perry
JOHN MUIR ELEMENTARY SCHOOL

Sun Shines
Bright light not night
Clouds white breeze
through the air
Beautiful blinding re-
freshing
Best Day

Salmon Strength

Lucas Murti
JOHN MUIR ELEMENTARY SCHOOL

Salmon
Red and Strong
Swimming, flipping,
splashing
They swim upstream to
their home
Fish

Rivers

Ethan Murti
JOHN MUIR ELEMENTARY SCHOOL

River
Waterdrops fly
Shimmers in the sun-
shine
Gleams through the
giant water stream
Shimmer

Keystone Species

Evelyn Kim
JOHN MUIR ELEMENTARY SCHOOL

Keystone
Species stand out
As they help animals,
Plants, and Mother
Nature to balance
Things out

The ocean

Jasmine Garcia Alvarado
JOHN MUIR ELEMENTARY SCHOOL

Ocean
Blue, bright, and cold,
With a glowing, shiny
coat, plants and rocks
around as it
flows by.

Ecosystem

Anna Seraypheap
JOHN MUIR ELEMENTARY SCHOOL

Blue depths stretch,
Ocean Salmon, River
eggs,
Fish swim in the cool

Life Cycle

Zereenah Ashiru
JOHN MUIR ELEMENTARY SCHOOL

A fish sees eggs fall
Then swims freely in
the sea
Swims back to its home

Forked River

Colleen Bunag
JOHN MUIR ELEMENTARY SCHOOL

A two forked river
One fork shimmered
with roe
The other with fry