

A Shared Space: Biodiversity and the Tijuana River Watershed

by the 7th grade students of High Tech Middle
Chula Vista Klein-McAfee-Frederick Team, 2012-
2013

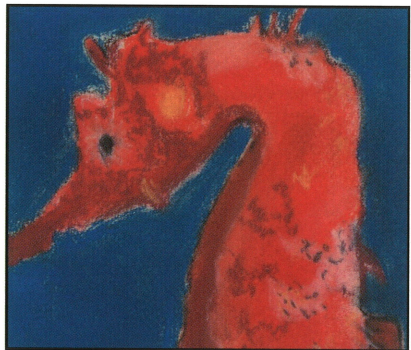


Table of Contents

Introduction	3
Acknowledgements	4
The Process	5
The Tijuana River Watershed	10
Amphibians	13
Birds	25
Fish	47
Invertebrates	63
Mammals	83
Plants	101
Reptiles	117
Being Part of the Solution	135
Glossary	136
Bibliography	139

Introduction

High Tech Middle Chula Vista sits on a parcel of land surrounded by currently undeveloped public and city land. Every day I look out of my classroom window I am struck by the beauty of the sun rising across the expanse of rolling hills with Otay Mountain to the east and Tijuana in the distance to the south. The chaparral environment that surrounds our school is an endless classroom. My students savor the moments when they glance out the window in time to see a coyote trot through the field or a Northern Harrier glide over the shrubs.

My inspiration for this project began as a want to document and discover the diversity of living organisms we see daily around our school. I have always felt so very lucky to have a classroom that overlooks such a rich ecosystem and I wanted to use our location in this chaparral environment to hoping to educate and inspire my students to become stewards of their land. As it turns out I was not alone in this hope. Meredith Frederick, our art teacher, and I shared a similar vision for an interdisciplinary art and science project in which students would discover native species through research and create beautiful chalk pastel depictions of each one. Additionally, during this time my teaching partner, Michael Klein, and I were beginning a new semester with the hopes of creating an interdisciplinary project that focused on the U.S.-Mexico border region.

As I began gathering more inspiration for the project I learned about WILD COAST organization's involvement in helping to restore the Tijuana River Watershed. I was soon put in touch with Paloma Aguirre, WILD COAST's Coastal Conservation Program Manager, who agreed to help collaborate with us on our project to educate our students about the Tijuana River watershed, our shared space.

This book is a result of months of inspiration, research and discovery of the Tijuana River Watershed through the scope of art, and life science and is meant to raise awareness about our watersheds and the organisms that are connected by them. We hope that you enjoy our book and find inspiration through it to help preserve the fragile ecosystems and organisms that rely on them, especially our shared space, the Tijuana River Watershed.

Ann McAfee, math and life science teacher

#1. Learning about watersheds

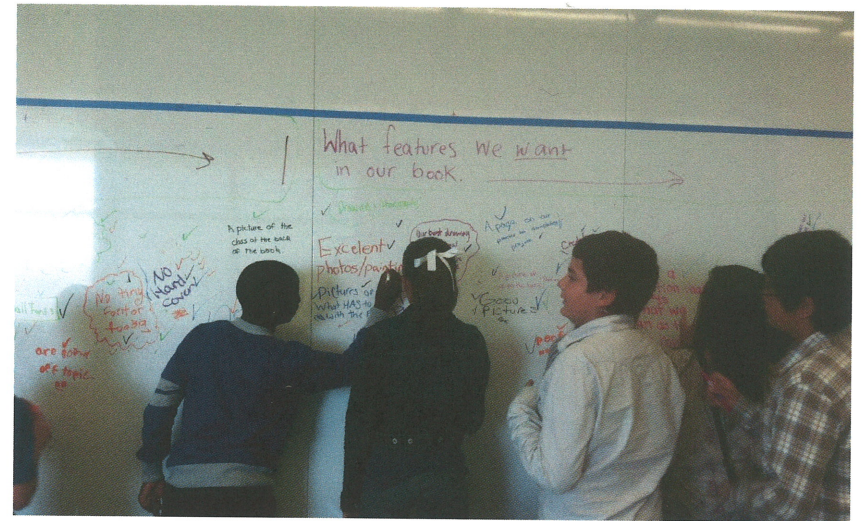


Kicking off our project by learning about the Tijuana River Watershed from Paloma Aguirre from WILD COAST organization.

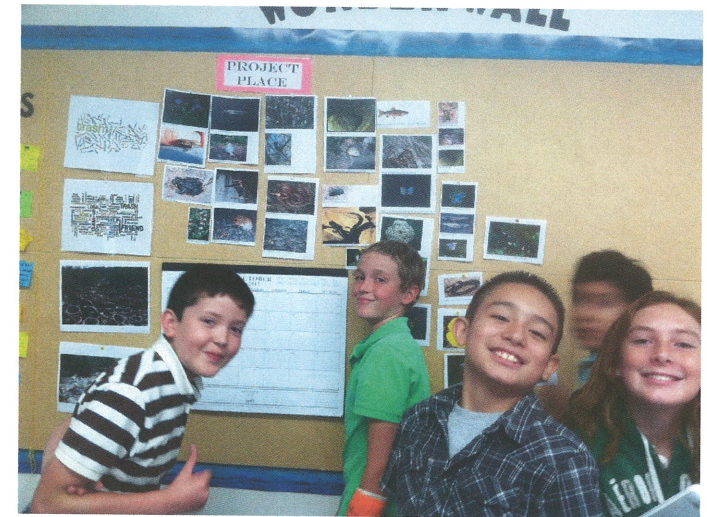


At the Living Coast Discovery Center learning about biodiversity and watersheds.

#2. Brainstorming and researching for our book

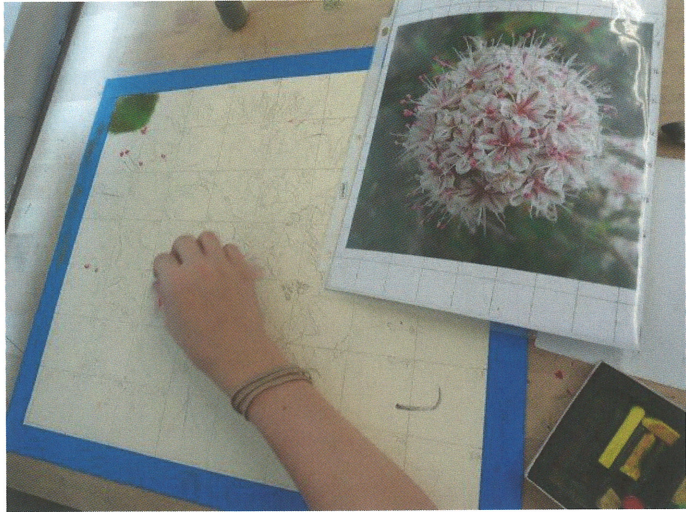


Having a chalk talk about the important features of our book.



Doing some initial research on native California plants and animals in preparation for our species descriptions and depictions.

#3. Creating species depictions



Scaling and sketching.



Students hard at work.



How does it look?



Almost finished!

The Tijuana River Watershed

The Problem

The Tijuana River is an important ecological resource for the San Diego-Tijuana border region. The binational watershed is 1,739 square-miles in area with 1/4 in the U.S. and 3/4 in Mexico. Pollution in the Tijuana River is a multidimensional problem that impacts public health, the environment, and the economy of San Diego-Tijuana border communities. During rain events, trash and wastewater "runoff" in Tijuana enter the river basin and flow through San Diego and ultimately pollute the Pacific Ocean. Depending on ocean current direction, the pollution impacts beach water quality from Playas de Tijuana, Mexico, all the way north to Coronado Island, in the U.S. Much of this pollution results from a lack of proper sewage collection/treatment and trash collection infrastructure in Tijuana. Trade agreements like NAFTA attract international companies and throngs of workers to Tijuana with the promise of cheap labor and easy access to the U.S. consumer market. Much of the city's growing population lives in unplanned urban developments that lack sewage hookups. As Tijuana has expanded, so have binational environmental problems, like pollution in the Tijuana River, that affect communities on both sides of the international border. Only through a cooperative binational approach by local, state and federal governmental and non-governmental stakeholders can the impacts posed by Tijuana River pollution be comprehensively addressed.

Problem:

Pollution from the Tijuana River impacts public health, the environment, and the economy along the San Diego-Tijuana border.

Public Health Impacts:

Sewage and trash in the Tijuana River poses a significant health threat to border area residents.

WILDCOAST
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The Tijuana River Watershed is a shared space between Mexico and the United States. This space is heavily impacted by the people who live in and around these areas. To learn more about our watershed and the public health issues and environmental threats that result from damage to and neglect of our watershed, we partnered with Paloma Aguirre from WILDCOAST organization.

Here is some information about the problems at the watershed.

In southern San Diego County, the Tijuana River Valley Regional Park and the Tijuana Estuary offer residents and visitors beautiful hiking, equestrian, and bird watching trails. Yet, trash and sewage from the Tijuana River have so heavily degraded parts of these public parks that they have become too polluted for outdoor recreational use by community members.

Pollution from the Tijuana River also heavily impacts beach water quality from Playas de Tijuana to San Diego County beaches, depending on ocean currents. A WILDCOAST survey found that 3 in 5 regular ocean users in Imperial Beach, CA reported illness related to physical exposure to contaminated ocean waters (WILDCOAST 2007 survey). A study by San Diego State University showed that coastal waters impacted by Tijuana River pollution almost always harbored harmful viruses, in addition to the bacteria that are usually measured to detect impacts on public health. Both hepatitis A virus (HAV) and a variety of enteroviruses that can cause human diseases were found in significant quantities.

The threat of contamination of near shore coastal waters by toxic industrial chemicals from the Tijuana River is particularly acute. Among the eight largest creeks and river in Southern California, the Tijuana River has been found to contain the highest concentration of toxic metals, and the toxic organic compound PCB, and is the single greatest lead loading to the coastal ocean of the Southern California region.

This pollution also poses health problems for those who work in close proximity to the Tijuana River. In 2005, U.S. border patrol agents won a class action lawsuit to receive hazardous work pay for working near the Tijuana River.

Environmental Threats:

Pollution in the Tijuana River affects the sensitive coastal ecosystems and wildlife of the border region, including the 2,500 acre federally protected Tijuana River National Estuarine Research Reserve. This estuary is the endpoint of the Tijuana River Watershed and consists of the Tijuana Slough National Wildlife Refuge, Border Field State Park, Navy lands, Tijuana River Valley Regional Park, and San Diego city property. In addition to its habitat value, the Tijuana Estuary filters water flowing from the Tijuana River into the Pacific Ocean.

In the Tijuana Estuary, pollution causes habitat destruction, affects water quality, and damages sensitive ecosystems. Since 2006, sediment carried by the storm-water has been responsible for the destruction of more than 20 acres of salt marsh. Since 2008 California State Parks, with the support of community-led cleanup efforts, has removed over 8,000 waste-tires from Border Field State Park. A recent study estimates that over 10 million plastic

bottles and over 5000 waste tires are currently clogging this sensitive ecosystem. Much of this solid waste can be lethal to wildlife, as many animals accidentally ingest trash, mistaking it for food. The accumulation of marine debris, the majority of which is plastic, has the potential to negatively impact marine organisms worldwide. A research analysis found that a third of bottom feeding species of fish had ingested plastics. These bottom feeders are a vital source for larger marine life.

Economic Impacts:

According to San Diego County's Department of Environmental Health, every year 80-95% of San Diego County's total beach closures are due to pollution emanating from the Tijuana River. Besides presenting an obvious public health and environmental threat, it has been shown that the degradation of beach water quality has negative economic implications for local communities in Southern California that rely on income from beach tourism. Frequent beach closures also negatively affect the local real estate market. In turn, cities that rely on revenues from property tax to fund public works projects are impacted.

Amphibians

Amphibians have lived on the Earth for many years, they have been alive since dinosaurs were. In this chapter we have listed some amphibians that occur in California and some that are even endangered, but if you don't know what a amphibian is here are a few pointers. Amphibians are cold blooded, similar to reptiles. Amphibians have to live in moist lands. The main reason that amphibians live in moist places is because they breathe through their entire skin and without moist lands it would be hard for amphibians to breathe.

-The Amphibian Group

Arroyo Toad,
Bufo californicus

Description and Behavior

The Arroyo Toad is a medium size toad with relatively short limbs, it is stocky and blunt-nosed with small, dark warts. The skin varies from light to tan to light olive with darker blotching. The underside is uniform, lighter color than dorsal surface. All Arroyo Toads possess a distinctive light colored "v" - shaped stripe spanning the eyes. The Arroyo Toad is mostly active in the night, and in the morning they are mostly resting in burrows in the ground. The Arroyo Toad is not aggressive but it will defend their territory if they need to.

Habitat and Geographic Range

This toad prefers riparian habitats with sandy streambeds with cottonwood, sycamore, and willow trees. Some populations occur in streams within coniferous forests. The stream setting usually has adjacent shallow pools where the toad may sit in the water while partially exposed above. The Arroyo Toad inhabits coastal southern California from Salinas River Basin in Monterey and San Luis Obispo to Arroyo San Simon in northern Baja California, Mexico.

Feeding and Predation

Its diet includes snails, crickets, beetles, ants, and plant tissue. The Arroyo Toad tadpoles are eaten by water bugs, garter snakes, bullfrogs, and a number of fish species. Toadlets and adults are attacked by killdeer, herons, garter snakes, and bullfrogs. It is also reasonable to conclude that turtles, raccoons, opossums, and ravens would prey upon them.

Reproduction and Development

Breeding is independent of rainfall. In California, the Arroyo Toad breeds from March to early June. Female Arroyo Toads deposit eggs at the male's calling site. Metamorphosis occurs June-July.

Conservation

Federally listed as an endangered species, Arroyo Toad is protected by the U.S. Fish and Wildlife Service and California Department of Fish and game. The Arroyo Toad was declared an endangered species on December 16, 1994. The main reason why the toad is endangered is because the toad's habitat is being destroyed.



**California Tree Frog,
*Pseudacris cadaverina***

Description and Behavior

The California Tree Frog is a very small frog, about 1 to 2 inches in length and have expanded toe pads. Also, their skin is quite bumpy. These frogs are very light brown and gray with dark, oddly shaped markings on their back, because of these markings they are hard to spot on granitic rock. You can tell the difference between males and females because males have a balloon-like throat. Males often have matches for wrestling and butting with other opponents so they have an encounter call to engage those opponents.

Habitat and Geographic Range

The California Tree Frog is mostly found near desert streams, quiet pools, and washes where there are rocks and shade, but very often this species lives far away from water outside the breeding season in habitats such as the forest, woodland, chaparral, grassland, pastures, oases, and urban areas. Geographically, it is found in the pacific and western regions of North America, most of southern California and Nevada.

Feeding and Predation

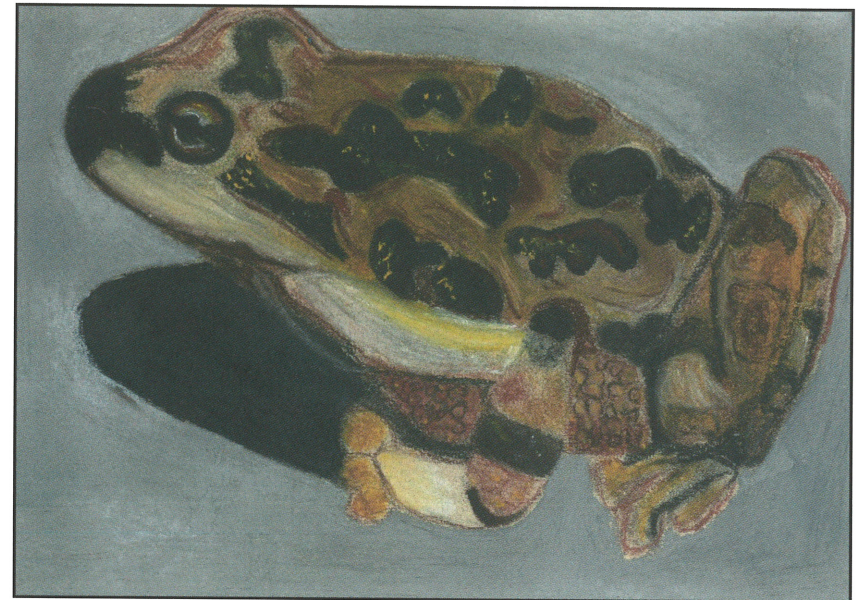
California Tree Frogs eat a variety of food, for example, invertebrates. They mostly eat on the ground at night. The invertebrates that they eat include a lot of flying insects such as baby crickets, flightless flies, or even live bloodworms or sometimes goldfish. California Tree Frogs sometimes eat mice and guppies. Some of its predators are snakes, raccoons, herons, egrets, and other reptiles and mammals.

Reproduction & Development

Breeding for California Tree Frogs is aquatic. The female California Tree Frog will lay an average between 400-700 eggs in different clusters that are about 10-80 eggs each. Males are very protective and during breeding season will take care of their territory by defending their families over anything that tries to hurt them using some kind of butting or wrestling. On average, it takes about 2 or 2½ months for reaching metamorphosis after hatching.

Conservation

The California Tree Frog is widely noticed but is considered to be a species of least concern because of its wide distribution and large population.



**Pacific Tree Frog,
*Pseudacris regilla***

Description and Behavior

Pacific Tree Frogs are small and slender frogs with large toe pads. Their smooth skin differs in color from light-brown to bright-green. They can also change color depending on their surroundings to avoid being eaten. Normally a line of broken spots stretches down the abdominal surface to the groin. The legs, arms, and feet are darker than the rest of the body. Males vary in color from females. Their upper body can be a dark gray olive color and can have a brown band stretching through the eye and yellow across the upper lip. An adult body size in the Pacific Tree Frogs goes from 2.5 to 4.8 cm. Mature females tend to be larger than males, which is uncommon for anurans.

Habitat and Geographic Range

The Pacific Tree Frog is found along the far northwest coast of California, from Humboldt County, north through most of Oregon, into Washington, northern Idaho and Montana, and north into British Columbia, Canada. This species lives in a wide variety of habitats, often from water outside of the breeding season, including forest, woodland, chaparral, grassland, pastures, desert streams and oases, to urban areas and has been recorded from elevations of sea level to high into the mountains.

Feeding and Predation

Many species prey on the Pacific Tree Frog such as snakes, mammals, bullfrogs, and birds. Other frogs and fish eat the tadpoles. The Pacific Tree Frog preys upon many insects and a wide variety of invertebrates. They eat a high percentage of flying insects, so they have really sticky tongues to catch their prey.

Reproduction and Development

Mating occurs under water. Breeding and egg-laying happens between November and July, depending on the location. Adults probably become reproductively mature in their first year. Males move to breeding water and begin to make their mating call. At first, these calls attract more males, then eventually the females will arrive. The callings begin in or near water at night, and during daylight at the peak of breeding, when calling can occur all day and night. When an egg is laid, the parents, both female and male, abandon the eggs. An egg will hatch in about 3.5 weeks. Body mass of newly hatched tadpoles is usually 0.24 cm. After about a month, their weight increases to between 0.35 and 0.45 grams, which is more typical of an adult Pacific Tree Frog.

Conservation

This species is of least concern (LC) because of its tolerance of a wide range of habitats and presumed large population.



Being Part of the Solution

Pollution is getting worse and worse every day affecting our watershed and the wildlife that lives in it. Though it keeps getting worse, we can help by doing different little things. Simply cleaning up after ourselves when we eat lunch outside helps out a lot and can affect the amount of trash that goes into the Tijuana river valley watershed eventually flowing out into the ocean. We can volunteer at different events such as beach clean ups. We can sign different petitions stating that we want to be able to restore and protect different places in our environment. We can also prevent the pollution by proactively checking our vehicles for leaks, upcycling and recycling more often by not purchasing the latest new things.

Educating the city officials on both sides of the border about our shared watershed and the pollution overtaking the beauty it once had can raise awareness to more people and help us to come together to help clean it up. Promote cleanup programs in urban canyons and be involved in different conservation organizations. We can educate all citizens of the U.S.A. and Tijuana about our polluted watershed. Knowing about it will have an impact because, people who are not aware of this problem can't do anything about it. We can take small steps to fix this big problem and we are taking the first one by making this field guide and sharing our knowledge about this with everyone and now you are aware too!

Through WILD COAST Organization we can become active with our watershed, our shared space, to make a difference:

- Sign petitions
- Volunteering at different events: beach clean ups
- Donate
- Intern at WILD COAST
- Become a sponsor

Glossary

Abdomen: The part of the body of a vertebrate containing the digestive organs; the belly.

Albino: An animal or plant with a marked deficiency in pigmentation.

Algae: Primitive chlorophyll-containing, mainly aquatic, eukaryotic organisms lacking true stems, roots, and leaves.

Anurans: Any amphibian of the order Anura.

Avian influenza: Avian influenza is a virus in birds. The infection in the birds can change and start to affect humans. It is also known as H5N1 and can cause an enormous threat.

Barracuda: A large ray finned fish with sharp edged fang like teeth.

Bivalves: An organism such as a cockle or mussel that has two shells that hinge together and a soft body inside.

Breeds: To produce (offspring); give birth to or hatch.

Brooded: To protect, warm or cover the young of a bird.

Brood: The number of young hatched at one time.

Buoyancy: The ability or tendency to float in water or other fluids or the power of a liquid to keep something afloat.

Carapace: Hard outer covering or case of certain organisms such as arthropods and turtles.

Caudal Fin: A caudal fin is a fish tail or other marine invertebrates tails.

Cephalothorax: The Cephalothorax is the head and chest of an arachnid or crustacean.

Chaparral: Chaparral is a dense growth of shrubs or small trees.

Coronet: A Coronet is a small crest like figure on the head. On a Seahorse, a coronet is also a crest like figure on the head but it is part of their bodies.

Diapause: a period of suspended development in an insect, other invertebrate, or mammal, esp. during unfavorable environmental conditions.

Diatoms: Microscopic unicellular marine or freshwater colonial alga having

cell walls impregnated with silica.

Dorsal: Relating to or on the back or upper surface of an animal.

Ecogeography: Ecogeography is the study of environmental effects on the distribution of living things.

Elliptical Pupils: Means that the eye is longer and thinner compared to a round eye.

Fertilized: Creation by the physical union of male and female gametes; of sperm and ova in an animal or pollen and ovule in a plant.

Gestation: The carrying of young in the uterus: pregnancy.

Glandular hairs: Glandular hairs are hairs on a plant that can help create a plant's smell

Incisors: Sharp teeth in the front of the mouth.

Larvae: An animal in an early stage of development that differs greatly in appearance from its adult stage. Larvae are adapted to a different environments and way of life from those of adults and go through a process of metamorphosis in changing to adults. Tadpoles are the larvae of frogs and toads.

Leptocephalus: Flat and transparent larva of the eel.

Marsh: Marsh areas are areas with water and very long grass that can inhabit many different types of species and it has water that flows through it.

Metamorphosis: Marked change of form, appearance, or character.

Nymphalidae: Nymphalidae is the largest family of butterflies with about 6,000 species distributed throughout most of the world. These are usually medium sized to large butterflies.

Nocturnal: Active mostly during the night, and usually asleep during the day.

Oval Ventral Brood Sac: A type of sac that that is only use for keeping young before they hatch during breeding season.

Pectoral fin: Pectoral fins are two fins located on the bottom sides of a fish or whale.

Photosynthesis: Photosynthesis is a way for plants to gain energy that uses sunlight and carbon dioxide to produce glucose (sugar) and oxygen.

Riparian: Relating to or inhabiting the banks of a natural course of water.

Roost: To stay or rest.

Stigma: A stigma is a patch of scent scales found on the forewing of some species of some male butterflies or sometimes moths.

Trawling: Fishing with a trawl net or seine.

Tubercles: A swelling or a bone.

Viviparous: Bringing forth living young rather than eggs, as most mammals and some reptiles and some fish.

Vegetation: All the plants life of a place, taken as a whole.

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