STRAW Project

Point Blue Conservation Science STRAW Project
December 2018 - May 2019 Report

Subtask 1: **Educate approximately 600 students representing Marin's diverse communities about their local watersheds and ways in which they can reduce pollution and trash and improve water quality, habitat, and community connections. These lessons will be created, edited and approved by the Contractor and the District (specifically, MCSTOPPP staff) on stormwater pollution prevention practices and will be aligned with the Next Generation Science Standards. The curricula will help satisfy public outreach, education and participation requirements outlined in the Phase II Permit (statewide municipal stormwater discharge permit), and will be presented within the context of the climate-smart restoration science education currently delivered to schools in Marin by Contractor.**

Specifically, between December 2018 and May 2019, we worked with 10 different schools, 1,237 students, and 32 teachers. (Table 1.1). Nearly a third of the 10 schools we worked with where over 50% of students are on free and reduced lunch. The total number of Marin students we reached was higher than the previous year, as we were able to work with all three grade levels at Miller Creek, which added about 700 students.

In current literature and conferences on increasing diversity, equity, and inclusivity within environmental education, frequency of lessons is valued much greater than sheer number of students reached. Thus, STRAW has been working to continually improve and expand our Multi-visit program for the most underserved and interested schools to enhance learning and provide more equity in environmental education. MCSTOPPP funding allowed us to do multiple lessons with one of those underserved schools, Bahia Vista Elementary, to increase learning, stewardship, and engagement. Four classes of 5th grade students at Bahia Vista Elementary received 4 separate lessons, for a total of 16 lessons. For the first time, we were able to offer all of these lessons in both Spanish and English, accommodating students who prefer to learn in Spanish and increasing their understanding. These lessons took place on March 7, 8, 28, 29; April 2, 3; and May 2, and 3. The four teachers we worked with at Bahia Vista, as well as their principal, showed great appreciation and gratitude for the program and ways it enriched their students and their own science learning.

During the 2018-2019 school year, we provided pre-restoration lessons for all students who attended a restoration, and additional lessons for students who did not complete a restoration, but still wanted to be involved in our program. In total, we provided pre-restoration lessons and full restoration days integrating stormwater pollution prevention for 2,515 students throughout the Bay Area. Table 1.2 shows all totals throughout the Bay Area for the 2018-2019 school year.

Table 1.1 Marin County Classroom Totals for 2018-2019

County	Underserved School	School	Total Teachers	Total Students	Sum of Chaperones	Total Volunteer Hours
Marin	Yes	Bahia Vista Elementary School	4	97	0	4
	No	Bolinas-Stinson Elementary School	1	14	4	80
	Yes	Hamilton Elementary School	3	63	12	337.5
	No	Hidden Valley Elementary School-Marin	2	42	7	168
	Yes	Loma Verde Elementary School	8	207	49	993.5
	No	Miller Creek Middle School	5	612	0	550.8
	No	Old Mill School	2	41	12	0
	No	Olive Elementary School	2	46	11	285
	No	Park Elementary School	3	68	15	0
	No	San Geronimo Open Classroom	2	47	12	296
Marin Totals	3	10	32	1,237	122	2714.8

During the 2018-2019 school year, we provided climate-smart restoration and conservation science lessons for all students who attended a sites with restoration or other conservation efforts taking place. This year, we provided science lessons and restoration and conservation site visits for over 2,500 students throughout the Bay Area. Table 1.2 shows all totals

throughout the Bay Area for the 2018-2019 school year. This year we were able to work with and service 1,237 Marin County students, almost half of the total students we worked with this year.

Table 1.2 Bay Area STRAW Totals 2018-2019

STRAW-Wide Metrics	
Total Students	2,515
Total Marin Students	1,237
Restoration Days	44
Total Plants	5,020
Total Volunteers	3,041
Total Volunteer hours	12,640.3
Total Planting Area (acres)	9.2668
Unique Schools	32
Total Counties (restorations)	7
Total Linear Feet	10,181.729

Task 2

Subtask 2:

In collaboration with the District's MCSTOPPP, STRAW Education staff continued to provide grade-level appropriate curricula to Marin County students, aligning and implementing MCSTOPPP public outreach, education and participation objectives (outreach objectives) to students' restoration and conservation lessons.
The district provided new MCSTOPPP outreach objectives to STRAW. This task list is now complete. STRAW did the following:

1. **delivered the curricula through STRAW's 2018-2019 school year educational activities.**
2. **Included the latest information regarding how trash gets into waterways.**
3. **Modified the curriculum effectiveness assessment protocol by providing assessments in Spanish and English.**
4. **Implemented the effectiveness assessment protocol during the 2018-2019 school years to evaluate participant learning as a result of exposure to the curriculum.**

STRAW delivered final curriculum to students, and implemented the effectiveness assessment protocol, as part of STRAW's 2018-2019 school year educational activities between March 7, 2019 and May 3, 2019. An example of a lesson we revised to incorporate MCSTOPPP Public outreach, education and participation objectives is attached to this report as appendix A.

STRAW's Multi-Visit Program (MVP) has become an important component for our STRAW interns experience and practice of environmental education. Two interns were able to further explore environmental education with the students of Bahia Vista Elementary School, working as a team to take the lead in developing and teaching curricula, assessing students' learning, and responding successfully to the challenge of evolving lessons to students' interests while accomplishing our established critical learning goals.

A critical learning goal for students was to understand the deep connection between water and land, learning that what we do to the land affects all inhabitants of the watershed. Following the success of past years approach, we emphasized the importance of storm drains in our first lesson when introducing the connectivity of watersheds by utilizing an image of storm drain. One of our main learning goals was that students understood that all storm drains in Marin discharge any trash or pollutants that people litter or dump directly to the nearest creek or bay. Students learned that when we protect the watershed from harm such as pollution, we are also protecting and helping ourselves and the many species that call our watershed home. An example lesson regarding trash and pollution in our watershed can be found in appendix A.

Students became interested in learning more about local endangered species and became motivated to help these animals by trash clean-ups and weeding of invasive species in their nearby transition zone ecosystem, Pickleweed Park. A simple connection we made for the students is that just as we thrive in a clean home, these endangered species that call Pickleweed Park and transition zones home, want to live in a trash-free home with clean water and space. An example lesson regarding endangered species in our watershed can be found in appendix B.

Table 2.1 below lists the classrooms we worked with through STRAW's MVP. Each classroom received 3 total lessons plus their Pickleweed Park Trash Clean-Up and Weeding Day. These visits helped accomplish our overarching goal of students having a deeper understanding of their local watershed and the many local and tangible ways they can improve it and prevent harm to all watershed inhabitants.

School Name	Teacher	Grade	Lesson 1	Lesson 2	Lesson 3 Pickleweed Park Trash Clean-Up & Weeding	Lesson 4	Number of Students
Bahia Vista Elementary (97.9% of students eligible for Free and Reduced Meals)	Kristen Doving	5th	3/7/2019	3/28/2019	4/2/2019	5/2/2019	25
	Kelsey Maldonado	4th and 5th	3/7/2019	3/28/2019	4/2/2019	5/2/2019	25
	Emily Koller	5th	3/8/2019	3/29/2019	4/3/2019	5/3/2019	24
	Colin Johnson	4th and 5th	3/8/2019	3/29/2019	4/3/2019	5/3/2019	23
Totals	4	—	4	4	4	4	97 students

Table 2.1: ***Marin MVP School Data 2018-2019.*** STRAW's MVP worked with four classes in Bahia Vista Elementary School, providing lessons to 97 students in total through the dates of March 7, 2019 and May 3, 2019.

Program Photos

Below are photos of Multi-visit program students from Bahia Vista Elementary School throughout their lessons and their Trash Clean-Up and Weeding Day at Pickleweed Park.

Image 1– Students finish their post-assessments, the same assessment they received in the beginning of their first lesson to determine their growth in watershed ecology knowledge.

Image 2 – Opening Circle for students at Pickleweed Park Trash Clean-Up and Weeding Day. Students learned how all storm drains in Marin discharge trash and pollutants to the nearest creek or bay and worked to eliminate trash from going directly into the Bay! The tools the students will need are to the right of the image, using shovels, trowels, scrapers and buckets to prevent pollutants from further entering their watershed.

Image 3 (Left Image) – STRAW Intern, Sierra, explains in the opening circle the day's learning game where students will be able to draw and describe different species they see in their local wetland.

Image 4 (Right Image) – Students apply their scientific skills, observing their surroundings and labeling and drawing three species of plants and three species of animals they see in Pickleweed Park. The learning objective was for students to apply their knowledge of the four parts of a wetland (upland, tidal marsh, mudflats, and open bay) to determine what adaptations species may have to be able to live in certain parts of the wetland.

Image 5 – STRAW Native Plant Nursery Manager, Josh, facilitates students learning in plant parts and physiology, specifically guiding the students to note the color difference between plant roots (white, transparent) and plant leaves (strong green due to chlorophyll).

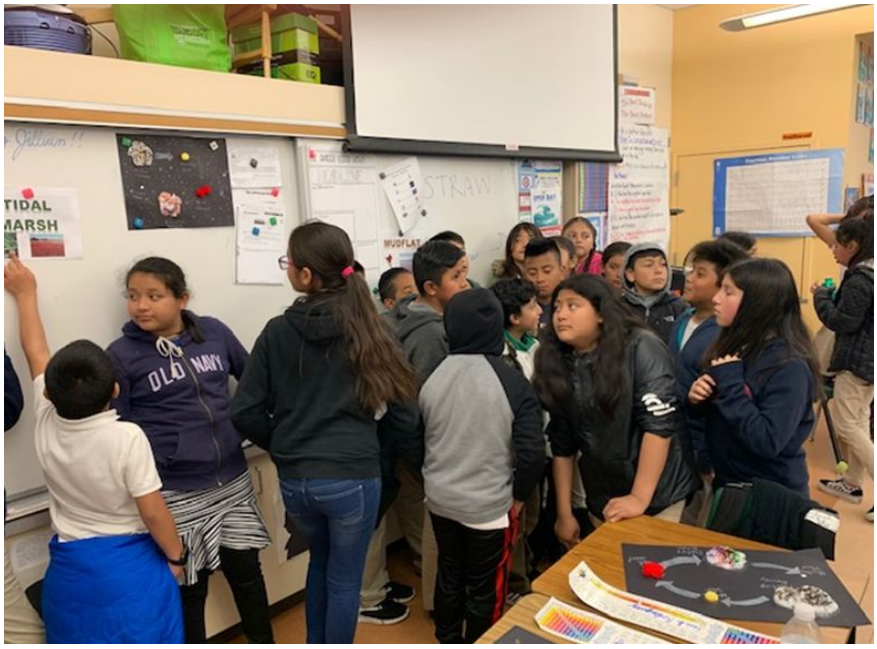


Image 6 – Students play the UTMO game to learn about the four parts of the wetland: upland, tidal marsh, mudflats, and open bay. The UTMO game, an acronym for the four zones of wetland, included posting the four zones around the room and then our STRAW Intern, Sierra, would show an image of a wetland species and students would then walk to the zone they believed the species lived in.

Image 7 – STRAW Conservation Educator, Alba, leads a group solely facilitated in Spanish during Pickleweed Trash Clean-Up and Weeding Day. Students here are distributing group roles, each student has been tasked with retrieving one tool: a bucket, trowel, scraper and shovel.

Image 8 – STRAW Intern, Alexis, leads a group during their Trash Clean-Up and Weeding Day. Students were instructed to pick a native plant they will choose, indicated by the small flags, to protect and work around it by weeding and picking up trash.

Image 9 – A team of students work together in a misty morning to protect their selected native plant, the mist and occasional rain seeming to be the highlight of the students' experience outside.

Image 10 – STRAW Education Coordinator, Gina, guides a group of students in their observation of wetland species, such as the white egret in the far horizon to the top right of the image.

Student Assessments

Assessment of Students *(oral and written assessments were provided in both English and Spanish)*:

- Pre and post oral or written assessments during restoration and conservation science lessons
- Pre and post oral or written assessments during restoration site or trash clean-up day
- Oral responses to questions at restoration site or trash clean-up day
- STRAW's MVP students also complete end of program reflections and share out with their peers

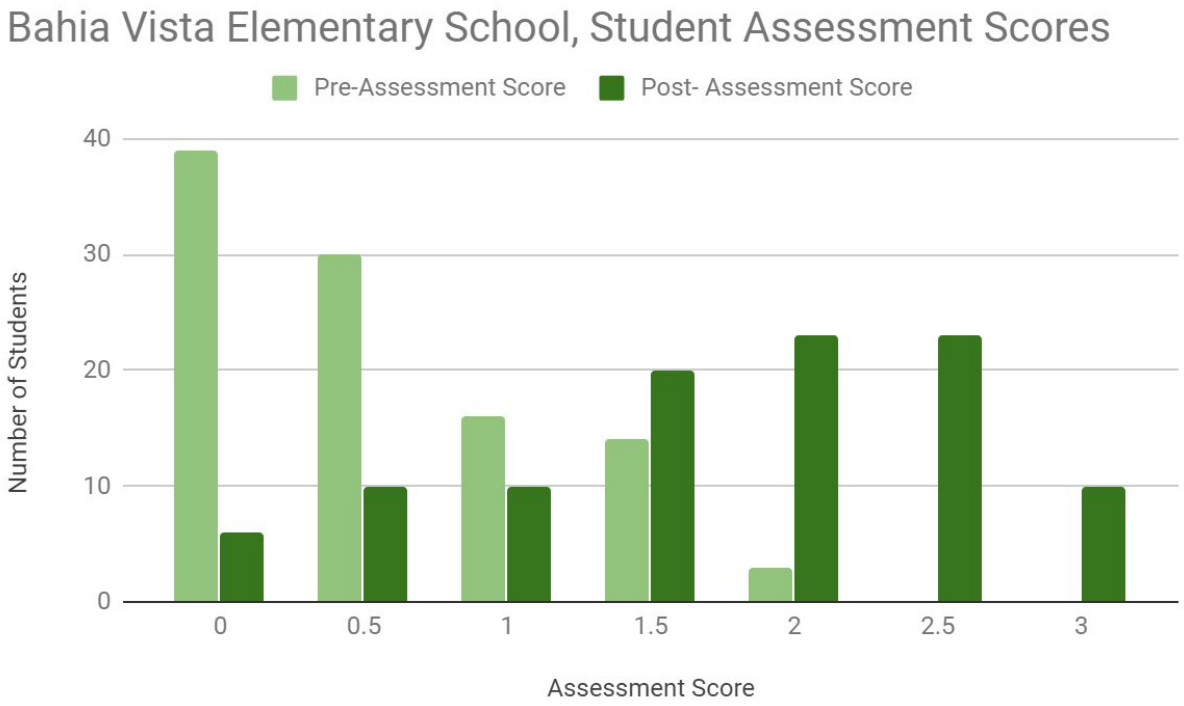
We maintained our successful education plan that included different assessment approaches to understand students learning, reflections, and questions to inform the lessons we provided to the students.

Especially in STRAW's Multi-Visit Program (MVP), we used the following assessments to further modify and evolve the lessons to the students interests and curiosities. This year, some of these modifications included providing lessons and assessments in Spanish. A group of our MVP students spoke predominantly Spanish, their families immigrating from Guatemala and Mexico, and like their other classmates, they were interested in learning more about animals, plants, and their local environment. By having smaller groups facilitated in Spanish, students were able to more deeply engage with the content by asking questions as they arose to them and make strong connections between their new local environment and the communities they immigrated from. All students level of engagement and interest was also quantified through their submitted assessments represented below in *Graph 1.1. Bahia Vista Elementary School, Student Assessment Scores*. Overall, 80.4% of our MVP students improved in their knowledge of watershed ecology, wetland transition zones, and local species.

The specific assessment technique we used at the end of students classroom lesson before their restoration day was to ask students to finish the following three phrases: "I know, I feel, I wonder." This technique was a successful approach across a range of grades and provided valuable information to our educators. This information allowed our educators: to understand concrete themes students understood, the opportunity to clarify any misconceptions or questions students had, and to share this synthesized information with the students' teachers and restoration site project managers.

For restoration site days, we began our restoration with an opening circle that served as a welcome, schedule and site orientation, and as an oral assessment of their classroom lesson by reviewing key themes to ensure a more meaningful day. Similarly, the end of the students restoration day concluded with a closing circle where we ask students to share what they hoped

their restoration sites will look like in 20 years; it is a space where students can share their hopes for their work and their highlights of their STRAW experience.



Graph 1.1. ***Bahia Vista Elementary School, Student Assessment Scores.*** Ninety-seven students submitted assessments, demonstrating that **80.4%** of our MVP students improved in their knowledge of watershed ecology, wetland transition zones, and local species.

Student Feedback

The 2017-2018 MVP students had great suggestions to improve our program and we incorporated them below by:

- *More time together, pick up more trash* – We were able to provide four lessons to each classroom this year, and were able to spend a portion of each lesson visiting Pickleweed Park
- *More activities/games* –we minimized the number of slides we projected onto the screen and increased the number of learning games. An example of this was our UTMO game, (UTMO an acronym for the four zones of a wetland: upland, tidal marsh, mudflats, and open bay) where we would post the four zones around the room, then show images of different species and the students would have to walk to the zone that they believed the species lived in; a photo of the game can be seen in *Image 6*.
- *More art* – we incorporated an art activity where students could draw their observations of different species into their local wetland landscape, Pickleweed Park; a photo of the activity can be seen in *Image 3* and *Image 4*.

When we asked this year's MVP students the changes and improvements they would make to the program, students encouraged us to increase the amount of outdoor time they have doing weeding and trash clean-up; the excitement of the students for this improvement can be seen below.

What would you change about the program?

- *Cristian*: "Nothing it's an awesome program already. I hope another class enjoys it as much as I did."
- *Tairy*: "Nothing and I just want to thank you for teaching us how to weed and learning the four parts of the tidal wetland."
- *Quynh*: "To be honest nothing except a little MORE weeding I LOVE weeding."

We also provided a space for students to share some of the lessons and content they enjoyed most. Students were excited to have learned about different positive ways they can help their local watershed, plants, and animals, and many felt motivated to continue to create this positive impact by continuing to visit Pickleweed Park.

What did you enjoy most about our time together?

- *Sherrylynn*: "I enjoyed going to Pickleweed to weed so that animals have a habitat."
- Yobani: "I enjoyed going to Pickleweed and taking out weeds and replacing it with mulch."
- *Lizbeth:* "The thing that I like more together is that we learn about animals and how to help our environment."

- *Yubian*: “Me gusto que ustedes me enseñaron a cuidar el medio ambiente como por ejemplo no tirar basura, recoger la basura, y cuidar a los animales.” (“I liked that you taught me to take care of the environment, such as not throwing garbage, collecting garbage, and taking care of animals. ")
- *Han*: “I think the most enjoy time is we go to Pickleweed Park and weed the grass and all the time with STRAW all great because I can learn a new thing.”
- *Danny*: “The thing that I most enjoyed was weeding because it was fun helping all the plants and animals.”
- *Mario*: “I enjoy taking plants that are not letting other plants have space to grow, and teaching us how to help other animals.”

Our successful collaboration supports these young students to become responsible and informed community members. The reliable and consistent support from MCSTOPPP allows us to continue to expand and address the innate curiosity that many young Marin County residents have about their local environment and how they can help improve it.

Appendix

Appendix A: Sample lesson revised and implemented to incorporate MCSTOPPP outreach objectives, specifically about storm drains carrying trash and pollution to the bay and local creeks.

STRAW Multi-visit Program (MVP): Visit 1 Bahia Vista Elementary 5th

Thursday
9:30-10:30 Maldonado
11:00-12:00 Doving

Friday
9:30-10:30 Johnson
11:00-12:00 Koller

Learning Goals

Enduring Understanding:

- Students will understand what a watershed is and that they will make a difference by improving their watershed through our work together.
- Students will understand that in a watershed, what we do to the land affects the water- that storm drains discharge trash and pollutants directly to the nearest creek or bay.
- The more you look, the more you see.

NGSS Standards Met:

- Science and Engineering Practices:
    - Developing and using models
    - Obtaining, evaluating, and communicating information
- Disciplinary Core Ideas:
    - LS2.A Interdependent relationships in ecosystems
    - LS2.C Ecosystem dynamics, functioning, and resilience
    - LS4.D Biodiversity and humans
    - ETS2: Links among engineering, technology, science, and society
- Crosscutting Concepts
    - Patterns
    - Structure and function
    - Stability and change
    - Systems and systems models

Essential Question(s):

- What is STRAW and what is my role within the program?

- What is a watershed?
- The more you look, the more you…?
- What is a wetland?

Students will know:

- The story of STRAW and how it began
- The ways in which we act as a community with STRAW
- The basic progression of the program
- That they will make a difference through this program
- Students will understand that they are part of our STRAW community, and have something unique to offer our community

Students will be able to:

- Identify what they most hope to learn from our program this year
- Use and practice observation skills

Learning Plan

Engage: (Indoors) 10 min- Alexis

· Introductions- Point Blue- STRAW- each of us introduce ourselves and what role we have in today's lesson and the program, each staff member say fave cereal
~What does STRAW stand for?
~Our goals: clean our watersheds, create habitat, prepare for climate change and possible sea level rise, and work with you to involve our communities!
· Challenge! We are going to be talking about *watersheds* and *tidal wetlands*–take some time to think about what these words mean to you. You don't have to know right now!
· Pass out pre-assessments, give students 5-8 minutes to complete.
· After pre-assessments are complete, turn your page over, pencil down and write your name with a marker on the name tag/ tape we pass out (if students don't already have name tags on)

Explore: 5 min- Alba/ Gina - reiteration?? Clarify how much explanation

· Story of STRAW & What we will do together
· What is a watershed? Think-pair-share
o Hint: we are in a watershed right now, look around (or out the window), do you see hills? Where would water flow if it were to rain right now? (point)
· Where are we in the watershed right now?
· Instructions for going outside

Walk outside- 10 min

Explain: (Outside, if weather allows)- 5 min total- Sierra

· What is a watershed? Think-pair-share

· Direct Instruction: Tell students that a watershed is anywhere where water is collected, stored, or drains. Ask students to look around, do they see any hills, mountains, taller parts of their school yard/ Pickleweed Park? When it rains, where does that water go? (2-3 volunteers share out)

- All water eventually flows to a stream or lake and ends up in the ocean.
- Water "sheds" off the mountains
- No matter where on Earth you go, you're always in a watershed!
- A watershed starts in the mountains/ hills, goes to rivers, then wetlands, then the bay, then the ocean
- All storm drains in Marin discharge any trash or pollutants that people litter or dump directly to the nearest creek or bay- A river can be the "report card" for its watershed
- Show laminated photo of a watershed and "How Trash Gets Into Creeks" flyer

Watershed dance- mountain, rivers, wetland, open bay, ocean- talk about how trash can flow right through the watershed if we don't pick up litter.

Elaborate: (Outside)- 12 min- Alexis

What is a wetland?- 5 min

· Where are we in the watershed right now? We are next to the wetland!

· Wetlands are literally areas of land that are wet

· Challenge for you: observe what you see, draw the wetland from this tree to the island (TIME PERMITTING), or just observe quietly and think pair share.

· Toe-to-toe circle: Our wetland has four key parts: Upland (above wetland), Tidal Marsh (can become inundated with tidal flow), Mudflats, and Open Bay (da ocean) (UTMO)- label the 4 parts of your wetland in your small groups in the circle- we will learn about the roles of the wetland and those parts of the wetland through our program. Maybe use whiteboard to draw 4 parts

· Ask students: Why are wetlands so important? They are special~salt and fresh water

o They provide habitat, protect from storms and high tides, filter our water, and hold carbon–how much do you all know about carbon and climate change?

Watershed dance- now w/UTMO in there - mountains, rivers, uplands, tidal marsh, mudflats, open bay, ocean

Walk inside- 10 min

Evaluate: (Indoors)- 5 min- Sierra

· Return to desks.

· On the other side of your piece of paper write one thing you're curious about, and one thing you're excited about for your time with STRAW. Remind students they can do something to prevent trash from entering nearby creeks and the Bay!

Thank you and see you next time!

Materials:

- Learning Plan
- Name tags for students and STRAW teachers
- Field white board
- White board markers
- “How Trash Gets into Creeks” Flyer
- 1 blank piece of paper/ student
- Pre-assessments for all students
- Pens/ pencils for each student
- Photo of a California freshwater shrimp
- Floppy white boards
- White board markers

Appendix B: Sample lesson implemented regarding local endangered species in our watershed

STRAW Multi-visit Program (MVP): Visit 4 Bahia Vista Elementary 5th

Thursday
9:30-10:30 Maldonado
11:00-12:00 Doving

Friday
9:30-10:30 Johnson
11:00-12:00 Koller

Learning Goals

Enduring Understanding:

- Students will understand the concept of endangered animals, and why they are endangered
- Students will better understand what animals exist in the SF Bay
- Students will be able to recall and reflect their work on Pickleweed Park

NGSS Standards Met:

- Science and Engineering Practices:
    - Developing and using models
    - Obtaining, evaluating, and communicating information
- Disciplinary Core Ideas:

    - LS2.A Interdependent relationships in ecosystems
    - LS2.C Ecosystem dynamics, functioning, and resilience
    - LS4.D Biodiversity and humans
    - ETS2: Links among engineering, technology, science, and society
- Crosscutting Concepts
    - Patterns
    - Structure and function
    - Stability and change
    - Systems and systems models

Essential Question(s):

- What is an endangered animal?
- How has our work impacted our community, the endangered animals, and our watershed? Specifically, how has protecting native plants and cleaning up trash helped?

Students will know:

- What "endangered" means
- Examples of endangered animals in the SF Bay
- Why and how to protect endangered animals

Students will be able to:

- Work together to apply vocabulary words
- Apply their art skills to a learning activity

Learning Plan

Engage: Quick Review Game (10-15 min) -

· Let's review all of the things we have learned together!

-Display picture of pickleweed park (drawn on a large poster by Sierra)

-Directions: There will be six groups, each group will get one important vocab word that will be used to label the poster (there should be pre-drawn boxes for each word)

-The six words are: **watershed, wetland, upland, tidal marsh, mudflat and open bay**. Each group will have a few minutes to discuss their given word, and when time is up, each group will come up one by one to place their word in the correct box that labels the drawing, and *explain* why they chose that spot/what their word means. The entire class should decide together if this was the correct choice.

Explore: Endangered Animals (5 min) -

· Why are we talking about this?

-In your post assessments it seemed that many of you were interested in learning more about endangered animals?

What is an endangered animal?

- An animal that is at risk of going extinct, or being gone forever.

· Why are some animals endangered?
    - Because they have lost their habitat (review: what is that?), sometimes from human activity, or because they have too many predators (what is a predator, can a human be a predator?)
· What are some examples of endangered animals that you know?

Explain: Endangered Animals of the Bay Area (10 min)

· Show the students the slideshow of endangered animals of the Bay
· Ask probing questions for each animal, such as what adaptations do you see and where might this animal live?
Animals we will focus on: Right whale, Salt marsh harvest mouse, Ridgway's rail, Northern spotted owl, California freshwater shrimp, Red-legged frog, Mission blue butterfly, Delta smelt
https://docs.google.com/presentation/d/1Q-k2jgCIe0Yot_4FkwxgcgvYrX5IXH_FiYDkqhZZivQ/edit#slide=id.p

Elaborate: Mover - Who Am I? (15 min)

· Explain that we are about to start an activity that requires NO ONE peeks at their paper, and no one spoils what animal each person has.
    - Sierra and Alexis will give a demo of how the game is going to work in front of the class
    - Each student has an animal (unknown to them) that they will hold on their forehead. Students must walk around the classroom and ask one question to each person they encounter to try to figure out which animal they are. Example questions will be written on board. When the student thinks they know which animal they have, they can return to their desk and wait for the reveal.
· At this point, all staff will pass out squares of paper that have the outline and name of one animal we talked about on them. These squares will have to be placed via tape onto each child's forehead without them seeing the paper…and the activity will commence.
· Feel free to ask each other questions in English or Spanish, both are languages Scientists speak
· Once all students think they know what they are and have returned to their desks, we will all reveal together what is on their paper.

- Now that the mover activity is over, we can focus on coloring our animals until it is time for the post-assessment, and place the animals where they belong in the watershed.
    - How might your climate smart restoration at Pickleweed Park help your animal? (on back of card for students to complete as they wait for everyone to be finished)

Evaluate: (15 min) -

· Pass out post-assessment. Explain it is the same assessment that they got when we first arrived, and they will have ten minutes to silently work.

Circle up for one last question whip around? (favorite thing about our program, one thing they were glad to learn?)

Materials:

- Learning Plan
- Name tags for students and STRAW teachers
- Pickleweed park poster with corresponding labels (1 poster and set of labels per class)
- One endangered animal card for **each student**
- Post-assessments for all students, AEL
- Pens/ pencils for each student, AEL

IMAGES:
https://docs.google.com/document/d/1fhnZRujgJ1tQr3IKCbLHIXze0eG9BMo7ZTOrawdkIxM/edit