Suisun Marsh
Watershed Education Program

2021-2022 Program Summary

Solano RCD is grateful to our program funders:

Solano County Water Agency

Solano County Department of Resource Management

Fairfield-Suisun Sewer District

SOLANO Resource Conservation District

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PROGRAM OVERVIEW

Solano County Water Agency (SCWA) is in the fourteenth year contracting with Solano Resource Conservation District (Solano RCD) to implement the Suisun Marsh Watershed Education Program, a sixth grade field trip-based program designed to deepen student understanding of watershed ecology and the impacts of human behavior on watershed health. The Solano County Department of Resource Management and the Fairfield-Suisun Sewer District provide additional support.

The curriculum was written in August 2008 and has been revised each year, with sections of the original curriculum adapted from *Waves, Wetlands and Watersheds* and *Our Wetlands, Our World,* published by the California Coastal Commission. The teaching objectives are directly linked to California's Next Generation Science and Common Core Standards, and incorporate research-based instruction practices highlighted by The BEETLES Project, a program of the Lawrence Hall of Science at University of California at Berkeley. Our programming included live, virtual class lessons; live, virtual field trips; in-person field trips at Rush Ranch Open Space; and field trip activities on school campuses.

GOALS AND OBJECTIVES

The Suisun Marsh Watershed Program takes a macro view of a discreet, special watershed, and builds on the ecology and stewardship lessons from our Watershed Explorers Program, but also stands alone. Participants leave the program able to:

- Describe the impacts of stormwater pollution on watersheds, particularly the impacts of motor oil, pet waste, chemicals, and trash debris;
- Identify the source of their drinking water and how to conserve it;
- Implement the reduce, reuse, and recycle messaging to address stormwater pollution issues;
- Recognize threats to Suisun Marsh and the solutions to those threats.

In accordance with California's Next Generation Science Standards and Common Core Standards, the guiding question for the Suisun Marsh Program is:

> How can we identify human impacts on Solano County watersheds and how can we lessen those impacts?

From this guiding question, the program is structured on the following goal:

> All participating students investigate and collect data to serve as evidence for scientific questions regarding how human activities affect watershed health with a special emphasis on the Suisun Marsh.

AUDIENCE

The 2021-2022 program engaged 2762 students, with students enrolled from 93 classes throughout Solano County.

In fall 2021, Solano RCD contacted all Solano County school districts to gather preliminary data on sixth grade registration. According to our research, we anticipated reaching 75% of all Solano County sixth graders, as enrollment was at 3,797 sixth graders. Upon completion of the school year, we calculated that we had reached 61% of sixth grade students in the county based on registration numbers from April 2022; the number of sixth graders had grown to 4,523 students by April 2022.

Table 1. *Summary of Program Enrollment by City*

Name of Participating School	City	# Students	# Classes
B. Gale Wilson Middle School	Fairfield	128	5
Benicia Middle School	Benicia	300	10
Browns Valley Elementary School	Vacaville	118	4
Cambridge Elementary School	Vacaville	26	1
Cooper Elementary School	Vacaville	104	4
Crystal Middle School	Suisun City	227	7
David Weir Elementary School	Fairfield	64	2
D.H. White Elementary School	Rio Vista	48	2
Dan O. Root II Health & Wellness Academy	Suisun City	90	3
Dixon Montessori	Dixon	64	2
Edwin Markham Elementary School	Vacaville	130	4
Eugene Padan Elementary School	Vacaville	76	3
Fairmont Elementary School	Vacaville	100	3
Grange Middle School	Fairfield	130	4
Green Valley Middle School	Fairfield	224	8
Highland Elementary School	Vallejo	65	2
Hogan Middle School	Vallejo	150	5
Loma Vista Elementary School	Vallejo	58	2
Mare Island Health & Fitness Academy	Vallejo	42	2
Mare Island Technology Academy	Vallejo	128	4
Orchard Elementary School	Vacaville	64	2
Public Safety Academy	Fairfield	136	4
Sheldon Academy	Fairfield	59	2
Suisun Valley Elementary School	Fairfield	53	2
Travis Elementary	Travis AFB	34	1
Vallejo Charter School	Vallejo	48	2
Virtual Academy of Fairfield-Suisun	Fairfield	96	3
TOTAL 2021-2022		**2762**	**93**
TOTAL ALL PROGRAM YEARS		**16,423**	**528**

CURRICULUM

Four program sessions were held September-May. The continuing COVID-19 pandemic required more flexibility in our programming to ensure we reached as many students as possible. In the fall of 2021, we offered virtual programming only. In the spring of 2022, in response to school and student needs, we offered both virtual and in-person programming. Content was adjusted accordingly, but maintained the core curriculum focus on drought and stormwater pollution no matter the site and context for the lesson.

Most students in our program participated in three 45-minute classroom lessons prior to the field trip and a final 45-minute lesson after the field trip.

ALL-VIRTUAL PROGRAMMING

During the virtual activities, students engaged with educators through the platform Peardeck, which allowed students to type responses to questions and answer polls. The entire program consisted of:

Lesson One: Students were introduced to the concepts of stormwater and watersheds as they pertain to the Suisun Marsh. Students use a model ("enviroscape") to explore how stormwater affects our creeks, marsh, and ocean.

Lesson Two: In this lesson, students explore the features and functions of the Suisun Marsh and other Solano County watersheds through mapping activities and modeling. They implemented their heightened skills of observation following the first lesson to better understand how water moves in both micro and macro landscapes.

Lesson Three: In this lesson, students investigate, analyze, and compare data to determine the impact of trash in Solano County and watersheds beyond. As a specific activity, students sort, count, graph, and analyze "collected trash" from a "local coast or creek cleanup event." Students reflect on their attitudes about trash and the Three R's as a result of these activities.

Field Trip to Rush Ranch Open Space: Classes virtually joined three Solano RCD staff live streaming each 90-minute field trip from Solano Land Trust's Rush Ranch Open Space. In line with the program goal and guiding question, the field trip highlighted how students can investigate the effects of stormwater pollution and drought on the Suisun Marsh watershed.

INTRODUCTION: Each field trip began with an introduction at the top of Overlook Hill and a land acknowledgement honoring the indigenous Patwin people and their ancestral lands. Students were set up to use a scientific mindset during three science stations centered on the topics of soil, water, and plants, and were given an overview for the day.

STATIONS: At the soil station, students compared marsh and grassland soil types, making observations and inferring how drought affects soil conditions at the marsh. At the water station, students investigated how drought and stormwater pollution affect water quality specifically by interpreting dissolved oxygen and turbidity test results. For the plant station, students conducted scientific sketches of marsh plants and discussed how the marsh could look in 5 years due to drought and stormwater pollution.

CONCLUSION: Returning to Overlook Hill, students were prompted to use their observations to begin writing poetry about their experiences and impressions of the watershed and their role in it. Teachers could submit the poems to *River of Words*, a program of The Center for Environmental Literacy and a part of the Kalmanovitz School of Education at St. Mary's College of California, which connects the public to the watersheds they live in through art and poetry. The organization also runs an annual Art and Poetry Contest.

Lesson Four: In this lesson, students use discussion and data to discover why the variability of rainfall in Solano County and throughout California calls for careful management of our precious water resources. The lesson aims to show indiscrete water use as a human impact on the watershed and water conservation as a way to minimize that impact.

IN-PERSON FIELD TRIPS

We worked closely with the District Science Coordinator for Vacaville Unified School District to bring as many sixth graders in-person to Rush Ranch Open Space in Spring 2022. Just like the virtual field trip, and in line with the program goal and guiding question, the in-person field trip highlighted how students can investigate the effects of stormwater pollution and drought on the Suisun Marsh watershed. Most students attending in-person field trips had three virtual lessons before and one virtual lesson after with RCD staff.

INTRODUCTION: Each field trip began with an introduction with Solano RCD educators and a land acknowledgement honoring the indigenous Patwin people and their ancestral lands. Students were set up to use a scientific mindset during three science stations centered on the topics of soil, water, and plants, and were given an overview for the day.

STATIONS: At the soil station, students compared marsh and grassland soil types, making observations and inferring how drought affects soil conditions at the marsh. At the water station, students investigated how drought and stormwater pollution affect water quality specifically by performing and interpreting dissolved oxygen and turbidity test results. For the plant station, students chose a plant for a scientific sketch and used their observation skills to produce a sketch and written descriptions of the plant.

CONCLUSION: Finally, students were prompted to use their observations to begin writing poetry about their experiences and impressions of the watershed and their role in it. Teachers could submit the poems to *River of Words*, a program of The Center for Environmental Literacy and a part of the Kalmanovitz School of Education at St. Mary's College of California, which connects the public to the watersheds they live in through art and poetry. The organization also runs an annual Art and Poetry Contest.

ON-CAMPUS FIELD TRIPS

Solano RCD offered schools the option to have field trip activities on their school campuses. Solano RCD staff scouted school campuses ahead of field trips to determine the best activities to offer based on green space available on campus (or at nearby parks) and the length of time allowed for activities by teachers. Curriculum was adapted to make hyper-local connections for students, encouraging them to see how their school environment and neighborhood are connected to their local watershed.

Activities offered were similar to the Rush Ranch Open Space field trip curriculum, with all students experiencing the soil and water stations. Some schools' activities included adapted activities from the Suisun Marsh Watershed Program lessons as well, such as learning through an enviroscape model or understanding water flow through interpreting topographic maps of the area.

PROGRAM EFFICACY

We assess gains in student knowledge about the relationship of stormwater and drought across watersheds using a two-part assessment quiz. Students take the first quiz prior to participating in any component of the program, allowing us to capture the baseline knowledge students already have. Participants take the second quiz after the final lesson, allowing us to measure the knowledge students possess after participating.

The six question pre- and post-assessment instruments attempt to measure understanding about stormwater and its role in the watershed, the types and effects of stormwater pollution, and stewardship strategies in response to drought. We also ask an open-ended pre- and post-assessment question about students' general interest in stream monitoring and stewardship:

1. **What is stormwater?**
   Desired responses:
   water flowing outside a house into the watershed; water that flows outside and picks up pollution; rain and water that flows into storm drains; water flowing into storm drains that goes into creeks without being cleaned

2. **Why does stormwater matter to your watershed?**
   Desired response:

Stormwater flows into storm drains and into creeks and other bodies of water without ever getting cleaned. If stormwater is polluted, our watershed gets polluted. This can harm the environment in which plants and animals live.

3. **What are three things we need to keep out of stormwater?**
   Desired response:
   Trash, motor oil, and pet waste

4. **What does drought do to the Suisun Marsh?**
   Desired response:
   For the wetland habitat, drought conditions mean there is less stormwater flowing into the Suisun Marsh, creating a saltier habitat for plants and animals there because more of the water is sourced from ocean tides. Not all plants and animals will be able to tolerate these conditions. The grassland habitat becomes more susceptible to fire during drought, and plants may die without enough rain, resulting in less food for animals living there.
5. **How can people make the best use of California's limited water? What can we do??**
   Desired response:
   We can conserve water, making sure we don't waste it in our daily lives.

6. **PRE-ASSESSMENT ONLY:** What are you most interested to learn about the Suisun Marsh?
   POST-ASSESSMENT ONLY: What is the one thing you took away from this program?

Assessment Results

Gains in student knowledge about the Suisun Marsh and its relevant stewardship concepts taught in the Suisun Marsh Program were assessed with a two-part quiz. Students complete the first quiz prior to participating in the program, to capture a baseline assessment of their topic knowledge. Participants take the same quiz again after completing program curriculum, allowing us to compare the two data sets. The identical 5-question pre- and post-assessment instruments attempt to measure understanding of the importance of storm water protection, water conservation, and drought as they impact the Suisun Marsh and gauge student awareness of stewardship strategies. We also ask an open-ended question on the post assessment to get a sense of what topics made the greatest impact on participants.

1967 students completed the pre-assessment quiz. In the aggregate, 52% of students provided correct or partially correct answers to the 5 pre-assessment questions. Just 17% of students were able to correctly or partially correctly explain why stormwater matters to their watershed. **78% of respondents were able to correctly or partially list strategies to conserve water.**

The number of students who completed the post-assessment dropped 46.21% in the aggregate. Because our lessons were virtual again this year, ensuring that post-assessments were completed continued to be a challenge. This resulted in notable issues with the assessment process, particularly a drop off in the number of classes completing the post assessment: 1967 students completed the pre-assessment questions and 1058 completed the post-assessment.

Students who completed the post-assessment quiz improved their ability to express understanding of the concepts for every question. An aggregate of students who completed the post assessment provided correct or partially correct responses to 89% of the questions. The question about why stormwater matters to a watershed proved the most difficult for students in both the pre- and post-assessment quizzes, and 76% were able to provide a correct or partially correct answer in the post-assessment**. Students averaged 93% correct or partially correct answers for the other 4 questions.**

For the free response question, we asked students to tell us one thing (idea, fact, connection) they took away from the program. We classified their answers into 4 categories:

Better understanding of water conservation	51%
Better understanding of nature	25%
A sense of general environmental awareness and concern	6%
Silly or no response	17%

This translates to 83% of students demonstrating enough engagement with the program and assessment to thoughtfully answer a question that required them to do a little self-assessment of their own. 17% of respondents provided a silly answer or no answer to this free answer question, a number similar to that of students who did not provide a correct answer to the water conservation strategy question.

APPENDIX A – TEACHER FEEDBACK

Anonymous Teacher Feedback

Students “were very engaged in all discussions and really liked the fact that they were learning about their own hometown and neighboring areas.”

“We are just very appreciative of the program and feel so lucky to be a part of it. Our students always have a wonderful time and they learn A LOT! I use this program to also teach many of our standards and weave them in and around the lessons to create a unit. I do look forward to when we can go back out to the Ranch as a class, in person. Another thing I really appreciate was being able to see an incredible team of women in Science. It is inspiring to the kids.”

“The program educators were engaging and complimentary of the students' efforts. Solid use of technology and ‘hands on’ science.”

APPENDIX B – STUDENT POETRY AND REFLECTIONS

At the end of their virtual field trip, students were prompted to reflect and write poetry in response to their experience for the River of Words poetry competition. The following poems are from students at B. Gale Wilson Middle School in Fairfield.

While the marsh may look bare,
there's much more that lies there.
You see the pollution and trash,
and you think that things may look rash.
But just realize what a watershed is,
for it will open your eyes, give you a glimpse.

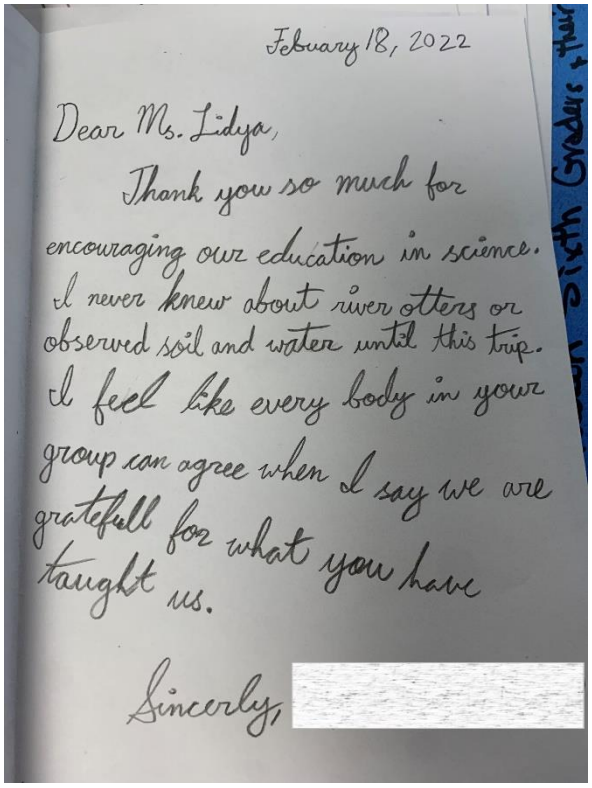
It's such a pretty sight.
Rich green plants,
dry light brown grass,
and deep green water.
Birds singing in the background.

The beautiful blue water shining in the light just like the blue sky.

The sky is clear
the sun is shining
but the water is murky
and the animals are crying.

It feels like a breeze,
Smelling the fresh air,
I wish the time could freeze,
So I will always be there.

APPENDIX C – STUDENT THANK YOU NOTES

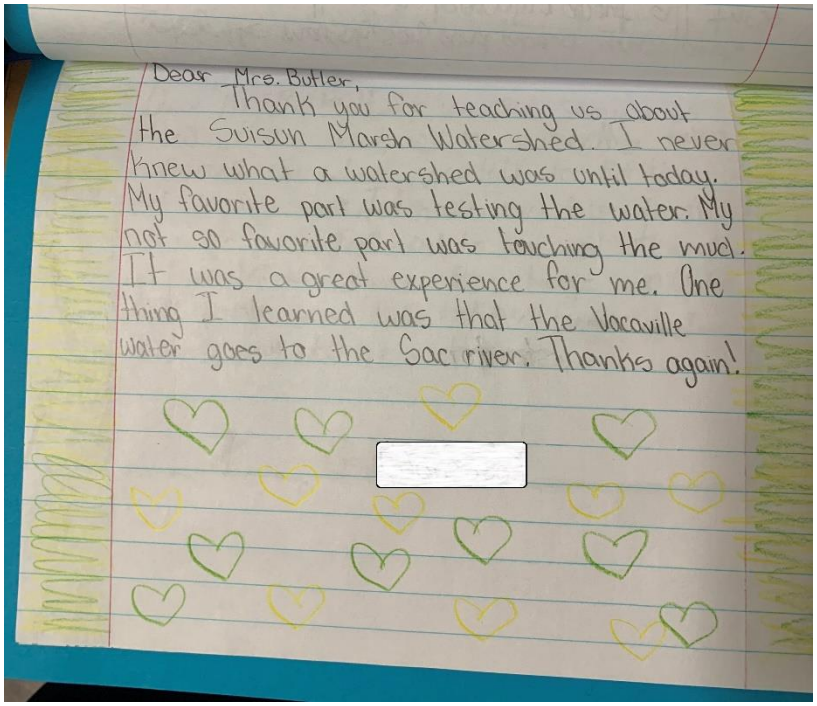


February 18, 2022

Dear Ms. Lidya,

Thank you so much for encouraging our education in science. I never knew about river otters or observed soil and water until this trip. I feel like every body in your group can agree when I say we are gratefull for what you have taught us.

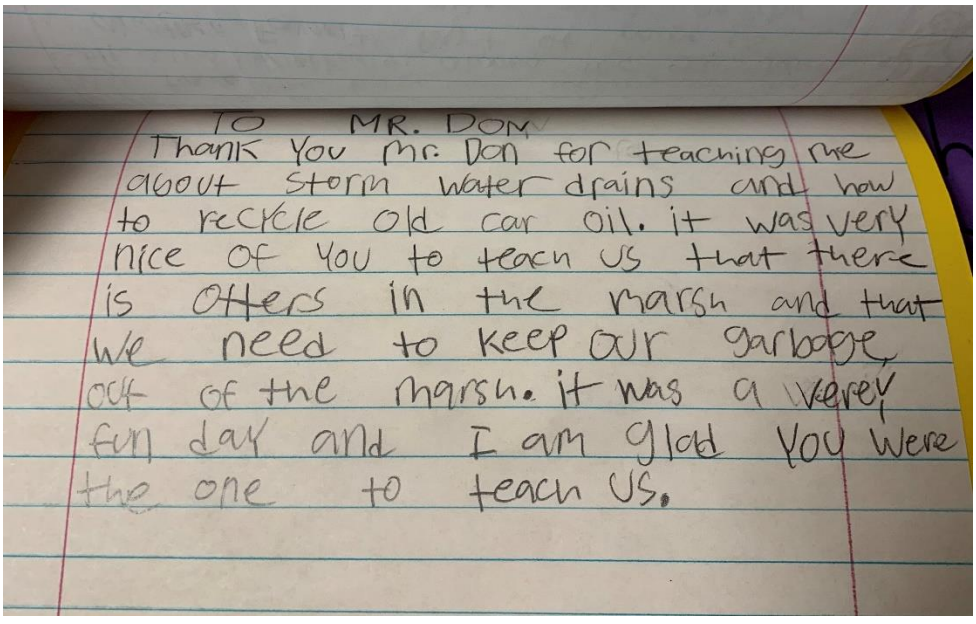
Sincerly, [redacted]



Dear Mrs. Butler,

Thank you for teaching us about the Suisun Marsh Watershed. I never knew what a watershed was until today. My favorite part was testing the water. My not so favorite part was touching the mud. It was a great experience for me. One thing I learned was that the Vacaville water goes to the Sac river. Thanks again!

[redacted]



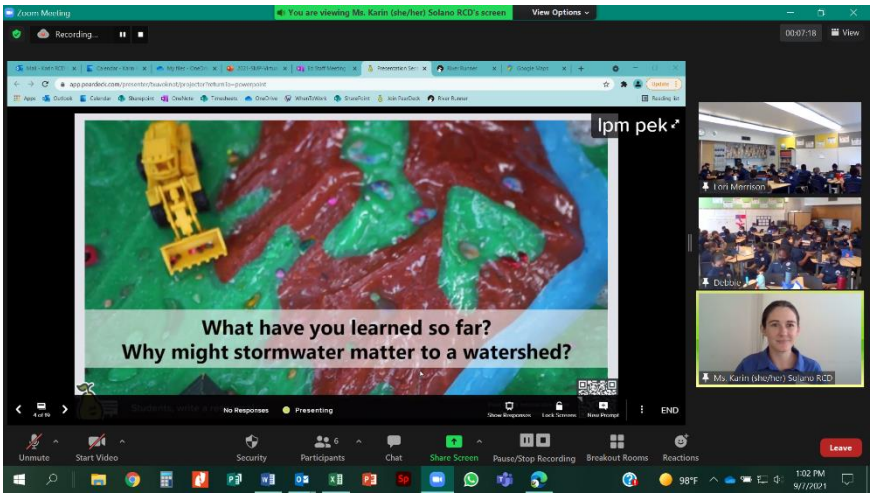
TO MR. DON

Thank You Mr. Don for teaching me about storm water drains and how to recycle old car oil. it was very nice of You to teach us that there is Otters in the marsh and that we need to keep our garbage out of the marsh. it was a verey fun day and I am glad You were the one to teach us.

APPENDIX D – PHOTO DOCUMENTATION

Program Educator Karin Young shows students samples of marsh soil during a virtual field trip.

Program Educator Paula Marckesano-Jones displays a test tube and color chart to help students interpret the results of a dissolved oxygen test during a virtual field trip.



Students from Public Safety Academy in Fairfield participated in a virtual lesson with an enviroscape, which taught them about how stormwater pollution occurs and how to prevent it.

Students from Browns Valley Elementary School in Vacaville use a turbidity tube to test the turbidity of water sampled from a slough at the Suisun Marsh.

Students listen to Program Educator Don Broderson introduce the soil station during on-campus field trip activities at Sheldon Academy in Fairfield.