Suisun Marsh
Watershed Education Program

2020-2021 Program Summary

Solano RCD is grateful to the 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 thirteenth year contracting 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. 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 incorporates research-based instruction practices highlighted by The BEETLES Project, a program of the Lawrence Hall of Science at University of California at Berkeley.

This year, Marianne Butler directed the program, Allison Martin managed the curriculum, and Lidia Tropeano coordinated teacher relations, scheduled lessons and was the field trip lead. Program Educators Gaia Pazienti, Laurel Olson, Arianna Oneto, and Shannon Denno facilitated live, virtual class lessons and/or field trips.

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:

- Identify the source of their drinking water and how drought affects their water supply;
- Describe the impacts of stormwater pollution on watersheds, particularly the impacts of motor oil, pet waste, chemicals, and trash debris;
- Implement the reduce, reuse, and recycle messaging to address stormwater pollution issues;
- Communicate stormwater pollution and drought impacts on the Suisun Marsh and how to address these issues.

The guiding question for the Suisun Marsh Program is:

> How can we identify human impacts on Solano County watersheds and how can we lesson 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.

AUDIENCE

The 2020-2021 program engaged the most participants in the program's history, with 2,104 students enrolled from 70 classes throughout Solano County. There were a total of 42 virtual field trips across Solano County. Over 46% of all Solano County sixth grade classes participated in the program.

In fall 2020, Solano RCD contacted all Solano County school districts to gather preliminary data on sixth grade registration. According to that research, we anticipated reaching 50.3% of all Solano County sixth graders. Upon completion of the school year, however, Vacaville and Vallejo school districts reported higher sixth grade student registration numbers than anticipated, resulting in a small drop in our goal outcomes.

The increase in enrollment mid-year is likely due to students returning to school for hybrid learning in spring 2021. This discrepancy is unlikely to repeat next year; however, Solano RCD will coordinate with Solano County Department of Education to prepare enrollment projections for 2021-2022 programming.

Table 1. *Summary of Program Enrollment by City*

Name of Participating School	City	# Students	# Classes
Benicia Middle School	Benicia	350	12
Dixon Montessori	Dixon	41	2
Center Elementary School	Fairfield	27	1
Grange Middle School	Fairfield	140	4
Green Valley Middle School	Fairfield	240	8
Public Safety Academy	Fairfield	128	4
Oakbrook Academy	Fairfield	55	2
Scandia Elementary	Travis AFB	67	2
Travis Elementary	Travis AFB	66	2
Crystal Elementary	Suisun City	260	7
Browns Valley Elementary	Vacaville	125	5
Cooper Elementary	Vacaville	120	4
Fairmont Elementary	Vacaville	67	3
Orchard Elementary	Vacaville	64	2
Highland Elementary	Vallejo	68	3
Loma Vista Environmental Science Academy	Vallejo	30	1
Mare Island Tech Academy	Vallejo	128	4
Solano Widenmann Leadership Academy	Vallejo	128	4
TOTAL 2020-2021		**2,104**	**70**
TOTAL ALL PROGRAM YEARS		**13,661**	**435**

METHODOLOGY

Three program sessions were held September-February with about a third of total participating classes attending each session. In response to the COVID-19 pandemic, all Solano County K-12 public school students were required to participate in virtual, online instruction for most of the 2020-2021 school year. To accommodate this new instruction style, Solano RCD updated the Suisun Marsh Program to be offered virtually.

Students participated in three weekly 30-minute classroom lessons prior to the field trip and a final 30-minute lesson after the field trip. Students also completed pre-lesson activities on Nearpod, an interactive online learning platform with videos, quizzes, and learning tools created by Solano RCD. Participants also created and shared videos in response to Solano RCD prompts on Flipgrid, a video discussion tool.

During the virtual activities, students engaged with educators by typing in the chat, using reaction keys, responding with hand signals, taking turns speaking on microphone and/or video, and responding to polls. The entire program consisted of the following components:

Lesson One: Students were introduced to the concepts of stormwater and watersheds as they pertain to the Suisun Marsh. They completed an introductory Nearpod module that included a prompt for students to create their own simple watershed model and then practice presenting their model on Flipgrid. For the live 30-minute virtual lesson, students discussed their models to help reinforce key concepts and practice discussion skills.

Lesson Two: Students learned how different surfaces affect the movement of stormwater. They used an interactive tool (Model My Watershed - Runoff Simulation) and digital maps to better understand the watershed concept and predict the flow of stormwater. There were no pre or post lessons.

Lesson Three: Students explored stormwater pollution and connected that to the global issue of marine debris. Prior to the live lesson, students completed a Nearpod module that prompted them to examine and collect data on storm drains in their neighborhoods and practice field journaling. Following their storm drain investigation, students shared their observations on Flipgrid. The 30-minute virtual lesson focused on the social-emotional learning aspect of marine debris and designing solutions to local and global waste management issues.

Field Trip to Rush Ranch Center: Two classes virtually joined two to 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 people can investigate the effects of stormwater pollution and drought on the health of 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 affects water quality specifically by interpreting dissolved oxygen and turbidity test results. For the plant station, students conducted scientific sketches of marsh plants or plants around their home and discussed how the marsh could look in 5 years due to drought, stormwater pollution, and invasive species.

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, 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: For the final lesson, students completed a Nearpod module centered on drought and tracking their water use. Students inputted their information into a Water Use Calculator and discussed their observations in a Flipgrid video. In the live-streamed lesson, students learned about Solano County rain variability and how they can help conserve water during times of drought. Students also participated in a Jeopardy-style game to demonstrate and reinforce what they learned.

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 question about students' general interest in stream monitoring and stewardship:

1. **What is stormwater?**
   Desired response: Stormwater is rainwater that moves or flows on land. In cities, it goes into storm drains and collects in creeks, rivers, or other nearby waterways.

2. **Why does stormwater matter to your watershed?**
   Desired response: Stormwater matters to my watershed because polluted stormwater can spread throughout

the watershed and harm plants, wildlife, and possibly our drinking water sources.

3. **What are three things we need to keep out of stormwater?**
   Desired response: Trash, motor oil, and pet waste; as well as pesticides, fertilizers, and other chemicals.

4. **What does drought do to the Suisun Marsh?**
   Desired response: During drought, the water in the marsh can become saltier or more brackish. Soils will be drier, affecting the plants that live there and their ability to survive. Dried out plants can be fuel for wildfires. All of this affects the availability of freshwater or food for living things in the marsh.

5. **Humans can't prevent drought, but what can they do about it?**
   Desired response: Work together to conserve or save water/use less water and save water in our reservoirs such as at Lake Berryessa.

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

The COVID-19 pandemic response required us to convert this year's program to an entirely online environment, including the assessments. This resulted in notable issues with the assessment process, particularly a drop off in the number of classes completing the post assessment: 1,203 students completed the pre-assessment questions and 967 completed the post-assessment. We discarded all pre-assessment data that was not paired with post assessment data, reducing our pre-assessment data set to 1,128 students.

Assessment Results

- **Pre-Assessment:** Working with a 25% sample of 282 pre-assessments, 66% of students provided correct or partially correct answers to the fixed answer questions (questions 1-5) prior to participating in the program:
  - 73% of students were able to correctly and partially correctly define stormwater (question 1).
  - 78% of students could not provide a correct answer for why stormwater matters to the watershed (question 2).
  - 75% of students could correctly provide at least one thing that should be kept out of stormwater (question 3).
  - 65% provided correct or partially correct answers about the impacts of drought on the marsh (question 4).
  - 71% were able to provide correct or partially correct answers to the question about best responses to drought (question 5).
- **Post-Assessment:** The number of students who completed the post assessment dropped 19% taken together, but 79% of students who provided responses to both the pre and post assessment instrument were able to provide correct or partially correct answers to all questions, and improvement of 13%. This includes an 18% improvement in the number of students able to correctly answer all questions.
  - Students who completed the post assessment provided correct or partially correct responses to 98% of the questions, and provided incorrect or no answer to just 2% of the questions.
  - 49% of students provided correct answers to question 3, an improvement of 43%.
  - 85% of students correctly identified good drought response behaviors (question 5), an improvement of 32%.

As we process our evaluation data across all programs, we continue to develop a better understanding of the challenges of virtual programming evaluation. There have been a statistically small number of plagiarized answers in every program, and we experience variable drop off in post assessment participation. We are working to identify the factors that contribute to these problems and develop appropriate responses wherever we can.

APPENDIX A – TEACHER/STUDENT FEEDBACK

Teacher Feedback (Anonymous)

"I know the program excited and piqued the interest of my students because many of them wrote in their weekly reflection about how they really enjoyed learning about the water shed and especially the virtual field trip."

"I keep signing up because the programs are wonderful. They are in our own backyard, so that makes the content real to the students. The presenters are great with the kids. It is obvious they are passionate about what they do. I hope we can go back outside next year. Thank you for all you do."

"Students told me they enjoyed learning about storm drains and what happens with trash as well as what happens during droughts."

Student Feedback

"I think the program is great for learning about the drought, watersheds and storm water things"
"One thing I took away is that drought in a Marsh can hurt a lot of things such as living things and plants."

Benicia Middle School, Benicia

"Being mindful of the amount of water you can use each day can be powerful way to prevent droughts."
"I think it's helpful so that when we are older maybe someday we will teach about this to."

Solano Widenmann Leadership Academy, Vallejo

"I gave the program this score because it was really fun and I enjoyed every second of it and learning about the Suisun Marsh, drought, and watershed."

Mare Island Technology Academy, Vallejo

"Why I gave the program a 5 is because it helps kids become more aware about litter in our storm drains and droughts, and we also could do fun things instead of just having to read."

Highland Elementary School, Vallejo

"I liked learning about our watershed and what we can do to help during drought, and to clean our city."

Orchard Elementary School, Vacaville

APPENDIX B – FLIPGRID VIDEO REPORT LINKS

CITY	SCHOOL	TEACHER	LESSON	FLIPGRID LINK (CLICK STUDENT NAME)
BENICIA	Benicia Middle	Mrs. Tuttle	Lesson 1	Tatum G. (Watershed Model)
DIXON	Dixon Montessori	Mr. McGovern	Lesson 3	David E (Storm Drain Inspector)
FAIRFIELD	Green Valley Center Elementary	Mr. Lapid Ms. Jones	Lesson 1 Lesson 3	Ava H. (Watershed Model) Joshua P (Storm Drain Inspector)
SUISUN CITY	Crystal Middle	Mrs. Rohrer	Lesson 1	Londyn V (Watershed Model)
VACAVILLE	Orchard Elementary	Mrs. McGilvary	Lesson 1 Lesson 3	Landon M (Watershed Model) Sophia B (Storm Drain Inspector)
VALLEJO	Highland Elementary	Mrs. Drane Mrs. Taylor	Lesson 3 Lesson 4	Daniel J (Storm Drain Inspector) Abigail J (Home Water Use)

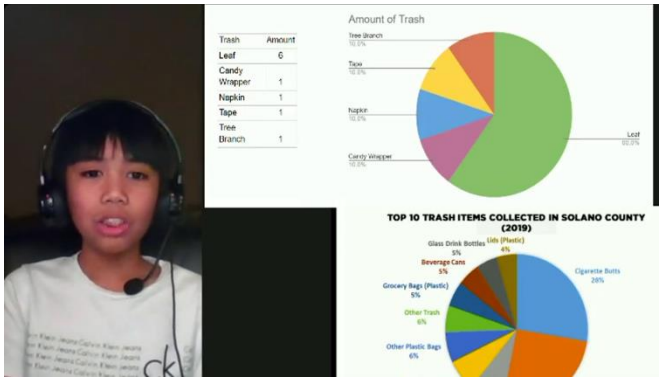
APPENDIX C – PHOTO DOCUMENTATION

Program Educator Shannon Denno prompts students to measure the turbidity of slough water as part of the water quality station.

Students compare wetland and grassland soil samples shared by Program Educator Laurel Olsen as part of the field trip soil station.

Program Educator Gaia Pazienti introduces students to different types of plants and how many of them are adapted to drought.

Program Coordinator Lidia Tropeano presents the water quality station from Suisun Slough at Rush Ranch Open Space.



A student from Center Elementary (Travis USD) compares the trash debris they found at storm drains around their home to Solano County Coastal Cleanup Day data. This was part of an activity assigned to students to complete prior to Lesson 3.

A Travis USD student uses a homemade watershed model to demonstrate how motor oil is carried by water through the local watershed. This was part of an activity assigned to students to complete prior to Lesson 1.