

# Suisun Marsh

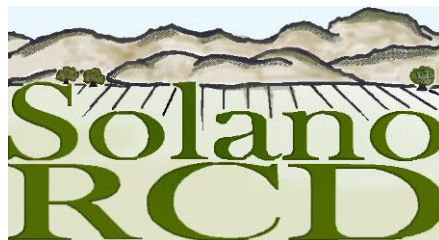
# Watershed Education Program

## *2018 Program Summary*

January 2019

***Program Funding***  
Solano County Water Agency

*Additional Funding*  
Solano County Office of Resource Management  
Fairfield-Suisun Sewer District



1170 N Lincoln Suite 110 Dixon, CA 95620  
Office 707.678.1655  
[solanorcd.org](http://solanorcd.org)

Solano County Water Agency (SCWA) is in the eleventh year contracting the Solano Resource Conservation District (Solano RCD) to implement the Suisun Marsh Watershed Education Program. Additional support is provided by Solano County Department of Resource Management and the Fairfield-Suisun Sewer District.

Sections of the curriculum were adapted from the California Coastal Commission's *Waves, Wetlands and Watersheds* and *Our Wetlands, Our World*. The teaching objectives are directly linked to California's Next Generation Science and Common Core standards. The curriculum was written in August 2008 and has been revised each year.

Marianne Butler manages the program, Allison Martin and Laura Morgan teach the in-class lessons and lead the field trips, and program educators Don Broderson, Carla Murphy, Wendy Low, Deborah Bartens, Shiree Rezendes, Briedi Scott, Marisa Coyne and Michelle Rozman lead field trip groups.

## **Students**

In 2008, 4 classes of 140 students participated from Crystal Middle School in Suisun City.

In 2009, 18 classes of 600 students participated from Crystal Middle in Suisun City, Grange Middle in Fairfield, Sullivan Middle in Fairfield, and Cambridge Elementary in the Travis Unified School District.

In 2010, 18 classes of 626 students participated from Crystal Middle in Suisun City and Grange Middle in Fairfield.

In 2011, 33 classes of 1,129 students participated from Crystal Middle in Suisun City, Grange and Sullivan Middle in Fairfield, Vaca Peña Middle and Orchard in Vacaville, Center Elementary in the Travis District, and Solano Middle in Vallejo.

In 2012, 27 classes of 882 students participated from Crystal Middle in Suisun City, Grange, Tolenas, and Suisun Valley in Fairfield, Vaca Peña Middle and Orchard in Vacaville.

In 2013, 27 classes of 869 students participated from Crystal Middle in Suisun City, Public Safety Academy, Matt Garcia, David Weir, Nelda Mundy, and Suisun Valley Elementary in Fairfield, Vaca Peña Middle and Orchard Elementary in Vacaville.

In 2014, 30 classes of 940 students participated from Crystal Middle in Suisun City, Public Safety Academy, Nelda Mundy, Rolling Hills Elementary, Grange Middle and B Gale Wilson in Fairfield, Vaca Peña Middle and Orchard Elementary in Vacaville.

In 2015, 41 classes of 1,299 students participated from Crystal Middle in Suisun City, Public Safety Academy and Nelda Mundy in Fairfield, Vaca Peña Middle and Orchard Elementary in Vacaville, Solano Middle in Vallejo, Benicia Middle in Benicia and Riverview Middle in Rio Vista.

In 2016, 21 field trips occurred with 43 classes of 1,281 students from Crystal Middle in Suisun City, Public Safety Academy in Fairfield, Vaca Peña Middle and Orchard Elementary in Vacaville, Solano Middle in Vallejo, Benicia Middle in Benicia, Gretchen Higgins in Dixon and Riverview Middle in Rio Vista.

In 2017, 15 field trips occurred with 33 classes of 899 students from Crystal Middle in Suisun City, Vaca Peña Middle and Orchard Elementary in Vacaville, MIT Academy in Vallejo, Travis Elementary in Fairfield, Benicia Middle in Benicia, Gretchen Higgins in Dixon and Riverview Middle in Rio Vista.

In 2018, 15 field trips occurred with 29 classes of 938 students from Sierra Vista K-8 School and Orchard Elementary in Vacaville, Cave Language Academy in Vallejo, Travis Elementary in the Travis Air Force Base, Green Valley Middle and Public Safety Academy in Fairfield, Benicia Middle in Benicia and Riverview Middle in Rio Vista.

## 2018 Suisun Marsh Watershed Education Program Summary

School	City	Grade	Total Students	Number of Classes
Sierra Vista K-8 School	Vacaville	7 <sup>th</sup>	120	4
Orchard Elementary	Vacaville	6 <sup>th</sup>	68	2
Riverview Middle	Rio Vista	6 <sup>th</sup>	64	2
Travis Elementary	Fairfield	6 <sup>th</sup>	70	2
Green Valley Middle	Fairfield	6 <sup>th</sup>	272	8
Public Safety Academy	Fairfield	6 <sup>th</sup>	130	4
Cave Language Academy	Vallejo	6 <sup>th</sup>	64	2
Benicia Middle	Benicia	6 <sup>th</sup>	150	5
<b>TOTAL</b>			<b>938</b>	<b>29</b>

**Since 2008, 9,603 students in 303 classes have participated in this program.**

### Deliverables and Results

All deliverables involved in planning and implementing this program were successfully completed.

Goals and objective include:

- Increasing student understanding of storm water pollution within their watershed, particularly the impacts of oil, chemicals and human debris in storm water;
- Increasing student awareness and knowledge of reduce, reuse, recycle messaging, and its impact on storm water pollution issues;
- Articulating the threats to Suisun Marsh and demonstrating how they can help mitigate these ongoing issues;
- Articulating how water moves through the watershed and how it ends up in the Delta and ocean;
- Understanding that drought is inevitable in the California landscape and how students can conserve water and lessen their impact on the water system.

### Methods

Program sessions take place August-October and October-December. Three classroom lessons are held prior to each field trip and one lesson occurs after the field trip. Each class has the option of participating in a poster session at their school and taking a field trip to the North Bay Regional Water Treatment Plant.

The student field manual is included with this report. The lessons are updated each year and align with the current state science standards. Descriptions of the lessons are as follows:

The first lesson is an overview of the watershed concept. Specifically, students utilize aerial maps and/or Google Earth to visually connect “watersheds” with the Solano County landscape. Students then interpret the flow of water in a watershed by participating in a watershed model demonstration. This demonstration involves the addition of representative “pollutants” (motor oil, animal waste, and trash) to a model landscape, adding representative “rain,” and tracking where the water goes. Using these activities as a foundation, students examine the Suisun Marsh watershed and interpret the path of water from its nearest cities into storm drains, creeks and into the Suisun Marsh.

During the second lesson, students work in groups and use topographic maps to answer a series of questions about where and how water flows through Solano County. During a second activity, students model the path a piece of litter takes from a student’s home, through the storm drains and creeks systems and eventually ending up in the ocean.

In the third lesson, students solidify what they’ve learned and talk about the ramifications of human behaviors on marine and marsh health. Students examine an albatross bolus and observe the quantity of plastic pieces the chick ingested along with its actual food. From there, students infer how the trash

ended up in the ocean. After describing how trash enters the ocean from in-land sources, students conduct a Solano County trash survey by sorting and counting the number of “trash” items collected during a “volunteer cleanup event.” From this activity, students can describe that the most common items ending up in Solano County waterways are single use plastic debris. After quantifying the trash, participants create a plan of action to reduce the amount of waste they personally contribute to the environment (such as by practicing the Three R’s).

An optional poster session allows participants to examine plants and animals found at Suisun Marsh more closely by researching and creating posters about the organism’s habitat, behavior, and population status.

The field trip at Rush Ranch Nature Center typically takes place between 9:15am and 1:45pm. Students have the opportunity to collect data and play the role of a scientist as they engage in three science stations centered on the topics of soil, water, and plants. At the soil station, students use a color chart to identify soil composition and use their hands to experience the different textures of soil in the marsh and grassland. At the water station, students test the water from First Mallard Slough for dissolved oxygen, temperature, phosphates, pH, and turbidity. At the plant station, students set up a plant sampling quadrat and analyze the percent cover of plant species (native or non-native, invasive) within the site using plant guides created by Suisun RCD. As a small group, they discuss the data from the different experiments and theorize how various types of storm water pollution, development, and invasive species may affect the Suisun Marsh.

Following the stations, students enjoy lunch at the picnic tables in a eucalyptus grove. Students also take a moment to assess the environmental impact of their lunch choices and how they can utilize the Three R’s (reduce, reuse, recycle) to have a waste free lunch.

Next, students explore the Rush Ranch property by taking a nature walk through the different habitats, which include a eucalyptus grove, grassland, and marsh. While on the walk, students look for scat, tracks, plants, and wildlife. Each student is equipped with a pair of binoculars to look for birds and they have the opportunity to view barn owls. An olive tree outside of the barn provides evidence of owls as students observe owl pellets found on the ground by the tree’s trunk.

Following the interpretive walk, students sit quietly on top of Overlook Hill and write poetry about their experiences and impressions of the wetland. Teachers submit the poems to River of Words. River of Words is a California-based non-profit organization that connects kids to the watersheds they live in through art and poetry. The organization runs an annual Art and Poetry Contest in conjunction with the Library of Congress. All program participants receive a Watershed Explorers Certificate. In 2010 a student from Grange Middle School was a finalist in the One Block Contest.

Lesson Four takes place following the field trip where students participate in a Water Conservation Challenge. Students first participate in a discussion about the importance of water in their daily lives and to reflect on how they would survive with extremely limited water resources. Students complete a prediction of their household’s water use for an upcoming day based on their family’s usual water use. After they complete their prediction, students take their worksheet home and log their family’s water use – as well as their own – for an entire day. Students also calculate the cost of their day’s water use and extrapolate it for a year. The goal of this lesson is to get students to assess if their water use is more or less than they predicted and to implement, along with their families, water conservation measures, as well as to consider how excess water usage impacts their watershed.

### **Program Evaluation Overview**

This program took place over an eighteen-week period during September through December, 2018. Student participants were asked to take a seven-question assessment quiz developed by program staff at the start of the program and again on the last day of the program. The participant cohort returned 850

pre-assessment quizzes and 830 post-assessment quizzes. From this response, a straight 20 percent sample was drawn from the pre and post-assessments. The data set can be found in Appendix C.

Student answers on the pre-assessment instruments in the two samples reflected very low knowledge about all the concepts examined in the quiz. Student ability to provide correct or partly correct answers to the 7 questions ranged from 7% to 47%. In the pre-assessment, students had the most difficulty explaining why the Suisun Marsh is important to the ecosystem, why they should conserve water, and describing the flow of water through a watershed system. They were slightly more able to name threats to the Marsh, describe ways to assess those threats and describe personal good watershed stewardship practices. Overall, the cohort returned just 19% correct and partially correct answers to the pre-assessment questions.

Post-assessment performance improved by 48%, improving most significantly in the questions about personal stewardship behaviors and environmental threat identification. Participants improved their responses to the water conservation question by 51%, with 63% of respondents correctly or partially correctly providing reasons for personal water conservation in the post-assessment instrument (compared to 12% in the pre-assessment). Performance on the general personal stewardship question improved by 61% over the pre-assessment, with 93% of respondents providing correct or partially correct answers. Response improvement to all questions was similar.

The assessment instruments ask students to provide both a sketch and narrative description of the path of water through a watershed. Curiously, in both the pre-assessment and post-assessments, students performed slightly better in the narrative version of this question, providing correct or partially correct answers 2% more in the narrative than they did in the drawing. This is a relatively small difference, but responses showed that it was consistent across the cohort.

Pre and post assessment of each Suisun Marsh Watershed Program class has been performed since the program's inception. Participating group size and composition varies from year to year based on project funding and district and teacher priorities, and there are too many uncontrollable variables including consistent long-term funding for us to meaningfully track results year to year or undertake longitudinal study of the program. That said, we do have a sense of trends and tendencies, and this year's class assessment results were generally consistent with those of previous years in terms of overall gains from pre to post assessment administration. We continue to use these assessments to look at the areas where students struggle and make program adjustments and adapt our methodology to improve student understanding of our core concepts.

Appendix A – Teacher Feedback

“This program positively engages students to understand that what they do affects our world. It makes them feel powerful.” Ms. McGilvary, Orchard Elementary, Vacaville

“The models and their ability to participate hands-on was so meaningful. This experience provided students with knowledge that they can use for a lifetime.” Ms. Glover, Orchard Elementary, Vacaville

“The program is great for young scholars because it exposes them to nature and their environment.” Mr. Saephanh, Riverview Middle, Rio Vista

“I love participating in this program. We always discuss these ideas, but it puts in perspective the local and personal part of the global issues.” Mrs. Phillips, Green Valley Middle, Fairfield

“A meaningful and engaging program that helps students understand the marsh and their impact on it.” Ms. McKenna, Green Valley Middle, Fairfield

“This program is relevant and gets students excited because it puts science in the context of something local.” Mr. Lapid, Green Valley Middle, Fairfield

“I thought this was one of the most engaging and effective programs I have ever experienced, and I’ve taught for 18 years!” Mrs. Grant, Cave Language Academy, Vallejo

“This is a fabulous program that brings awareness and knowledge of the watershed to students.” Mrs. Shishido, Benicia Middle School, Benicia

2018 Suisun Marsh Watershed Education Program Summary

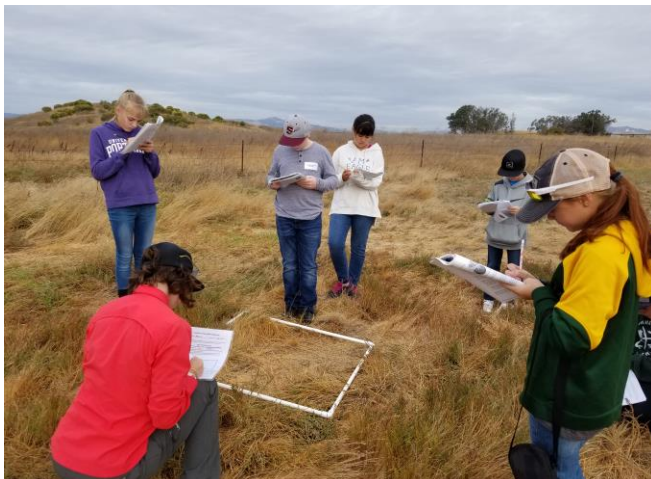
Appendix B – Photo Documentation



6<sup>th</sup> graders from Benicia Middle preparing for their nature hike to Overlook Hill



6<sup>th</sup> graders from Benicia Middle reading about the water test they are about to perform



Students and instructor plotting data at the plant station



6<sup>th</sup> graders from Orchard Elementary in Vacaville conducting a trash survey and talking about how it makes its way to the ocean



6<sup>th</sup> graders from Orchard Elementary in Vacaville painting their face with wetland soil

Appendix C: 2018 Solano County Environmental Education Suisun Marsh Watershed Program  
Pre and Post Class Assessment Data

#	Assessment Questions	Pre-Assessment								Post-Assesment											
		correct	%	part correct	%	correct & part. correct	%	wrong/ no answer	%	correct	%	Δ	part correct	%	Δ	correct & part. correct	%	Δ	wrong/ no answer	%	Δ
1	Why is the Suisun Marsh Important	16	9%	12	7%	28	16%	142	84%	114	69%	59%	4	2%	-5%	118	71%	55%	48	29%	-55%
2	What are the 3 main threats to Suisun Marsh?	0	0%	80	47%	80	47%	90	53%	90	54%	54%	76	46%	-1%	166	100%	53%	0	0%	-53%
3	As a scientist on a field trip, what three tests could you do to find out if the Marsh is healthy?	2	1%	52	31%	54	32%	116	68%	110	66%	65%	32	19%	-11%	142	86%	54%	24	14%	-54%
4	Why might we want to conserve (use less) water at home?	20	12%	0	0%	20	12%	150	88%	44	27%	15%	60	36%	36%	104	63%	51%	62	37%	-51%
5	What can YOU do to help protect your watershed?	32	19%	22	13%	54	32%	116	68%	134	81%	62%	20	12%	-1%	154	93%	61%	12	7%	-61%
6	Draw the path of a chip bag water carries it from your school to the ocean. You are not being graded on artwork, but you are being graded for include in all of the parts of the chip bag's journey.	4	2%	8	5%	12	7%	158	93%	54	33%	30%	50	30%	25%	104	63%	56%	62	37%	-56%
7	Now explain in writing what is happening in your drawing above.	5	3%	10	6%	15	9%	155	91%	58	35%	32%	53	32%	26%	111	67%	58%	55	33%	-58%
total percentage per category		9%		14%		19%		68%		45%		36%	22%		9%	68%		48%	20%		-48%

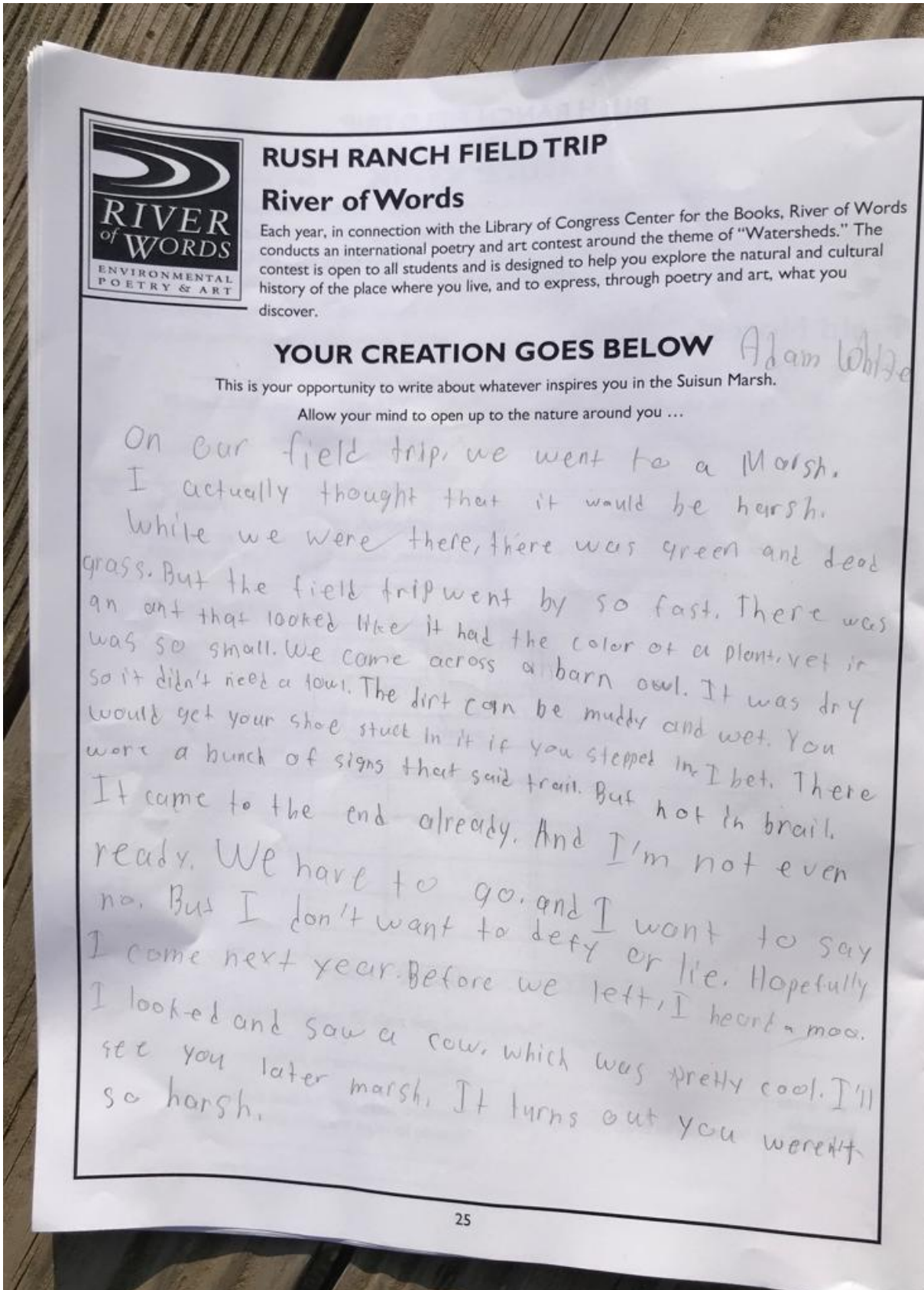
# pre-class assessment participants: 850  
sample total =20% = 170

# post-class assessments: 830  
sample total =20% = 166

- 2.38% fewer post assessment responses than pre assessment responses
- 20% sample drawn from total of each response group
- All numbers are rounded to the nearest integer



Appendix D – River of Words Poetry





Each year, in connection with the Library of Congress, the University of California, Davis, and the Suisun Marsh Watershed Education Program, the University of California, Davis, conducts an international poetry and art contest around the theme of "Watersheds." The contest is open to all students and is designed to help you explore the natural and cultural history of the place where you live, and to express, through poetry and art, what you discover.

### YOUR CREATION GOES BELOW

This is your opportunity to write about whatever inspires you in the Suisun Marsh.  
Allow your mind to open up to the nature around you ...

S  
U  
S

Nature in it's home  
Where beauty is grown  
Helping humans live  
Water it gives  
Collecting every drop  
Flooding does it stop  
Pollution clogs it  
People should stop it  
Birds have made this home  
This marsh has shown  
Watersheds are helpful  
But people are forgetful  
Our watershed is here  
It's time is coming near  
When trash won't be present  
Can people learn this lesson  
Watersheds are needed!  
Please be believing  
People can help  
What watersheds need

—S. Pollin

