



California Project WET Gazette

A project of the Water Education
Foundation

***Funded by grants from the Bureau of Reclamation, Mid-Pacific Region;
U.S. Geological Survey, California Water Science Center and
California Department of Water Resources
Volume XVIII, Issue IV Autumn 2013***

Color Me a Watershed

An otherworldly glow of scattered sunlight and the occasional scent of smoke still linger in the atmosphere of the Central Valley, as fires continue to burn in watersheds throughout the state. As I write, wildfires have burned roughly 547,759 acres or 856 square miles of the state – or an area size of the combined city footprints of Los Angeles, Sacramento, San Jose and Fresno. But the debris and potential for sediments to wash off denuded slopes into the nearest water body is only one of many threats facing our waterways at the end of our long, dry Mediterranean summers. Salmon are responding in record numbers to water temperature and chemical signals triggering the annual fall run. Predators, low water levels, increased sediments, urban storm water runoff and the accumulated litter floating through our neighborhoods and left behind near our shores by the thousands enjoying a California summer all pose threats to our returning salmon. Yes, some of these threats are natural, which salmon are well adapted to surviving after millions of years of evolution, but human activities in our watersheds pose new threats and increase others at a rate far more rapid than many species can respond – and fouls the water we drink and the beaches, streams, trails, campgrounds and parks we like to visit. Thus the reason for so many fall events aimed at cleaning up our shores and watersheds, fixing potential erosion hazards and checking the chemical pulse of our waterways – and Project WET can help students build awareness, conceptual knowledge and skills applicable to these volunteer opportunities, while helping connect this learning to Common Core and the Next Generation of science standards.

In 2010, more than 1.2 million pounds of trash and recyclables were removed from our beaches, lakes, and waterways by the 82,500 plus Californians who participated in Coast Weeks events. However, as noted in their promotion, these events are about much more than picking up trash. It's an opportunity to come together to as citizens to accomplish something vital, while learning about California water sources and good water stewardship from the source to the sea – which is where Project WET activities come into the picture. *'Common Water'* (p: 249) can introduce the concept of water as a shared resource to lower elementary students, while connecting the concept to local history and the need for management in the upper elementary portion of the activity– and the activity tends to generate a fantastic discussion on water quality after all those dirty fingers and whatever that stuff on the sponges gets left in the water! *'Sum of the Parts'* (p: 283) gets the same points across with upper elementary and middle school students, as they also learn about *'point source'* and *'non-point source'* pollutants and some of the methods or Best Management Practices (BMPs) used to reduce or eliminate their impact. *'A-maze-ing Water'* (p: 231), where students have to guide a drop of water through a maze of city streets to learn how activities in our

homes and schoolyards affect water quality, includes directions for use with grades K through 8 and is a wonderful follow-up to either or both activities.

We all have a role to play in water stewardship is highlighted in the above activities, but how do our actions connected to the watershed from source to sea? Teachers can help students ‘fill in’ their watershed using an adaptation of *‘The Incredible Journey’* (p: 155). Place the names for actual rivers, lakes, coastal zones, groundwater basins and high mountain areas (as a substitute for the ‘Glacier’ station) within your larger watershed on slips of paper in envelopes at each of the stations in the activity. Students draw and record the locations they visit as they take their journey through the water cycle – then plot the locations on a map, connect the dots and determine if the journey is feasible and if not, what path a water drop would to include in the story of their journey. This simple adaptation allows students to learn basic geography of a local watershed in addition to the learning and application of the vocabulary of water transitioning from state-to-state and place-to-place in the water cycle and the calculations of ratios or percentages of where water tended to reside in the cycle. The K-2 adaptation of *‘Discover the Waters of Our National Parks’* (p: 500) can be used with younger students to learn about a National Park site within your watershed. Trace the route water takes from the park to the nearest river – or from a coastal park back up the river nearest the school. Higher grade level students don’t just define the term ‘watershed’ in the Project WET activity *‘Seeing Watersheds’* (p: 187); they are also challenged to apply knowledge and skills associated with it to identify and delineate watersheds on a map. A number of mapping programs – including the **National Map** – make it easy to locate topographic maps, allowing students to apply their new skills to local watersheds and locate for themselves the connections from source to the sea.

National Public Lands Day is the nation's largest, single-day volunteer event for public lands in the United States and focuses on educating Americans about critical environmental and natural resource issues and the need for shared stewardship. Land use is the topic of *‘Color Me a Watershed’* (p: 239), where students learn how to use maps to study changes in land use over time, assess potential impacts within the watershed and calculate potential changes in water runoff due to the changes in land use. The name derives from Option 1 of the activity, where students use different colors to delineate land use areas – i.e., forest, agriculture, residential, wetland, etc. – on maps showing an area over a 100-year period. A series of questions guides students in interpreting the land use changes observed over time. Option 2 of the activity then has students applying their math skills to calculate and compare the scale of changing land use on the maps, then challenging them to calculate volume of rainfall and total percent run-off for each land use area in Option 3. Students use their calculations to revisit the earlier questions to see how math and science can be used to refine estimates for potential impacts on the ground. Land cover maps for a given area at different time periods can be generated from the National Map for students to apply their knowledge to interpreting local land use changes. The activity can also be extended the activity to the fires by having students blacken a portion of one of the maps to represent a fire – *How did the fire change the mix of land use in the watershed? There are no slopes in the activity – How may the runoff estimates change as slope increases? What if the slope was burned?* **NOTE:** Option 1 of *‘Color Me a Watershed’* has been used with students down to 3rd grade to introduce the concept of changing land use – often in regards to changes in habitat – and is often paired with *‘Just Passing Through’* (p: 163), where students investigate how vegetation – or the lack thereof – affects the movement of water over land surfaces.

The primary goal of World Water Monitoring Challenge (WWMC) is to educate and engage citizens in the protection of water resources, including awareness of how our own behaviors impact water. *‘Sum of the Parts’* (p: 283) raises this awareness and is one of the Project WET lesson plans available on the World Water Monitoring Challenge **website**. Another is *‘A Snapshot in Time’* (p: 377), where middle and high school students learn to discern differences in value between an individual water quality data set – collected at one time in one place in the watershed – versus a series of data sets collected at various points in a watershed over time. Also available is *‘Water Quality? Ask the Bugs!’* (p: 421), which allows students to practice their skills before every hitting a stream bank in a simulated stream bioassessment of aquatic macroinvertebrates in the classroom. Of course, Elementary students love *‘Macroinvertebrate Mayhem’* (p: 343), which uses a game of tag to simulate the effects of pollutants and other environmental

stressors on an aquatic macroinvertebrate population, to learn how organisms can act as indicators of ecosystem health. *'Blue River'* (p: 135) is also becoming a runaway hit and reinforces the concept of *'watershed,'* as students simulate a river system over a year, measure the flow and create a *'hydrograph'* of the data. Actual stream flow data can be pulled from local USGS stream gauges, which can be located and accessed using the USGS **Mapper** program.

An important aspect of Project WET activities is they don't just raise awareness of the negative aspects of environmental issues, but also challenge students to investigate solutions. Your school doesn't have to be on the banks of a stream to participate in Fall stewardship activities – as students will learn in the above activities, we are *all* part of some watershed and stewardship begins at our door step – or on the schoolyard. Students investigate and map the flow of water and what it is carrying through the school grounds in the activity *'Rainy -Day Hike'* (p: 169). While the K-2 version of the activity has students making boats and raising awareness of litter to track water flow, older students can identify issues and possible solutions. I've used a variety of the free, on-line mapping programs to get satellite and/or planning maps of school grounds for students to use with the activity, which eliminates the time spent on drawing buildings and gives student more time to do their investigation. Consider sampling the water coming out of the downspouts students locate in the activity, preferably within the first 20 minutes of the first fall storm and another sample after. If you don't have access to a test kit, have students observe and record what the water looks like before and after settling overnight – Use gloves when collecting the water! Pair *'Rainy – Day Hike'* with *'Storm Water'* (p: 395) to introduce students to specific BMPs to control storm water runoff, many of which are already being used in school programs to control storm water issues on their schoolyards. Schools adjacent to open land or slopes may also want to include *'Just Passing Through'* (p: 163) and/or review the list of BMPs listed in *'Sum of the Parts'* (p: 286-287) – a number of which have been implemented by students to mitigate actual post – fire runoff.

It is hoped the suggestions above will help you take students from awareness to action, whether this fall or at some point in the school year. Direct experience and application of knowledge are great at setting conceptual understanding and skills in one's mind and students are going to need every edge we can give them as they prepare for Common Core testing. Please check out the *'Websites of Interest'* to find additional information on issues mentioned above and resources to integrate with your Project WET activities.

WEBSITES OF INTEREST

Aquapedia

<http://www.aquapedia.com>

Developed and managed by the Water Education Foundation, Aquapedia provides balanced information on major water issues, topics, and terms. Teacher and students will find easy-to-understand information on water issues from the Sacramento - San Joaquin Delta to the Salton Sea to the potential impacts of climate change with photos, videos, interactive maps, historical timelines and other online tools providing background and context to understand California's complex water issues. The glossary of [water terms](#) in Aquapedia can be used to extend the Project WET activity *'River Talk'* (p: 175) for higher grade levels!

California Salmon Educator Guide

http://science.kqed.org/quest/files/imp/307a_CaliforniaSalmon.pdf

Overall, salmon have disappeared from more than 40 percent of their range in the West. While dams, logging, overfishing and development all pose serious problems to salmon on the West Coast, research shows that climatic and environmental changes in sea-level temperatures, sea-level pressure and wind patterns can also wreak havoc on fish populations. A resource for using QUEST video, audio, blogs and maps in the classroom.

Streamer

<http://nationalatlas.gov/streamer/>

Have you ever dropped a stick into a river and wondered where it might go as it floats downstream? Now you can trace its journey using an online map service that lets anyone trace upstream or downstream along America's major rivers and streams simply by picking a point on a stream. Not only will Streamer let you locate U.S. Geological Survey stream flow gaging stations, learn about current or historic stream flow, create concise or detailed reports for your upstream and downstream traces and print maps of your downstream and upstream traces. An excellent resource for use with Project WET activities such as *'Seeing Watersheds'* (p: 187), *'Blue River'* (p: 135) or *'Sum of the Parts'* (p: 283).

Fire and Resource Assessment Program

<http://frap.cdf.ca.gov>

The Fire and Resource Assessment Program (FRAP), a CAL FIRE program, provides a variety of products including fantastic maps on statewide fire threat, fire hazard, watersheds, socio-economic conditions, environmental indicators, and forest-related climate change. Much of this information involves Geographic Information System (GIS) analysis, tables, maps, data and calculation tools that are available on this website. The site is the source of the California precipitation map used in the California version of *'Discover the Waters of Our National Parks'* (p: 493).

The National Map

<http://nationalmap.gov>

The National Map is a collaborative effort among the USGS and other Federal, State, and local partners to improve and deliver topographic information for the Nation. The geographic information available from *The National Map* includes elevation, aerial photographs, hydrography, geographic names, boundaries, transportation, land cover, current and historical topographic maps. Tools in *The National Map* program allows the user to produce maps of the local area, delineate watersheds, calculate area and view changes in an area over time – All advanced versions of the skills introduced to students in the Project WET activities *'Color Me a Watershed'* (p: 239) and *'Seeing Watersheds'* (p: 187).

National Water Information System: Mapper

<http://maps.waterdata.usgs.gov/mapper>

The Mapper allows users to locate and retrieve data from approximately 1.5 million active and inactive stream gauges sites in all 50 States. You can find current and historical data on stream flow (discharge), temperature, specific conductance, pH, nutrients, pesticides, and volatile organic compounds for streams throughout California – information that can be used with *'A Snapshot in Time'* (p: 377) and as a comparison for a World Water Monitoring Challenge event. One can also find links to annual stream reports that date major flow changes to a stream and break the flow data accordingly, allowing students to graph and interpret the changes as a fantastic extension to the *'Blue River'* (p: 135) activity!

Bay Delta Conservation Plan

<http://baydeltaconservationplan.com>

The Bay Delta Conservation Plan (BDCP) provides a wealth of topics and information on current water issues at the very heart of the California water system that can be integrated into or used to extend many Project WET activities including: *'8-4-1, One for All'* (p: 299), *'Humpty Dumpty'* (p: 335), *'Invaders!'* (p: 263), *'Pass the Jug'* (p: 447) and a number of others. This website and the news blog Aquaforia will keep those interested current on the status of the plan. The Summer Gazette featured suggestions on how to use Project WET to integrate study of BDCP elements into your classroom and a Gazette archive can be found at: <http://www.watereducation.org/doc.asp?id=1066&parentID=1008>

CREEC Network

<http://www.creec.org>

For the 2013-2014 school year, The California Department of Education is proud to introduce a new and improved way for teachers to connect to exploratory, place-based, and environmental education instruction for students from pre-K through high school! With this site, we can help you easily access local student programs aligned to content standards and quality STEM instruction, as well as professional development opportunities that further support our collaborative educational endeavors.

Work for Water!

<http://www.workforwater.org>

Welcome to Work for Water! It's the place where students and job seekers can explore green careers, and utilities will find a clearinghouse of resources for recruiting in the wonderful world of water. Developed by the American Water Works Association and Water Environment Federation, this site is packed with resources to find jobs or prepare for rewarding careers in protecting public health and the environment. Use this website with the Project WET activity '*Urban Waters*' (p: 413) and have students learn about what it takes to work for water and get a great job for a great cause!

Flipping 'The Incredible Journey'

<http://projectwet.org/flipped-day/water-cycle>

As if 'The Incredible Journey' doesn't already have enough variations, now it has been turned into a 'flipped' lesson! Project WET's '*Discover the Incredible Journey of Water in the Water Cycle*' was one of nine lesson plans highlighted on the September 6th National Flipped Learning Day, but you can find the lesson – and a great video overview of the water cycle for kids – at the website listed above.

Project WET Portal

<http://portal.projectwet.org>

Have you used the code on Project WET Guide 2.0 to access the Portal? The site allows to you download and/or print any of the student copy pages in your guide and includes links to children's literature, media and material resources for use with each activity. The site includes the Common Core alignments for each 2.0 activity and a draft alignment to Next Generation Science Standards. Need more enticement? *Portal users now have access to the 46 Project WET activities that didn't make it into Guide 2.0!*

Water Facts & Fun

<http://www.water.ca.gov/education/wffcatalog.cfm>

Lots of free materials for California educators, including '*The California Water Works*' that has a colorful comic book character, Professor Goodwater, leading students through the water cycle, showing them how water is delivered through California's built and natural water systems to the end users. Guidelines for water conservation are provided as well.

If you would like more information on Project WET please contact Brian Brown, California Project WET Coordinator at: projectwet@watereducation.org or (916) 444-6240.

Check our website www.watereducation.org and/or contact us for updates.