



California Project WET Gazette

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Earth's Connected Systems

Earth Science Week occurs annually in the second week of October and is designed to promote awareness of the dynamic interactions between natural and human systems, while engaging students in exploring how this knowledge is applied in the geosciences. One will notice while perusing the *Events* section of this Gazette that the title of this article is the 2014 theme of Earth Science Week, with a goal of deepening student understanding of the interactions between Earth systems - geosphere, hydrosphere, atmosphere and biosphere. One will also notice a plethora of potential funding opportunities – so many, they have been divided into *School, Classroom & Teacher Grants* and *Student Contests*. At the top of the list is the State Water Resources Control Board's DROPS grant, which stands for Drought Response Outreach Program for Schools. The title of the grant makes sense, as the drought dominates our headlines with a running list of impacts from farmers struggling to get water to an increased incident of fire, a battle royale brewing in regards to groundwater management, hard questions on current and future water management, plenty of finger-pointing between neighbors regarding water use and some very frightening news regarding how long this drought may last. There has also been a rise in news on the use of water dowsers, cloud-seeding and a prediction for 'normal' winter precipitation in California in the most recent edition of the Old Farmer's Almanac. The curious thing about the DROPS grant is that it is *'focused on school projects that reduce storm water pollution.'* What!? It may not seem to make sense at first, but one way to reduce storm water is to catch and conserve the water before it can become a run-off problem. The grant description goes on to state the State Water Board is looking for applications from schools that also *'provide multiple benefits including water conservation and increased awareness of water resource sustainability. Projects must include an education/outreach component designed to increase student and public understanding of the project's environmental benefits and the sustainability of California's water resources directly related to the project'* Sounds like a great opportunity to engage students in a deeper understanding of Earth system interactions, while giving them an opportunity to apply knowledge and skills that will provide input to a school DROPS grant application, lay the groundwork for the class to engage in many of the other opportunities available this Fall all while helping make those Common Core and Next Generation Science Standards elements stick – and Project WET activities can help!

'Just Passing Through' (p:163) is a great place to start, as student engage in a simple simulation of how a stream may interact with the surrounding land with and without the presence of vegetation and how the resulting flow rates influence the processes of erosion, deposition and sedimentation. In the classroom, student understanding from the simulation can be applied to understanding how this naturally

occurring process influences biological communities along streams, human communities built along streams past or present, the formation of the Central Valley, the presence of gold and spread of mercury in our streams – and how our actions can alter the process. The activity is also a perfect set-up for *'Rainy Day Hike'* (p: 169), which has students sleuthing out and mapping where and how water will flow across the school grounds in the next storm. Students are also mapping likely water pollutants, rates of flow, a rough study area percentage of permeable and impermeable surfaces and I add a rough estimate of tree canopy and ground vegetation coverage – All information that could contribute to a DROPS proposal. The activity also provides a nice introduction to Geographic Information Systems (GIS) if you break the class into teams focused on a specific mapping element and they can see how each map provides a different layer of knowledge. The maps can also provide a great way to bring knowledge gained from other activities back to how the information applies to the study area.

A case in point would be helping students understand the links between the potential contaminants they mapped and 1) How water moves contaminants (*'A-maze-ing Water,'* p: 231); 2) What are the potential combined effects of contaminated water moving off multiple properties (*'Sum of the Parts,'* p: 283) and 3) What are common Best Management Practices (BMPs) that can reduce water pollution from storm water run-off? The activity *'Storm Water'* (p: 395) addresses this latter question and covers content addressing the very heart of the State Water Boards DROPS grant. The activity has students run simple simulations based on our society's storm water management philosophy that existed until very recently, then introduces them to ten common BMPs that are used to mitigate it. It should be no surprise most of the BMPs focus on slowing or capturing the flow of water, with the latter being the key element linking storm water reduction with the water conservation element of the DROPS grant. Most of the BMPs introduced in the *'Storm Water'* activity have been implemented by and integrated into school activities around the state, including native plant and rain water gardens, rain barrels or cisterns, and the installation of swales, retention ponds or trees on the school grounds. The *'Storm Water'* activity also includes a component that has students map the storm drains nearest the school – another key addendum to the *'Rainy Day Hike'* maps. *'Color Me a Watershed'* (p: 239) should be added to this list, as it engages students in understanding how changes in land use can effect storm water run-off rates – which again begs the question of how does this apply to the school and any potential storm water controls.

An understanding of the climate, precipitation patterns and soil are key factors in determining what storm water and water conservation measures would be appropriate for the school site. As noted in previous Gazettes, the California extensions to *'Discover the Waters of Our National Parks'* (p: 493) are a great way to introduce students at multiple grade levels to the array of California climate zones and the resulting effects on water availability, biological communities and the role of geography through the lens of National Park Service areas in California. A California extension has also been developed for the activity *'Water Address'* (Guide 1.0) to further explore the interactions between local environmental conditions and organisms in the elementary and middle school grades – the California cards include state endemic species that are being studied as key climate change indicators. A logical extension for either activity would be to investigate natural ecosystems in the local area and interpret what they indicate about the local climate and compare this to the biological make-up of the school grounds. *'A House of Seasons'* (Guide 1.0) remains a venerable hit in the primary grades, but I'd now consider using it with older students – with some modification - after what I observed in a workshop last Spring. Roughly 90% of the adults in the room drew nearly identical representations of how they perceive each season and it struck all of us that the representations were more reflective of climate zones east of the Mississippi River! The activity continues throughout the school year with students recording their observations of each season and reflecting on how their observations compare to their original perceptions. Extending the warm-up procedure in *'The Thunderstorm'* (p: 209) to include all senses gets students to think about how to use sensory awareness in observing the world, which can be reinforced by having them apply their senses – within reason – as they record their observations for the *'A House of Seasons'* extension. Precipitation monitoring and mapping in Part II of *'The Thunderstorm'* open the door to establishing or supplementing a school precipitation monitoring program – and as noted in previous Gazettes, local data can be gathered

from the Western Regional Climate Center allowing middle school students to apply the precipitation mapping knowledge to their area to better understand precipitation patterns. The students could also apply the skills from *'Color Me a Watershed'* (p: 239) to local precipitation data to calculate storm water volume estimates for the school grounds – All of which could be integrated into a school storm water reduction and conservation project. Soil factors can also greatly influence any project involving the ground. *'Wetland Soils in Living Color'* (p: 217) introduces students to basic soil properties and identification using a very simplified version of the Munsell color charts used by natural resource professionals, setting the stage for a visit by a local Natural Resources Conservation Service (NRCS) or other professional natural resources team to discuss soil science and assessing the school grounds for a potential storm water reduction project.

Multiple interdisciplinary pathways can be built off the activities above to create a course of study that integrates multiple Common Core and Next Generation Science Standards. There are also plenty of other Project WET activities that can enliven those potential pathways. A few examples would be having students apply the knowledge from *'The Incredible Journey'* (p: 155) or *'Seeing Watersheds'* (p: 187) to better understand where the school fits and interacts within the water cycle or within the local watershed; using *'Get the Ground Water Picture'* (p: 143) to study how the school grounds and neighborhood may interact with water infiltration into a local aquifer; or engaging students in a more ambitious study of the interaction of Earth systems and human communities through time in the local watershed through *'Make-a-Mural'* (p: 515). There are also past gazettes that outline the use of Project WET activities to address the *water conservation* element of the DROPS grant or using many of the activities mentioned in this article to tie into *Fall waterway clean-up events*. Please visit the *'Websites of Interest'* to find additional information mentioned in this article. Hope you have a wonderful Fall!

WEBSITES OF INTEREST

Current Conditions

<http://www.watereducation.org/post/current-conditions>

What are the current water conditions in California and the West? The Water Education Foundation has aggregated a number of the best websites to get this information – and often the data – that can both be integrated into your classroom.

DROUGHT: More water to be had in state, report says

<http://www.watereducation.org/aquaformia-news/drought-more-water-be-had-state-report-says>

By recycling more water, capturing storm runoff and boosting efficiency on farms and at home, California would have more than enough water to cover its needs, even during a drought, the authors of a new report said Tuesday. Almost 14 million acre-feet of water per year – enough to fill Lake Shasta more than three times – could be saved with the adoption of aggressive technologies across the state, according to research by the Pacific Institute and Natural Resources Defense Council.

Stormwater

<http://www.watereducation.org/aquapedia/stormwater>

Prior to modern urban development, precipitation was typically absorbed by the ground after storms, with water slowly seeping into underground basins. But as more ground became covered by buildings, roads and other infrastructure, runoff was directed into swift-moving conduits designed to drain areas quickly and prevent flooding. Today, these conduits continue to send stormwater to the nearest surface system—streams, rivers, and the ocean. This is particularly the case in urban areas with impervious surfaces such as pavement. *Click here* to review current and recent stormwater news headlines.

Streamer

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

Streamer lets anyone trace upstream or downstream along America's major rivers and streams simply by picking a point on a stream. You can 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), *'A Snapshot in Time'* (p: 377) or *'Sum of the Parts'* (p: 283).

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).

USGS: Runoff

<http://water.usgs.gov/edu/runoff.html>

When rain or snow falls onto the earth, it just doesn't sit there, it starts moving according to the laws of gravity. A portion of the precipitation seeps into the ground to replenish Earth's groundwater. Most of it flows downhill as runoff. If you have ever wondered how many gallons of water falls during a storm, use our interactive rainfall calculator to find out! <http://water.usgs.gov/edu/sc2.html>. USGS also has information on water dowsing. <http://water.usgs.gov/edu/dowsing.html>

Regional Climate Centers

<http://www.wrcc.dri.edu/rcc.html>

NOAA's Regional Climate Centers (RCCs) are a federal-state cooperative effort. The six centers that comprise the RCC The climate data provided is a wealth of information one can use with Project WET activities ranging from *'Wet Vacation'* (portal) to an extension of Part II of *'The Thunderstorm'* (p:209). Click the following link to find current California data summaries: <http://www.wrcc.dri.edu/monitor/cal-mon/index.html>

CoCoRAHS

<http://www.cocorahs.org>

The Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) is a non-profit, community-based network of volunteers of all ages working together to measure and map precipitation. Using low-cost measurement tools, stressing training and education, and utilizing an interactive web-site, our aim is to provide the highest quality data for natural resource, education and research applications. Learn how your class can participate in real hands-on science!

http://www.cocorahs.org/Content.aspx?page=CoCoRaHS_Schools

Water Facts & Fun

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

Lots of free materials for California educators, including Project WET's *'Discover Storm Water'*, a nationwide student activity book that explains what storm water is, where it comes from, how it can get polluted and can affect the environment and what we can do to prevent storm water pollution that was developed in collaboration with the California Department of Education.

CREEC Network

<http://www.creec.org>

For the 2014-2015 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.

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.