

# A Teacher's Guide to Rainwater Harvesting on Campus

By the Salmon Protection And Watershed Network, SPAWN

*"Rainwater Capture is transitioning from an individual act of personal survival and self reliance, to one that is replanting seeds of community, interdependence, resilience, and sustainability. Andy Lipkis, <http://www.treepeople.org/>*

*Every drop of rain is a looking glass. Anonymous.*

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### **BACKGROUND ~ Why Each Drop Counts!**

\* Global population growth, pollution and climate change are all accelerating and clean, freshwater is becoming increasingly limited in supply. Reducing our water footprint is necessary for our survival!

\* Enormous volumes of water are lost each winter as rain pours off our roofs and other impermeable surfaces into storm drains. And, during the hot, dry summer months 30-50% of our water use goes to irrigating our landscapes! So we can tap into a winter resource (storm water) to meet part of our summer irrigation needs!

\* As we send this water down storm drains we interfere with the natural Hydrologic cycle: instead of feeding the cycle by allowing water to infiltrate into the ground, we deprive it. This results in dehydration of the soil and the water table. Working to keep the water on your property and in the ground helps create more resilient terrestrial and the stream ecosystems.

\* Creek health is also impacted by unnaturally high water flows, which cause erosion and carry pollutants from parking lots, streets and yards.

\* Harvesting rainwater can contribute to flood mitigation on both a large scale and on an individual property, as well as decrease the energy required to pump, treat and supply water.

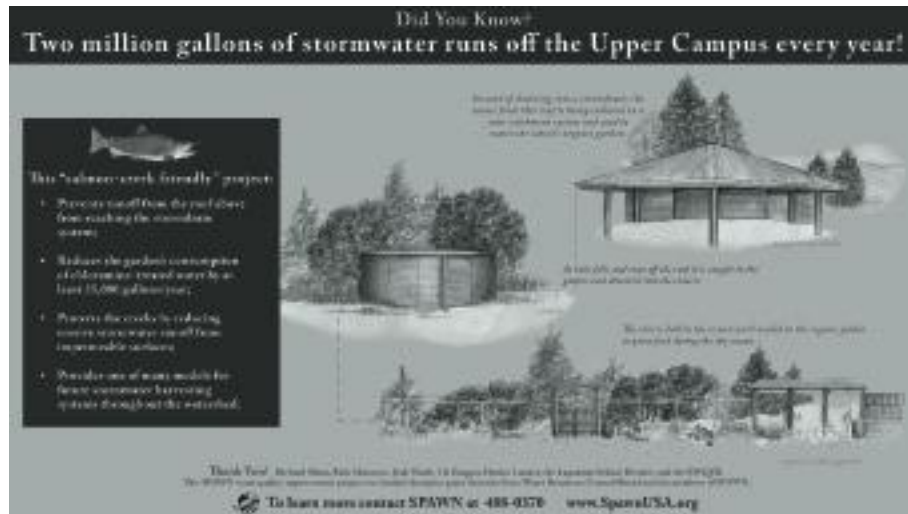
\* The more rainwater we can harvest, the less we have to rely on water coming to us from unsustainable sources (i.e.; an energy-intensive desalinization plant, or distant watersheds).

## DEMONSTRATION SCHOOL PROJECTS

School campuses, and especially food or pollinator gardens on campus, are great locations to create rainwater harvesting projects. Parent and student participation in fun, outdoor and sustainability-focused projects is relatively easy to secure. Campus projects are also highly visible and serve as model projects for thousands of students, parents and teachers together.

Check these successful School Rainwater Harvesting Projects out! **Read their stories at the links provided...**

○ *Lagunitas School Project, Lagunitas CA.*



<http://raingardens.spawnusa.org/lagunitas-school-organic-garden.html>

○ *Marin Waldorf School, Terra Linda CA.*



## BENEFITS OF HARVESTING THE RAIN!

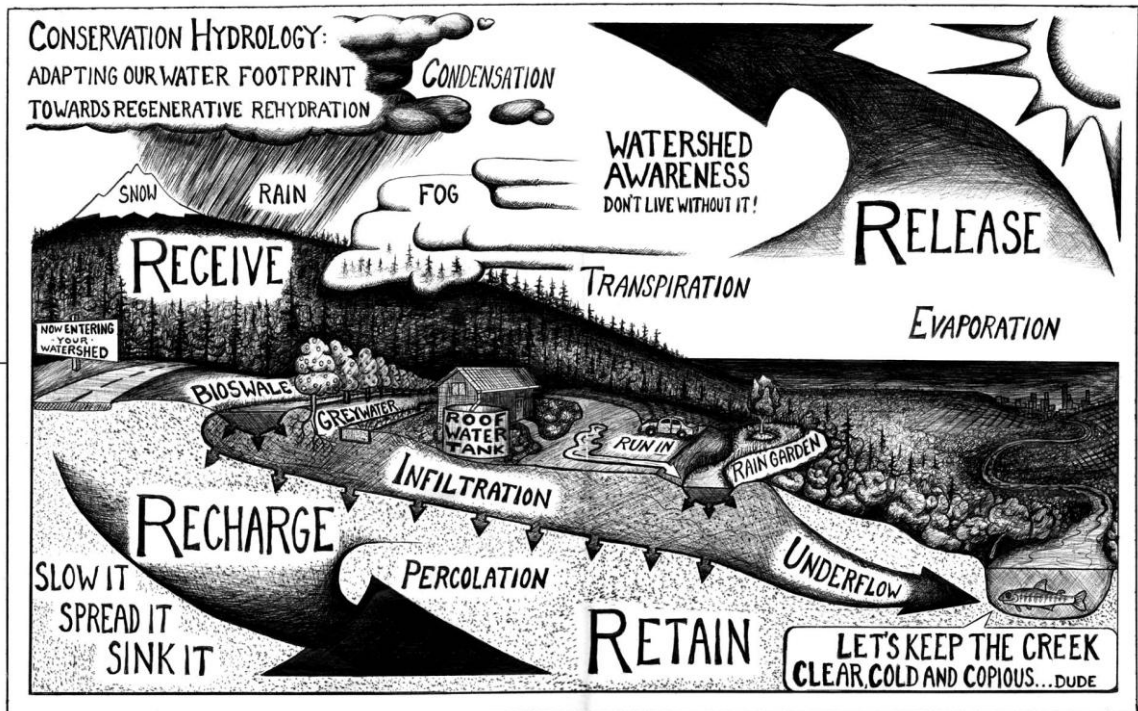


Illustration by Jim Coleman. Occidental Arts and Ecology Center's WATER Institute, [www.oaecwater.org](http://www.oaecwater.org)

### Conserves Precious Water In Our Rivers and Streams

- In California, most all of the water we drink comes from behind dams fed by rivers dependent on snowmelt or rainfall. For example, if you live in Southern Marin, we get 75% of our water primarily from rainfall collected behind large dams on Lagunitas and Nicasio Creeks. An estimated 50% of historical salmon habitat in Marin County has already been lost behind dams. And still, local demand exceeds local supply, so the remaining 25% of the water we consume is diverted from the Russian and Eel rivers in northern California, endangering already devastated salmon runs in these watersheds as well.

*During the hot, dry summer months 30-50% of our water is used to irrigate our landscapes! By harvesting rainwater we can tap into an abundant winter resource (storm water) to meet part of our summer irrigation needs and reduce the demand on our precious treated, municipal water supplies!*

*The more rainwater we can harvest locally and the more we adapt our water "footprint" to matching local supplies, the less we have to rely on water coming to us*

*from distant watersheds or from costly pipelines and energy-intensive sources such as desalinization.*

### **Prevents Stormwater Pollution into Our Rivers, Streams and Bays**

- Living in a suburban/urban environment, we are surrounded by paved surfaces that are designed to divert rainwater like waste into stormdrains in enormous quantities, very quickly, rather than allow it to slowly soak into the soils where it can recharge groundwater.

In Marin County alone, billions of gallons of rainwater pour off of impervious surfaces, into our creeks each year. This means more water running off faster-- tearing up creek banks and harming aquatic life such as salmon. Along the way, this lost resource also picks up pollutants such as motor oil, gasoline, heavy metals, pesticides and animal waste which eventually makes its way into our streams and bays.

- Harvesting rainwater helps reduce impacts on our sewage treatment plants which more and more are overwhelmed and experiencing failures and spills into our bays during storm events.

### **Recharges Groundwater and Reduce Erosion of Local Streams**

- By "throwing away" all this rainwater, we interfere with the natural hydrologic cycle: Instead of feeding the cycle by allowing water to infiltrate into the ground, we deprive it. This results in dehydration of the soil and the water table and leads to bone dry creeks during the summer. Baby salmon need water! So runoff has serious consequences for streams that steelhead or coho fry depend upon.
- Stormwater runoff contributes to flooding. Harvesting rainwater can contribute to flood mitigation on both a large scale and on an individual property.

## **TAKING ACTION.... HARVESTING RAIN ON YOUR CAMPUS!**

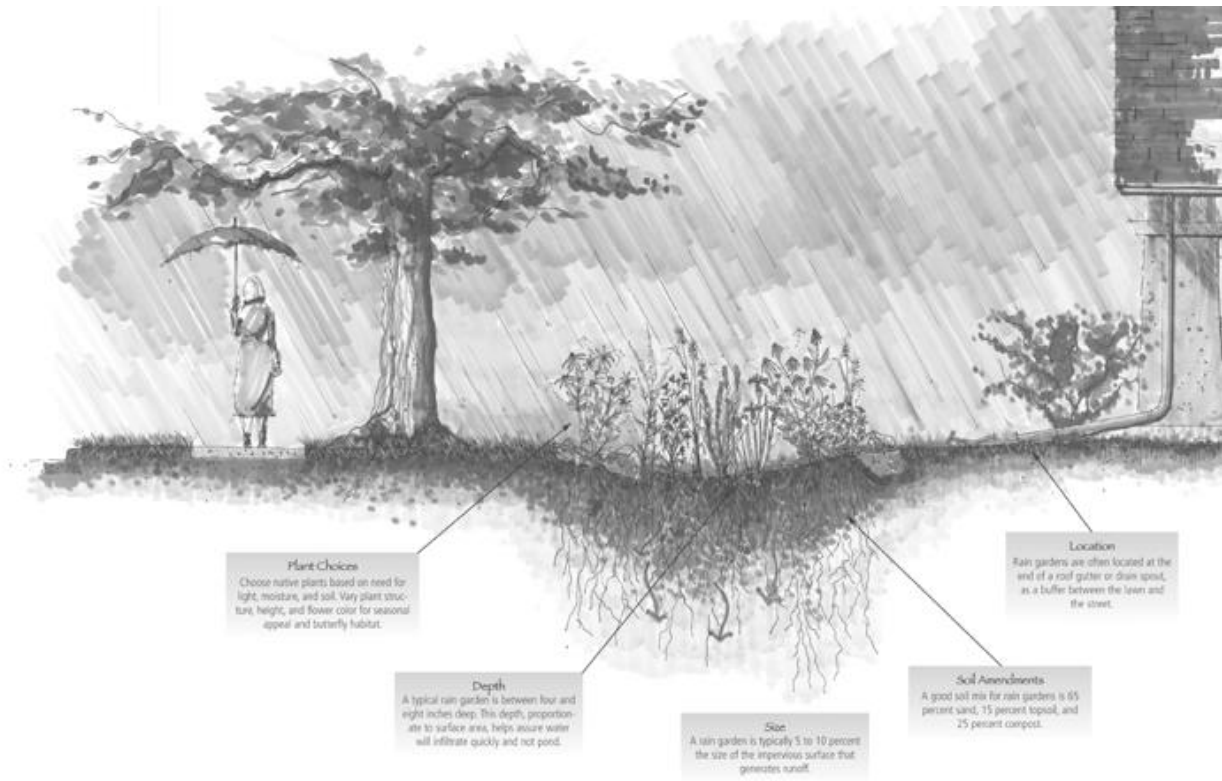
**Simple, and scalable (depending on time and resources), techniques can be used to conserve water and energy while protecting our campus' watersheds.** Two simple strategies include:

1. Gather a group of fellow students and friends and build *Rain Gardens* on campus to "Slow, Spread, and Sink" rainwater!

**What is a Rain Garden?** A Rain Garden is a wide, shallow depression in your garden that can capture rainwater from a downspout (or paved area such as a playground or parking area) and allow it to slowly percolate into the ground.

Rain Gardens are mulched and planted with beneficial species that can withstand having their roots moist in the winter (when it is raining) and can also withstand dry conditions in the summer. Rain Gardens add beauty, provide habitat (e.g. pollinator gardens or food gardens) while also capturing and filtering storm water to keep our rivers and streams clean!

- **Organize a work party to build your Rain Garden! Many hands make light work!**



2. Install a **Rain barrel or Cisterns** to catch and store winter rainfall from your roof. Catching and storing roof water to help irrigate your gardens reduces the demand on precious potable water for our gardens, and also helps reduce the large amount of energy it takes to deliver municipal water to your tap. Rain barrels and cisterns work really nicely together with rain gardens built in to capture the overflow out of the rain barrels/cisterns.

- **Rain barrels (often recycled food-grade barrels) are now widely available at local hardware and garden centers.**
- **Organize a Rain Barrel Art Party to beautify them!**



## Designing your Campus Rainwater Harvesting Project

**DURATION:** *Adaptable depending on time available. Process involves assessment.*

**AGES:** 6-12 grades

**SUBJECT AREAS:** *Math, Natural Sciences, Geography, Biology*



*Photos: Laura Honda and Manor School's Green Team with their 3,000-gallon rainwater harvesting system that irrigates the Ishi Bee and Butterfly Sanctuary, a pollinator and science-learning garden*

### PREPARATION

1. "What is a Watershed" environmental curriculum
2. Review of "Where Does Water Run" and "Can Water Get Through This" environmental curriculum
3. MATERIALS
  - A. Map of your campus or area being assessed for rain water harvesting potential.
  - B. Calculators
  - C. Graphing paper

## PROCEDURE

### ***YOUR CAMPUS RAINWATER FOOTPRINT***

**Duration:** 2-3 hours (adaptable)

**Subject Areas:** Math, Natural Sciences

**Objectives:** Identify stormwater runoff – where it originates from, where it goes

**Start with your own classroom....**

- Ask the students to count the downspouts that drain water off the roof of your classroom. Have them locate the buildings and mark the downspouts on the map.
- During the next rainstorm, have the students follow and map the path of the water from the downspouts draining your classroom. You will need to make observations while it is raining! Be prepared, watch the weather report, and plan accordingly!
  - i. How much water drains from the roof with 1” of rainfall? [Use the “Where Does Water Run” curriculum to help you calculate the runoff.]

**Next, explore runoff from the closest parking lot on campus...**

- ii. Where does the water drain to? Is the water flowing into grassy areas? Or, does the water disappear into a stormdrain below ground. If so, where does that stormdrain lead to? Have each student diagram and map the flow of the water.
- iii. Have each student calculate how much water drains off this parking lot with 1” of rainfall. [Use the “Where Does Water Run” curriculum to help you calculate the runoff.]
- iv. Does the water look clean or is it turbid (full of sediment) or oily?
- v. Discuss what pollutants are possibly being carried in the water from the parking lot? How do [research] these pollutants impact young salmon and aquatic life?
- vi. How does the quality of the roof water compare to the quality of the runoff from the parking lot?

### ***HARVESTING THE RAIN ON CAMPUS ~ Designing your Student-Led Project!***

**Duration:** Variable and adaptable. Project is appropriate for a semester-long project.

**Subject Areas:** *Math, Geography, Natural Sciences*

- **Objectives:** *Design and implement a rainwater harvesting system to reduce stormwater and other runoff from entering the creeks.* Discuss ways in which your students can help prevent pollution and stormwater runoff on your campus. Can you build a rain garden, or install a cistern and rain garden, to capture stormwater from your classroom? How – students can research their local watershed organizations, water or utilities districts and look for ways to design and plan the process.

**Additional Design Resources & References:**

- SPAWN's 10,000 Rain Garden Project ~ Check out <http://www.spawnusa.org/water> or give us a call and we will help!
  - San Francisco Public Utilities Commission ~ <http://www.sfwater.org>
  - East Bay:
    - Friends of 5 Creeks ~ <http://www.fivecreeks.org/>
    - Urban Creeks Council ~ <http://www.urbancreeks.org/>
  - North Bay:
    - Occidental Arts & Ecology WATER INSTITUTE ~ <http://www.oaecwater.org/>
  - ALL regions
    - Rainwater Harvesting for Drylands ~ <http://www.harvestingrainwater.com/>
- Have the students map (where on campus will it be located) and draw a schematic of your rainwater harvesting design, including a rain barrel and a rain garden, to capture water from the classroom and allow rainwater to percolate into the ground.
  - Have the students identify what supplies you will need – soil, plants, shovels, rain barrel or cistern, plumbing, etc.
2. Schedule a field tour and have the students present their project ideas to their schoolmates and teacher and gather feedback on the design. Explain the problem statement, and then present your solution. Gather feedback from everyone, are there ways to improve your design and get support from your peers (volunteer help, donations of time and supplies) to help you build the project?
  3. Once the design is complete, have the students present the final project to their peers and invite the School principal.

4. Have the students brainstorm ways to raise money for the project and supplies (cisterns, rain barrels, soil, plants, etc.): bake sales, car washes, community fundraiser, etc.
5. Have the class organize a Rainwater Harvesting Workday, invite friends, schoolmates, teachers and parents to help and donate needed supplies. Make sure to take before and after photographs!
6. Create a scrapbook and/or website to document and SHARE your project.

## EVALUATION

After the development and implementation of the rainwater catchment and/or gardens, have the students evaluate its effectiveness and discuss the positive effects on the nearby creeks. Discuss other ways they can educate the community about water conservation.

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