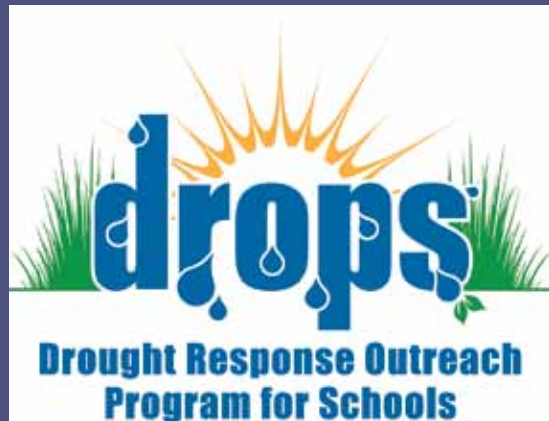


Drought Response Outreach Program for Schools (DROPs)



Technical Assistance Webinar
September 26, 2014

Presented by:

Kevin Robert Perry, ASLA, Urban Rain | Design
Darla Inglis, Ph.D., Low Impact Development Initiative

Webinar Outline

1. Why we need to rethink how rain and storm water are managed
2. How Low Impact Development (LID) can make a difference
3. Technical assistance for LID concept designs is being offered during the DROPS application period





PART 1

Rethinking Stormwater Management

Rethinking Stormwater Management



Photo: Kevin Robert Perry

Too Much...



Photo: frostproofblog.com

Too Little...



The Hydrologic Cycle in the Natural Landscape

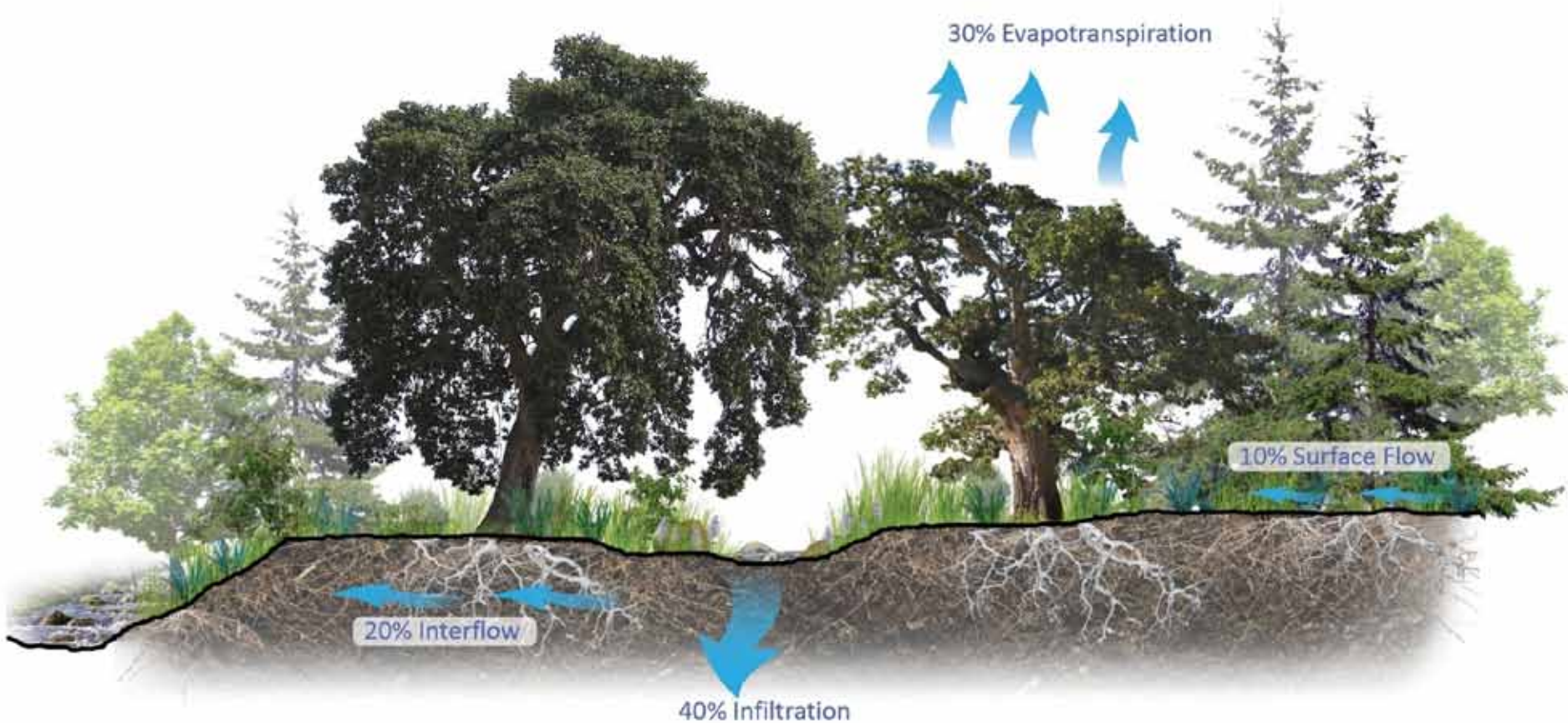


Photo: Nevue Ngan Associates



The Hydrologic Cycle in the Urban Environment

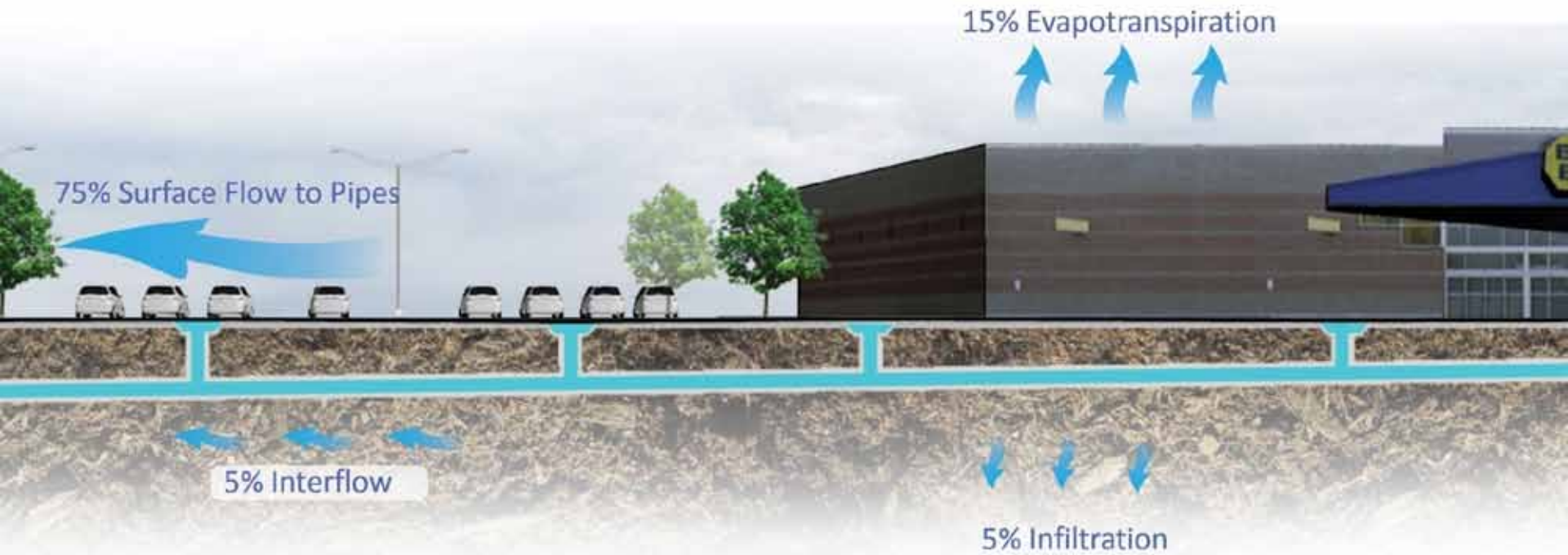


Photo: Nevue Ngan Associates



Conventional Mangement Devalues Water



Conventional Mangement Devalues Water



City of Richmond, CA



USGS

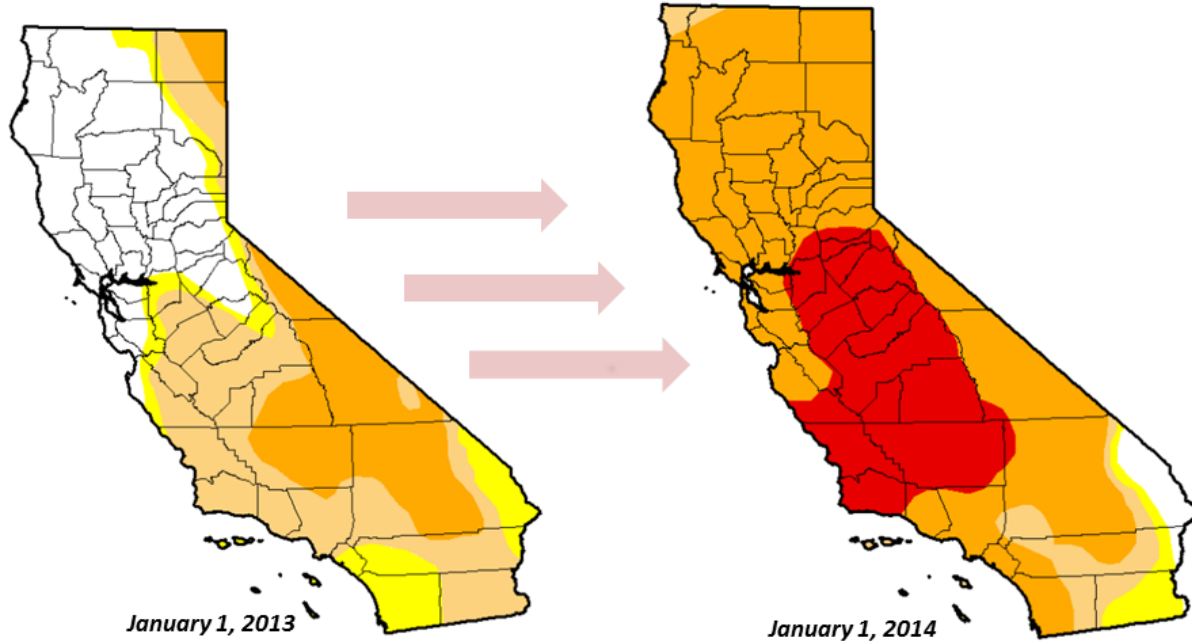


Heal the Bay



Conventional Development Inhibits Absorption

Drought Monitor for California – One Year Change



<http://droughtmonitor.unl.edu/>



August 19, 2014

We need to protect and replenish our groundwater resources



Conventional Development Inhibits Absorption



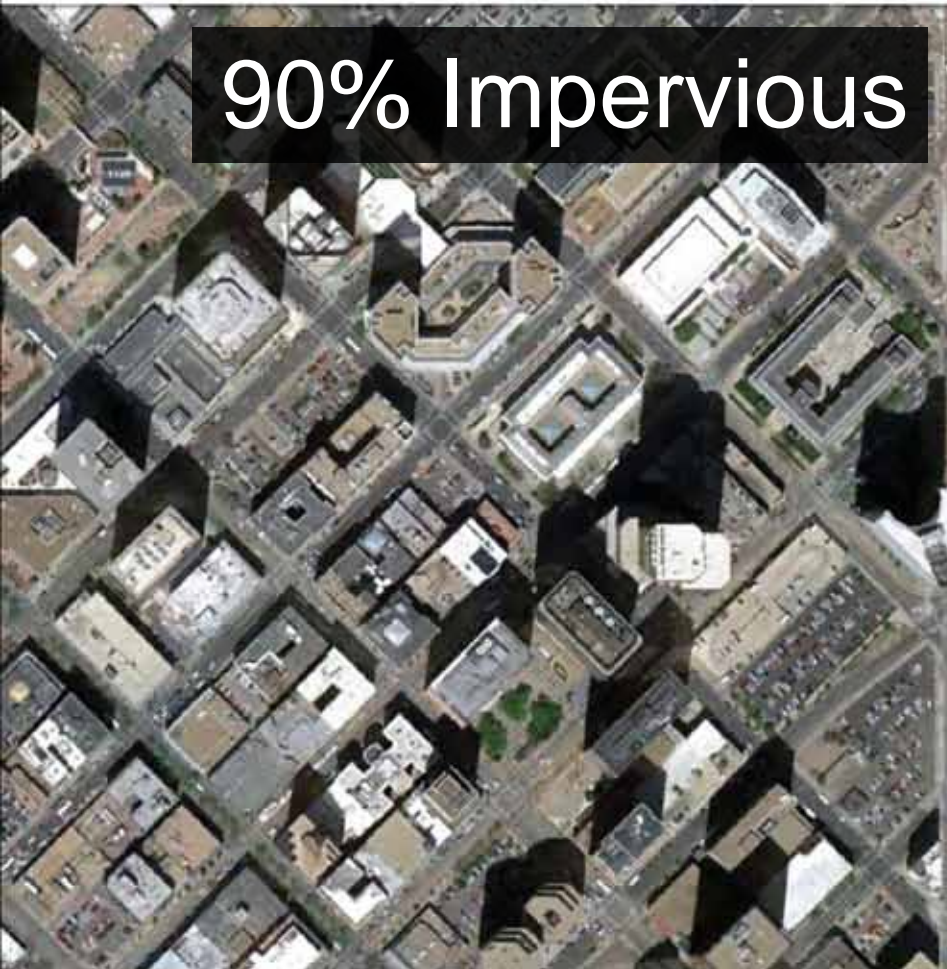
Photo: Kevin Robert Perry

Wouldn't it be great to capture and use this water?

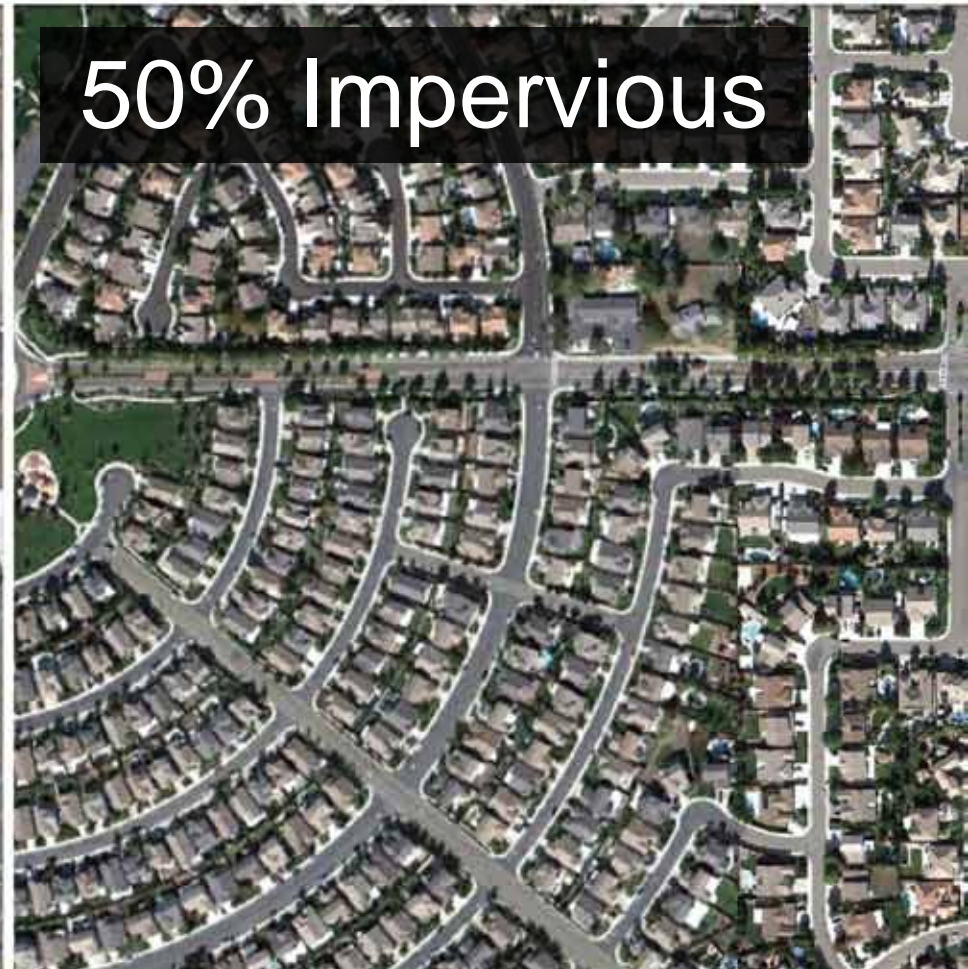


Conventional Development Inhibits Absorption

90% Impervious



50% Impervious



Photos: Google Earth

Ultra-Urban Conditions

Suburban Conditions



Conventional vs. Sustainable Management



Photo: Patchogue Village



Sustainable Stormwater Management



What's so special about this parking lot?

It was built using basic LID design principles

Photo: Illinois Environmental Protection Agency





PART 2
Low Impact Development (LID)

Low-Impact Development (LID)



Design techniques that reduce the impacts of urbanization by mimicking the natural hydrologic cycle.

- **Evapotranspiration**
- **Slow the Flow**
- **Infiltration**
- **Storage**
- **Pollutant Removal**

Photo: Kevin Robert Perry



Listing Grant LID Techniques

- Bioretention basins
- Vegetated swales and filter strips
- Reduced impervious area
- Permeable pavers/pavements
- Rooftop capture/use (cisterns)
- Tree/planter box filters
- Constructed wetlands

Additionally:

- Asphalt removal or ornamental turf replacement with drought-tolerant landscaping



The LID Common Design Strategies



Vegetated Swales



Stormwater Planters



Rain Gardens



Pervious Paving



Rainwater Harvesting



Water-wise Landscapes



Vegetated Swales

DEFINITION: Vegetated swales are shallow landscaped areas designed to capture, convey, and potentially infiltrate stormwater runoff as it moves downstream.

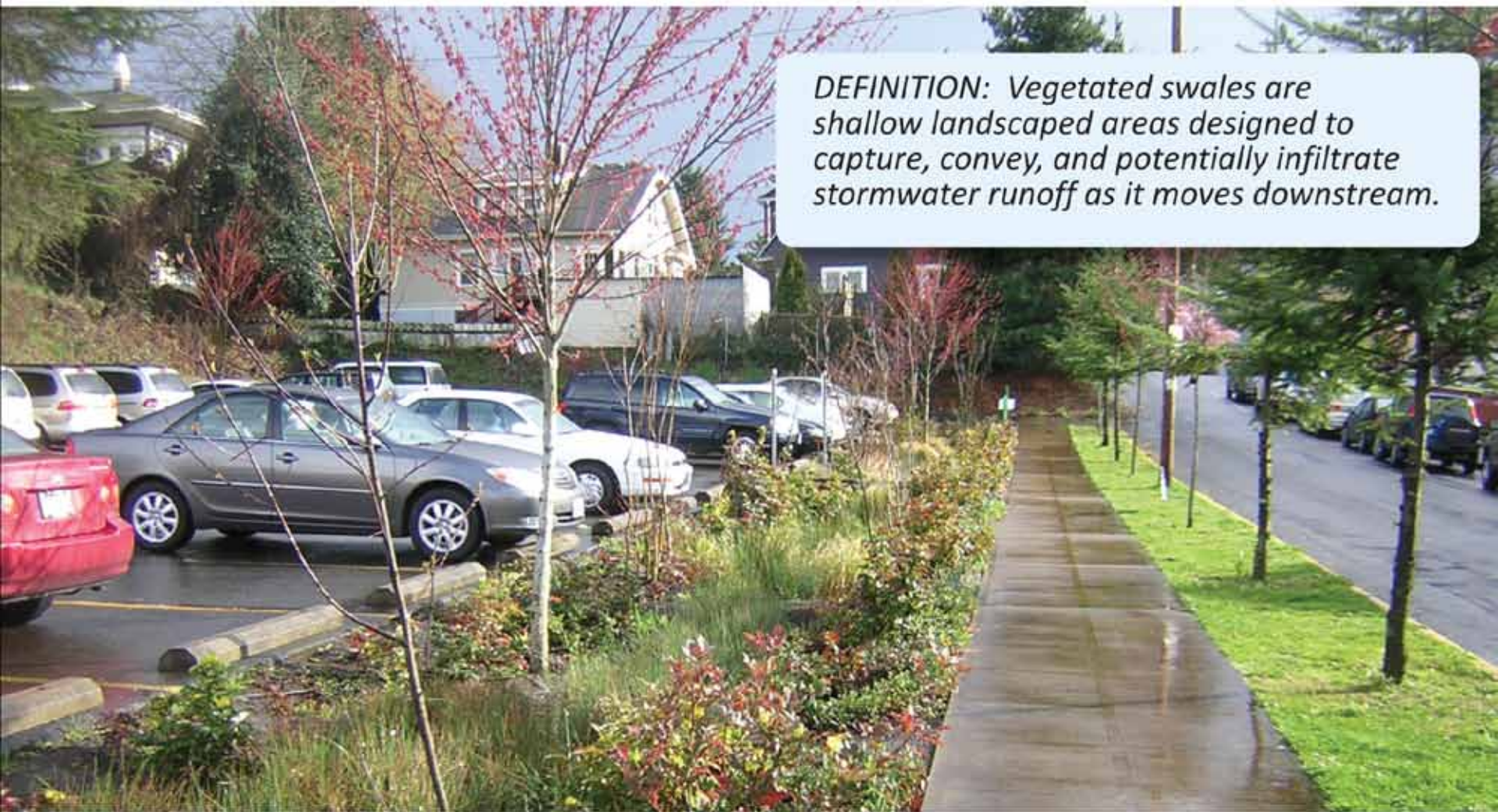


Photo: Kevin Robert Perry





Vegetated Swales





Photo: Kevin Robert Perry

Why Choose Vegetated Swales?

-  Swales are a widely-accepted stormwater strategy.
-  Swales often require less infrastructure to build and as a result are simple to construct and relatively low cost to implement.

Potential Constraints?

-  Swales need long, continuous spaces which can be difficult to find in retrofit conditions.
-  In street and parking lot situations, the design needs to maintain adequate pedestrian circulation.



Stormwater Planters

DEFINITION: Infiltration and flow-through planters are contained landscape areas designed to capture and retain stormwater runoff.



Photo: Kevin Robert Perry



Stormwater Planters




Photo: Kevin Robert Perry

Why Choose Stormwater Planters?

-  They are the best landscape solution for more urban/tight-space conditions.
-  Can fit between other streetscape elements (trees, utilities, signage, etc.) and are highly versatile in shape and size.
-  Can provide both volume and flow stormwater benefits.

Potential Constraints?

-  Are generally more expensive than swales due to increased hardscape infrastructure.



Rain Gardens

DEFINITION: Rain gardens are shallow landscape areas that can collect, slow, filter and absorb large volumes of water, delaying discharge into the watershed system.



Photo: Kevin Robert Perry






Rain Gardens





Photo: Kevin Robert Perry

Why Choose Rain Gardens?

-  Can often significantly “green” a space that would otherwise be leftover space.
-  Can provide the greatest stormwater flow and volume benefit because of their large size.
-  Offer versatility in shape and size.

Potential Constraints?

-  Often more maintenance required because of their large size.
-  Can be difficult to find large spaces for rain gardens in ultra-urban or retrofit conditions.



Pervious Paving

DEFINITION: Pervious paving allows rainwater to either pass through the paving system itself or through joint openings between the pavers.



Photo: Kevin Robert Perry






Pervious Paving






Photo: Kevin Robert Perry

Why Choose Pervious Paving?

-  Reduces the size of stormwater treatment measures
-  Can be the only viable option in ultra-urban conditions or in parking lots that are interiorly drained
-  Can be used on parking lot, streetscape, or walkway applications with a wide variety of materials available.

Potential Constraints?

-  Requires well-drained native soil
-  Has a relatively high installation cost and can be more difficult to maintain.
-  Has a limited infiltration effectiveness on street slopes over 5%



Rainwater Harvesting

DEFINITION: The ability to capture and reuse rainfall in order to reduce reliance on potable water for landscaping needs and provide a recharge benefit to underlying groundwater aquifers.

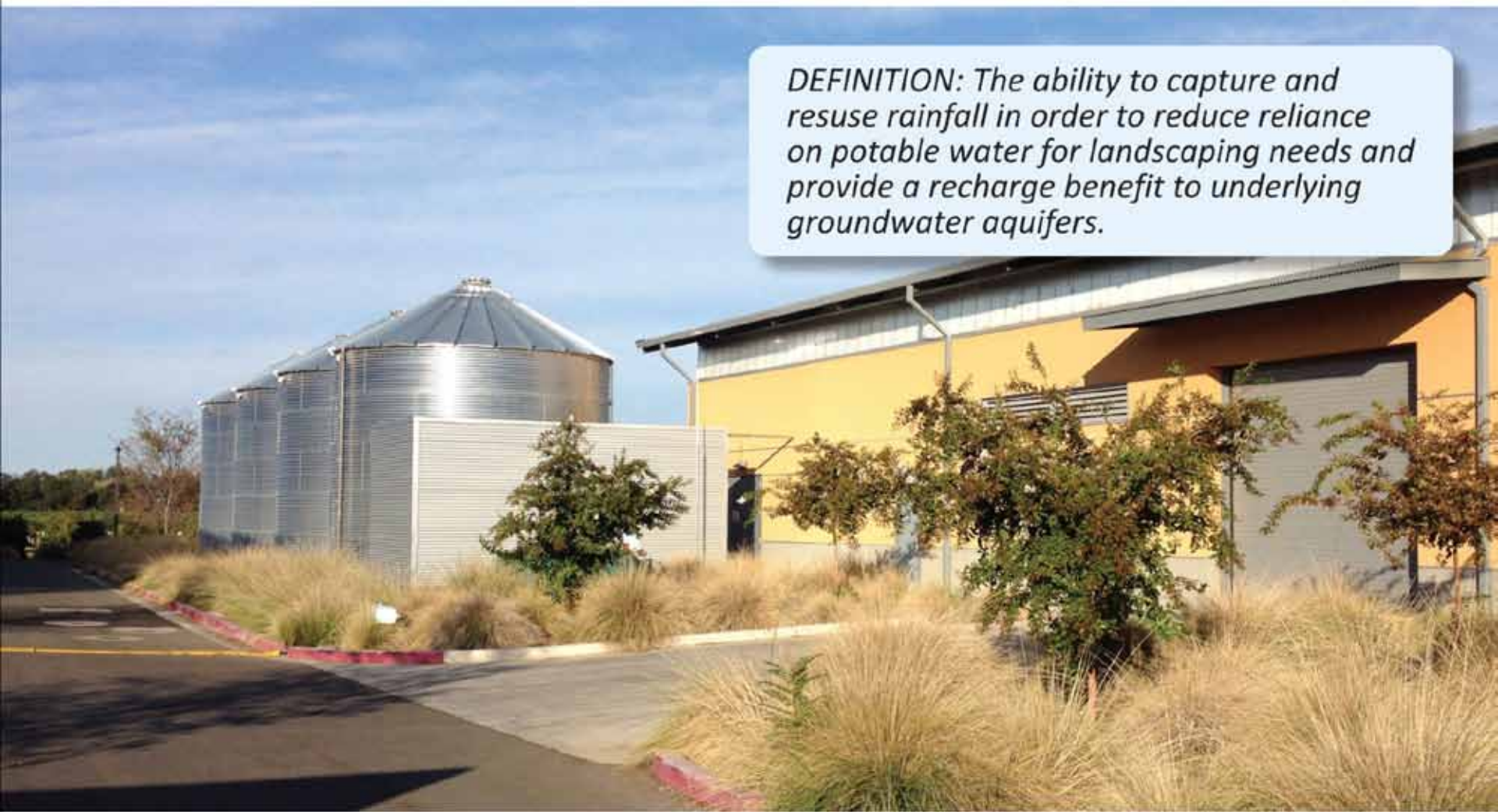


Photo: Kevin Robert Perry







Rainwater Harvesting





Photo: Texas A&M AgrLife Extension Service

Why Choose Rainwater Harvesting?

-  Captured water can be reused to irrigate adjacent landscape areas.
-  Cisterns can be made of a wide variety of materials and sizes.
-  Depending on the cistern type, they can be relatively simple to install and do not need extensive design and engineering.
-  Rainwater harvesting serves as a very tangible water conservation education tool.

Potential Constraints?

-  Needs more operational support than other passive LID designs.
-  Timing of rain supply doesn't always correspond to irrigation demand.



Water-Wise Landscaping

DEFINITION: Water-wise landscapes are those that utilize California native plantings or adaptable ornamental plantings that conserve overall water use.



Photo: GoHomeDesign.com






Water-Wise Landscaping





Photo: GoHomeDesign.com

Why Choose Water-Wise Landscaping?

-  Can absorb more water during rain events and conserves water during dry conditions.
-  Can be inexpensive to convert lawn to water-wise landscaping.
-  Building downspouts can easily be directed into large landscape areas with minimal infrastructure.

Potential Constraints?

-  Generally requires some extra training to successfully maintain water-wise landscapes.
-  Is a different aesthetic than typical lawn and shrubs landscape that might take time for general acceptance.



LID and Green Infrastructure Fits Everywhere!



Streets



Parking Lots



Buildings



Site





PART 3
Low Impact Development and Schools

Existing School Conditions



Photo: Kevin Robert Perry

If They're Lucky, They Get This...



Existing School Conditions



Photo: Kevin Robert Perry

But Usually They Get This...



Existing School Conditions



Photo: Kevin Robert Perry

But Usually They Get This...



Existing School Conditions



Photo: Kevin Robert Perry

But Usually They Get This...



Existing School Conditions



Photo: Kevin Robert Perry

But Usually They Get This...



Existing School Conditions



Photo: Kevin Robert Perry

But Usually They Get This...



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Interior Courtyards Can Be Redesigned With Landscape



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Interior Courtyards Can Be Redesigned With Landscape



Finding Retrofit Potential at Schools

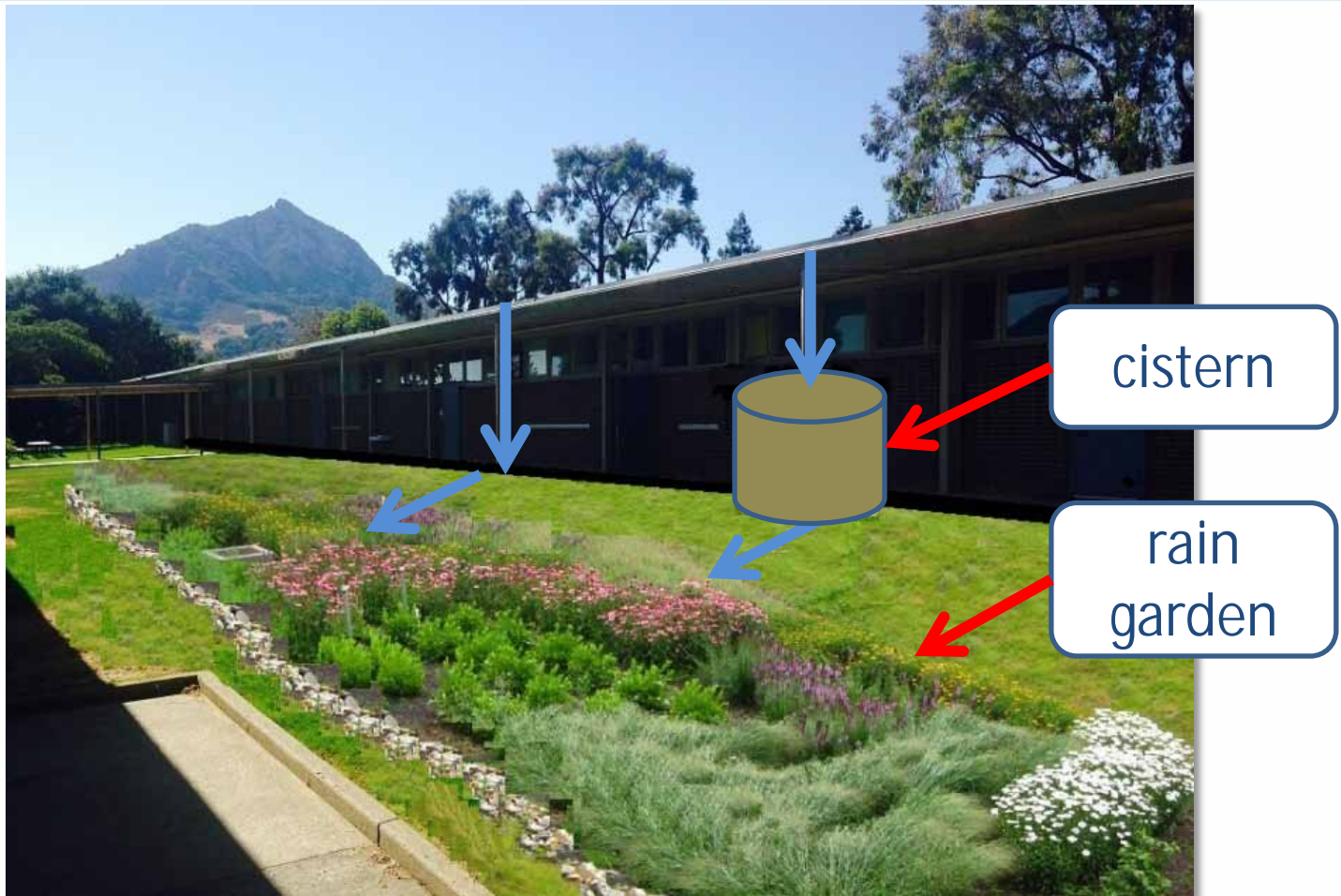


Photo: Kevin Robert Perry

Perimeter Landscape Can Be Repurposed



Finding Retrofit Potential at Schools



cistern

rain
garden

Photo: Low Impact Development Initiative

Perimeter Landscape Can Be Repurposed



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Perimeter Landscape Can Be Repurposed



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Roof Downspouts Can Be Disconnected



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Roof Downspouts Can Be Disconnected



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

The Perimeter of Play Areas Can Be Redesigned



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

The Perimeter of Play Areas Can Be Redesigned



Finding Retrofit Potential at Schools



Photo: Henry Stevens

Parking Lots Can Be Redesigned With Landscape
and/or pervious pavement



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Lunch/Student Gathering Space Can Be Redesigned



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Lunch/Student Gathering Space Can Be Redesigned



Finding Retrofit Potential at Schools



Photo: City of Watsonville

Lunch/Student Gathering Space Can Be Redesigned



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Adjacent Street Frontage Can Be Redesigned



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Adjacent Street Frontage Can Be Redesigned



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Adjacent Street Frontage Can Be Redesigned



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Adjacent Street Frontage Can Be Redesigned



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Adjacent Street Frontage Can Be Redesigned



Finding Retrofit Potential at Schools



Photo: Kevin Robert Perry

Adjacent Street Frontage Can Be Redesigned



LID Transformations



2002

Photo: Kevin Robert Perry

Glencoe Elementary School
Portland, Oregon



LID Transformations



Photo: Kevin Robert Perry

Glencoe Elementary School
Portland, Oregon



LID Transformations (multiple strategies)



2006

Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



2006

Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Mount Tabor Middle School
Portland, Oregon



LID Transformations



2008

Photo: Google Earth

Brisbane City Hall Rain Garden
Brisbane, California



LID Transformations



Photo: Kevin Robert Perry

Brisbane City Hall Rain Garden
Brisbane, California



LID Transformations



Photo: Kevin Robert Perry

Brisbane City Hall Rain Garden *Brisbane, California*



LID Transformations



Photo: Kevin Robert Perry

Brisbane City Hall Rain Garden
Brisbane, California



LID Transformations (multiple strategies)

2014



Hacienda St

Photo: Google Earth

Laurel Elementary School
San Mateo, California



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Laurel Elementary School
San Mateo, California



LID Transformations (multiple strategies)



Photo: Kevin Robert Perry

Laurel Elementary School
San Mateo, California



to Engage.....



Photo: Kevin Robert Perry

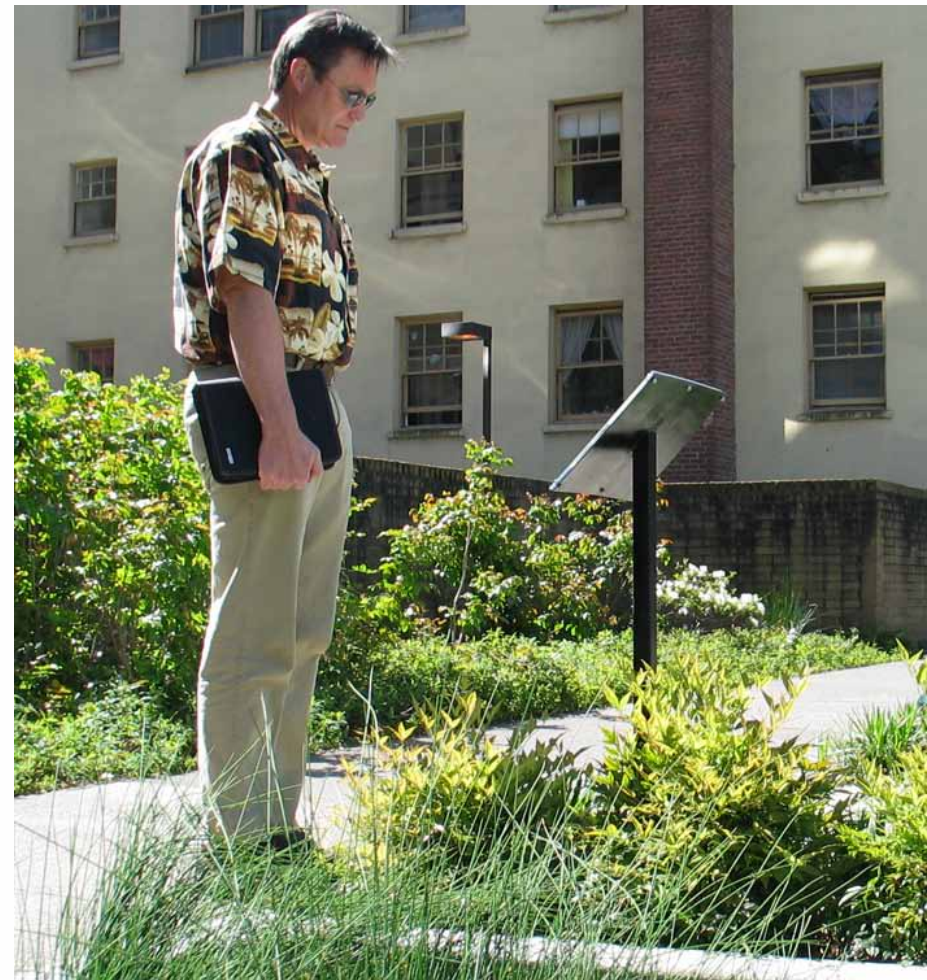


Photo: Kevin Robert Perry



Grow as Environmental Stewards

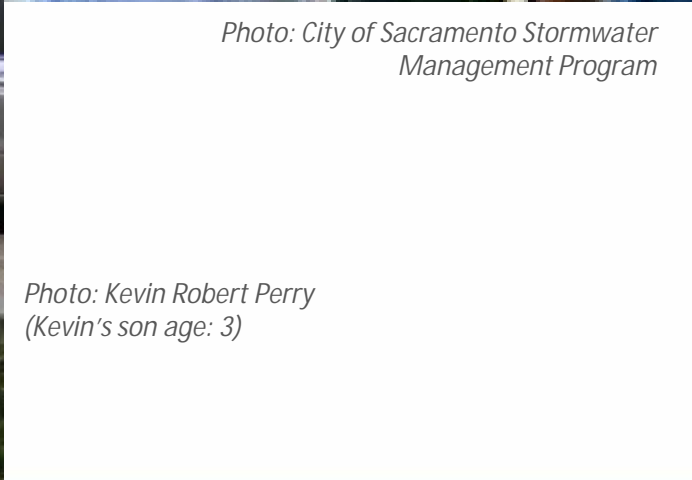
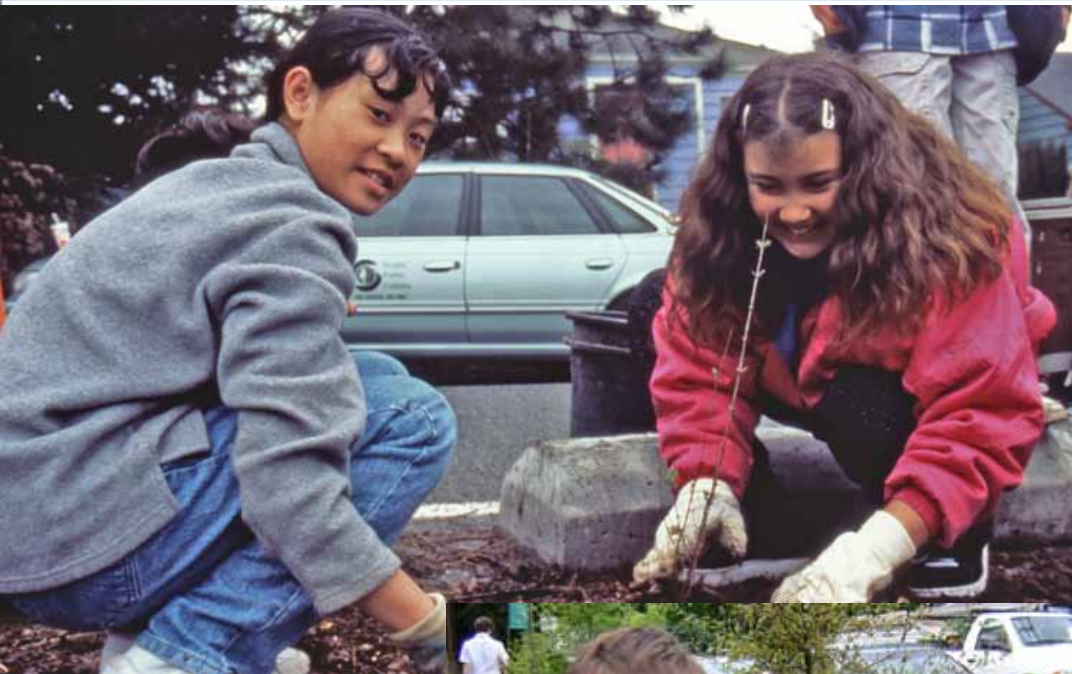


Photo: Low Impact Development Initiative

Photo: City of Sacramento Stormwater Management Program

Photo: Kevin Robert Perry (Kevin's son age: 3)





PART 4

Developing A Grant Proposal: Technical Support

DROPS Technical Assistance for Grant Applicants

- State Board is offering technical assistance for selected grant applicants to help develop concept designs for common LID practices such as bioretention, rain gardens, and pervious pavements.
- Assistance will be provided by LID experts including those who have experience with LID implementation at K-12 schools.



DROPS Technical Assistance for Grant Applicants

- Two types of technical assistance will be offered:
 - 1) A technical assistance email “hotline” to answer relatively short questions.
 - 2) More comprehensive assistance which may include site visits to identify potential LID projects and associated concept designs, and estimation of project costs and benefits.



DROPS Technical Assistance for Grant Applicants

- Interested applicants must submit an application for technical assistance
- Disadvantaged Schools will be prioritized
- The application is available on the DROPS website
- Applications are due October 10, 2014



Technical Assistance Application for Low Impact Development Projects

Please tell us more about your school, so we can evaluate your need for technical assistance. **Once you have completed this form, please email to: Ranvir.Jawanda@waterboards.ca.gov.**

1. Name of School District or County Office of Education(COE) (primary grant applicant):
2. Primary School District/COE contact name, title, phone and email:
3. Name and address of each project location requesting assistance (*sufficient to locate via Google Maps*):
4. Contact name, title, phone and email for each project location:
5. Is your school considered a "Disadvantaged School"? Please see Page 5 of the DROPS Guidelines. (<http://www.waterboards.ca.gov/drops/>). Please list each school and the percent (%) of students eligible for Free and Reduced Priced Meals. If you have questions regarding this item, please contact a State Board representative listed on the DROPS website.
6. Is there internal support to seek and implement this grant (are the appropriate faculty, staff, and management on-board?) Once constructed, do you have the resources to maintain a stormwater capture project for 20 years? Please limit the response to a ½ page.
7. Has there been coordination between the schools, school district and/or COE regarding the DROPS grant application?
8. What type of area does your school predominantly serve?
___ Highly-urban ___ Suburban ___ Community <10,000 population ___ Rural ___ Other (describe)
9. Do you know what the closest waterway that is likely to receive the stormwater runoff from the project location, such as a creek, lake, or ocean? (Don't worry if you don't know the answer to this question)

<http://www.waterboards.ca.gov/drops/>

Page 1





Additional LID Resources

Additional Resources

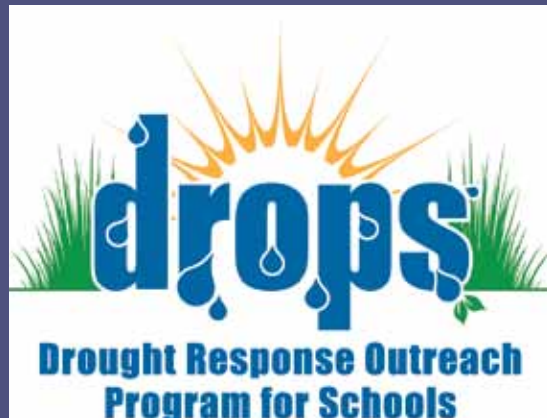
1. State Water Board's Storm Water Program, "Slow the Flow: Be a California Water Warrior" Film Series:

http://www.swrcb.ca.gov/press_room/press_releases/2014/pr070814_slowtheflow.pdf

2. Search for related terms: "low impact development" "rain garden" "pervious pavements" There's a lot of information available online.
3. State Board will provide second webinar to provide more in-depth coverage of technical design including facility sizing, cost estimates and maintenance considerations. The webinar date will be announced on the DROPS website.
4. The EPA provides information related to stormwater education for the classroom:
<http://water.epa.gov/polwaste/npdes/swbmp/Classroom-Education-on-Stormwater.cfm>
5. Other places to look for help: local watershed groups, local watershed agency, non-profits, etc.



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