Tools & Resources supporting Green Infrastructure

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Sustainable Water Infrastructure Program
~Federal Green Challenge Water Webinar~
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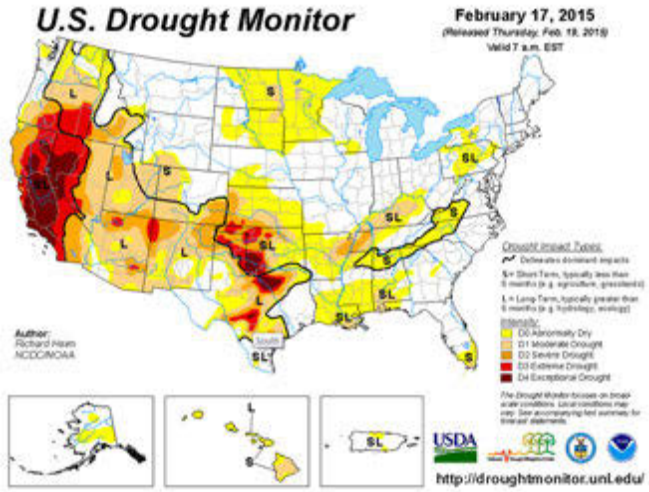
EPA Region 9 Sustainable Water Infrastructure Program

Providing technical support and financial resources to our communities to increase water and energy efficiency in water, wastewater, and stormwater infrastructure.

- Major Challenges to water & wastewater systems:
  - Water Scarcity
  - Climate Change
  - Increasing Population
  - Energy Uncertainty
  - Aging Infrastructure

- **Interconnected** challenges, e.g. Water/Energy Nexus



California	U.S.
~20% of electricity	~2% of national energy consumption
~30% of natural gas	~70 billion kWh

An interconnected solution

Green Infrastructure (GI)/Low Impact Development (LID):

Tools for mitigating sewer overflows, reducing energy use and improving permit compliance by using natural or engineered systems to capture, cleanse, and reduce stormwater runoff.

GI/LID approaches:

- Reduce heat island effect
- Improve water quality in streams and rivers
- Recharge aquifers
- Reduce pollutants in storm water
- Sequester Carbon
- Increase wildlife habitat, preserve sensitive environmental areas
- Preserve pre-development hydrology
- Reduce water/energy load of water infrastructure

Tools & other Resources Supporting LID

Cost-Benefit Resources: **http://water.epa.gov/infrastructure/greeninfrastructure/gi_costbenefits.cfm**

- Cost Analyses
- Cost Benefit Analyses
- Tools
  - e.g. Green Values National Stormwater Management Calculator

Green Improvements

- ☐ Green Roof
- ☐ Planter Boxes (disconnect downspout)
- ☐ Rain Garden (disconnect downspout)
- ☐ Cisterns / Rain Barrels (disconnect downspout)

- ☐ Native Vegetation
- ☐ Vegetation Filter Strips
- ☐ Amended Soil
- ☐ Roadside Swales (elimination of curb and gutter)
- ☐ Trees

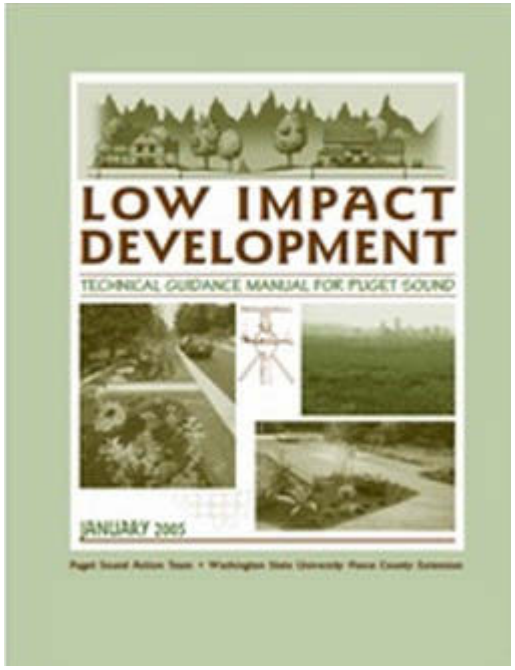
- ☐ Swales in Parking Lot
- ☐ Reduced Street Width
- ☑ Permeable Pavement on Parking

Tools & other Resources…cont'd

Design & Implementation Resources:

http://water.epa.gov/infrastructure/greeninfrastructure/gi_design.cfm

- Design Manuals
- Design Tools
  - e.g. WERF's SELECT & BMP and LID Whole Life Cost Models
- Design Challenges
  - Clay or Glacial Till
  - Poor Urban Soils
  - Brownfield Sites
  - Sediment Laden Stormwater
  - Cold Weather
  - Limited Water Supply for Irrigation
  - Space Constraints
- Implementation
- Operations and Maintenance
- Homeowner Resources

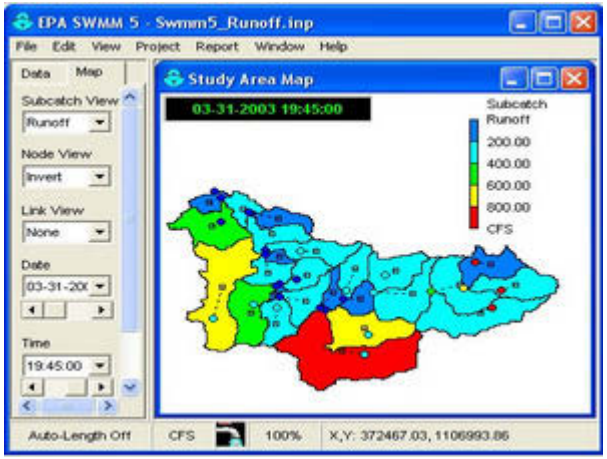


Tools & other Resources…cont'd

Modeling Tools:

http://water.epa.gov/infrastructure/greeninfrastructure/gi_modelingtools.cfm

- Simpler Models
  - EPA's National Stormwater Calculator
  - USDA's i-Tree Vue
- More complex models to evaluate multiple parameters
  - EPA Stormwater Management Model (SWMM) with LID Controls
  - EPA System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN) Model
  - EPA Hydrological Simulation Program – FORTRAN (HSPF)



Tools & other Resources…cont'd

Other resources:

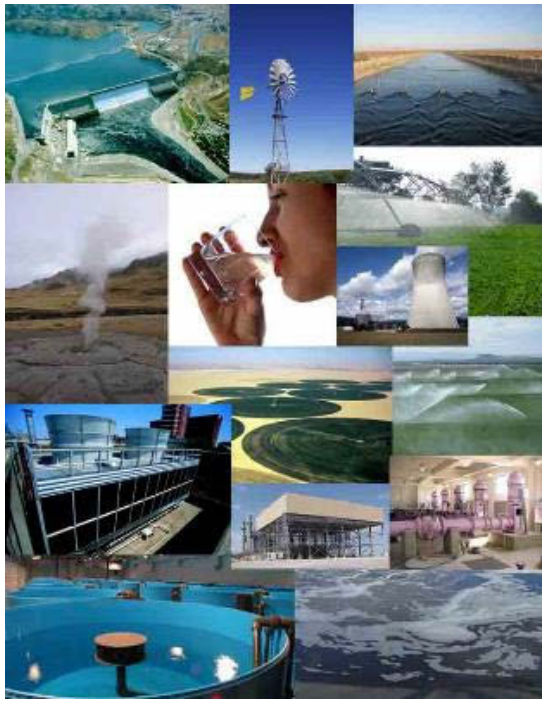
- Policy Guides: http://water.epa.gov/infrastructure/greeninfrastructure/gi_policy.cfm
- Case Studies: http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm#tabs-4
- Research: http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm#tabs-5
- Library: http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm#tabs-6

look for WaterSense Meets EPA Criteria

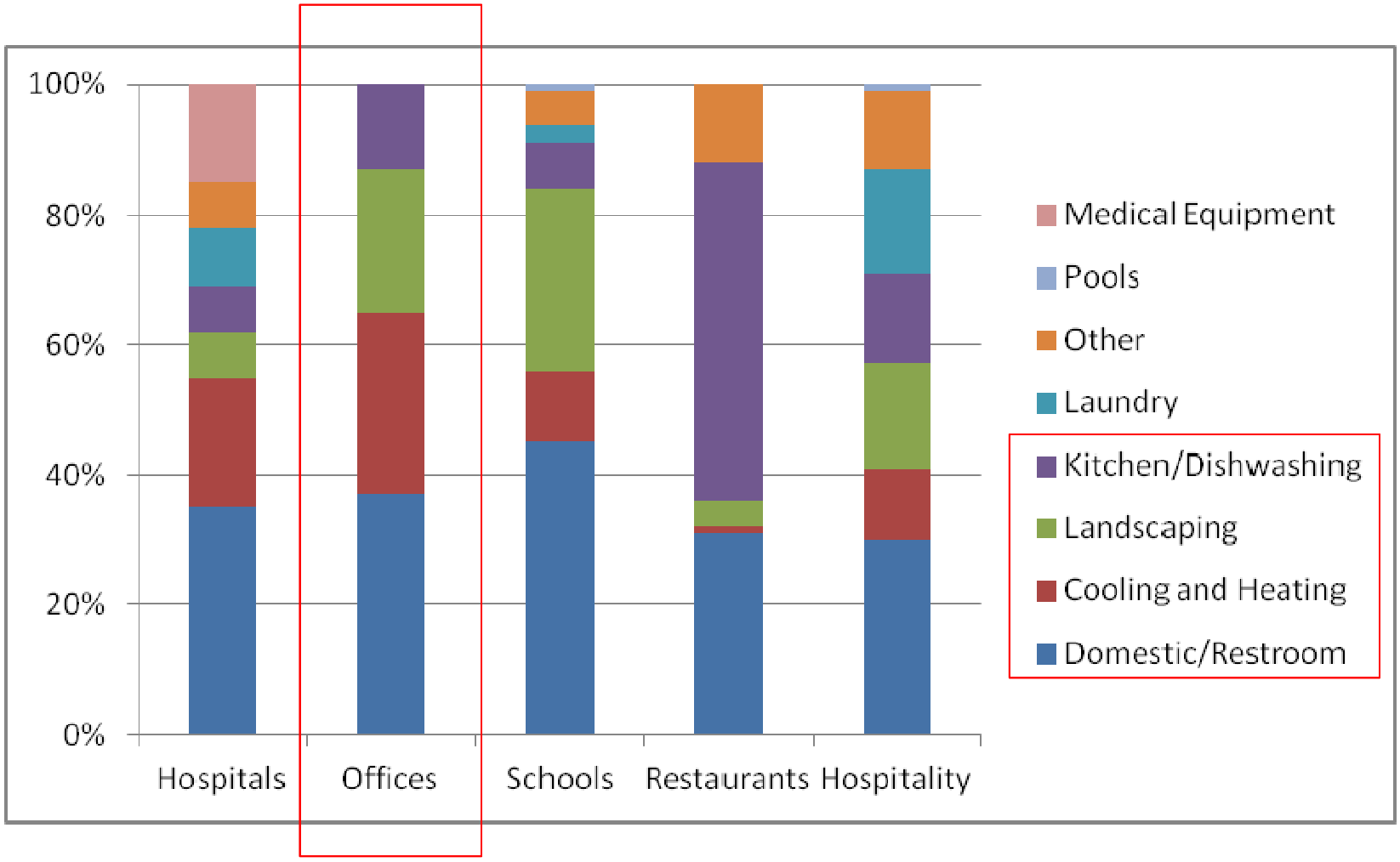
Use your *WaterSense* to save Water in Federal Facilities

Saving Water Provides Multiple Benefits

- Water efficiency increases resilience to water shortages caused by drought
- Water, sewer, and energy costs are rising; water efficiency helps reduce these operating costs
- Saving water saves energy
  - Every gallon of water has an energy footprint associated with providing the service and at the end use
- Energy for Water
  - Pumping
  - Treating
  - Heating



End Uses of Water in Commercial Facilities



Created by analyzing data from: New Mexico Office of the State Engineer, American Water Works Association (AWWA), AWWA Research Foundation, and East Bay Municipal Utility District

WaterSense Vision

- All Americans will understand the importance of water efficiency and take positive actions to reduce their water use – in their homes, outdoors, and at work

- How will we achieve it?
  - By transforming the marketplace for products and services that use water
  - By promoting a nationwide ethic of water efficiency to conserve water resources for future generations and reduce water infrastructure costs

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WaterSense Labeled Products

Flushing Urinals

Lavatory Faucets

Irrigation Controllers

More than 14,000 Labeled Product Models

Pre-rinse Sprayers

Tank-Type Toilets

Showerheads

New Homes

Water factors are also included in many ENERGY STAR qualified products

WaterSense, ENERGY STAR® and FEMP

- WaterSense, ENERGY STAR, and FEMP designated products complement each other to meet executive order goals.

- Water factors are included in many ENERGY STAR qualified products
  - Ice machines
  - Steam cookers
  - Dishwashers
  - Clothes washers

- FEMP designates products in all categories, but defers to all final WaterSense and ENERGY STAR standards

  http://www1.eere.energy.gov/femp/technologies/eep_purchasingspecs.html

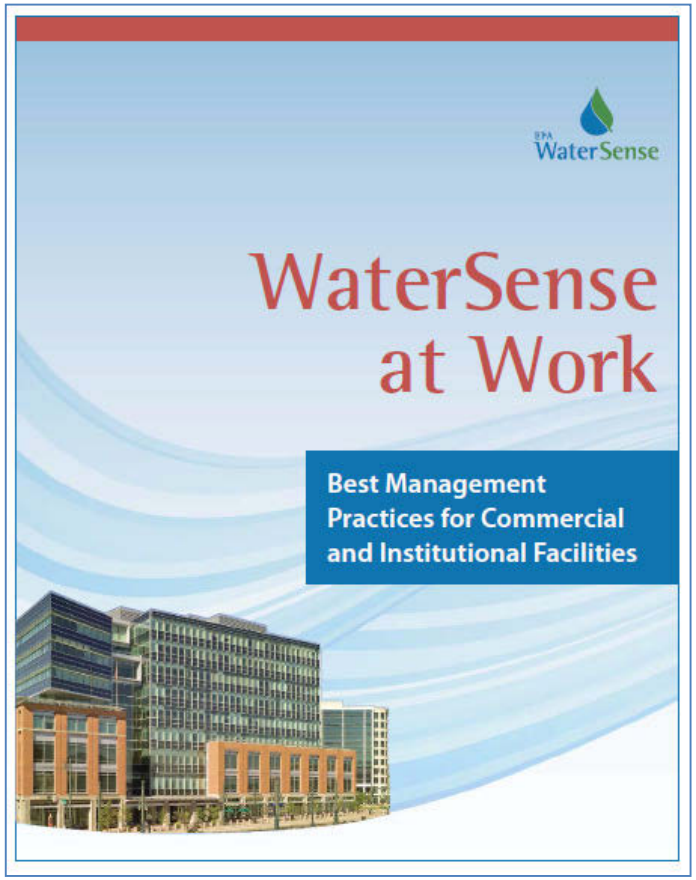
WaterSense Resources

All federal agencies can be WaterSense partners

- Access to free promotional materials, tools, campaigns, partner webinars and newsletters
- Product listings, outdoor water budget tool, and technical specifications
- Best Management Practices and Manuals

  http://www.epa.gov/watersense/commercial

Water Efficiency Best Management Practices



Step 1: Make a Commitment
Step 2: Assess Facility Water Use
Step 3: Set and Communicate Goals
Step 4: Create an Action Plan
Step 5: Implement the Action Plan
Step 6: Evaluate Progress
Step 7: Recognize Achievement

Aligns with ENERGY STAR's Guidelines for Energy Management…so just add water to your programs!
www.energystar.gov/index.cfm?c=business.bus_index

Water Efficiency Best Management Practices

- Each of 36 BMPs provides:
  - An overview of the technology
  - Operation, maintenance, and user education tips
  - Retrofit and replacement options
  - Calculations for potential water, energy, and dollar savings and payback
- 7 case studies outline success stories in major BMP areas

6.3 Cooling Towers

EPA WaterSense

Overview

Cooling towers are used in a variety of commercial and institutional applications to remove excess heat. They serve facilities of all sizes, such as office buildings, schools, supermarkets, and large facilities, such as hospitals, office complexes, and university campuses. Cooling towers dissipate heat from recirculating water that is used to cool chillers, air conditioning equipment, or other process equipment. By design, they use significant amounts of water.

Cooling towers often represent the largest use of water in industrial and commercial applications, comprising 20 to 50 percent or more of a facility's total water use. However, facilities can save significant amounts of water by optimizing the operation and maintenance of cooling tower systems.[1]

Cooling towers

Cooling towers work by circulating a stream of water through systems that generate heat as they function. To cool the system, heat is transferred from the system to the water stream. This warm water is then pumped to the top of the cooling tower, where it is sprayed or dripped through internal fill (i.e., a labyrinth-like packing with a large surface area). Fans pull or push air through the tower in a counterflow, crossflow, or parallel flow to the falling water. As some of the water is evaporated, the heat is removed.[2] The remaining cooled water is recirculated back through the systems to repeat the process.

The thermal efficiency and longevity of the cooling tower and its associated water loops depend upon the proper management of water recirculated through the tower. Water leaves a cooling tower system in four ways: evaporation, blowdown or bleed-off, drift, and leaks or overflows.

Evaporation

Evaporation is the primary function of the tower and is the method that transfers heat from the cooling tower system to the environment. The quantity of evaporation is not typically targeted for water-efficiency efforts, because it controls the cooling process (although improving the energy efficiency of the systems that use the cooling water will reduce the evaporative load on the tower). The rate of evaporation from a cooling tower is typically equal to approximately 1 percent of the rate of

[1] North Carolina Department of Environment and Natural Resources, et al. May 2003. *Water Efficiency Manual for Commercial, Industrial and Institutional Facilities*. Page 39. www.waterinc.org/bushome.php.
[2] Ibid.

6-8 *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities*

WaterSense Information

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