




Green Infrastructure in Arid and Semi-Arid Climates

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EPA Survey

*Thank You to
WESTCAS members
for participating in
the EPA survey!*



GREEN RESERVE
The American Recovery and Reinvestment Act (ARRA), Green Project Reserve of 2009, through the State Revolving Fund, provided funding for a wide variety of qualifying projects in the categories of: green infrastructure, energy efficiency, water efficiency, and other innovative projects.

Green Infrastructure in Arid and Semi-Arid Climates



Adapting innovative stormwater management techniques to the water-limited West.

landscapes of the arid and these water-limited regions most-effective approach to

runoff into conveyance giving waters, increasing y and flood flows. These increase erosion and degrade green infrastructure refers to a hat recognizes the connection quantity and water quality, and the natural water balance. By tion and evapotranspiration green infrastructure reduces, runoff at its source.

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Subject: Draft Arid GI Brochure

Dear experts and burgeoning experts on arid GI/LID,

If you have the time to review the attached brochure (7.5 pages) that the EPA is developing on the application of green infrastructure techniques in arid and semi-arid regions, I would very much appreciate your input.

Specifically, concerns have been raised that the brochure does not emphasize the appropriate topics. In reviewing this brochure, are there any topics you feel should be added? elaborated upon? de-emphasized? Recall that the objective is to promote the use of green infrastructure in arid and semi-arid regions by addressing the questions of why and how .

Many thanks for your input,
Tamara Mittman

(See attached file: 10504-08 Arid Climates Case Study_v2.pdf)

Adapting Green Infrastructure to Conserve Water Supply

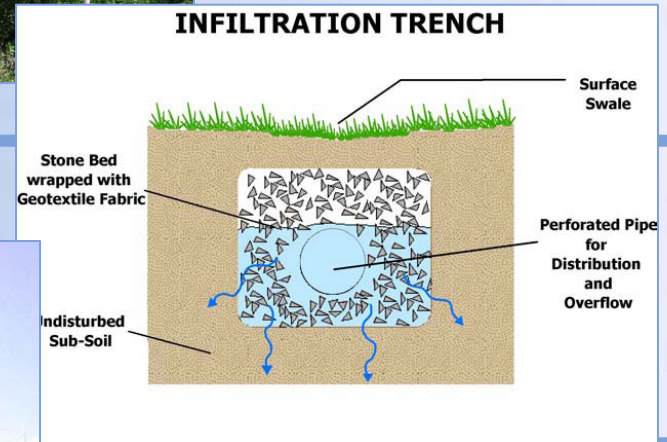
Passive rainwater harvesting



Active rainwater harvesting



Subsurface infiltration basins



Green roofs



Rainwater Harvesting and Water Rights

State	Responsible Agency	Jurisdiction over Atmospheric Water?	Permit Required?	Who May Apply for Permit?
Arizona	Arizona Department of Water Resources	No	No	N/A
California	California Environmental Protection Agency, Division of Water Rights	No	No	N/A
Idaho	Idaho Department of Water Resources	No	No	N/A
New Mexico	New Mexico Office of the State engineer	No	No	N/A



Rainwater Harvesting and Water Rights

State	Responsible Agency	Jurisdiction over Atmospheric Water?	Permit Required?	Who May Apply for Permit?
Colorado	Colorado Division of Water Resources	Yes	Yes. Colorado law identifies properties that may apply for a permit.	1. Residential properties that are supplied by a well (or could qualify for a well permit) and that are not served by a municipality or water district. 2. Developers wishing to apply for approval to be one of 10 statewide pilot projects.
Montana	Montana Department of Natural Resources & Conservation, Water Resources Division, Water Rights Bureau	Yes	Yes	No formal policy.
Nevada	State of Nevada, Department of Conservation & Natural Resources, Division of Water Resources	Yes	Technically, yes	Applications not accepted.
Oregon	Water Resources Department	Yes	No. Oregon law exempts “the collection of precipitation water from an artificial impervious surface” from permit requirements.	N/A
Wyoming	State engineer and Wyoming Board of Control	Yes	Technically, yes, but residential rainwater harvesting is regarded as de minimus	No formal policy.

Rainwater Harvesting and Water Rights

State	Responsible Agency	Jurisdiction over Atmospheric Water?	Permit Required?	Who May Apply for Permit?
Utah	Utah State engineer	Possibly	Yes	No formal policy.
Washington	Washington Department of Ecology	Possibly	No	N/A



Rainwater Harvesting and Water Rights

State	State/Municipal Policies and Incentives
Arizona	<p>A state tax credit is available for plumbing stub outs and water conservation systems (including rainwater harvesting) through 2011.</p> <p>The city of Tucson mandates that commercial developments meet 50% of their landscaping water requirements with harvested rainwater.</p>
California	<p>A draft Los Angeles ordinance would require builders to employ rainwater storage tanks, permeable pavement, infiltration swales, or curb bumpouts to manage 100% of the runoff from a 3/4" storm, or pay a mitigation fee.</p>
New Mexico	<p>The New Mexico State Engineer issued a Rainwater Harvesting Policy encouraging "the harvesting, collection, and use of rainwater from residential and commercial roof surface for on-site landscape irrigation and other on-site domestic uses."</p> <p>Santa Fe County's Water Harvesting Ordinance mandates the use of rain barrels, cisterns, or catchments for small residences, and the use of buried or partially buried cisterns for large residences and commercial buildings.</p> <p>The Albuquerque Bernalillo County Water Utility Authority offers rebates for rainwater harvesting systems based on the amount of water that can be stored.</p>
Oregon	<p>Building Code OPSC 08-01 allows rainwater harvesting systems for residential, potable uses as a statewide alternative method.</p>
Washington	<p>The Washington Department of Ecology issued an Interpretive Policy Statement clarifying that a water right is not required for rooftop rainwater harvesting.</p> <p>Kitsap County offers a 50% reduction in stormwater management fees to new or remodeled commercial buildings that utilize rainwater harvesting.</p>

Rainwater and Stormwater Capture/Use

Rainwater and Stormwater Capture/Use					
Size	Single Family Residential or small business	Commercial Development to Comply w/COT Water Harvesting Ordinance		Sub-regional	
		New Construction (convenience store)	Retrofit (convenience store)	New Construction	Retrofit (Kino)
Technology	Cistern for roof and perimeter berm to retain water on-site	Collection and diversion system for common area irrigation	Collection and diversion system for common area irrigation	Collection, storage ponds and pumping system for park and turf irrigation (includes filtration and chlorination/de-chlorination)	Collection, storage ponds and pumping system for park and turf irrigation (includes filtration and chlorination/de-chlorination)
Water Collection System	Earthworks (inexp) Storage \$1/gal-\$3.50/gal Gutters & Dist \$2000 (typical)	Earthworks (inexp) Storage \$1/gal-\$3.50/gal + Gutters & Dist \$5000 (typical)	Earthworks (inexp) Storage \$1/gal-\$3.50/gal + Gutters & Dist \$8000 (typical)		\$11mil (multi-use project) for ~371 ac-ft/yr stormwater
Water Delivery/Irrigation System	Gravity System (\$600 mats + labor) Pressurized System (\$1500-\$4400) \$2000 (typical)	\$5000 (typical)	\$8000 (typical)		
Water Quality Issues	Low TDS, possibility of metals, fecal coliform, algal buildup Req minor filtration if used with pump, potable filtration if used inside build	Low TDS, possibility of metals, algal buildup Req minor filtration if used with pump, potable filtration if used inside building	Req minor filtration if used with pump, potable filtration if used inside building		Mixture of Surface and Reclaimed issues
Permits Needed	General County/City Zoning & Engin. only if under 5,000gal	County/City Building	County/City Building		AZPDES, Surface Water Right, Floodplain APP
Financing Options	Cash Loans	Bonds Cash Grants/Loans	Bonds Cash Grants/Loans		\$12 M Total: Bonds, Cash and Federal Grants

Multiple Benefits of Green Infrastructure

Environmental benefits



Social benefits



Economic benefits



Resources

- Rainwater Harvesting for Drylands and Beyond www.harvestingrainwater.com
- Harvesting Rainwater cals.arizona.edu/pubs/water/az1344.pdf
- WateReuse Foundation www.watereuse.org/foundation
- EPA Green Infrastructure www.epa.gov/greenkit/green_infrastructure.htm
- Arizona – Water Resources Research Center ag.arizona.edu/azwater
- California – California Sustainability Alliance sustainca.org
- Oregon – Water Resources Department www.wrd.state.or.us

