



Regional Water Reuse Activities, Gaps, and Research

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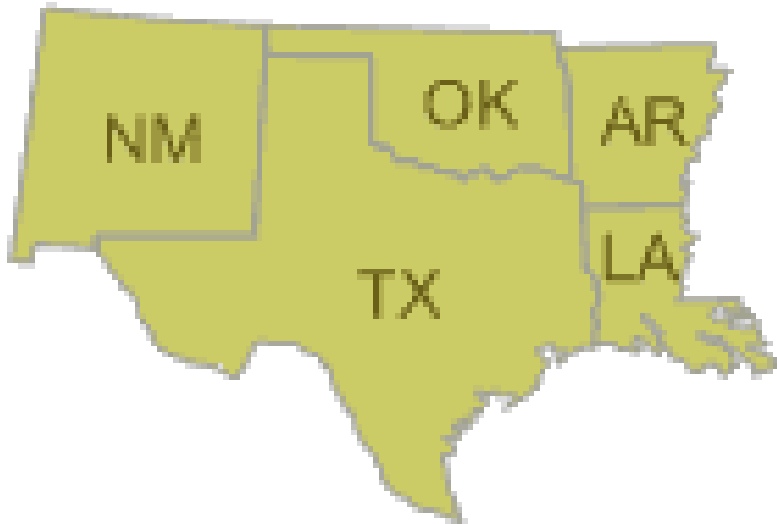


Discussion Areas

- Current Situation in Region 6
- Public Health Implications
- Re-Use Activities/Projects
- Rainwater Regional Applied Research Effort Project



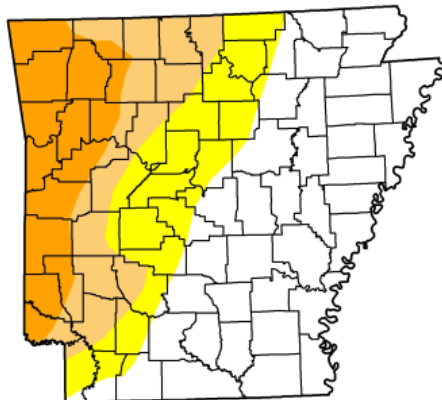
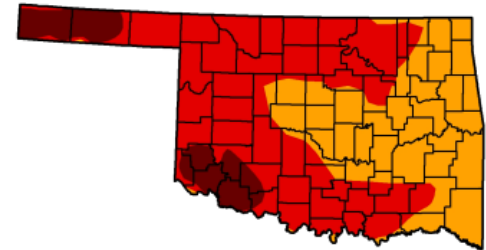
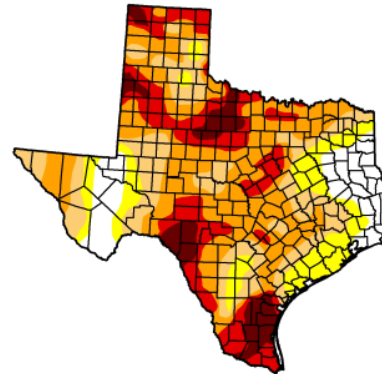
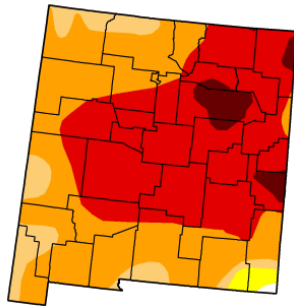
EPA Region 6



- 66 Tribal Nations
- 5 States
- 14.3% population growth from 2000-2010
- Drought conditions range from severe to exceptional

R6 Drought Situation (March 2013)

Intensity:



Texas Drought Update (April 2013)

- 23 water systems have < 180 days of source water available
 - Impacting small water systems serving less than 10, 000 persons
- 1023 water systems on either mandatory, voluntary, or no outside watering schedule

Severe Conditions Measures

Restrictions: *The use of water is prohibited for the following uses:* Washing of cars, driveways, sidewalks, windows, eaves, landscape watering of lawns, shrubs, gardens, watering of parks, athletic fields, golf courses, street washing, fire hydrant flushing, filling swimming pools, dust control sprinkling.

Commercial/Industrial uses will be controlled to the extent dictated by the Member City Official or District's General Manager depending on the appropriate jurisdiction. Businesses requiring water as a basic function of the business, such as nurseries, commercial car wash, laundromats, high pressure water cleaning, well flooding, livestock watering, etc. will obtain written permission for the intended use from either the Member City Official or District's General Manager, depending on the jurisdiction.

System Priority for water service shall be based on the following priority list: 1 Hospitals, 2 Residential family dwellings, nursing homes, assisted living centers, 3 Schools, 4 Industrial, Commercial businesses, 5 Recreation

When It Rains, It Pours



- Flash Flood Events
- Tropical Storms
- Electrical Storms
- Accidental spills
- Freak rainstorm events of 14-26 inches of rain over 2-4 days
- Damages from millions to billions

Public Health Concerns From Storm Events


- Norwalk-like viruses
- West Nile Virus
- Hepatitis A
- *Cryptosporidium parvum*
- *Giardia lamblia*
- *E.coli*
- *Salmonella*
- *Campylobacter*





West Nile Hits Hard Around Dallas, With Fear of Its Spread


By MANNY FERNANDEZ and DONALD G. McNEIL Jr.
Published: August 16, 2012

DALLAS — An outbreak of [West Nile virus](#) has engulfed Dallas County, with nearly 200 cases of human infection and 10 deaths, leading the mayor of Dallas to declare a state of emergency and to authorize the first aerial spraying of a pesticide in the city since 1966.

 FACEBOOK

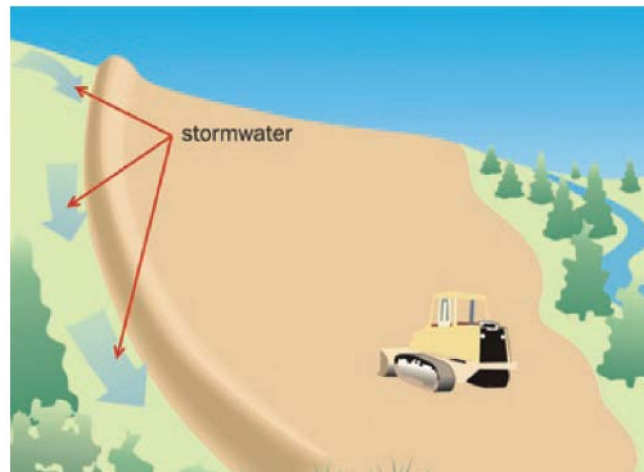
 TWITTER

 GOOGLE+

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Where Does The Water Go?

- Diverted to reservoirs, bayous, or rivers
- Underground aquifer recharging
- Retention / detention ponds
- Stormwater Beneficial Re-use



Past Activities For Water Collection

Retention Ponds

- Used to hold back stormwater and later wasted
- Viewed negatively (eyesore)
- Poor design lead to issues such as mosquito infestations leading to West Nile Virus outbreak



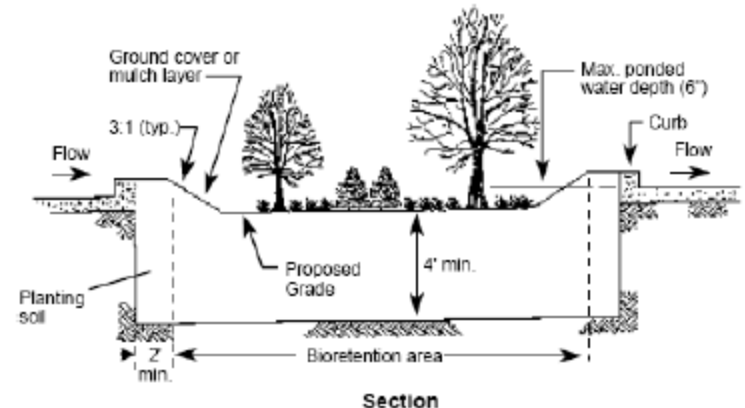
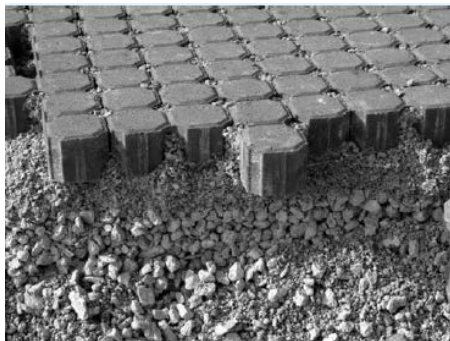
Rain Barrels

- Not self maintaining, needs attention
- Plastic barrels not temperature tolerant during 100°F days
- Potential cross connections with potable water supply



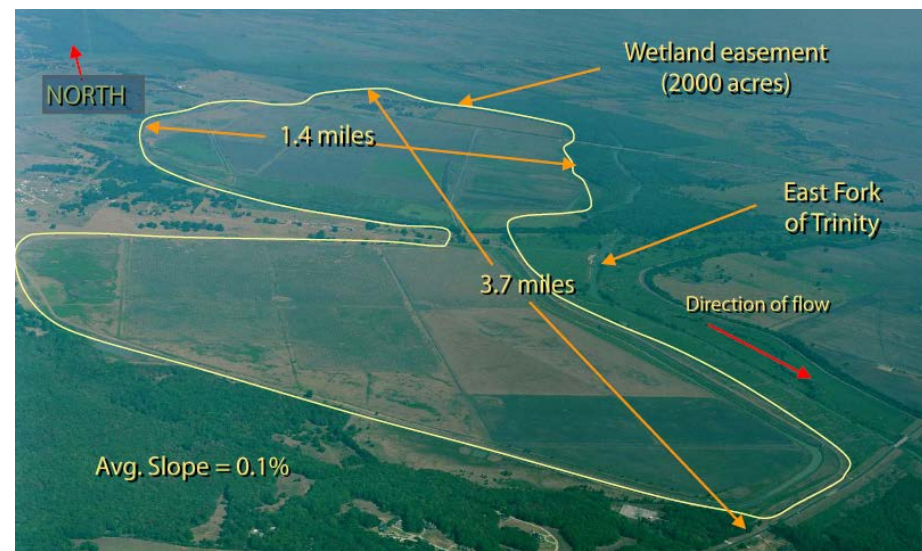
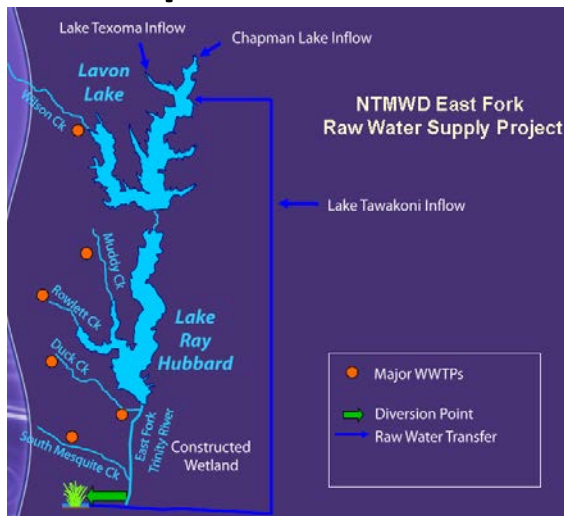
New Approaches for Water Re-Use in Region 6

- Green construction using low impact development principles
- Grassed swales
- Constructed wetlands
- Infiltration basins
- Porous Pavements



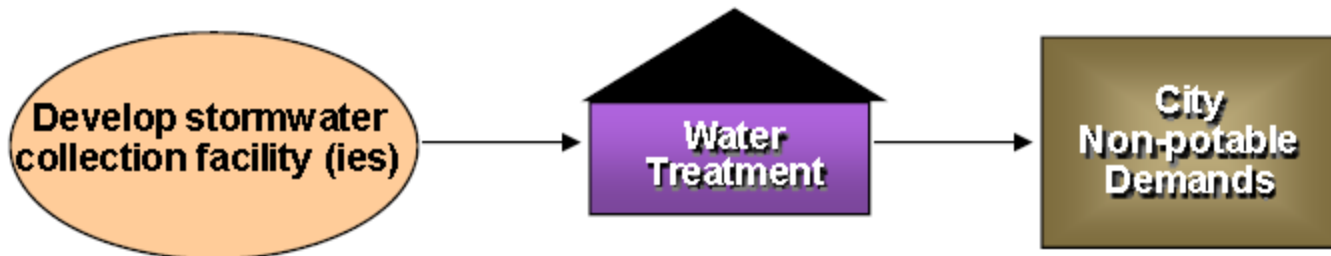
Tarrant Regional Water District Water Reclamation Project

- Divert stormwater from the Trinity River to a wetland
- Naturally bioremediate solids, nitrogen, and phosphorous
- Pump water to reservoirs as needed



Stormwater Beneficial Re-Use Option Edmond, Oklahoma

- Land needed for collection basin and treatment
- Construction of stormwater collection basin
- Construction of water treatment facility
- Costs
 - \$1.4 Million
 - Fixed O&M costs \$28,000 per year
 - Variable O&M costs \$128 per acre-foot



Innovations in Landscape Architecture

Lincoln Parish, Louisiana

- Stormwater retention as rain garden
- Mixture of sustainable practices and design restraint



Photo: Jeffrey Carbo, Landscape Architects



Stormwater Management

- Use of permeable pavements, bioswales, rain gardens, and larger bioretention systems



- Permeable pavers



Commercial Applications

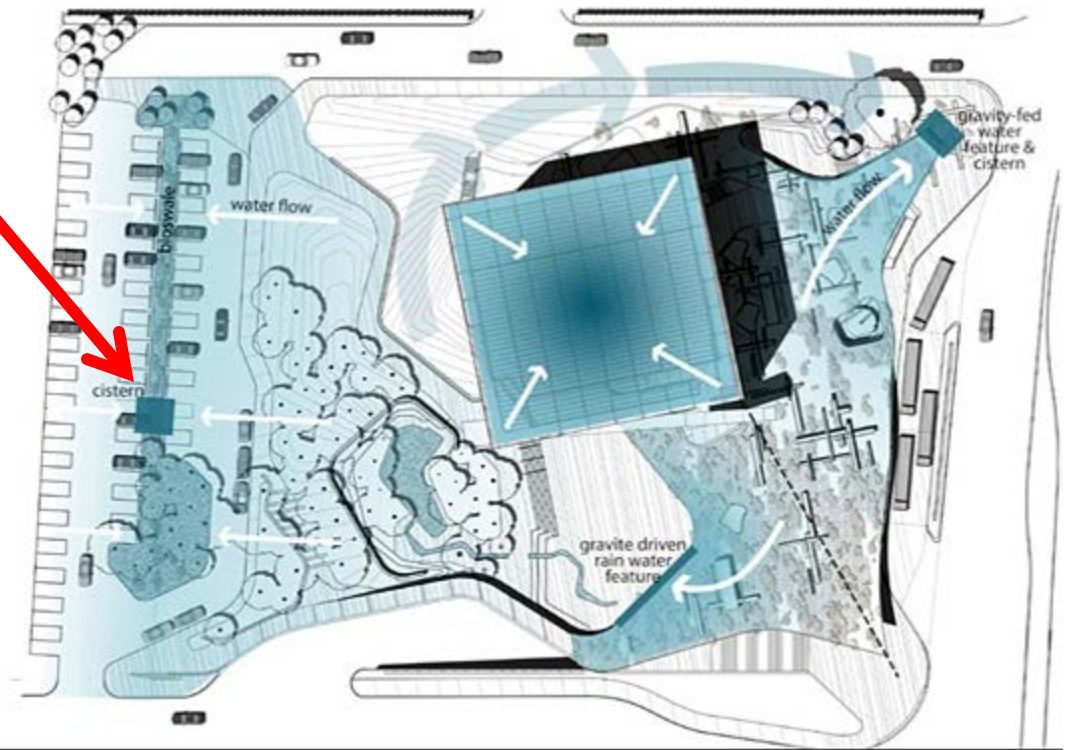
Omni Hotel Dallas, Texas

- Hotel completed projects to achieve LEED Gold
- Reduced stormwater run-off through turf and rain garden
- 25,000 gallon cistern captures condensate water for irrigation



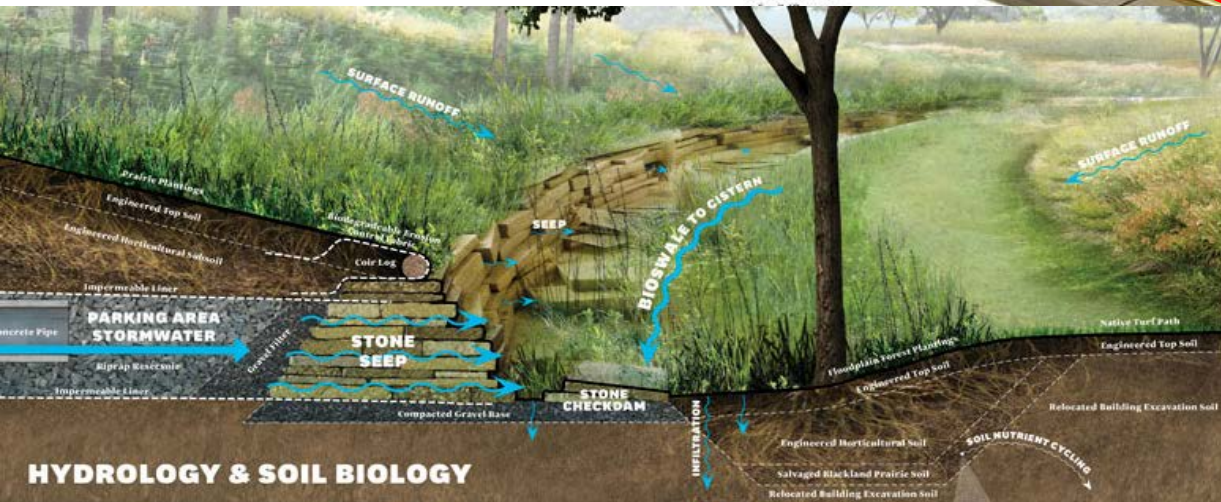
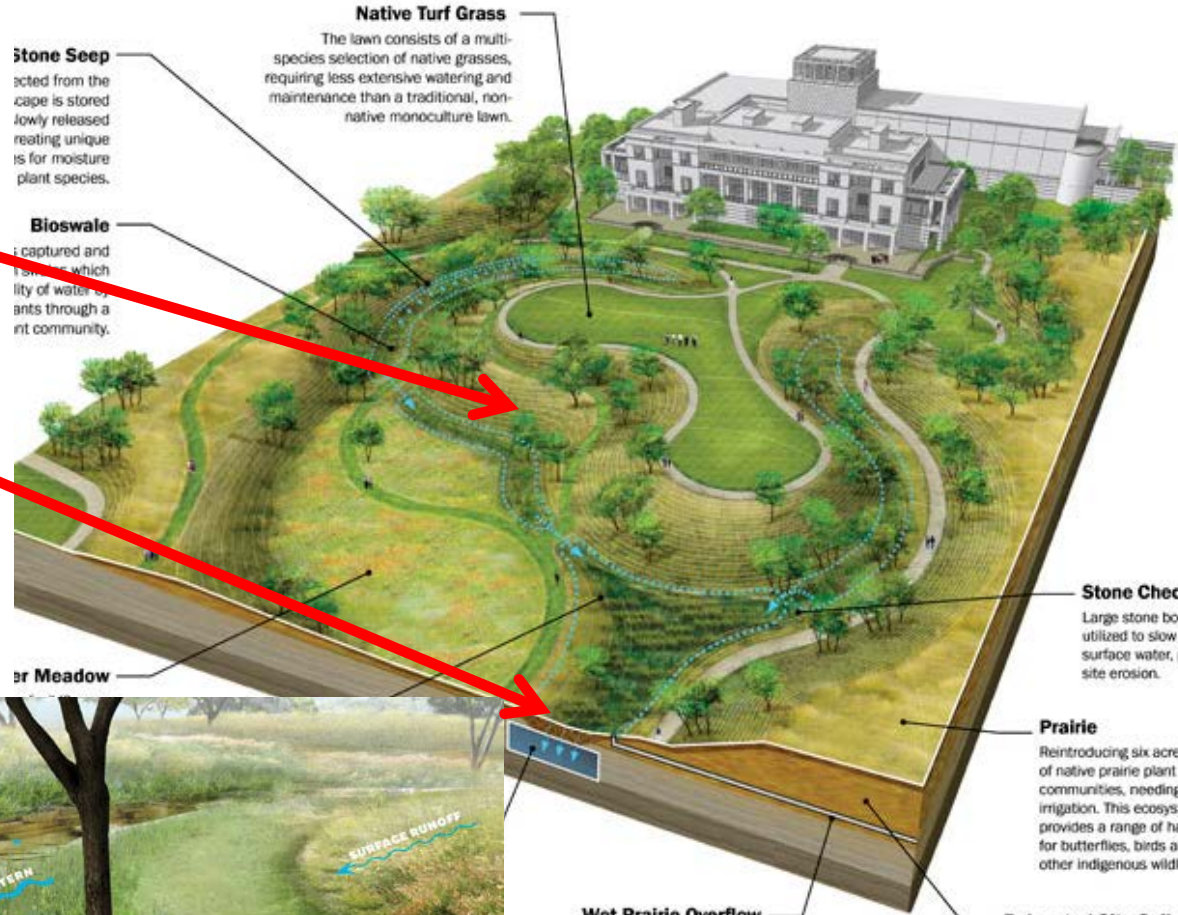
Perot Museum of Nature and Science

- Shallow bioswales throughout the parking lot to capture/filter stormwater runoff
- Underground cistern collects 50,000 gallons of air conditioning condensate, roof and parking lot runoff
- Resource is recycled as site irrigation and as supplemental source for toilets and cooling tower functions

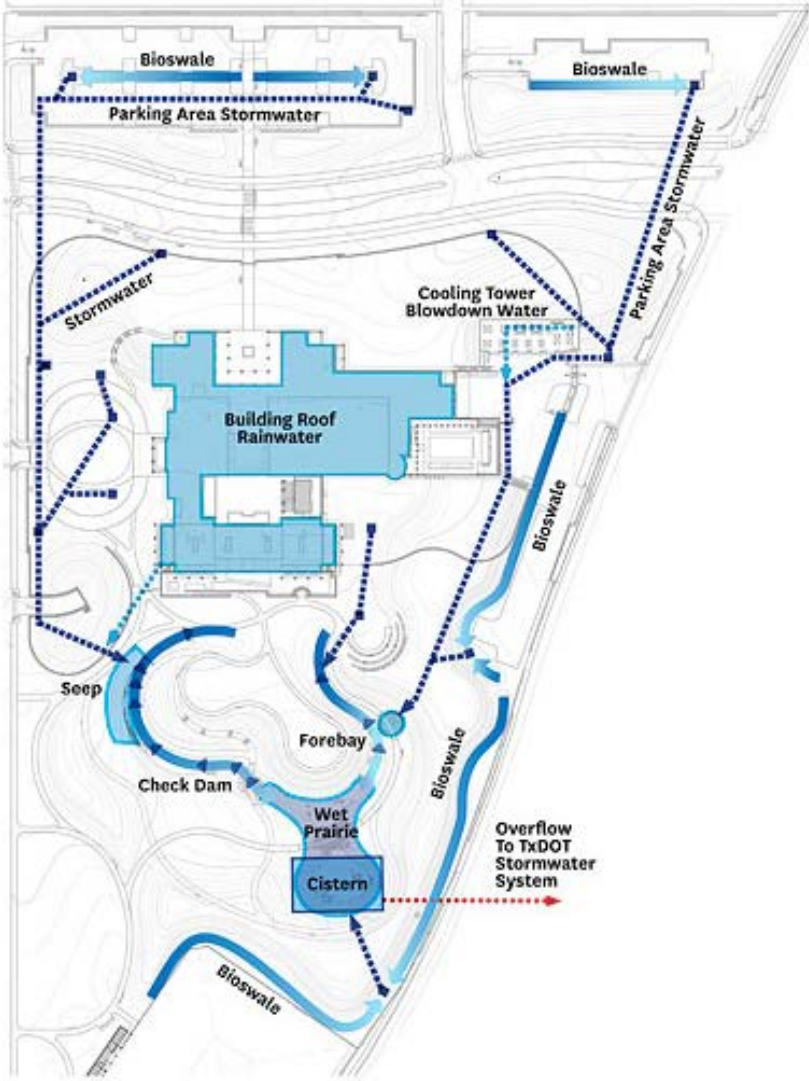


G.W. Bush Presidential Center

- Facility retains and reuses stormwater
- Vegetated bioswales take runoff to a wet prairie to remove sediment that feeds an underground cistern for irrigation reuse
- Platinum LEED



G.W. Bush Presidential Center Site Plan



WaterSense Labeled Home

- First WaterSense labeled home in North Texas and the first renovated WaterSense labeled home in the nation
- Renovations included
 - Installation of rainwater harvesting system
 - Stormwater runoff control
- Home will be open throughout the year to the public for training demonstrations and showcase the latest water efficient systems.

Before



After



Stormwater Runoff Control Features

- Permeable pavements
- Rainwater collection system



Rainwater Project

Microorganisms Associated with Rainwater Collection Systems Providing Non-potable or Potable Water

Collaborators

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Dr. Mary Jo Kirisits (UT Austin)

Mr. Tae-Gyu Kim (UT Austin)



Rainwater Research

- Understand the microbial community of harvested rainwater following common in-home treatment processes
 - Filtration
 - Chlorination
 - UV Disinfection

Sampling Sites

- 6 residential rainwater systems in Central Texas
- Collect raw water sample in cistern and treated water from cold tap inside residence

Site #	1	2	3	4	5	6
Roof	Galvalume®					Shingle
First flush	Yes	Yes	No	Yes	Yes	No
Disinfection	Chlorine	UV	UV	UV	UV	No
Potable use	Yes	Yes	Yes	Yes	Yes	No

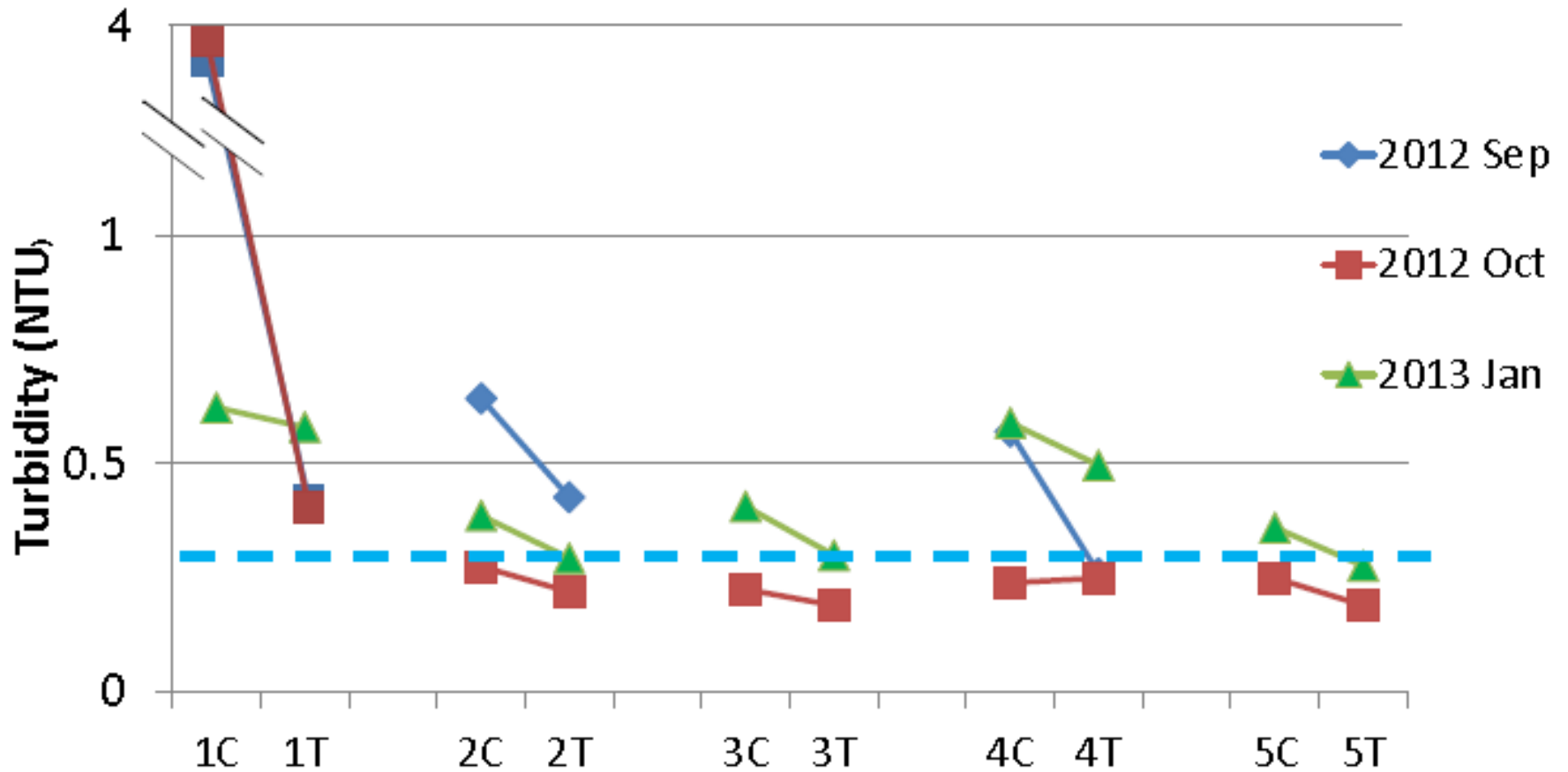
Rain water Harvesting System



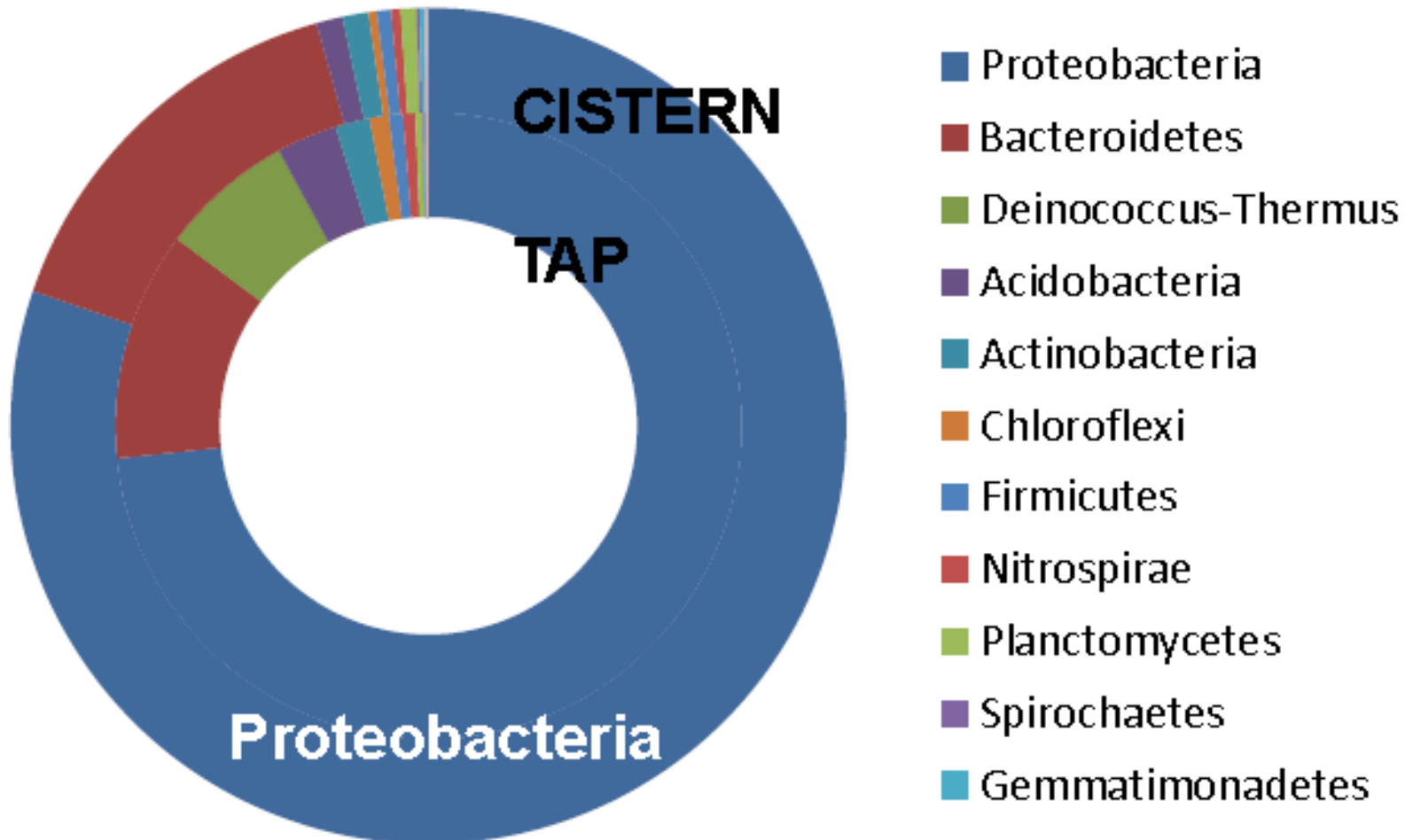
Analytical Parameters

	Analysis
Physical	Temperature Turbidity
Chemical	pH Dissolved oxygen (DO) Dissolved organic carbon (DOC) Residual chlorine
Biological	Heterotrophic plate counts Indicator bacteria Bacterial community analysis Fungal community analysis Pathogen enumeration (e.g., <i>Legionella</i> , <i>Mycobacterium</i>)

Turbidity Reduced by Filtration

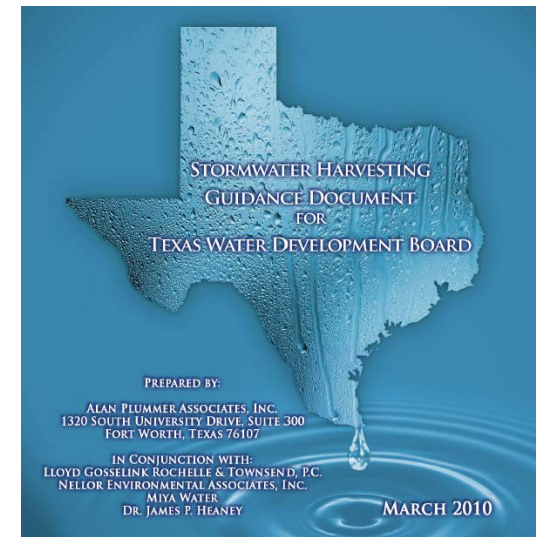


Pyrosequencing Results From Site 4 (UV Treatment)



References

- Stormwater Harvesting Guidance Document for Texas Water Development Board. March 2010
http://www.twdb.texas.gov/innovativewater/reuse/projects/stormwater/doc/stormwater_final_rpt.pdf



Questions?

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