Texas A&M AgriLife Research | Extension

THE DALLAS CENTER

Texas A&M AgriLife Research

Water University

#WaterUDoing
for Texas Horticulture ?

What can you do to save blue in The Green Industry ?

DANIEL CUNNINGHAM

Project Manager
Horticulturist

@TXPlantGuy

You Tube

Texas Research Foundation

Texas Agricultural Research Experiment Station

The Renner Station

County Cooperative Extension Center

Texas Co-Op Extension

Texas AgriLife Research Center

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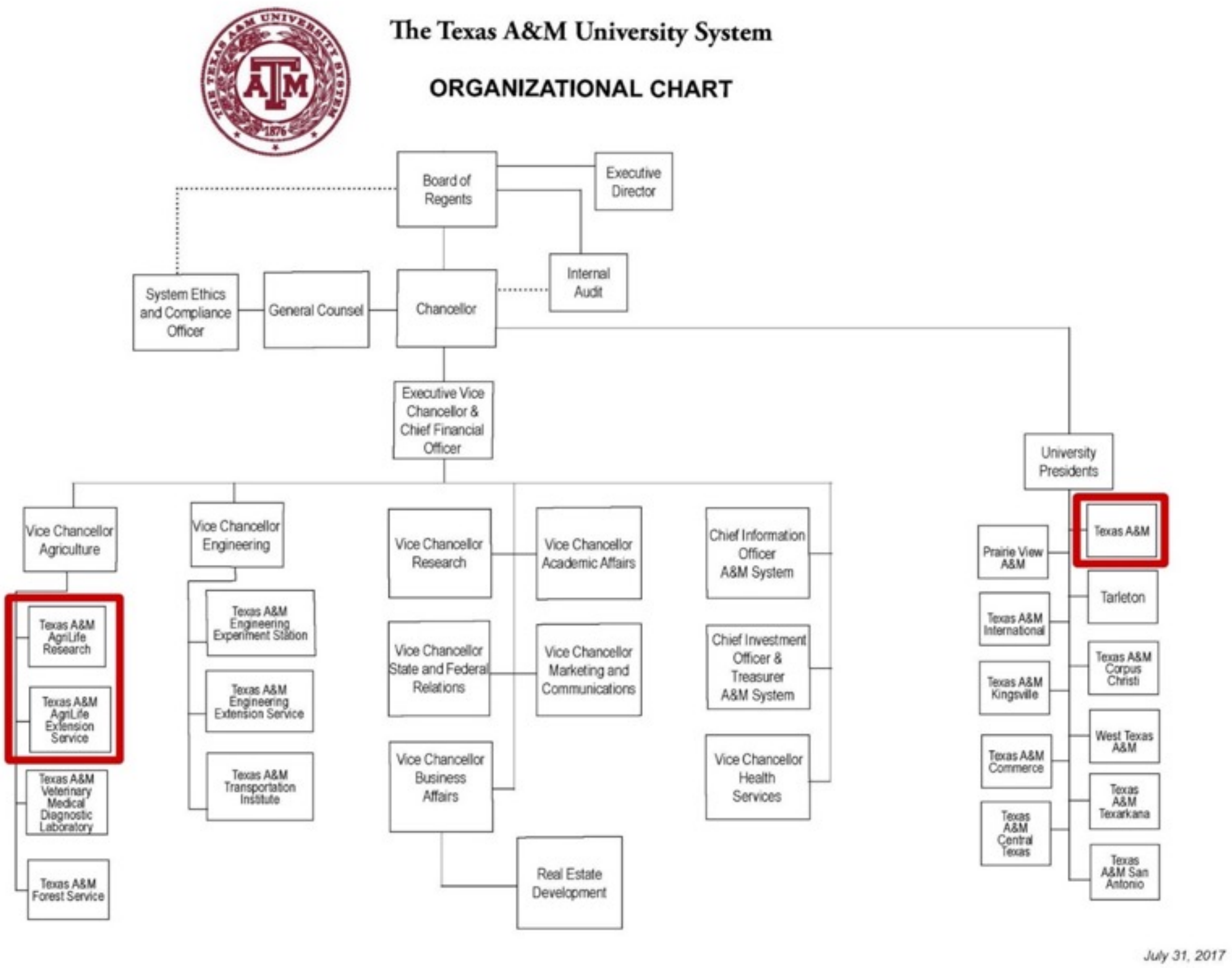
Urban Solutions Center

Texas Ag-Life

Texas A&M AgriLife Research and Extension Center At Dallas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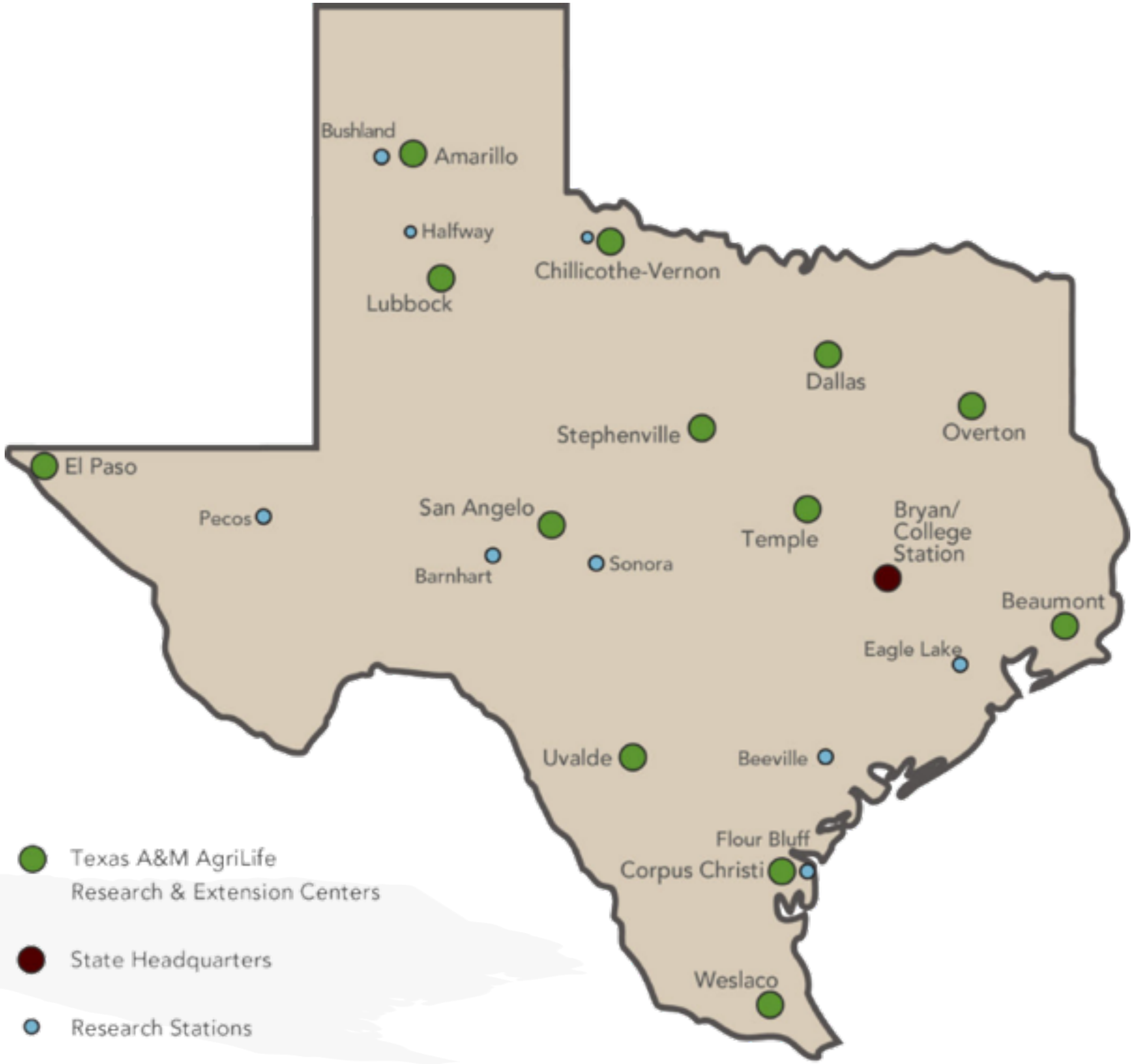
July 31, 2017

TEXAS A&M AGRILIFE RESEARCH | EXTENSION

THE DALLAS CENTER

13 research and extension centers across Texas



RESEARCH

1. Water University
2. Plant Virology
3. Turfgrass Breeding
4. Plant Genomics
5. Plant Abiotic Stress
6. Plant Biotic Stress
7. Freshwater Mussels

EXTENSION

1. Family and Community Health
2. Urban Entomology
3. School IPM
4. Agricultural Entomology
5. Ecological Engineering
6. Texas 4-H Urban Outreach
7. Texas 4-H
8. Urban Municipal Parks
9. Agricultural Business Management

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Water University

WaterUniversity.tamu.edu

RESEARCH, PUBLIC OUTREACH AND CONTINUING EDUCATION

WATER USE EFFICIENCY

IN THE URBAN ENVIRONMENT

THE WATER UNIVERSITY TEAM

CLINT WOLFE
Program Leader

PATRICK DICKINSON

DANIEL CUNNINGHAM

DR. DOTTY WOODSON

ABOUT 50%

Of any urban area is covered by lawns and landscaping.

TURFGRASS

Is the largest irrigated crop in the US

ABOUT 50%

Of any urban area is covered by lawns and landscaping.

ABOUT 30%

Of all water used by the average U.S. home is used outside.


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Water University
MISSION
Shape perception
Change behavior

WaterUniversity.tamu.edu

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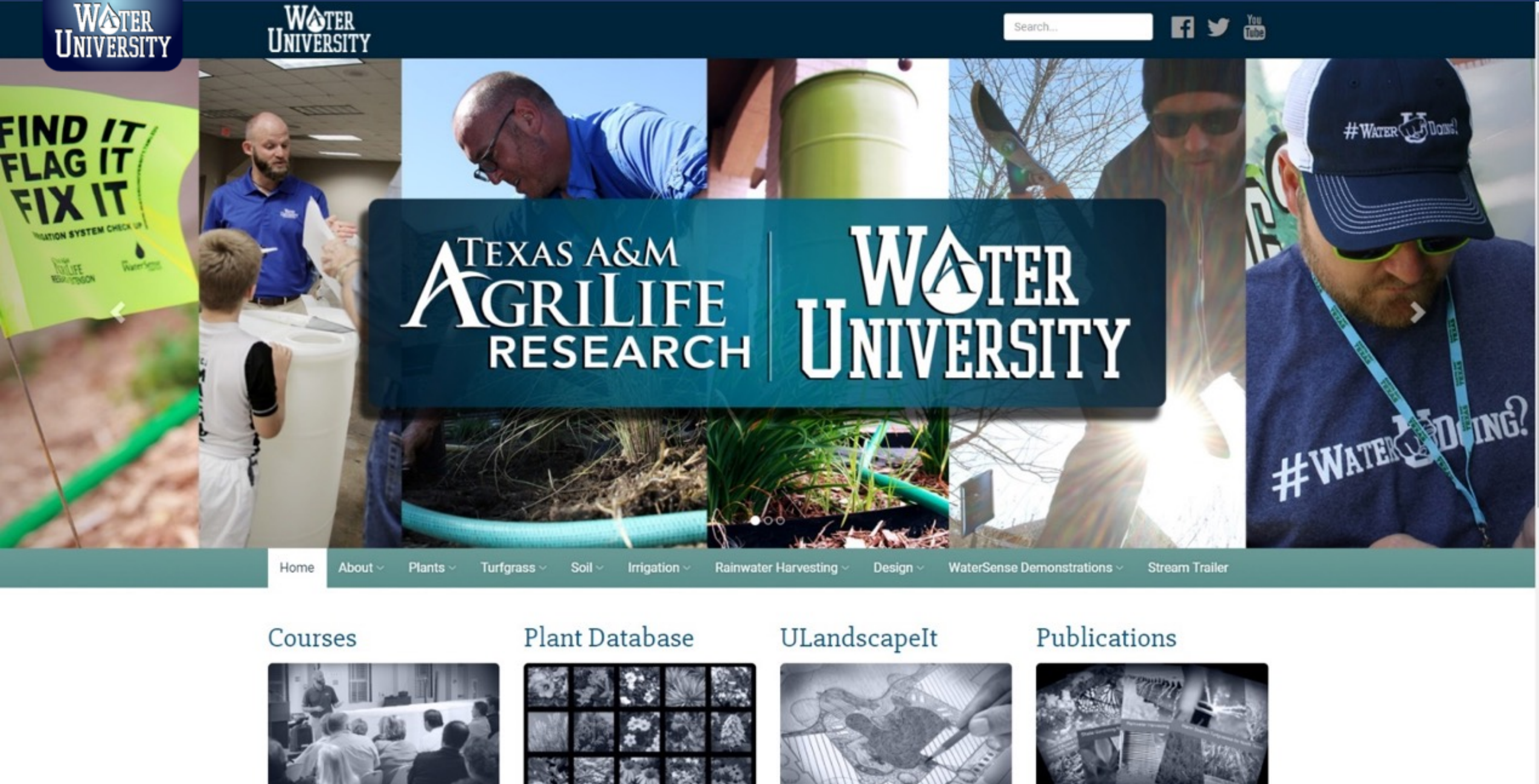

D.I.Y. GUIDES, OTHER PUBLICATIONS

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The State Of Water

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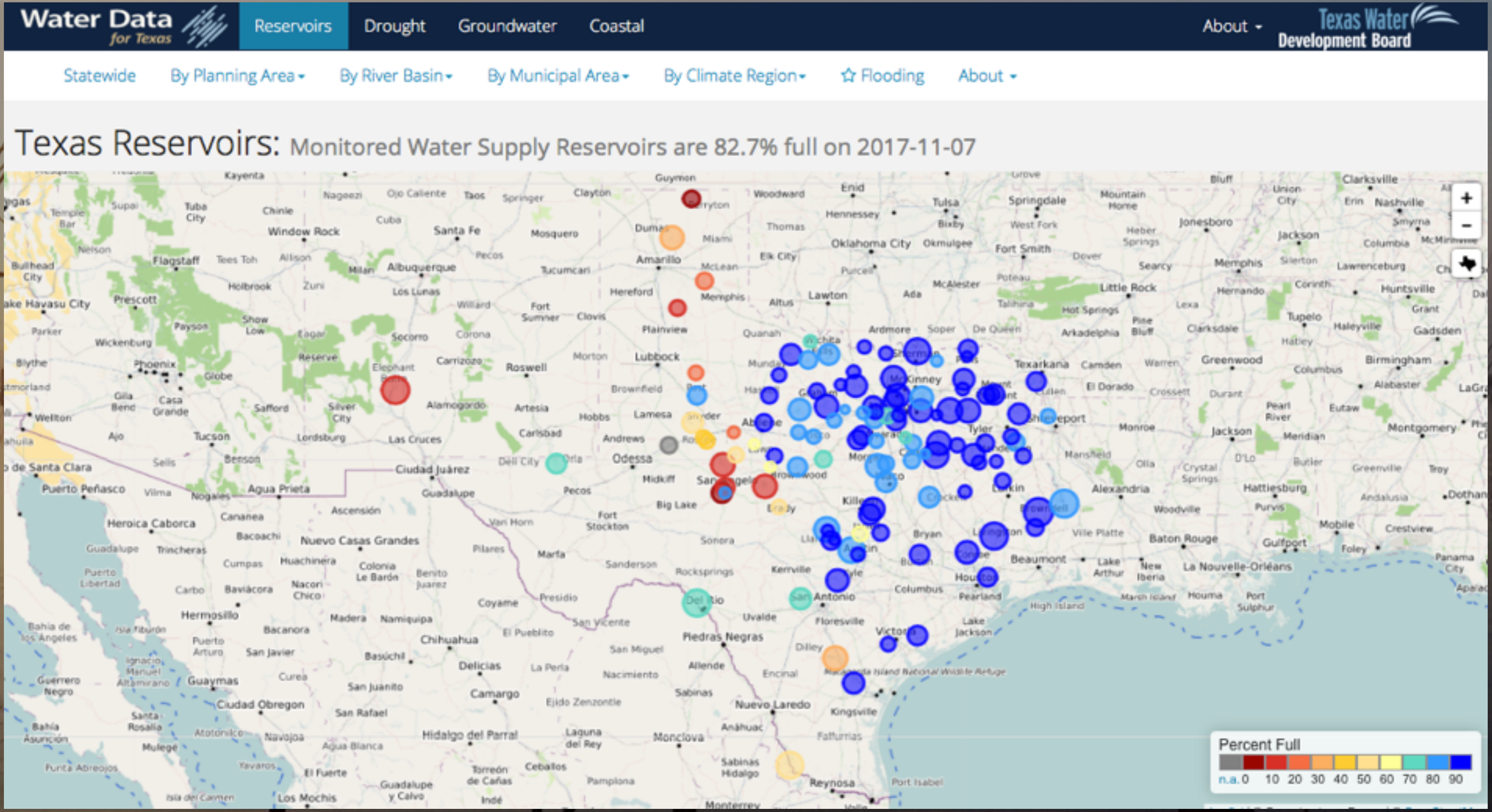


How Much Water Do We Have?

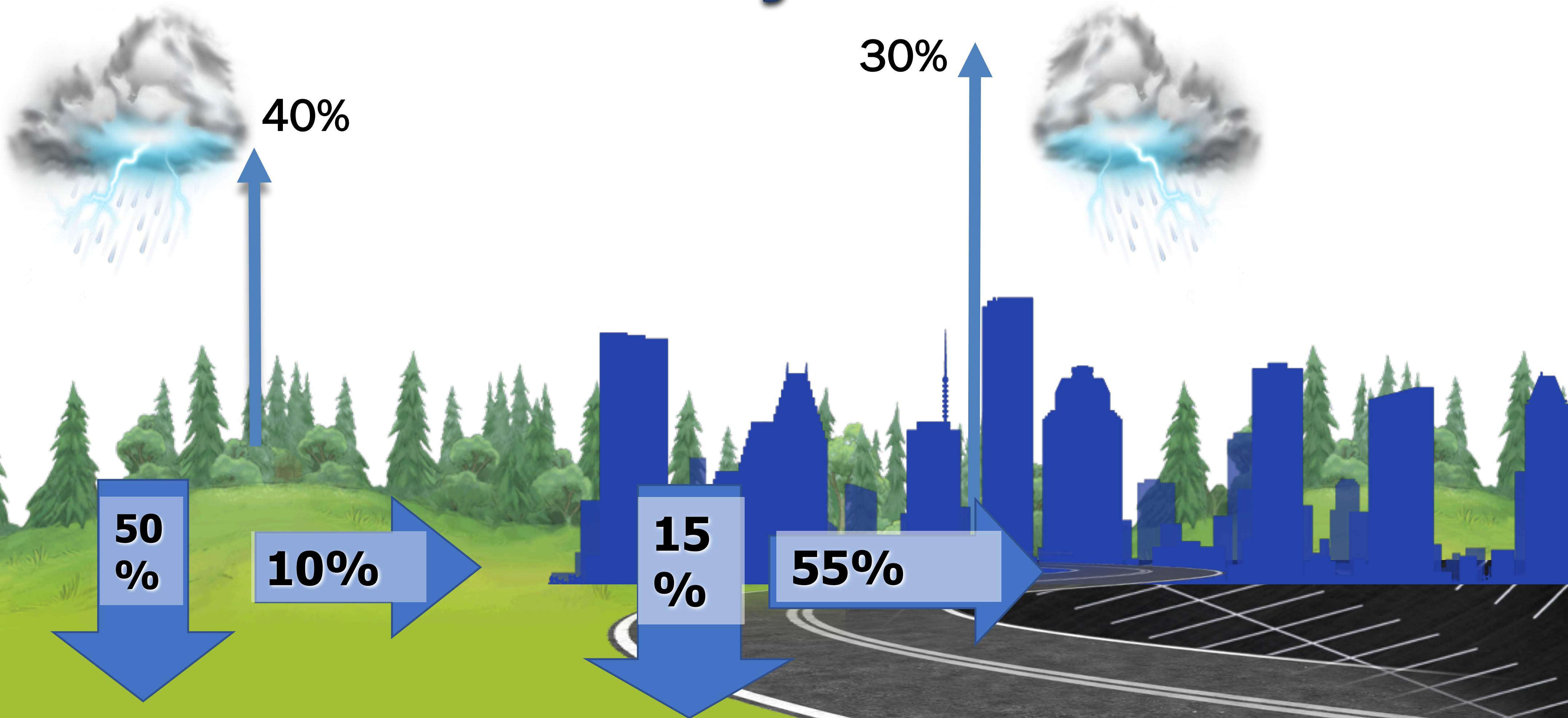
Texas' existing water supplies

(that can be relied on in the event of drought)

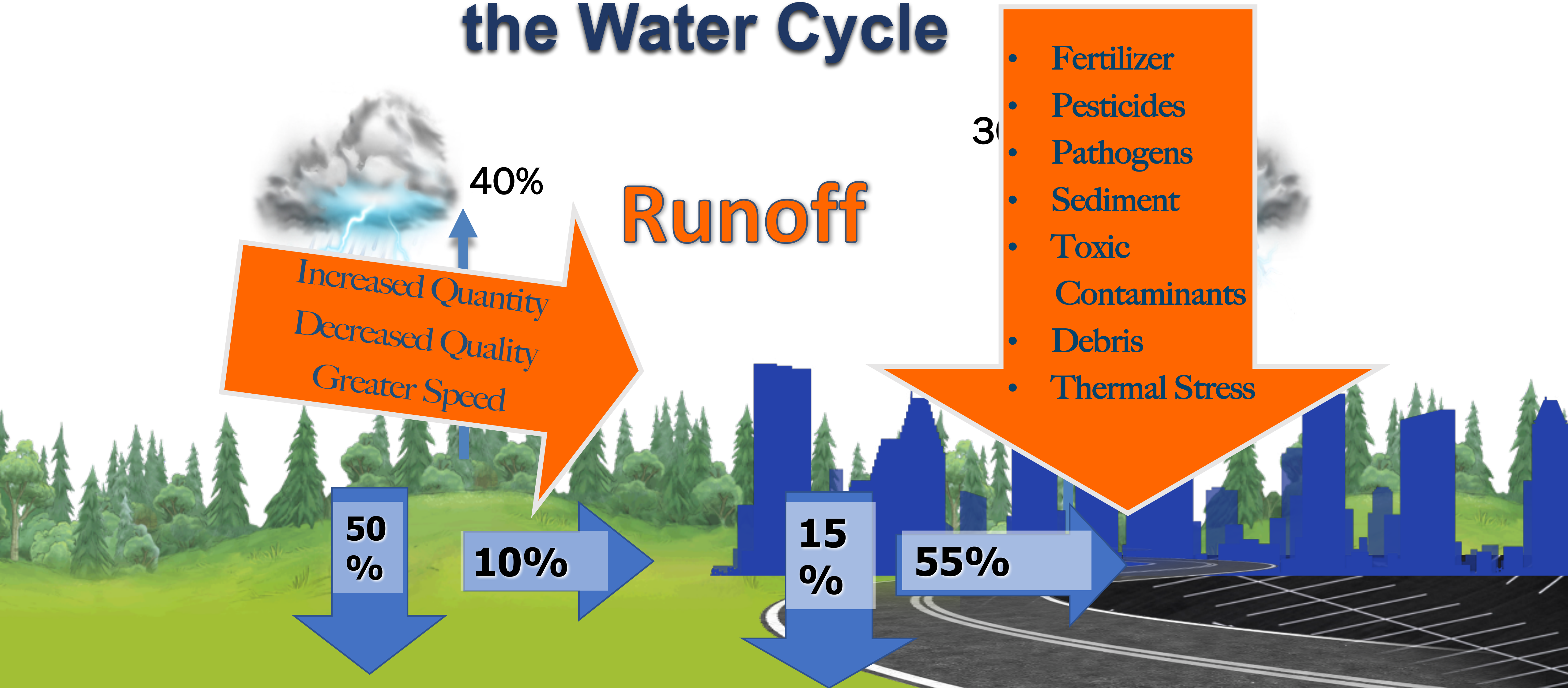
Expected decline by approximately 11% (2020 -2070)

15.2 million to 13.6 million acre-feet

Development Impacts the Water Cycle



Development Impacts the Water Cycle



Protecting Our Surface Water

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Water University

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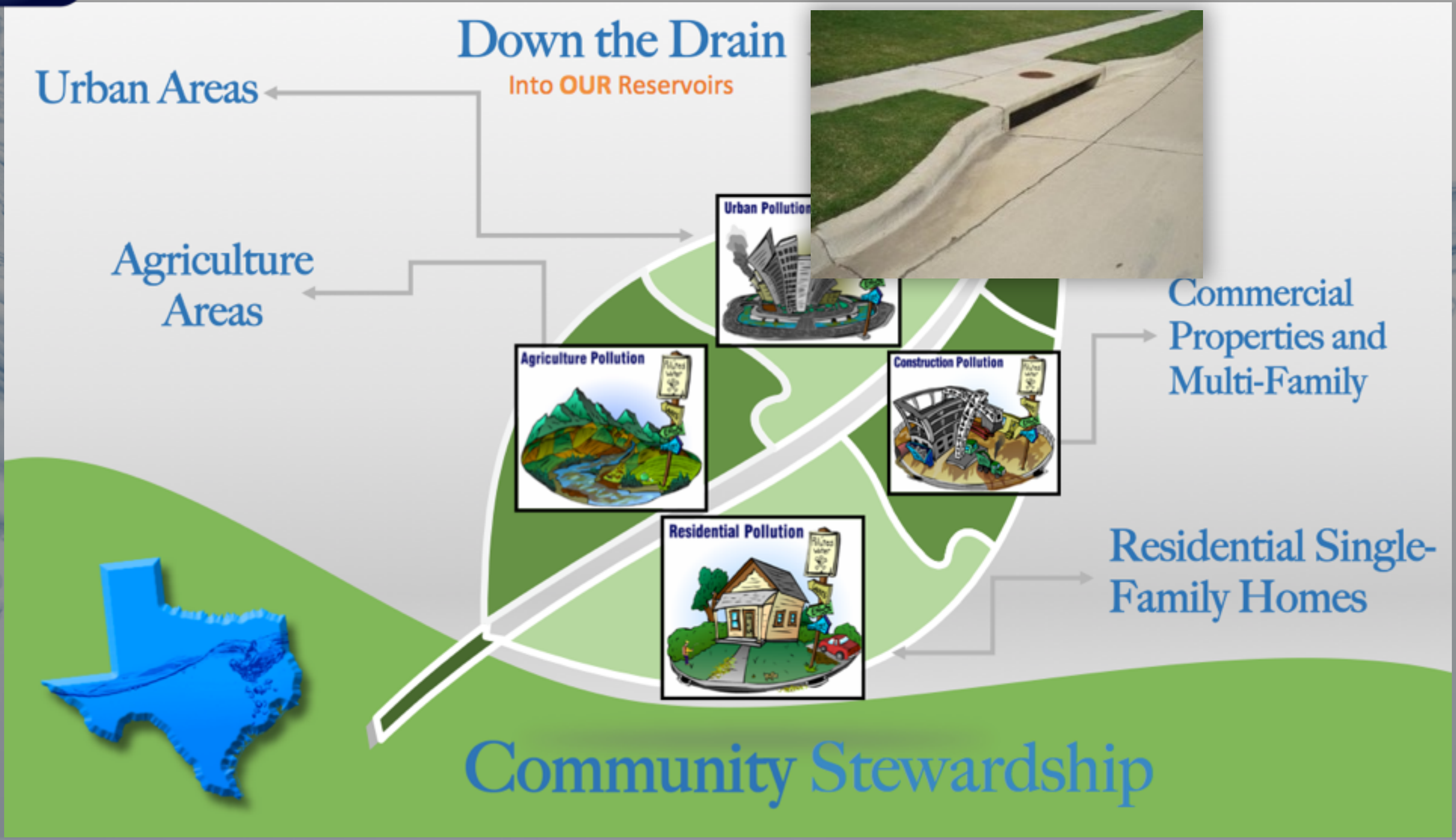
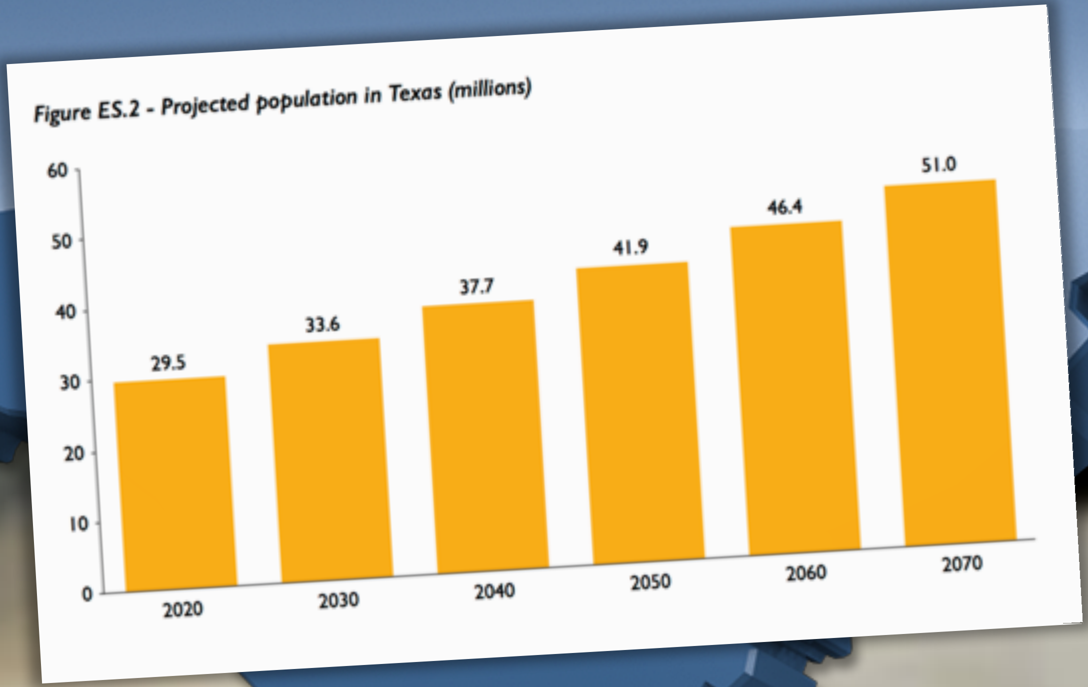


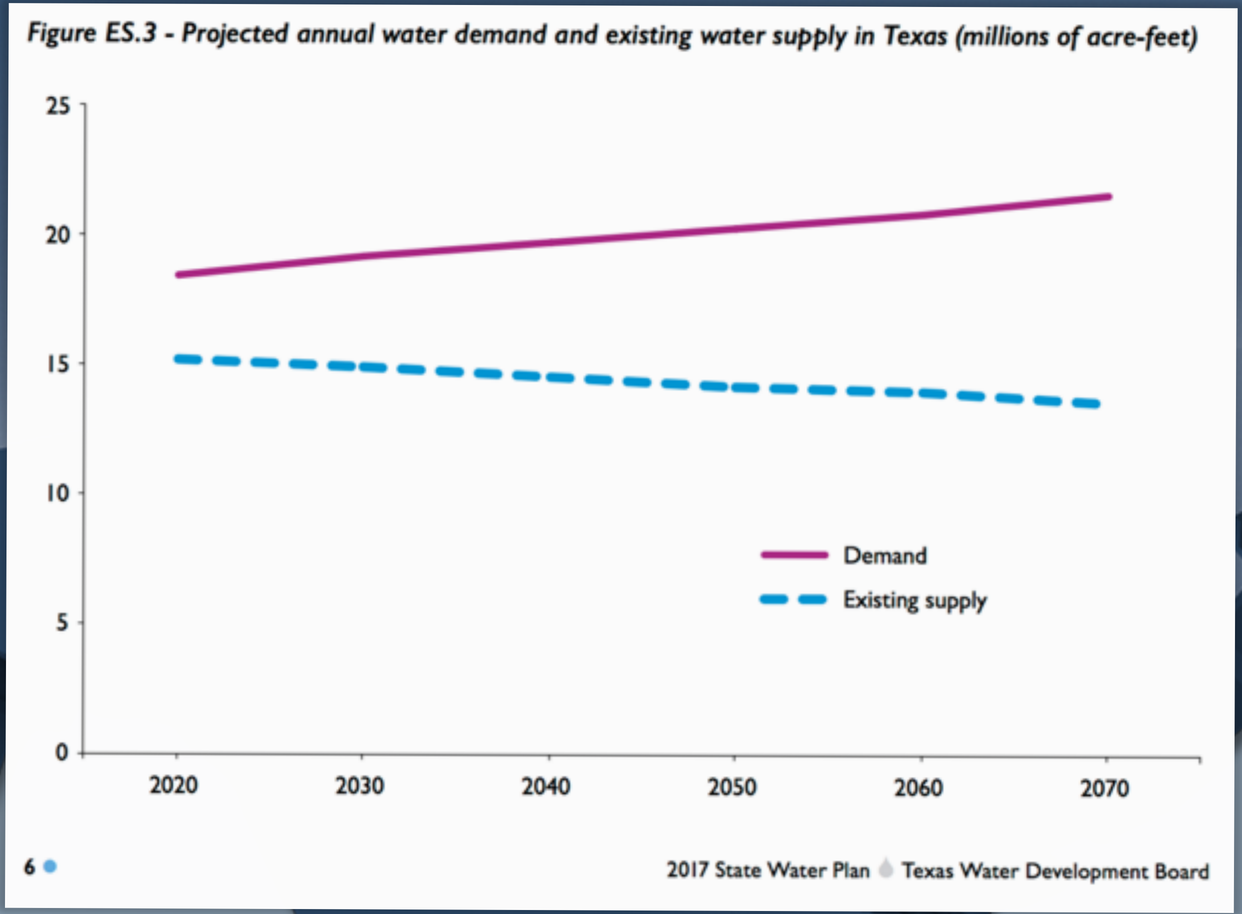
Population of Texas

Increase 70% by 2070
(29.5 million to 51 million by 2030)
*TWDB Projections



Population of Texas

Water supply expected to decrease (from 15.2 million acre feet to 13.6)



Drought In Texas

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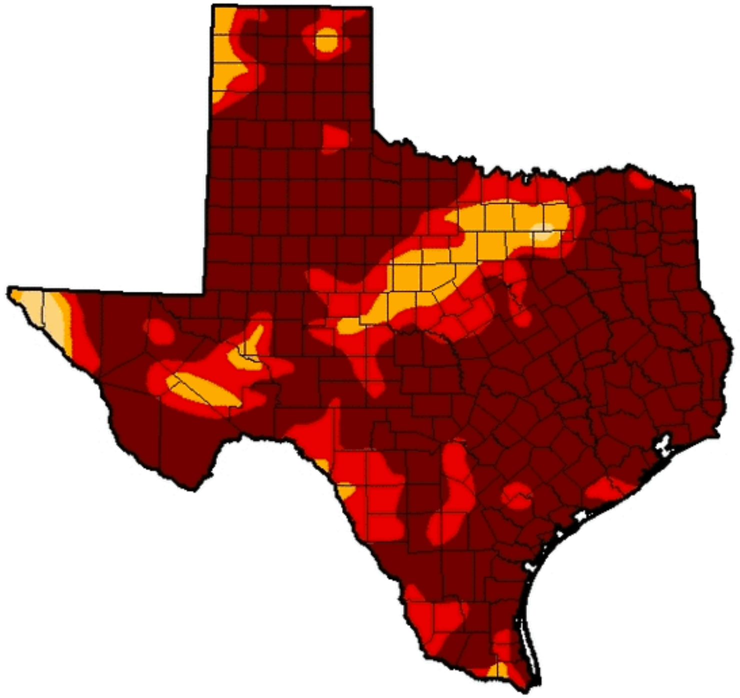
U.S. Drought Monitor
Texas

October 11, 2011
(Released Thursday, Oct. 13, 2011)
Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	99.15	91.96	73.13
Last Week 10/4/2011	0.00	100.00	100.00	99.16	96.99	87.99
3 Months Ago 7/12/2011	0.00	100.00	97.43	95.78	90.97	71.66
Start of Calendar Year 1/4/2011	13.55	86.45	66.68	36.30	13.04	0.00
Start of Water Year 9/27/2011	0.00	100.00	100.00	99.16	96.65	85.75
One Year Ago 10/12/2010	72.27	27.73	3.79	1.03	0.02	0.00

Intensity:
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

USDA   National Drought Mitigation Center

http://droughtmonitor.unl.edu/

Potential water shortage?

4.8 million acre-feet per year in 2020
8.9 million acre-feet per year in 2070

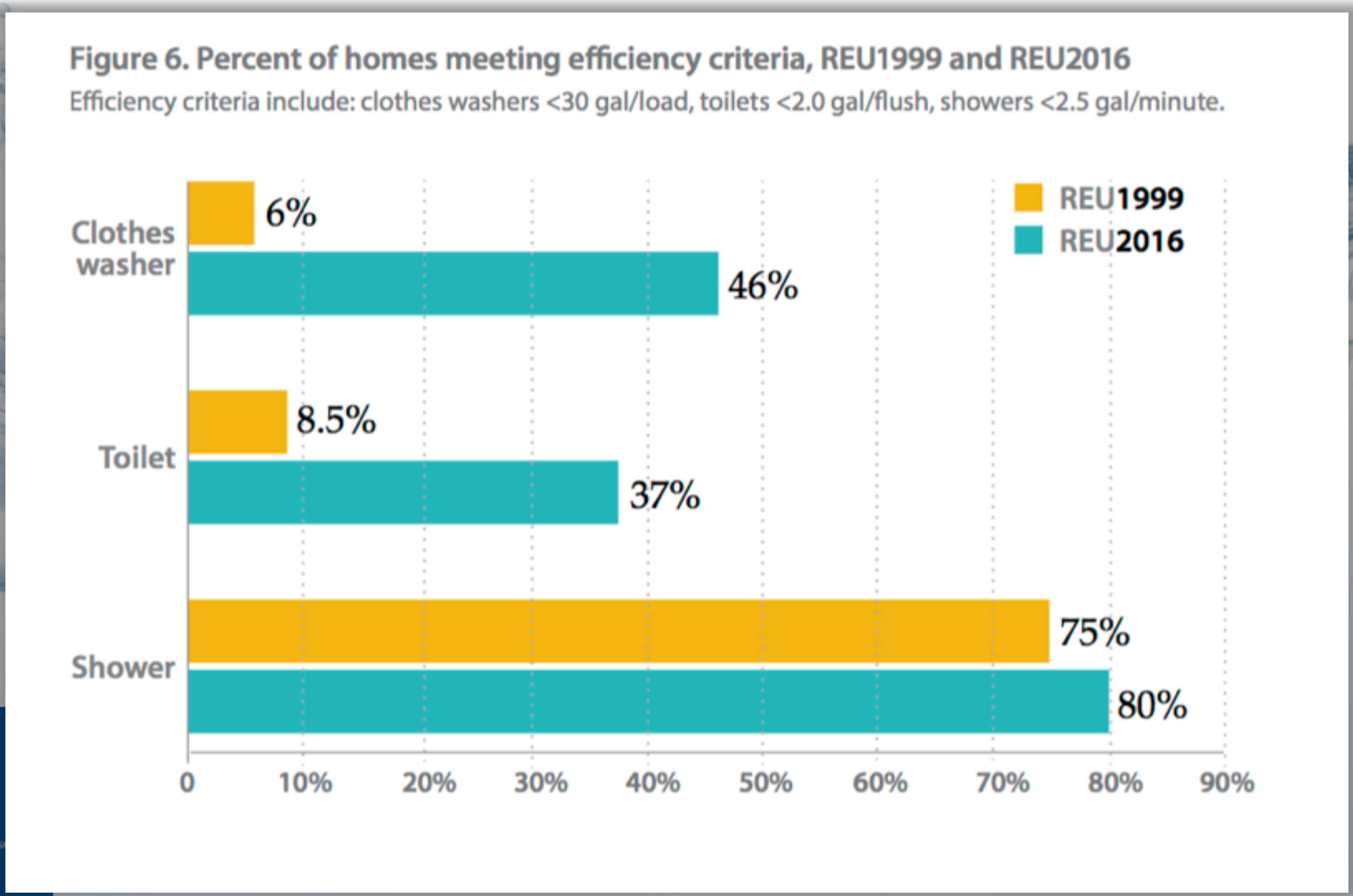
*(in **drought of record** conditions)*

Texas 2017 State Water Plan

Conservation & Reuse strategies –

Increased from 34% to 45 % of total future water volume!

Indoor Use



Water Research Foundation

Conservation Potential

Outdoor Use

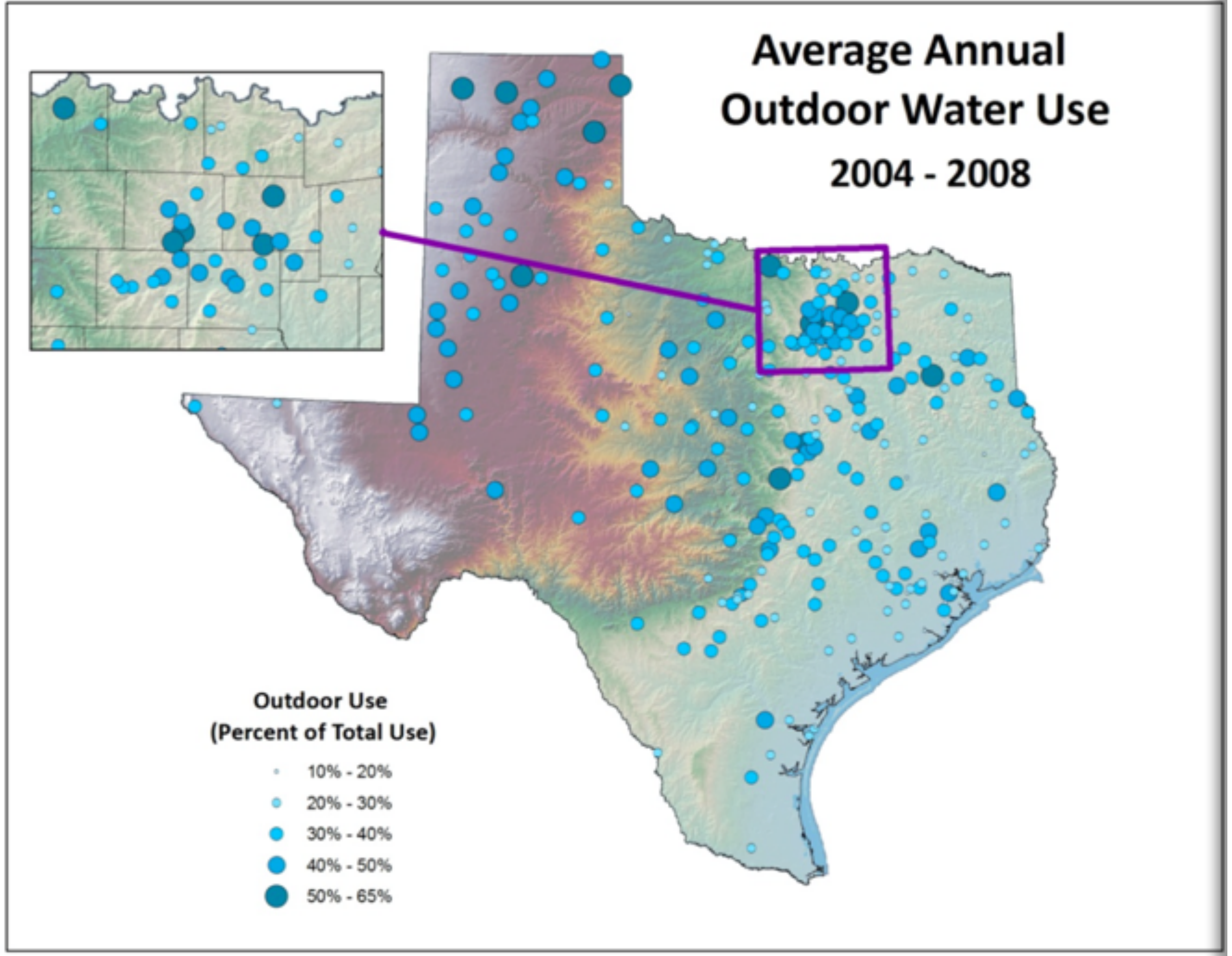


Table 3: Annual average water use by city for 2004 through 2011.

	City	Indoor use (gallons)	Outdoor use (gallons)	Outdoor use as a percentage of total use	Gallons per household per day for indoor use (gallons)	Gallons per household per day for outdoor use (gallons)
1	Amarillo	4,203,333,000	3,110,188,125	42	194	143
2	Arlington	6,579,447,000	3,806,411,375	36	198	114
3	Austin	11,532,894,150	5,879,032,288	33	176	89
4	College Station*	1,510,618,286	922,872,143	38	-	-
5	Corpus Christi	4,983,501,000	1,839,473,375	26	179	66
6	Dallas	16,293,358,200	11,668,235,723	41	173	125
7	El Paso	12,676,702,014	6,231,936,280	33	220	105
8	Fort Worth	11,576,921,511	6,819,864,226	37	166	97
9	Garland	4,398,659,640	2,234,119,198	33	198	100
10	Houston	22,287,783,000	5,629,024,250	20	148	37
11	Katy	281,554,500	202,737,375	40	188	135
12	Laredo	5,013,600,000	1,707,862,500	25	265	93
13	Lubbock	4,332,784,500	2,341,568,000	36	177	96
14	Odessa	2,327,562,000	1,358,331,500	37	205	119
15	Pflugerville	558,544,200	393,038,375	39	219	152
16	San Antonio**	23,242,411,406	7,713,879,696	25	202	67
17	Tyler	1,682,887,500	1,937,568,750	53	171	195
	City average			*35*	*192*	*108*
	City median			*36*	*191*	*102*
	Statewide average			*31*	*181*	*86*

Outdoor Design Trends

Clients are asking for:

Outdoor living spaces that

- Are environmentally sustainable
- Reduce water costs
- Are lower maintenance

88% Rainwater Harvesting or Graywater Harvesting
86% Native plants/Adapted Plants
77% Pervious Paving
75% Edible Landscaping
73% Rain Gardens
72% Drip/ Efficient Irrigation
72% Reduced Lawn Area

Landscape CPR

Conservation-

Saving resources **Water, Soil, Energy, Air Quality**

- Preserving and **enhancing habitat** and **ecological functions** of the watershed

Permeability-

Disconnecting impermeable surfaces

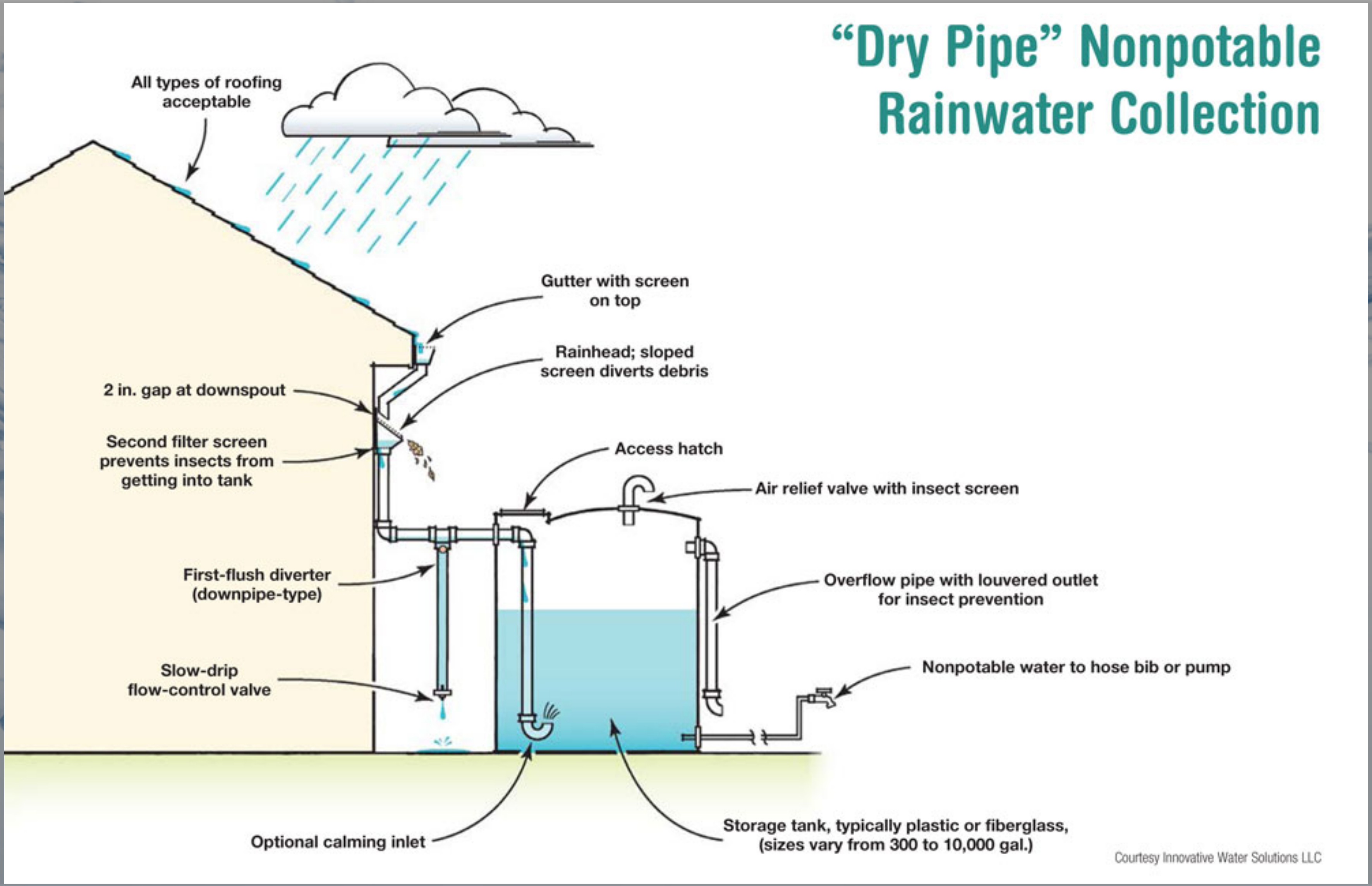
- Breaking up hard surfaces to **allow water to spread** out and sink into the ground
- **Creating soil** that is biologically active and **holds on to water**

Retention-

Holding water on the property for the benefit of **Soil, Plants, and Habitat**

- Rather than allowing it to **Run Off** into the storm system
- Grading to **capture water** and **allow it to sink** throughout the landscape
- **Elimination of Runoff**

Rainwater Harvesting



Rainwater Harvesting

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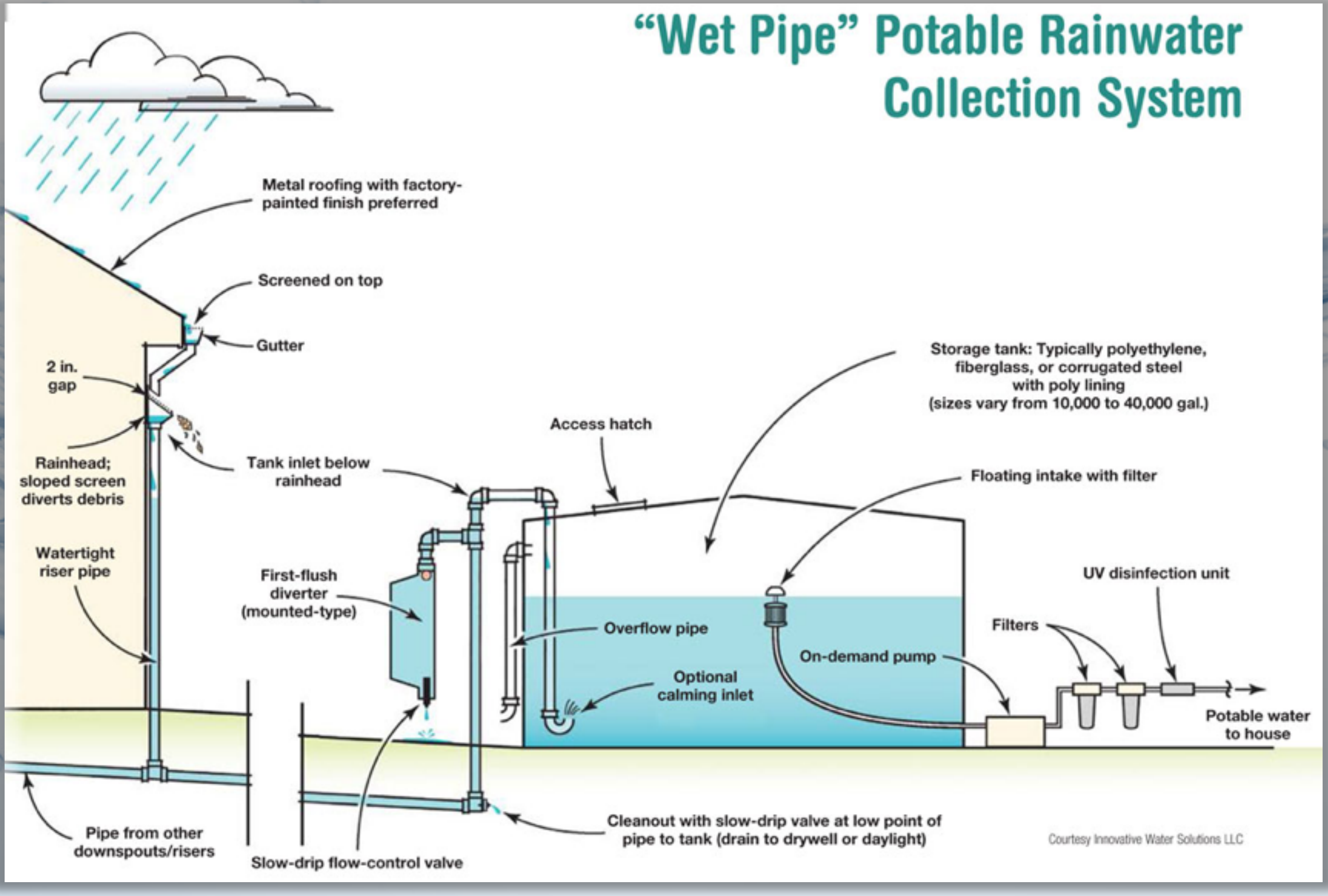
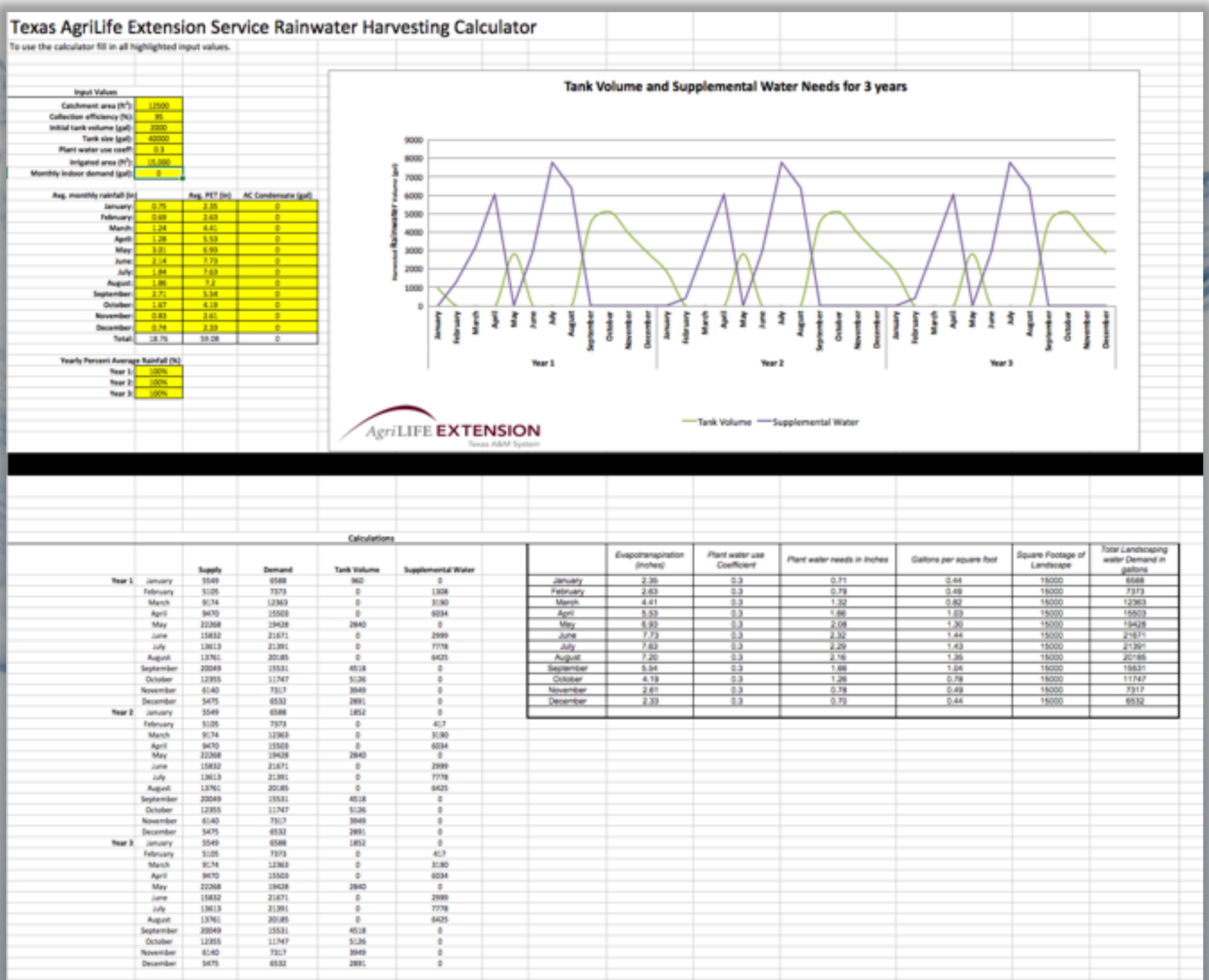


RWH Tools

RainwaterHarvesting.tamu.edu



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RWH Tools

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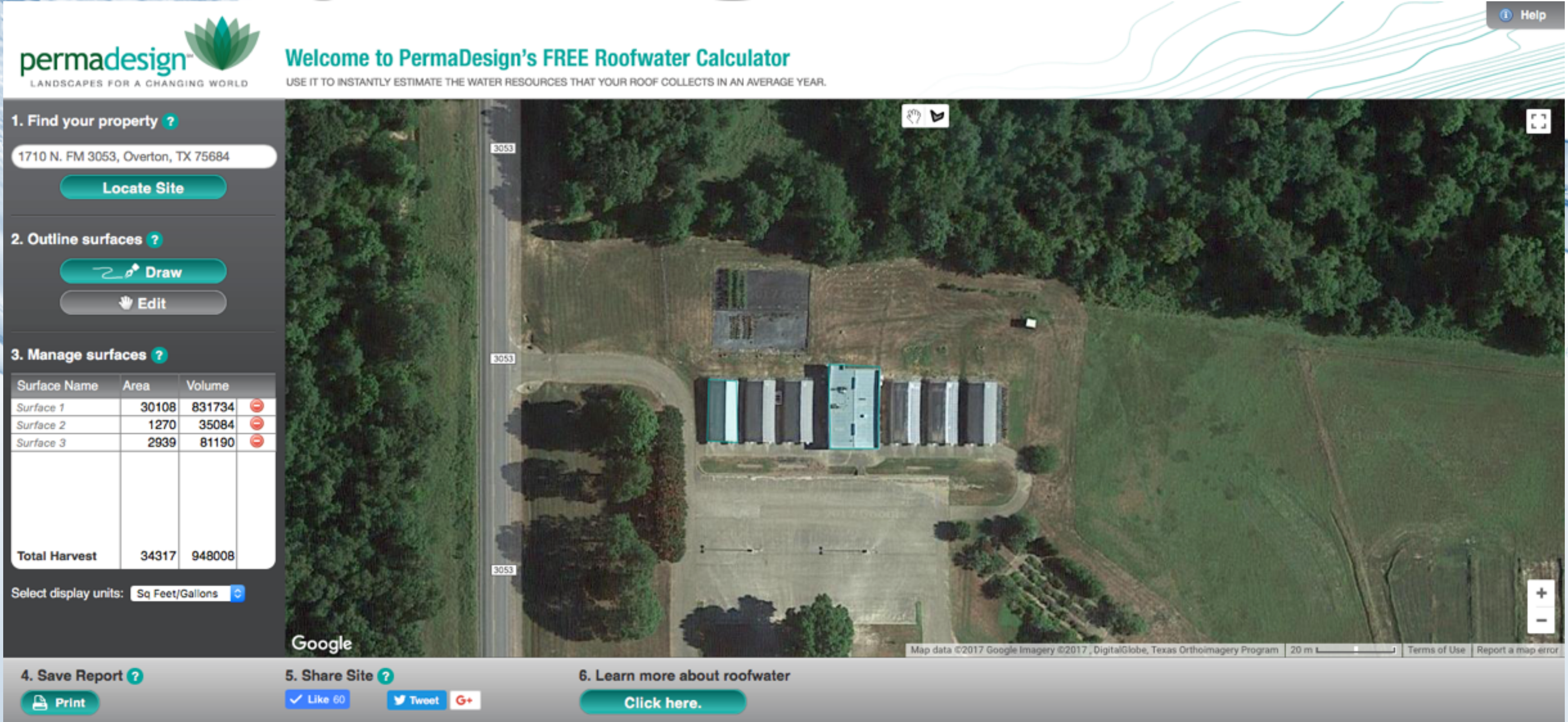
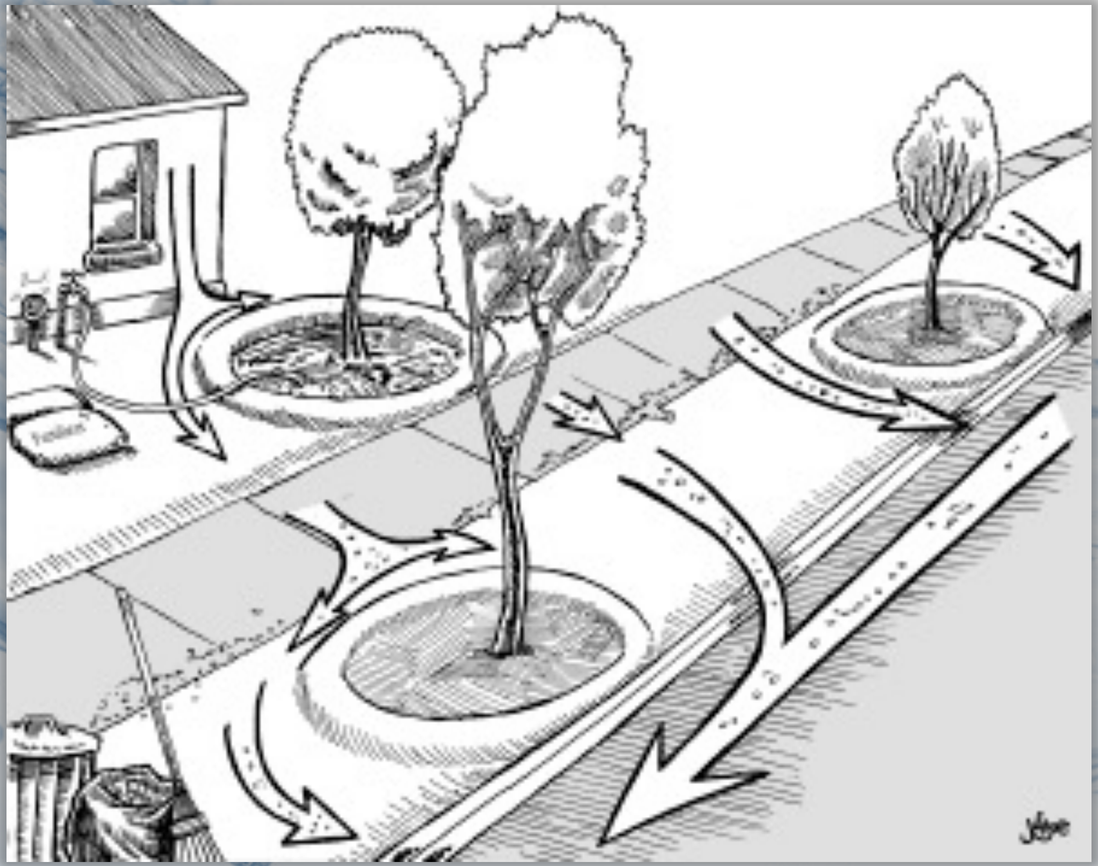
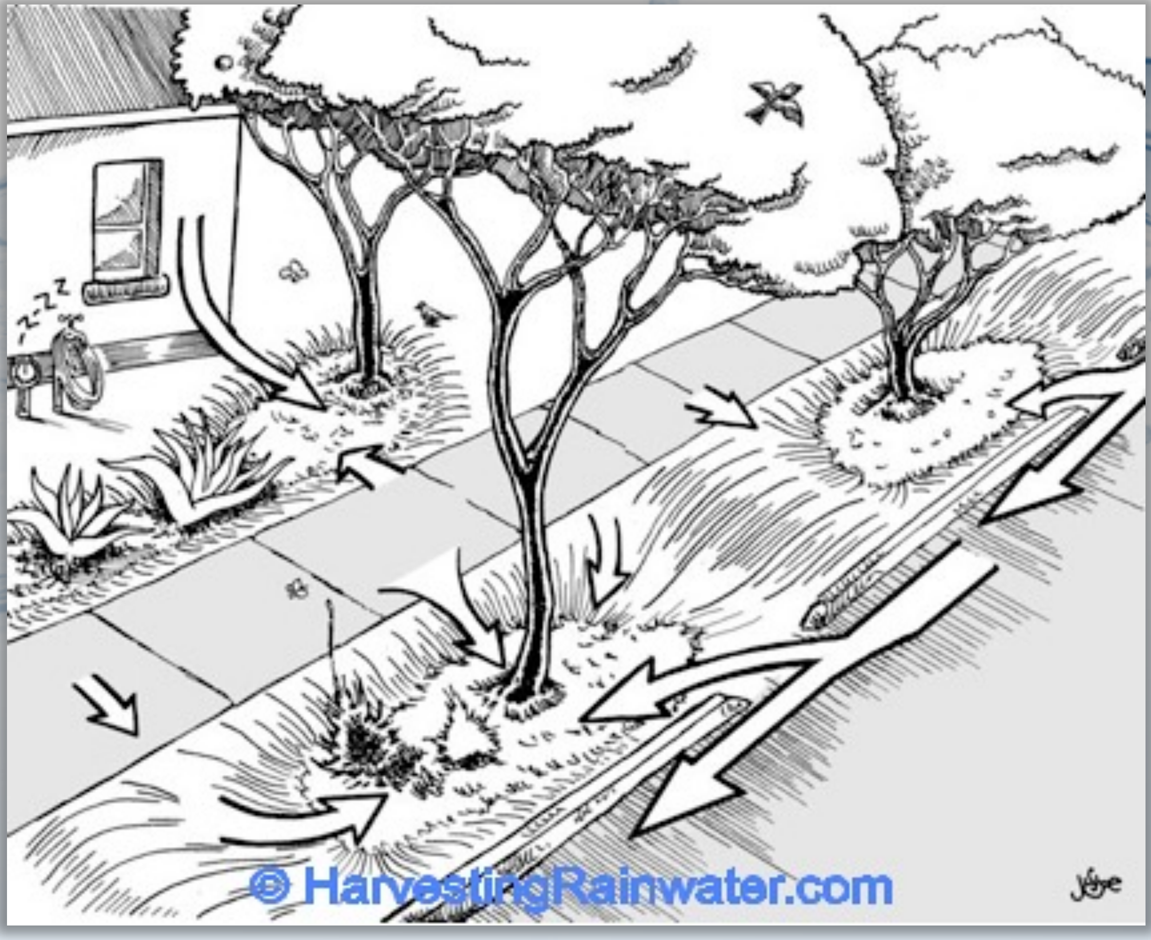
permadesign.com/calculator



But a Cistern Only Holds So Much...

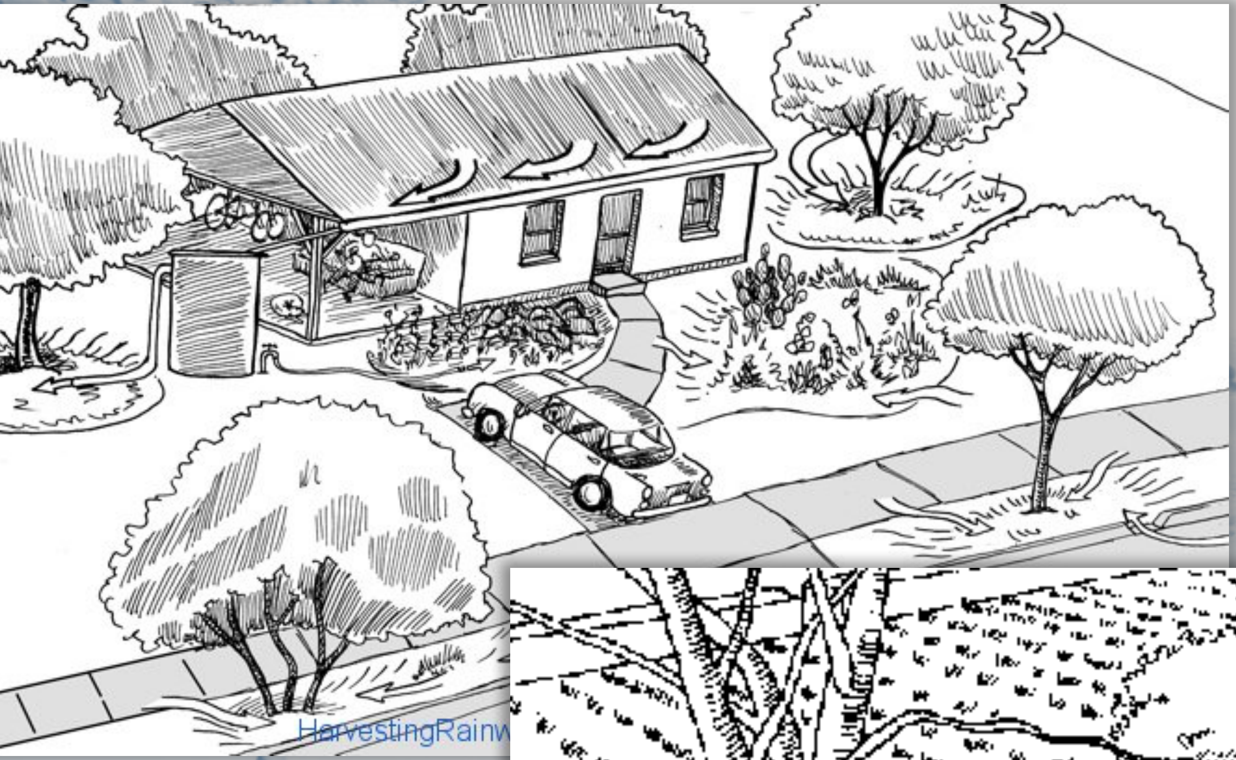
Our Water Problem

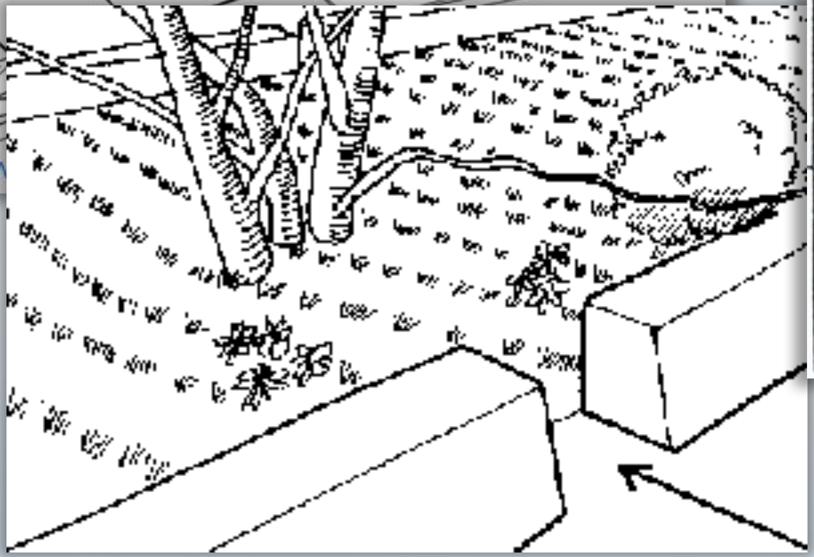


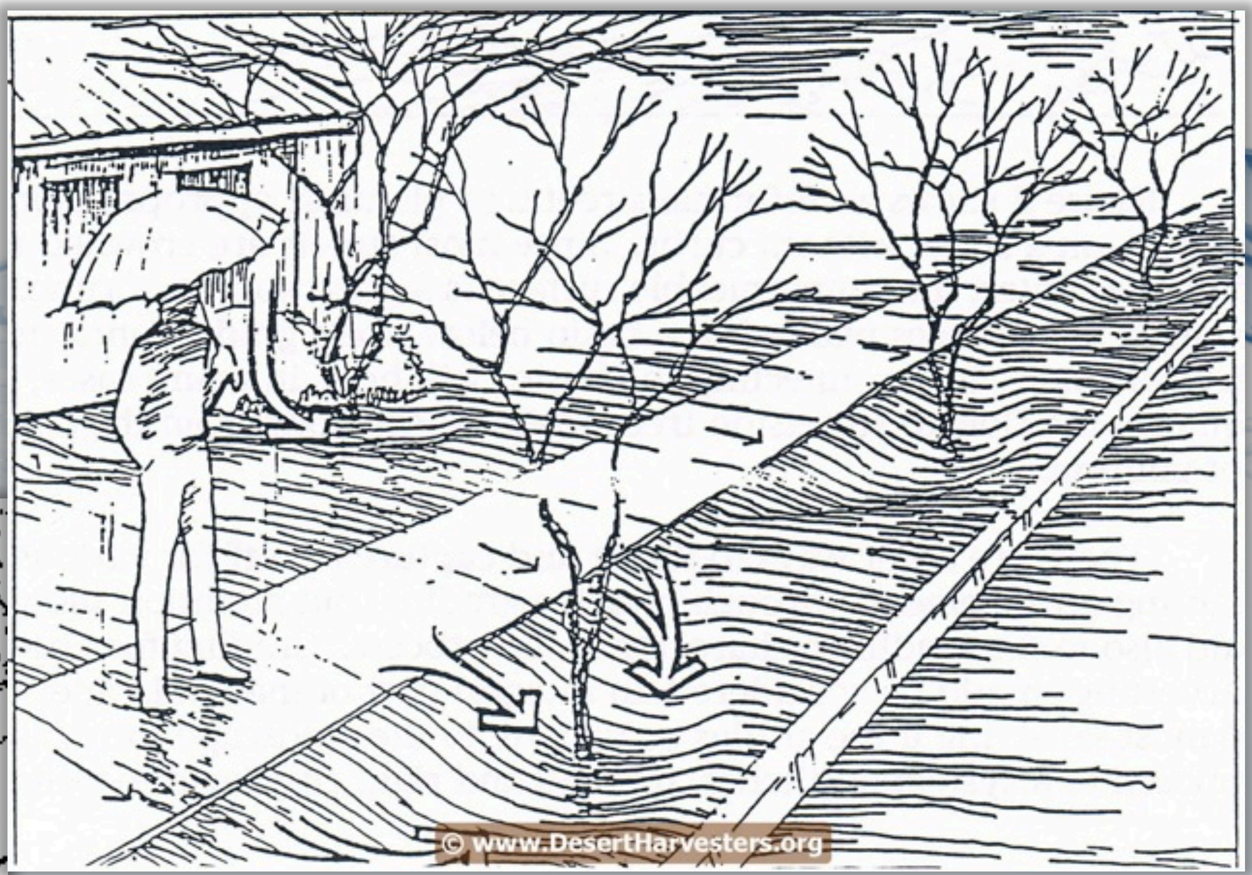


Our Water Solution –

Green Infrastructure

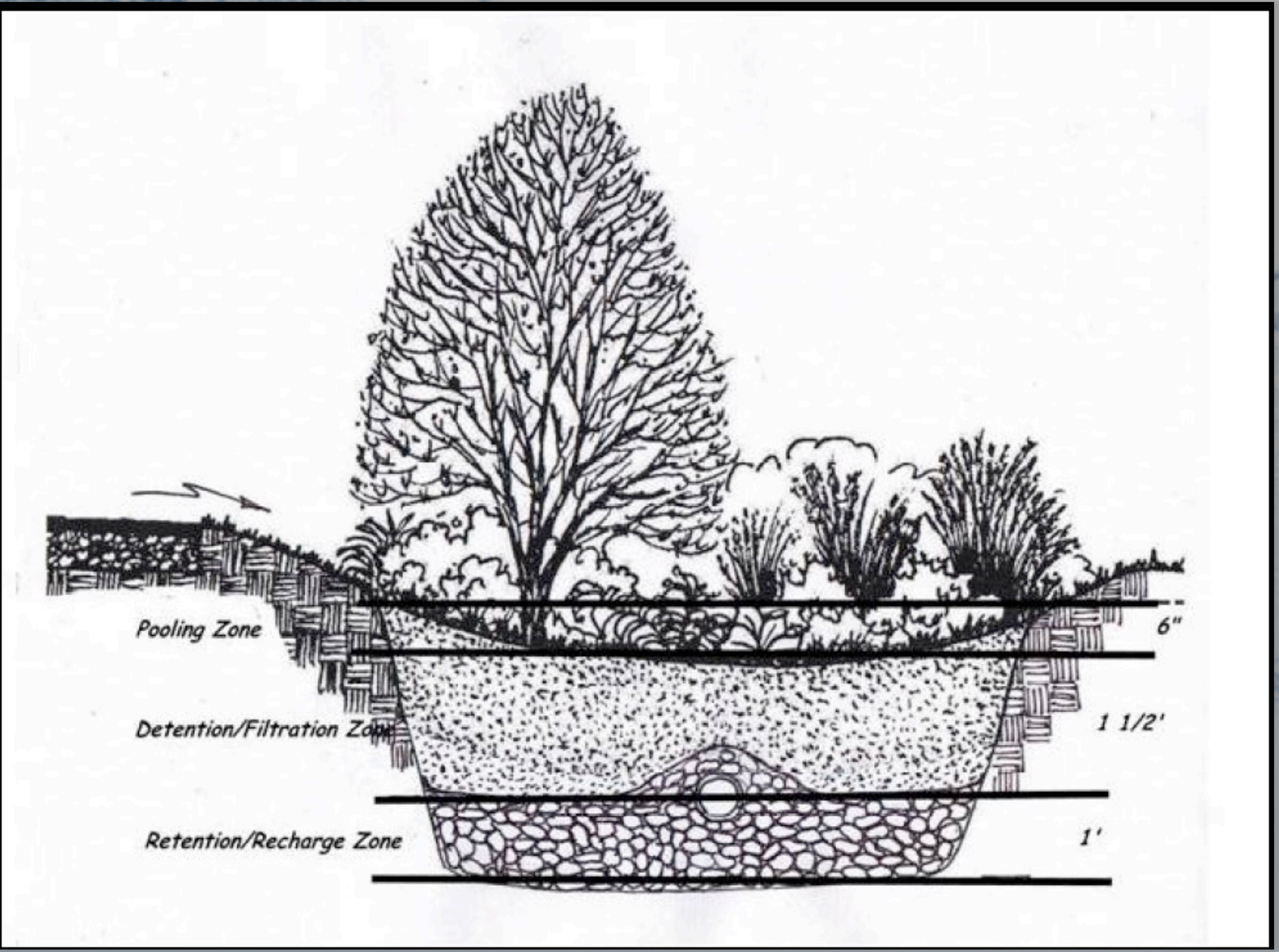






Our Water Solution –

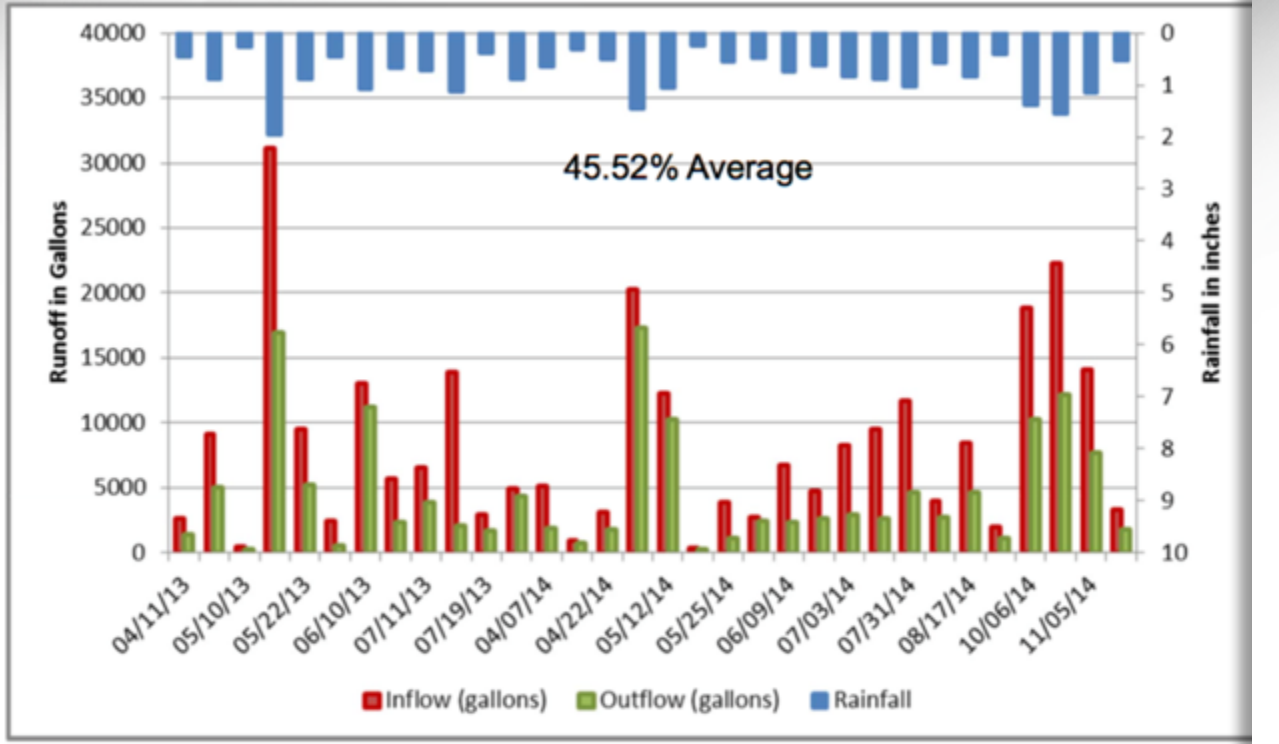
Rain Gardens



Our Water Solution –

Rain Gardens

Volume Reduction



Load Reduction

Contaminant	Inflow (lbs)	Outflow (lbs)	% reduction
NO3	94070	20268	78%
NH4	15102	5192	66%
TKN	177932	63353	64%
Orthophosphate	3190	2056	36%
Total Phosphorus	9082	5320	41%
TSS	2020645	341401	83%

Lawns

Commonly over watered

- Creates the stigma "water hogs"

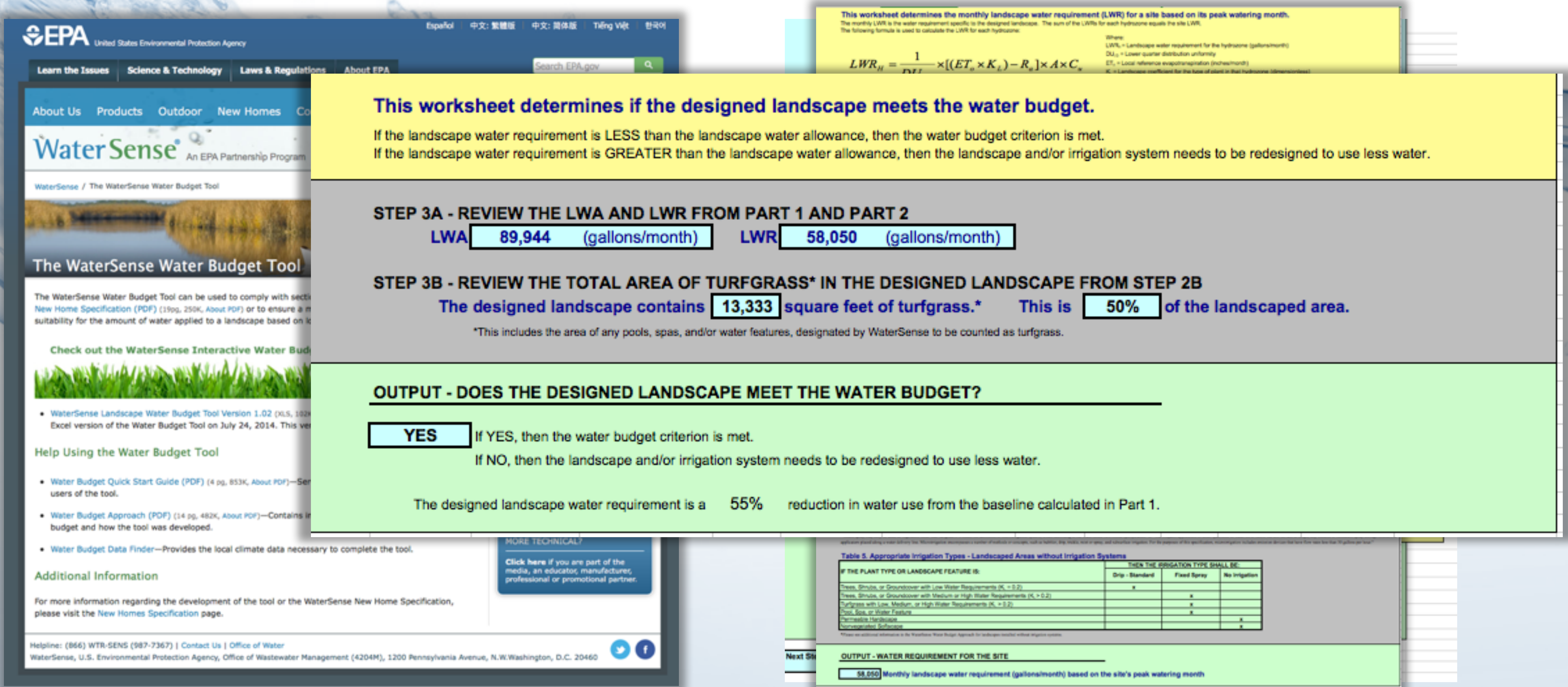
Overuse can lead to Water Pollution

- Fertilizers
- Pesticides,
- Other chemicals

(If managed the wrong way)

Reduce Turf Areas?

EPA WaterSense



Benefits of Native & Adapted

Drought Tolerance

Heat Tolerance

Less Water

Less Fertilizer

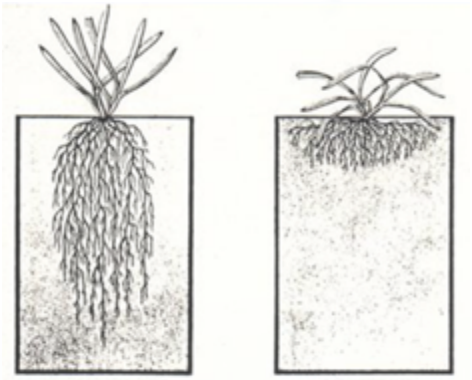
Less Pesticides

*Native=Hardy & from Texas

*Adapted=Hardy & introduced to landscapes

Best Management Practices

- Water only <u>when needed</u>
- <u>Water deeply</u> to promote deep and healthy roots
- <u>Water slowly</u> for better absorption. Use drip wherever possible and the <u>Cycle & Soak</u> method
- <u>Maintain</u> a 2” to 4” <u>mulch layer</u>
- <u>Design</u> for efficiency
- Install per state (and local) specifications
- Water <u>without</u> creating <u>runoff</u>
- <u>Check</u> irrigation system monthly



The best results come when there’s
<u>collaboration between landscape AND irrigation disciplines</u> !!

Irrigation BMP's

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Site Inventory

- Wind
- Structures
- Hardscape

- Hydrozones
  - Soil Type
  - Sun Exposure (Full sun – Full shade)
    - Reflected Light
  - Plant Material-Water Requirements and Root Depth
    - Turfgrass Variety
    - Annual Color
    - Herbaceous Perennials
    - Ground Cover
    - Trees/Shrubs/Woody Perennials

Irrigation BMP's

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Water Requirements

- How much water is needed for each Plant?
- Does the water budget allow for enough water?
- Watering Window-Water restrictions?
- ET-Evapotranspiration

Water Source

- Municipal Water
- Alternative Water Sources
  - Rainwater Harvesting
  - Graywater
  - AC Condensate

Irrigation BMP's

The purpose of an irrigation system?

To support the health and viability of managed landscapes by delivering supplemental water <u>when rainfall is minimal</u>

It all comes down to better WATER MANAGEMENT!

(as simple as turning the water off)

- *Establishment*
- *Maintenance-Repair/Monitor*
- *Adjust for maturity*

"Old" Technology

Most Efficient Irrigation Method

- 90% efficient compared to 60% or less with other systems
- Easily installed and equipment readily available
- Typically exempt from water restrictions imposed during drought
- Reduces water loss due to evaporation
- Reduces water loss and contamination due to runoff
- Reduces leaching of water and nutrients below the root zone
- Saves Water and Money

Drip Irrigation

Rain and Freeze Sensors

Gutter mount

Surface mount

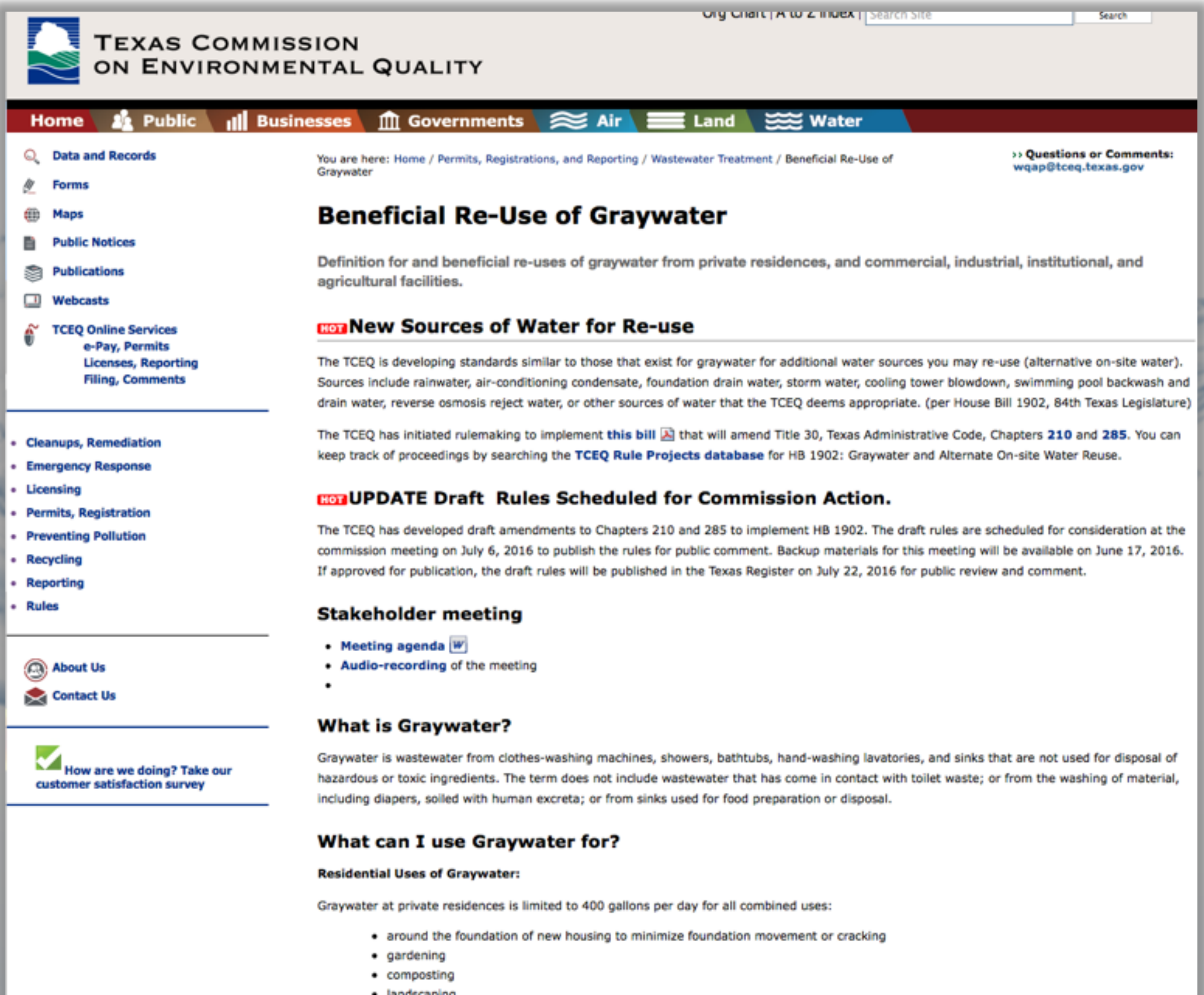
Pole mount

New “er” Technology

- *Increase efficiency of spray irrigation by replacing spray nozzle with multi-stream rotors.*

- *More than 60% more efficient than regular nozzles.*

What's Next?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TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

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How are we doing? Take our customer satisfaction survey

You are here: Home / Permits, Registrations, and Reporting / Wastewater Treatment / Beneficial Re-Use of Graywater

›› Questions or Comments: wqap@tceq.texas.gov

Beneficial Re-Use of Graywater

Definition for and beneficial re-uses of graywater from private residences, and commercial, industrial, institutional, and agricultural facilities.

HOT New Sources of Water for Re-use

The TCEQ is developing standards similar to those that exist for graywater for additional water sources you may re-use (alternative on-site water). Sources include rainwater, air-conditioning condensate, foundation drain water, storm water, cooling tower blowdown, swimming pool backwash and drain water, reverse osmosis reject water, or other sources of water that the TCEQ deems appropriate. (per House Bill 1902, 84th Texas Legislature)

The TCEQ has initiated rulemaking to implement **this bill** that will amend Title 30, Texas Administrative Code, Chapters **210** and **285**. You can keep track of proceedings by searching the **TCEQ Rule Projects database** for HB 1902: Graywater and Alternate On-site Water Reuse.

HOT UPDATE Draft Rules Scheduled for Commission Action.

The TCEQ has developed draft amendments to Chapters 210 and 285 to implement HB 1902. The draft rules are scheduled for consideration at the commission meeting on July 6, 2016 to publish the rules for public comment. Backup materials for this meeting will be available on June 17, 2016. If approved for publication, the draft rules will be published in the Texas Register on July 22, 2016 for public review and comment.

Stakeholder meeting

- **Meeting agenda**
- **Audio-recording** of the meeting

What is Graywater?

Graywater is wastewater from clothes-washing machines, showers, bathtubs, hand-washing lavatories, and sinks that are not used for disposal of hazardous or toxic ingredients. The term does not include wastewater that has come in contact with toilet waste; or from the washing of material, including diapers, soiled with human excreta; or from sinks used for food preparation or disposal.

What can I use Graywater for?

Residential Uses of Graywater:

Graywater at private residences is limited to 400 gallons per day for all combined uses:

- around the foundation of new housing to minimize foundation movement or cracking
- gardening
- composting
- landscaping

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Water U #Doing?

For The

The Green Industry

Water Management Challenges

- Adequate Water Supply
- Filtering Water
- Fertilizer Injection
- Pathogens
- Chemical Runoff?
- Sustainable Profitability

Subirrigation

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- Capillary Mats
- Ebb and Flow Benches
- Flood Floors

Advantages

- Save Labor Time
- Save Water? *Fertilizer?*
  - Circulated systems
- Space Efficiency *(flexible)*
- Uniform Growth
- Less Foliar Disease

Challenges

- Cost Effectiveness
- Retrofit?
- Learning Curve for Success
- Salts *(Fertilizer concentrations)*
- Disease and Insects

Overhead Irrigation

Mist Nozzles, Impact Sprinklers, Booms

- Drawback...
  - Overhead irrigation = Foliar disease?

<u>Increase Water Efficiency</u>

- Correct timing
- Automation
- Saucers/ Trays underneath? *(capture excess through capillary action)*

- Dense plantings?

Substrate Surface Irrigation

Technology

- Drippers
  - Peat, Coir, Perlite
- Spray type emitters
  - Course media (bark etc)

Considerations

- *Pressure compensated
- Time of installation
- Cost

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Irrigation Treatment and Recycling

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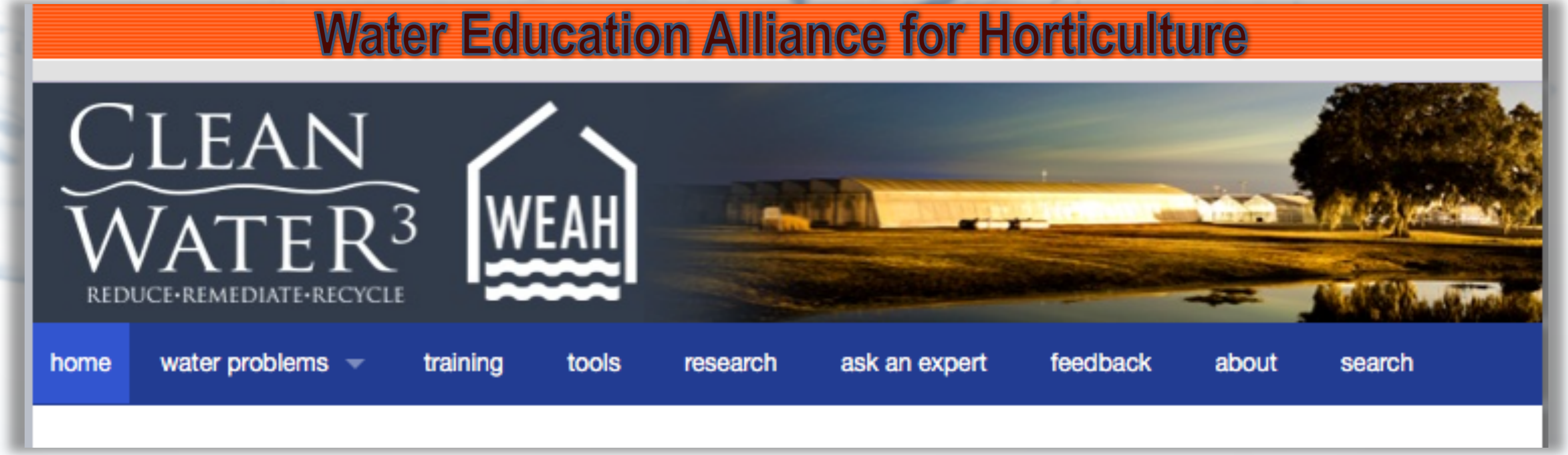
Uncertainty about the cost of water treatment is the greatest potential barrier to adoption of irrigation treatment and recycling

- *Initial water source*
- *Cost of production losses from quality issues*
- *Cost of treatment*



WaterEducationAlliance.org

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Be Proactive
Consider All Options
What Works For Other Folks?

Reduce Overwatering
Reduce Storm Runoff
- **Design**
- **Maintenance**
- **Scheduling**

Treat or Recycle Runoff?

aggie-horticulture.tamu.edu

Texas A&M AgriLife Extension

/Teaching /Research /Extension /Service Search

Aggie Horticulture | Academics | Fruit & Nut | Vegetable | Earth-Kind® | Master Gardener | JMG® | Small Acreage

Ornamental Production

Treating and Recycling Irrigation Runoff

The potential contamination of surface and groundwater from runoff presents a major challenge for the greenhouse industry. Growers rely heavily on the use of fertilizers and pesticides, as well as water, to produce quality crops. As a result, these operations can pose a threat to our natural water resources. Collecting, treating and recycling greenhouse effluent is one of the best solutions to this environmental problem.

Many states now require a water discharge permit to control irrigation runoff. These permits regulate the level of discharge that flows into surface and groundwater reserves. In many situations quantitative discharge standards are vague and each case is based by the best professional judgment of the regulatory agency.

Although these permits differ somewhat from state-to-state, there are some common features:

- Usually 3-5 years in duration
- Must retain all irrigation runoff
- Must retain all or part of storm runoff (usually first 2")
- Must dispose of irrigation runoff
- No pesticides discharged
- Nitrate and Ammonia discharge < 2ppm
- Discharge pH between 6 and 9
- Acceptable level of suspended solids

Monitoring is very important in the overall process of treating greenhouse runoff. Knowing what contaminants are present and their relative concentrations, is the basic information required for developing a management plan. Nitrates, salts, pesticides and pathogenic organisms are the principal contaminants to be on the lookout for. Many of the tests for these materials are quite expensive to run. Also, sampling technique, handling and analytical methodology can impact the results and interpretation. Table 1 provides a list of labs that are currently conducting runoff analysis.

Table 1. Labs, as of publication, conducting runoff analysis.

Name	Address	City, State, Zip	Phone
Millipore	P.O. Box 255	Bedford, Mass 01730	(617) 275-9200
HACA Company	P.O. Box 389	Loveland, CO 80539	(800) 227-4224
National Testing Laboratories	6151 Wilson Mills Rd.	Cleveland, OH 44143	(216) 449-2524

Minimizing Runoff

The best method of managing runoff is to utilize production practices which reduce volume. Obviously, the less runoff you have to deal with, the less of a problem it creates. In addition, these techniques are usually much more economical to implement than large scale treatment and disposal procedures. The following are some basics to consider:

Utilize Efficient Irrigation Systems

Ornamentals Home
Texas Greenhouse Management Handbook
- Greenhouse Structures
- Greenhouse Heating Requirements
- Growing Media
- Growing Media & pH
- Fertilizing Greenhouse Crops
- Diagnosing Nutritional Deficiencies
- Irrigating Greenhouse Crops
- Monitoring the Quality of Irrigation Water
- Treating Irrigation Water
- Managing Soluble Salts
- Treating and Recycling Irrigation Runoff
- Air, Water And Media... Putting Them All Together
- Additional References for Greenhouse Management

The Texas Poinsettia Producers Guide
A Reference Guide to Plant Care, Handling and Merchandising

Test Your System - Aggie Catch Can Test

Proper design= Efficiency

- Pumps
- Lines
- Emitters
- Water Pressure

Overwatering
Under watering
Increasing Distribution Uniformity

Resources

Ellison Chair in International Floriculture

Blog | Benefits of Plants | Marketing & Economics | Water Resources | Sustainability

Executive Academy for Growth & Leadership (EAGL)

Water Resources

The Big Picture — Water Issues & Policy Resources

Water Management Practices (BMP's)

Water Conservation Practices

Water Auditing Tools For Growers

EllisonChair.tamu.edu

Texas A&M AgriLife Research | Extension
The Dallas Center

Texas A&M AgriLife Research
Water University

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Additional Resources and Standards

ASPE American Society of Plumbing Engineers
ARCSA American Rainwater Catchment Systems Association

PLUMBING ENGINEERING & DESIGN STANDARD

ARCSA/ASPE/ANSI 63-2013: Rainwater Catchment Systems

ARCSA American Rainwater Catchment Systems Association
ASPE American Society of Plumbing Engineers

ARCSA/ASPE 78: Stormwater Harvesting System Design for Direct End-Use Applications

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DRAFT