



Rainwater Harvesting

**Presentation for the Colorado River Watch
Network Stewardship Workshop
Riverside Conference Center-Bastrop, Texas**

By

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Texas Water Development Board**

Texas Water Development Board

Agency Vision

Sustainable, affordable, quality water for Texans, our economy, and our environment

Agency Mission

To provide leadership, planning, financial assistance, information, and education for the conservation and responsible development of water for Texas

Data

Scientific basis for water planning



State Water Plan

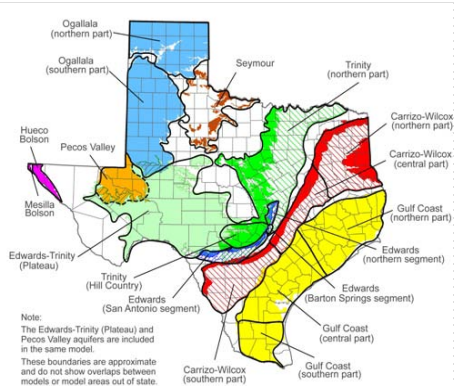
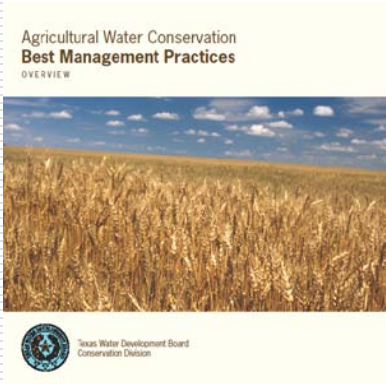
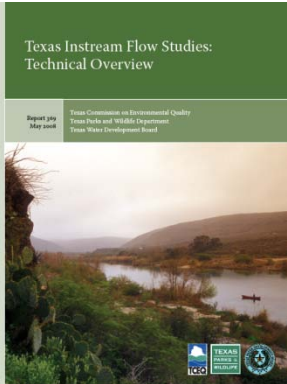
Roadmap for water supply infrastructure development



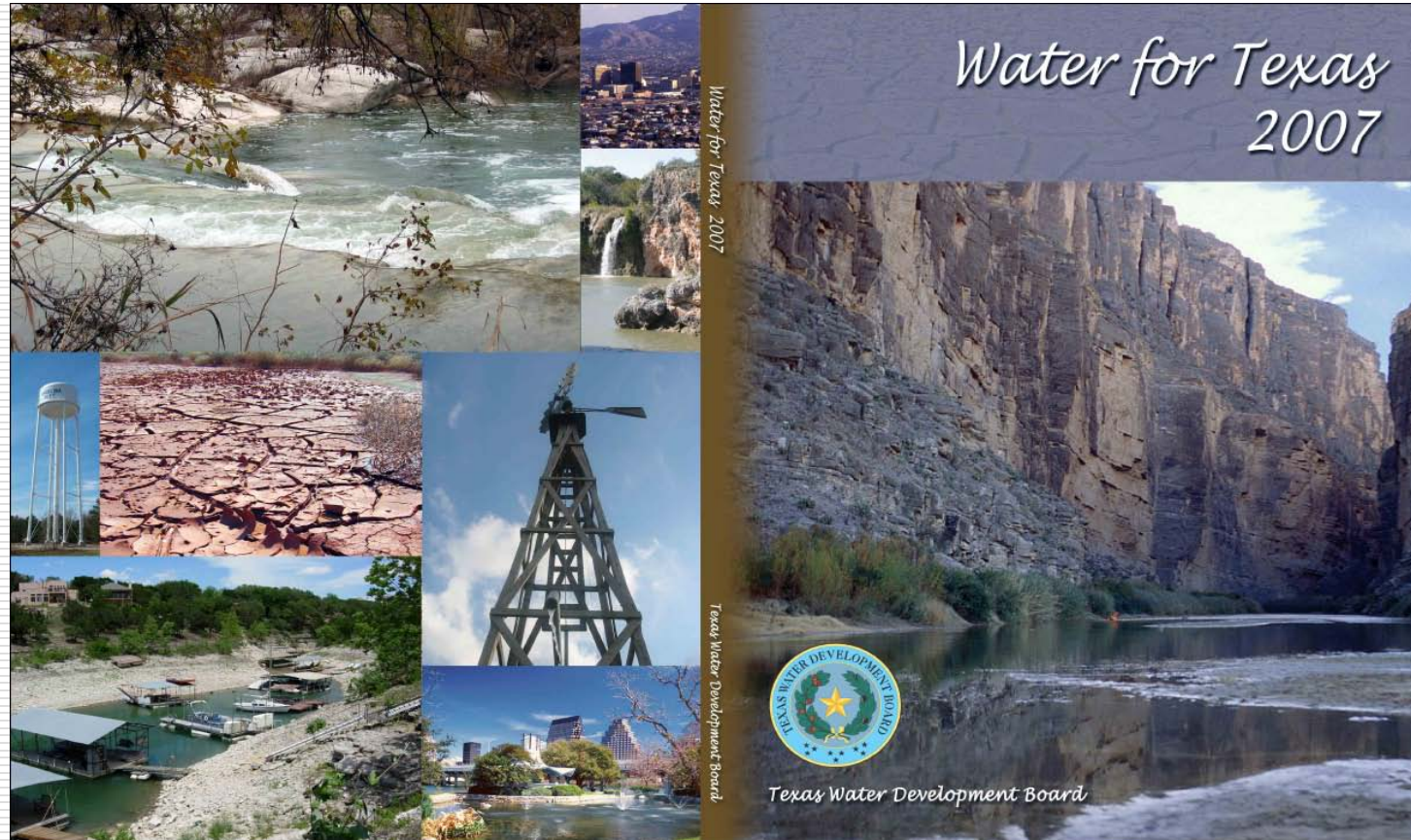
Financial Assistance

Implement the State Water Plan

Best Data – Best Science

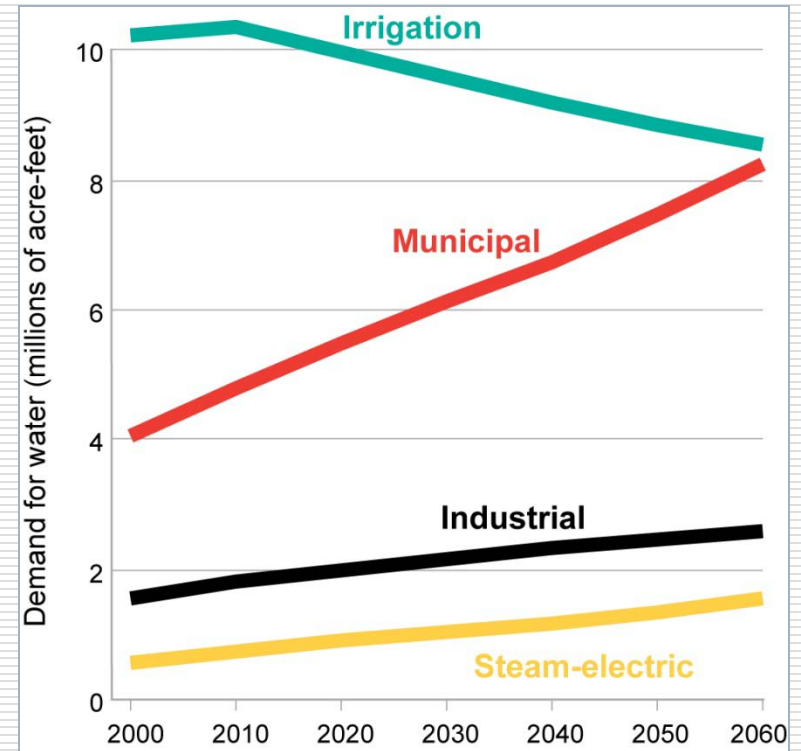
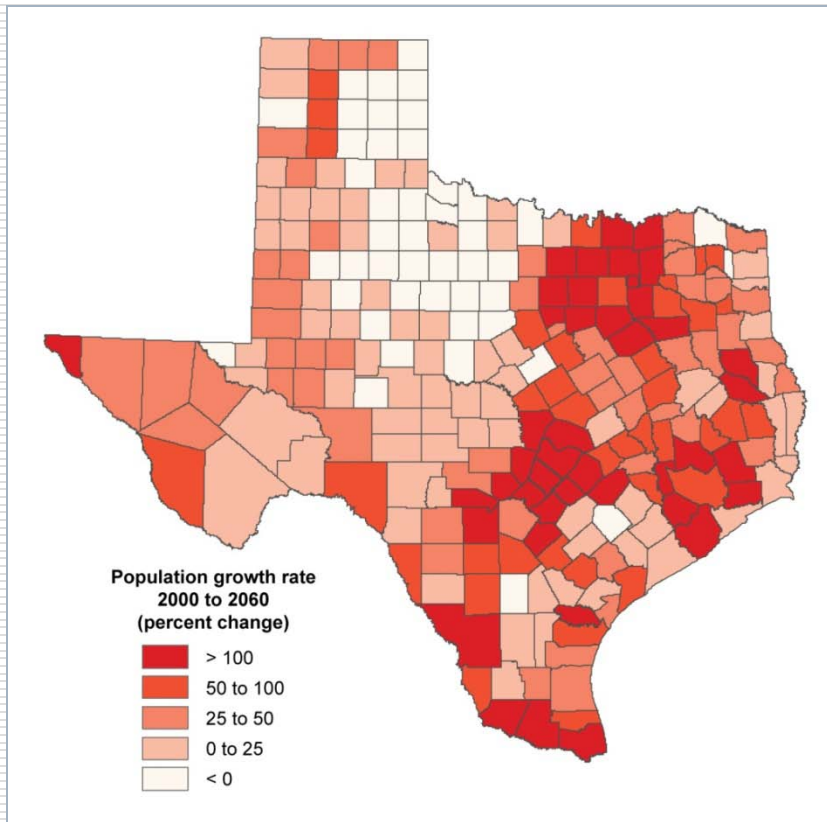


Regional and State Water Planning



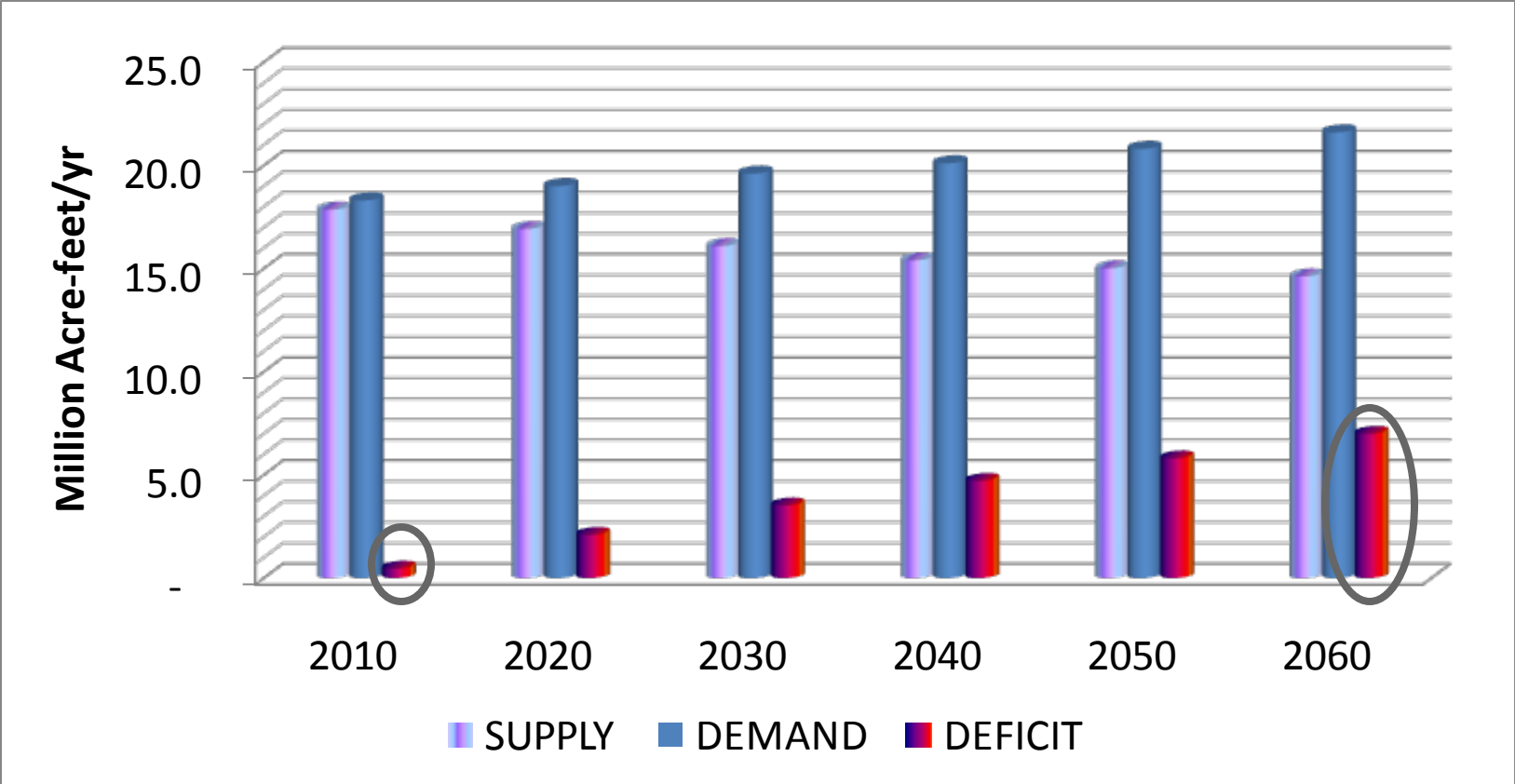
Rainwater Harvesting

Population and Demand for Water



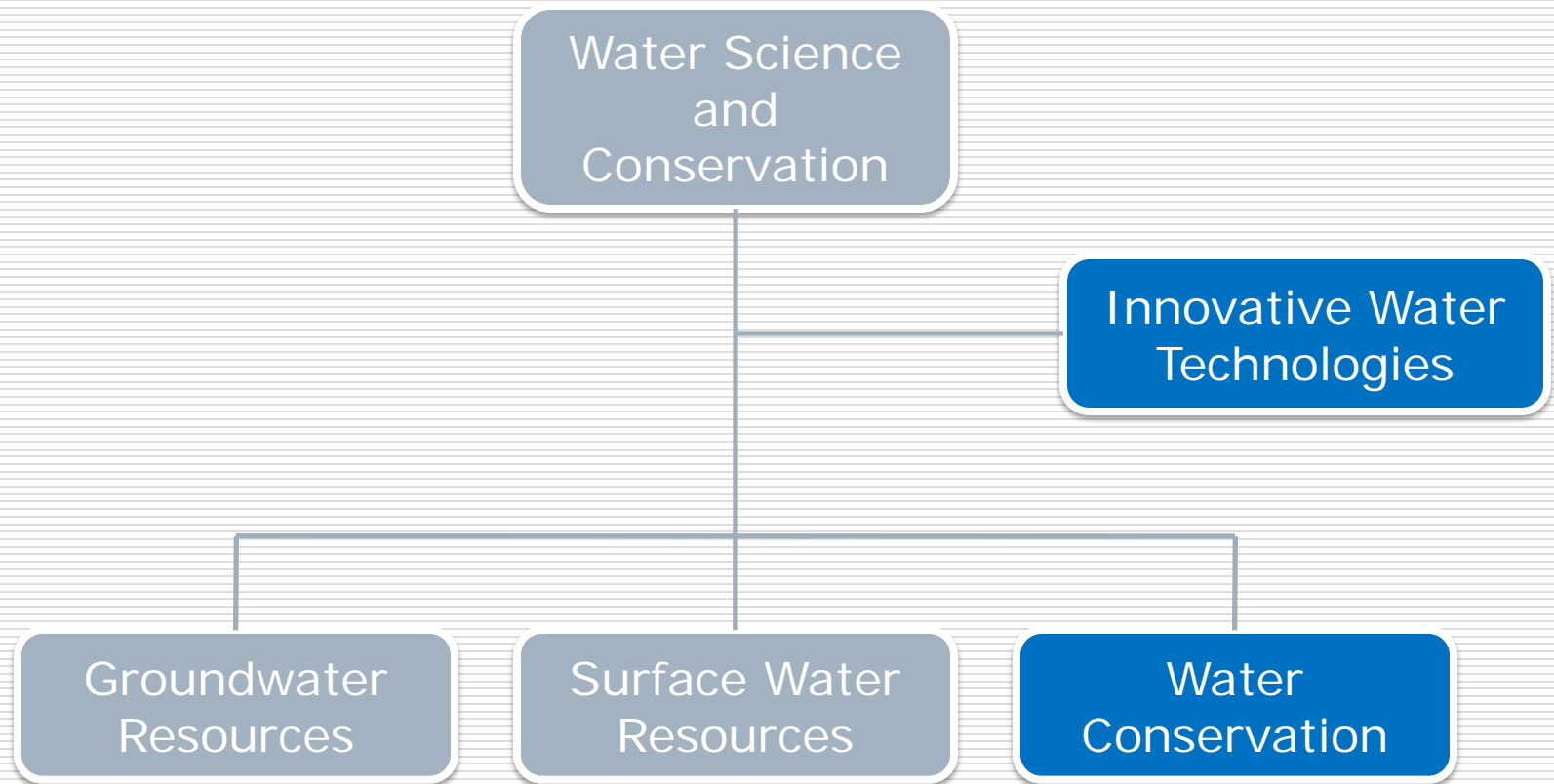
Rainwater Harvesting

2007 State Water Plan-Projections



Rainwater Harvesting

Water Science and Conservation



Innovative Water Technologies

To research, develop, and disseminate information to advance the development of innovative water management strategies in Texas

**Seawater Pilot
Plant Studies**

**Assessment of
Forward Osmosis**

**Stormwater
Harvesting
Guidance**

**Advancing Water
Reuse in Texas**

**Aquifer Storage
Recovery in Texas**

**RWH: Impact of
roof material on
water quality**

**Technology
Demonstration
Projects**

**Brackish GW
Desalination
Guidance**

**Rainwater
Harvesting
Guidance**

Rainwater Harvesting



Rainwater Harvesting

Types of rainwater harvesting systems

□ Land based

- Collecting runoff from land surfaces
- Stock ponds
- Reservoirs

□ Roof based

- Collecting runoff from roof surfaces
 - rain barrels
 - cisterns
-



From the very simple.....



Rainwater Harvesting



Redbud Center - Lower
Colorado River
Authority, Austin

to the more sophisticated.....



River Bend Nature Center, Wichita Falls



Tarrant Regional Water District



Rainwater Harvesting

Benefits of rainwater harvesting

- ❑ Zero Hardness, pH neutral, sodium free
- ❑ Utilities
 - May lower peak demand
 - May delay infrastructure investments
 - Lowers demand on other sources
- ❑ Environmental
 - Reduces storm water runoff
 - Reduces Non-point source pollution
 - **Creates awareness of value of water**

Considering rainwater harvesting

- Inadequate quantity or poor quality of existing sources
- Remote and/or inaccessible areas
- Abundant rainfall
- Personal choice

Residential uses of rainwater

Non-potable uses

- Only basic filtration needed
- Landscape and vegetable gardens
- Pets, livestock, fish ponds
- Indoor non-potable (i.e. flushing toilets)

Potable uses

- Filtration & disinfection
 - Showers
 - Tap water, kitchen
- **Professional assistance recommended**

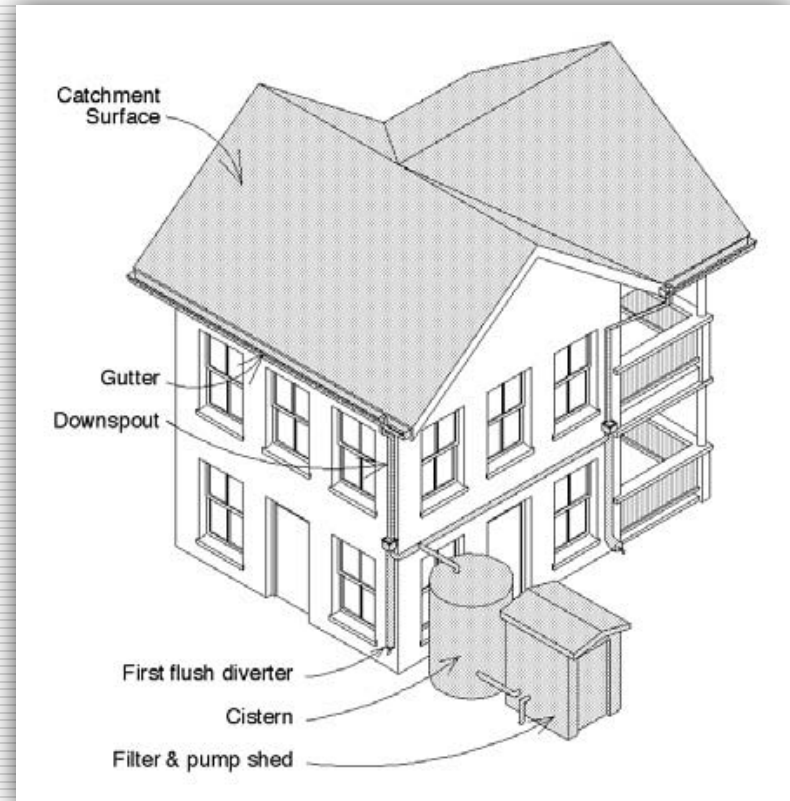
Basic components of a residential rainwater harvesting system

□ Minimum

- Roof
- Gutter System
- Roof Washer / screen
- Cistern

□ More complex units

- Pump & pressure tank
- Filtration system
- Disinfection



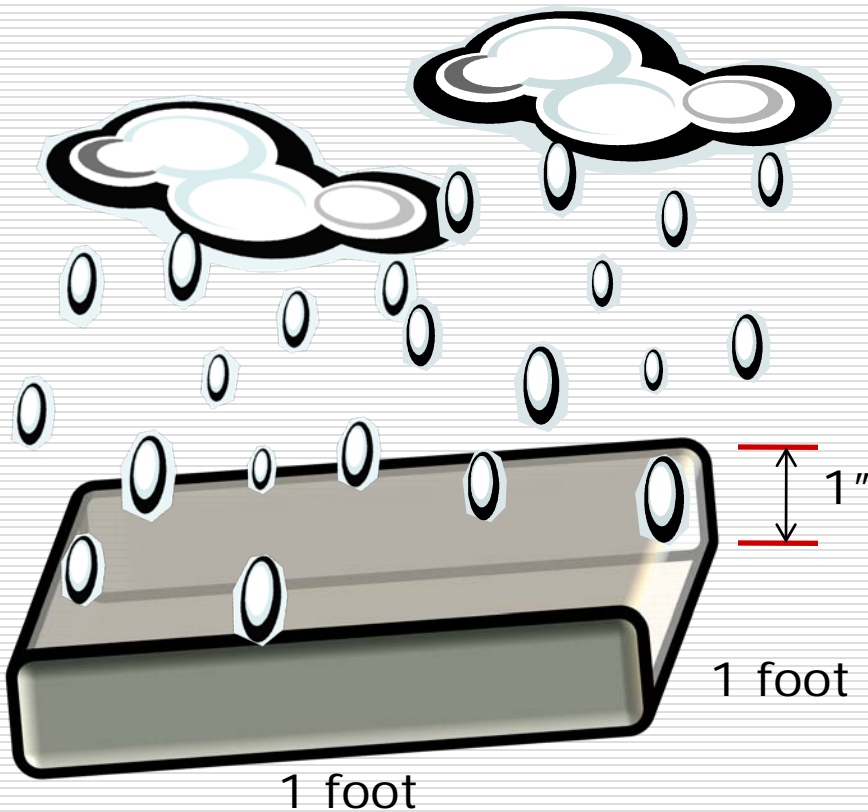
Operation and maintenance considerations

- Conserve water
- Provide regular maintenance
 - Filters
 - Pumps
 - Disinfection system
 - Storage
 - Keep good records
- If used as source of potable water supply:
 - Adopt periodic testing procedures
 - Identify a backup water supply for emergencies





How much water can you collect ?



1" of rain = 0.62 gallons/sq. ft.

House footprint : 40 ft X 40 ft
Roof area ~ 1,600 sq. ft.

➔ **992** gallons of water

How much water can you collect ?

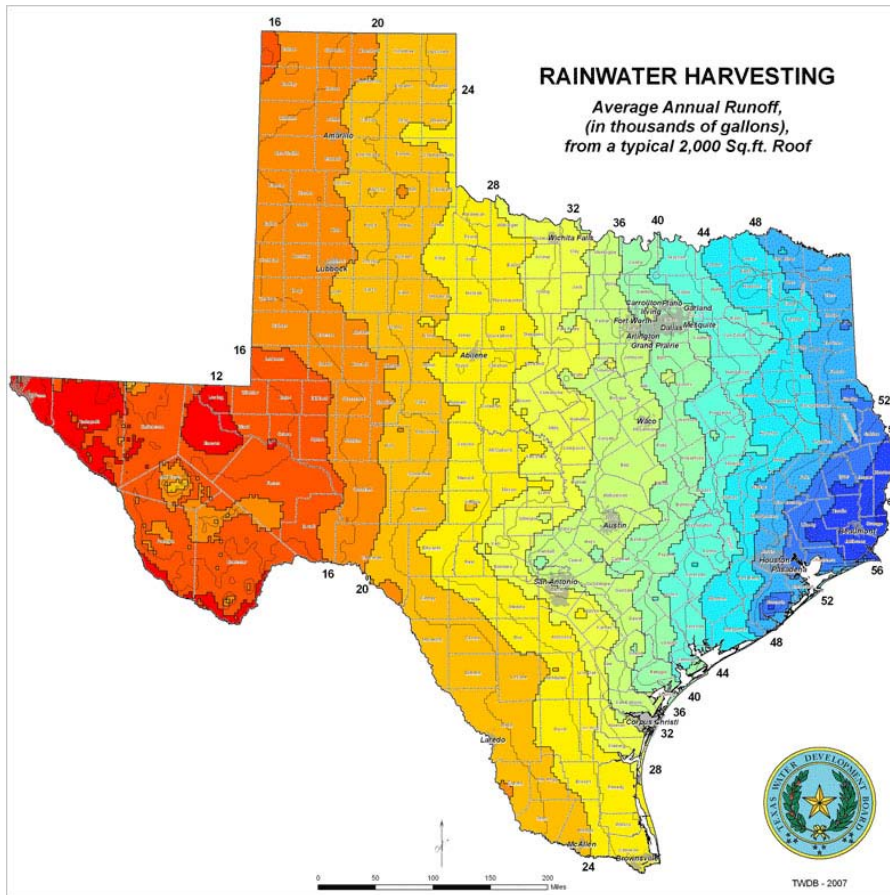
□ Rule of Thumb....

- 1 inch of rainfall on a 1,000 sq.ft. of roof collects 600 gallons of water

□ For math-lovers:

- $RWH \text{ (Gallons)} = \text{Collection Efficiency} \times \text{Rainfall(in)}/12 \times \text{Roof Area(sq.ft.)} \times 7.48$

Average Annual Runoff



□ 2000 sq ft roof

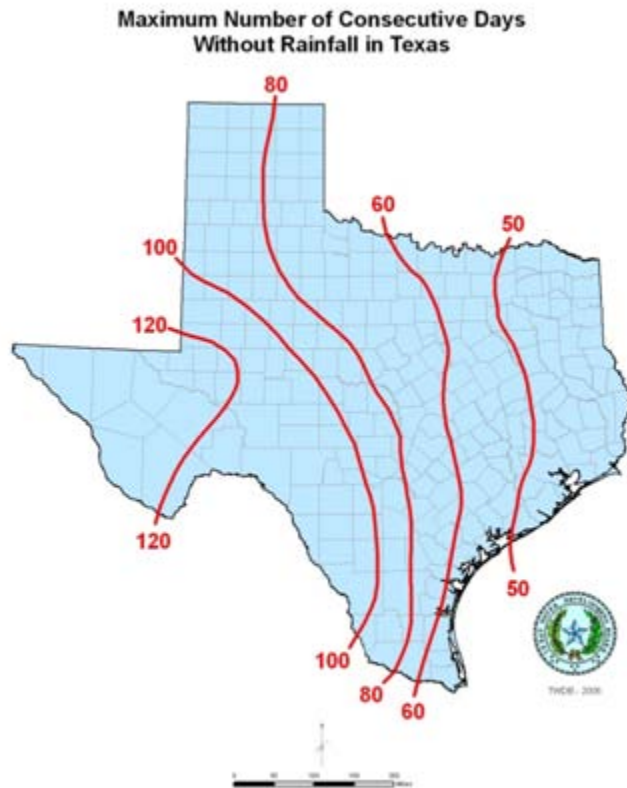
■ Bastrop

□ ~40,000 gallons

■ Houston

□ ~55,000 gallons

Days without any rain in Texas



- Need for storage
- Location
- Collection area
- Water use
- Budget

Change to fit your conditions

Catchment Area (sq. ft.)	2,500
Monthly Indoor Demand (gals)	3,000
Outdoor Demand (gals)	150
Water in Storage to Begin (gal)	0
Tank Size (gal)	10,000

RWH System Sizing Calculator

<http://www.twdb.state.tx.us/iwt/rainwater/>

	Indoor demand	Irrigation	Total demand	Average rainfall	Collection surface size	Gallons/ft ² collection coefficient	Efficiency factor	Rainfall collected (85% efficiency)	End of month storage (*)
January	3,000	0.0	3,000	2.12	2,500	0.62	0.85	2,792	0
February	3,000	0.0	3,000	2.41	2,500	0.62	0.85	3,179	0
March	3,000	150.0	3,150	2.23	2,500	0.62	0.85	2,941	0
April	3,000	150.0	3,150	2.97	2,500	0.62	0.85	3,907	519
May	3,000	150.0	3,150	4.02	2,500	0.62	0.85	5,294	2,664
June	3,000	150.0	3,150	3.39	2,500	0.62	0.85	4,460	3,974
July	3,000	150.0	3,150	1.96	2,500	0.62	0.85	2,578	3,402
August	3,000	150.0	3,150	2.21	2,500	0.62	0.85	2,907	3,159
September	3,000	150.0	3,150	3.17	2,500	0.62	0.85	4,175	4,184
October	3,000	150.0	3,150	3.44	2,500	0.62	0.85	4,528	5,562
November	3,000	0.0	3,000	2.68	2,500	0.62	0.85	3,536	6,099
December	3,000	0.0	3,000	2.35	2,500	0.62	0.85	3,099	6,198

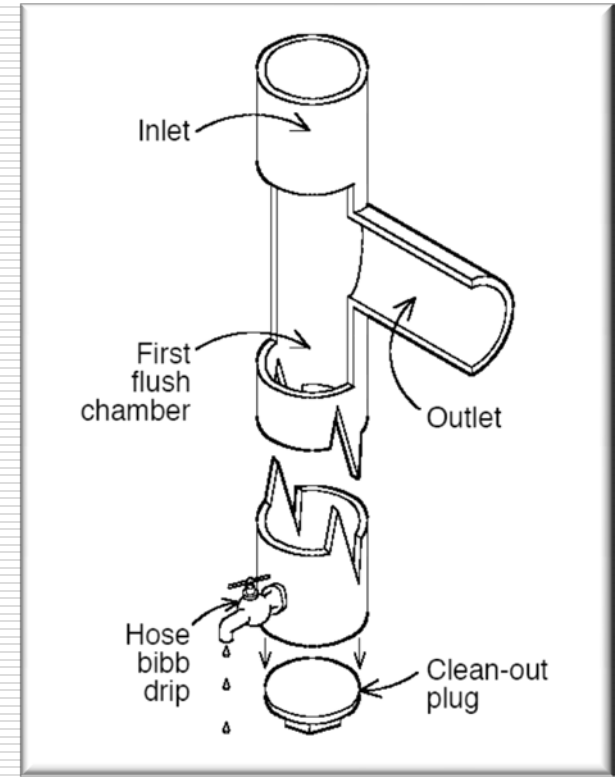
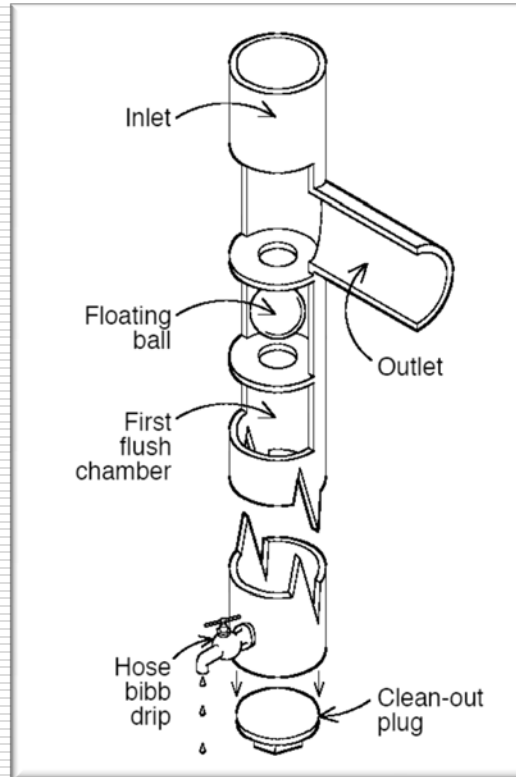
(*) starting with water in storage

Roof, gutters and downspouts

- Material
- Toxic substances
- Organic contaminants
- Design
 - Avoid pooling
 - Avoid sharp bends
 - Think maintenance
 - Leaf screens
 - Strainer baskets
- System integrity
 - Eliminate potential entry points for varmints and insects

First flush diverters

- Remove contaminants
 - Dust
 - Bird droppings
 - Leaves
- 10 gals per 1,000 sq. ft of roof area



First-flush sock filter



Kight Residence, Boerne, 2008

Stand pipe diverter



Roof gutter, Y valve connector and downspout on barn



Larrison Residence, Georgetown, 2008

Storage tanks

- Opaque
- Food grade
- Location
 - Close to collection and point of use
 - Level and stable foundation
 - Accessible
- Overflow
 - Away from structures and septic system
- Plan for cleaning and maintenance

Kight Residence, Boerne



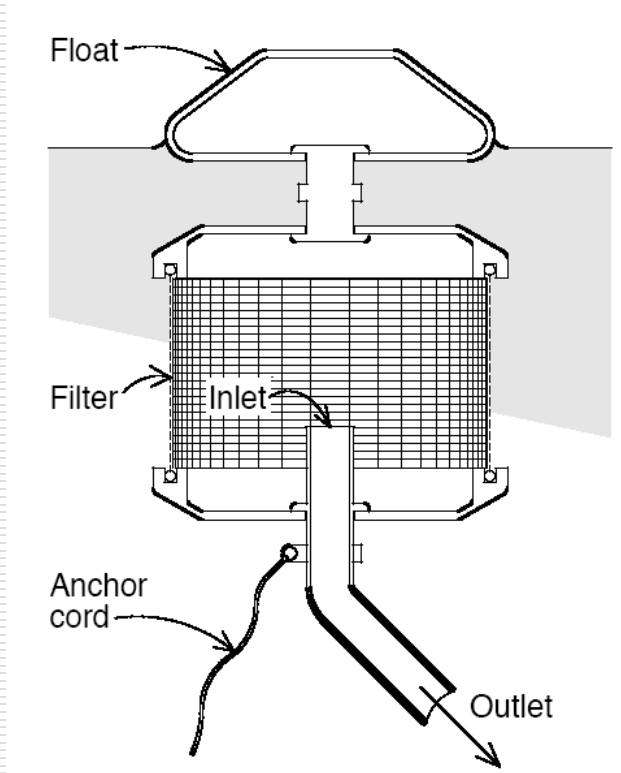
Rainwater Harvesting

Carver Center Enhanced Academic Services, Midland



Rainwater Harvesting

Filtration and disinfection



Cost of rainwater harvesting systems

- ❑ Depends on the size of the system
- ❑ < \$500 - over \$10,000
- ❑ Complete system for a typical home:
Guttering, 10,000 gallon cistern, roof washer, pump, filters, and UV light
Approx. cost \$ 9,000

Regulations

- In cases where residence is connected to a public water system:
 - harvested rainwater should be used only for non-potable purposes.

Guidance for Potable Use -TCEQ – Report GI-366



Harvesting, Storing, and Treating Rainwater for Domestic Indoor Use

Texas Commission on Environmental Quality

(GI-366) Jan. 2007



- ❑ Harvesting, Storing, and Treating Rainwater for Domestic Use
 - ❑ This publication offers guidance for individuals who want to install a rainwater harvesting and treatment system to supply potable drinking water for a single household.
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Incentives

- State of Texas
 - sales tax exemption on rainwater harvesting equipment
- Austin
 - cash rebates for rain barrels and rainwater harvesting systems
- Hays county
 - property tax exemption on the value of the rainwater harvesting system

References

- Texas Rainwater Harvesting Manual
 - Published by the Texas Water Development Board
 - Available on the TWDB website
[www.twdb.state.tx.us / iwt / rainwater.asp](http://www.twdb.state.tx.us/iwt/rainwater.asp)



SIGN UP
TWDB E-NEWSLETTER

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