

CONSERVING A RESOURCE

- *Rainwater Harvesting: A Water Conservation Method*



TEXAS A&M
AGRILIFE
EXTENSION

 Rainwater
Harvesting

 ARCSEA

WATER CONCERNS



The ability to effectively manage our water resources is essential for personal and global sustainability.

*DROUGHT FOCUSES ATTENTION
ON WATER AVAILABILITY IN
TEXAS.*

*WHAT IS PROJECTED FOR THE
FUTURE SUPPLY OF TEXAN'S
WATER?*

BIGGER PICTURE

- *Rainwater harvesting is a method to achieve water sustainability*
- *Sustainability – Having a high quality, ample water supply for current without compromising the water supply of future generations*
- What percentage of the world's surface area is covered in water?

Over 70%

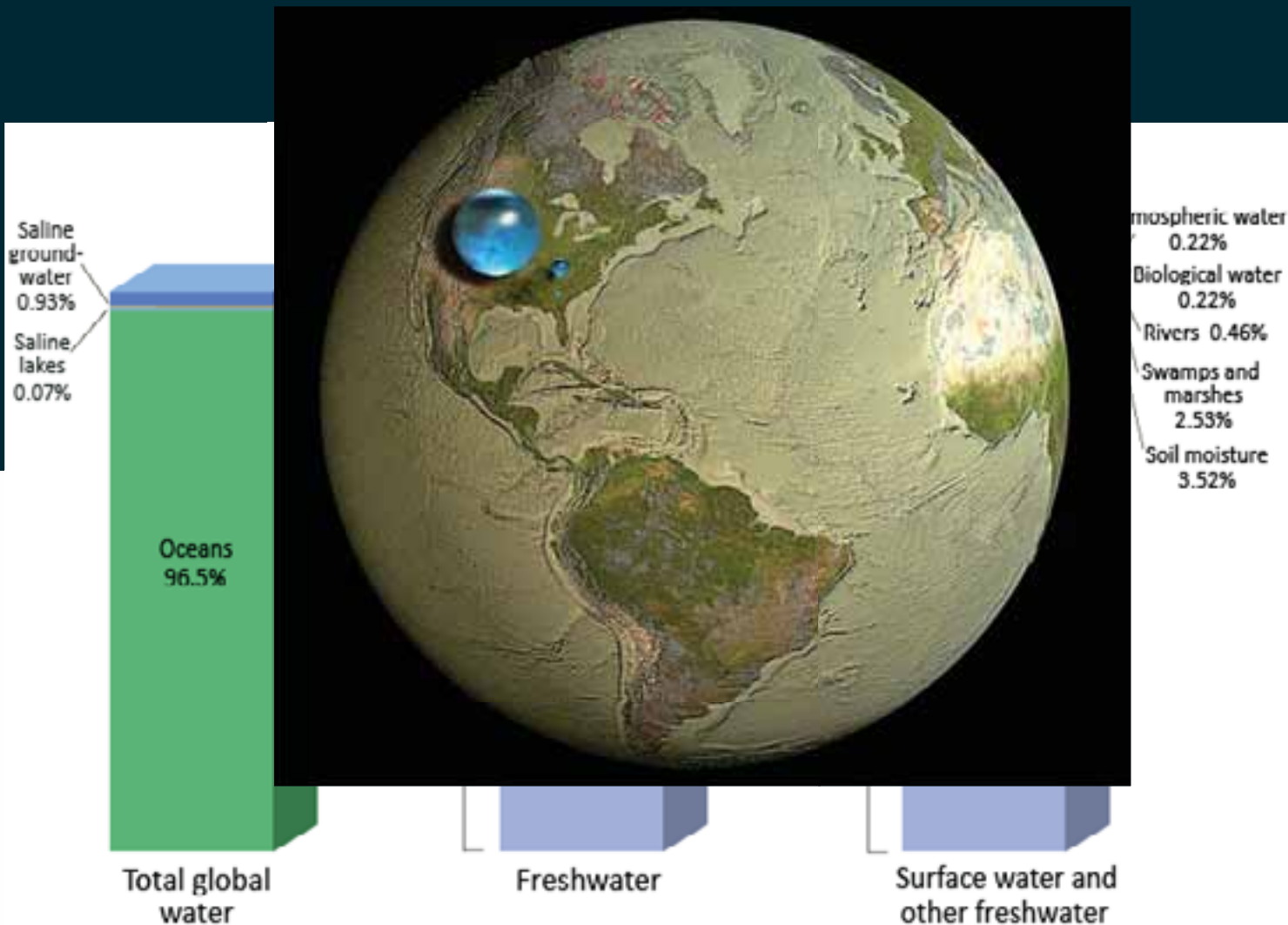


Photo: NASA

WATER RESOURCES

- *What percentage of that water is fresh?*

2.5-3%



Source: Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick (editor), 1993, *Water in Crisis: A Guide to the World's Fresh Water Resources*.

SUSTAINABILITY THROUGH RWH

- Water Supply (quantity)
- Water Quality



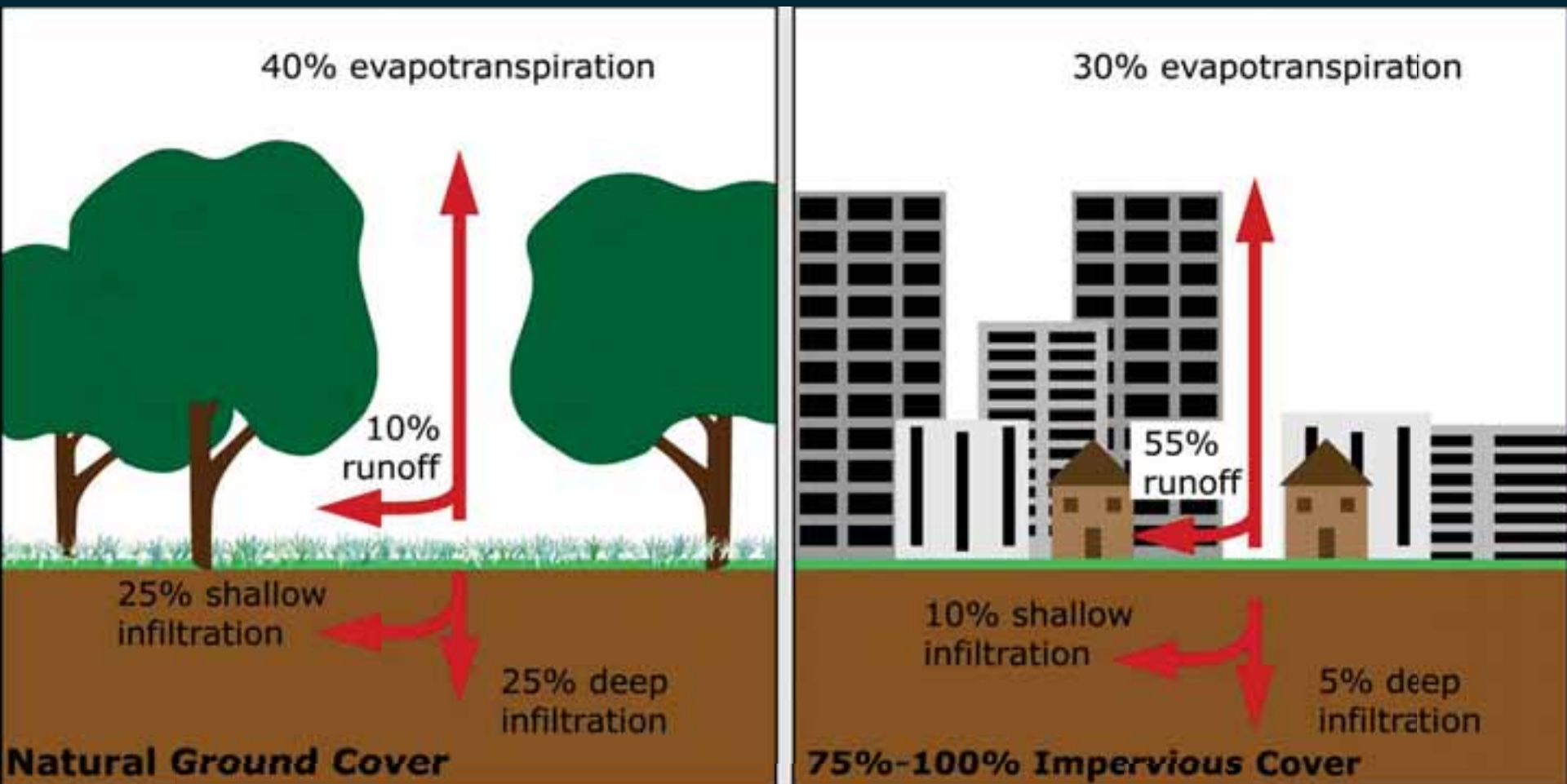
WATER SUPPLY

- RWH reduces demand on municipal supply
- Reduces well water demand
- Increases awareness of water used:
 - Leads to higher efficiency

WATER QUALITY

- RWH is a method of stormwater management
 - This equals less pollution runoff
- RWH reduces peak runoff
- Allows water to be slowly recharged into aquifer
 - Whether through irrigation or septic system or rain garden

IMPERVIOUS SURFACES



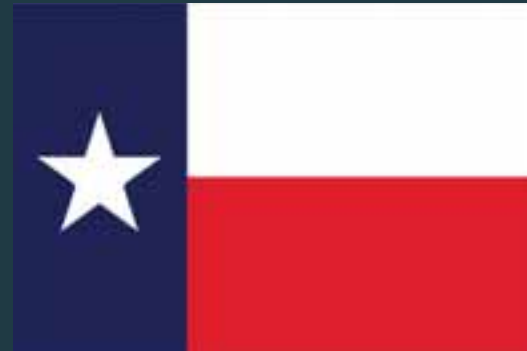
Increased Surface Runoff

Water Quality Impairments

- Stormwater carries suspended sediment that can cloud water, limiting the amount of light that penetrates the water's surface and making it difficult or impossible for aquatic plants to grow.



STATE OF WATER IN TEXAS



A CRASH COURSE IN
TEXAS WEATHER

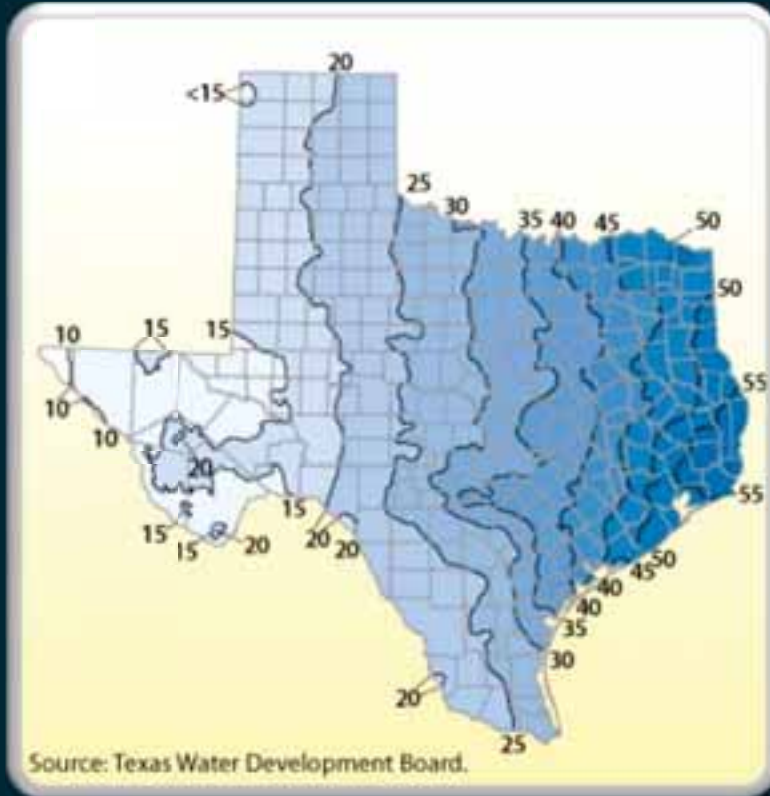


THE FOUR SEASONS

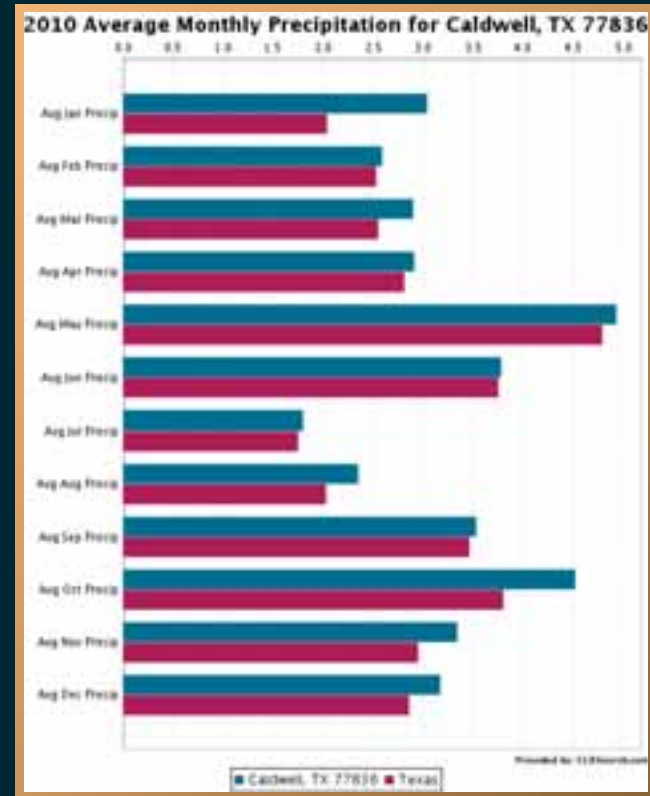


SCALES OF PRECIPITATION

- *Spatial* = Variations in space:



- *Temporal* = Variations in time:



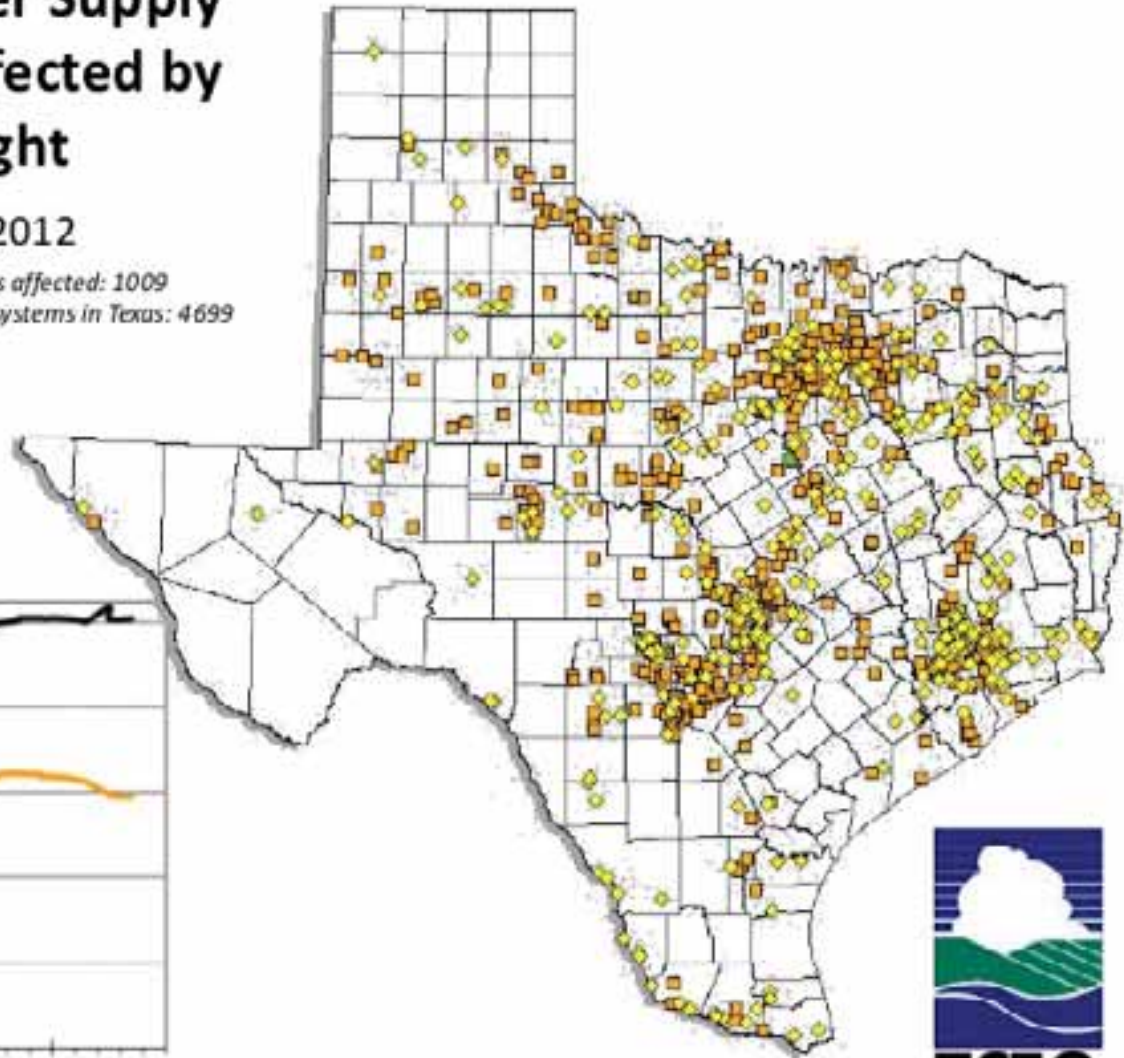
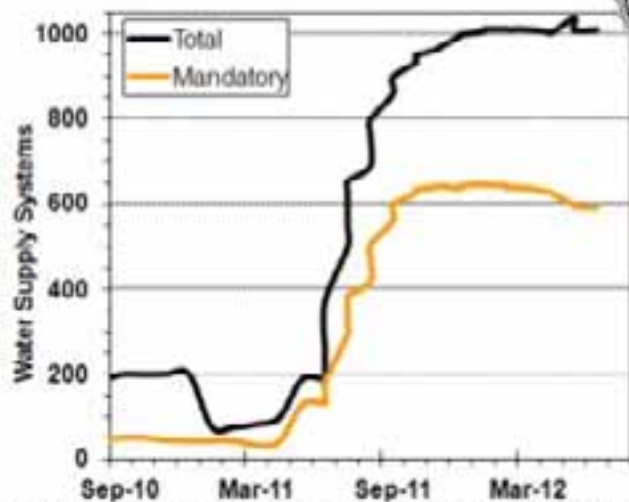
Public Water Supply Systems Affected by Drought

June 6, 2012

Total number of Community water systems affected: 1009

Total number of active Community water systems in Texas: 4699

- RESOLVED (1)
- ◆ WATCH – Voluntary (417)
- WATCH – Mandatory (592)



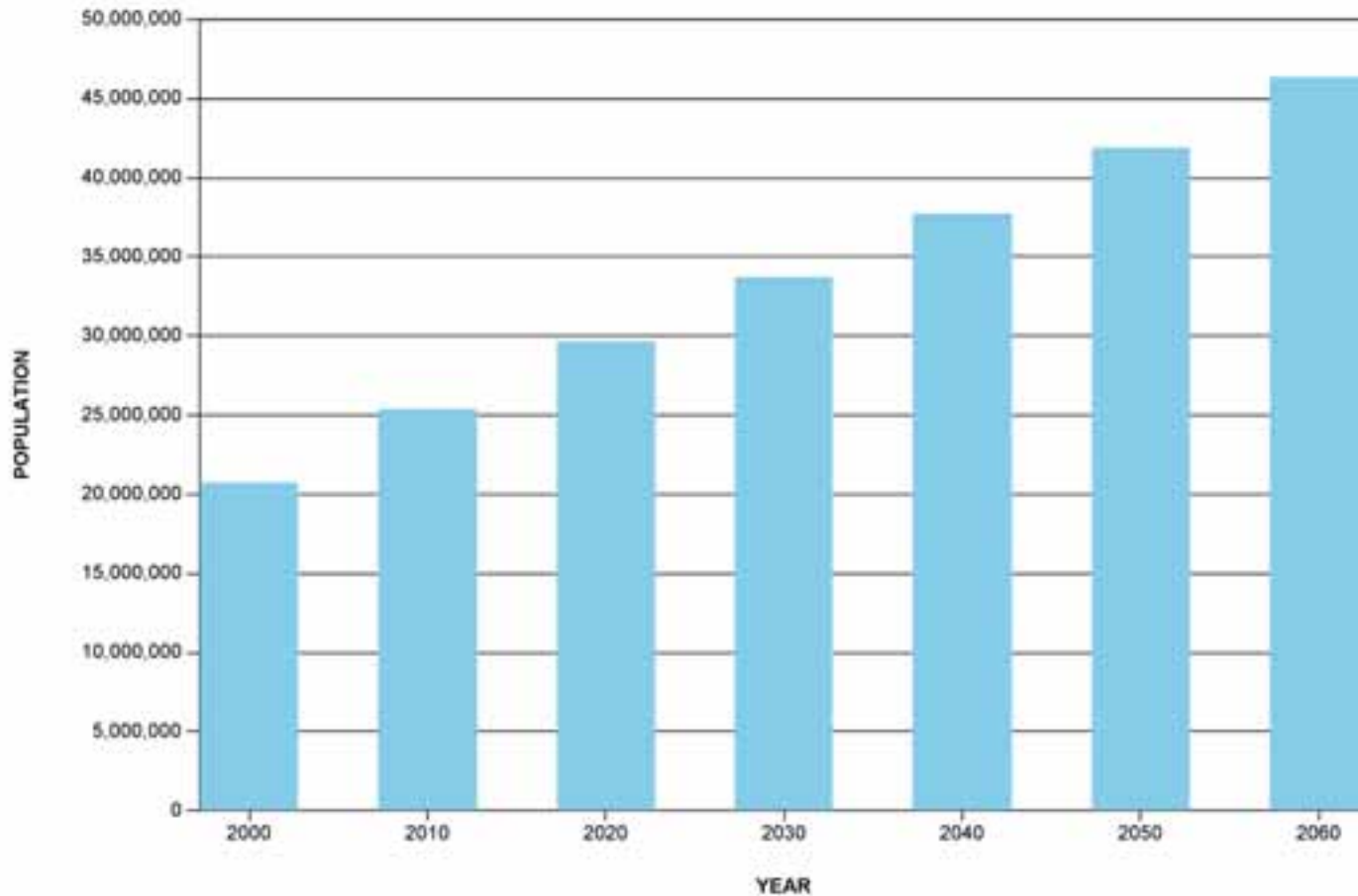
http://www.tceq.state.tx.us/permitting/water_supply/pdw/trot/location.html

UNLIMITED WATER SUPPLY?

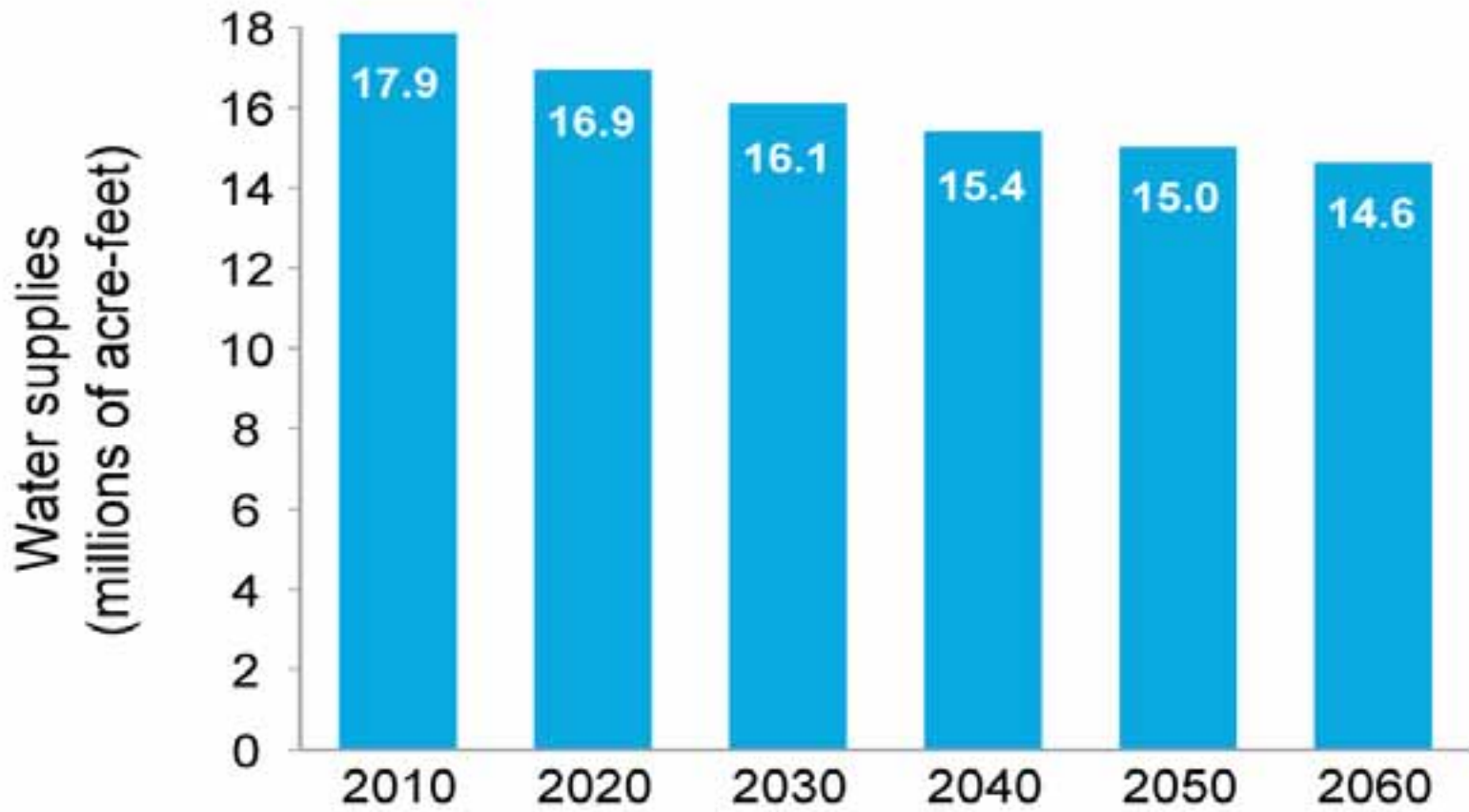


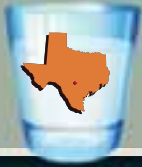
WATER DEMAND

POPULATION PROJECTIONS 2000 - 2060

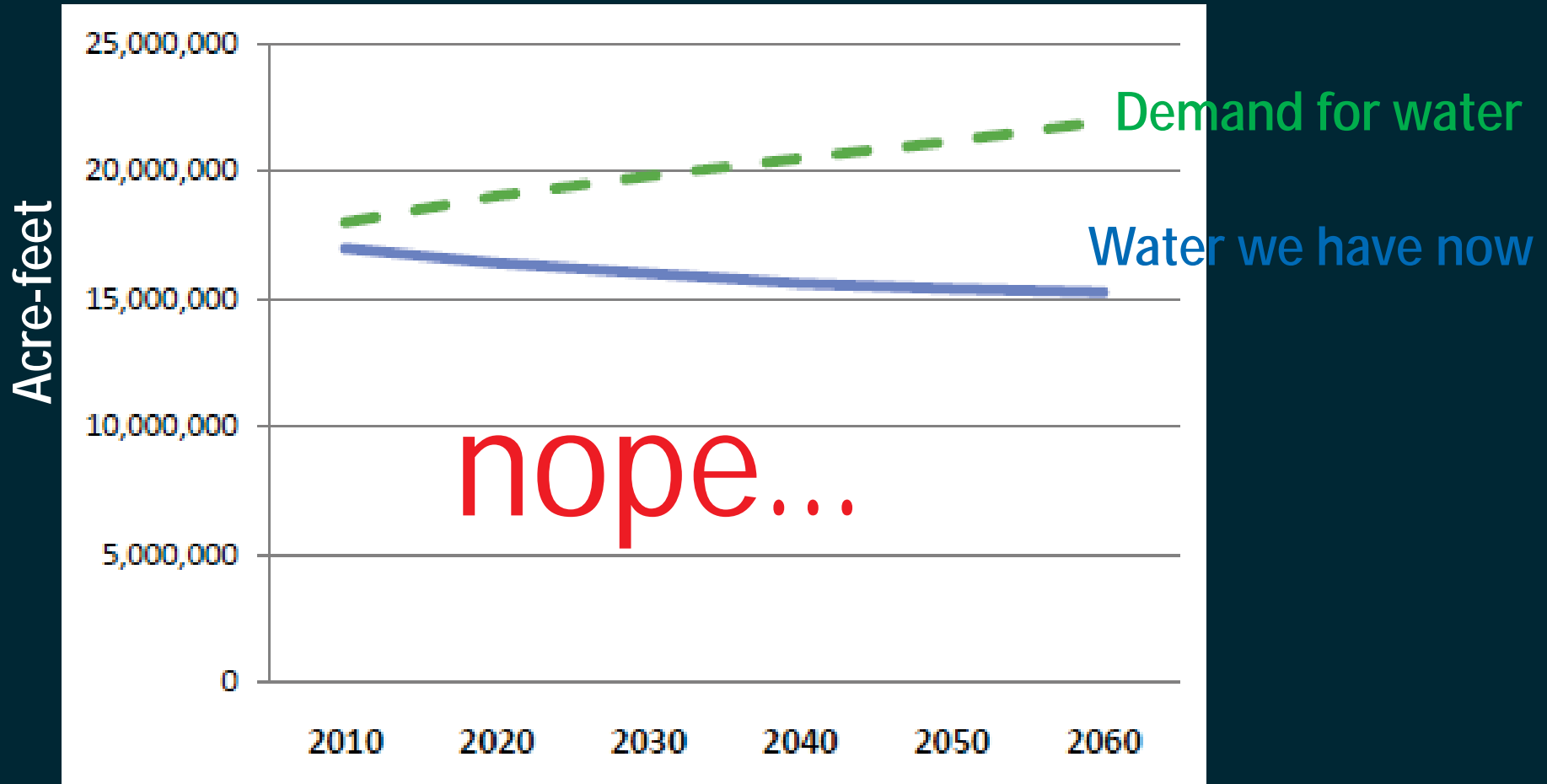


WATER SUPPLY

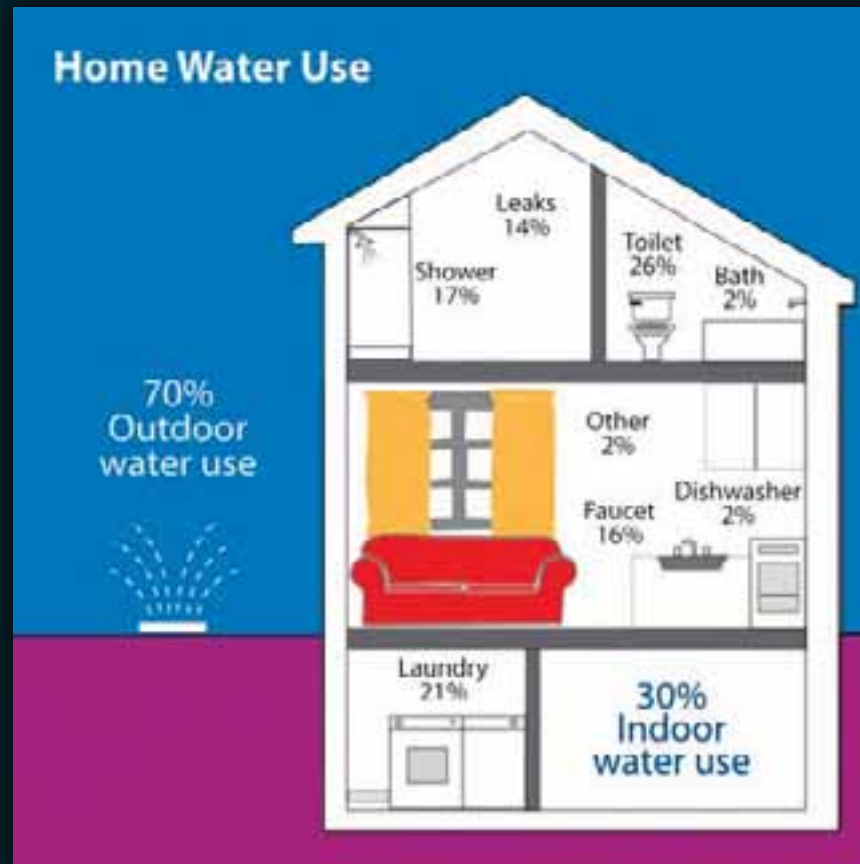




Are we ready for the next drought?

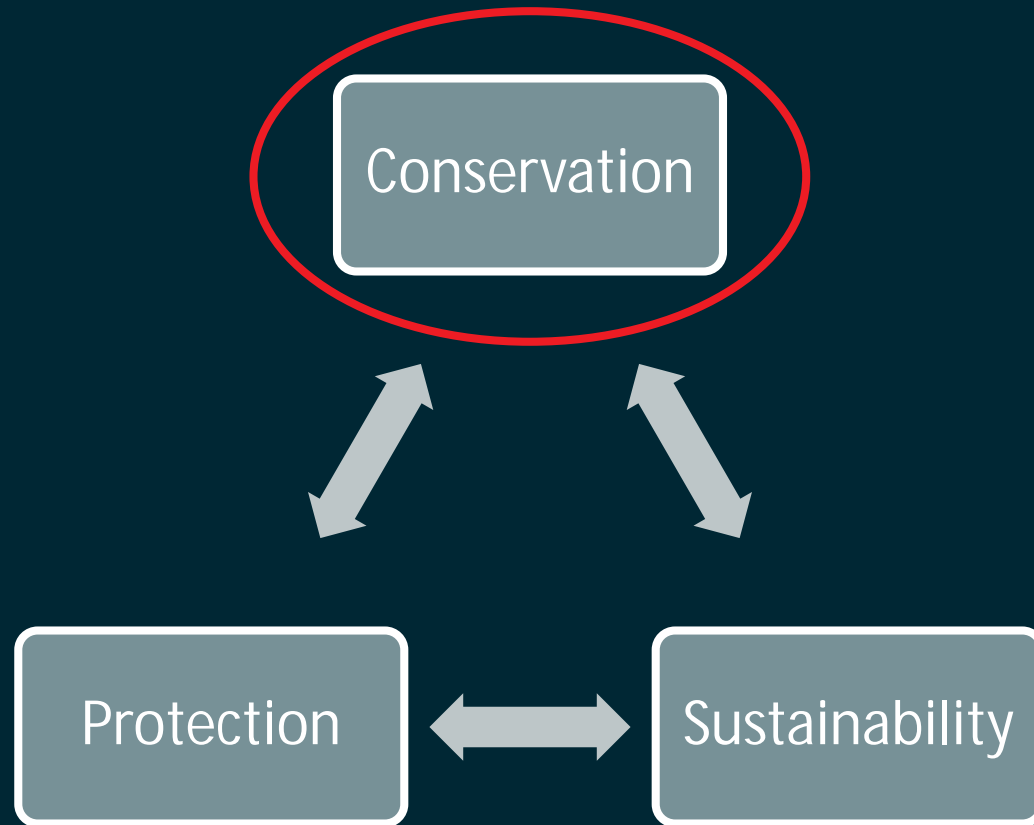


HOW DO WE USE WATER?



Source: <http://www.cfpua.org>

WHAT CAN WE DO?





WATER IN THE FUTURE...

- *The cost of water will go up*
- *Water conservation will become more important*
 - *Landscape watering*
 - *Water loss*
 - *Efficient fixtures*
- *Water reuse will increase*
- *Other sources of water (desal) will become more economically viable*
- *Transfers from agriculture to municipal use*

STORAGE OF WATER

- *Since we can not depend on water to come when we want it, we either store or move it to be available when and where needed.*



RAINWATER HARVESTING

- *Rainwater harvesting is the capture, diversion, and storage of rainwater for use in landscaping, rangeland, and other purposes.*



RAINWATER HARVESTING



Possible uses of rainwater

Outdoor uses

Indoor non-potable uses

- Toilet flushing
- Laundry
- Cooling

Indoor potable uses

- Drinking
- Bathing
- Cooking, etc.



“Irrigation of the land with seawater desalinated by fusion power is ancient. It's called rain. ” Michael McClary



**Rainwater
Harvesting**

NOT A NEW IDEA!



Because of periodic shortages of water, Mr. Jefferson installed four cisterns. They were placed at strategic points to collect rainwater from the roof and walkways. Each held 3,830 gallons.

ADVANTAGES OF RAINWATER HARVESTING

- *Serves as a conservation practice*
- *Rainwater harvesting can reduce storm water runoff, thereby decreasing load on storm sewers*
- *Rainwater is of superior quality: zero hardness, sodium-free, and nearly neutral pH (neither acidic nor basic)*
- *When properly managed, rainwater harvesting eliminates the need for costly treatment and distribution systems*
- *Apart from costs to collect, store, treat, and convey the water into the facility, rainwater harvesting is free*

DISADVANTAGES OF RAINWATER HARVESTING

- *Rainwater harvesting may need to be supplemented with water from other sources, especially during extended dry periods or droughts*
- *Systems require regular maintenance after installation*
- *Storage systems can take up space around the house*
- *Standardized construction guidelines for systems are lacking*

HOW MUCH RAIN CAN I HARVEST?

- During a one inch rain, each ft² of a collection surface footprint receives 0.6 gallons of water

Total Gallons H₂O = Square Feet of Footprint X 0.62 Gallons/ft²



HOW MUCH RAIN CAN I HARVEST?

1 inch of rain falling on a roof surface results in 0.62 gallons of water per square foot of roof



Source: web.mit.edu

Example:

*If 1 inch of rain falls on a 40 ft x 40 ft roof it would produce **992gallons** of water [40 ft x 40 ft x 0.6 gallons/sq ft = **992gallons** of water]*

However, not all of this water can usually be collected because of losses resulting from overflow or gutter splashout. To take these losses into consideration, a collection efficiency factor (generally 0.85) is applied.

*Thus, in the above example, the actual amount of water that may be collected is about **843gallons**.*

*[992 gallons x 0.85 = **843 gallons**]*

COLLECT RAINWATER IN A DROUGHT?

Monthly Rainfall

Average By Month

This Year

2014 To Date

See how total rainfall so far this year compares to average



Examples:

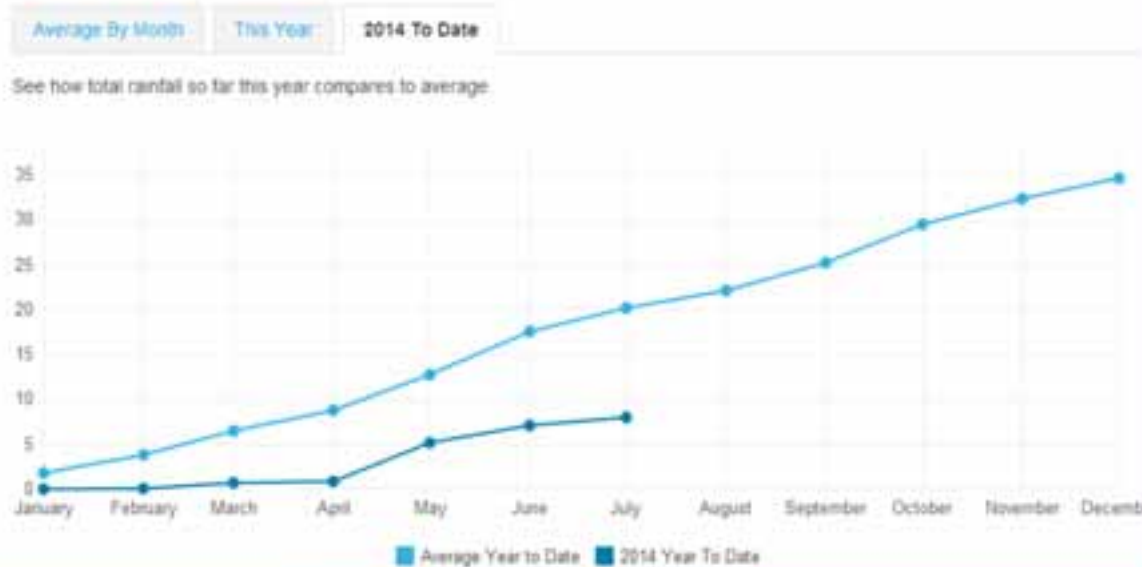
$$2000 \text{ sq}^2 \times .6 \times 8.04 \text{ in} = 9,648 \text{ gallons}$$

$$6400 \text{ sq}^2 \times .6 \times 8.04 = 30,874 \text{ gallons}$$



COLLECT RAINWATER IN A DROUGHT?

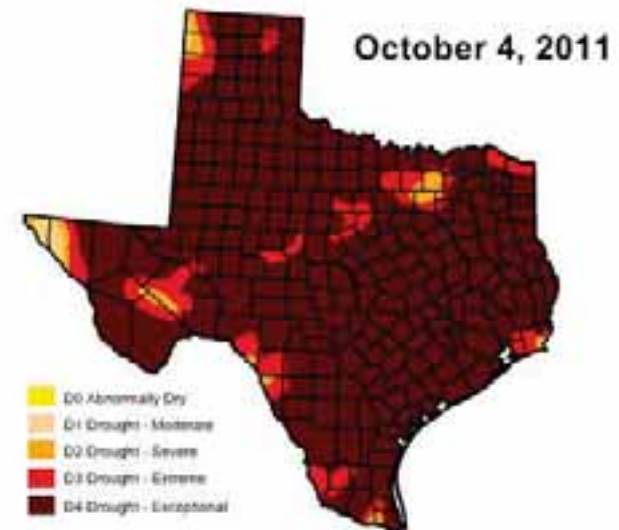
Monthly Rainfall



Examples:

-Average Year
 $2000 \text{ sq}^2 \times .6 \times 34.62 \text{ in}$
 $= 41,544 \text{ gallons}$

-Rainfall for 2011
 $2000 \text{ sq}^2 \times .6 \times 16.90 \text{ in}$
 $= 20,280 \text{ gallons}$



HUNTERS CABIN





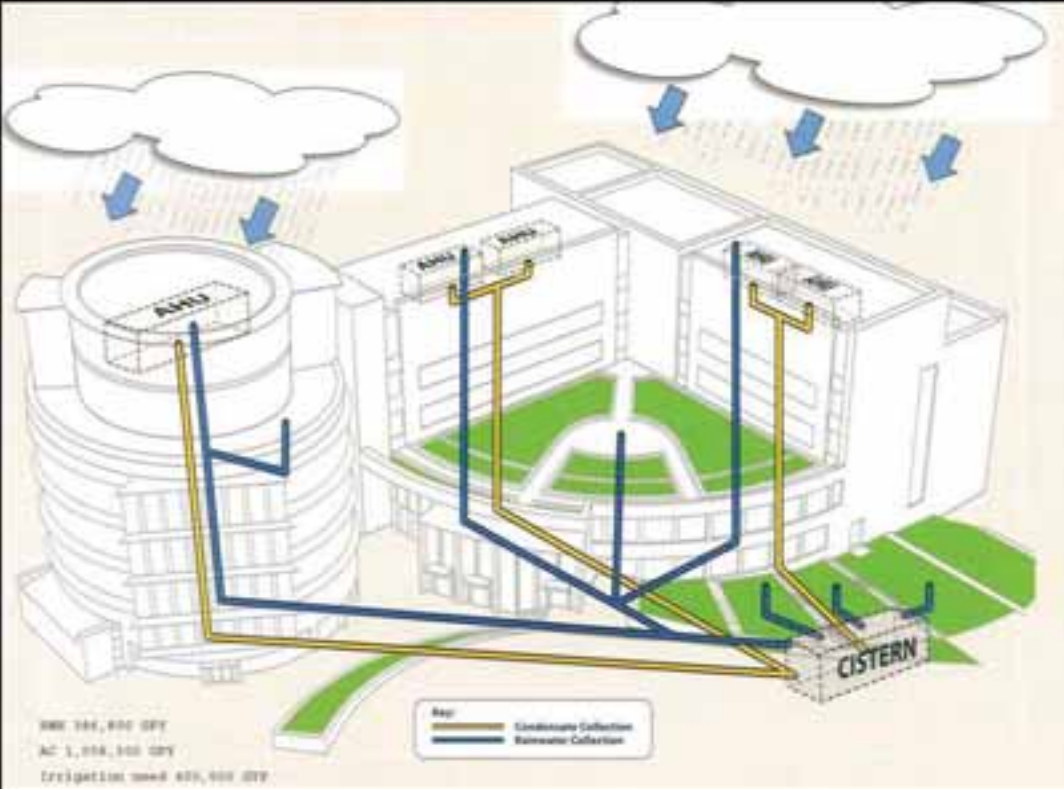
TEXAS A&M
AGRILIFE
EXTENSION

NEW WATERING SOURCE!



ALL DIFFERENT TYPES!





TEXAS A&M
AGRILIFE
EXTENSION

COMPONENTS



Collection Surface



Conveyance System



Filter



First Flush Diverter



Storage



Overflow