

Rainwater Harvesting Basics

Designing and Installing Systems for Home and Landscape

Chris Maxwell-Gaines, P.E.





- Integrated water conservation solutions
- Rainwater, Graywater, Drainage, Irrigation
- Design / Build
- Residential / Commercial



So what's the big deal about
rainwater harvesting?

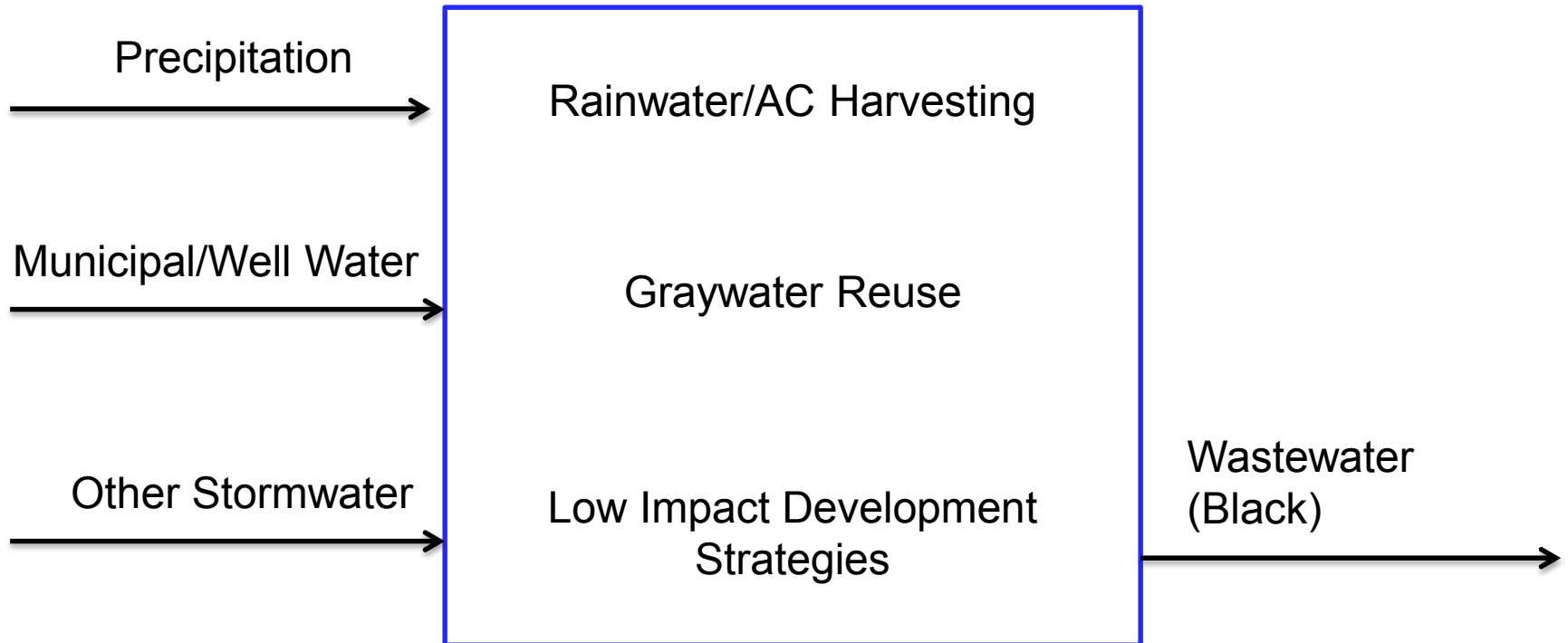
Aren't we in a drought?

It's NOT going to rain ever
again, don't you know?

Typical Urban Water Balance Model










Integrated Urban Water Balance Model



ENVIRONMENT > WATER SUPPLY

Despite Increased Restrictions, Urban Water Use Climbs

by Paul Theobald | March 14, 2012 | [13 Comments](#)

 Print  Republish  Share  Comment  Email  Tweet  Recommend



 [Enlarge](#)

During 2011, one of the driest years on record in Texas, residents of some of the largest cities increased their water usage — despite the widespread adoption of restrictions on lawn-watering.

"When you have hot and dry conditions, people tend to use more water, mostly for outside watering," said Jennifer Walker, of the Lone Star Chapter of the Sierra Club. "Also, many communities do not implement water restrictions until late summer," she added.

Data from various water utilities around the state shows a rise in 2011, compared with 2010. In both San Antonio and Dallas, average water use at single-family accounts rose by 17 percent in 2011 compared with 2010, and residential usage increased by the same amount in Fort Worth

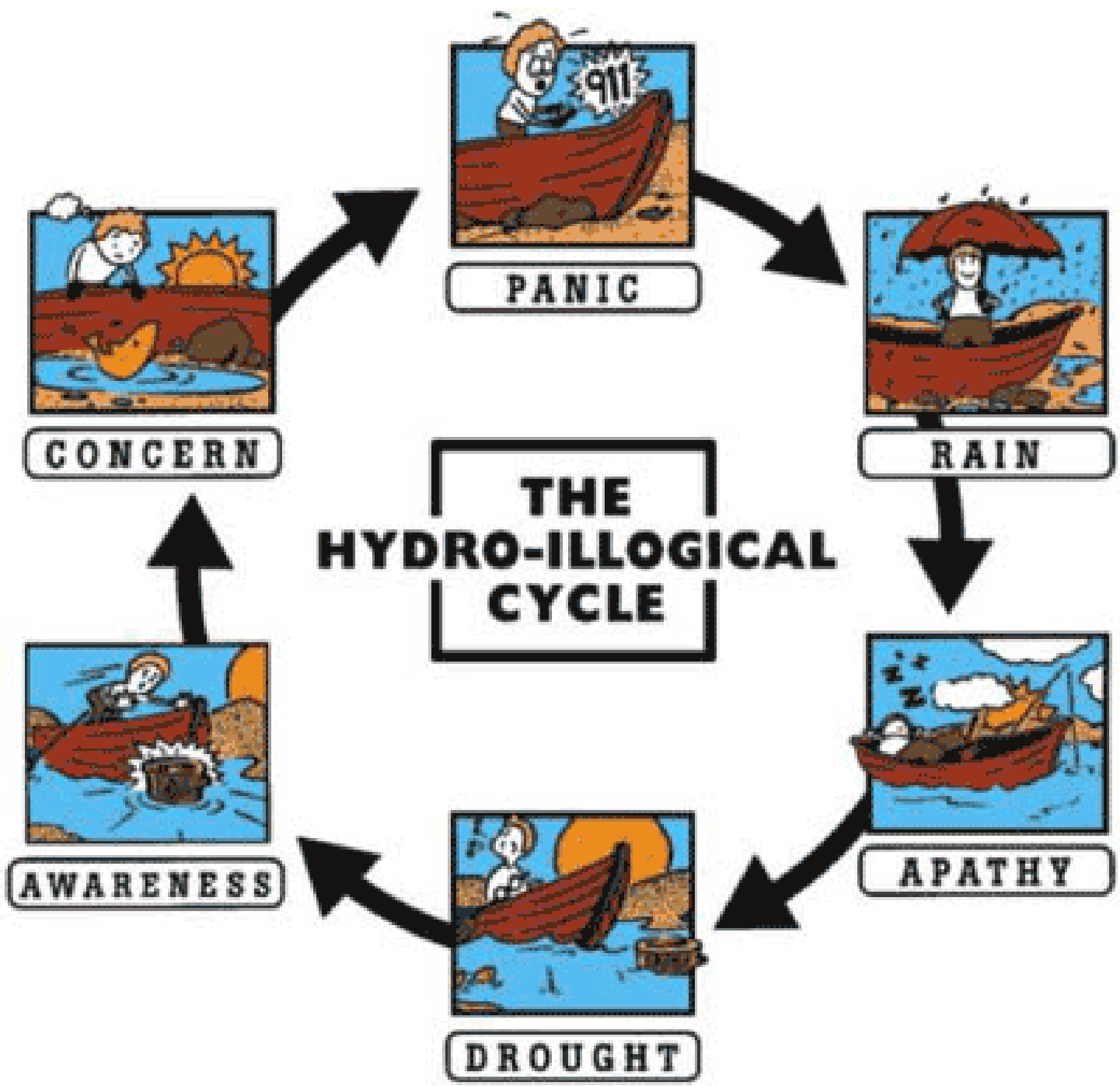
11

SOUTH EAST
WATER

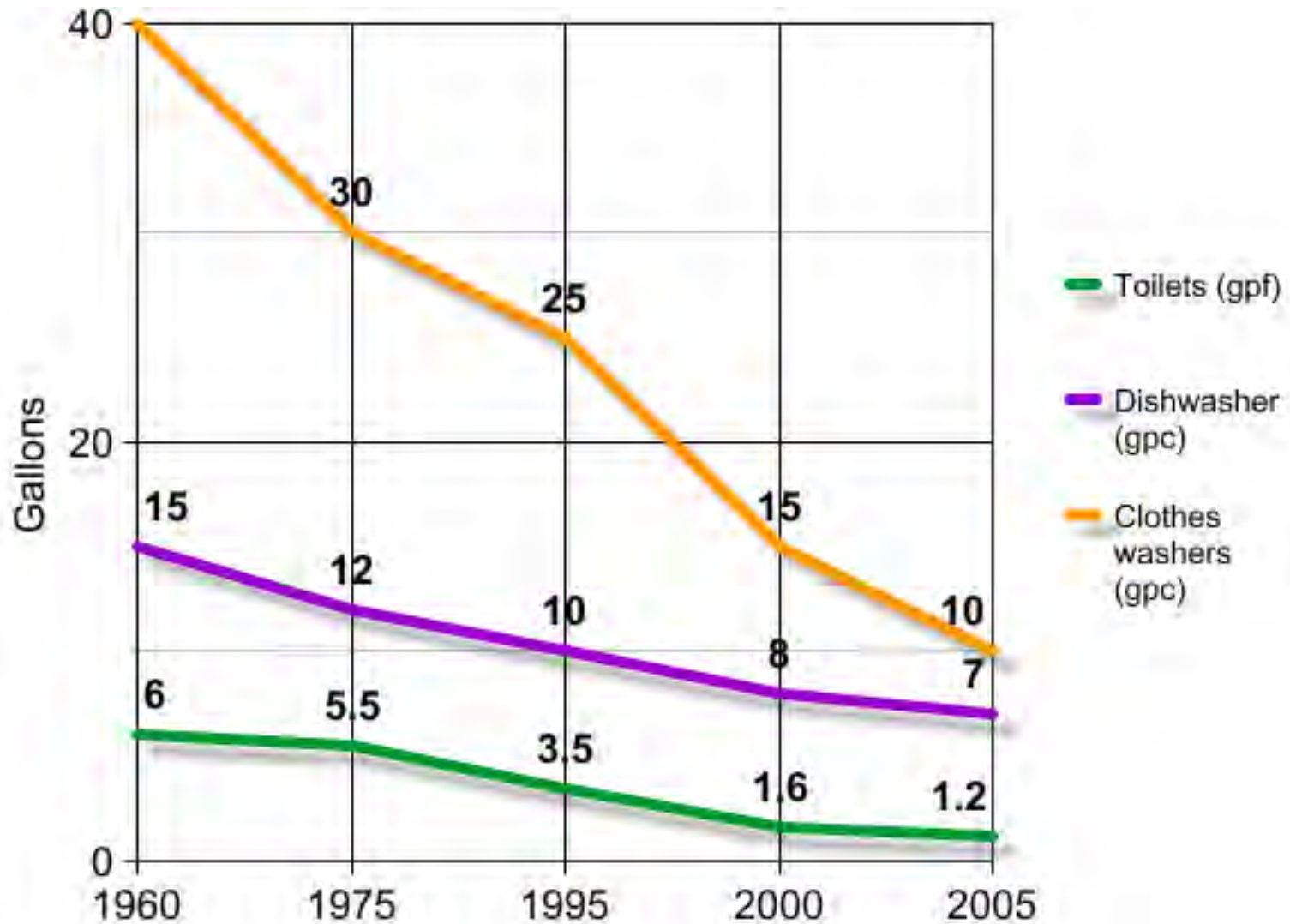


Supplying Water East Kent

**WATER
PATROL**

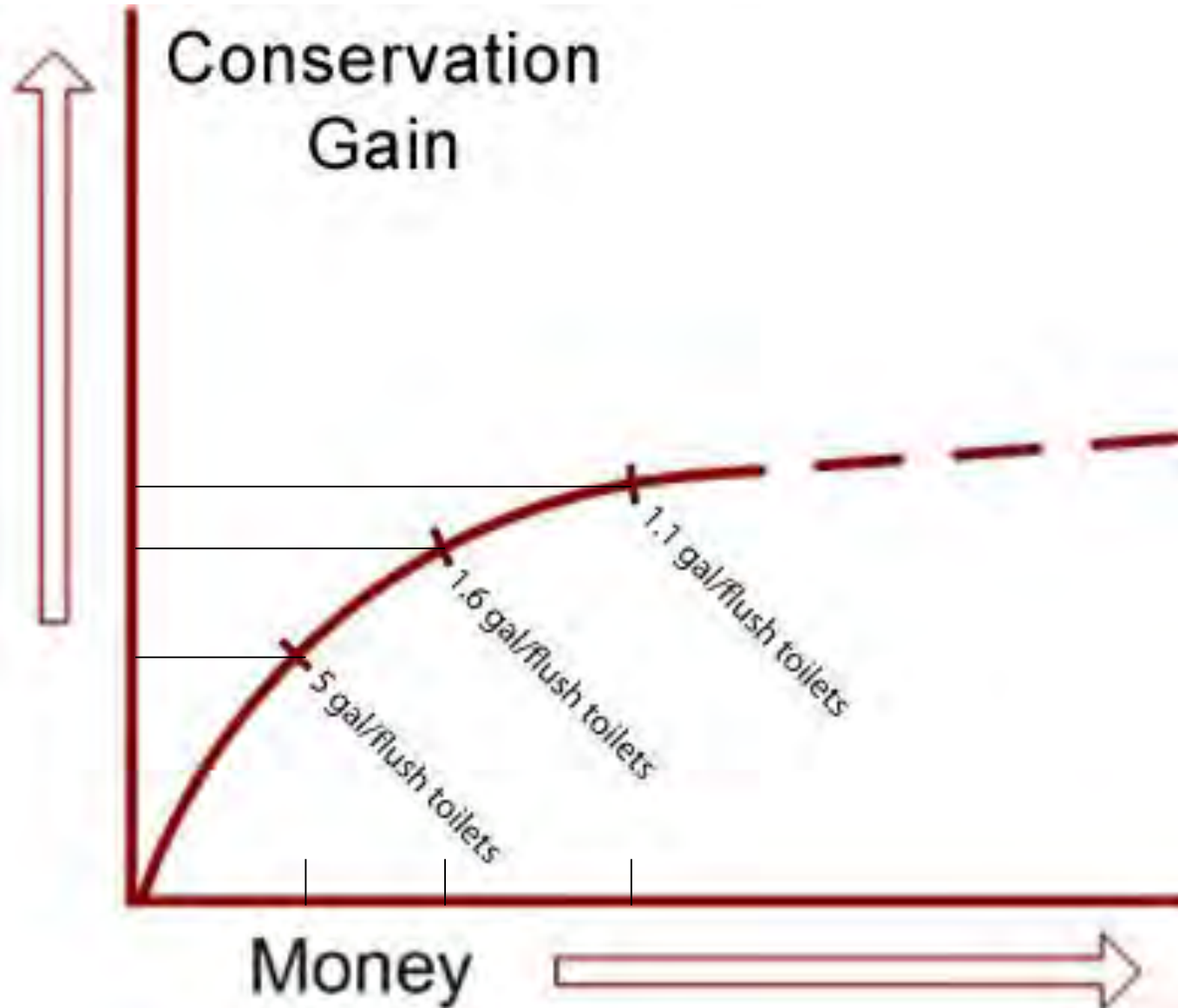


Future Conservation Gains will be Outdoors



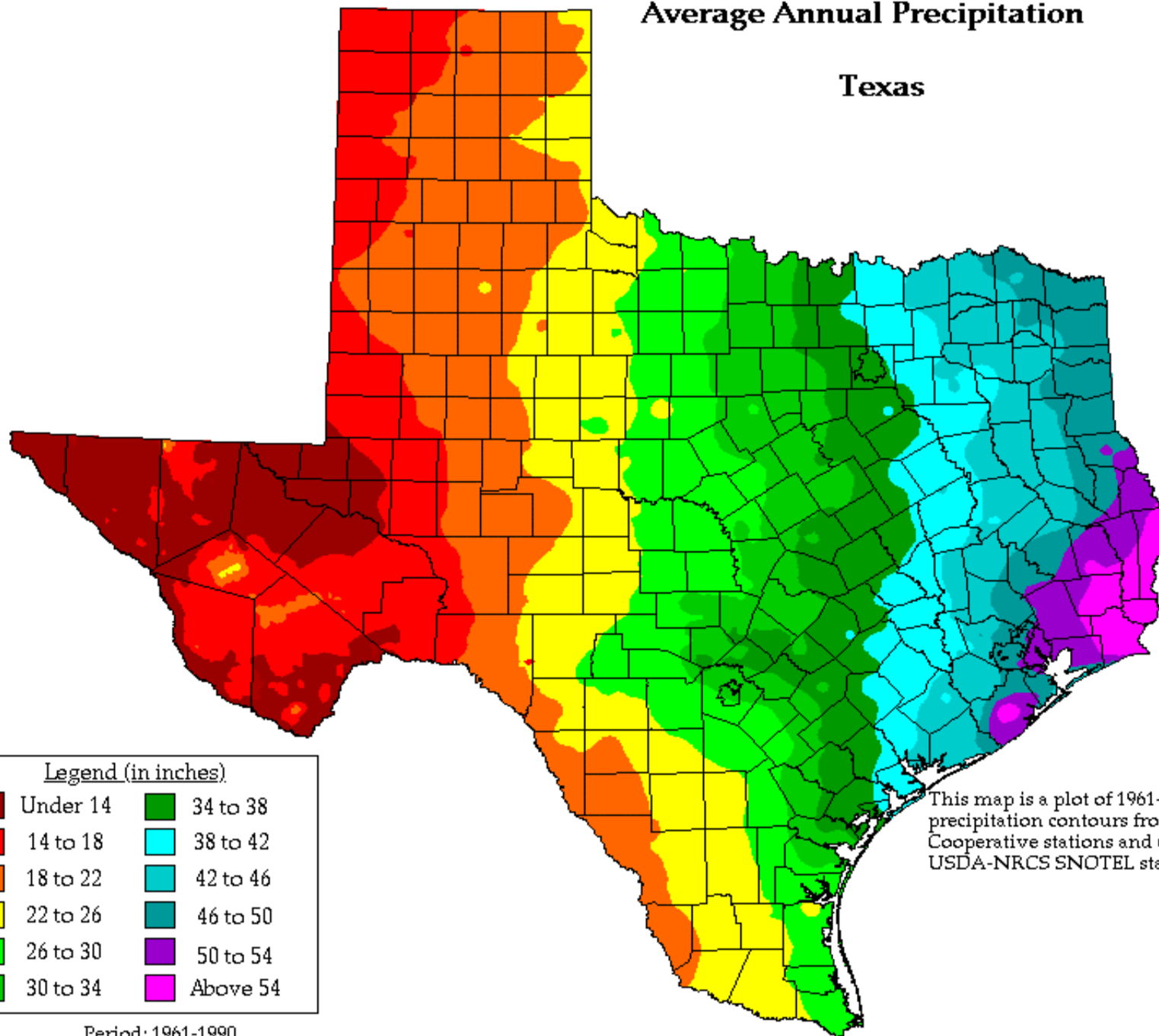
Indoor Water Conservation Standards

Law of Diminishing Returns



Average Annual Precipitation

Texas



Rainwater Math

“1 inch of rain on a 1,000 sq ft collection area
will yield 623 gallons”

___ in of rain X ___ roof sq ft X 0.623 gal/sq ft



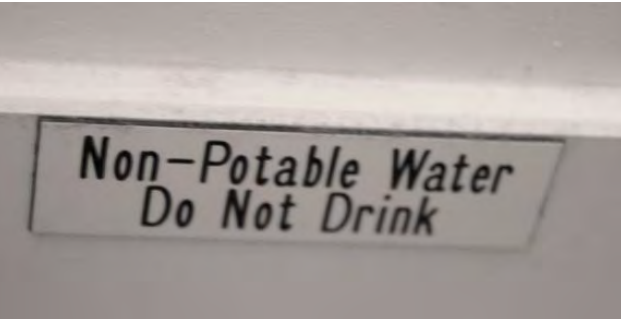
Rainwater collection benefits

- Reduces storm water runoff
- Better for your lawn and garden plants
- Simple technology that is easy to maintain
- Recognizable as a green building technique
- Solution to on-site drainage problem
- Reduces effective impervious cover

The Uses of Rainwater



- Outdoor water use
 - Irrigation of landscaping and lawns
 - Other outdoor uses



- Indoor, non-potable water use
 - Toilets, urinals, & clothes washing machines



- Potable water supply
 - Filtration and disinfection required

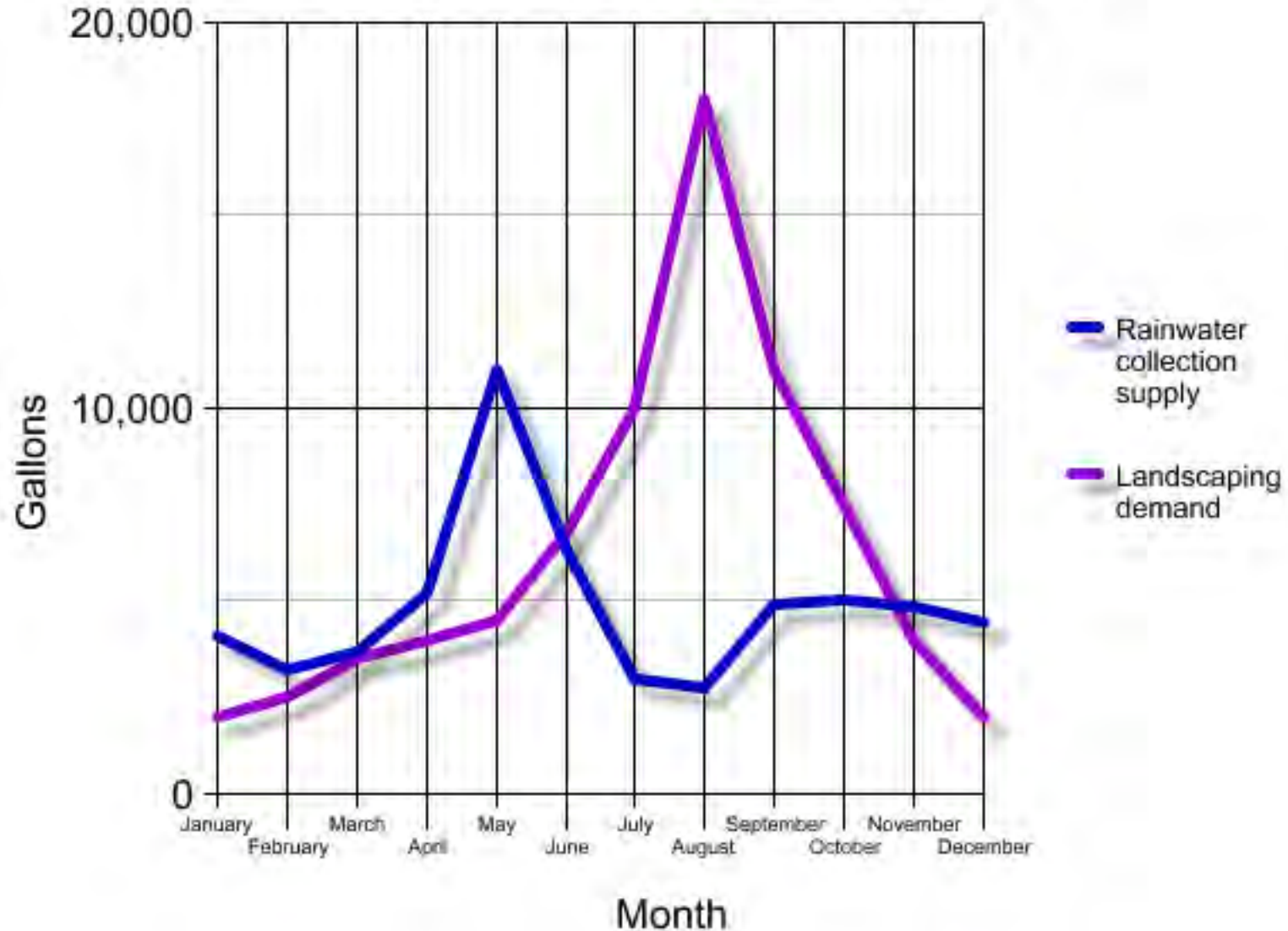
System Sizing & Efficiency

- Most frequently asked question – tough to answer
- Water budgets are good start
- Collection surface size
- Two basic constraints:
Physical space & Budget



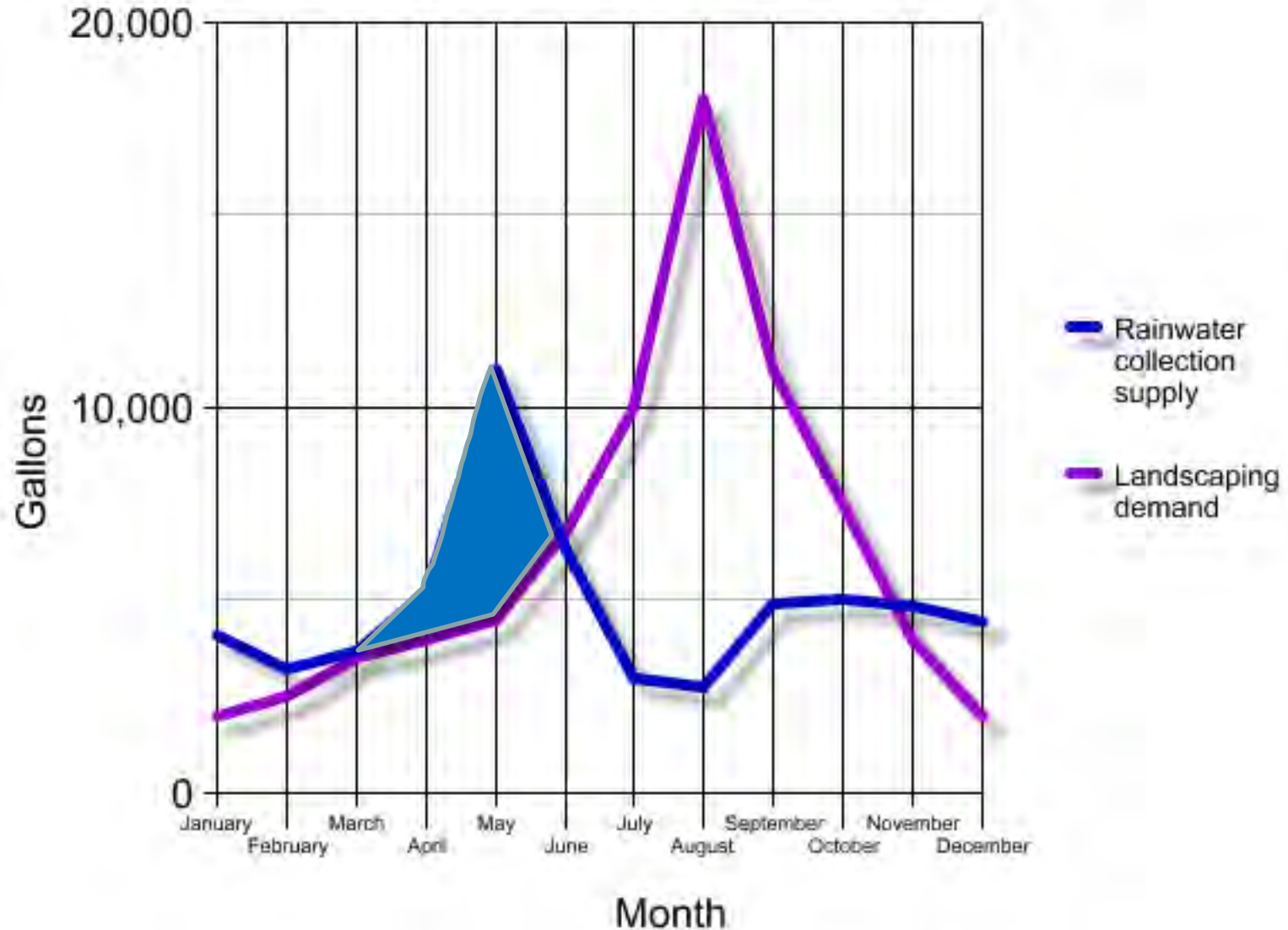
The Importance of Storage Volume

Hypothetical 3,000 sf building with landscaping



The Importance of Storage Volume

Hypothetical 3,000 sf building with landscaping



Always Have a Back-up Strategy

- Water budgets look good until the first drought

Calculations using Average Rainfall: Dallas/Fort Worth area

	Indoor demand (gal)	Irrigation (gal)	Total demand (gal)	Rainfall collected (gal)	End of month storage (gallons)	Municipal Water Saved (gallons)
January	0	2,034	2,034	14,896	12,862	2,034
February	0	6,702	6,702	18,735	22,400	6,702
March	0	10,816	10,816	23,957	22,400	10,816
April	0	22,506	22,506	24,187	22,400	22,506
May	0	11,904	11,904	41,694	22,400	11,904
June	0	41,705	41,705	24,418	5,112	41,705
July	0	55,414	55,414	16,048	0	21,160
August	0	53,798	53,798	16,125	0	16,125
September	0	32,928	32,928	18,582	0	18,582
October	0	4,773	4,773	30,791	22,400	4,773
November	0	3,409	3,409	18,659	22,400	3,409
December	0	0	0	19,196	22,400	-
Total:						150,981 *

Rainwater system typology

“Dry” Connection:

Pipes drain completely

Easy system to install and maintain

Tank must be located close to collection surface



“Wet” Connection

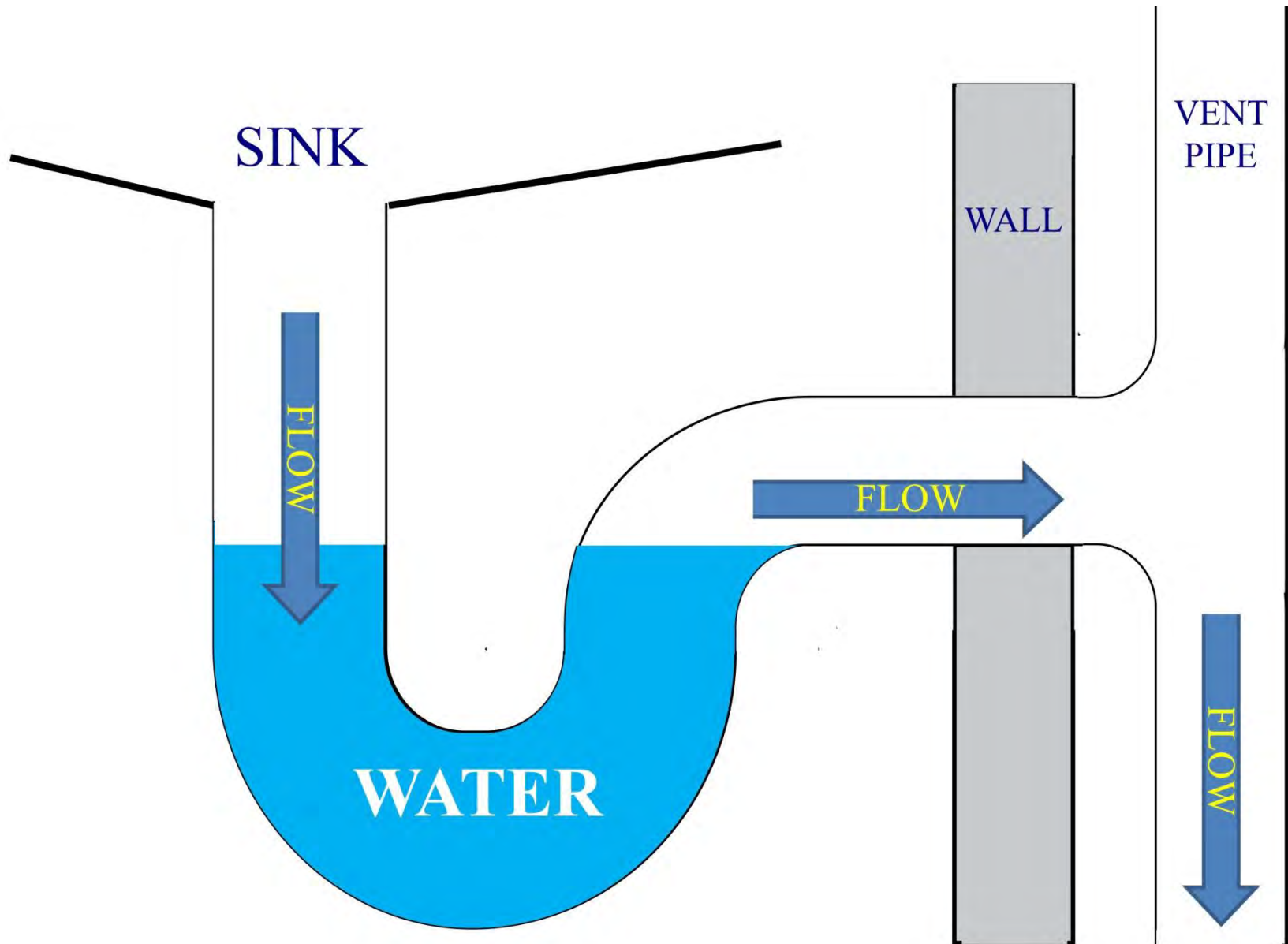
Water remains in collection pipes

Gutter must be above tank inlet

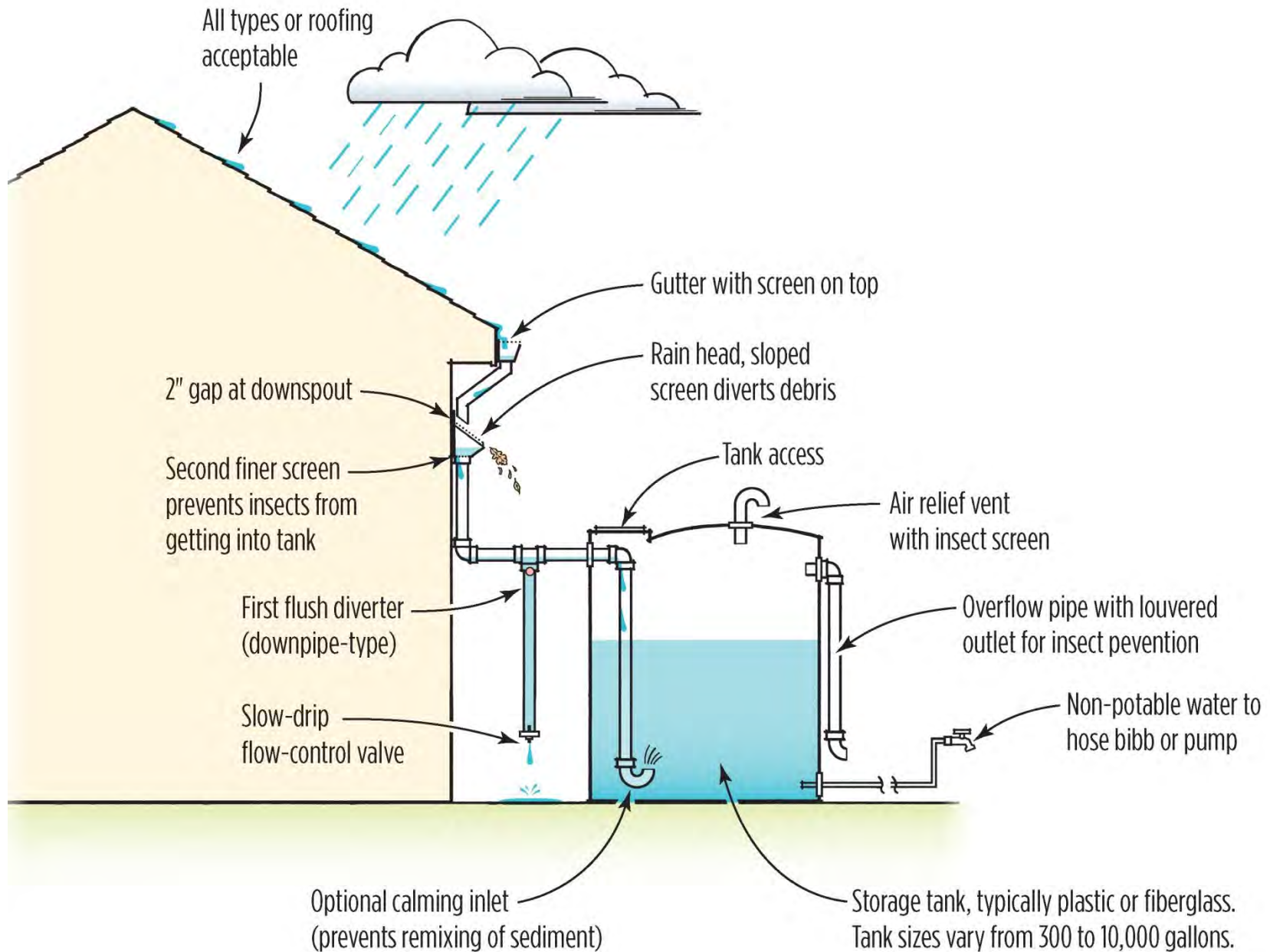
Allows any location of storage tank



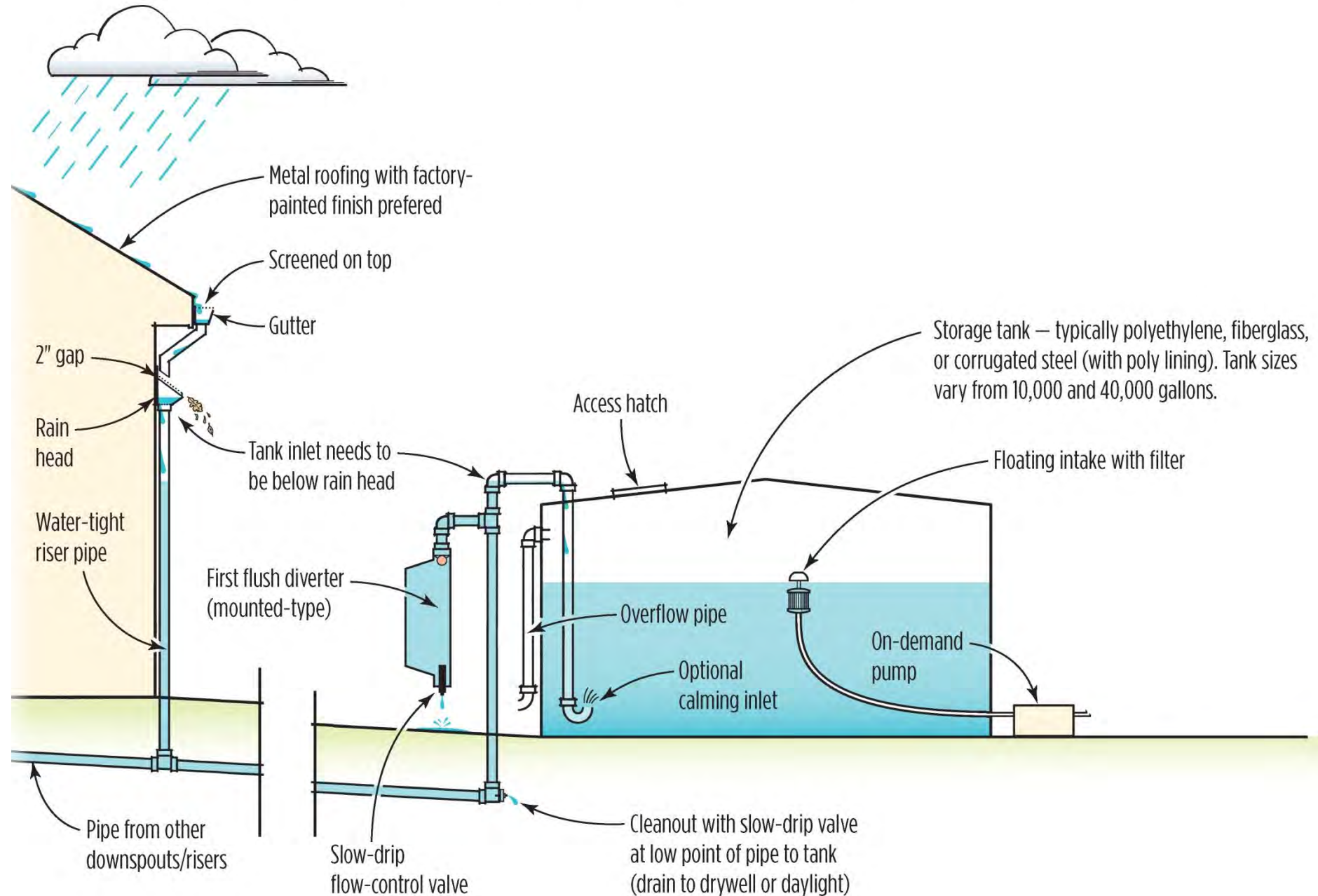
Imagine a P-Trap...



Dry Pipe System for Non-Potable Water

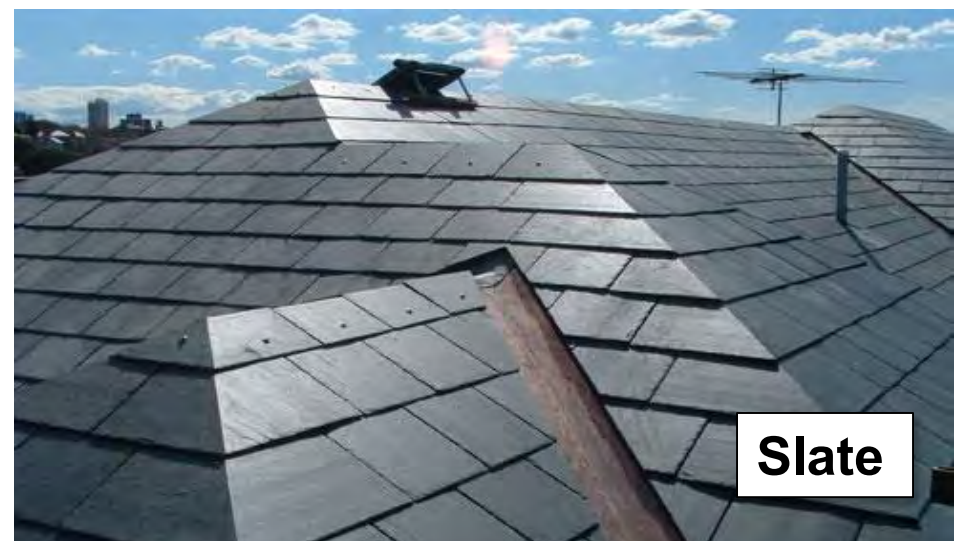


Wet Pipe System to Remote Tank



Rainwater system components:

Roof Type



Rainwater system components:

Gutter or Inlet Screening

“Your first line of defense”



Rainwater system components:

Tank inlet filter and screen



Inlet filtration is vital



Inlet filtration is NOT first flush

- Inlet filters keep large debris out
- First flush from the roof carries a higher concentration of pollutants. It should be diverted from collection, not just “filtered”.
- Inlet filtration + First flush = **Best Practice**



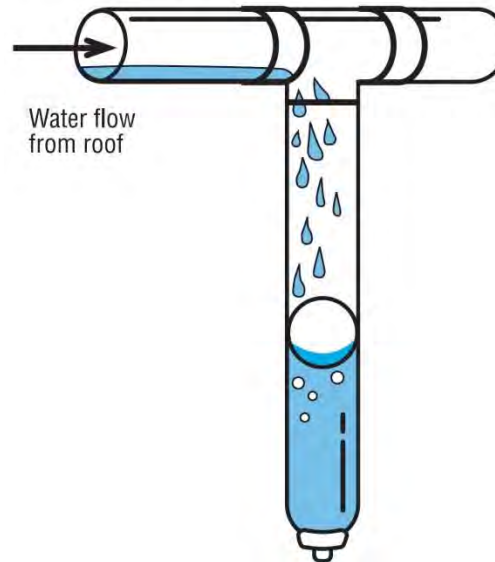
Rainwater system components:

First Flush Diverter

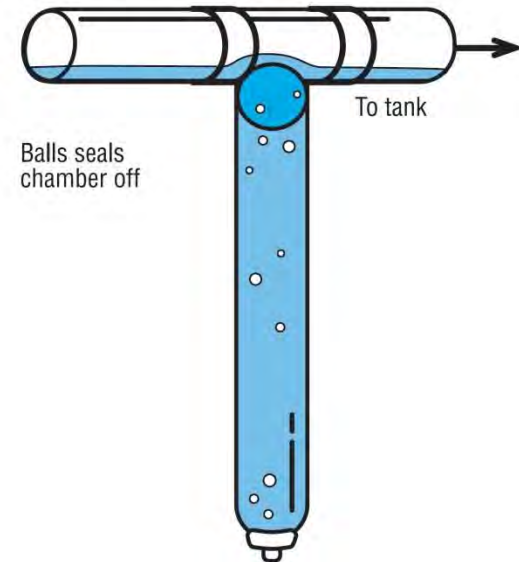


Diverts the initial wash of the roof

First flush of contaminated water is diverted into chamber



Once chamber is full fresh water flows to tank



Adequate first flush amount?

- TWDB suggests >10 gallons / 1,000 sf
- Depends on who you ask and what research you read
- Ultimately depends on use of rainwater, roof type, and location issues

Rainwater system components:

Backup Water Supply

- Auto-fill mechanism
- Manual fill
- Auto-switch

- Remember,
Air gap or RPZ



Rainwater system components:

Water Level Gauge



Rainwater system components:

Irrigation Pump System

- Pump sized for demand
- Different type of systems:
 - Hose bibb only
 - Connected to irrigation
 - On-demand
- Don't have to settle for onsite water pressure



Rainwater system components:

Potable Pump/Filtration/Disinfection System

- Cartridge filters
- Disinfection methods:
 - UV
 - Ozone
 - Chlorine



Rainwater Incentives

- COA provides a rebate up to \$5,000 for systems over 300 gallons
- Rainwater harvesting equipment is sales tax exempt in TX
- Hays County gives property tax exemption
- COA provides water quality credits
- LCRA provides impervious cover credits



diverter
valve

filter
input
storage

diverted
water
through
here

filter
input

Diverter
storage

wet
harrow
drain

slow
sand
filter

filter
output

filtered
water
storage

Recent bad install sighting in Austin







System Design Overkill



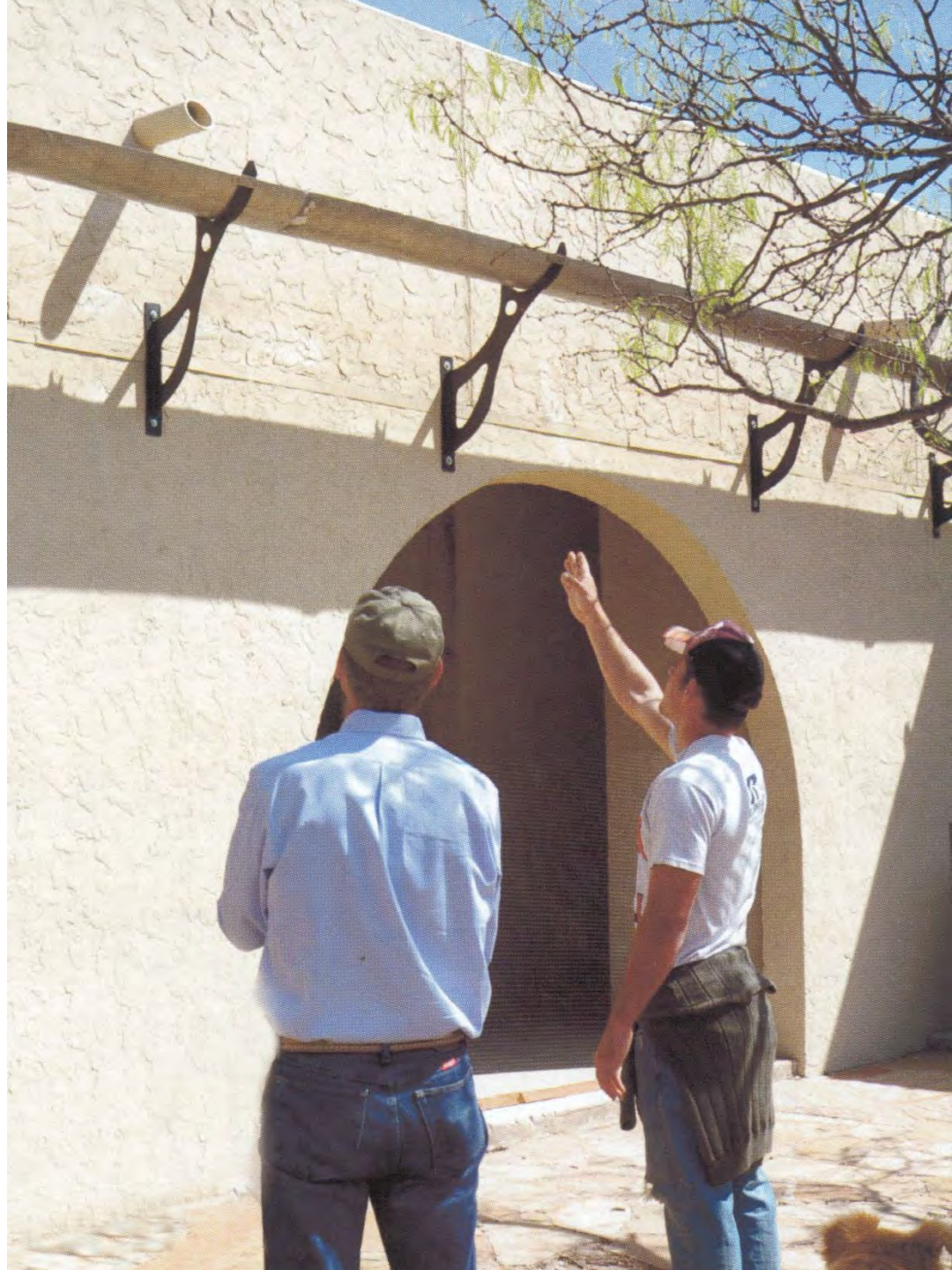




Aboveground tank buried??



Where will
the rainwater
hit?



Flying pipes?





First-Flush Mixing with the Good



Bad inlet connections



Exposed
PVC
to the sun







Underground Filter “Aboveground”

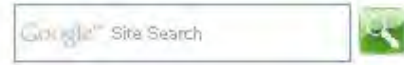




www.watercache.com



Contact Us Today!
512-490-0932



Integrated Water Conservation Solutions...

Rainwater Collection: Graywater Recovery
Drainage Solutions : Landscape / Irrigation Systems

Want to save water, reduce your utility bills, or build a green home?
Searching for an alternative water source? We can help you!!



Education / Information

Learn how to conserve water in your home and how our integrated systems can save you money

Get more specifics about rainwater harvesting and graywater reuse

[Learn More](#)

[Have Questions?](#)

Installation / Maintenance

Homeowners, builders, and general contractors...

Let us create a customized solution for you and take care of all the details with our turn-key installation services

[Learn More](#)

[Request Consultation](#)

Design / Consulting

Architects, Engineers, and Developers...

Professional design services that create conservation opportunities through stormwater and water demand management

[Learn More](#)

[Contact Us](#)

DIY / Contractors

Find out more about the high-quality products and components we install

Browse our complete line of rainwater collection and water conservation products

[Learn More](#)

[Download Catalog](#)