

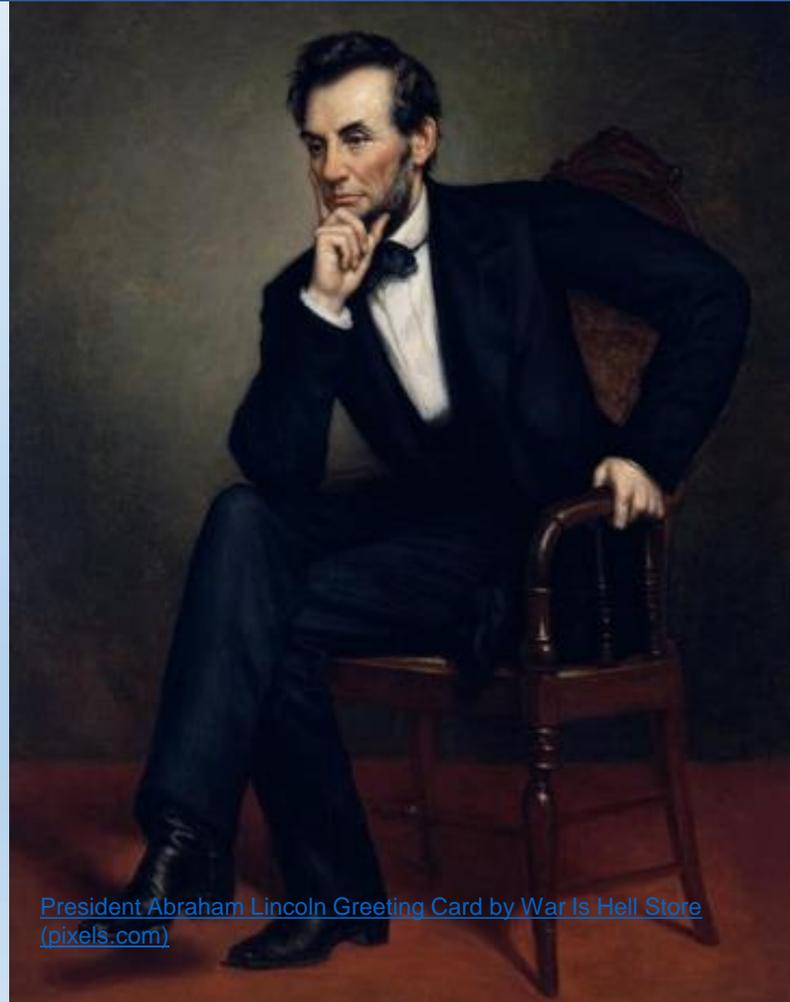
Urban Water Harvesting



Jacob Shaffer

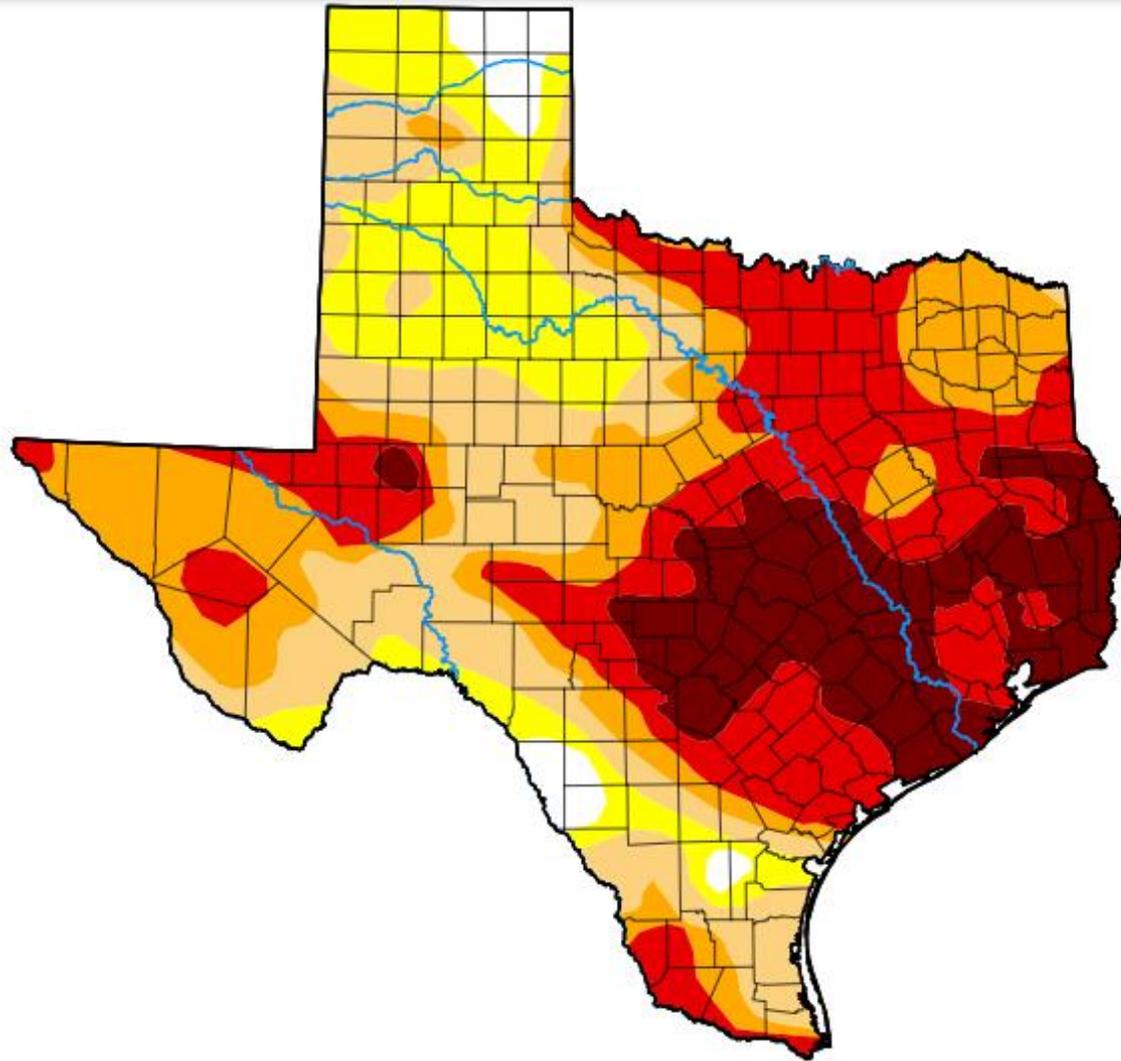
Water Conservationist

*“Why is it we never think about rationing
Until we see the bottom of the barrel?”*
-Abraham Lincoln



[President Abraham Lincoln Greeting Card by War Is Hell Store \(pixels.com\)](#)

Data valid: September 19, 2023 at 8 a.m. EDT



Intensity

- None
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Extreme Drought)
- D4 (Exceptional Drought)
- No Data

Authors

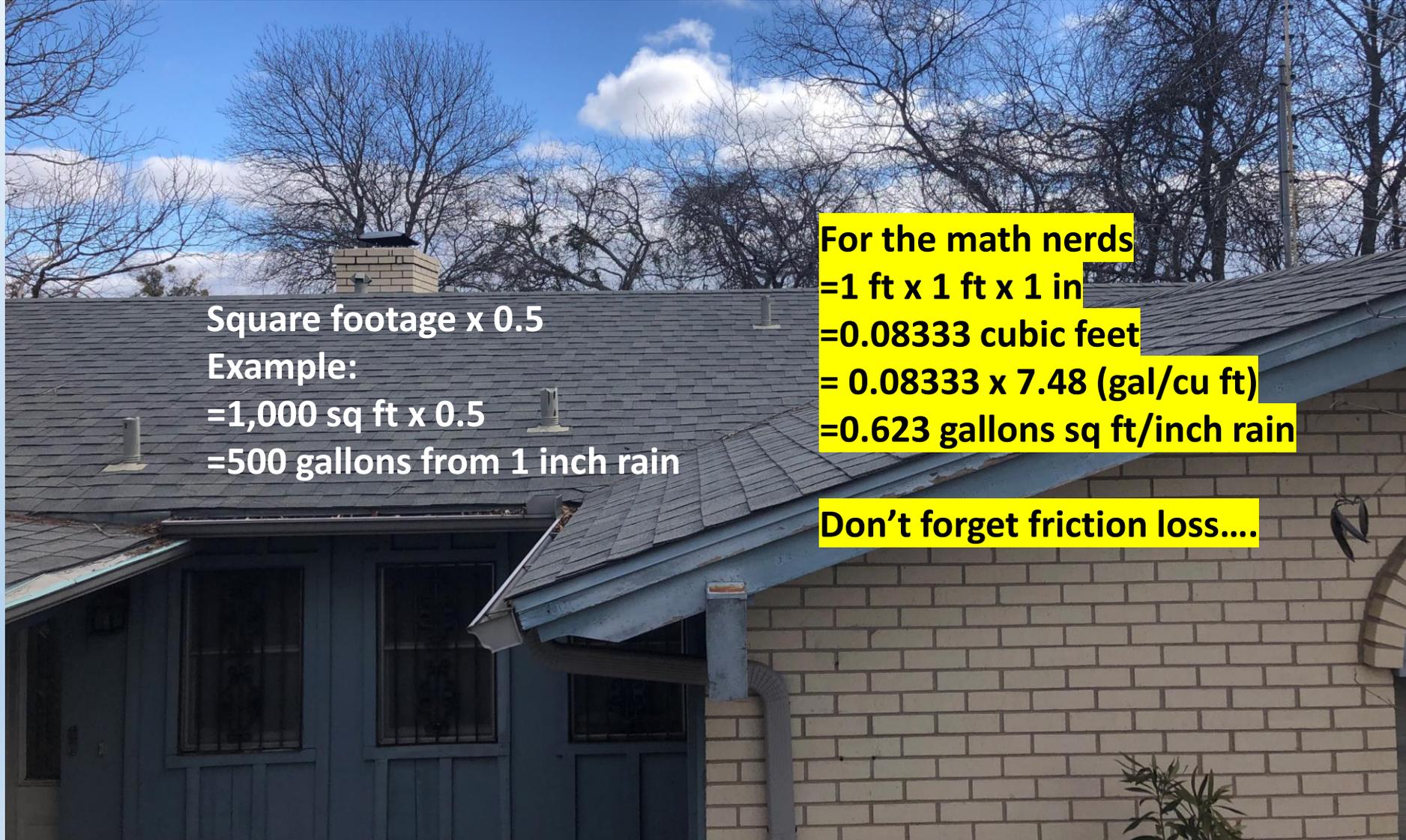
United States and Puerto Rico Author(s):

[Richard Heim](#), NOAA/NCEI

Pacific Islands and Virgin Islands Author(s):

[Richard Tinker](#), NOAA/NWS/NCEP/CPC

1) Catchment Area



Square footage x 0.5

Example:

=1,000 sq ft x 0.5

=500 gallons from 1 inch rain

For the math nerds

=1 ft x 1 ft x 1 in

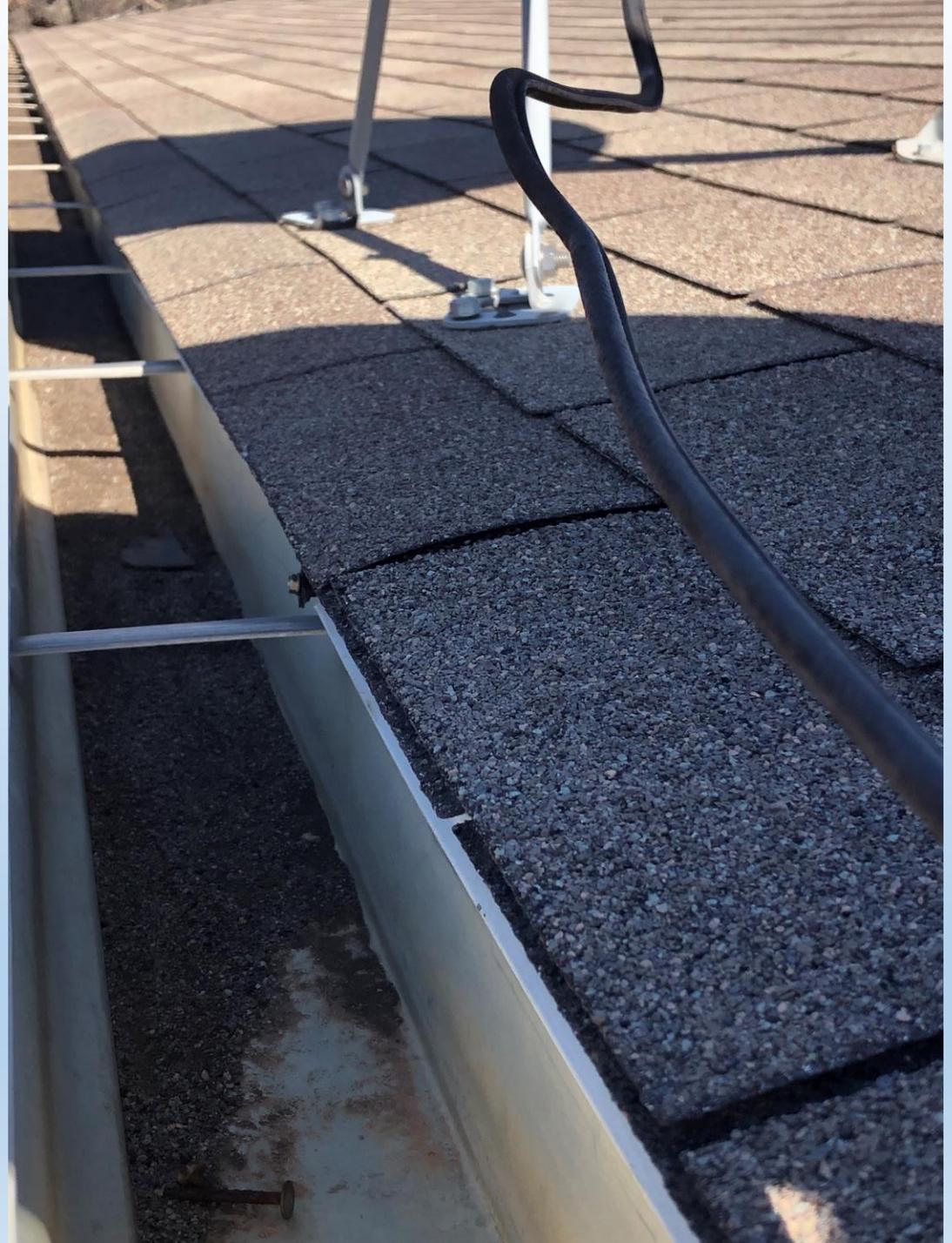
=0.08333 cubic feet

= 0.08333 x 7.48 (gal/cu ft)

=0.623 gallons sq ft/inch rain

Don't forget friction loss....

2) Conveyance



2) Conveyance-Wet System

Standing water in transfer pipe if not drained after rain event

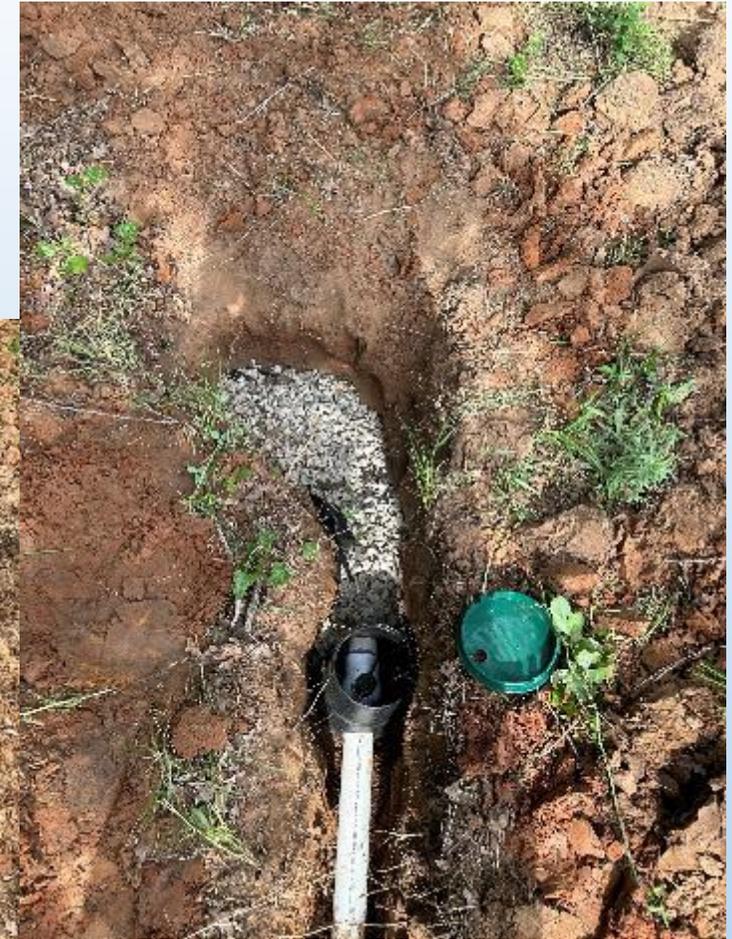


ing system uses a roof,
ground, and backup into
prevents livestock from
damaging the pipes and allows the tank to be much further
away from the shed. Unless there is a drain along the lower
pipe, the standing pipes will contain water that is susceptible



2) Conveyance-Wet System

Standing water in transfer pipe if not drained after rain event



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Standing water in transfer pipe if not drained after rain event



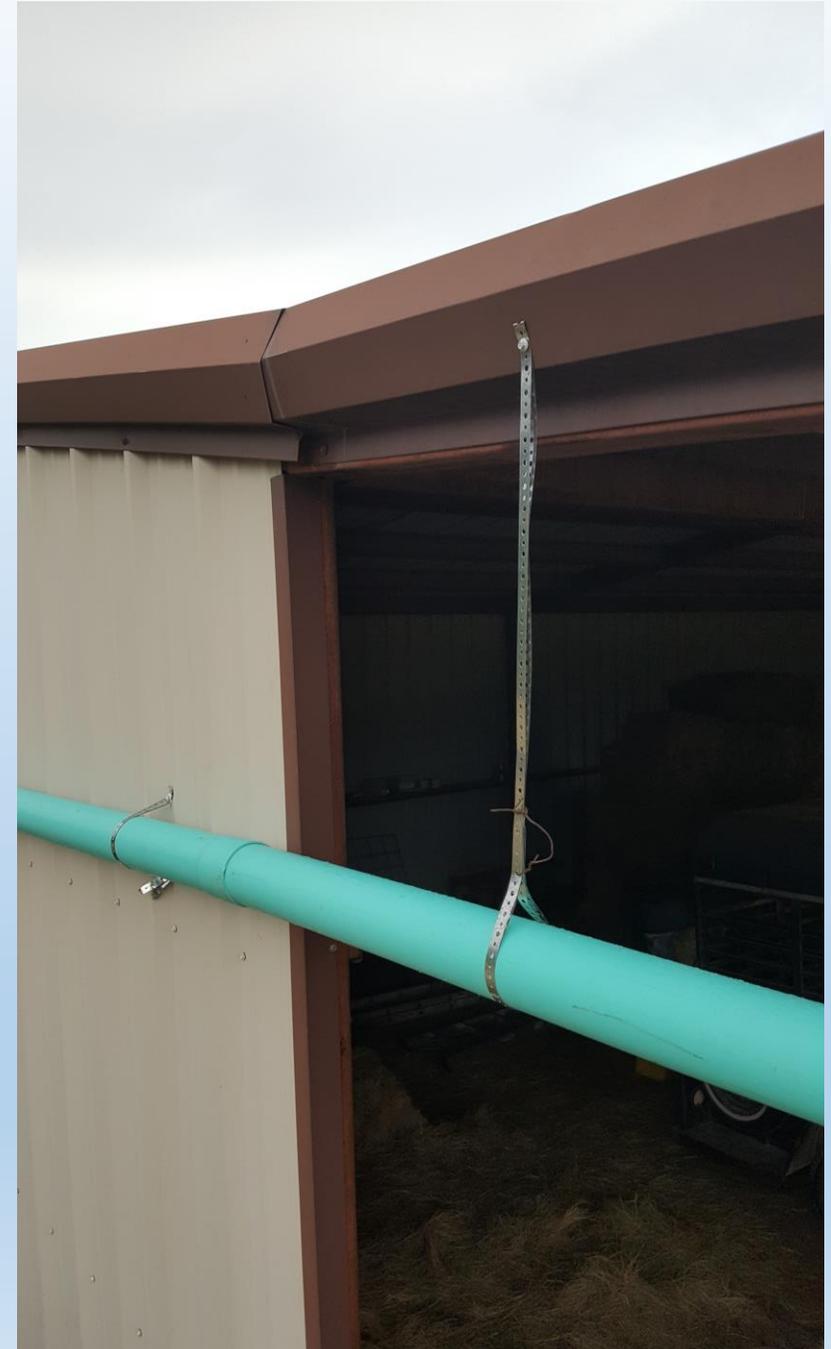
2) Conveyance-Wet System

Standing water in transfer pipe if not drained after rain event



2) Conveyance-Dry System

No standing water in transfer pipe



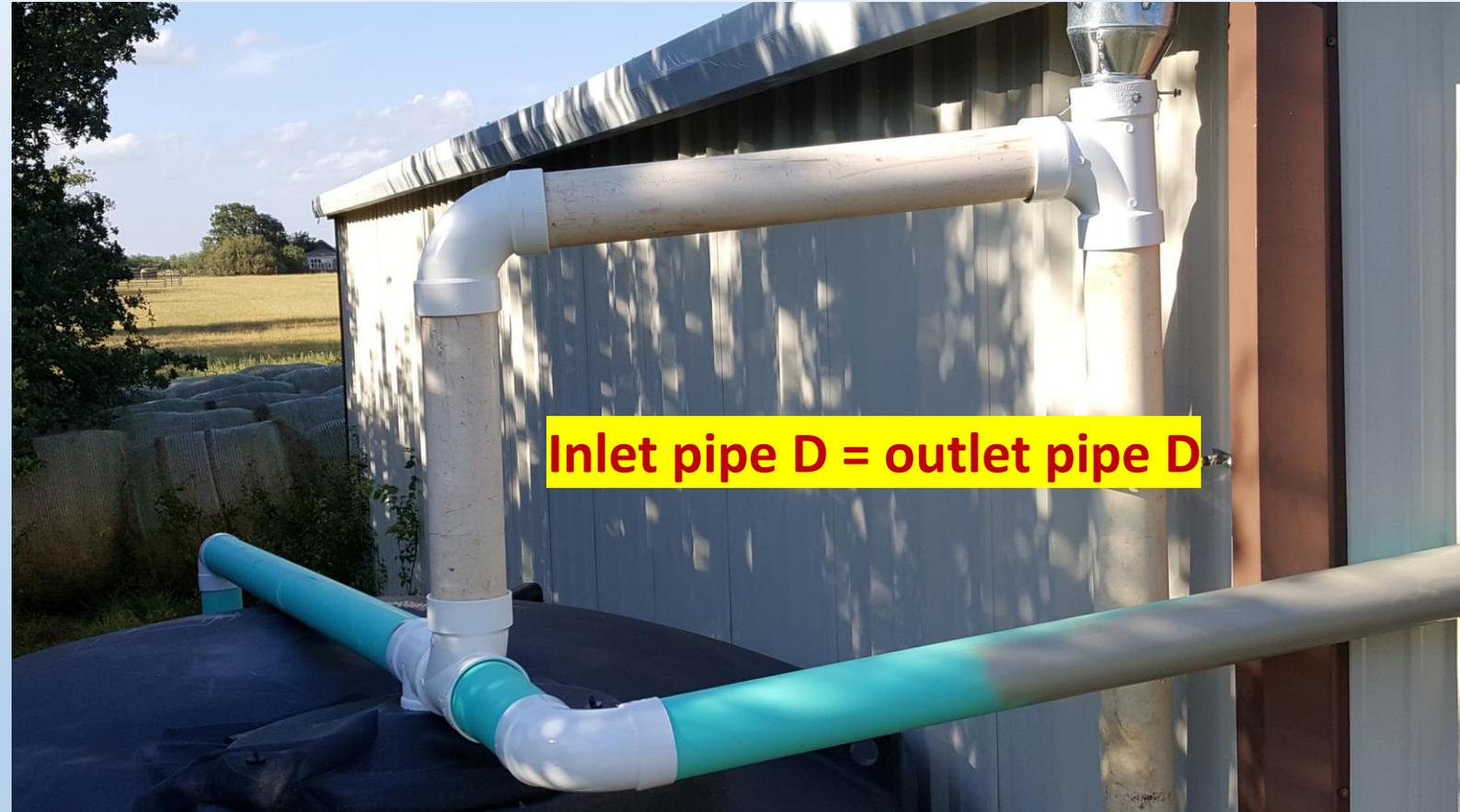
3) Storage



3) Storage



3) Storage

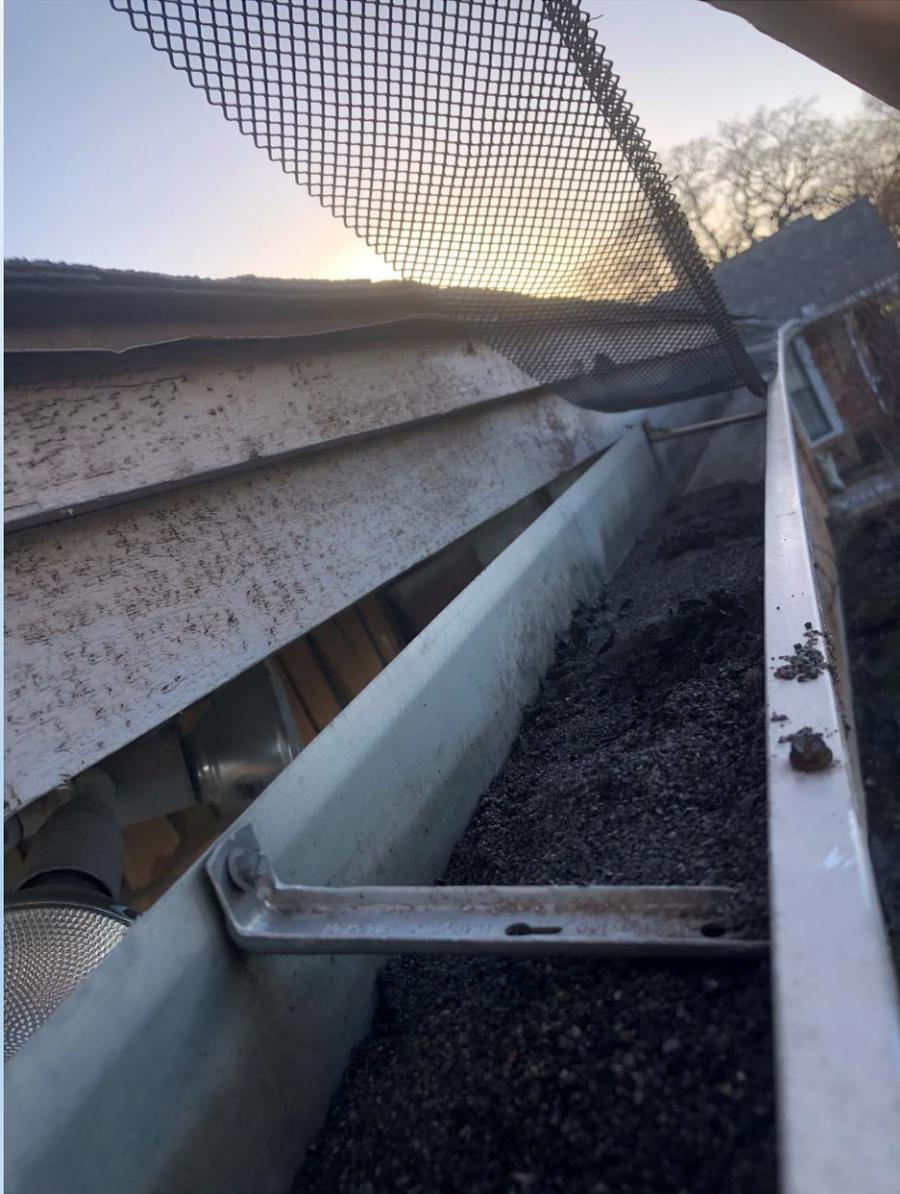


3) Storage

Pipe overflow away from tank base to slow erosion



4) Treatment



4) Treatment



4) Treatment



4) Treatment

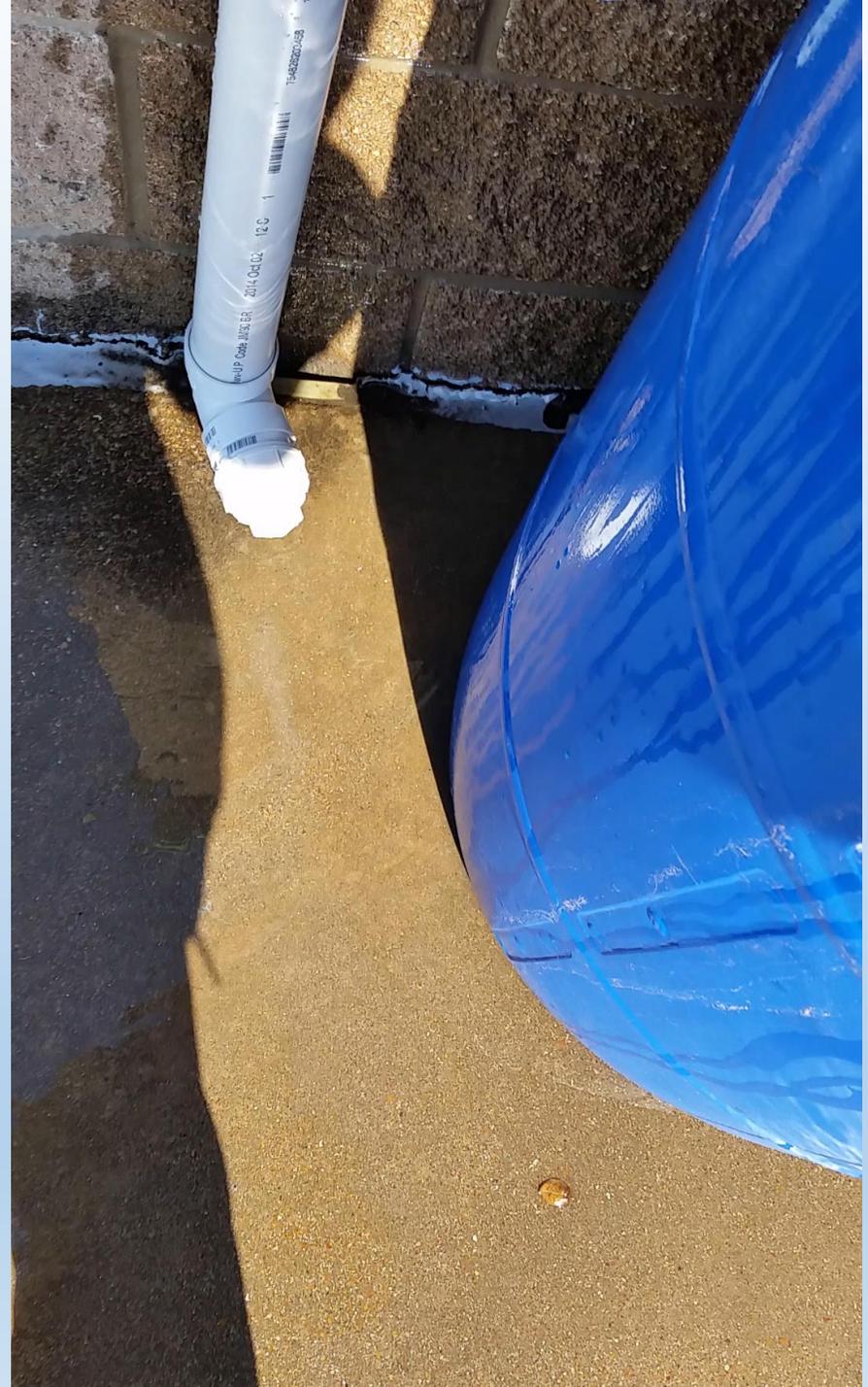
First flush clean out

For every 100 square feet divert 0.5 to 1 gallon as first flush water

Example: 1,000 square feet / 100

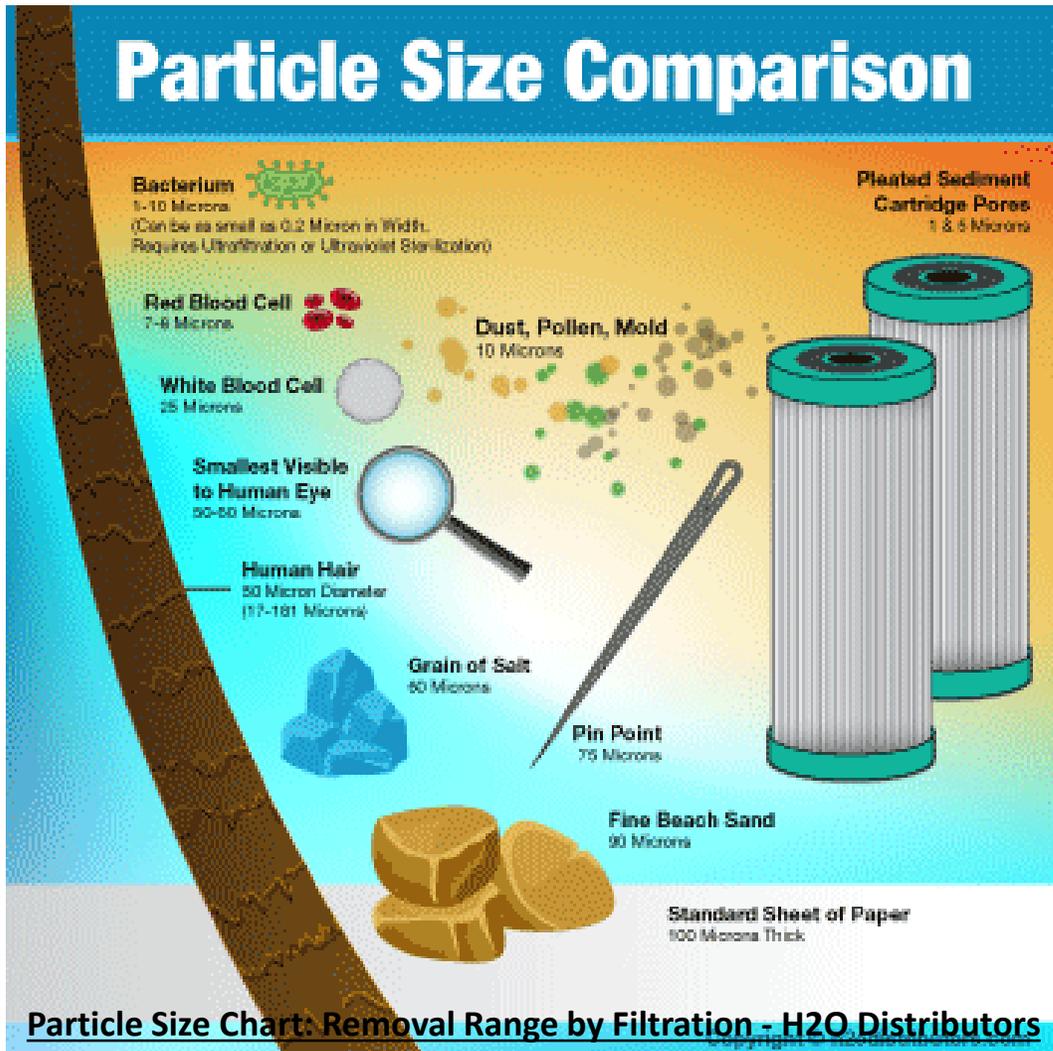
= 5 to 10 gallons diversion water

-Will vary depending on trees, rainfall intensity, etc..



4) Treatment

Particle Size Comparison



**Before
RH₂O**



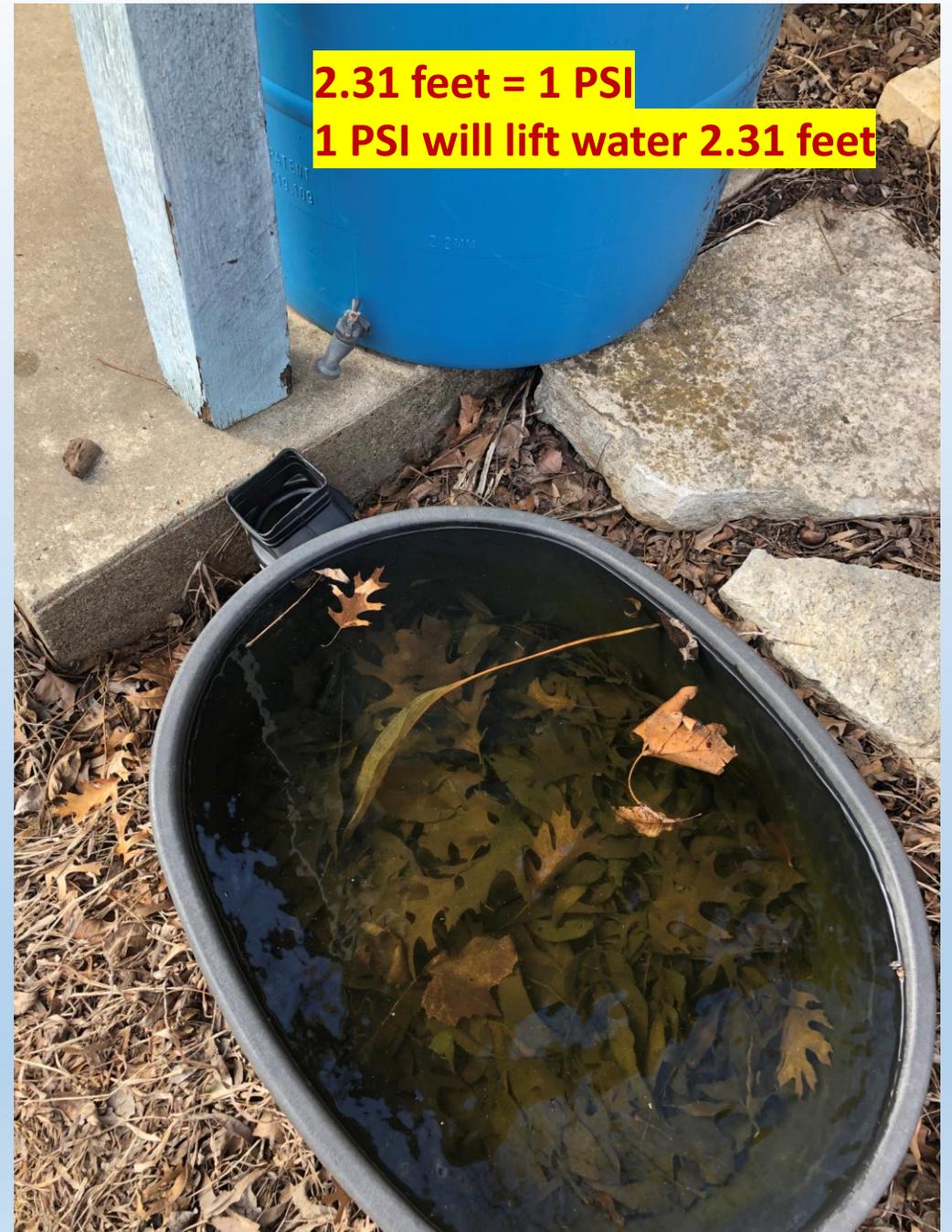
**After
RH₂O**



Parameter analyzed	Results	Units	Method	V. Limiting	Limiting	Acceptable
Calcium (Ca)	3	No restrictions				*****
Magnesium (Mg)	< 1	No restrictions				*****
Sodium (Na)	4	20 ppm and under				*****
Potassium (K)	< 1	No restrictions				*****
Boron (B)	< 0.01	0.33 ppm sensitive crops				*****
Carbonate (CO ₃)	0	No restrictions				*****
Bicarbonate (HCO ₃)	8	No restrictions				*****
Sulfate (SO ₄ -calculated from total S)	< 3	250 ppm and under				*****
Chloride (Cl-)	3	250 ppm and under				*****
Nitrate-N (NO ₃ -N)	0.04	10 ppm and under				*****
Phosphorus (P)	< 0.01	0.1 ppm in stagnant water may cause algal blooms				*****
pH	5.35	6.5 and under acidic				
Conductivity	36	No limit				*****
Hardness	1	No standard				*****
Hardness	11	No standard				*****
Alkalinity	7	500 ppm for dairy cattle				*****
Total Dissolved Salts (TDS)	24	500 ppm and under				*****
SAR	0.5	10 ppm and under				
Iron (Fe)						
Zinc (Zn)						
Copper (Cu)						

Rating	Grains per Gallon	Total Hardness (ppm)
Soft	0-1	0.0-17.17
Slightly hard	1-3.5	17.18-60
Moderately hard	3.5-7	61-120
Hard	7.1-10.5	121-180
Very hard	>10.5	>180

5) Distribution



5) Distribution

2.31 feet = 1 PSI
1 PSI will lift water 2.31 feet



5) Distribution



Rainwaterharvesting.tamu.edu

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2-3,000 gallon poly tanks

**Half of 40ft x 60ft shop
=1,200 sq ft x 0.5
=600 gallons 1 inch rain
=10 inches to fill tanks**



**Downspout directing
Water into the tank
With screen**





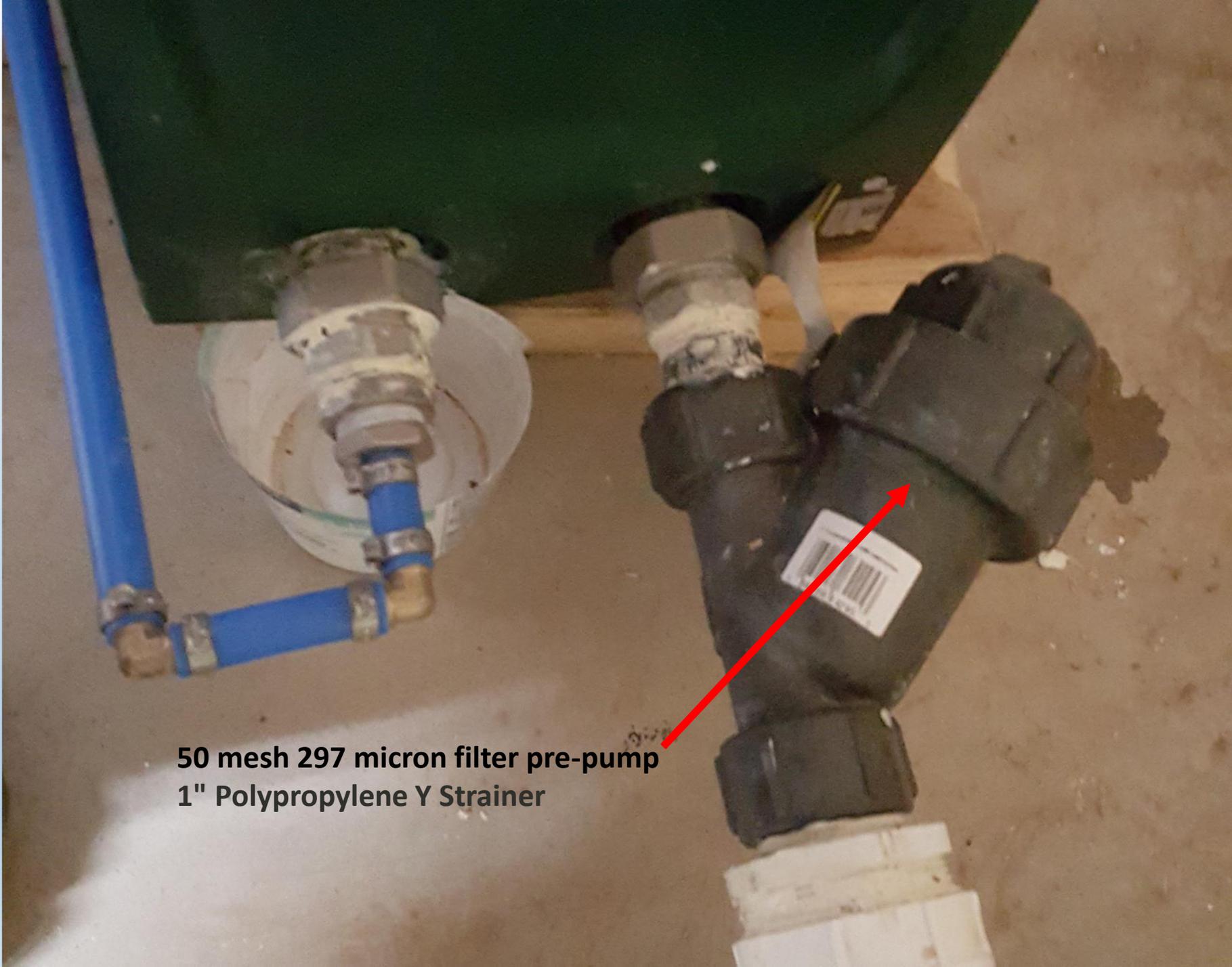
2 inch camlock x $\frac{3}{4}$ inch male
for garden hose



**Approximate 800 micron
Window screen**

Clear totes or barrels need to be inside, in the shade, or painted to help slow algae growth inside the tank due to sunlight





**50 mesh 297 micron filter pre-pump
1" Polypropylene Y Strainer**

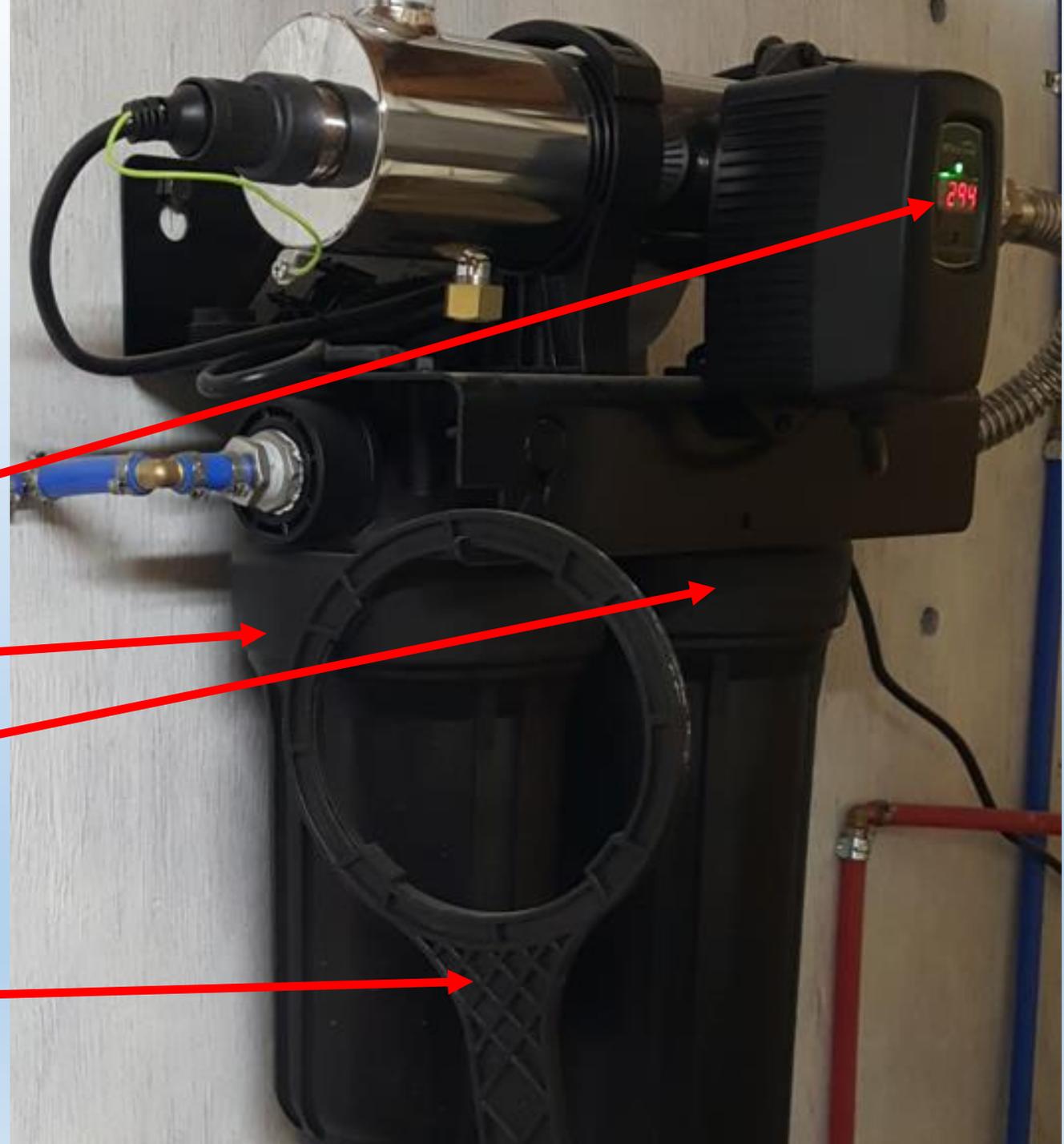
When to change filters

UV Lamp 365 days with counter

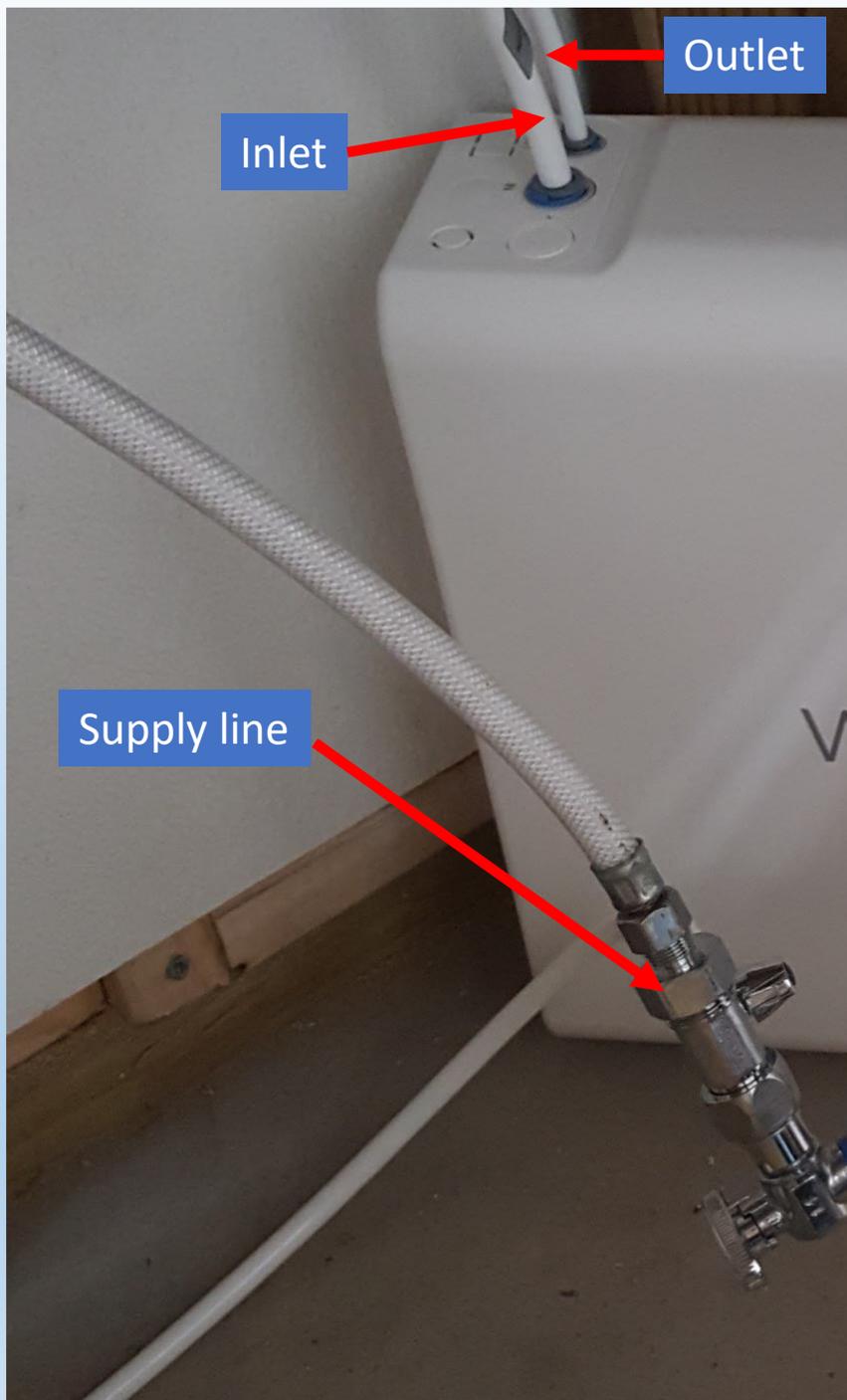
5 micron Sediment 3 – 6 months

**5 micron High Capacity Carbon
6 – 18 months**

Water Filter Wrench







Ultrafiltration membrane

With a pore size of **0.01 micron**, this ultrafiltration membrane can reduce harmful substances. Bacteria, viruses, and other contaminants that are larger than 0.01 micron cannot pass through this membrane, resulting in excellent filtration performance.

Waterdrop

PP Filter

To effectively reduce large impurities

UF Filter

To effectively reduce harmful contaminants

CT Filter

To create better-tasting water and enhance the overall drinking experience

Polypropylene Sediment

Ultrafiltration 0.01 micron

Counter Top Filter

	Recommend service life
PP Filter	6 months
UF Filter	24 months
CT Filter	12 months







Date:
4/8/2023



Date:
4/20/2023



Date:
9/25/2023



Cover-All Fall Cover Crop Mix

LOT: CCF832

NET WT: 40 LBS.

KIND AND VARIETY	PURITY	TOTAL GERMINATION	TEST DATE	ORIGIN
OAT, BOB	17.10%	85%	9/23	TX
BARLEY, VARIETY NOT STATED	12.00%	85%	9/23	TX
WHEAT, FORAGE MAXX	17.00%	85%	7/23	MO
FIELD PEA, AUSTRIAN WINTER*	18.20%	85%	7/23	OR
YELLOW BLOSSOM SWEETCLOVER, VNS*	1.50%	85%	7/23	CAN
ARROWLEAF CLOVER, YUCHI*	3.10%	85%	7/23	OR
CRIMSON CLOVER, VNS*	3.10%	85%	6/23	OR
HAIRY VETCH, VARIETY NOT STATED*	7.80%	85%	7/23	ARG
TURNIP, PURPLE TOP WHITE GLOBE	1.10%	85%	7/23	OR
RADISH, DAIKON	1.10%	85%	7/23	OR

*LEGUMES COATED WITH INOCULANT, EFFECTIVE THRU 3/31/24 PURITY: 80.00%
INERT MATTER: 19.00% OTHER CROP SEED: 0.80% WEED SEED: 0.20%

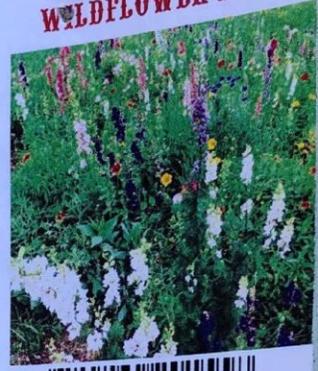
NOXIOUS WEED SEED: 2 WILD OAT, 2 WILD MUSTARD, 2 CHEAT OR CHESS

MBS SEED, INC. DENTON, TX 76202 TX PERMIT # TX21909

NOTICE OF REQUIRED ARBITRATION: Under the seed laws of Texas, arbitration is required as a precondition of maintaining certain legal actions, counterclaims, or defenses against a seller of seed. Information about this requirement may be obtained from the state commissioner of agriculture.

This mixture contains both annual and perennial flowers adapted to the South. They are selected for their long-season color and hardy growth through our highly variable weather here. Works well both in beds and in pastures and prairies. Utilized by many pollinators and wildlife for food. For best results, disturb the soil before spreading to ensure a well-textured surface for seed to make good soil contact no deeper than 1/4 inch. Plant fall through spring.

**TEXOKLA
WILDFLOWER MIX**



Date:
2/8/2024



Date:

4/27/2024

Blue Cornflower

Red Phlox

Red Poppy

Rocket Larkspur

Winter Pea

Hairy Vetch

Oats

Wheat

Bee Balm

Bluebonnet

Sulphur Cosmos

Indian Blanket

Brassica



Date:

5/27/2024

Blue Cornflower

Red Phlox

Red Poppy

Rocket Larkspur

Winter Pea

Hairy Vetch

Oats

Wheat

Bee Balm

Bluebonnet

Sulphur Cosmos

Indian Blanket

Brown-eyed Susan

Brassica





Other Uses



Other Uses

=10 ft / 2.31
=4.3 PSI



Water Harvesting Partner's Project



PARTNERS

Alabama-Coushatta Tribe of Texas
Bureau of Indian Affairs Southern Plains Office
Bureau of Indian Affairs Tribal Climate Resilience
United States Department of Agriculture

Approximate Acres: 10,000

State and County: TX, Polk County, Texas



Planned Pioneer Corrugated Tank
65,000 gallons
40 ft diameter
2 Overflow Pipes
(Location pending)
Tank Cost = \$50,509 (includes installation)

8 functioning metal downspouts 3.5" x 2"
piped into 6" pvc pipe

North side of Pavilion
250 ft x 110 ft
27,500 sqft
13,750 gallons from 1 inch rain
5 inches of rain to fill tank





Groundbreaking
10/17/2023





TEAM WORK



Foundation Complete





65,000 gallon storage tank

- Fire Protection**
- Irrigation**
- Road Construction water**
- Livestock**



Other Uses



Fire protection
FDC Fire Department
Connection

Water level gauge

Alabama-Coushatta Tribe of Texas



Alabama-Coushatta Tribe of Texas

[Alabama-Coushatta Tribe of Texas Water Harvesting - YouTube](#)

Tribal Climate Resilience Program

BIA TCR

Applications are due October 13

**Category 1: Planning (maximum \$250,000)
does not include funding for implementation**

**Category 2: Implementation (maximum \$4,000,000)
projects must identify whether they include construction**

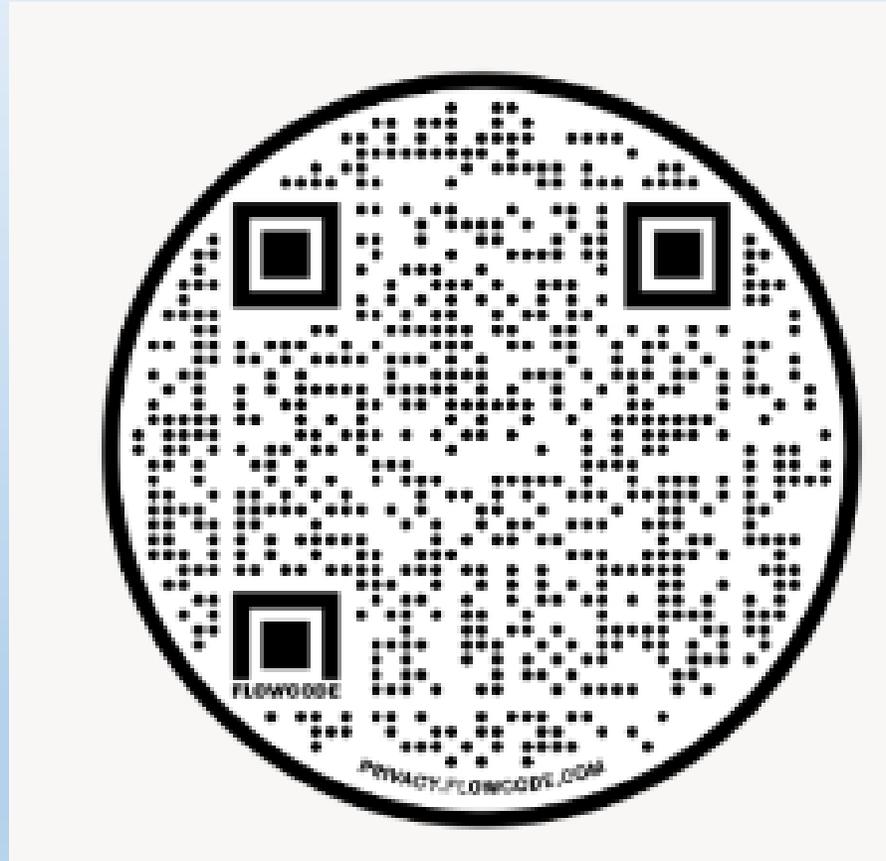
Southern Plains/EOK Region Climate Coordinator

Sheena.Schemm@bia.gov

817-771-4335

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**“You can live 4 days without water,
but not 1 second without hope.”**



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