

Landscape Management for Water Conservation

Tim Hartmann, Ph.D.
Extension Program Specialist
Texas A&M AgriLife Extension
College Station, TX



Earth-Kind®
Landscaping



Earth-Kind program uses research-based information and “real-world” solutions to create a systematic approach to landscape management to create beautiful landscapes and prolific gardens & fruit plantings that require reduced maintenance and low-inputs.

- ⦿ **Blend of conventional and organic**
- ⦿ **Maximum enjoyment**
- ⦿ **Reduced maintenance**
- ⦿ **Resource efficiency (environmentally sound)**

Earth-Kind® Rose Cultivars

Please select a cultivar to see more information on that rose.

Dwarf Shrubs



[Marie Daly](#)



[Souvenir de
St. Anne's](#)



[The Fairy](#)

Small Shrubs



[Caldwell Pink](#)



[Cecile Brunner](#)



[Perle d'Or](#)

Medium Shrubs



[Belinda's
Dream](#)



[Carefree
Beauty](#)



[Ducher](#)



[Duchesse de
Brabant](#)



[Else Poulsen](#)



[Georgetown
Tea](#)



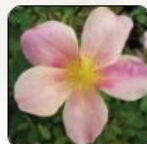
[Knock Out](#)



[La Marne](#)



[Madame
Antoine Mari](#)



[Mutabilis](#)



[Spice](#)

Mannerly Climbers

[Earth-Kind® Roses Home](#)

[About Earth-Kind® Roses](#)

[How Cultivars Are
Selected](#)

**Earth-Kind® Rose
Cultivars**

[Belinda's Dream](#)

[Caldwell Pink](#)

[Carefree Beauty™](#)

[Cecile Brunner](#)

[Climbing Pinkie](#)

[Ducher](#)

[Duchesse de Brabant](#)

[Else Poulsen](#)

[Georgetown Tea](#)

[Knock Out®](#)

[La Marne](#)

[Madame Antoine Mari](#)

[Marie Daly](#)

[Mutabilis](#)

[New Dawn](#)

[Perle d'Or](#)

[Reve d'Or](#)

[Sea Foam](#)

[Souvenir de St. Anne's](#)

[Spice](#)

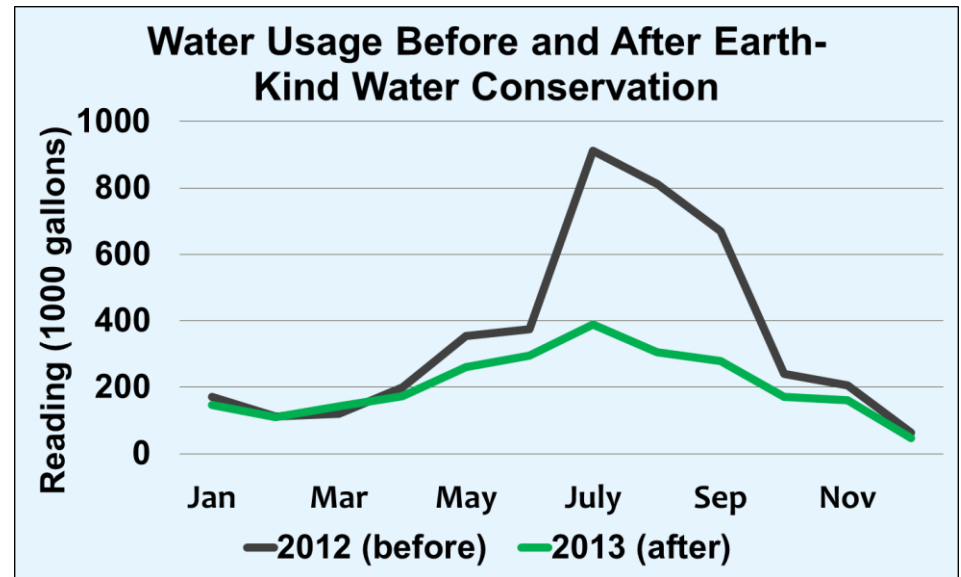
[The Fairy](#)

[Earth-Kind® Rose Press
Room](#)

[Growing Tips for Earth-
Kind® Roses](#)

Earth-Kind Education

- ⦿ **Master Gardener Training**
- ⦿ **Printed publications**
- ⦿ **Videos**
- ⦿ **Web-based modules**
- ⦿ **Facebook**
- ⦿ **Demonstration plantings**
- ⦿ **Plant evaluation trials**





Earth-Kind®

Landscaping



<http://earthkind.tamu.edu>



Earth-Kind Landscaping uses research-proven techniques to provide maximum garden and landscape enjoyment while preserving and protecting the environment. The objective of Earth-Kind Landscaping is to combine the best of organic and traditional gardening and landscaping principles to create a horticultural system based on real world effectiveness and environmental responsibility. Earth-Kind Landscaping Encourages:

- [Landscape Water conservation](#)
- [Reduction of fertilizer and pesticide use](#)
- [Landscaping for energy conservation](#)
- [Reduction of landscape wastes entering landfills](#)

Individuals using Earth-Kind landscaping principles and practices can create beautiful, easy-care landscapes, while conserving and protecting natural resources and the environment.

Ask an Expert

Earth-Kind® Home

[10 Ways to Make Your Landscape Earth-Kind®](#)

[Take the Earth-Kind® Challenge](#)

[Planning the Home Landscape – Earth-Kind® Edition](#)

[Earth-Kind® Plant Selector](#)

[Search the Earth-Kind® Plant Selector](#)

Earth-Kind® Publications

[Landscape Publications](#)

[Master Gardener On-Line Training](#)

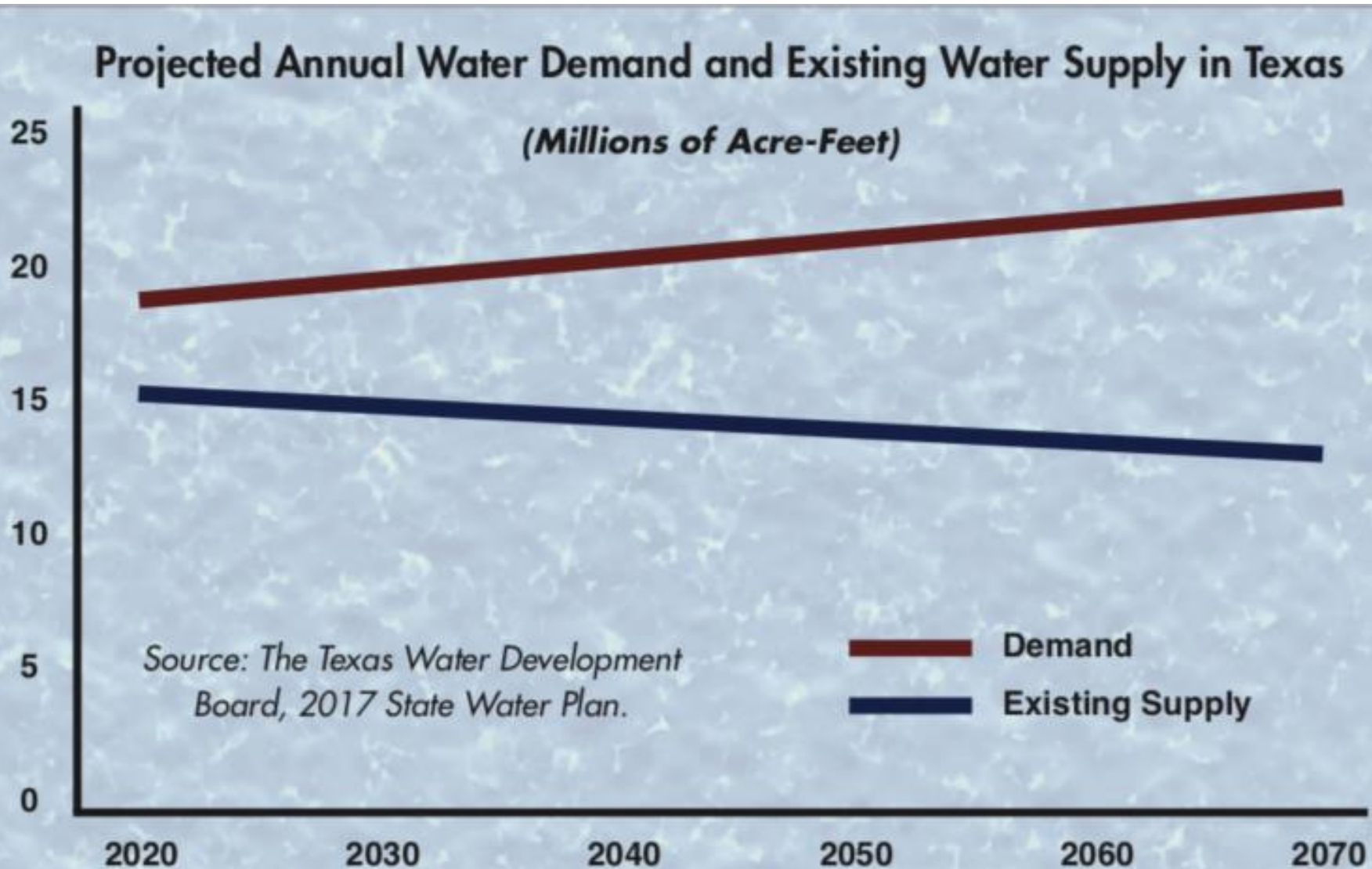
[Additional Earth-Kind® Resources](#)

[Earth-Kind® Drought Preparedness](#)

Goals of Earth-Kind

1. **Conservation of water **AND** quality**
2. **Reduction of chemical and fertilizer use**
3. **Energy conservation**
4. **Reduction of solid waste**

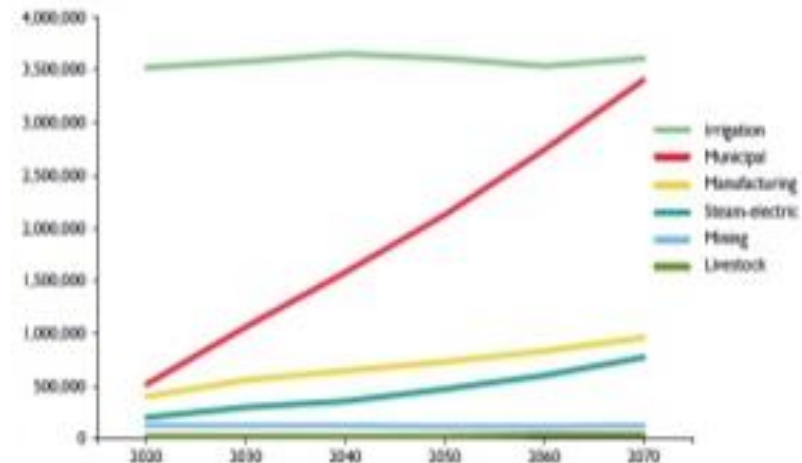
Is Texas Running out of Water?



Water: what role do we play?

- By 2060, 46,000,000 people will need 22 Million acre-feet
 - Only 15 Million acre-feet expected to be available (TWDB)
- 25-30% (60%) of municipal water used in landscapes.
- 9 Billion gallons per day across the nation for landscaping (EPA)
 - As much as 50% wasted

Figure 7.1 - Annual water needs by water use category (acre-feet)



Seven principles of Earth-Kind:

- 1) **Planning and design**
- 2) **Soil analysis and preparation**
- 3) **Practical turf areas**
- 4) **Appropriate plant selection**
- 5) **Efficient irrigation and rainwater harvesting**
- 6) **Effective use of mulches**
- 7) **Appropriate maintenance**

Practical Turf

- Among the heaviest water users in TX landscapes
- Benefits:
 - Erosion control, water infiltration
 - Cooling through transpiration (30° F)
 - Effective design element
- Largely due to behavioral issues:
 - Quality expectations
 - Improper selection of turf
 - Inefficient management
 - Excessive use



Zoysiagrass

Casey Reynolds, PhD



College Station, TX

Latin Name: *Zoysia* sp.

Growth Habit: Rhizomatous and Stoloniferous

Vernation: Rolled

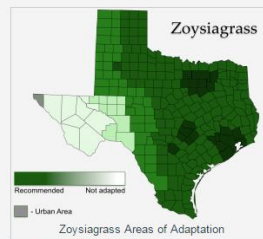
Leaf: Hairy on upper surface

Ligule: Fringe of hairs

Auricles: Absent

Inflorescence: Spike with 3-12 spikelets (*Z. pacifica*) or 10-50 spikelets (*Z. japonica* and *Z. matrella*)

Description: Zoysiagrass is a warm-season turfgrass that spreads laterally by rhizomes and stolons, and is one of the most diverse turfgrasses available for use. This is primarily due to the fact that there are at least 11 species of zoysiagrass used as a turfgrass, with 2 species (*Z. japonica* and *Z. matrella*) being most predominate in the southern United States. Available varieties of *Z. japonica* typically possess coarser leaf texture and better cold tolerance relative to varieties of *Z. matrella*, while varieties of *Z. matrella* have improved shade tolerance



Bermudagrass

Casey Reynolds, PhD



College Station, TX

Latin Name: *Cynodon dactylon* L. Pers and *Cynodon dactylon* (L.) Pers x *Cynodon transvaalensis* Burtt Davy

Growth Habit: Rhizomatous and Stoloniferous

Vernation: Folded

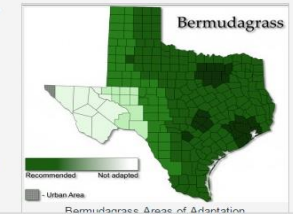
Leaf: Smooth or hairy on both surfaces

Ligule: Fringe of hairs

Auricles: Absent

Inflorescence: Panicle with 2-9 spike branches arranged in a digitate manner at the apex of the culm

Description: Bermudagrass is a warm-season, fine-textured



Buffalograss

Casey Reynolds, PhD



St. Augustinegrass

Casey Reynolds, PhD



Woodlands, TX

Latin Name: *Stenotaphrum secundatum* (Walt.) Kuntze

Growth Habit: Stoloniferous

Vernation: Folded

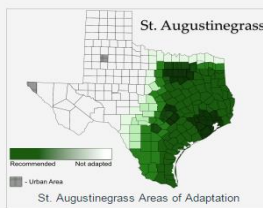
Leaf: Flat, smooth on both surfaces, with a blunt tip

Ligule: Fringe of hairs

Auricles: Absent

Inflorescence: Spicate, with spikelets partially embedded in the rachis

Description: St. Augustinegrass is a warm-season turfgrass that spreads laterally by stolons and is one of the most widely planted turfgrass species in Texas, particularly in urban environments. This is due to its superior shade tolerance relative to other warm-season grasses as well as its deep rooting potential and drought tolerance. It also performs well when mowed with a rotary mower at higher mowing heights, relative to other warm-season species, which makes it a popular choice for use in home lawns.



<https://aggieturf.tamu.edu/texas-turfgrasses/>

Latin Name: (*Bouteloua dactyloides* (Nutt.) J.T. Columbus)

Growth Habit: Stoloniferous

Vernation: Rolled

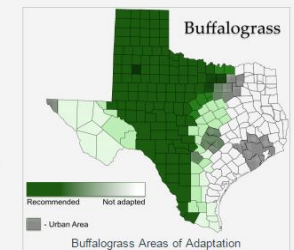
Leaf: Hairs on both surfaces; Ridges on upper surface

Ligule: Fringe of hairs

Auricles: Absent

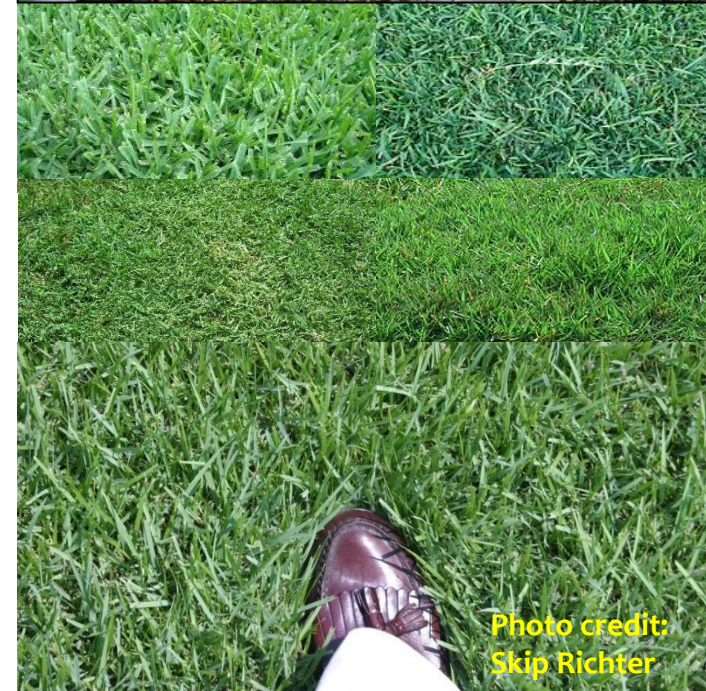
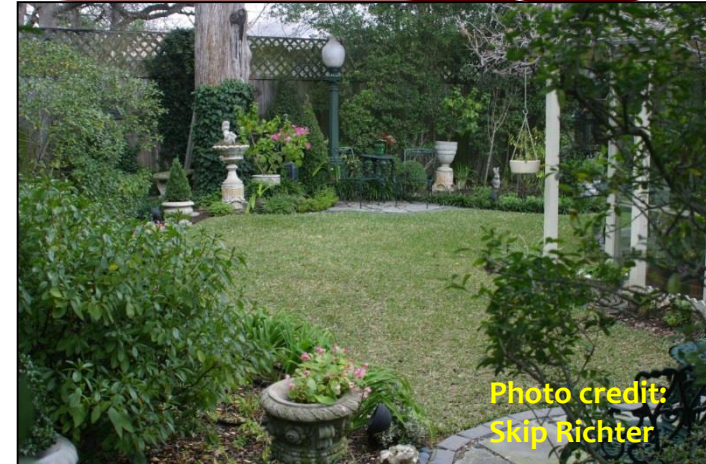
Inflorescence: Staminate and pistillate spikelets in separate inflorescences; usually on different plants. Staminate spikelets in 1-4 spike inflorescences; Pistillate spikelets in 2-4 burlike clusters.

Description: Buffalograss is a warm-season, native turfgrass that spreads laterally by stolons and is best suited as a low-input, low-use turfgrass. It is unique from other turfgrasses in that it has male (staminate) and female (pistillate) flowers on separate inflorescences. These are usually



Practical turf solutions

- ✓ Correct proportion (user-dependent)
- ✓ Appropriate selection (species/cultivar)
- ✓ Proper placement in landscape
- ✓ Sound management practices
 - Mulching of lawn clippings
 - Mowing at a taller height
- ✓ Aeration and addition of compost to compacted areas



General Turf Maintenance Tips

- Fertilize based on soil testing:
 - After 2nd or 3rd mowing
 - August / September
 - Excessive N promotes disease
- Mow at the correct height
 - Cut to remove 1/3 of blade length
- Water established turf on as necessary
- Recycle (“mulch”) grass clippings
- Aeration and/or compost application

Turf Coefficient Values (Tc)

| | |
|-------------|-----|
| Warm Season | 0.6 |
| Cool Season | 0.8 |

Quality Factor (Qf)

| | |
|------------------|-----|
| No Stress | 1.0 |
| Low Stress | 0.8 |
| Normal Stress | 0.6 |
| High Stress | 0.5 |
| Very High Stress | 0.4 |

<http://texaset.tamu.edu/coefs.php>

Table 1. Mowing height recommendations for warm-season turfgrass species according to intended use (Lawns & Public Spaces, Athletic Fields & Golf Course Fairways, and Golf Greens).

| Warm-Season Turfgrass Species | | | | |
|---------------------------------------|--|-----------------------|----------------------------------|--------------|
| Recommended Height of Cut | | | | |
| Common Name | Scientific Name | Lawns & Public Spaces | Athletic Fields & Golf Fairways* | Golf Greens* |
| Bermudagrass (Common) | <i>Cynodon dactylon</i> | 1.5" to 3" | 0.75" to 1" | NA |
| Bermudagrass (Hybrid)* | <i>Cynodon dactylon</i> (L.) Pers and <i>Cynodon dactylon</i> (L.) Pers x <i>Cynodon transvaalensis</i> Burtt Davy | 1" to 2.5" | 0.5" to 1" | |
| Bermudagrass (Dwarf and Ultradwarf) * | | NA | NA | <0.15" |
| Buffalograss | <i>Bouteloua dactyloides</i> (Nutt.) J.T. Columbus | 2" to unmowed | NA | NA |
| Centipedegrass | <i>Eremochloa ophiuroides</i> (Munro) Hack. | 1.5" to 2" | NA | NA |
| Seashore Paspalum | <i>Paspalum vaginatum</i> Sw. | 1" to 2" | 0.75" to 1" | <0.15" |
| St. Augustinegrass | <i>Stenotaphrum secundatum</i> (Walt.) Kuntze | 2.5" to 4" | NA | NA |
| Zoysiagrass (Coarse-textured) | <i>Zoysia japonica</i> | 1" to 2.5" | NA | NA |
| Zoysiagrass (Fine-textured)* | <i>Zoysia matrella</i> | 1" to 2" | 0.5" to 1" | <0.15" |



Recent Posts

New AgriLife Extension specialist
touts turfgrass practices for
environmental, human health **August
7, 2018**

New statewide turfgrass specialist
joins TAMU Soil and Crop Sciences
faculty **August 7, 2018**

Information Pages

[Texas Turfgrasses](#)
[Turfgrass Weeds](#)
[Turfgrass Insects](#)
[Glossary](#)
[Publications](#)

Howdy! Welcome to the AggieTurf website!

Aggieturf.tamu.edu has been designed to provide information on Texas turfgrasses and the role they play in the lives of millions of Texans. Turfgrasses often serve as the backbone for residential and commercial landscapes, athletic fields, recreational areas, and golf courses while also playing a vital role in the Texas Green Industry.

AggieTurf is designed to be a comprehensive site for Texas turfgrasses, selection & management considerations, pest control (weeds, insects, & diseases), links to Texas A&M Agrilife Extension content, and other useful information.

Update (8/28/2018): Our website will be undergoing gradual renovations including a change to the overall look and feel, as well as added content. Sign-up to receive updates as we continue to develop new content and information for you!

Sign up for updates!

Get updates from AggieTurf to your inbox.

* Email

First Name

Hydrozoning: saving water and plants!



Hydrozoning: three main groups

1.) Regular (high) water use

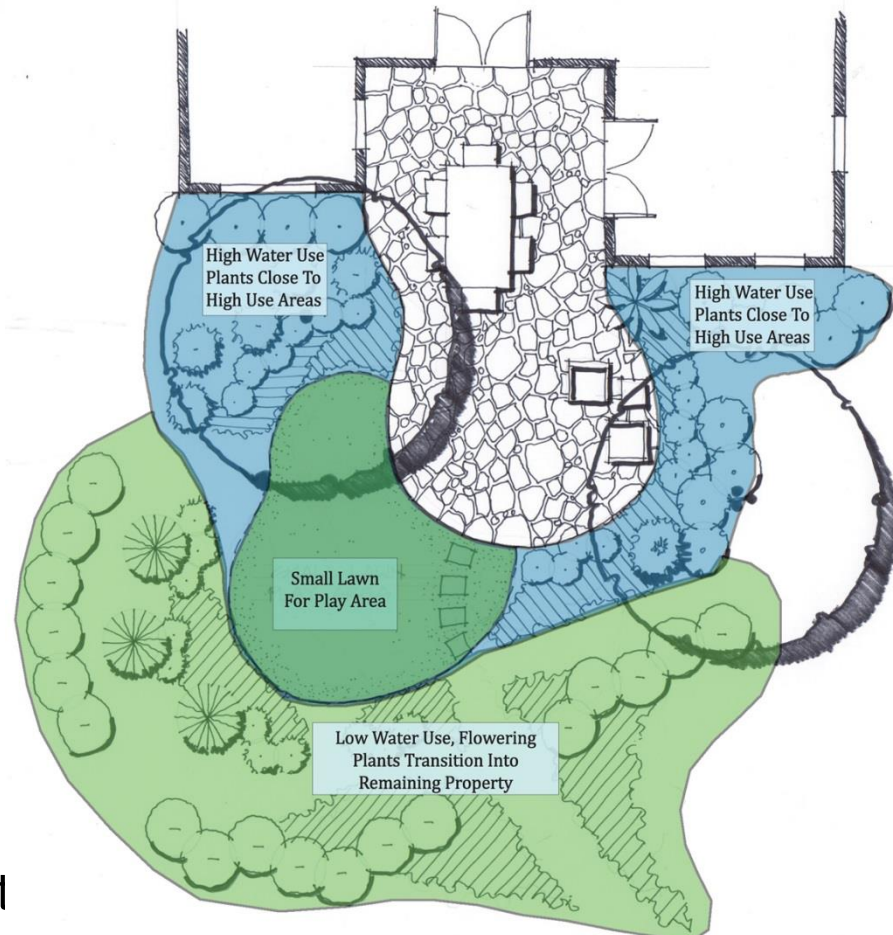
- 1x or 2x **per week**
- Turf & most annuals

2.) Occasional (medium) use

- 1x to 2x **per month**
- Most perennials / groundcovers

3.) Natural rainfall (low) use

- Occasionally, during severe drought
- Native & adapted trees / shrubs



<http://wynn-smith.blogspot.com/>

Ideal soil type???

Mechanville in Burleson/ Milam Counties....



<https://homeownerbob.wordpress.com/tag/black-gumbo-dirt/>

The never-ending battle with clay



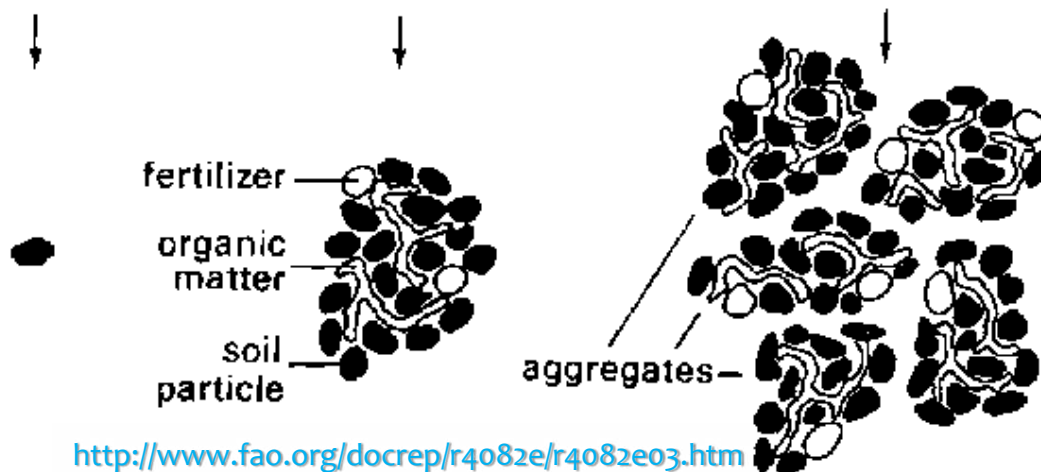
Soil texture vs. structure



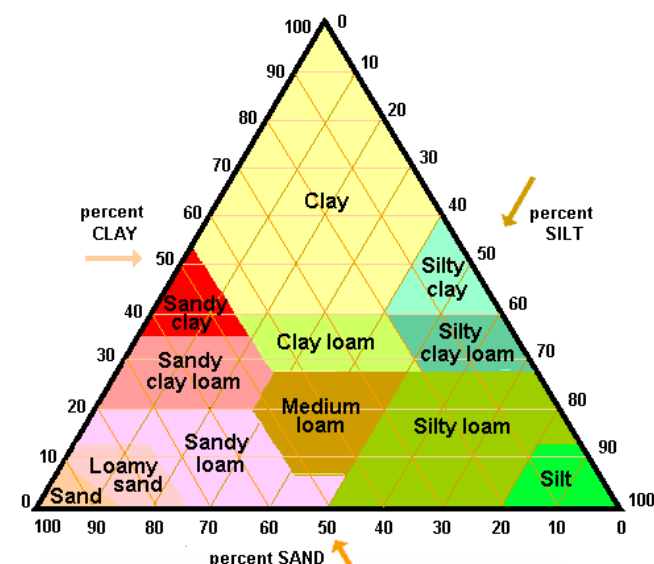
soil particle

soil aggregate

soil structure



<http://www.fao.org/docrep/r4082e/r4082e03.htm>



<http://www.oneplan.org/Water/soil-triangle.asp>

Soil Preparation

- ◎ One-time incorporation of compost
 - ◎ Fully-finished (avoid nitrogen sink)
 - ◎ 3 inches, fully incorporated

- ◎ Top-dressing with layer of organic mulch
 - ◎ 3" maintained year-round
 - ◎ Continuous nutrient and organic matter source

- ◎ Raised beds in poorly-drained sites
 - ◎ ≥ 12 inches and crowned in center
 - ◎ Facilitation of drainage and greater rooting depth



Composts: choose wisely



<http://mea.com.au/soil-plants-climate/soil-moisture-monitoring/learning-centre/what-is-soil-structure>



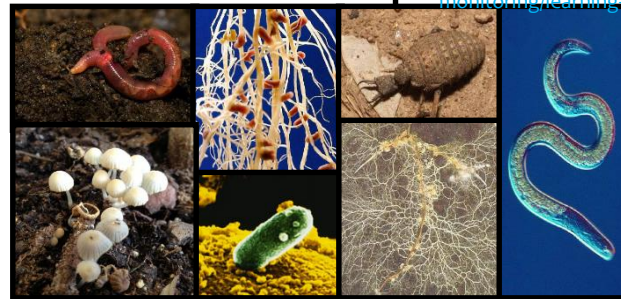
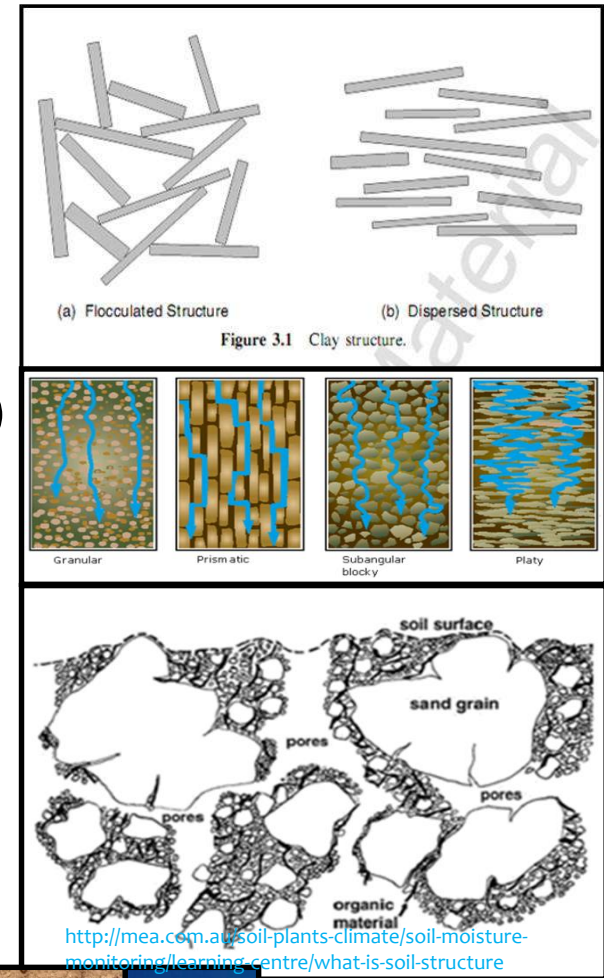
<http://www.cranfordinc.com/>

Raised beds



Benefits of a Healthy Soil

- ✓ Drainage in clay soils through structure
- ✓ Better Water & nutrient retention (even in clay)
 - 1% SOM \approx 1 acre inch of water
- ✓ Slow-release source of nutrients
- ✓ Greater diversity in soil microbes
- ✓ More expansive root system
- ✓ Buffering against pH & salinity



What can your soil do for you?



Appropriate plant selection

Plant selection for drought-tolerance?



Some plants just don't belong in Texas





Native and Adapted Plants



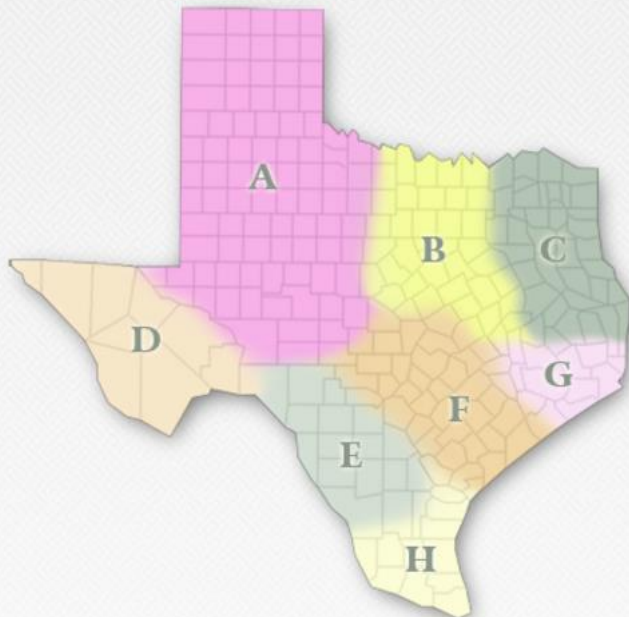
Earth-Kind® Plant Selector

Select your general region on the map or use the region list. You can also find your region by searching via zip code. The next page will allow you to search for plants by specific characteristics, or view all plants for the particular region.

The Earth-Kind® Plant Selector DOES NOT provide information concerning the potential inva with a high Earth-Kind® index value will generate [Invasiveness](#) for more information.

ekps.tamu.edu

Regions



USDA Hardiness Zones



Find Region by Zip Code

Please enter the Texas zip code for your region

5-Digit Zip Code

Search by Region

Please select the Texas region

Region

Search by USDA Hardiness Zone

Select the desired USDA Hardiness Zone(s). Click on the zone(s) to the left for a larger view of the zone.

Hardiness Zone:

6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐

Additional Considerations

- [Using the Plant Selector](#)
- [About Invasiveness](#)



Earth-Kind® Plant Selector

Select Search Type

Considerations

[Using the Plant Selector](#)

[About Invasiveness](#)

[Hardiness Zones](#)

TEXAS A&M
AGRI LIFE
EXTENSION

Texas A&M
Horticulture
The ultimate growth experience

Earth-Kind
Texas A&M AgriLife Extension

Search for plants in “Region G - Southeast Texas”

Fill in the information to refine your search, or select "Show ALL Plants for Region" to see all plants listed for your region/zone. Plants will be ordered by those most well adapted to your region. *Photos are not available for all plants at this time.*

Your selections will return 116 results

Name 🌿

Common Name:

Scientific Name 🌿

Scientific Name:

Growth Habit 🌿

Habit or Plant Use:

Exposure 🌿

Partial sun ☐ Shade ☐ Sun ☐

Blooming 🌸

Flower Color:

Bloom Period:

Fall ☐ Spring ☐ Summer ☐ Winter ☐

Leaf Character 🌿

Annual ☐ Deciduous ☐ Evergreen ☒ Herbaceous perennial ☐ Semievergreen ☐

Firewise Index 🌿

Firewise Index:

USDA Hardiness Zone 🌿

The dropdown below only lists hardiness zones found in the current region

USDA Hardiness Zone:



Click image for enlarged map of USDA Hardiness Zones

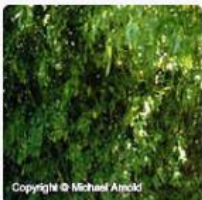


Chinese Holly

Ilex cornuta

sun, partial sun

10.00

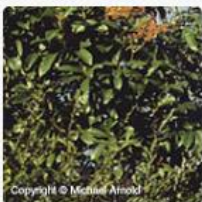


Golden Bamboo

Phyllostachys aurea

sun, partial sun, shade

10.00



Chinese Photinia

Photinia serratifolia
(*Photinia serrulata*)

sun, partial sun

10.00



Split-Leaf
Philodendron

Philodendron selloum

partial sun, shade

10.00



Pineapple Guava

Feijoa sellowiana (*Acca
sellowiana*)

sun, partial sun

10.00



Rockrose

Pavonia lasiopetala

sun, partial sun

10.00



Black Bamboo

Phyllostachys nigra

sun, partial sun, shade

10.00

Common Name:

Pineapple Guava

Scientific Name:

Feijoa sellowiana (*Acca sellowiana*)

Family Name:

Myrtaceae

Description:

Pineapple guava is an underutilized medium to large evergreen shrub. The dark gray-green to blue-green foliage is attractive year-round. The most unique feature is the unusual fragrant flowers. Profusion of bloom varies among seedlings, but can be numerous. Individual flowers have petals that are purple inside, white outside, and with long red stamens. From a distance the overall effect is reminiscent of passion flowers (*Passiflora* spp.). In the USDA zone 9 (8B?) the edible green-red fruit are an added feature. The growth form tends to be a bit open and leggy, hence old specimens are sometimes limbed up to reveal the showy exfoliating bark.

Plant Habit or Use:

Shrub, medium shrub, large shrub

Exposure:

sun, partial sun

Flower Color:

Overall light purple, petals white and purple, stamens red

Blooming Period:

Spring

Fruit Characteristics:

Oval berry, green-red, 2 inch to 3 inch long, edible



I Height:

8 ft to 10 ft (12 ft)

→ Width:

7 ft to 9 ft

🌍 Earth-Kind® Index:

10.00

[Explanation of the Earth-Kind® Index numerical value](#)

- Heat Tolerance: High Heat Tolerance
- Water Requirements: Low Water Use
- Soil Requirements: Low Soil Requirements
- Pest Tolerance: High Pest Resistance
- Fertility Requirements: Low Fertility Requirements

[Explanation of the Earth-Kind® Index breakdown](#)

🌳 Firewise Index

9.00

[Explanation of the Firewise Index numerical value](#)

🌾 USDA Hardiness Zones:

8, 9, 10

Regions that intersect these hardiness zones:

Region A - Panhandle and High Plains • Region B - North and Central Texas •
Region C - Northeast and East Texas • Region D - West Texas • Region E -
Upper Rio Grande • Region F - Hill Country and Central Coast • Region G -
Southeast Texas • Region H - Rio Grande Valley



Click image for enlarged map of USDA Hardiness Zones

☞ Additional Comments:

Good drainage is critical, much more vigorous when shielded from direct afternoon sun. Fairly tolerant of soil salts. Can survive in humid areas, but is more vigorous in lower humidity locales. Scale insects and mealy bugs can be troublesome pests.

Feijoa / Pineapple Guava

Acca sellowiana

- ⦿ USDA 8 to 11
- ⦿ Full sun to partial shade (some afternoon shade beneficial)
- ⦿ Spread: 8'-12' high x 7'-9' wide with gray-green foliage
- ⦿ Tolerant of a variety of soils, but prefers well-drained
- ⦿ Moderate heat and drought tolerance
- ⦿ Showy (edible) pink flowers give way to tasty fruit in late fall





Water Clover

Marsilea macropoda

- ◉ USDA 8 to 10
- ◉ Full sun to part shade
- ◉ Looks like four-leaved clover, but related to fern
- ◉ Native to Texas Hill Country
- ◉ Great for water gardens, but also as groundcover



How much does selection matter?



'Care-free Beauty' Rose (tolerant)



'Ivory Palace' Rose (susceptible)

Sprinkler Irrigation: 50% to 70% efficiency



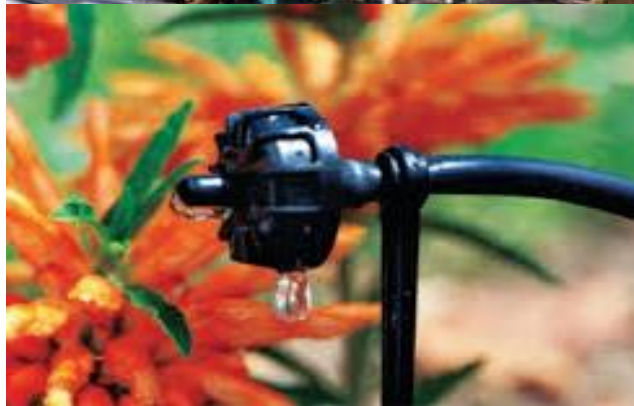
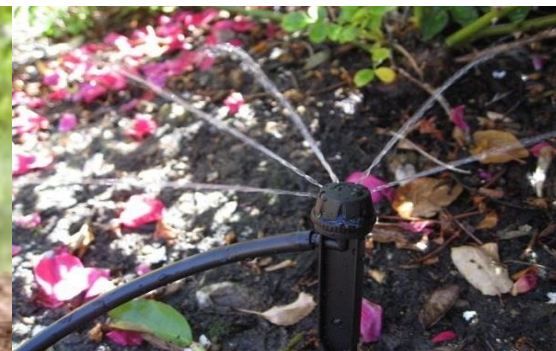
- Evaporation
- Runoff
- Off-target precipitation

Drip and Microirrigation

● ≈90% efficiency

- ✓ Low-volume emission
 - ✓ Reduces runoff loss
- ✓ At or near-ground application
 - ✓ Evaporation loss eliminated
- ✓ Precise, targeted delivery
- ✓ Soil texture & emitter spacing / volume





Additional benefits of drip irrigation



Photo credit: Juan Anciso

Retrofitting existing systems



<http://www.rainbird.com/landscape/products/dripControl/SprayToDripRetrofitKit.htm/>



<http://www.sprinklerwarehouse.com/Rain-Bird-Sprinkler-Spray-Retro-Fit-p/1800-retro.htm/>





Aggie Horticulture



Tim

Home

Create



Aggie Horticulture

17K followers

Aggie Horticulture® serves gardening and horticultural crop information and news.

Home

Live

Videos

Events

Posts

About

Community

Photos

Create a Page

<https://www.facebook.com/Aggie-Horticulture-26803072143/>



Followed by Tricia, James, Larry and 17,148 others



Following ▾



Liked ▾



Share



Latest Videos



52:30

18. How to Grow Blueberries in Containers

2 days ago · 7.2K Views



164



25:46

17. Indoor Gardening

a week ago · 5.2K Views



86



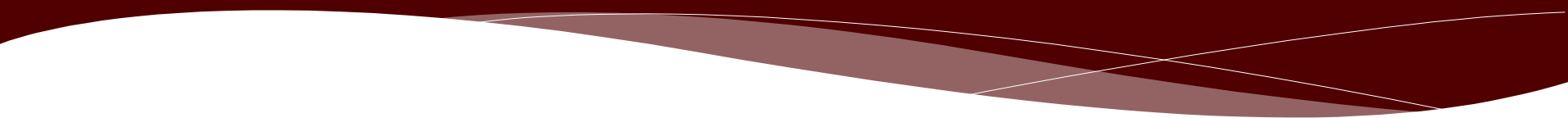
53:18

16. Keys to Successful Peach Production

a week ago · 6.1K Views



90



Back

TEXAS A&M

Share Comment Like

13. Drip Irrigation Essentials

Aggie Horticulture was live.
about 3 weeks ago ·

Texas A&M AgriLife Extension Agent Boone Holladay from Fort Bend County shares about "Drip Irrigation Essentials." A team of Extension Specialists were also available to answer questions in the chat window during the event.

Additional Resources and upcoming schedule are available on <https://aggie-horticulture.tamu.edu/fb.../>

94 36 Shares 5.4K Views

Like Comment Share

Comments Up Next

Realtime Comments

- Becky Hewitt Center** · 13:38 sound quality is good
Like · Reply · 3w
- Blair Margot** · 13:39 sounds good
Like · Reply · 3w
- Replying to **Tamu Tim Hartmann** · 13:41 Yes, there is a limit to how many linear feet you can run for most inline-drip. For 1/4" it's typically 30 feet, but varies by pressure and emitter output and spacing. 40" is typically over 200 feet.

Write a comment...

Proper Tree Watering



Benefits of mulch

- ✓ Limiting of evaporation loss (25%-30%)
- ✓ Soil temperature modification
- ✓ Inhibition of weed germination
- ✓ Erosion and runoff mitigation
- ✓ Improvement of soil structure
- ✓ Continuous, slow-release nutrient supply
- ✓ Avoidance of foliar disease

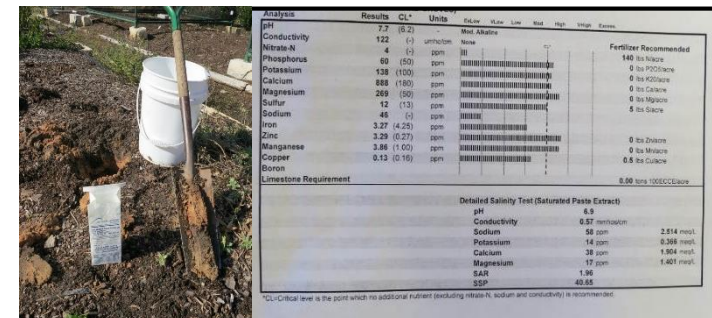
Effective use of mulch

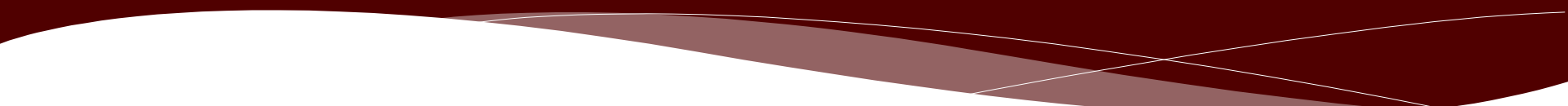
2 to 3 inch layer under plant canopy



Sound Maintenance Practices

- ✓ Mulching of lawn clippings
- ✓ Maintaining taller grass height
- ✓ Fertilizing based on soil tests
- ✓ Regular irrigation audit / troubleshooting
- ✓ Integrated Pest Management (IPM)





15. Tidying up your Sprinkler Irrigation Systems

Aggie Horticulture was live.
about 2 weeks ago ·

Texas A&M AgriLife Extension Agent Boone Holladay from Fort Bend County shares about Tidying up your Sprinkler Irrigation Systems. A team of Extension Specialists will also be available to answer questions in the chat window during the event.

See More

48

14 Shares 3.1K Views

Like Comment Share
Comments Up Next

Realtime Comments

Bev Clark · 33:12 Is there a way to protect a rotary pop-up sprinkler head installed along a driveway if it gets run over by a vehicle. Rotary pop-ups apparently don't uphold to the same abuse as flat head, pop-up spray heads.

Like · Reply · 2w

Chinnu Meher-Homji · 33:14



Like · See Thread · 2w

Replying to Chinnu...

Write a comment...

Thank You!

Other Resources:

<http://aggie-horticulture.tamu.edu/>

<http://aggie-horticulture.tamu.edu/earthkind/>

<http://texassuperstar.com/>

<http://urbanlandscapeguide.tamu.edu/>

<http://ipm.tamu.edu/>

<http://rainwaterharvesting.tamu.edu/>

<http://itc.tamu.edu/Drip%20Project.php>