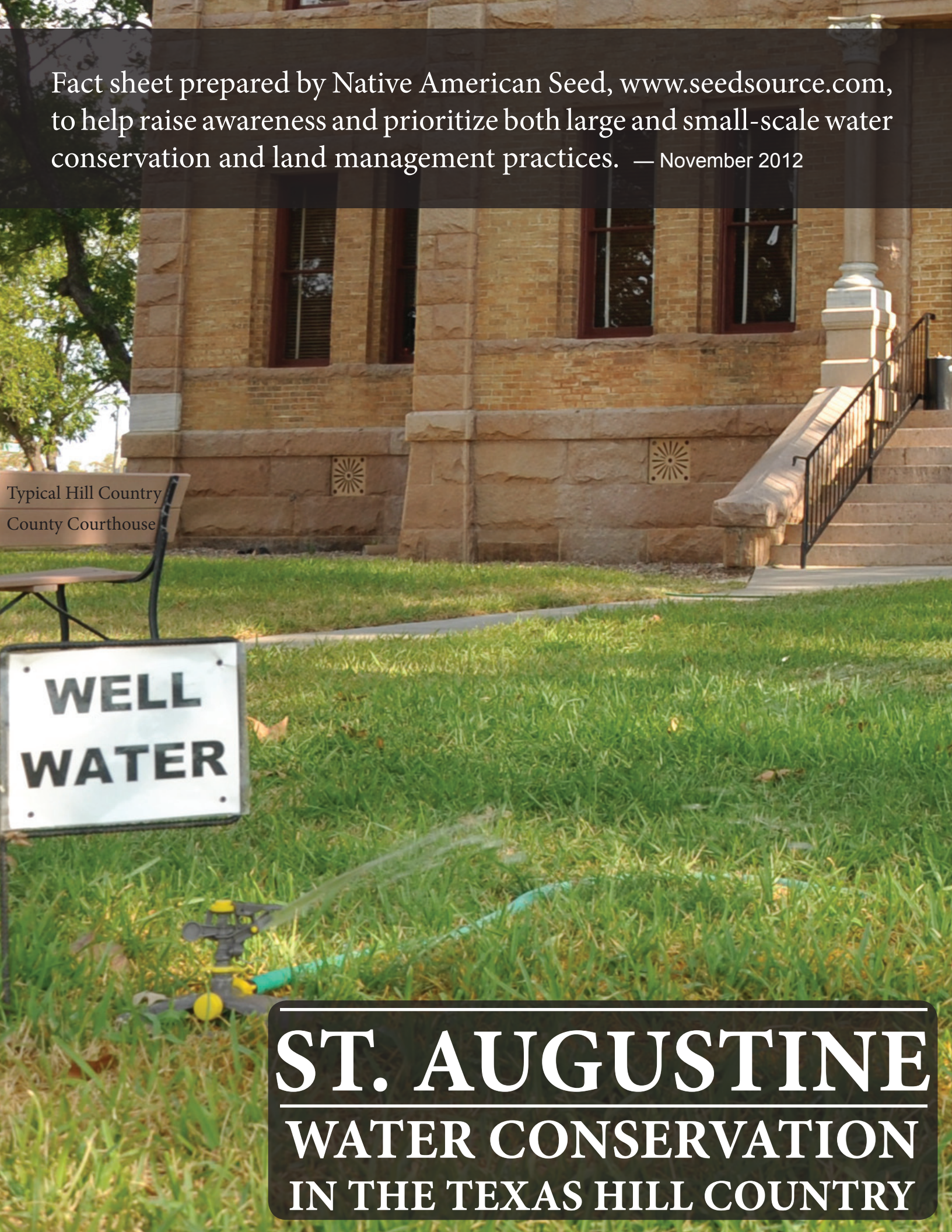
Fact sheet prepared by Native American Seed, www.seedsource.com, to help raise awareness and prioritize both large and small-scale water conservation and land management practices. — November 2012



Typical Hill Country County Courthouse

ST. AUGUSTINE

WATER CONSERVATION IN THE TEXAS HILL COUNTRY

St. Augustine Warm Season Tropical Grass (*Stenotaphrum secundatumis*)

The infamous 'driest year on record' of 2011, coupled with continuous population growth and land fragmentation, has caught the attention of every Hill Country land steward, both urban and rural.

Dating back to previous times of abundant water and lesser human population densities, St. Augustine grass has commonly been used in the Texas Hill Country region for turf grass. Since records have been kept, St. Augustine grass was reported along the tropic-like Atlantic coasts of Africa and the Americas. Even before 1800, this tropical grass was documented growing in Bermuda, South Carolina, Uruguay, Brazil, Nigeria, Sierra Leone and the West Indies. Rainfall in these areas often exceeds 65 inches or more per year. The indigenous, native habitat of St. Augustine is typically regarded as mostly frost-free, tropical, high-humidity, coastal marine, with near sea level elevations. Deep, acidic, sandy soils are typical. (Duble)

But along the eastern foothills of the Texas Hill Country, average annual rainfall only ranges from 31 to 33 inches near Austin and San Antonio. This eastern side of the Hill Country is about 800-1,000 feet above sea level. The climate is influenced by upslope moisture rising out of the Gulf of Mexico. Moist water-laden clouds move from the lower elevations of the Coastal Plains and Blackland eco-regions. Relative humidity is moderate with summer daytime high temperatures often bumping 100*F. The area is known for shallow alkaline caliche and dark clay-loam soils overlying fractured limestone on rolling to steep hills. Soil depths can range 4 inches or less on side slopes and hilltops. The geology and soil formations of the Hill Country are complex, resulting in a complex mixture of historic vegetation types. Mid to tall grass oak savanna was one of several historic vegetation types described by early settlers (Nelle 46-51). Less than 200 years ago, plentiful and productive mixed prairie grasses with scattered woodlands and forests dominated the savanna. These prairies gave rise to intensive grazing by domestic livestock introduced by the European settlers. Before the fences and cattle were introduced, extensive herds of migratory buffalo frequented the area, but always moved on.

Droughts are common and sometimes extend for years. During periods of drought, expanses of the dry grassy regions were also visited by huge grassfires. These fires renewed fertility of the soils and were a natural suppressant of brush and woody species that could not tolerate the extreme heat of the flames. Some fires were intentionally set by the tribal inhabitants, some set by lightening strikes. The prairies and oak woodlands evolved with this fire regime. The grasses are actually stimulated by fire and bounce back with fresh new green shoots. Over time, since the arrival of Anglo settlers, much of the Hill Country grassland areas have been converted to heavy woody shrub land and juniper/oak forest due to continuous confined livestock grazing and continuous suppression of fire. In today's Hill Country, the mesquites have taken to the deeper fertile soils while the juniper/cedar laid claim to the rocky upland slopes. In large part, the productive warm season native grasses are gone. It is widely believed that deep roots from native grass more efficiently contribute to aquifer recharge by preventing excessive run-off during heavy rains. The role of woody shrubs and juniper/oak forest on water supplies is less understood.

On the west side of the Hill Country, near IH 10 at Junction and Sonora, average annual rainfall ranges from 22 to 25 inches, though drought years are common. The area is distinctly semi-arid with mostly shallow soils. The western Hill Country climate is more often influenced by southwesterly winds flowing from the neighboring Chihuahuan desert regions. The terrain rises around 2,000 feet above sea level or more. Very low relative humidity often accompanied by dry winds and summer daytime temperatures of 100*F are common for several months each year. The western Hill Country is a region of exceptionally high evapotranspiration rates for vegetative plants. Over time, much of the Hill Country has become a large expanse of semi-arid land covered with woody brush, thin stands of early successional "band-aid" grasses, wildflowers and cactus species.

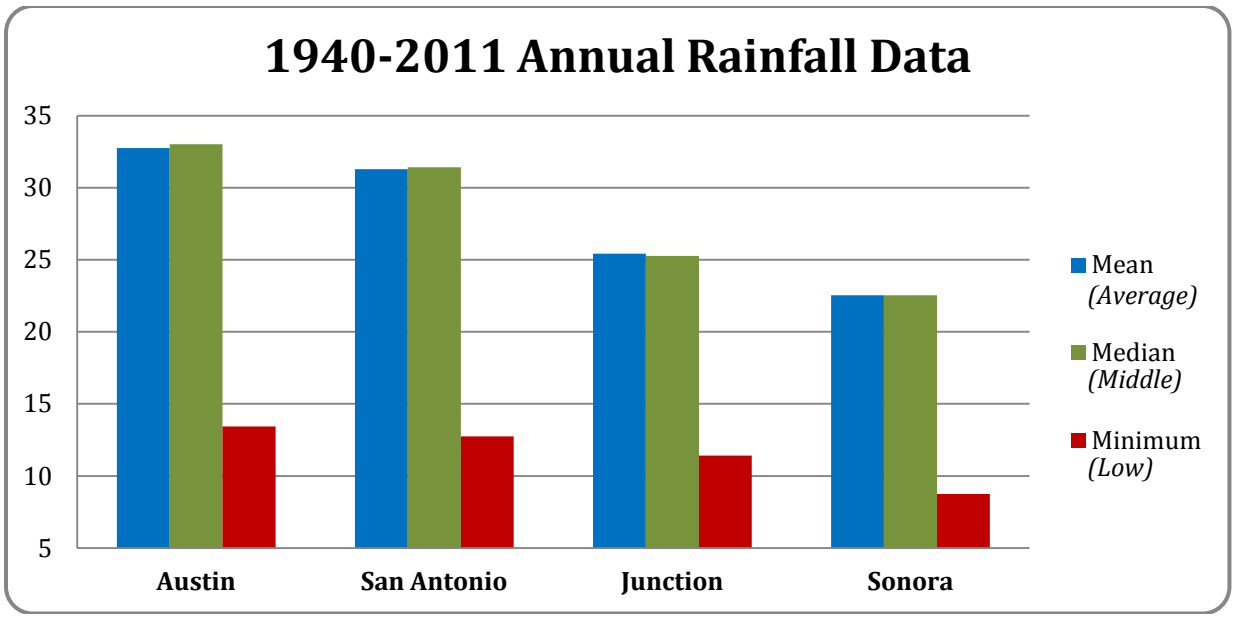


Figure 1

During the recent drought of 2011, New Braunfels, Texas received 13.9 inches of rainfall. But, 5.24 of those inches fell in January and December, a time when the warm season tropical St. Augustine grass is dormant. Only 6.87 inches fell between March 1, 2011 and October 31, 2011, the active growing season of St. Augustine ("Midgewater").

For every 1,000 sq ft of surface, 1" of rainfall or irrigation water applied accounts for 623 gallons. In 2011, a single 2,000 sq ft sized St. Augustine lawn in New Braunfels required an additional 72,430 gallons over the growing season to match the 65 inches per year the grass would normally receive in its evolutionary native habitat on the Atlantic coastline. Although, it is possible for St. Augustine to survive on 30 in. of rain falling at the right times during the growing season. To demonstrate the additional gallons required using a 30 inch benchmark need, multiply the following gallons by .46 (46% of 65 inches).

72,430 gallons applied over the 2000 sq ft lawn during the 2011, 8-month growing period equals:

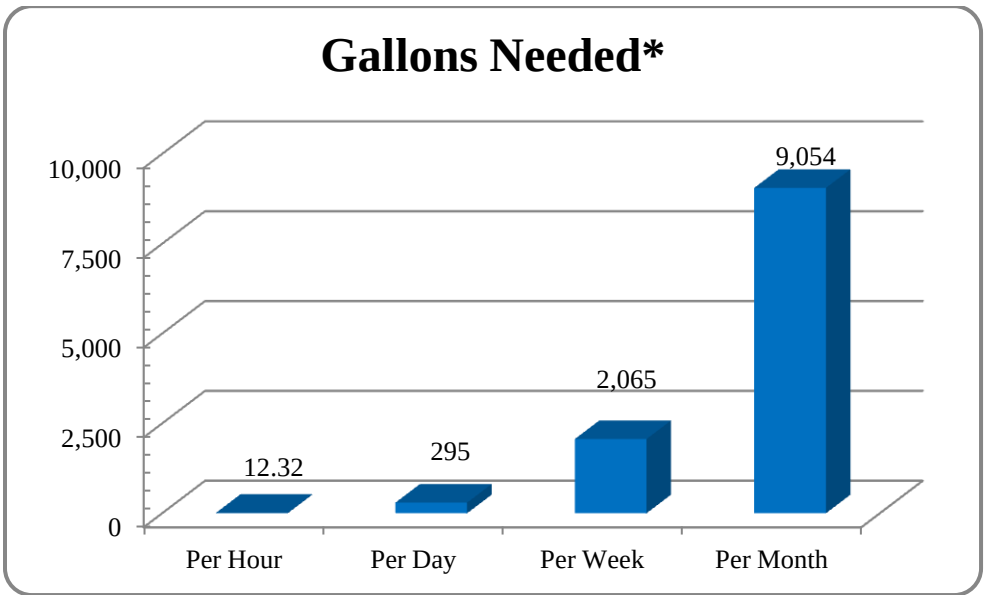


Figure 2

*No accounting has been made for the evapotranspiration differential of the tropical grass imported into the local semi-arid region.

No irrigation system or their controllers are 100% efficient, which often translates to increasing the amount of gallons required to maintain this tropical grass. Various local Hill Country climate conditions can create significant water losses. Wind deflection, evaporation and run-off from shallow soils on steep rocky terrain is normal while delivering irrigation water to Hill Country landscapes.

The US Environmental Protection Agency has estimated that 70% of municipal water is devoted to the outdoor uses such as landscape irrigation. For example, New Braunfels has administered Stage 3 Water Restrictions that entailed a one-week ban on outdoor watering and use of irrigation sprinkler systems.

In their August 24, 2012 press release the New Braunfels Utilities (NBU) states:

> This is the first time that New Braunfels has been under Stage 3 watering restrictions. **Landscape watering accounts for approximately 50% of the water used by customers.** And in a related article published by the San Antonio Express News, **"It kind of shows you the volume of watering used on landscaping,"** said Gretchen Reuwer, NBU Communications Manager, (830) 629-8486, noting daily usage dropped to about 8 million gallons during a wet spell last spring. The average daily water consumption in the 88-square mile service area for 25,000 customers before the ban was 17 million gallons per day. (MacCormack)

Crunching the numbers reveals on average that <u>each NBU customer consumes 680 gallons</u> per day during times of drought when not restricted by the watering ban. The World Water Council found that the average American uses 158.5 gallons of water per day, ranking the highest usage in the world. Europeans rank second using between 66 and 92 gallons per day. The minimum basic standard is 13 gallons per day. Americans use over <u>twelve</u> times more than the basic standard, with the majority being applied to our landscapes. ("Global Researcher" 31)

St. Augustine grass is not native to the Texas Hill Country; it provides nearly no ecological benefit. Plants are the only species on the planet that can capture the sun's energy and turn it into food. Therefore, plants are the foundation of the entire world's food chain. Every animal gets its food either directly from eating plants or from eating something that has eaten a plant. Central Texas is known for abundant native wildlife, but the native fauna has no long-term evolutionary exposure to St. Augustine. When alien plants are introduced into the landscape, they displace native plants. Local and/or migratory wildlife often have no use for alien plants. For example, if a monarch butterfly cannot locate a host milkweed to lay its eggs upon, she cannot simply move over to petunias. Her larvae, in the caterpillar stage, are only adapted to survive on the dwindling number of Asclepias (milkweed) species. All songbirds feed insects to their young. Insects are highly selective and have evolved to feed on specific plant species. If food is not available, wildlife moves on or eventually life does not continue (Tallamy, "Bringing Nature Home" 20). Research has shown that alien ornamentals support 29 times fewer insects than do native ornamentals (Tallamy, "A Call for Backyard Biodiversity" 35).

But interestingly, St. Augustine does come with some pesky alien insects and viruses. White grub worms eat the roots and microscopic chinch bugs suck the juice out of the leaves. St. Augustine is susceptible to attacks by fungi. Standard lawn maintenance practices have been devised to control the predators with chemical insecticides and fungicides.

Other common cultural practices include monthly applications of fertilizers and/or "weed and feed" granular chemical-type treatments. Lawn fertilizing leads to excess phosphorus, nitrates and algae blooms that affect nearby streams caused by over-watering or heavy rain events over the typically shallow rocky soils. St. Augustine grass normally requires up to 35 weekly mowings per growing season. Mowers using attachments catch the clipped grass. Then bags full of the clippings often find their way flowing into the disposal stream at the municipal landfill. (Duble)

St. Augustine has no long-term evolutionary exposure to our climate. It does not tolerate extremely harsh winters. Whole lawns die-out during extended wintertime periods of temperatures below freezing. The biggest driving market force to use St. Augustine grass is its ability to tolerate moderate shade.

Some data can easily be translated into dollars. Costs to maintain 2,000 square feet of St. Augustine in New Braunfels Utilities system during 2011 growing season are estimated below:

Item/Task	Quantity	Units	Unit Cost		Total Cost
Watering	72,430	Gallons	$0.02512		$1,819.44
Fertilizing	52.8	Pounds	$1.07		$56.50
Mower Fuel	20	Gallons	$3.50		$70.00
Labor	52.5	Hours	$15		$787.50
				Total	**$2,733.44***

Figure 3 ("New Braunfels Utiltites")

**** Estimated costs do not include insecticides, herbicides, sprinkler systems or maintenance costs, mower/trimmer equipment, or any other associated costs.***

But our demand for lawn watering is outstripping supply. Unfortunately, Texas' major statewide focus is on developing 'new supply'. There is no new water. And wherever water is, somebody or something is using it. We may be best served by changing our 'demand or needs'. Do we really need shade tolerant tropical grass in the Hill Country?

Converting large expanses of mown turf to less demanding native plants and grasses, whether in shade or sun, may be the best approach to managing Hill Country lawns and urban landscapes. No one watered or fertilized these hills before the first settlers arrived. And with rooftop rainwater harvesting, the best water yet can often be collected to supply our basic indoor needs.

There are many informed choices to be made in adopting new ways of building sustainable water conserving landscapes. Simply changing from one expansive monoculture of turf to another variety may not be the best choice, native or not. Reducing the natural resource footprint of the lawn is an important first step to securing future water by simply reducing the unnecessary needs. Texas lawns can be adapted to become models of land stewardship. Time has arrived for elevating urban land management practices, thereby creating the next generation of sorely needed Texas land stewards.

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