

South Texas Natives

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Native Plants Need Soil Microbes

By Larry Zibilske, Ph.D.

Native plants live in very competitive circumstances. They have “learned” many tricks that allow them to compete with other plants, harsh environments, insects, and diseases. In addition to their own strengths, they can take advantage of opportunities presented by growing in proximity to other plants, or in association with other organisms that result in a survival advantage. Relationships with other organisms can make all the difference in survival of particular plants. Many of these relationships are fairly well documented, but it is the relationships between plants and soil microbes that are arguably the most poorly understood—but may be among the most important.

Soil microbes form several close relationships with plants. Their relationship with plant roots is probably the most important in terms of plant establishment and survival. The fact that nearly half of plant mass is root material indicates soil factors are of prime importance to plant development. Many microbes can colonize plant roots, which can result in either beneficial or detrimental outcomes. Most often, however, microbes promote plant growth. They aid the plant by improving access to nutrients, i.e., mycorrhizal fungi increase the absorbing area of roots for nutrient and water uptake. One little-known aspect of



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Native grasses such as (left to right) Rio Grande bristlegrass (*Setaria ramiseta*), Arizona cottontop (*Digitaria californica*), slim tridens (*Tridens muticus*), and pink pappusgrass (*Pappophorum bicolor*) have fibrous root systems.

root zone microbes, collectively called rhizosphere microbes, is their antagonism to disease-producing microbes. A closer look at plant-soil relationships reveals that soil microbes are an important factor in the success and failure of plant populations.

South Texas native plants exhibit a range of “preferences” for growth. If we can agree that chief among these is tolerance to heat and dry soil, we can look to other factors for help with re-vegetation problems. Soil type is one such factor. Plants such as bundle-flower (*Desmanthus* sp.) appear to do best on clay soils, while woolly croton (*Croton capitatus*) is more common on sandy soils. Another croton (one-

seeded croton, *Croton monathogynus*) tends to favor clay soils high in caliche. Other factors such as soil pH and nutrient availability are also of critical importance but most nutritional problems can be largely overcome by soil fertilizer use. Re-establishing native plant populations may also involve re-establishing native soil microbial populations, or at least, improving the soil to boost microbial growth around developing plant roots. How can we do this?

It is reasonable to assume that as native plants are lost, populations of their specific beneficial rhizosphere microbes become decimated. Replacing those native soil microbial



© Larry Zibilske

Legumes can take care of their nitrogen needs by producing root nodules containing nitrogen-fixing bacteria.

populations may not be easy. But, it is realistic to expect that it would be beneficial to replace lost native soil microbes with microbes that have been shown to aid plant growth. Seed coating may be a viable way to inoculate native plants with beneficial microbes. This ensures the presence of beneficial microbes as the plant roots take hold in the soil. Coating or pelleting seed can also be used to provide trace elements and other needed growth factors that promote seedling vigor.

Almost all of our understanding of plant-microbe interactions comes

from agriculture. In that environment, soil microbes are intentionally applied to soil or plants to assist in nutrient acquisition or to protect the plant against some pathogen. Most of this is practiced on organic farms. Since organic farmers try to mimic natural ecosystems, parallels between organic farming and natural systems are abundant. Organic farmers pay much attention to the soil. They realize that soil physical properties, soil fertility, and soil biology determine how productive their plants will be. What they do in promoting soil health and plant vigor in agricultural systems should also provide useful guidance and concepts for native plant re-vegetation efforts. Using what we know from agricultural systems may give us a leg-up on addressing the frustrating problems in re-establishing native plant populations in South Texas. 🌱

Dr. Larry Zibilske is a Research Soil Microbiologist for the USDA-ARS Integrated Farming & Natural Resources Research Unit in Weslaco. He also serves on the *South Texas Natives* Technical Committee.

What's in a Name?

By Forrest Smith, STN Collections and Evaluations Manager

South Texas Natives (STN), the USDA-NRCS E. “Kika” de la Garza Plant Materials Center, and the Texas Agricultural Experiment Station are pleased to announce 7 new native plant germplasm releases in 2006. These include ‘La Salle’ Arizona cottontop, ‘Dilley’ slender grama, ‘Atascosa’ Texas grama, ‘Chaparral’ hairy grama, ‘Catarina’ plains bristlegrass, ‘Mariah’ hooded windmillgrass, and ‘Welder’ shortspike windmillgrass.

Development of each germplasm release begins by collecting seed of a species from its native field environment. The number of field collections varies by species according to the native distribution but is commonly 10–50 collections for a single species. When an adequate number of collections (or accessions) are obtained, the initial evaluation begins. Evaluation plots are planted at various locations in the region. After 2–3 years of evaluation, superior collections are identified for seed increase and release, then distributed to commercial producers.

Most of our germplasm releases are made up of several accessions of each species. However, hooded windmillgrass and shortspike windmillgrass exhibit unique growth forms, making them valuable for use in right-of-way stabilization efforts. Consequently, they will be initially released as single lines. All of the releases are comprised of material that is adapted to multiple range sites, various soil types, and the broad range of climatic conditions found in South Texas.

Each germplasm has been assigned an exclusive name. These names will provide seed dealers and consumers with a unique way to identify releases made by STN and our cooperators.

South Texas Natives is pleased to announce that the Texas Department of Transportation has renewed our grant in the amount of \$150,000 a year for 5 years to continue our pursuit of releasing quality native plant seeds for use along highways.

When choosing a name for our releases, one component of the name represents a county name, soil type, or area of collection. For example, 4 of the 12 accessions released as part of 'La Salle' Arizona cottontop originate from La Salle County, TX. The goal of each release name is to make them identifiable to South Texans and unique to South Texas. Future releases developed by STN will be named similarly.

Each release will be tagged with a Texas Department of Agriculture green seed tag containing the *South Texas Natives* logo. When buying native seed for your next South Texas project, ask specifically for these releases. Only seed sold by the germplasm name, tagged with a green seed tag bearing the STN logo, and certified as "selected/tested" seed is produced and adapted for use in South Texas. Whenever possible, these releases should be planted as part of a mixture of native species to maximize the diversity of the restoration planting. As we release more species, a mixture of forbs and grasses will be available representing the various vegetation types in our region.

Several other species are currently under evaluation for release in upcoming years. In 2007, look for germplasm releases of pink pappusgrass, whiplash pappusgrass, slim tridens, sideoats grama, brownseed paspalum, crinkleawn, orange zexmenia, and clammy weed. In 2008, look for yellow Indiangrass, little bluestem, big bluestem, seacoast bluestem, silver bluestem, four-flower trichloris, awnless bush sunflower, bundle flower, woolly croton, partridge pea, and Texasgrass. And, there's more yet to come! We are currently evaluating the potential of many other native plants for future release. 🌿

Large Seed Increases

By Forrest Smith

A necessity of releasing a germplasm of any plant is to have adequate quantities of seed available for commercial growers. Seed quantities of many of our original collections are very small, and the seed collected from evaluation sites cannot be used for seed increase (that is, seed production) because of possible cross pollination. Our limited greenhouse space is utilized primarily for growing transplants for evaluation plots, which are much smaller than a seed increase field. For example, to plant a replicated evaluation field plot, only 20 transplants of each accession (or collection) are needed. However, to plant a seed increase field, we need 10,000 transplants of each accession! Since STN does not have the space to grow the large quantities of transplants required for seed increase fields, Speedling, Inc. in Alamo, TX, provides this service for STN.

Speedling, Inc. is a world renowned grower of vegetable transplants. With

the aid of Speedling's sophisticated greenhouses and seed sowing equipment, STN can have large quantities of transplants grown for seed increase fields. Transplanting greenhouse-grown seedlings is the most reliable method of increasing small quantities of seed from our native plant accessions. Speedling's technology allows STN to maximize the number of plants we can produce from a given amount of seed. Transplant fields can be kept much cleaner than seeded fields by applying pre-emergent herbicides that will not harm transplants while preventing germination of weed seeds. The transplant fields are rigorously cleaned and inspected for weeds because the harvested seed needs to be extremely pure. The seed produced from these increases is the final product we release to seed dealers and consumers for commercial production. Additionally, we utilize this same pure seed in our establishment experiments. This past spring, STN and our cooperators transplanted approximately 200,000 seedlings to produce seed of several selected native species for subsequent germplasm releases.



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Several hundred 200-plug trays of grass seedlings approaching readiness for transplanting.



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Planting a seed increase field at Bladerunner Farms, Inc., in Poteet, TX.

Seed Increase Growers

In 2006, Bladerunner Farms and Rio Farms will be growing our seed increases. Bladerunner Farms, near Poteet, is one of the largest commercial turf grass growers in South Texas. They will be growing increases of hairy, slender, and Texas grammas. Rio Farms, near Monte Alto, is a large research farming operation. They will be growing increases of yellow Indiangrass, Arizona cottontop, little bluestem, big bluestem, hooded windmillgrass, shortspike windmillgrass, and sideoats grama. Previously, the plains bristlegrass increase field was planted in 2005 at the Texas Agricultural Experiment Station in Beeville. Our cooperators play an essential role supporting our efforts in reaching our goal of releasing quality native germplasm to the public. *South Texas Natives* in conjunction with the Texas Foundation Seed Service oversees distribution of the seed from the increases. Ownership of the seed is retained by STN until final release to commercial seed producers. We could

not progress with the development of native seed without the valuable assistance from our cooperators. ♣

STN Welcomes 2 New Research Associates

By Forrest Smith

South Texas Natives recently hired 2 new part-time research associates—both bringing much needed knowledge and experience to the program. Our new employees will focus on 2 major facets of the project: greenhouse management and pest management.

Stephanie Campbell joined STN in January 2006 and is initiating a pest management program for STN. She received her bachelor's and master's degrees in plant and soil science from Texas A&M University-Kingsville. Stephanie recently worked as a Plant Protection and Quarantine Officer for the USDA Animal and Plant Health Inspection Service (APHIS) in Atlanta, GA. Additionally, she has several

years of experience in the commercial nursery and landscape industry. Stephanie's experience with APHIS primarily involved the collection and identification of plant pests, including insects, diseases, and noxious weed seeds as well as regulation of imported plant and animal products. Her work with STN will focus primarily on collection, identification, and control of pests that interfere with native plant and seed production. She will also catalog the beneficial insects that live on native plants and those insects that provide a tasty meal to insectivorous wildlife. Stephanie is married to Dr. Tyler Campbell, who is the field station leader for the USDA National Wildlife Research Center Texas Field Station, which is located at Texas A&M University-Kingsville. Stephanie and Tyler have a 3-year-old son Wesley and a 1-year-old daughter, Morgan.

Robin Harkey joined STN in December 2005. She oversees the greenhouse operations and seed testing for STN. Robin's role focuses on propagating plants for field evaluations and seed increases. She also heads seed germination testing and will work to optimize growing practices in both the greenhouse and the



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STN research associates Stephanie Campbell (left) and Robin Harkey.

Upcoming Releases by *South Texas Natives*

Arizona cottontop

Slender grama

Texas grama

Hairy grama

Plains bristlegrass

Hooded windmillgrass

Shortspike windmillgrass

seed testing laboratory. Robin earned 2 bachelor's degrees, one in horticulture from Texas A&M University and one in biology from Southwest Texas State University. She previously worked 5 years as a greenhouse research associate on the development of transgenic corn with ProdiGene®, a biotechnology company in College Station. Her experience with ProdiGene® primarily involved greenhouse management, research, and writing of standard operating methods and procedures for greenhouse protocols. Robin has also enjoyed experiences in other plant research including peas and potatoes, and commercial horticultural and botanical garden environments. She and her husband Dr. Justin Harkey, a local veterinarian, have a 2-year-old daughter, Morgan. Please welcome these new assets to STN! 🌿

Plants Selected for Horticultural Evaluation 2006

By Paula Maywald, STN Coordinator

While evaluating native plants for seed production, it's hard not to notice when a plant has attractive foliage or beautiful flowers. Since very few of the native species we grow are available as ornamentals, we are growing several of them to be evaluated for their potential to be released as horticultural selections by commercial nurseries. Plants have been sent to

TAES Uvalde, TAES Dallas, Corpus Christi Botanical Gardens, San Antonio Botanical Gardens, and the World Birding Center in Mission to grow as ornamentals in landscapes. These plants include the following:

Clammyweed (*Polanisia dodecandra* ssp. *riograndensis*) is an annual forb with bright pink flowers attracting butterflies, bees, and other pollinators.

Arizona cottontop (*Digitaria californica*) is a perennial grass with 'cottony' seedheads and pubescent leaves.

Big bluestem (*Andropogon gerardii* var. *gerardii*) is a robust perennial bunchgrass considered one of the "big 4" native grasses of the true prairies of North America.

Sideoats grama (*Bouteloua curtipendula* var. *curtipendula*), the State grass of Texas, is a perennial bunchgrass that grows 2–3 feet tall.

Yellow Indiangrass (*Sorghastrum nutans*) is a perennial, rhizomatous

bunchgrass considered one of the "big 4" prairie grasses of the true prairie associations in North America.

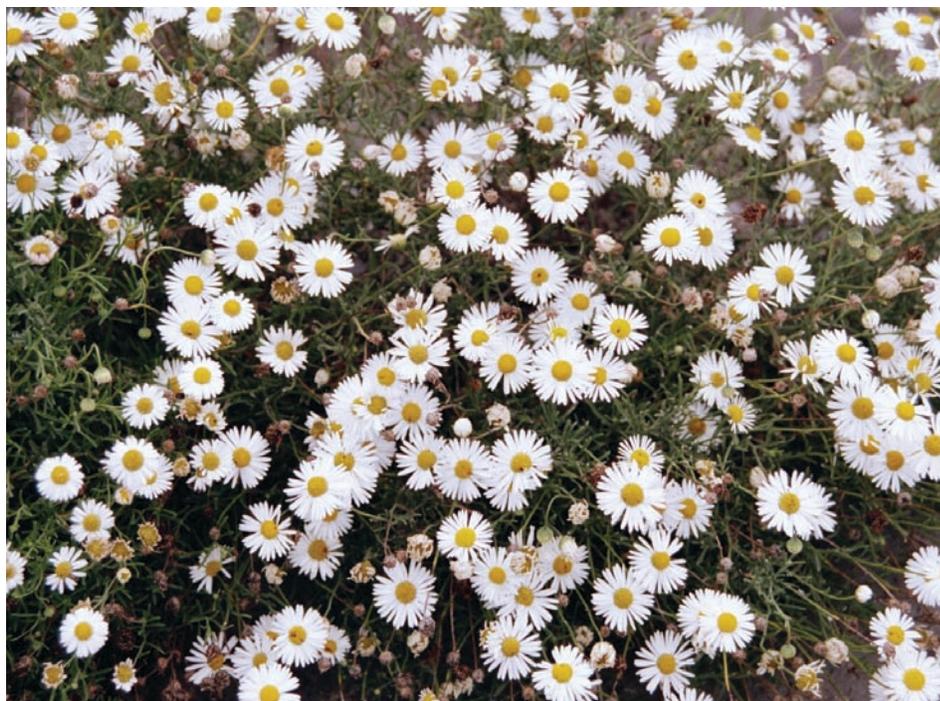
Seacoast bluestem (*Schizachyrium scoparium* var. *littoralis*) is a perennial bunchgrass native to coastal regions throughout North America.

Indian blanket (*Gallardia pulchella*), or firewheel, is an annual or weak perennial found in sandy areas growing to 2 feet tall.

Perennial lazy daisy (*Aphanostephus riddellii*) grows 9–12 inches tall and has yellow-disked, white-rayed flowers that bloom from February to December.

Eastern gamagrass (*Tripsacum dactyloides*) is a clump-forming rhizomatous perennial grass that grows 5–10 inches tall.

Two-flowered trichloris (*Chloris crinita*), or sometimes called false Rhodesgrass, is a warm-season perennial bunchgrass. 🌿



© Shelly Maher

Perennial lazy daisy is one of the plants selected for horticultural evaluation.

Plant Profile
Arizona cottontop
(*Digitaria californica*)

By Forrest Smith

Arizona cottontop (also known as California cottontop) is a warm season, perennial grass native to South Texas. Arizona cottontop is found in much of the southwest, ranging from Colorado, through New Mexico and Arizona, Oklahoma, most of Texas and south into the northern portions of Mexico. It is most common in the central and western portions of South Texas. Within these areas it is found on sandy loam, loam, gravelly loam, clay, and clay loam soils. In South Texas, Arizona cottontop is usually found growing in relatively undisturbed prairies or well-managed prairies and in brushlands, on good and excellent condition range sites. It frequently grows in association with other perennial native grasses such as bristlegrasses (*Setaria leucopila*, *S. vulpiseta*), gramas (*Bouteloua* spp.), pappusgrasses (*Pappophorum bicolor*,

P. vaginatum), trichloris (*Trichloris criniata*, *T. pluriflora*), windmillgrasses (*Chloris cucullata*, *C. subdolichostachya*), and slim tridens (*Tridens muticus* var. *muticus*, *T. congestus*). Arizona cottontop is somewhat shade tolerant and frequently grows within the canopy of shrubby plants such as hog plum (*Columbrina texana*), granjeno (*Celtis pallida*), shrubby blue sage (*Salvia ballotaeflora*), and guaycan (*Porlieria angustifolia*).

Arizona cottontop provides good forage for livestock and fair forage for wildlife (Gould 1975). It is highly palatable (Bedunah and Sosbee 1984) and is preferred over most other native forage species during all seasons of the year by domestic livestock (Cable 1979). The upright, bunchgrass growth form of Arizona cottontop makes it an ideal species to use when attempting to increase nesting cover for ground nesting birds such as bobwhite quail. Many species of wildlife (mammals, reptiles, and insects) benefit from the rapid production of seed and vegetative biomass following rainfall in South Texas.

Arizona cottontop has been shown to have very high potential for use in rangeland revegetation in Arizona, and the Sonoran and Chihuahuan deserts (Cox et al. 1982, USDA et al. 1999). These traits make Arizona cottontop an ideal species to use when attempting to restore or revegetate rangelands in South Texas. However, until now, no regionally adapted, commercially available seed stock has been available for purchase or use in South Texas.

South Texas Natives began obtaining Arizona cottontop collections in 2001. Above average rainfall across most of South Texas in the summers of 2002 and 2003 provided ideal conditions for wild seed production of Arizona cottontop. We were able to obtain 54 collections (accessions), 31 of which were chosen (based on distribution of the collections) for evaluation, selection, and potential release. The evaluation of these 31 accessions of Arizona cottontop took place for 2 years at Rancho Blanco (Laredo, TX), Rio Farms (near Monte Alto, TX), Texas Agricultural Experiment Station-Uvalde, and the USDA-NRCS E. "Kika" de la Garza Plant Materials Center in Kingsville. Seedlings of each accession were grown and planted in replicated field plots at each location in the spring of 2004. Each plot was evaluated bi-monthly in 2004 (irrigated) and monthly in 2005 (non-irrigated). The seed was collected from each accession when ripe and tested for germination each year. During the course of evaluation, we gained a great deal of knowledge about the life history and characteristics of Arizona cottontop in South Texas that further supported its use in rangeland restoration.

We tested multiple accessions of Arizona cottontop over a 2-year period at multiple sites. We observed extremely high active seed germination, averaging 60.9%. Furthermore, 93% of seeds germinated on days



© Forrest Smith

Arizona cottontop's velvety white panicle grows 2–5" long. The seed is a food source to mammals, reptiles, and insects.



© Forrest Smith

Arizona cottontop in a field plot.

3–5 after initiation of favorable conditions. High active seed germination, combined with the quick germination response of Arizona cottontop, means that this species is able to establish itself very quickly—an important trait in South Texas—where we know how fast things can dry up! Most species that possess these traits are annuals, but Arizona cottontop is strongly perennial, and the plants in our research plots have shown excellent survival (near 100%) during 2 years of observation; one of those years was without irrigation. Studies in Arizona have shown that individual plants may live as long as 15 years, even when grazed (Cable 1979). Plants respond to adverse conditions (e.g., drought, extreme temperatures) by going into dormancy. However, upon the return of favorable conditions (like rainfall) they can produce forage and seed extremely fast. At Rancho Blanco, we observed Arizona cottontop go from being completely dormant to having ripe seed in just 20 days! Our data show that plants will produce seed year-round, even during the heat of the

summer, if adequate soil moisture is present. Seed production during June–July 2005 at Rancho Blanco was 142 lbs/acre with excellent seed quality.

Following our evaluations in 2004 and 2005, 12 accessions of Arizona cottontop were selected for release as ‘La



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Arizona cottontop occurring within a stand of bufflegress.

Salle’ germplasm Arizona cottontop. These accessions had an average germination of 62.7% over a 2-year period at all sites combined. Accessions were selected based on evaluation performance (plant vigor, seed production, forage production, etc.) and active seed germination. The accessions representing this release originate from 9 South Texas counties, with differing soil types, climates, and range sites.

Arizona cottontop seed is fuzzy and lightweight. Consequently, the seed will likely require coating to facilitate planting with seed drills and conventional broadcasting equipment. Without coating or use of a carrier, it is difficult to obtain uniform planting distribution. For pure stands, Arizona cottontop should be seeded at a rate of 1–2 pounds pure live seed (PLS) per acre. When used in combination with other species, seeding rates should be adjusted according to the percentage of Arizona cottontop desired at the site. Arizona cottontop can be planted across most of South Texas in sandy loam, clay, clay loam, loam, and gravelly loam soils. Arizona cottontop is rarely

found in deep sandy soils of South Texas, and it is not recommended for such areas. Newly seeded areas should be deferred from grazing for 1–2 growing seasons to ensure establishment of seedlings. Dates for planting vary according to rainfall in South Texas, but generally late summer to fall, or spring plantings are best. Arizona cottontop seedlings have been observed emerging most frequently in late summer at our evaluation locations. The seed should be planted no deeper than a ¼ inch. Some seedbed preparation (light disking) is recommended before inter-seeding in established vegetation.

It appears that Arizona cottontop is a good choice for reseeding highly disturbed sites, such as pipeline right-of-ways or recent brush control projects. Its rapid germination and growth provide quick cover and may help prevent soil erosion. Additionally, it can be inter-seeded into existing vegetation to help increase species diversity or forage production. In fact, Arizona cottontop has been observed spreading into established stands of bufflegass (*Pennisetum ciliare*) at our Rancho Blanco evaluation plots and fallow cropland at TAES-Uvalde and Rio Farms.

Two accessions of Arizona cottontop are being evaluated for horticultural use as well. These accessions exhibit a blue-green color and are covered with pubescent hairs, making them an attractive ornamental. These accessions are currently under evaluation at several locations in South Texas to determine their suitability for landscape use.

Seed of the 12 accessions comprising 'La Salle' germplasm Arizona cottontop is currently being produced in seed increase fields at Rio Farms near Monte Alto, TX. Foundation seed (seed used to establish commercial production fields) will be released to commercial growers this fall. We anticipate commercial seed production to begin before the spring of 2007.

For help with planting recommendations, seeding mixtures, or to report your results with 'La Salle' germplasm Arizona cottontop, please contact Forrest Smith, STN Collections and Evaluations Manager, at email address forrest.smith@tamuk.edu.

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