South Texas Natives

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Growing the "Thorn Bushes" of South Texas

By Forrest Smith

In his 1969 book, *Forgotten Legions*, Val Lehman says, "It is quite true that the Rio Grande Plain as a whole once had fewer woody plants and more grass than now, it is also true that an ample seed stock of shrubs and trees has been widely distributed for as long as man has known." Today, we still have more woody plants than were here under virgin range conditions, and scientists and landowners have now begun to appreciate the fact that as Stephen F. Austin wrote in 1822, parts of the Rio Grande Plain were (and still are) "covered with thorn bushes"!

Today, these "thorn bushes" as they were called then, are more affectionately referred to as shrubs. Across South Texas, shrubs are now valued as crucial habitat components for native wildlife. From the white-winged dove food provided by lime prickly-ash, to the high protein deer browse offered by Texas kidneywood, or the butterfly nectar produced by the flowers of a guayacan, it is plain to see that native shrubs are an integral part of the South Texas ecosystem.

It is because of this importance that *South Texas Natives* (*STN*), The Nature Conservancy (TNC), and Texas Parks and Wildlife Department (TPWD) have formed a partnership to develop a region-wide shrub nursery for South Texas. The concept of a shrub nursery is to propagate and maintain a group of stock plants for seed production and collection by those interested in restoration projects. Shrub seeds collected across South Texas by *STN* personnel are cleaned and sent to the TNC Southmost Preserve for germination and transplanting into the nursery. TPWD provides a major source of funding for the project. *STN* personnel collect not only a variety of different species for the nursery, but also strive to get collections from a variety of locations and soil types. The goal is to have a diverse assemblage of ecotypic shrubs available for seed collection. Those interested in shrub restoration will be able to select seed from adapted plants originating in areas comparable to the restoration site.

Coma (*Bumelia celastrina*) is an important shrub for many species of South Texas wildlife.

Currently, the shrub nursery at Southmost Preserve contains 45 species of native shrubs. Collections are ongoing, and new additions are sent as soon as seed is collected. These new collections are processed by a variety of methods to maximize germination of the particular batch of seed. TNC has built several new growing tables to help in the propagation of seedlings for the nursery. Each table utilizes an automatic watering system that uses water from a new rainwater catchment system. Plants grown from seed harvested by *STN* from 2001–2003 have already been transplanted into the nursery. A seed vault has also been installed at Southmost Preserve. The seed vault is important for storage and protection of the original and harvested shrub seeds.

The need for native shrub seed in South Texas "stems" from many factors. State and government

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Texas kidneywood (*Eysenhardtia texana*)

organizations are seeking to restore degraded or destroyed public lands, often with the needs of endangered species like the ocelot in mind. Thick stands of native Tamaulipan thornscrub are vital habitat components of the ocelot as well as many other wildlife species. Other areas of South Texas are planted with native shrubs because of a lack of quality or quantity of desirable shrub species. Areas that have been mechanically treated for unwanted brush have been left with an unproductive monoculture of mesquite or huisache. Those interested in creating wildlife habitat seek to diversify shrub communities by adding more desirable species to the area. When restoring croplands to native habitat for wildlife, the establishment of a diverse shrub community is very important. Commercial growers of native shrubs will also benefit from a South Texas shrub nursery, as a dependable source for shrub seeds will be available for growing transplants used in restoration projects.

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TNC Shrub Nursery at Southmost Preserve

So, despite the fact that as Lehmann writes, "an ample seed stock of shrubs and trees has been distributed" we hope to make the use and acquisition of this seed stock easier for those interested in initiating restoration projects in South Texas.

William R. Ocumpaugh – Profiling a *STN* Partnership

By Charity Kraft-Bartoskewitz, Cody W. Lawson, and Paula D. Maywald

South Texas Natives (*STN*) prides itself in the partnerships we have developed that continue to inspire and motivate the success of this project. We have one such partner in Dr. William R. Ocumpaugh, otherwise known as "Dr. O". Through his experience in grazing research and his expertise in developing legumes for habitat improvement, Dr. Ocumpaugh has been instrumental in guiding *STN* through the native seed development process.

Dr. O is a Regents Fellow and Professor with the Texas A&M University Agricultural Research Station (TAES) in Beeville, where he started in 1983. Before coming to TAES-Beeville, he worked as a Research Scientist and Professor of Agronomy at the University of Florida from 1975–1983, where he worked with over 50 graduate students. He received his B.S. in Farm Crops from Oregon State University, and his M.S. and Ph.D. in Agronomy from the University of Missouri-Columbia.

Dr. O has written over 400 publications, holds one patent, and has over a dozen plant variety releases accredited to his name. He has participated in research with grant funding in excess of $2,000,000. Some of his recent awards include the "2000 Public Service Award" by the Texas Forage and Grassland Council, "Vice Chancellor's Award in Excellence" for Off-Campus Research in 1999, "Regents Fellow" TAMU system, Board of Regents 1999, "Fellow" American Society of Agronomy, 1998, and "Fellow" Crop Science Society of America, 1999.

His primary work has focused on finding legumes that can be used in rangeland improvement projects. His efforts led him to the development and release of a locally adapted species of Armadillo burr medic in 1998 and BeeWild Bundleflower during 2003. The development of BeeWild Bundleflower, a mechanical blend of several varieties, has taken much of his time over the last decade. Dr. Richard Hoverson, a retired forage specialist, states that the development of BeeWild Bundleflower is "one of the most significant contributions to South Texas forage because of its exceptional qualities for wildlife and drought resistance."

Most recently, Dr. O has been focusing on evaluating several legumes for summer and winter wildlife food plots. His interests in legumes that can be imbedded in perennial grass stands has led to the successful establishment of

© Cody W. Lawson

Dr. William R. Ocumpaugh

BeeWild Bundleflower in buffelgrass stands for improving wildlife habitat. He also hopes to release a locally adapted little burr medic along with a native vetch, collected near Cotulla, Texas. The objective is to plant these species in conjunction with BeeWild Bundleflower in wildlife food plots.

Dr. O has been the backbone of the evaluation process for *STN* as he maintains one of our satellite evaluation sites. Satellite evaluation sites allow the comparison of the performance of individual plant collections on different soil types representative of South Texas. Individual collections that demonstrate the best overall plant characteristics are then selected for the seed increase phase. Dr. O has been helpful in arranging to have *STN*'s evaluation sites at TAES-Beeville and Rancho Blanco (located in Webb County). *STN* presently has collections of plains bristlegrass and brownseed paspalum growing at the Beeville evaluation site. In addition, we have planted sideoats grama, big bluestem, and yellow Indiangrass for seed production. He plans to investigate technologies that will facilitate the planting of native seed derived from the evaluation process.

Filiberto Herrera, a Ph.D. student from Mexico, is currently benefiting from Dr. Ocumpaugh's expertise. Filiberto is working at the Kika de la Garza Plant Materials Center under the guidance of Dr. O. He is working on three grasses: plains bristlegrass, hooded windmillgrass, and brownseed paspalum, which are of particular importance to the *STN* initiative. With Dr. Ocumpaugh's assistance, he is investigating the germination and establishment requirements of these grasses.

Dr. Ocumpaugh and his wife plan to retire in their home state of Oregon in a few years. We will dearly miss him and the passion he brings to everything he does, but in the meantime, he will continue to be a key researcher in the development of South Texas ecotypes.

The Case for Ecotypes

By Paula D. Maywald

Like myself, many of you have had dismal results from planting "native" seed from regions other than South Texas. Our experience which says that the more closely you match the environmental conditions of the source of your seed or plant materials to that of the planting site, the better it should grow and persist. But, at this point in time, we have little knowledge guiding the selection of seed or plant materials based on geographic or climatic ranges. So, "What type of 'native' seed do I plant?" And, "Should I plant cultivars, regional ecotypes, or locally harvested seed?" The short and long term success of your restoration project may depend on choosing the appropriate genetic source of the seed or plants you purchase.

Before beginning the discussion of ecotypes, it is necessary to define the terms **native plant species** and **ecotype**. A **native plant species** is defined as a plant species indigenous to the natural plant community where it is found. This is usually based on geographic range that can vary widely, from plants that occur within a 50-mile radius of a site to as large as a continent. An **ecotype** is a subset (or population) of a native species that differs genetically from other populations of the same species. Through natural selection it has adapted to a specific (or localized) set of environmental conditions. Native plant ecotypes are populations of a plant species that because of their genetic makeup (genotype) and morphological adaptations to environmental conditions can persist and reproduce for extended periods in the habitat.

If a native seed source collected from Kansas is planted in South Texas, the question is, "Is it really native?" Plants adapt genetically to environmental conditions such as climate and soil type. Seeds from Kansas may possess genetic blueprints adapted to harsh winters, whereas seeds from Texas may possess genetic blueprints adapted to harsh summers.

Genetic differences for nonlocal plant material can include timing of germination, bud-break, growth, flowering, fruiting, seedset, and climatic tolerances. Local populations may have specific adaptations to cold, drought, flooding, disease, fungal organisms, insects, grazing, fire or allelopathy.

Savannah landscape, Jim Hogg County

Spring landscape in bloom near Freer

By simply perpetuating at a site, a plant population has proven that it has the genetic ability to survive at that location.

Hundreds of research papers have been written about the tallgrass prairie, and recent research conducted by Dr. Danny Gustafson and his colleagues was the first to show genetic structuring and differential performance of three dominant plant species across the tallgrass prairie. This research helps answer some of our questions about the differences between the cultivars, local and non-local native seed. They found that genetic differences do exist between local and non-local seed sources, and that differences in plant performance could be related to seed source. In the genetic and ecological research they conducted, the questions they addressed were (1) are local (Illinois) populations genetically different from non-local (Arkansas, Kansas, Nebraska, Iowa) populations? (2) what are the levels of genetic diversity in remnant and restored prairies and commonly used grass cultivars? and (3) are differences in plant performance related to seed source? The three species their research focused on were big bluestem *(Andropogon gerardii* Vitman.), Indiangrass (*Sorghastrum nutans* Nash.), and purple prairie clover (*Dalea purpurea* Vent.). All three species are perennial long-lived prairie plants, significant components of the prairie ecosystem, and also found in South Texas. Genetic analysis of all three species showed differences between the local Illinois remnant populations and the non-local populations. Using molecular markers they documented genetic relationships and diversity among native populations, as well as identified non-local genotype introductions. They found that grass cultivars tested tended to be more similar to one another than they were to local remnant populations.

In addition to genetic differences, growth form, phenology, and competitive ability among local and non-local seed sources were significantly different. It was interesting to see that the non-local plants were typically shorter than the local Illinois plants. Despite significant pollen exchange, the local and non-local populations had maintained their genetic identity for over 20 years. Results of this research support the use of local seed sources for restoration.

To further address the earlier question, "What type of 'native' seed do I plant?" Several factors need to be considered. These include the size and degree of disturbance of the area to be restored, how rapidly the plants establish, what is the long-term persistence of the restored community, what native seed is available, and what is my objective for the site. Determining these factors will help you decide what approach or method of restoration to choose and what type of "native" seed to plant.

Accuracy and Functionality of Restored Populations

Functionality measures the success of a reintroduced population in terms of persistence, resilience, and stability. The **accuracy** or authenticity of a restoration project is a measurement of how well the project replicates the original gene pool of the population it replaces.

With the functional restoration approach, a range of genotypes can be introduced, allowing selection to sort out those best adapted for the site. In most instances, a greater genetic diversity of a population will increase the chances that the population can adapt to the environmental conditions of the site. The most common approach is to select a geographic range where

STN-TxDOT Hwy 77 Demonstration Project

The construction underway on Highway 77 in Kingsville is the site of *STN*'s native plant demonstration project. The overpass construction is expected to be finished in early spring of 2005. *STN* is collaborating with Texas Department of Transportation to demonstrate the future importance of native plant species in roadside plantings. Plants used to create the landscape include a variety of trees, shrubs, forbs, and grasses native to South Texas. There are two types of grass seed mixes that will be planted along the median and bar ditch. *STN* is currently growing the grass species that will provide seed for these mixes. The grass mixes contain primarily short grass species that should reduce the frequency of mowing. The landscaping will be planted in the spring of 2005 and the grass seed mixes will be planted in the fall of 2005.

source material can be collected. Climatic zones may offer a better first approximation of separation between populations than geographic range alone.

With the accuracy or authenticity restoration approach the range of potential collections will usually be very small. If the original population has been destroyed, then perfect accuracy is impossible. In South Texas, it may be difficult to find local, native stands to harvest that are not infested with aggressive, introduced species.

South Texas Natives (*STN*) uses a regional ecotype approach that emphasizes a mixture of seed that has a broad genetic base collected from multiple sites with similar environmental conditions to the area to be planted. We collect multiple collections of a species at varying times of the year over several years at various sites. When possible, we collect smaller amounts of seed from a large number of plants within a single community or a patch to increase genetic diversity within a sample. This approach is based on functionality instead of accuracy.

This is not the only way to restore a native plant community, and *STN* supports restoration ecologists who use other methods to restore disturbed or invaded sites. Our initial efforts are to provide a basic native mix that can be planted to provide a medium for nurturing an ecologically diverse native plant community, to help prevent soil erosion, and to minimize the invasion of non-native species. Supplementing ecotype seed planting with locally collected seed is encouraged.

Regional ecotypes provide genetically adaptable plant material that can be produced in sufficient quantities and at reasonable prices. These regional ecotypes should have a higher probability of establishment and persistence. Planting seeds or plants that are not adapted to South Texas could limit the establishment, and long-term survival of a population.

Points to Remember:

Use regional ecotypes when feasible. Seed and plant material locally collected and produced may provide enough genetic variation to establish persistent stands when it is collected from ecologically varied habitats. Mixtures of genotypes from different sources may provide the best strategy for restoring highly disturbed sites.

Locally harvested collections with comparable environmental conditions are best suited to restore sites where disturbance is low or confined to a small area. These can also be used to supplement regional ecotype plantings.

Cultivars are generally selected for aggressive traits, such as vegetative vigor. They can disrupt the ecological interactions between native species and resident gene pools of local communities, but they may be appropriate when the goal is rapid recovery of small sites that are highly disturbed.

In closing, the goal of using ecotype-based seed is to plant adapted species that will persist and restore ecosystem function.

Our thanks to The Native Plants Journal for their permission to use an excerpt from the recent article, "Using local seeds in prairie restoration...data supports the paradigm" by Danny J. Gustafson, Ph.D., Department of Biology, The Citadel; David J. Gibson & Daniel L. Nickrent, Department of Plant Biology, Southern Illinois University.

PLANT PROFILE
Bristlegrasses, Genus *Setaria*

By Forrest Smith

Across much of South Texas bristlegrasses are an important component of native vegetation communities. Bristlegrasses belong to the genus *Setaria* (root seta, meaning "bristle"), which comprises around 150 species found throughout the tropical and warm areas of the world (Diggs et al., 1999). South Texas is home to eight native, perennial species of bristlegrass that are commonly found in upland habitats. They include the following:

- *Setaria firmula*, knotgrass
- *Setaria geniculata*, knotroot bristlegrass
- *Setaria leucopila*, plains bristlegrass

Knotgrass (*Setaria firmula*)

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Solitary bristlegrass (*Setaria ramiseta*)

- *Setaria macrostachya*, no common name
- *Setaria ramiseta*, solitary bristlegrass
- *Setaria reverchonii*, Reverchon bristlegrass
- *Setaria scheelei*, southwestern bristlegrass
- *Setaria texana*, Texas bristlegrass

(Hatch et al., 2001)

South Texas Natives (*STN*) is working to develop ecotypes of several of these species because of their importance as forage and the benefits they provide to wildlife. Based on their value, distribution, and ease of eventual commercial production, plains bristlegrass, *Setaria macrostachya*, knotgrass, solitary bristlegrass, and southwestern bristlegrass have been selected for collection.

Plains bristlegrass is the most common and widespread bristlegrass being developed by *STN*. It occurs throughout South Texas in a variety of soil and habitat types, and responds rapidly to disturbance and rainfall by producing abundant seed and forage. This grass is present in a variety of successional stages on many different range sites. This versatility makes it an ideal addition to rangeland seed mixes. In addition, plains bristlegrass provides good forage for livestock and produces large amounts of seeds for wildlife.

Another bristlegrass of interest is *Setaria macrostachya*. This grass is very similar to plains bristlegrass but generally has taller and wider leaf blades. It also occurs throughout South Texas but tends to be restricted to areas with greater soil moisture. *Setaria macrostachya* provides fair forage to livestock and is also a good seed producer for wildlife.

Knotgrass has the most limited distribution of the bristlegrasses in South Texas. It is restricted to deep sandy soils common to the sand sheet of southeastern Texas. Knotgrass is a prolific seed producer and may be a locally and seasonally important food source to granivorous wildlife. Knotgrass is reported to have good forage value.

Solitary bristlegrass is closely related to knotgrass, but can be distinguished by longer more slender leaf blades. It prefers sandy and sandy loam soils on upland sites. Solitary bristlegrass has a wide distribution in South Texas and provides good forage as well as fair seed production.

Southwestern bristlegrass occurs on various soil types across South Texas, usually under the canopy of trees in or near riparian areas. It is generally the largest of the bristlegrasses found in our area, reaching a height of over four feet. Southwestern bristlegrass can be an important forage species and is also a good seed producer for wildlife (Hatch et al., 1999).

Bristlegrasses are a significant component of many habitats across South Texas and are important to future restoration efforts. Cultivation and eventual production of these grasses has proven challenging. For one, bristlegrasses seem to have a high degree of seed dormancy (mechanisms that prohibit germination) and, consequently, low germination. Personnel at the E. Kika de la Garza Plant Material Center, Texas Agricultural Experiment Station in Beeville, and *STN* are working together with graduate students to determine the mechanisms that inhibit germination and techniques that can break dormancy. Another problem with these grasses is inconsistent seed shatter upon maturity. We hope to resolve this problem by selecting superior collections that have consistent seed shatter, which will facilitate ease of commercial production.

On the upside, bristlegrasses set seed several times per year, an advantage for commercial production. Bristlegrasses have a hard, round seed that is seasonally important for several wildlife species. Bristlegrasses also provide a major

© Forrest Smith

Plains bristlegrass (*Setaria leucopila*)

portion of the native forage available on many southwestern ranges (Hitchcock, 1971).

STN is continuing to collect bristlegrasses and your help in our efforts would be greatly appreciated. If you know of, or have good stands of bristlegrass or other native plants on your property and would be willing to allow us to collect seed, please contact *STN* at 361-593-4525.

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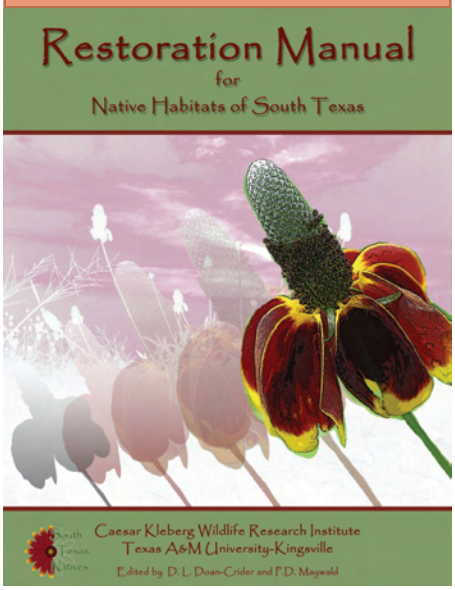
Restoration Manual Update

Final edits are in progress for the *South Texas Natives* Restoration Manual. And, the layout has already begun. Look for this cover when copies become available.



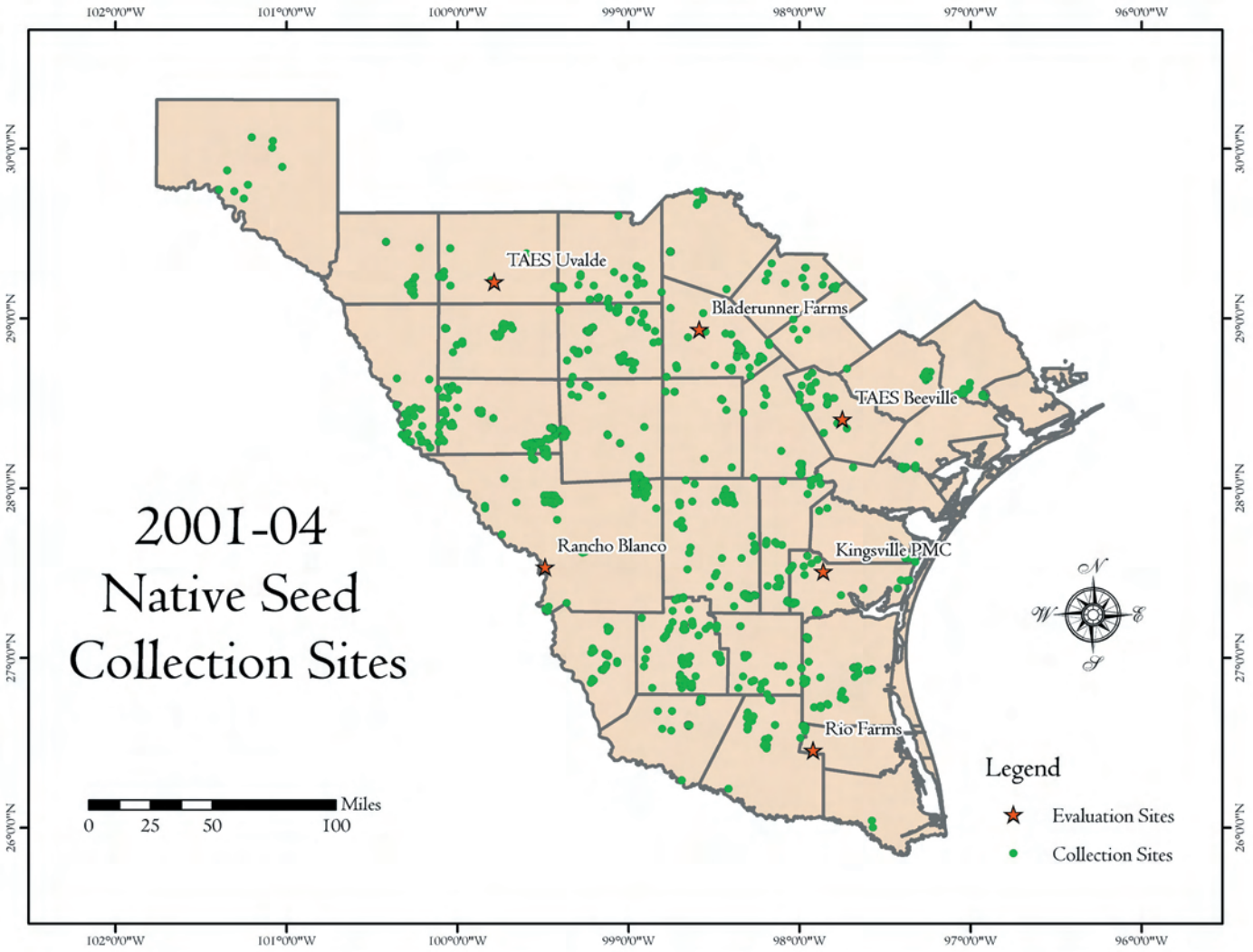
Satellite Evaluations

By Forrest Smith

Part of developing regional ecotypes involves the evaluation of collections at various locations across South Texas. We call this process "satellite evaluation." Sites selected for this process allow *South Texas Natives* (*STN*) to compare and document how a particular collection of a species will perform in various soil types and climatic conditions. Different collections of a species often perform better at different locations. The best performing collections will eventually be combined in order to produce an ecotype that can be reliably planted across South Texas. Collections that perform poorly are culled and not included in the final ecotype release. *STN* has evaluation sites at Bladerunner Farms in Poteet, Rancho Blanco near Laredo, Rio Farms near Raymondville, and the Texas Agricultural Experiment Station (TAES) at Uvalde. In addition to these sites, collections are initially evaluated at the USDA Kika de la Garza Plant Materials Center and TAES-Beeville.

Currently, we are evaluating collections of big bluestem, little bluestem, yellow Indiangrass, sideoats grama, and Arizona cottontop. Greenhouse grown transplants are planted at locations that have similar characteristics to the species' natural habitat (i.e., species adapted to sandy soils are only planted at evaluation sites with sandy soils). Each collection at each site is periodically evaluated for 13 commercially important traits such as seed shatter, foliage density, and uniformity. Seed is harvested from each collection to give estimates of seed production and germination percentage. Data from all observations are combined and analyzed to select which collections of a species are most desirable for the final released ecotype. In addition, species at the satellite evaluation sites are compared to the commercially produced cultivars available for each species. Some species such as Arizona cottontop have exhibited uniform characteristics across accessions and locations, due in part to it being highly self-fertilized. Others like big bluestem, yellow Indiangrass, and sideoats grama have highly variable characteristics. For example, sideoats grama accessions generally fall into two distinct forms, one having excellent foliage characteristics and leaf density with limited seed production, and the other having moderate to poor foliage characteristics with excellent seed production. Further evaluation of these species will help *STN* determine which accessions can be effectively combined to produce an ecotype that is adaptable to large parts of South Texas, yet preserve the greatest amount of species diversity. Slim tridens, crinkleawn, orange zexmenia, multi-flowered false rhodesgrass, pink pappusgrass, hairy grama, Texas grama, slender grama, and prairie acacia are being added to the evaluation sites for fall 2004 and spring 2005.

Charity Bartoskewitz (left) and Cody W. Lawson (right) evaluating Arizona cottontop.



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