

Woody ornamentals for a 21st century landscape: a Texas perspective[©]

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INTRODUCTION

Stephen F. Austin University's SFA Gardens comprises 128 acre (58 ha) of on-campus property at Stephen F. Austin State University (SFA), Nacogdoches, Texas. Tree, shrub, and herbaceous perennial evaluation at SFA Gardens is scattered across gardens and landscapes. Soils are generally well drained, slightly acidic, and the native flora is dominated by pine, oak, river birch, sweetgum, sycamore, Florida maple, hornbeam, elm, hackberry, pecan, and hickory.

Nacogdoches is Zone 8b with an average annual rainfall of 1219 mm (48 in.). June through August is characteristically hot and dry. In recorded history, 1 Sept. 2000 was the record high, 44.4°C (112°F), and 23 Dec. 1989 was the record low -17.8°C (0°F). In 2010 and 2011, Nacogdoches experienced all-time record drought and heat. The SFA Gardens lies in the floodplain of LaNana creek and flooding is a reality usually occurring every 3 to 5 years. However, we had two big floods in 2015 and one in 2016. All predictive NOAA and NASA models show Texas moving to hotter times, more dry spells and more heavy precipitation incidents. While Virginia is predicted to be a bit hotter—precipitation stays about the same and more frequent violent weather events are expected.

EMERGING THREATS IN TEXAS

Many scientists accept that the rate of current ecological transformations are a major threat to biodiversity. The implications of this "sixth extinction" is not lost on the scientific community. There's a strong documented reduction in the wide diversity of plants, and it is due to a myriad of factors, including the alteration and loss of habitats, introduction of exotic species and genetically modified organisms, pollution, climate change—and the overexploitation of resources. Collectively, the trends and models for the future, suggest a science-based and prudent approach is needed to deal with emerging threats.

Two recent threats in Texas have emerged. First, the Texas A&M Forest Service confirmed 23 May 2016 that occurrences of the emerald ash borer, *Agrilus planipennis*, had been found in Harrison county in northeast Texas. Native to Asia, this pest was first detected in southeast Michigan in 2002 and has invaded states and killed ash trees in great numbers. While ash generally makes up less than 5% of the Texas forest, the urban landscape is more greatly affected. The prognosis to date is dire. Without extensive treatments, the trees do not survive. Some cities in the war zone are proactively removing healthy ash trees and replanting. If anyone has ever seen the great expanses of green ash in some of the bottomlands of the Red River near Bossier, Louisiana, the scale of the coming devastation is quite dramatic, to say the least.

Crape myrtle bark scale (CMBS), *Eriococcus lagerstroemiae*, can now be categorized as a real threat to *Lagerstroemia* and a number of other important plants. It is easy to identify. During the white crawler stage which when pressed produces a pink juice that is quite distinctive. In severe infestations, branches die, blooms are small and unattractive, and there's often a heavy deposit of honeydew and sooty mold. This creates the perfect environment for aphids, ants, and wasps. Crape myrtle bark scale is thought to move to susceptible plants in the air or by birds and small animals. First discovered in 2004 in Richardson, Texas, this scale insect has marched across the Gulf south and is just beginning on the east coast. By 2012 it had spread to Ardmore, Oklahoma, and Shreveport, Louisiana.

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In 2013, it was reported in Tyler, Texas; Houma, Louisiana (60 miles southwest of New Orleans); and Germantown, Tennessee (near Memphis). In January 2014, it was confirmed in Little Rock, Arkansas. Since then, the occurrences have increased to the point we can now conclude this pest is widespread. The pest was recently identified in Nacogdoches, Texas, at a local restaurant and the condition of the trees indicated the infestation had been there several years. Homeowners, nurserymen, and landscapers who notice symptoms of scale insect infestation on crape myrtles should contact their local county extension office (Gu et al., 2010).

PROJECT AT MOODY GARDENS, GALVESTON ISLAND, TEXAS

In 2016, SFA Gardens embarked on a project at Moody Gardens, Galveston, Texas that will: (1) characterize the soil, topography and drainage patterns of Moody Gardens, (2) establish a long term platform for acquiring, evaluating, and propagating plant materials that show promise under the soil, water, and climate conditions of Moody Gardens, (3) establish research projects with root zone treatments that mitigate soil conditions to allow for better growth and performance of test plant materials, (4) establish an outreach program to educate the public via social media, workshops and seminars, about the results of this research project, and, (5) propagate and grow the most successful plant materials for further testing at Moody Gardens and other locations on Galveston Island.

This project is a first for Galveston Island in that it establishes a long-term platform for plant materials testing. The plot is less than 2 m above sea level and windy conditions off Offatt Bayou exacerbate aerial salt damage. Hurricane Ike in 2008 is a benchmark for high water levels in that it inundated much of the island with sea water. Ocean water at a salinity of 36 parts-per-thousand (ppt) [average sea water—34.7 ppt; fresh water 0-0.5 ppt] and Offatt bayou bay water at 18-24 ppt moved across the island for over 36 h. Consequently, the island lost 55,000 old live oaks, many quite old. Many other species succumbed. There is strong evidence that annual high tide levels are increasing and “clear day high tides” and “nuisance flooding” events are becoming more common.

The project has built about 1.6 (1 miles) of 2.4 km (1.5 m-wide) beds using off-island sand and composted pine bark tilled in and mulched with the same. A trellis system will be completed during the next month. The project is intended to serve as a long term platform for salinity research and for comparing new ornamentals that perhaps have both soil and aerial salt tolerance. Our responsibility is to find and acquire potential ornamental candidates, plant them in groups of five, map their location, and evaluate performance for 3 years. After a few years, promising plants will be dug and placed into the Moody Gardens landscape, into civic projects on the Island, or discarded. New plants will be rotated into the plots.

The current plot includes the following in multiples of five: *Acacia anisophylla*, *Allagoptera arenaria* (seashore palm), *Malacomeles denticulata* (syn. *Amelanchier denticulate*) (Mexico form), *Butia capitata* (jelly palm), *Butia capitata* × *Syagrus romanzoffiana* (Mule palm), *Callicarpa rubella*, *Chamaedorea radicalis*, *Chamaerops humilis* (green form of Mediterranean fan palm), *Chamaerops humilis* (blue form of Mediterranean fan palm), *Eucalyptus* LLC1 (cold hardy introduction by Mark Crawford), *Euscaphis japonica* (Korean sweetheart tree), *Ficus afghanistanica* subsp. *afghanistanica*, *Grevillea robusta* (silky oak), *Hibiscus dasycalyx* (Neches river rose mallow), *Hibiscus hamabo*, *Ilex vomitoria* (Yaupon, coastal), *Leucophyllum langmaniae* ‘Lynn’s Legacy’ (Texas sage), *Livistonia chinensis* (Chinese fan palm), *Myrcianthes fragrans* (twinberry), *Nannorrhops ritchieana* (Mazari palm), *Parrotia persica* (ironwood), *Phoenix canariensis*, (Canary Island date palm), *P. sylvestris* (silver date palm), *Populus nigra* (black poplar), *Prunus* ‘Purple Pride’, *Punica granatum* (pomegranate, five cultivars), *Quercus canbyi* (Canby oak), *Q. rysophylla* (loquat leaf oak), *Q. virginiana* (live oak, coastal), *Rhapis excelsa* (lady palm), *Sabal mexicana* (Mexican palmetto), *S. minor* (dwarf palmetto), *S. × brazoriensis* (Brazoria palm), *Salix babylonica* (syn. *Salix chinensis*), *S. humboldtiana* (Humboldt’s willow), *S. nigra* ‘HSC weeping’, *Serenoa repens* (blue form saw palmetto), *S. repens* (green form saw palmetto), *Sophora affinis* (Eve’s necklace), *S. secundiflora* (Texas mountain laurel), *Taxodium* (Nanjing

Botanical Garden), *Taxodium* 405 (Nanjing Botanical Garden), *Taxodium* 406 (Nanjing Botanical Garden), *Taxodium* 407 (Nanjing Botanical Garden), *Taxodium* 502 (Nanjing Botanical Garden), *Taxodium* 'Oaxaca child', *Trachycarpus fortunei* (windmill palm), *Washingtonia robusta* (Mexican fan palm), *Yucca gloriosa* var. *tristis* (syn. *Yucca recurvifolia*) (soft yucca). Numerous plants will be added as this project progresses.

Two master of science thesis projects are underway. Elaine Harris, Environmental Science, is testing three species (*H. hamabo*, *Q. virginiana*, and *Taxodium* '406') in plots that include with and without raised beds, with and without gypsum, and with and without incorporated bark. Survival has been good on all treatments after one growing season. Height and diameter growth are also being measured as plant response variables. Select soil chemistry parameters, including sodium adsorption ratio and electrical conductivity, have been monitored along with sea spray aerosol Na and Cl input via dry-fall and wet-fall. Elaine Fowler, a biology student, is studying the mycorrhizal association of salt-tolerant plants in the research plots and to determine the effects of soil treatments on bacteria, actinomycete, pseudomonad, and fungal populations.

HIGHLIGHTS OF THE SFA GARDENS PLANT EVALUATION PROGRAM

The mission of the SFA Gardens is to assemble a wide range of woody ornamentals, plant them in a landscape setting and evaluate their performance over many years. Major collections include clones and genotypes of baldcypress, maple, oak, Chaste tree, hydrangea, crapemyrtle, and camellia. The focus of this work has been described in previous *Combined Proceedings of the International Plant Propagators Society* and many are covered in the author's blog: <https://dcreechsite.wordpress.com/>

The bald cypress collection is represented by over 136 genotypes or cultivars with special emphasis on clones introduced by the Nanjing Botanical Garden, Nanjing, China. Most of those are numbered selections of controlled crosses between Montezuma cypress and baldcypress (*T. distichum* var. *mexicanum* × *T. distichum* var. *distichum*). Currently, one selection 'T406' has demonstrated good form, no knees, fast growth rate, salt and alkalinity tolerance and, most important, good resistance to leaf blight, *Cercosporidium sequoiae* (Ellis and Everh.) W.A. Baker and Partridge. Clones and genotypes from high-rainfall, high-humidity areas generally have less defoliation associated with the presence of this leaf blight fungus (McDonald et al., 2008).

Acer saccharum subsp. *skutchii*, the Mexico mountain sugar maple, is rarely encountered in Mexico, where it is endangered, and in USA collections. This species features good heat and alkalinity tolerance, fast growth and adaptation to the Gulf South—including central Texas in sites where sugar maples generally perform poorly because of soil alkalinity issues. The SFA Gardens has a research plot of 277 seedlings planted in 2011 and seven selections made purely on the basis of form.

The Mexico oak collection includes several species that are close to USA champs, including: *Q. rysophylla*, loquat leaf oak; *Q. canbyi*, Canby oak; *Q. polymorpha*, Monterrey oak; *Q. grisea*, gray leaf oak, *Q. germana*, Royal oak; *Q. tarahumara*, basin leaf oak. Our most recent acquisition, *Q. insignis*, features the largest acorns in the genus and will be planted in the winter, 2016.

The crapemyrtle collection is located in the SFA W.R. Johnson coliseum parking lot and along nearby LaNana creek. This planting is a cooperative project with the program at LSU, Hammond, Louisiana, under the direction of Allen Owings. The focus of the project is to compare and evaluate the latest varieties of crapemyrtles, with particular attention to bloom period and foliage quality.

Finally, the most recent development centers on fruit variety evaluation with the recent plantings of 17 varieties and selections of pecans, a vineyard with 56 varieties and selections of muscadine grapes, a planting of 70 fig varieties, a planting of over 100 genotypes and cultivars of blueberries—and finally, an evaluation plot for golden kiwifruit, *Actinidia chinensis*; it received some interest due to good crops in 2014 and 2015, and a modest crop in 2016.

CONCLUSIONS

The SFA Gardens has been planting uncommon, rare and unusual trees and shrubs since 1985. Collections include many ornamentals common to the landscapes of the South, providing a germplasm repository for interested nurserymen, landscapers and botanists wanting to compare plant performance, obtain cutting wood, or simply make observations in the garden.

Literature cited

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