

Saratoga Horticultural Research Endowment Grant Progress Report
Introduction and Testing of Texas Trees in Sacramento Valley Landscapes – Year 2
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Investigators

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Project Summary

With support from the Saratoga Horticultural Research Endowment, we are in the middle of the second year of a multi-year project to introduce and test new trees from arid zones in west and central Texas in Sacramento Valley landscapes. There is a pressing need to expand the palette of climate-ready trees available for California's urban landscapes in the Central Valley, which is predicted to shift to more desert-like climate conditions by the end of the 21st century. In the first year of our project, with the support of the SHRE, we collected and propagated seeds from more than 30 tree taxa from west and central Texas. For the second year of the project, we are focusing on growing out our expanding stock of over 500 of these trees for future research plantings. We will install our first field trials in the UC Davis Arboretum and Public Garden and carry out thorough field monitoring. Finally, we will launch an informational website to share our preliminary research and results with horticultural professionals and the public. These are the critical next steps to carrying out the research necessary to ensure the success of new introductions that will increase the diversity and resilience of our community's trees.

Accomplishments

Nursery production of young trees

Since July, there has been continuous care of the young trees in the nursery – watering, fertilizing, training, and up-potting them to prepare them for field trials. In addition, propagation efforts have continued from the first year of the project. Some species with extended seed dormancy, such as *Styphnolobium affine*, have germinated over a year after the initial sowing. Arboretum nursery tree growing areas have been enhanced and expanded to accommodate the growing inventory.

Please see the attached January inventory for a recent summary of quantities and sizes of stock of each species.

Field trial pilot phase

A field monitoring protocol has been developed in consultation with US Forest Service researchers Greg McPherson and Natalie Van Doorn. Following their recommendations, field monitoring will be performed annually in the late spring. The protocol is based on the monitoring protocol for the Climate-Ready Trees experiment (McPherson et al. 2018) and recent USFS publications on urban tree monitoring (Roman et al. 2020; van Doorn et al. 2020).

A few preliminary plantings of *Dermatophyllum secundiflorum*, *Ungnadia speciosa*, and *Arbutus xalapensis* were installed this fall into Arboretum mixed planting beds. Plans are in development for establishing a reference site in a field near the Arboretum where three replicates of all 40 tree taxa can be planted. We hope to develop this as a research and demonstration site for the project that will be open to the public and marked with interpretive signage. Final approval of the site is currently being sought from the Campus Planner, and we plan to begin planting in late February.

Public outreach and engagement

The PIs are partnering with two student co-coordinators, Iris Garcia and Annika Peterson, on leading a new Urban Tree Stewardship Learning by Leading™ internship program during winter and spring quarter. Due to the pandemic, the eight interns in the program are focusing on virtual leadership projects instead of hands-on horticulture. A top priority project for the interns is developing a website featuring this research project on Texas trees. Over the last month, interns have been collecting information about and images of the 40 tree taxa in the study to feature on the new website.

We are working in partnership with colleagues in the UC Davis Finance, Operations and Administration Communications Team to launch the website this spring. They are supporting us in developing a custom interactive plant database for the site.

In a related effort, we are collaborating with our Museum Education and Interpretive Manager Maya Makker and her student apprentices to develop interpretive signage that will be placed on the field trial plantings. The signage will introduce the goals of the project and contain a QR code that will link visitors to the new project website.

Obstacles

When we wrote the proposal, the disruption from the COVID-19 pandemic had recently begun, and we were optimistic about being able to resume in-person activities with our staff, interns, and volunteers by the summer or fall of 2020. We had anticipated that our new team of Urban Tree Stewardship interns and our nursery and garden volunteers would have been able to assist with potting up trees in the nursery and planting out the first field trials. To date, we have not been able to secure university permission for unpaid interns or volunteers to return to campus. As a result, we have struggled with labor shortages across UC Davis Arboretum and Public Garden operations, and it has been challenging to keep up with tree transplanting needs in the nursery. The cost of the project has gone up, because we have needed to allocate more paid staff time to repotting and caring for trees in the nursery. We recently needed to hire an additional student nursery assistant to help us keep up with the demands of the project.

The extreme heat in summer and fall of 2020 constrained our tree transplanting season in the nursery. We discovered that some species would not tolerate transplanting during high temperatures. As a result, we decided to delay most transplanting and up-potting to later in the fall season. The high temperatures and lack of rainfall in fall of 2020 also caused us to choose to delay field trial plantings until the winter.

Literature Cited:

McPherson, E. Gregory; Berry, Alison M; van Doorn, Natalie S. 2018. **Performance Testing to Identify Climate-Ready Trees**. Urban Forestry & Urban Greening, vol. 29, pp. 28–39.

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Taxon	Current nursery stock quantity	Container sizes	Ready for outplanting
<i>Acacia wrightii</i>	28	8x16 tree pot, 2 gal, Pioneer 4"	0
<i>Acer grandidentatum</i>	34	8x16 tree pot, Pioneer 4", 4x14 tree pot	0
<i>Arbutus xalapensis</i>	39	8x16 tree pot, 4x14 tree pot, Pioneer 4"	0
<i>Bauhinia lunarioides</i>	17	8x16 tree pot, 4x14 tree pot, Pioneer 4"	0
<i>Carya illinoensis</i>	26	4x14 tree pot, 8x16 tree pot, D40	0
<i>Celtis laevigata</i>	19	8x16 tree pot, 4x14 tree pot	3
<i>Celtis lindheimeri</i>	25	8x16 tree pot, 4x14 tree pot	8
<i>Cercis canadensis</i> var. <i>texensis</i>	32	seedling flat, 4x14 tree pot, 8x16 tree pot, Pioneer 4"	0
<i>Dermatophyllum secundiflorum</i>	18	4x14 tree pot, 8x16 tree pot, 1 gal	3
<i>Diospyros texana</i>	27	8x16 tree pot, 4x14 tree pot, 3 gal, 1 gal, Pioneer 4", 2 gal	3
<i>Fraxinus cuspidata</i>	2	8x16 tree pot	0
<i>Fraxinus greggii</i>	28	8x16 tree pot, 3 gal, Pioneer 4", 4x14 tree pot	0
<i>Hesperocyparis arizonica</i>	25	2 gal, Pioneer 4", 4x14 tree pot, Pioneer 4"	3
<i>Juglans major</i>	35	8x16 tree pot, 2 gal, 4x14 tree pot, 4x14 tree pot, D40	3
<i>Juglans microcarpa</i>	21	8x16 tree pot, 4x14 tree pot, D40	9
<i>Juniperus deppeana</i>	19	8x16 tree pot, 8x16 tree pot, 4x14 tree pot	3
<i>Leucaena retusa</i>	15	8x16 tree pot, 4x14 tree pot, Pioneer 4"	0
<i>Pinus cembroides</i>	6	Pioneer 4", Pioneer 4"	0
<i>Pinus remota</i>	7	8x16 tree pot, 1 gal	0
<i>Pistacia texana</i>	9	3 gal, Pioneer 4"	0
<i>Prosopis glandulosa</i>	27	8x16 tree pot, Pioneer 4", 4x14 tree pot	3
<i>Prunus mexicana</i>	18	4x14 tree pot	0
<i>Prunus serotina</i> var. <i>eximina</i>	17	8x16 tree pot, 4x14 tree pot	0
<i>Quercus</i> aff. <i>arizonica</i>	8	8x16 tree pot, 8x16 tree pot	2
<i>Quercus emoryi</i>	1	8x16 tree pot	0
<i>Quercus fusiformis</i>	71	8x16 tree pot, 4x14 tree pot, 4x14 tree pot	0
<i>Quercus graciliformis</i>	22	8x16 tree pot	12
<i>Quercus gravesii</i>	3	8x16 tree pot	3
<i>Quercus grisea</i>	6	8x16 tree pot	3
<i>Quercus laceyi</i>	25	8x16 tree pot, 4x14 tree pot Pioneer 4"	0
<i>Quercus marilandica</i> var. <i>ashei</i>	3	Pioneer 4"	0
<i>Quercus muhlenbergia</i>	11	4x14 tree pot, 8x16 tree pot	0
<i>Quercus oblongifolia</i>	2	8x16 tree pot	0
<i>Quercus stellata</i>	31	8x16 tree pot, 4x14 tree pot	0
<i>Quercus vaseyana</i>	25	8x16 tree pot, 4x14 tree pot	0
<i>Sapindus drummondii</i>	25	4x14 tree pot	0
<i>Styphnolobium affine</i>	4	4x14 tree pot, Pioneer 4"	0
<i>Taxodium distichum</i>	15	8x16 tree pot, 4x14 tree pot, 3 gal	7
<i>Ulmus crassifolia</i>	33	8x16 tree pot, 4x14 tree pot, Pioneer 4"	3
<i>Ungnadia speciosa</i>	42	2 gal, 8x16 tree pot, 4x14 tree pot, 2 gal	19
TOTAL	821		87