

Regional Tree Nursery Summary



Lower Rio Grande Valley of Texas



Executive Summary

American Forests’ groundbreaking report on the national shortfall in available nursery seedlings highlighted the urgent need to more than double production across the Lower 48 United States by 2040.

In the Lower Rio Grande Valley (LRGV) of Texas, that shortfall is especially acute.

In This Report:

Regional Context	4
Reforestation Opportunity	8
Labor & Employment	12
Challenges & Opportunities	16
Update	20
References	22

As this report details, there are approximately 81,000 acres of high-priority reforestation opportunities that are essential to providing native thornforest habitat connectivity in the LRGV, including 24,000 public acres and 57,000 private acres. Assuming planting densities of 1,000 seedlings per acre, 24 million seedlings would be needed to reforest public lands in the LRGV, and 81 million total would be needed for all lands. That means it would take over 150 years at maximum operating capacity (MOC) to produce the seedlings needed to reforest the entire area (MOC: 510,000 seedlings a year). It would take nearly 50 years just to restore priority public lands.

The two main markets for thornforest seedlings in the LRGV are the commercial/residential landscaping sectors and the public lands restoration market. Restoration activities here depend on artificial regeneration using nursery grown stock and account for the bulk of seedlings produced in the region.

Demand is expanding for LRGV thornforest seedlings in both public and commercial markets. A strong supply of U.S. Fish and Wildlife Service (USFWS) lands that are still in row crop production will yield additional opportunities to grow the public lands market. Demand within the commercial market has also grown in the past decade as more residents and municipalities within the LRGV, San Antonio and Austin have become cognizant of the advantages in aesthetics and maintenance provided by natives, including drought resilience.

For federal and some private nurseries, productivity is contingent on operating budgets. Given the importance of public lands restoration in overall regional demand for thornforest seedlings, recent reductions in staffing have had ripple effects for this effort.

Labor supply is a huge challenge. The economically disadvantaged LRGV region currently has a lack of available workers for nursery support and management roles. In 2020, less than 20 full-time individuals were employed in thornforest seedling production at both federal and private nurseries in the LRGV. They are servicing a production level of approximately 337,000 seedlings and rely on time and labor-intensive annual wild collections of seed from over 30 hardwood species.

The LRGV presents an opportunity for significant job growth and related economic development opportunities in seed collection, nursery production, site preparation and reforestation. This, in turn, increases the growth potential for ecotourism in the region as birders, butterfly enthusiasts and others seek out nature-based tourism experiences. Ecotourism currently generates a gross regional product of \$135 million per year.

Developing stronger connections with regional community colleges and universities could help provide opportunities to help direct a career pipeline of skilled labor to thornforest nurseries.

The thornforest nursery sector is a developing component of the larger nursery industry in Texas but lacks the market representation found in other segments. Greater representation of the unique challenges and opportunities in thornforest seedling projection may help advance the sector.

81 million

Total number of seedlings needed to reforest all lands in the LRGV. At current maximum operating capacity, it would take over 150 years to produce this many seedlings.

1 Regional Context

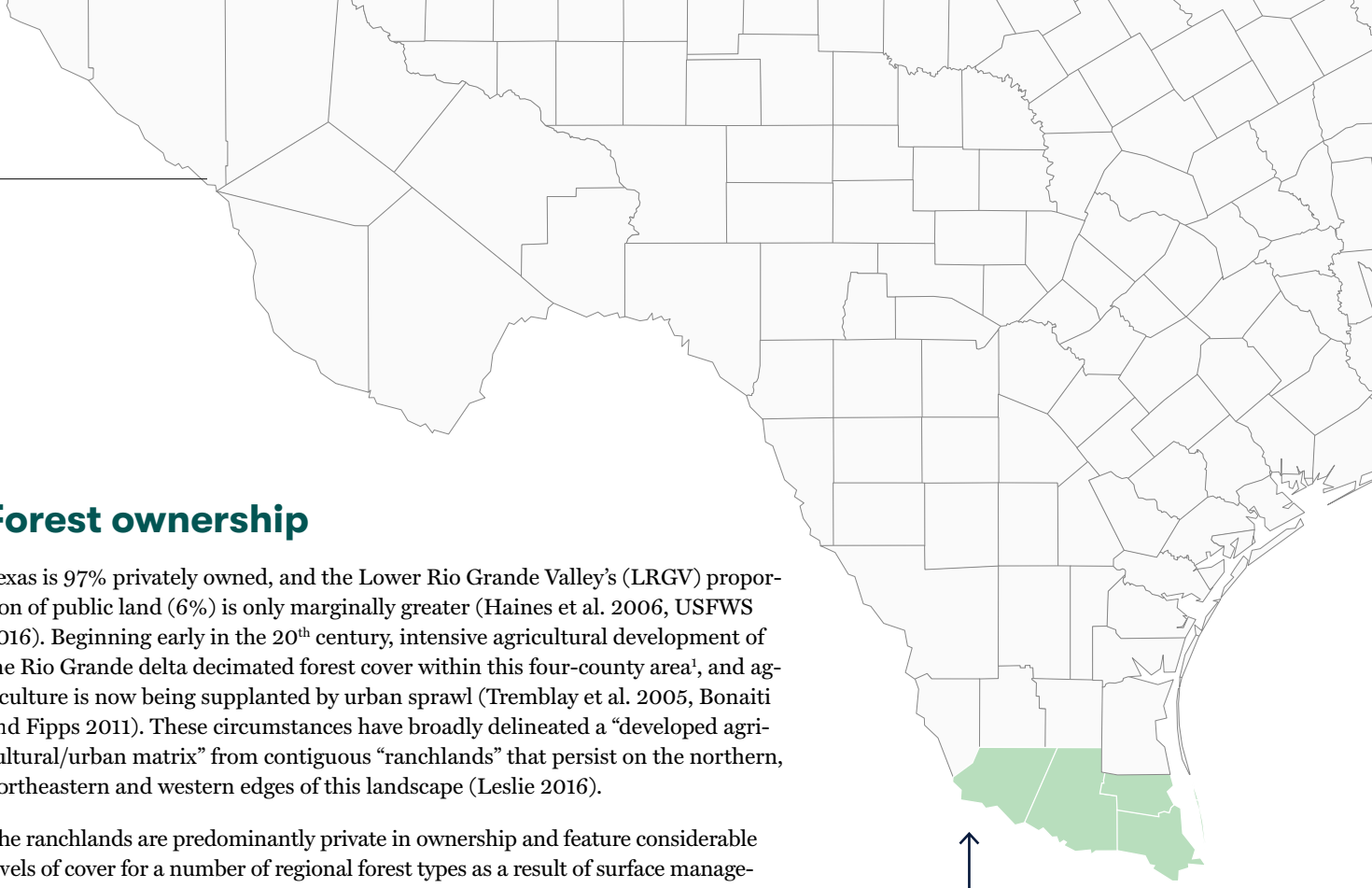


Forest ownership

Texas is 97% privately owned, and the Lower Rio Grande Valley's (LRGV) proportion of public land (6%) is only marginally greater (Haines et al. 2006, USFWS 2016). Beginning early in the 20th century, intensive agricultural development of the Rio Grande delta decimated forest cover within this four-county area¹, and agriculture is now being supplanted by urban sprawl (Tremblay et al. 2005, Bonaiti and Fipps 2011). These circumstances have broadly delineated a “developed agricultural/urban matrix” from contiguous “ranchlands” that persist on the northern, northeastern and western edges of this landscape (Leslie 2016).

The ranchlands are predominantly private in ownership and feature considerable levels of cover for a number of regional forest types as a result of surface management goals associated with cattle ranching and hunting (e.g., deer leases). However, depending on substrate and past use, it's clear that fire suppression and overgrazing have led to the proliferation of native, invasive covers that were either non-existent or at least more limited in distribution prior to a European colonization that initiated about 1750 (Hanselka 1980, Brown and Archer 1988, Fulbright 2001).

In contrast, much of the developed matrix that occupies the Rio Grande delta was likely forested in historical times and featured several endemic, species-diverse thornforest associations of limited extent within the bi-national Tamaulipan Biotic province (Diamond 1998, Brush 2005). The U.S. Fish and Wildlife Service (USFWS), and to a lesser extent, the Texas Parks and Wildlife Department (TPWD) and The Nature Conservancy (TNC), now collectively protect most vestiges of these forest associations within the delta's developed matrix (USFWS 1997). Further, these organizations own lands that are not currently forested but that would benefit from ecological restoration of native thornforest. Smaller acreages of extant thornforest, generally less than 50 ha (124 acres), are also privately owned by smaller nonprofits and by local governments.



The Lower Rio Grande Valley is comprised of the 4 southern-most counties in Texas: Hidalgo, Starr, Willacy and Cameron.



6%

Percentage of land in the LRGV that is public property. The remaining 94% is privately owned.

Forest types

The USFWS and TPWD currently manage thornforest to accommodate broad mission objectives in conservation and limited public use (e.g., species recovery, hunting, ecotourism).



These reusable plastic shelter tubes conserve moisture, protect seedlings from animals, and help seedlings grow straight and tall, helping them outcompete invasive grasses.



Restoration activities occur within the LRGV's developed matrix on parcels that are often spatially fragmented and that have been under continuous cultivation in specialty or row crops for most of the past century. These realities prevent complete autogenic regeneration from being successful in most cases since soil seed banks have become depleted over time and invasive grass species often arrest any form of natural succession (Best 2006).

Further, restoration project designs often include planting at maximum densities (e.g., 1,000 plants/acre) to more rapidly approximate the late successional forest conditions that many conservation target species depend upon (Alexander et al. 2016). While these land managers look to natural processes like seed dispersal to augment a site's mid/long-range potential as habitat for these species, there is no substitute for the strong foundation that planted seedlings provide (Fulbright 1992).

Ranchland managers seeking greater thornforest species diversity face similar needs as introduced grasses proliferate in these portions of the LRGV as well (Wied et al. 2020). There is, however, an autogenic thread to many of these efforts since thornforest seedbanks are more readily available in this contiguous landscape. Further, objectives for land managers there do not strictly coincide with those of USFWS in the neighboring developed matrix (Rappole et al. 1986). Indeed, a robust effort has grown up around native grassland restoration in the rangeland districts of south Texas, and many managers within the LRGV ranchlands place a higher premium on grass/forb cover as it relates to their business models.



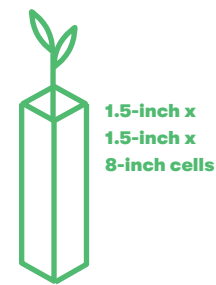
Markets for tree seedlings

There are two markets for thornforest seedlings, the commercial and residential landscaping sector (generally private lands) and the restoration market (largely public lands). The market for thornforest seedlings in the LRGV is also segmented by container size. Seedling “bands” (1.5-inch x 1.5-inch x 8-inch cells) are currently produced in the highest volumes and are utilized for habitat restoration activities on public lands typically owned by USFWS. The next size, 1-gallon pot, is grown for local residential and commercial (e.g., landscaper) end users and commands a higher unit price. Although roughly the same number of species are available for both restoration and residential/commercial markets, certain growers are able to produce small quantities of rarer species that may not figure into restoration designs for a typical USFWS project (USFWS 2014).

The 1-gallon variety is also sold retail or wholesale to residents, garden centers and municipalities located in other parts of south/central Texas (e.g., San Antonio-Austin), with these municipalities being the northern distributional limit for some of the LRGV’s thornforest species. Seedling bands are grown only on contract since their container size and composition (i.e., cardboard) places limits on how long they can be effectively managed prior to outplanting. Larger containers (3- to 10+-gallon pot) are reserved for older seedlings or mature specimens that might have been rescued from areas where development is imminent. As could be expected, demand for these larger containers is comparatively minor with the notable exception of Sabal palms (*Sabal mexicana*), which are transplanted from bare root after 10 to 25 years of age.

There is also a regional market for seedlings among private land managers, within both the developed matrix and ranchland portion of the LRGV. In the ranchlands, corporations have begun to investigate restoration of both thornforest and grassland on reclaimed oil and gas well infrastructure. Other private landowners in close proximity to USFWS lands also periodically purchase seedlings for their own restoration efforts, especially in association with conservation easements and/or as voluntary actions in conjunction with a limited number of safe harbor agreements for listed species.

Although a handful of thornforest species lend themselves to artisanal crafts derived through woodworking (e.g., mesquite (*Prosopis glandulosa*)), there is no substantive regional industry for this or anything related to timber usage. Similarly, research use accounts for an insignificant demand for seedlings. Restoration work in bordering regions of Tamaulipas and Nuevo Leon, Mexico by Pronatura Norestre and other non-profit and government groups often makes use of many of the same species. But, there is currently no demand or, perhaps more importantly, current regulatory vehicle that would easily permit flow of plant material between the LRGV and these locations.



Seedling “bands” are currently produced in the highest volumes and are utilized for habitat restoration activities on public lands typically owned by USFWS.



2

Reforestation Opportunities

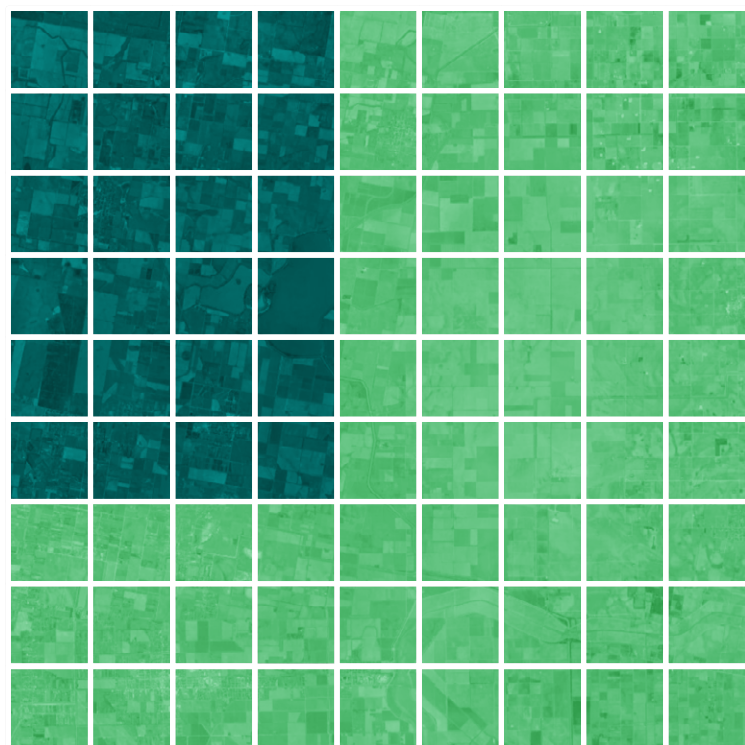


The Thornforest Conservation Partnership (TCP), a coalition of agency, NGO, industry and research institution stakeholders formed in 2018, has identified a regional approach to strategic restoration that would facilitate efforts to expand these markets (TCP 2020).

The Thornforest Conservation Plan utilized an extensive modeling process to determine suitability and placement of lands with the greatest capacity to influence habitat connectivity for a number of wildlife species of special concern. The group is now formulating a business plan to address restoration of these lands over the next 10 years. Approximately 24,000 acres of public lands are considered imperative to this effort, along with another 57,000 acres (81,000 acres total) of privately owned lands.

As a whole, demand is expanding for LRGV thornforest seedlings. In particular, the public land restoration market has been growing in the past decade to accommodate increasing investment from agency, nonprofit and business sources. The unique regional challenges of restoring thornforest (see section 1) in combination with a strong supply of USFWS lands that are still in row crop production will yield additional opportunities to grow this market in years to come. USFWS expects to retain a percentage of these working lands under lease agreement with local crop producers going forward, as this arrangement generates funding to help offset restoration costs elsewhere within the refuge system (USFWS pers. comm.). However, signals for increased seedling demand remain strong and could be legitimized through evolving restoration methodologies (e.g., higher planting rates per acre) and growth within USFWS' land acquisition capacity.

Approximately 81,000 acres of public and privately owned lands are targeted for restoration as part of the Thornforest Conservation Plan.



Demand within the commercial market has also grown in the past decade as more residents and municipalities within the LRGV have become cognizant of the advantages in aesthetics and maintenance provided by natives (Cabrera et al. 2013).

While the species palette will likely remain less diversified in this sector as compared to restoration, expanding urbanization, an increasingly complicated situation regarding regional water allotment, and prospective changes within municipal/HOA codes (e.g., landscaping: acceptable plant lists) all point to increasing demand (Kannan 2012, TWDB 2016). Demand for LRGV-sourced seedlings is also present in the San Antonio-Austin region and is also predicated on these same factors in addition to climate change projections for the Texas region as a whole (EPA 2016).









In addition to regional demand, demand for LRGV-sourced seedlings is also present in the San Antonio-Austin region.

Albeit the least understood market for thornforest seedlings, private lands restoration does account for a small portion of current demand.

These are land managers with acreage beyond what would be typically considered residential (e.g., >1 acre) and who are likely managing these parcels for one or more objectives in wildlife conservation, ecotourism (e.g., guest ranches), agriculture production, hunting and/or resource extraction. Existing mechanisms for some of these projects include agency programs (e.g., Conservation Reserve Program, EQIP, State Acres for Wildlife Enhancement) and wherein an expansion in scope and recruitment efforts could serve as a focus for increased demand in seedlings. An emerging area of interest that could also improve demand on private lands is that of remediation for permanently retired oil and gas production infrastructure. Reclamation of these surface features (e.g., well pads, service roads, etc.) and existing pipeline easements with both native and non-native grass/forb mixes has been playing out for the better part of two decades in the south Texas region but could also eventually be cost-effective for thornforest establishment in some cases (Smith et al. 2010, Pawelek et al. 2015).

Table 1. Summary table of nurseries interviewed in the region.

Nursery type	Production capacity (container/hardwood)	Current production level as a percentage of total potential production capacity	Seed source	% of seed need met through annual collections vs. current seed inventory	Unique attributes of nursery	Markets nursery sells into
 Federal	110,000	39%*	50-75% wild 25-50% seed orchard	90%	sub-contracts with all other regional nurseries to attain target seedling quantities	Public land restoration
 State	80,000	93%	25-50% wild 25-50% unknown	75%	located outside the LRGV	Public land restoration
 Private	80,000	53%	>75% wild	75%	also a producer of exotic ornamentals	Public land restoration private land restoration commercial
 Private	30,000	40%	>75% wild	60%	part of a working 1,000+ acre ranch	public land restoration commercial
 Private	60,000	36%	50-75% wild 50-75% seed orchard	50%	non-profit status, unable to sell commercially to the public	public land restoration private land restoration
 Private	150,000	100%	>75% wild	50%	extra-regional clientele: Austin-San Antonio	public land restoration commercial

*Normally operates at maximum capacity on a year-to-year basis, but planned improvements to infrastructure reduced this to 39% for the survey year.

3

Labor and Employment



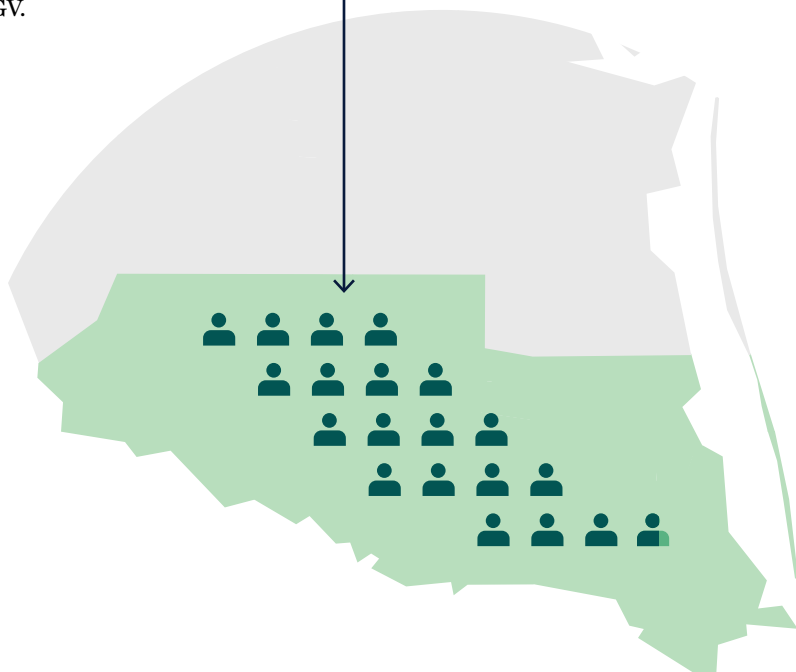
Overview of employment within the nurseries interviewed

To better characterize employment within the LRGV's native nursery sector, it is important to note that production is a year-round activity for both markets, but the majority of work for public land restoration by federal/federal sub-contractees (e.g., all respondents, see section 2) runs from March to October. The planting season (October through March) bookends this busy interval in seed collection, propagation and general plant care.

The federal nursery interviewed for this study was being operated by three permanent full-time equivalent staff members and included seasonal, full-time work for one other person. This arrangement has persisted for at least the past two seasons; however, the seasonal position's wage is typically contingent on receiving funds through annual grant submissions. Of the four private nurseries interviewed, none featured more than one permanent, full-time employee and this was the manager or owner/manager. At three of these nurseries, only seasonal assistance from one to two additional workers was required during the "busy" season (March through October). This situation has not significantly changed for any of these nurseries over the past two to three seasons. At a fourth private nursery, the manager was the sole individual engaged in daily nursery operations. The situation was vastly different for this nursery in the previous two years, when three additional staff were present. Employment numbers for the state-run nursery were not available. Overall, less than 20 full-time individuals were cumulatively engaged in 2020 thornforest seedling production (total: ~337,000) at the respondent federal/private nurseries.

A focus on intensive management for only part of the year allows the majority of private owner/managers to rely on seasonal assistance (part-time or full-time) to achieve production goals for restoration seedlings. This is a key factor to maintaining profit margins (private) or staying within budget (agency) at the scales on which these parties operate. With the exception of one respondent, sole proprietorship is clearly the norm for private, native seedling nurseries in the LRGV.

Overall, less than 20 full-time individuals were cumulatively engaged in 2020 thornforest seedling production at the respondent federal/private nurseries.



Overall, one could say that both an entrepreneurial outlook and a strong public service element have guided most of the respondent nurseries into their current roles. Many managerial-class respondents were deeply aware of the fundamental role that their product has played in shaping a commitment to conservation in the LRGV.

Insights into technical knowledge of nursery personnel

Technical knowledge is at a premium for the highly specialized niche that LRGV native plant producers fill. All nurseries annually produce at least 12 individual species, and some have the capacity to reliably grow in excess of 70 native species for the various markets. It's important to note that the current generation of LRGV producers is essentially the first generation of their kind. Public land restoration dates back roughly 60 years in the region, but requisite breakthroughs in production technique for many species were still lagging into the 1980s and beyond (Vora 1989). Some of this survey's respondents were the pioneers of these techniques, so they have an intense understanding of the process.

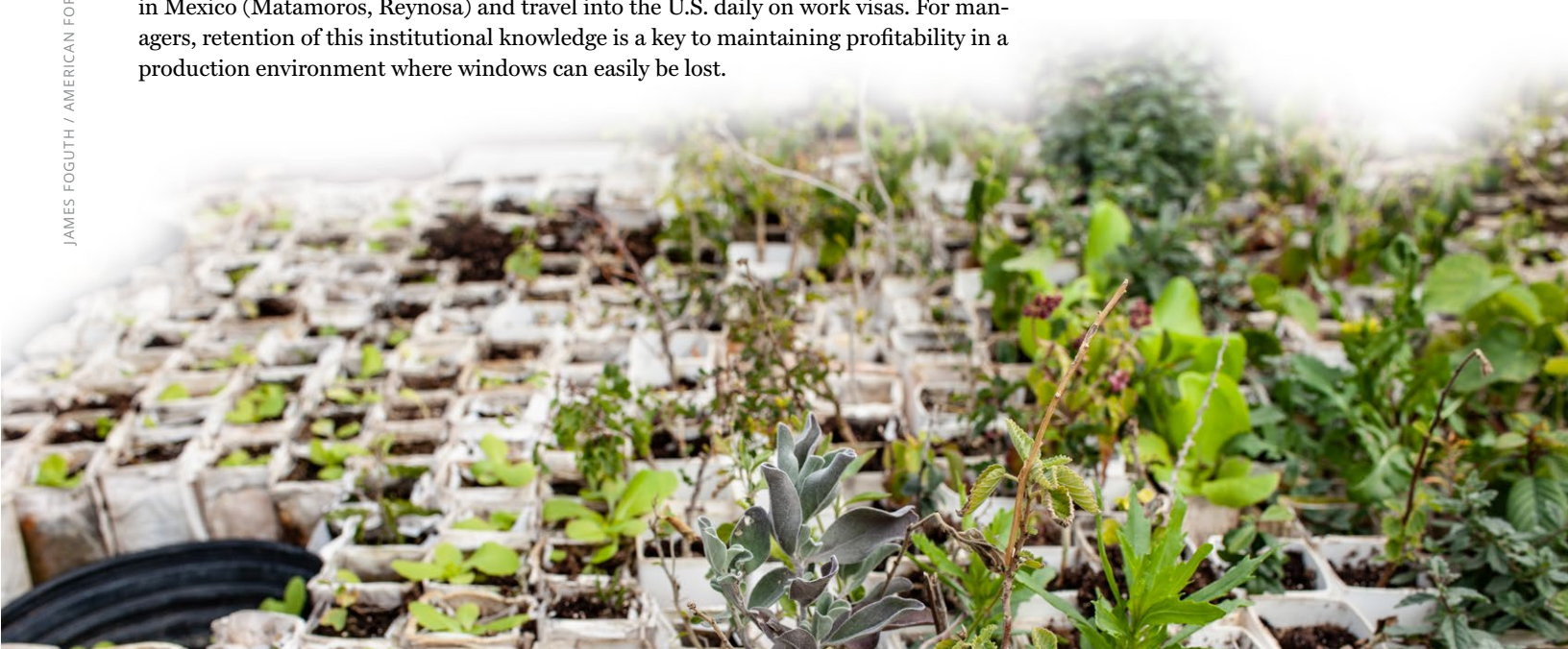
As sole proprietors, these individuals are also accustomed to wearing all the proverbial hats necessary to make their operation profitable for their scale. Further, the process is still intimate for many nursery personnel as they participate in all aspects of a production process, which typically begins in a natural setting for wild seed collection. Another common thread for most of the private nurseries is that their operation began as a sideline to a full-time occupation. Several existing nursery personnel have also made professional transitions into the native trade from the agricultural nursery sector, especially as it relates to regional citrus production. These individuals likely retained an early advantage as they possess a skillset that includes prior nursery management and at least a working background in horticultural principles. Overall, one could say that both an entrepreneurial outlook and a strong public service element have guided most of the respondent nurseries into their current roles. As noted in survey interviews, many managerial-class respondents were deeply aware of the fundamental role that their product has played in shaping a commitment to conservation in the LRGV.

Part-time and seasonal positions at private nurseries tend to be recurrently occupied by the same individuals if they are available. Seasonal work in other industries (e.g., agriculture) can supplement some of these individuals during the October through March "off season" in the nursery. Some of these same individuals are residents of nearby cities in Mexico (Matamoros, Reynosa) and travel into the U.S. daily on work visas. For managers, retention of this institutional knowledge is a key to maintaining profitability in a production environment where windows can easily be lost.

In the LRGV, all nurseries annually produce at least

12
individual
species.

Some have the capacity to reliably grow in excess of 70 native species for the various markets.



4

Challenges and Opportunities

facing the region's nursery sector in scaling up production



Based on survey responses and general developments in conservation awareness over the past one to two decades, there is little doubt that demand for LRGV thornforest seedlings is rising in the key markets of public land restoration and commercial use.

Scaling up existing production levels to meet demand in these sectors and other outlets, as yet untapped, is essential, but there is a list of long-term challenges to address before that happens. In fact, the issue facing the region's nursery sector right now is how to maintain current productivity. While we accept that a nursery's physical infrastructure will periodically require replacement, what often escapes calculation is even more fundamental: attrition among nursery owners. Profit margins aside, the LRGV sector is susceptible to high attrition due to the steep learning curves that come with required proficiencies for a large number of hardwood species. However, what compounds this reality at the moment is the impending loss of several key growers due to retirement, likely in the next several years. In an industry that all told has rarely counted more than 10 growers at one time, it will be hard to pick up this lost slack. Growers have, of course, eventually found ways to do this in the past, but the more far-reaching question involves sustainability. Can the industry as a whole ever be in a place to offer significant production increases if smaller sole proprietorships remain the norm, some of which may not be interested or capable of expanding to meet greater demand?

While the scale is disproportionate, real world analogs and other lessons for this same general situation can be found within sectors of the LRGV's agricultural industry. In citrus, for example, despite demand remaining high and increasing for certain varieties, much of the traditional land base for groves has been lost in recent decades to urban development facilitated by factors that include parallel conditions (e.g., retirement among older growers). Where a dozen packinghouses and hundreds of growers were counted as recently as 20 years ago, the list is now down below a handful a sheds and less than 100 producers. However, the product quality is as strong or stronger than it has ever been, and demand has led a pair of new producers into the region in the past decade. These groups have not only diversified the industry's layout but have found ways to begin scaling production up again with greater efficiencies in place.

For some nurseries, productivity is contingent on operating budgets that can be subject to appropriations at national and/or regional levels. The loss of several positions at one private nursery in the last year demonstrates a course correction at one or more of these levels that will have a significant impact on at least the current year of production destined for public lands restoration. If this budget impasse becomes permanent, the immediate challenge for the nursery sector then becomes how to compensate for this loss within the network of remaining growers. This scenario is illustrative of how important labor is to all aspects of nursery production.



Can the industry as a whole ever be in a place to offer significant production increases if smaller sole proprietorships remain the norm, some of which may not be interested or capable of expanding to meet greater demand?

Nonprofit trade organizations have always played a crucial role in helping to organize the citrus industry and producers of other regional commodities by leading the charge into new markets, working with individual growers to solve key production issues and serving as a strong voice for additional support at both state and federal levels.



In terms of seed collection, LRGV growers sourced nothing less than 50% of the year's production from collection efforts made in the wild (vs. seed orchard) and several sourced 75%-100% from this environment (Section 2).

The investment in time required to conduct these collections has far-ranging effects and influences the disparity between production capacity and current production levels for most growers. Similarly, the lack of a labor pool that is proficient in nursery support roles also has long-term implications for future productivity in the region. These are comparatively low-wage positions to begin with and many individuals, as in most geographies, gravitate toward higher paying positions as economic conditions allow. In the LRGV, these competing pools for skilled labor include construction, manufacturing and service sectors.

Opportunities to address challenges

Seedling production is key to realizing comprehensive and meaningful long-term goals in the conservation of native ecosystems throughout the LRGV. By extension, this production will also serve to expand a strong economic focus on ecotourism, which generates a gross regional product of \$135 million per year (USFWS 2019). Further, the social value of this output will appreciate for generations to come as the region continues along its urban trajectory and the benefits of restored areas are viewed consistently positive by a greater cross-section of the public. This re-evaluation will likely be the product of science-driven revelations into the ecosystem services (e.g., flood mitigation, carbon sequestration in the face of climate change, etc.) and quality of living (e.g., recreation, open space, etc.) values that forests provide to area residents. These are not nominal considerations in a region that annually ranks near or at the bottom of many economic indexes, including one of the highest urban poverty rates in the U.S. (Cohen 2013). This situation is exacerbated by a lack of access to natural areas for much of the minority-majority Hispanic population and underscores serious health disparities driven home by the COVID-19 surge that ravaged this trans-border area during summer 2020 (Manusov et al. 2020, Schultz et al. 2020).

Many of the aforementioned challenges to native nurseries in deep south Texas could be mitigated by finding additional venues of support for this industry. For example, the parallels in recent restructuring in the Texas citrus industry, mentioned earlier, are not based on the efforts of individual growers alone. Nonprofit trade organizations have always played a crucial role in helping to organize the citrus industry and producers of other regional commodities by leading the charge into new markets, working with individual growers to solve key production issues and serving as a strong voice for additional support at both state and federal levels. Although at least one respondent nursery actively belongs to the Texas Nursery and Landscape Association (TNLA), this group is

more typically associated with ornamental growers of a larger scale. While the current size of the LRGV industry makes formation of a distinct, regional trade organization unlikely in the short term, a similar role with some of these same objectives could be derived through the membership of individual nurseries in an existing or newly created nonprofit organization focused on thornforest advocacy. The shared resources and collective nature of decision-making in this enterprise would spread out some of the risk inherent to scaling up for increased demand.

Another major opportunity to assist this native nursery sector would be in developing stronger connections with regional universities and school districts to address needs in both research and career pipelines. Researchers at both Texas A&M University-Kingsville (TAMUK) and the University of Texas-Rio Grande Valley (UTRGV) have been periodically involved in experimental contributions toward regional restoration since the 1960's but more consistent participation is needed. Many science-related questions surrounding LRGV thornforest restoration remain unanswered, including techniques in individual species propagation, optimal restoration designs and post-plant success monitoring. These discrepancies in our knowledge need to be addressed before additional commitments on nursery production are made, especially in response to a changing climate and its effect on individual species. USFWS and TPWD have typically sponsored much of this work as opportunistic grant funding has become available to individual researchers. However, an investment in long-term funding is needed to create a dedicated program within one or both of these universities to sustain multi-year studies on both private and public lands. TAMUK's South Texas Natives program is heavily invested in both restoration science and landowner-driven outreach but most of this work to date has revolved around native grassland restoration throughout Texas.

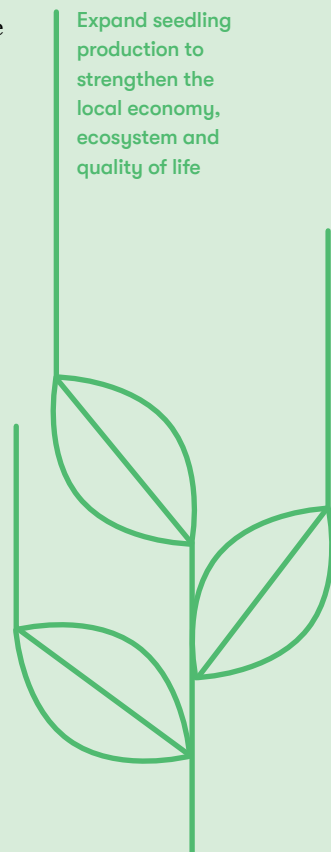
University-led initiatives also hold a prospective key to some of the labor issues that could prevent an effective scale-up in production. Educational institutions are traditionally looked upon to create career pipelines for employers in local economies and the same concept would clearly apply to thornforest nurseries in search of skilled labor. A university-sponsored nursery could provide hands-on training to both undergraduate and graduate students either interested in careers therein or in conducting meaningful research to advance the industry. UTRGV is currently at the initial stages of such a nursery-research concept on their Brownsville campus and this undertaking could help provide industry assets over time. The same principle would apply to local community colleges and school districts, with students gaining applicable real-world skills earlier that would be advantageous on any future recruitment route for them.

Opportunities at a Glance:

Expand seedling production to strengthen the local economy, ecosystem and quality of life

Utilize additional venues of support for the industry

Strengthen connections with regional universities and school districts



5 Update



In 2021, American Forests (AF) is working to catalyze progress on these identified challenges to LRGV nursery production.

A new staff position was created in June of this year to assist AF's long-standing regional partner, USFWS, with annual seed collection goals for over 30 tree species utilized in thornforest restoration. A guiding objective of this work is to maintain, and ultimately expand, the genetic diversity found in USFWS' restoration outplantings by harvesting and banking seed from disjunct tree populations throughout south Texas. This diversity carries additional significance in the face of a changing climate, projections for which indicate hotter and drier conditions on average by mid-century, if not sooner, for the region (Wehner et al. 2011, Nielson-Gammon et al. 2020). These actions enhance the persistence of genetic variation within forest species, and, in turn, fitness derived from these variations may be instrumental in achieving greater climate resilience in outplantings (Ledig and Kitzmiller 1992, Axelsson et al. 2020, American Forests et al. 2021). The region's increasing rate of urbanization also places a premium on seed harvest from privately-owned sites with in situ thornforest remnants that may be lost to development in coming years (Borders et al. 2011). The inference here is that variation found at these sites will find a repository within the program's seed bank and, ultimately, dispersal through restoration outplantings despite conversion of the original collection site.

In conjunction with UTRGV, AF is also making a down payment on the expansion of both research and job skills necessary to realize an increase in seedling production capacity within the LRGV. Undergraduate students hosted by AF have recently been recruited into a multi-year university program and will be studying seedling production techniques alongside AF and USFWS staff. The goal of this study is to produce information that will be of direct use to nursery managers in their efforts to produce seedlings more efficiently in coming years. This experience is expected to also serve as a capacity multiplier for thornforest restoration research in general as program students transition into undertaking Master of Science studies at UTRGV's College of Science. In the course of this work, students will also be exposed to nursery environments and are expected to become productive members of these operations as their time and coursework allow. This assistance (e.g., seed collection, propagation, thinning, watering, maintenance, etc.) is critical as it will create a revolving base of experience that nursery owners can draw from to fill open positions. Additionally, this exposure also sets the stage for increased seedling production as some of the individuals from this program make the transition into work/entrepreneurship and become federal sub-contractees in coming years. This is a meaningful approach to stemming some of the production capacity losses that manifest with attrition among private nursery operations.

A USFWS staff member picking seeds on a private ranch in 2021. The region's increasing rate of urbanization places a premium on seed harvest from privately-owned sites with in situ thornforest remnants that may be lost to development in coming years.



The potential opportunities for expanding thornforest restoration in the Lower Rio Grande Valley are massive. But so are the challenges, and increasing seedling production is at the top of the list. If we accept these challenges and choose to face them with the right investment of funds and capacity, the resulting economic development and biodiversity protection will leave a powerful and long-lasting legacy in this unique region.

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