



August 2023

United States Forest Nursery Landscape Assessment



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Introduction

New Leaf Climate Partners is pleased to share our assessment of the seedling nursery market in the continental United States.

We came to this project believing that:

- 1) the critical role of specialist nurseries in the US restoration and reforestation value chain was underappreciated;
- 2) the nursery sector was underfunded;
- 3) this combination posed a risk to the necessary and ambitious growth expected in the domestic reforestation market; and
- 4) a specialist finance facility, tailored to the needs of this market, would help retool the sector for the 21st century.

Our research has validated those beliefs and enhanced our conviction. We look forward to the next phase of work, bringing the first-of-its-kind US Nursery Finance Facility to market.

Funders

New Leaf's research and market engagement was guided and supported by two strategically-aligned organizations. Each brings deep networks and expertise developing and implementing innovative approaches to reforestation and rural economic development.

Commissioned by:



<https://www.usendowment.org/>

Supported by:



JM Kaplan Fund Inc.

<https://www.jmkfund.org/>

Forest Nursery Landscape Assessment

2. Approach



Stage 1: Sourcing

The inspiration and primary source for the review was the US Forestry Service Database of forest nurseries and seed suppliers that is maintained by the Reforestation, Nurseries and Genetic Resources (RNGR) team.

As we researched each of the names in that data set, we added new nurseries, primarily those identified as having a land restoration and timber planting orientation.

No list can be truly exhaustive – and we will continue to adjust and add data over time – but we believe this is a detailed representation, and more comprehensive understanding, of the supply-side of the seedling market in the United States.

348
New Leaf



1,124
National
Nursery
& Seed
Directory

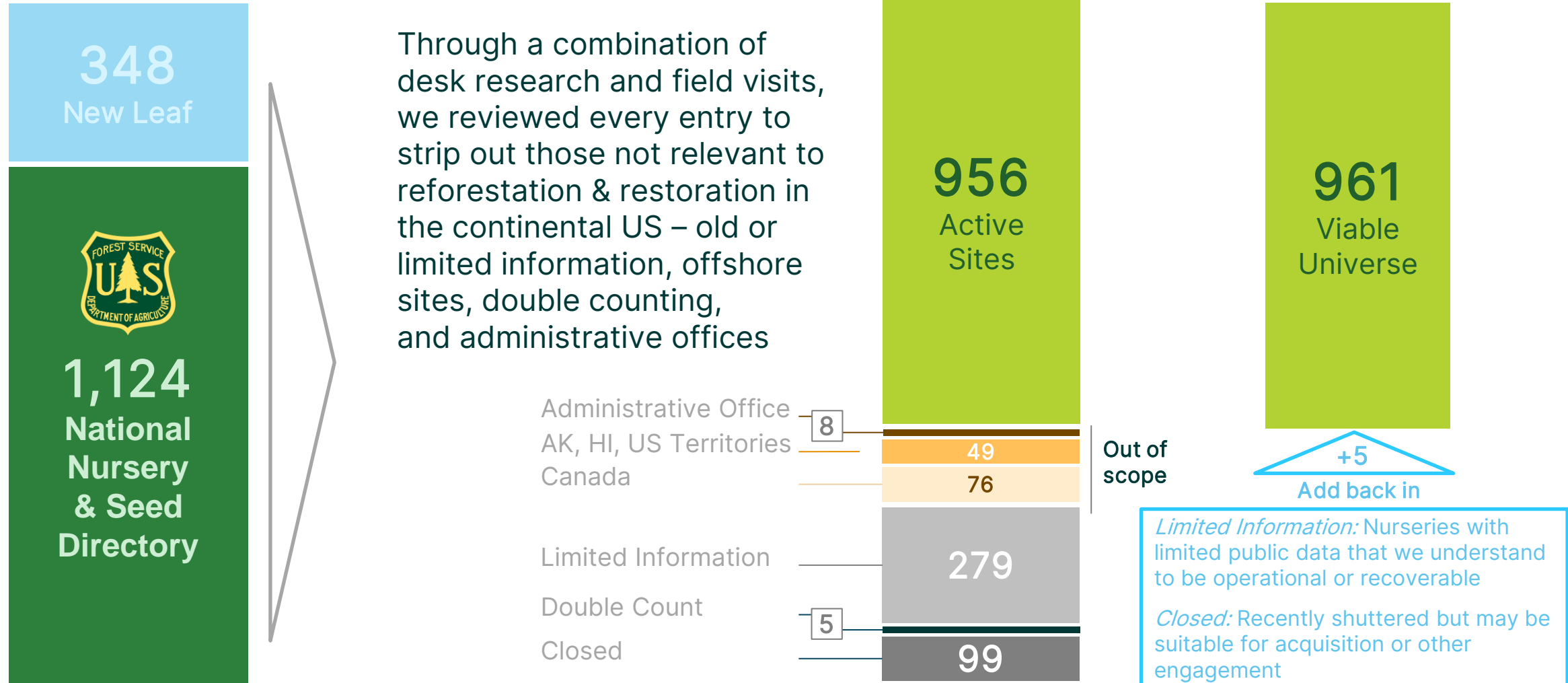


Manual additions from state forestry and nursery lists, keyword searches, aerial mapping, interviews, and other ad hoc sources

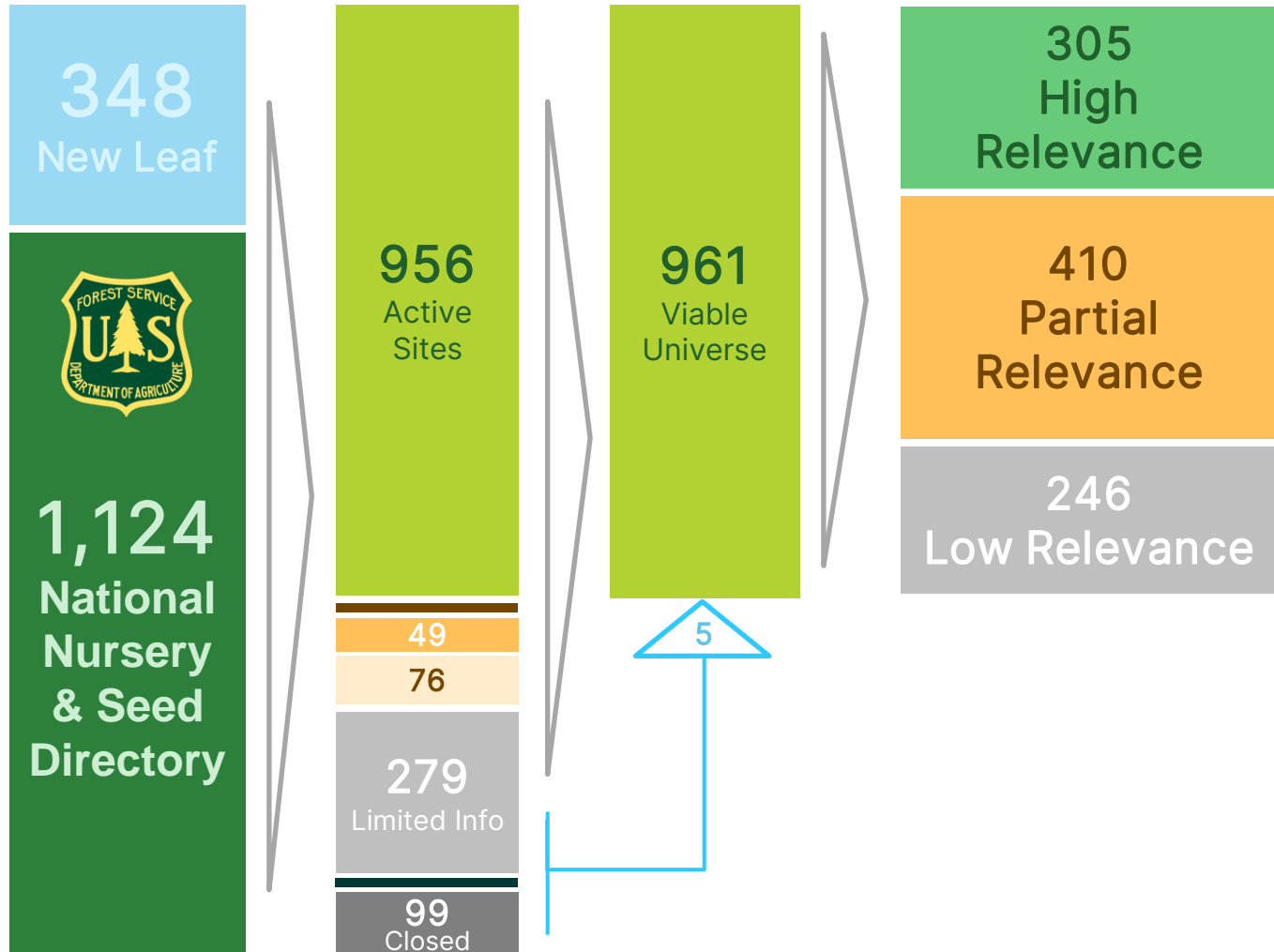


RNGR database of nurseries based on data pulls from December 2022 and January 2023

Stage 2: Sorting and Cleaning



Stage 3: Prioritizing



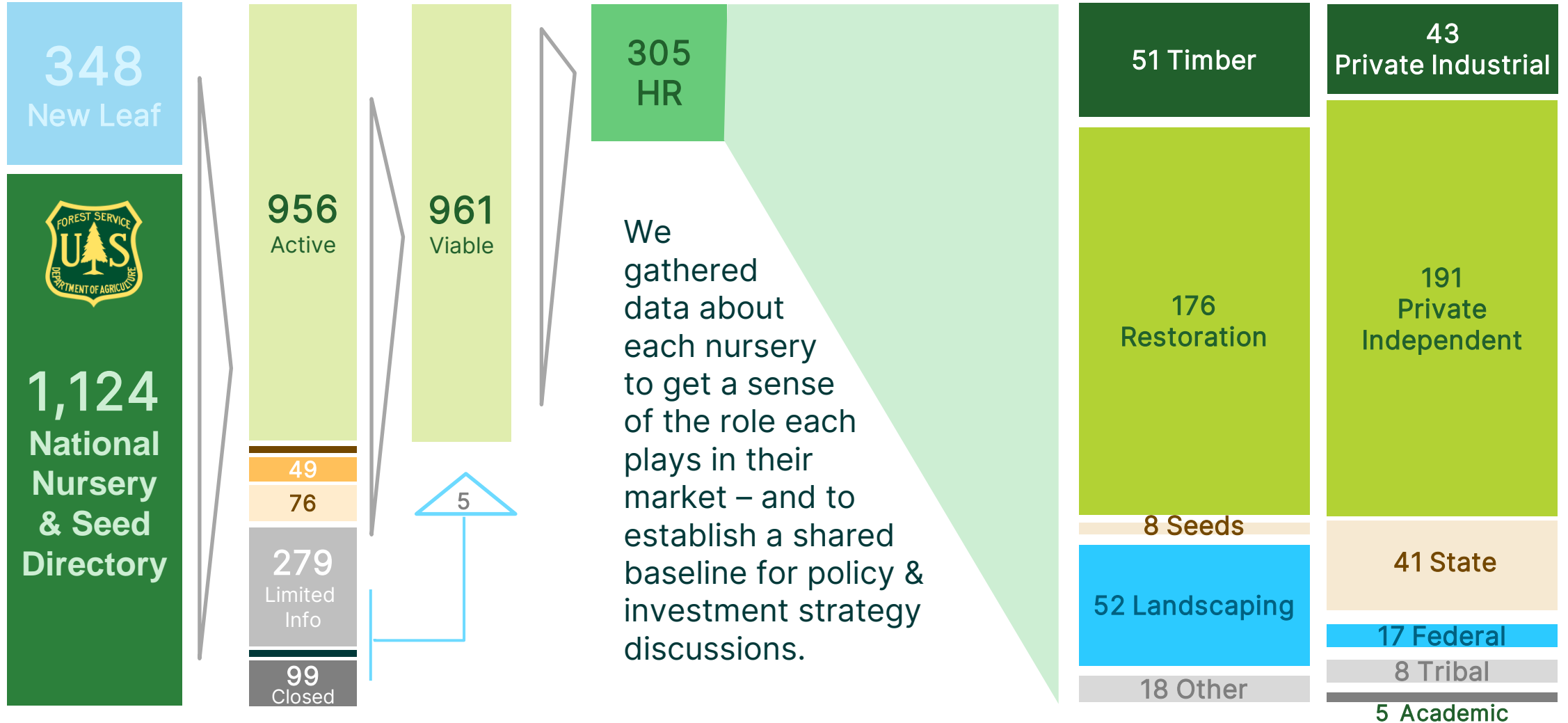
We rated entries for applicability to reforestation:

- > **High relevance** nurseries offer large volumes (e.g. 20,000+) of small, young tree and native plant seedlings.
- > **Partial relevance** nurseries include landscape nurseries skewing toward ornamental plants and retail buyers.
- > **Low relevance** nurseries include producers specializing in e.g. forest orchids or prairie wildflowers.

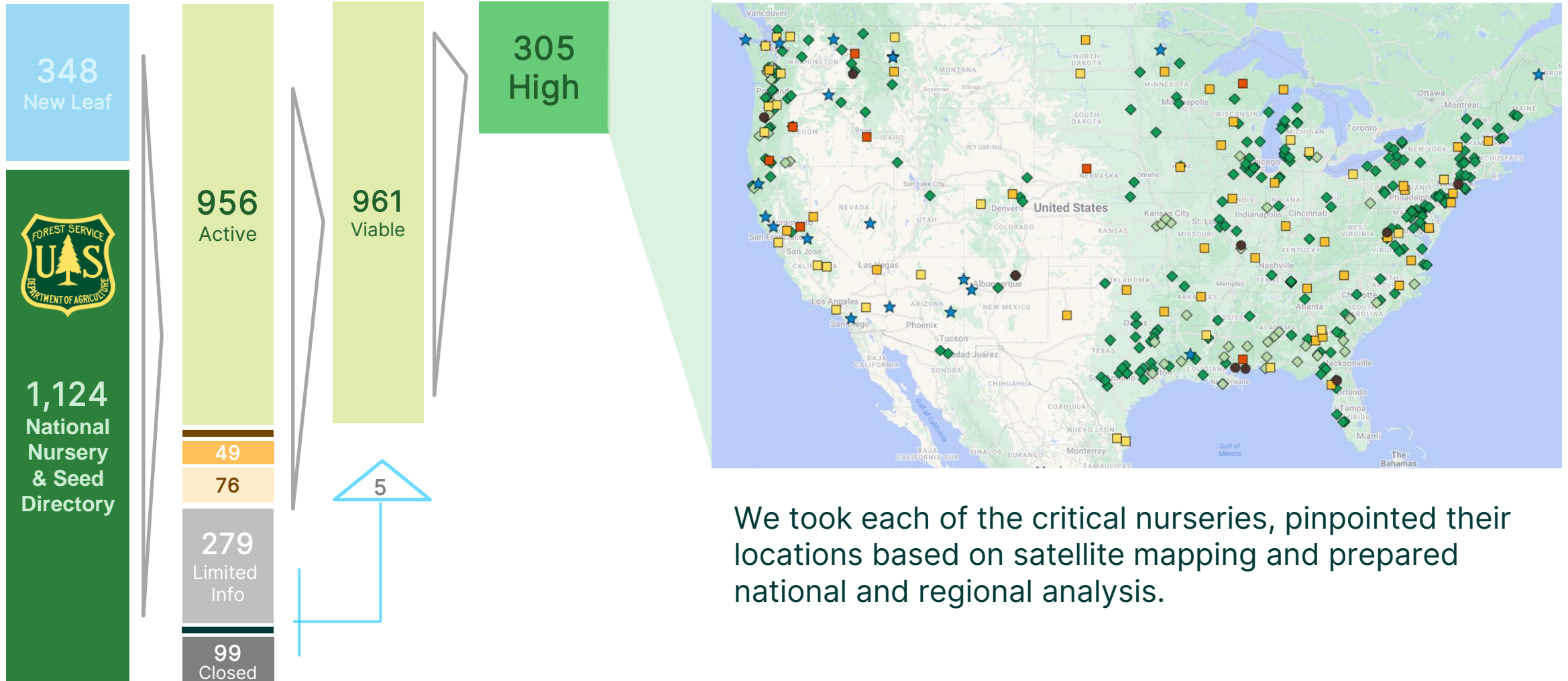
Entries can be upgraded if they change business plan to focus on native plants, conservation or tree propagation.

This process yields **305 highly relevant nurseries** which make / could make critical, active contribution to the reforestation value chain, and merit further analysis.

Stage 4: Profiling

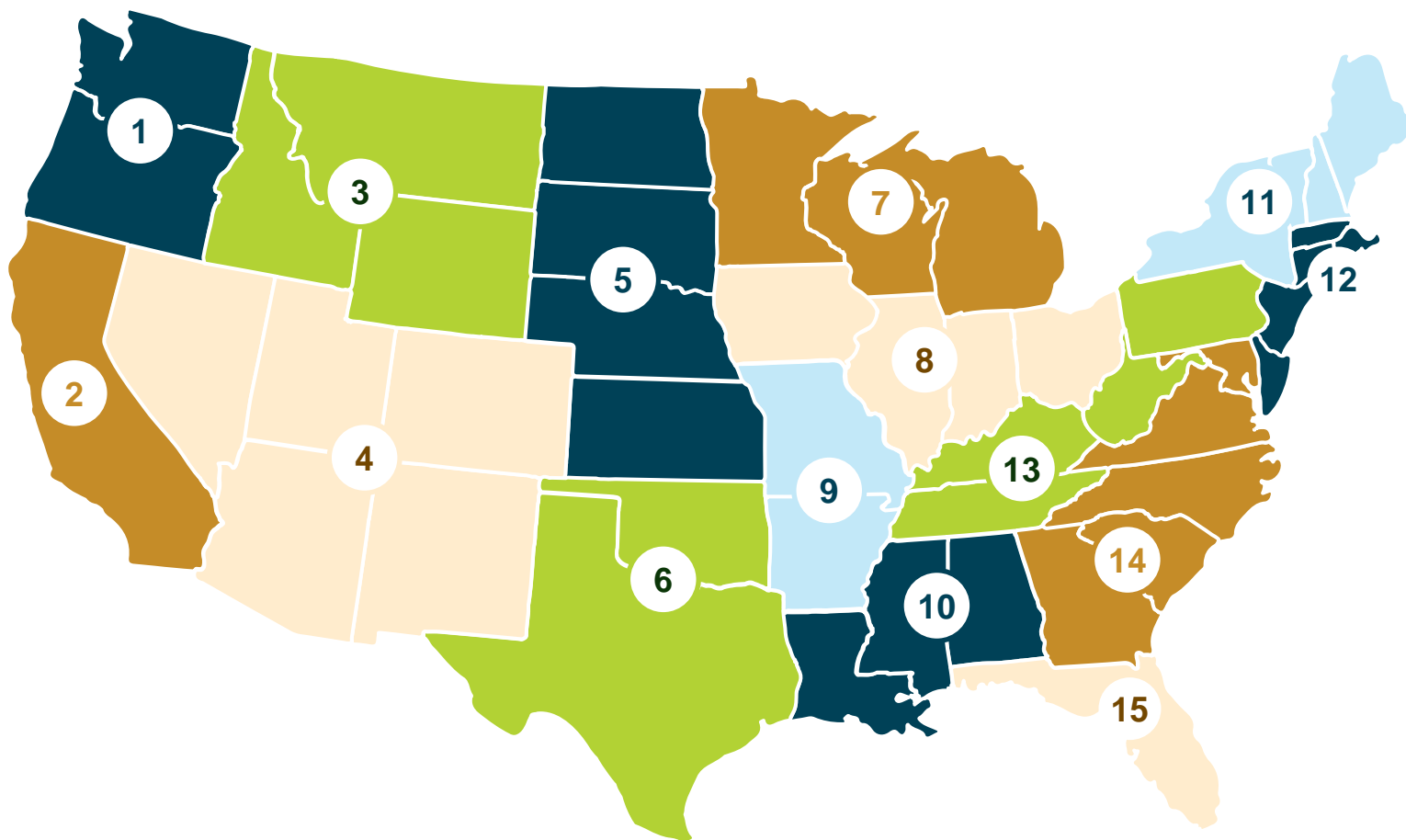


Stage 5: Mapping



We took each of the critical nurseries, pinpointed their locations based on satellite mapping and prepared national and regional analysis.

Stage 6: Grouping



We categorized the nurseries into 15 sub-markets to increase the level of detail and applicability of our analysis without losing sight of wider implications and opportunities.

NLC regional cohorts are determined by mapping climate conditions, native species zones, forestry industry dynamics, threats, and planting needs.

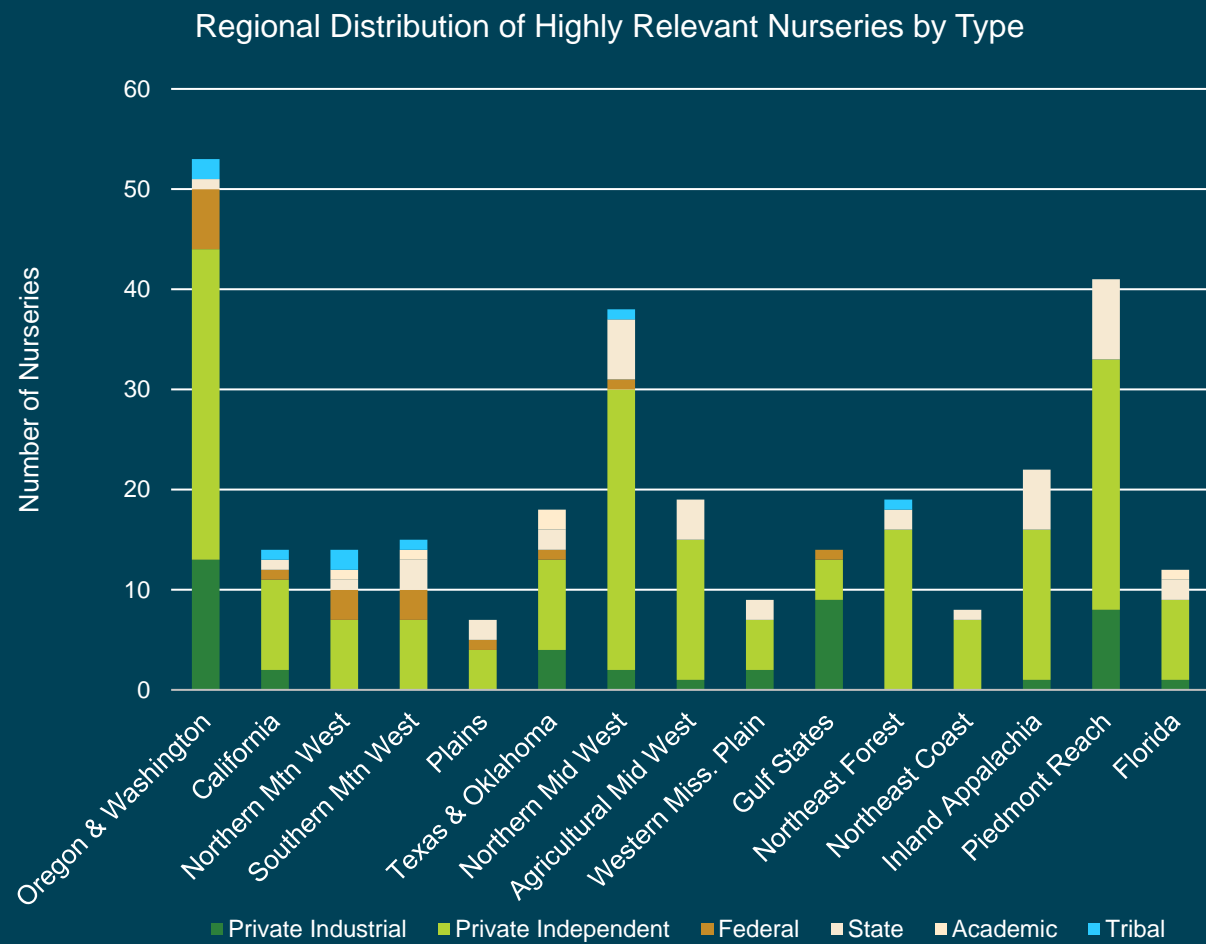
- 1 Oregon & Washington
- 2 California
- 3 Northern Mountain West
- 4 Southern Mountain West
- 5 Plains States
- 6 Texas & Oklahoma
- 7 Northern Midwest
- 8 Agricultural Midwest
- 9 Western Mississippi Plain
- 10 Gulf States
- 11 Northeast Forest
- 12 Northeast Coast
- 13 Inland Appalachia
- 14 Piedmont Plateau
- 15 Florida

Forest Nursery Landscape Assessment

3. Analysis



Observation 1: Nursery locations are coherently spread across the US



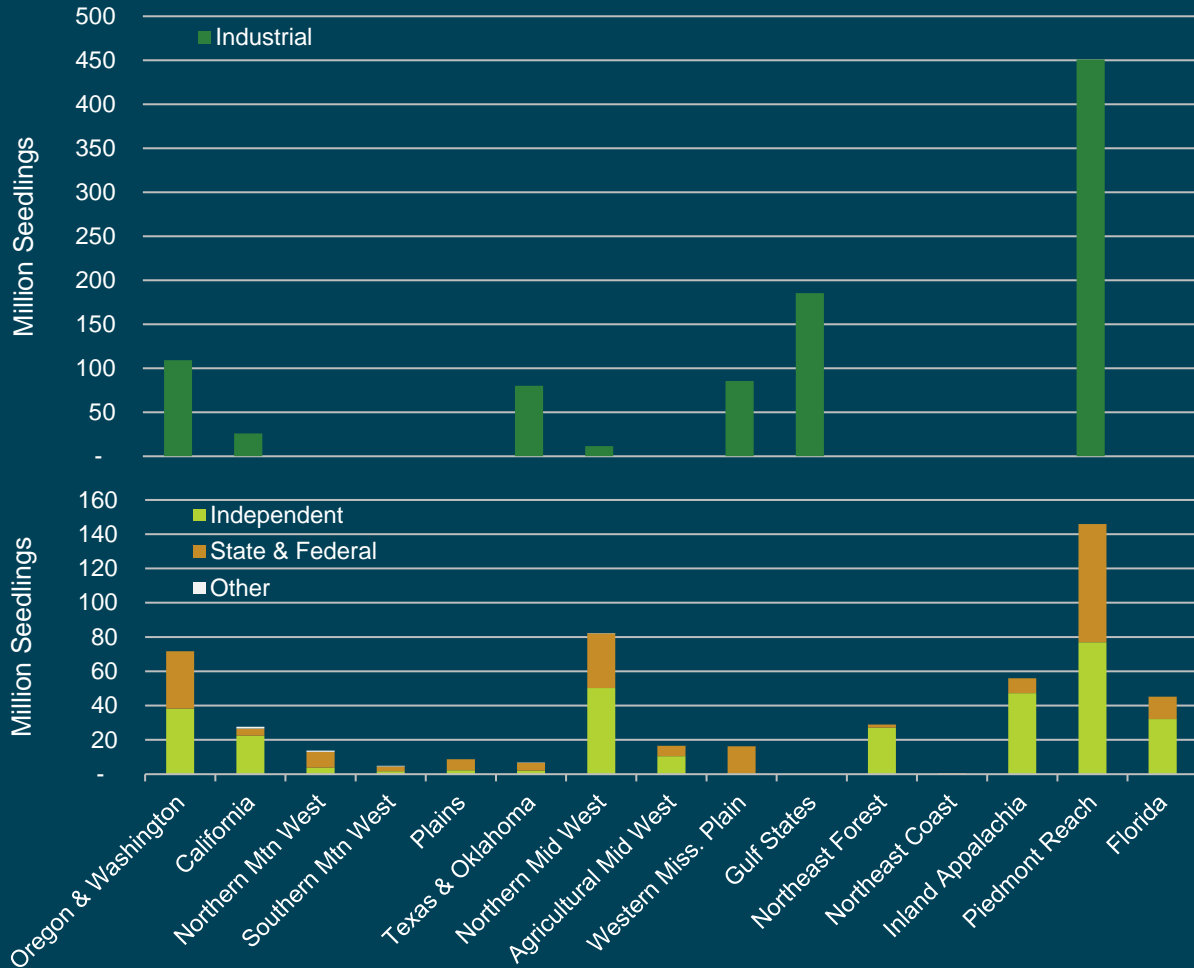
Based on New Leaf’s cohesive climactic, economic and thematic zones, we find that nursery footprint across the 300+ high priority locations is distributed across the country, aligning with:

- > Developed markets PNW and Piedmont, with supportive climates and strong industry footprint
- > Legacy forest markets (e.g. Northeast Forest – New York and Maine) and regions with nursery hubs for other plants (e.g. Inland Appalachia – McMinnville, TN, Indiana PA)
- > Low presence in lower priority reforestation and restoration markets i.e. Northeast Coast, Plains

Notable other takeaways from nursery distribution are:

- > The strong independent nursery landscape in the Northern Midwest with legacy Christmas tree nurseries supporting soil conservation, smallholder forest planting
- > The limited number of nurseries in California despite high forest area, timber market, strong agricultural sector and clear demand
- > Preponderance of industrial nurseries in the Gulf States, where there is the strongest concentrated timberland ownership

Observation 2: Seedling volumes, on the other hand, are significantly more concentrated



Although physical nurseries are coherently and evenly distributed, the production volume of seedlings is highly concentrated into a handful of regions:

- > Piedmont (GA, SC, NC, VA) accounts for 40% of the national total due to its supportive climate and deep industry footprint
- > Adding in the three other constituents of the Southern industrial timber belt – the Gulf States, Arkansas, Missouri – accounts for 60% of total supply
- > Texas and Oklahoma also have a strong showing through ArborGen’s assets along the Pine Curtain

The non-industrial supply chain is also highly concentrated geographically on a seedling production basis:

- > PNW and Piedmont zones retain key roles, driven by state and federal operations and climate, economic drivers for a healthy independent market
- > Inland Appalachia (and VA from Piedmont) have healthy production as the Northern-most long growing season to feed conservation and retail plant demand along the coast
- > Florida, California have 1-2 large independent suppliers
- > Northern Midwest (MN, WI, MI) conifer supply and legacy state nurseries play a crucial role for volume in that region

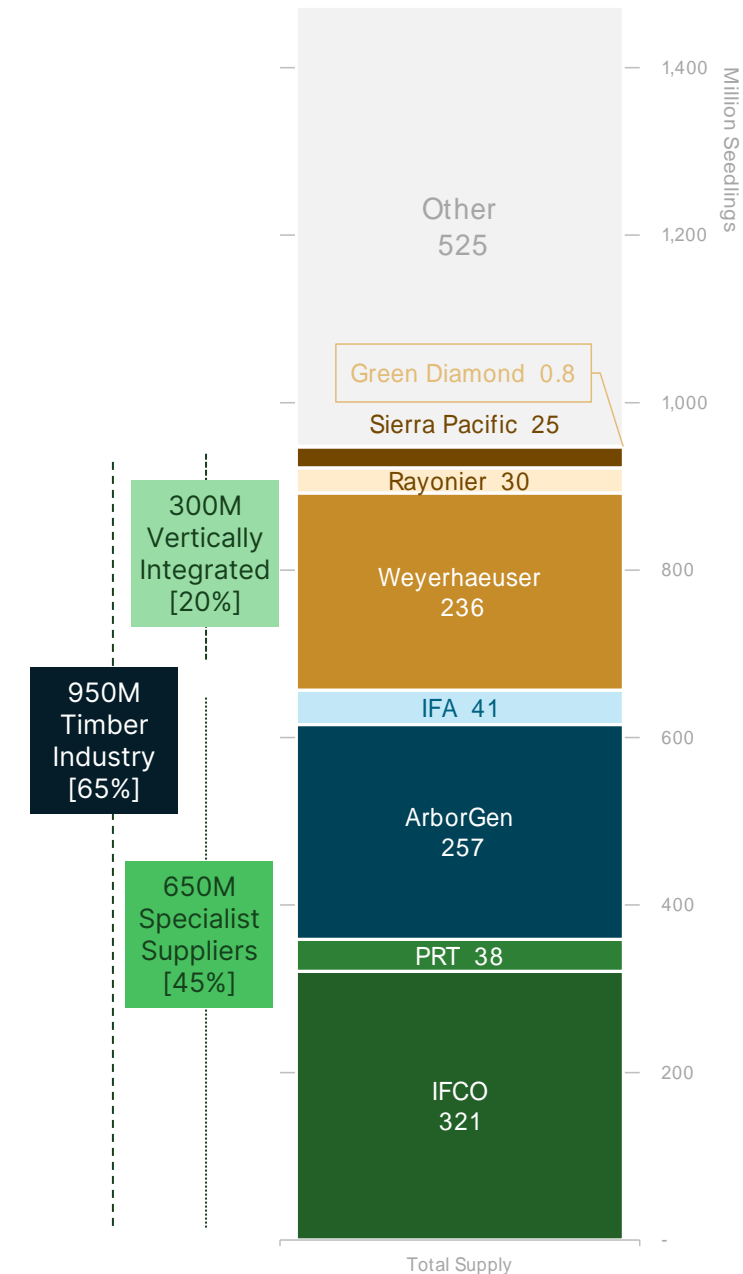
Observation 3: Industrial Nurseries Dominate the Supply Chain

Nurseries are the backbone of the timber industry across the US and have benefitted from extensive funding and support over the last 75+ years through investment in physical infrastructure, genetics and operating innovations. The diversity and flexibility of timber's contribution to seedling supply has gradually decreased over time as:

- > Timberland owners have consolidated through mergers, acquisitions and closures – Georgia Pacific, International Paper, Plum Creek Timber, CTT offloading and recombining underlying nursery infrastructure along the way
- > Timberland has become a financial commodity and timberland managers have externalized seedling propagation alongside other supply chain services
- > Specialist seedling companies have capitalized on these trends with PE support to build market share and a fixed asset base for resale
- > Competing smaller nurseries have been squeezed out on price, volume and investment – with a handful remaining in the SE and PNW with annual sales of 5-20M trees each
- > State and federal nurseries have been pressured or legislated out of the sector to reduce concerns around subsidized pricing and uncompetitive market access

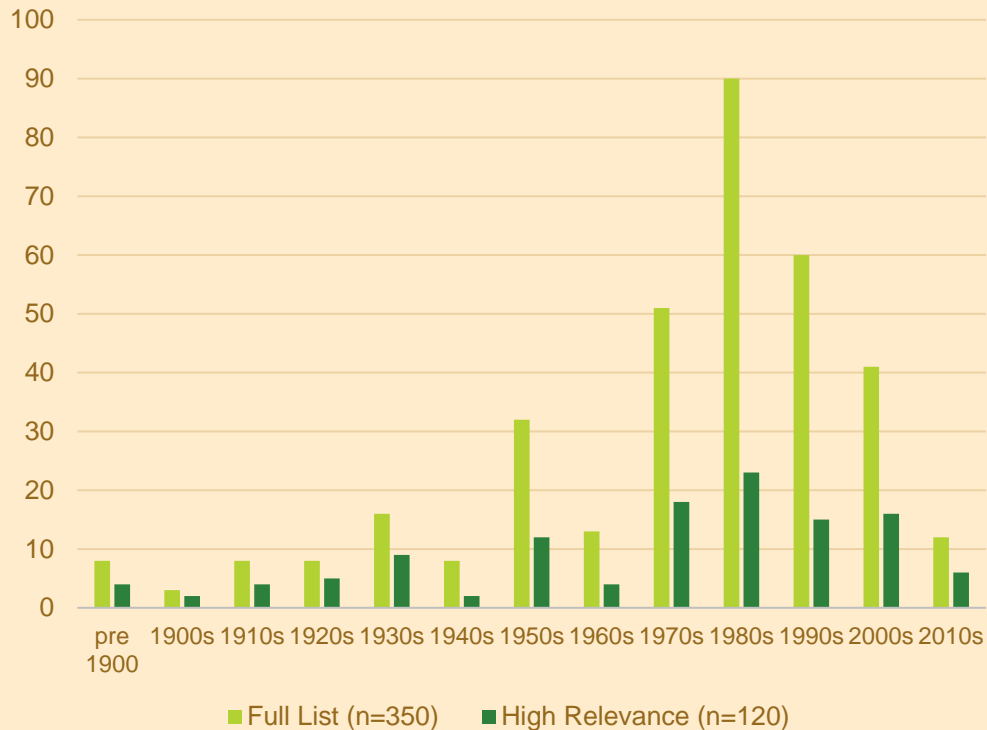
From an efficiency and scale perspective, this consolidation means that seedling supply is now concentrated to the point where:

- > **Three companies account for 850M / 60% of total US supply** – Weyerhaeuser, ArborGen and PRT (as of its April 2023 acquisition of IFCO)
- > The value chain **depends on only 40 physical sites** covering circa 3,000 acres
- > Production is **limited to handful of timber species** – douglas fir, loblolly, slash, shortleaf



Observation 4: The Market is facing a cyclical wave of retirements (and closures)

Distribution of Forest & Restoration Nurseries by Founding Year



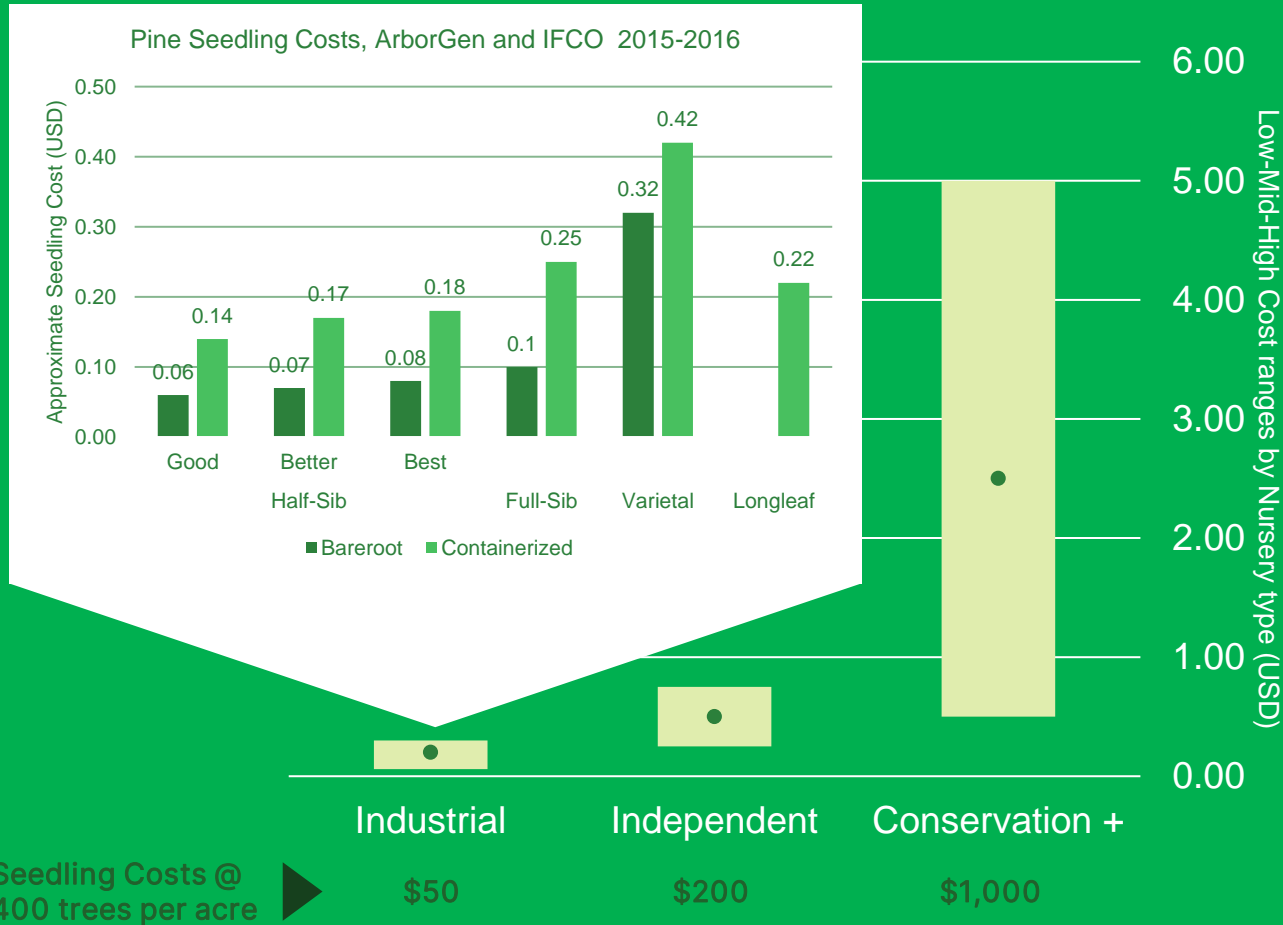
Nurseries are founded in response to market signals and macroeconomic conditions. We tracked some establishment years based on self-reported dates – very vulnerable to including survival bias and the relative size, age of the underlying businesses affecting internet/ and market presence. Caveats notwithstanding, the data could be interpreted as follows:

- > 1900s: Shift from existing timber to planting new stands
- > 1930s: New Deal and expansion of state and industrial timber planting
- > 1950s: Post WW2 construction boom
- > 1980s: Incentives & regulation for timber regeneration and wider conservation and restoration planting; general privatization
- > 2010s: Slower growth responding to competition and recession

What is undeniable is that **a 35 year-old who founded a nursery in 1985 as an owner manager would be 73 today**. As that wave of operators approaches retirement, there is limited scope to transition the business to new ownership and keep it operating as:

- > Junior staff do not have sufficient liquidity to buy out;
- > Newer entrants do not have capital, bandwidth to acquire; and
- > Many owners live on site/adjacent – meaning their cash is tied up in the real estate, and/or they may not want to have an operating site next to them in retirement – incentivizing shuttering the site

Observation 5: Divergent pricing frameworks are fragmenting the value chain



Nursery operators of all types are feeling pressure on pricing as a lever to unlock additional planting. The market is anchored around a few approximate price points:

- > Industrial efficiency pushing bareroot costs to single cents and product improvements and economies of scale pushing container seedlings to mid-teen cent pricing (see analysis of full sib/half sib and varietal costs, left)
- > Medium-scale independent operators with high client engagement and flexibility leading to higher costs for 20 cent+ seedlings (Varietal, Longleaf and Independent)
- > Conservation and native plant nurseries which offer a larger range of species and have higher sourcing, growing, handling costs with dollar plus pricing

As demand increases and nurseries move into new markets, these frameworks may overlap, creating confusion and disruption in the market. Federal and state nurseries further muddy the waters, balancing mandates of 1) supporting private landowner engagement in timber and restoration planting 2) without undermining or eliminating market share and profitability for private nurseries in region.

Seedling Costs @
400 trees per acre

Reference Pricing frameworks for seedlings by nursery type, Including industry cost analysis for controlled pollination)

Observation 6 Drivers of demand are changing

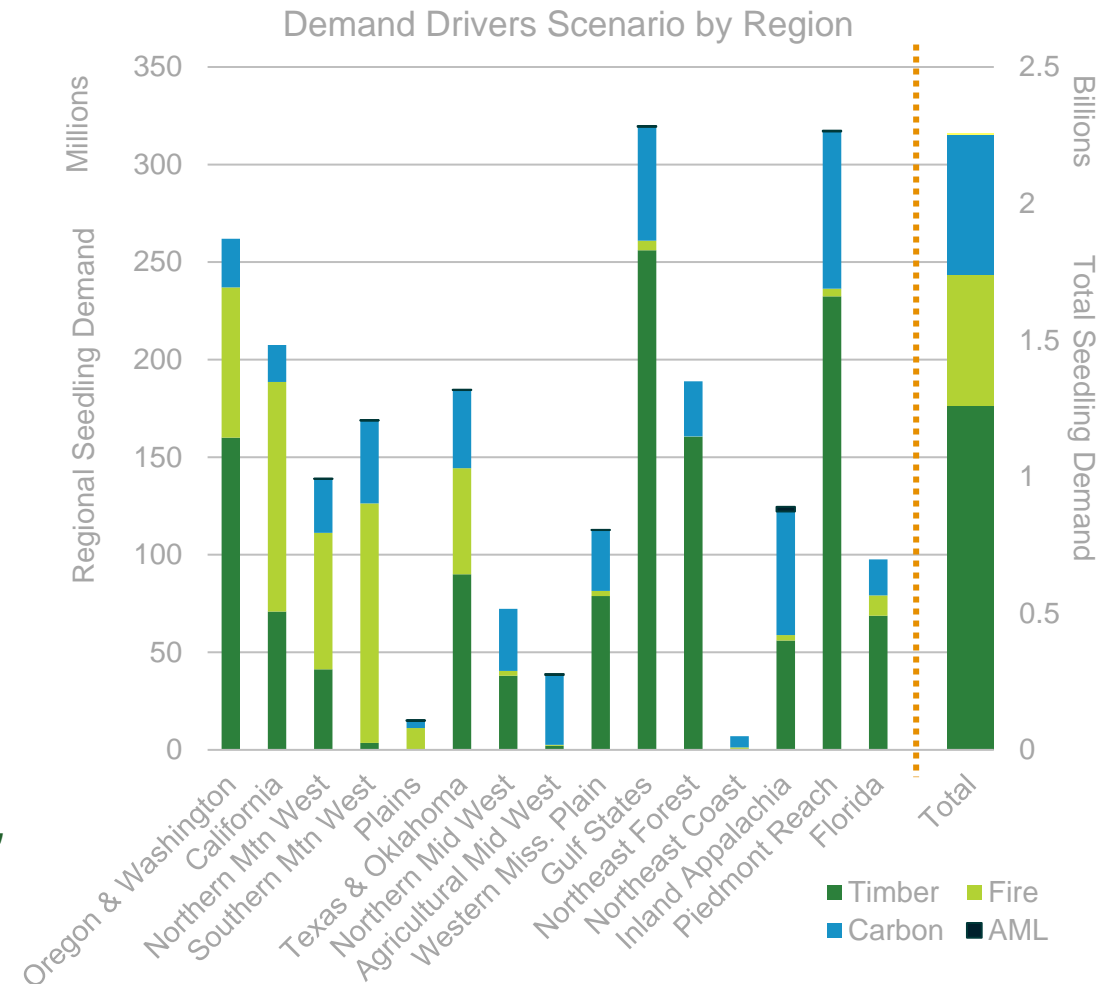
The demand drivers for tree planting are at an inflection point. Landowners increasingly look beyond timber to consider post-wildfire restoration, climate-smart planting for soil and water conservation and diversified cashflows through carbon and other credit schemes.

We applied rudimentary assumptions to show the implications of that shift. Our basic framework takes:

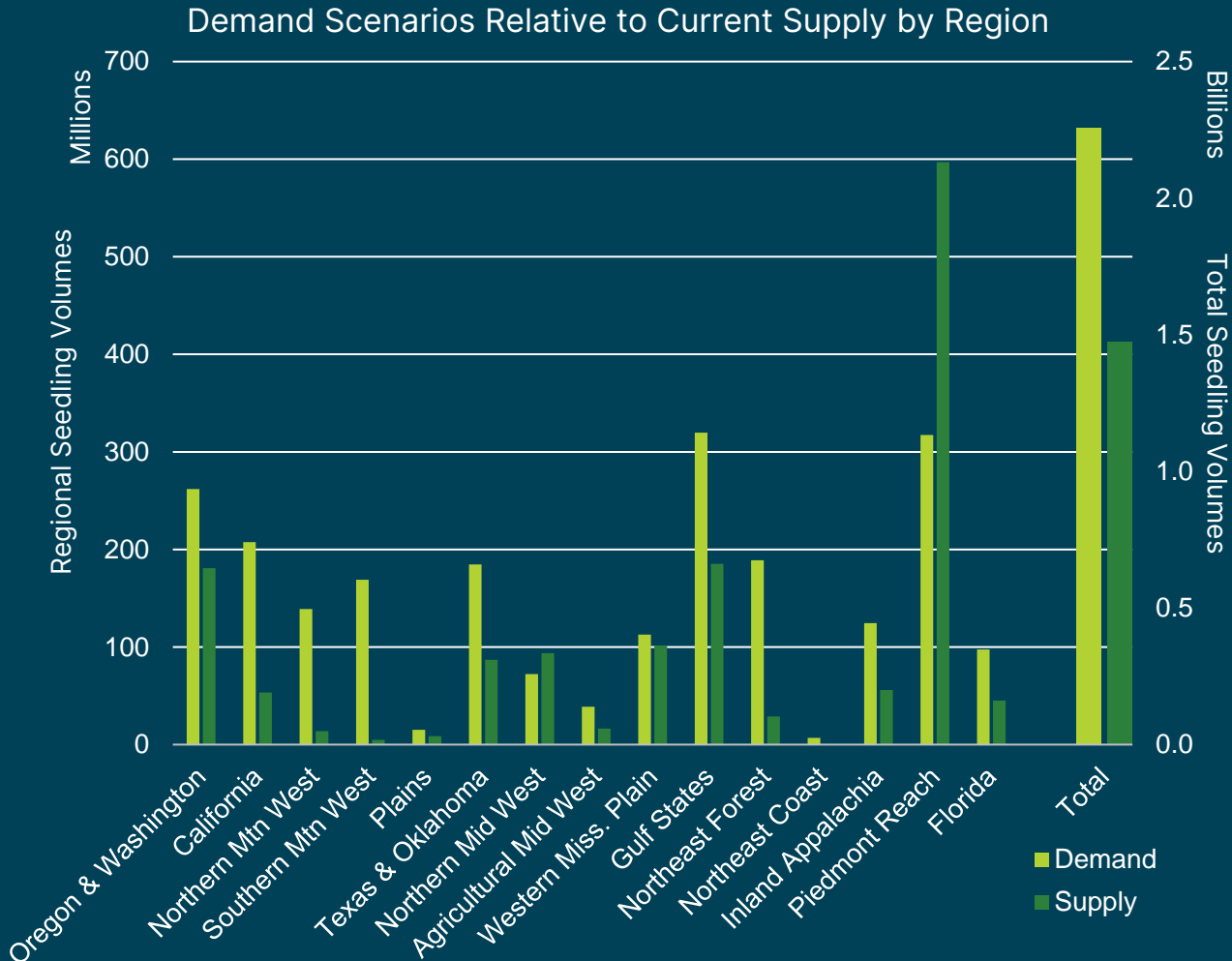
- > 35-year timberland harvest (and replanting) cycle with some regional adjustment for higher/lower rates)
- > 15% replanting of wildfire-affected acreage from the last 5 fire seasons over the next 5 years
- > 10% uptake new forest planting for carbon with 15-year planting cycle
- > 15% uptake of Abandoned Mine Land restoration projects with 15-year implementation time frames
- > In all cases we used USFS regional benchmarks for trees per acre

The punchline of this scenario is a 1bn+ increase in seedling demand. Involving a much wider distribution of demand across the US, driven by fire in the West and climate nationally.

This has implications both in terms of a wider range of species/products, and a new set of stakeholders engaging across the value chain – requiring new entry points and support on the way.



Observation 7: That forecast demand creates interesting regional opportunities



Comparing current supply to that simplistic demand forecast creates some national and regional dynamics that can inform follow on research and development, policy engagement and catalytic investment strategies. Strategies to engage can and should play a role regardless of the economic status – increasing resilience, diversification and market access in areas with surplus and creating additional supply in areas with deficit. In particular:

- > Total present supply is 750M seedlings in deficit even under this short term, conservative scenario. Existing suppliers (especially states and federal nurseries) can ramp up seedling production by about half that amount
- > The Piedmont region continues to have a surplus and act as a hub to support planting across the country – though the lion’s share of that supply is oriented towards (existing) timber demand and locked into contractual or vertically integrated supply chains in e.g. the Gulf States
- > The West – WA, CA on the coast and across the length of the Rocky Mountains is in deficit
- > There are also interesting regional deficits in TX/OK, the Northeast and Appalachian regions – driven by climate-smart planting as much as timber

Observation 8: Seedling supply is vulnerable to a weak seed supply market

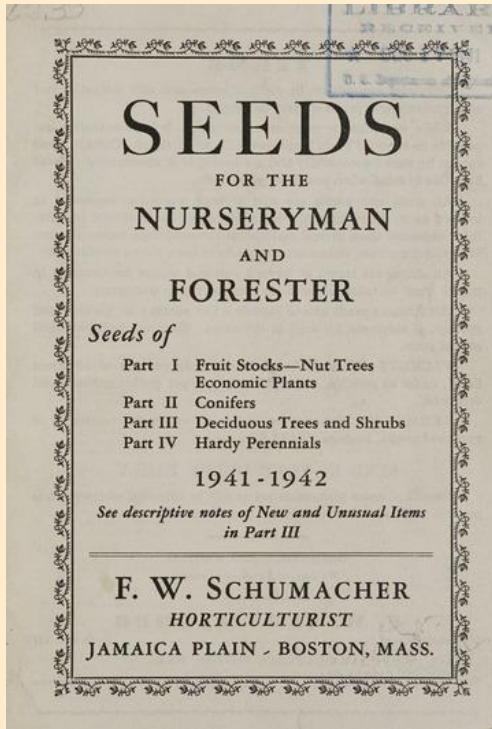
As seedling demand increases, a common observation throughout the literature and our in-person outreach has been uncertainty around seed to feed that supply. Historically, forest seed has been sourced from a combination of:

- > Seed banks collected over time from within a timber property for regenerative planting
- > Seed orchards centralizing, protecting and reproducing plants with key characteristics (growth, shape, seed or fruit production)
- > Specialist collectors on a seasonal basis who harvest and process wild seed
- > Public outsourcing of collection – individual contributions to state, federal and private seedbanks on a rolling volume/weight basis

As the geographic and economic drivers of demand increase, seed supply will need to increase and diversify in a way that factors in locality, climate change and cost. However:

- > Neither private nor the public sector have large inventories or orchards for new regions, species
- > There are fewer than 10 independent private seed collectors across the US who are focused on trees and operating at scale, and at least two of those have owners looking to exit
- > Public participation in seed collection is decreasing, depleting existing seedbanks
- > As demand increases for species variety, and in particular more hardwoods, the market will need more frequent collection as most seeds are recalcitrant and cannot be stored

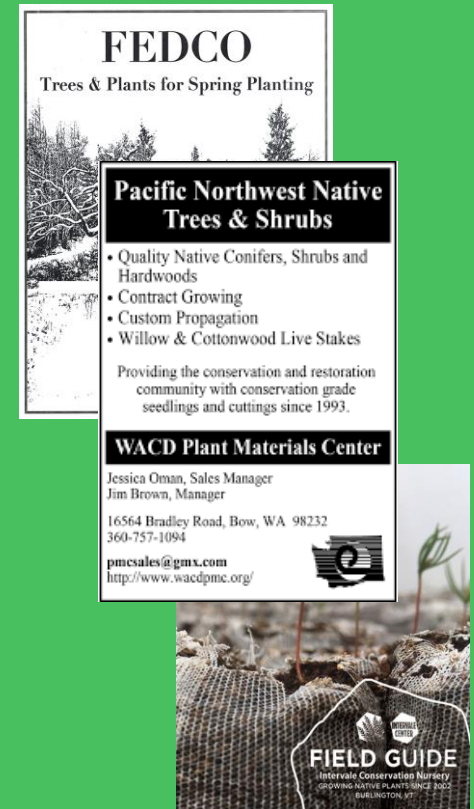
There is room for optimism – via technology that increases collection, science to improve seed production, fertilization rates and new public-private partnerships to use the existing resources – but in all instances this foundational step in the supply chain also requires support and investment.



Observation 9: Specialist Nurseries offer an angle for additionality

Outside the industrial and independent forest nursery segments, there are a handful of alternative nursery operators that can play an increasingly important role in the future of US seedling supply. These nurseries are entry points for smaller landowners and projects in underserved regions:

- > **Tribal nurseries** play an important role in terms of native plant propagation and understanding long term, sustainable forest stewardship. In a few cases, tribal nurseries are operating at scale to support regional forestry activity and as an engine for economic growth. As we see more demand, in particular in the Western US, tribal nurseries offer an avenue for massive additionality in terms of seed, species and climate and social impact.
- > **Specialist conservation nurseries** operating in the mitigation bank market – more focused on wetland and riparian planting – are increasingly paying attention to the larger set of scaled forest planting opportunities and moving into the market. This cohort comprises both small independent nurseries and well-funded groups such as RES and should be integrated into long term policy and investment strategies as essential sources of additional bandwidth.
- > **Regional Conservation Districts** (and equivalent) used to be an active part of the seedling ecosystem but have dwindled in number since 1981 so that only a handful remain, but these are a critical nexus for land trusts and related parties in terms of coordinating fragmented demand and looking beyond timber supply chains.
- > **Cooperatives:** there is scope to build on the success of cooperatives in the agriculture market to distribute the cost of collection and propagation across a community of stakeholders. Forest coops are rarer – IFA and FedCo stand out – but momentum could build alongside increasing demand for trees for agroforestry and water and soil management.

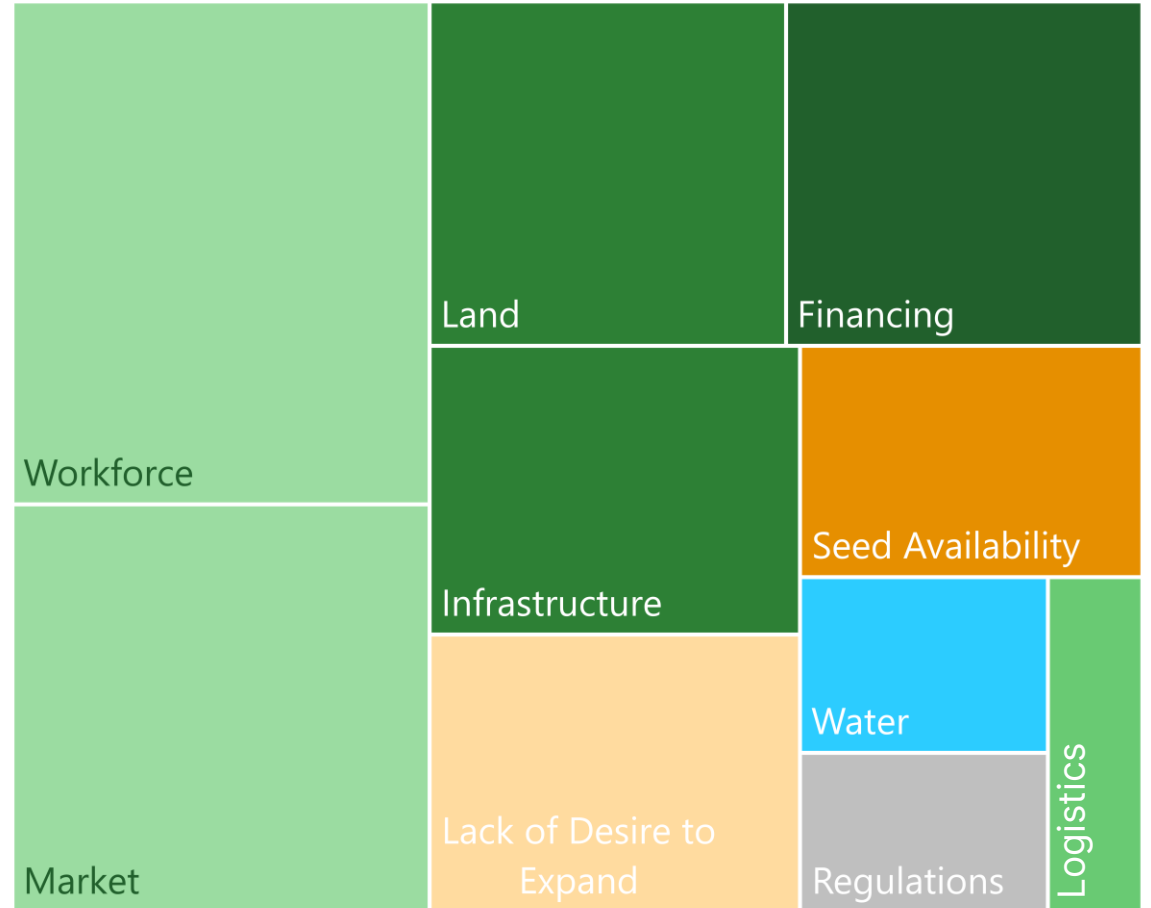


Observation 10: Investment to address key growth barriers

Feedback from nursery operators highlights the key challenges to expanding supply. A survey conducted across 7 regions in 2020 by American Forests led to a [policy memo](#) that supports our own observations and interviews from the field.

We have collated responses (right) such that larger area means more respondents flagged the named issue. Finance plays an essential role in addressing more than half of the issues cited in the survey, including:

- > **OPEX:** Workforce, Market and Logistics point to the underlying increase in payroll and weak market infrastructure and support through policy and innovation – while also hinting at falling migrant labor visa issuances, and low staff retention for physical jobs in remote areas
- > **CAPEX:** Land and Infrastructure speak to leasing and purchase costs for operating sites (especially reliable access to Water) and the cost of installing and expanding facilities and equipment
- > **Access to and cost of capital:** Financing is a top 5 challenge for nursery operators, who fall between the cracks of USDA and associated agriculture credit and insurance products and traditional commercial and small business lending



Ramping up Reforestation in the United States: A Guide for Policymakers March 2021, American Forests