

Native tree stock production and challenges for nursery operators in Vermont:

Survey results summary



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Background

This report summarizes the results of a survey of current and aspiring growers in Vermont to assess native tree and shrub nursery capacity in Vermont. The goals of the survey were to clarify current production, assess limitations and needs, and begin exploring opportunities for growth. This report accompanies the report released in June 2021 titled “Plant material sourcing needs for riparian forest and wetland restoration in Vermont: Survey results summary.” For additional context and background, [please see that report](#).

Approach

The authors of this report collaborated to design the survey, which was targeted at current and aspiring nursery owners and operators specializing in material for riparian and wetland restoration projects. The survey was distributed using the Watershed Forestry Partnership email list. Additionally, specific growers were asked independently to complete the survey to ensure that we could obtain as complete a picture of operations in Vermont as possible. The survey asked existing nursery operations and individuals hoping to start a nursery the following: how much, what type (e.g. bare root, containers, etc.), what size, and what species they grow and buy-in annually; whether they are able to meet current demand; whether they would like to expand if they had the resources to do so; and what limitations to expansion they encounter. Responses were gathered in April, May, and June 2021. A copy of the full survey can be found in the supplementary information (SI, pg iv-vi).



Seedlings emerging at the Champlain Valley Native Plant Restoration Nursery. Photo courtesy of Hilary Solomon.

Results: Nursery production and capacity

18 individuals from across Vermont, representing 7 existing nurseries and 11 aspiring growers, responded to the survey. Below we describe the main findings; please see supplementary information (SI, pg i) to view the results summary table.

Respondent demographics

The majority of survey respondents (11/18) indicated that they were hoping or planning to start a nursery, but did not yet have an existing operation; only seven respondents were existing growers, and the authors of the report believe this encompasses the majority of tree and shrub nursery production in the state for restoration purposes. Of the existing operations, 3 are non-profit and 4 are for-profit. Non-profit and for-profit growers face different limitations and opportunities.



Size of land base

All of the existing nurseries operate on a land base of 0.5 to 2 acres, which is small when compared with nurseries in other states. The small size of nursery operations in Vermont can limit economies of scale, making it more difficult for growers to realize certain efficiencies. It may be important for growers to think creatively across the industry in Vermont to consider how efficiencies could be achieved industry-wide, i.e. with different operations specializing in different elements of the production process.

Ability to meet demand

Five of the seven existing growers indicated that they are producing as much as possible with their current resources and/or experiencing a higher demand than they are able to meet. Meanwhile, all existing growers

indicated that they would be interested in expanding their operations if they had the resources to do so. Together, these results paint a clear picture that there is a high demand for locally-sourced plant material for restoration plantings in Vermont, and that the existing supply chains are working at or near capacity. Understanding the limitations preventing these operations from expanding—or new ones from starting—is a critical element in meeting current and future demand for native tree and shrub stock in Vermont.

Total annual sales at existing nurseries

According to the survey of growers, annual plant material sales total approximately 133,000 stems across plant material types, including material grown in-state and material bought in from out-of-state nurseries (see SI pg i for complete table of results).

Scale varied widely across responding growers, with the largest grower reporting 50,100 units sold annually and the smallest grower reporting 2,000 units sold annually. The majority of all stems sold were bare root (115,300 stems). Bare root is the preferred plant material type for larger restoration projects that require transporting and staging large numbers of seedlings.

Just under half of total sales, or 66,000 stems, were reportedly purchased from out-of-state nurseries for resale in Vermont. Of that material, 64,000 stems were bare root trees and shrubs, representing 56% of all bare root material sold for restoration purposes in Vermont.

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There was a discrepancy between our [survey of buyers](#) and our survey of growers in the amount of plant material reportedly sold/purchased. This is likely due to the fact we weren't able to reach all buyers, and those buyers that did respond reported average annual purchasing as a range, which adds variability. Those buyers who did receive and respond to our survey indicated that they expect to need 50-62% more plant material annually in the next 5-10 years. Since growers indicate they already have to buy almost half of their plant material from out of state to meet current demand, a significant increase in nursery

production capacity will be required in order to meet Vermont's rapidly growing demand for locally-sourced native plant material.

Meeting Vermont's demand for restoration seedlings with locally-sourced plant material has potential environmental and economic benefits. One producer wrote: "[Using] locally-grown and sourced plant material is of significant importance to establishing native trees and shrubs because they contain the genetic material and mycorrhizal associations already adapted to our Vermont climate and soils. This is key in climate change mitigation as the plants grown and sourced locally are already adapting to local and regional climate changes." Another stated: "[Using] locally sourced and grown native plants [in restoration plantings] maintains New England ecosystems, keeps money within our neighborhoods and communities, and provides employment opportunities."

Seed collection and propagation

Four of the seven existing growers engage in seed and/or cutting collection activities, suggesting there may be capacity for mentorship or other knowledge sharing within the nursery community. Several respondents expressed interest in seed collection across watersheds to increase genetic diversity, seedling resiliency, and to ensure quality, but the time and resources to do so are limited. Additionally, responses suggest that there is an opportunity for seed conservation and genetic adaptation work; for example: “I think propagule sourcing is more important than nursery location, especially considering impending climate change. I don't believe the restoration community is fully engaged yet in contemplating and considering assisted migration of intraspecific southern genetics of current native species or introducing southern future-climate adapted southern species.”

Results: Limitations

Overall, the top five limitations to expanding or beginning a new operation across all existing and aspirational growers were: accessing capital needed to expand or start an operation (n = 12 respondents); needing to know more about tree and shrub nursery standard operating procedures (n = 11); need for additional seed/cutting storage and processing capacity (n = 10); paying for needed labor (n = 9); and infrastructure challenges (n = 9) (see SI, pg ii for ranking of all limitations). As expected, top limitations for existing nurseries differed somewhat from those for aspirational nurseries (SI, pg iii), with market and operational concerns ranking higher for the former group than many other concerns. The top three limitations overall were also the top three for aspiring growers.

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Information and restoration seedlings from the Champlain Valley Native Plant Restoration Nursery. Photo courtesy of Hilary Solomon.

Compared to the findings described in the American Forests fact sheet “Barriers to Increased Tree Seedling Production in the Northeast and Midwest” (American Forests 2021) we find that labor is less of a limitation across our whole sample, but is a top limitation for existing nurseries. This is expected, since the American Forests report surveyed only existing nurseries. Market and infrastructure limitations were found to be important in both our survey and in the American Forests results. We also note that there is a marked enthusiasm for expansion of nurseries in Vermont, with all existing nurseries reporting that they would like to grow their production if they had the resources to do so; in comparison, 25% of the American Forests respondents indicated a lack of desire to expand.

Labor

Only one respondent expressed concerns with finding enough labor at any skill level. The majority of respondents reported that affording needed labor is a concern, and four respondents spoke specifically to concerns finding skilled labor; one respondent specifically named finding labor with seed collection and propagation expertise as a challenge.

“Overhead cost of starting up a nursery doesn't seem likely to be covered by a single year's worth of production - which means needing to take on debt.”

Access to Financing

Access to financing to start or expand an operation was a limitation for the majority of respondents (n = 12); this is important to note because in order to meet growing demand in Vermont with locally-grown material, it will be necessary to start new operations, expand existing operations, and/or develop creative solutions to achieve efficiencies across the industry. Additionally, a few respondents mentioned specific

limitations, including a lack of start-up funds oriented toward for-profit businesses and funding to support ongoing operations.

Plant Material Market

This survey confirmed that there are compounding challenges in the plant material market for restoration work, both with irregular demand and market rates being too low to cover costs. The majority of funding for restoration work in Vermont comes from federal and state programs, which can be inconsistent year-to-year. This can lead to unpredictable demand in any given year, challenging long-term planning and making investing in new equipment, staffing, and/or land risky. Furthermore, the price point of plant material grown in Vermont is higher than plant material produced by larger, industrial nurseries in other states. Programs need to account for that higher price point if they want to prioritize locally grown plant material.

As one survey respondent put it: “Overhead cost of starting up a nursery doesn't seem likely to be covered by a single year's worth of production - which means needing to take on debt. This is a difficult position to be in if there will be an increase in competition with other new nurseries opening. Long term contracts with funders and planting organizations could help get a few key nurseries off the ground.”

Contract growing was mentioned by respondents as a potential solution to the unpredictability of the market, and several buyers in our previous survey indicated that exploring contract arrangements would be of interest. One grower wrote: “Ideally plant specifications (species, size, container/bare root, quantity) would be provided 3-5 years (depending on size requirements) ahead of when they will be needed - contract growing would be ideal.” It is clear that increased coordination between growers and buyers (and possibly funders) is needed to stabilize the plant material market.

Equipment and infrastructure

Equipment and infrastructure concerns were limitations across existing and aspirational growers. A need for more greenhouse space was mentioned by several respondents. Additionally, the cost of specialized equipment for seed processing and storage was mentioned as a limitation. Ensuring that growers--particularly new and aspirational growers--have the knowledge necessary to make informed choices about the needed equipment and infrastructure is critical to making sure they are making the most efficient use of limited funds.

Knowledge

The majority of respondents noted lack of knowledge in some form as a limitation. Specific limitations included needing to know more about tree and shrub nursery standard operating procedures (n=11), needing to know more about funding and other market supports available (n=8), and needing to know more about business planning and development (n=7). This speaks to opportunities for industry-specific mentorship, networking, and other technical assistance catered to new and existing nursery growers. The already robust Farm Viability network in Vermont could be a valuable resource.

It is clear that increased coordination between growers and buyers (and possibly funders) is needed to stabilize the plant material market.

Land

Only half of respondents reported land as a limitation (n=8), with the majority of those respondents specifying land with the right growing conditions (e.g. soil type) as a limitation (n=7). Soils are a particularly important factor for bare root production. Respondents reported a substantial amount of bare root material can be produced on a relatively small amount of land; the largest nursery in Vermont reported having two acres currently in production for bare root material. This could make finding and accessing easier for some

growers, as large tracts of land are not needed to start up or expand production. For growers wishing to specialize in container material, greenhouse capacity, shrub mat, and/or shade house space are the more limiting factors.

Seed/Cutting Availability

The availability of seed/cuttings for propagation was a limitation for the majority of respondents (n=15). Knowledge of proper seed/cutting collection protocols and handling techniques was specifically noted as a limitation, as well as constraints with proper equipment and infrastructure for processing and storage. Some of these challenges



Maple seeds after collection. Photo courtesy of Annalise Carington, USFWS & The Intervale Center.

are inherent to working with wild-harvested material, as seed quality and quantity can vary widely season to season. For example, oak species have masting cycles that limit availability in any given year, whereas other species will produce more reliable seed crops annually. Honing storage protocols and expanding and/or optimizing seed storage capacity could help control for this seasonal variability, allowing growers to stockpile seed in good years to maintain consistent production.

Beyond managing for seasonal variability, this work requires a technical understanding of seed biology, phenology, and germination requirements across a diversity of species. It also requires significant time and skilled tree ID to scout for good collection locations; it is advantageous to have multiple collection locations for any given species to have safeguards in your harvest and to ensure genetic diversity. Increased knowledge sharing and technical assistance for growers is a major opportunity, as are opportunities for increased coordination in seed collection and processing. For example, certain growers with more expertise and/or infrastructure could share or sell seed to other growers that have propagation capacity.

Logistics

A few limitations related to nursery operation logistics were important to survey respondents, and we expect that logistical concerns will become more important if/when nurseries increase production. Bare root cold storage was cited as a limitation by five respondents, with some operations indicating they've been using smaller spaces for shorter amounts of time than would be ideal. Four respondents indicated that the distance between their nursery location and their customers poses challenges for distributing plant material. One option may be to consider increased coordinating between multiple operations to share storage space and/or distribution capacity.

Next steps

The next step of this work is to hold individual and focus group stakeholder conversations with current and aspiring growers; restoration practitioners and plant material purchasers; funders; and policy-makers to identify promising avenues to increase production of the types and species of plant material most needed for Vermont restoration projects. This will likely require developing and testing creative solutions that increase coordination across the sector while supporting the growth and success of individual businesses.

If you would like to participate in these conversations or have questions about the future of this work, please contact the authors of this report.



A reforestation site in Williston, VT. Photo courtesy of Annalise Carington, USFWS & The Intervale Center.

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References

American Forests. Reforestation Factsheets: Barriers to Increased Seedling Production in the Northeast and Midwest. 2021. Washington, D.C.

Supplementary information

Results summary table

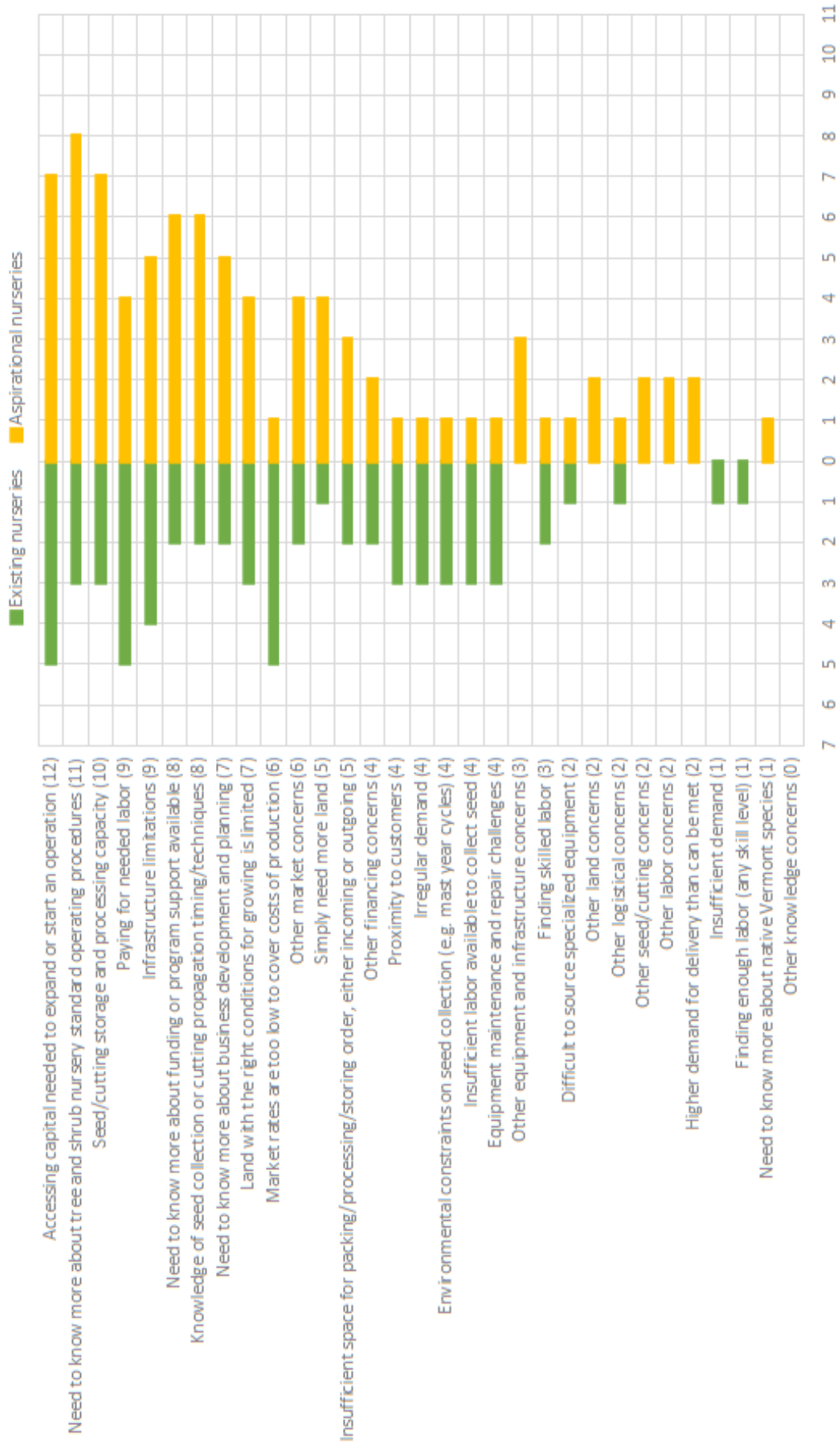
Respondent demographics (total n = 18)		#	
Number of respondents hoping or planning to start a nursery		n = 11	
Number of respondents with existing nursery operations		7	
Number of existing that are non-profit		3	
Number of existing that are for profit		4	
Size of land base at existing nurseries			
0.5 acre		n = 1	
1 acre		2	
2 acres		4	
Existing nurseries' ability to meet demand (n = 7)			
Number of existing nurseries that are producing as much as possible "with current resources"		n = 5	
Number of existing nurseries that report higher demand than they can currently meet		5	
Number of existing nurseries that would want to increase production if they had the resources to do so		7	
Total annual sales at existing nurseries (n = 7)		<i>range at individual operations</i>	
Overall total		131000	0* - 50100
Plant material propagated and grown on-site		67000	400 - 48100
bare root stems (4 nurseries)		51300	300 - 45000
containers (4 nurseries)		11700	500 - 1900
live stakes/fascines (3 nurseries)		4000	100 - 10000
Plant material bought in from other nurseries		66000	3900 - 52000
bare root stems (4 nurseries)		64000	2000 - 50000
containers (0 nurseries)		0	NA
live stakes/fascines (1 nursery)		2000	<i>only one operation</i>
Seed collection for existing nurseries (n = 7)			
Collect their own seed		n = 4	
Perform a combination of practices (collecting, buying, and/or propagating from live stakes)		3	

* Nursery exists but has not yet begun sales

Number of individuals that selected each limitation

Limitation	n
Labor	
Labor concerns are not a limitation	7
Finding enough labor (any skill level)	1
Finding skilled labor	3
Paying for needed labor	9
Other labor concerns	2
Access to financing	
Financing concerns are not a limitation	4
Accessing capital needed to expand or start an operation:	12
Other concerns about access to financing	4
Plant material market	
Market concerns are not a limitation	4
Irregular demand	6
Insufficient demand	1
Market rates are too low to cover costs	6
Other market concerns	6
Equipment and infrastructure	
Equipment and infrastructure concerns are not a limitation	4
Equipment maintenance and repair challenges	4
Infrastructure limitations	9
Difficult to source specialized equipment	2
Other concerns related to equipment and infrastructure	3
Knowledge	
Knowledge concerns are not a limitation	5
Need to know more about business development and planning	7
Need to know more about funding or program support available	8
Need to know more about tree and shrub nursery standard operating procedures:	11
Need to know more about native Vermont species	1
Other knowledge concerns	0
Land	
Land concerns are not a limitation	8
Simply need more land	5
Land with the right conditions for growing is limited (e.g. soil type, etc.)	7
Other land concerns	2
Seed/cutting availability	
Seed/cutting availability concerns are not a limitation	3
Knowledge of seed collection or cutting propagation timing/techniques	8
Storage and processing capacity	10
Environmental constraints	4
Insufficient labor available to collect seed	4
Other concerns related to seed/cutting availability	2
Logistics	
Logistical concerns are not a limitation	5
Proximity to customers (i.e., customers are too far away or too scattered)	4
Insufficient space for packing/processing/storing orders, either incoming or outgoing	5
Higher demand for delivery than can be met	2
Other logistical concerns	2

Overall limitation ranking with breakdown by existing vs. aspirational nurseries



Full survey text

Q1 What is your name?

[Open response]

Q2 What nursery do you represent, if an existing nursery? If you are hoping or planning to start a nursery but it does not yet exist, please enter "NA" here.

[Open response]

Q3 Is your nursery for profit or non-profit?

[For profit/Non-profit/I am hoping or planning to start a nursery, but it does not yet exist]

Q4 - Q14 only shown if answer to Q3 was "For profit" or "Non-profit"

Q4 What are your current average annual sales of plant material propagated and grown on-site?

stems bare root [Open response]

containers [Open response]

live stakes/fascines [Open response]

Q5 How much are you supplementing your sales with plant material bought in from other nurseries?

stems bare root [Open response]

containers [Open response]

live stakes/fascines [Open response]

Q6 If you buy in plant material, what are your top sources?

[Open response]

Q7 Are you producing as much as you can with your current resources?

[Yes/No]

Q8 If you'd like to expand on whether this is the maximum you can produce, please do so here:

[Open response]

Q9 Are you experiencing a higher demand than you can meet with your current capacity?

[Yes/No]

Q10 If you'd like to expand on demand, please do so here:

[Open response]

Q11 Are you collecting your own seed and propagules, or buying those things from other sources?

[Collecting/buying/A combination (please describe)]

Q12 What is your current land base in production? (in acres)

[Open response]

Q13 Our focus is on plant material for restoration purposes, but if your nursery has another significant market, please describe it:

[Open response]

Q14 Would you be interested in expanding your nursery production *if you had the resources to do so?*
[Yes/No]

Survey ends if respondent answered "No" to Q14

The following questions (Q15 - Q22) are regarding limitations you experience either to expanding your nursery (if you have an existing nursery) or to starting a nursery (if you don't yet have an existing nursery). For each category (e.g. labor, financing, etc.), please check all boxes that apply. Note that some options may overlap or connect; in those cases, please just check all relevant boxes.

Q15 Limitations related to labor:

[Labor concerns are not a limitation/Finding enough labor (any skill level)/Finding skilled labor/Paying for needed labor/Other (please describe)]

Q16 Limitations related to access to financing:

[Financing concerns are not a limitation/Accessing capital needed to expand or start an operation/Other (please describe)]

Q17 Limitations related to the plant material market:

[Market concerns are not a limitation/Insufficient demand/Irregular demand/Market rates are too low to cover costs of production/Other (please describe)]

Q18 Limitations related to equipment and infrastructure:

[Equipment and infrastructure concerns are not a limitation/Difficult to source specialized equipment (if so, please describe what kind(s) of equipment)/Equipment maintenance and repair challenges/Infrastructure limitations (please describe)/Other (please describe)]

Q19 Limitations related to knowledge:

[Knowledge concerns are not a limitation/Need to know more about business development and planning/Need to know more about native Vermont species/Need to know more about funding or program support available/Need to know more about tree and shrub nursery standard operating procedures/Other (please describe)]

Q20 Limitations related to land:

[Land concerns are not a limitation/Land with the right conditions for growing is limited (e.g. soil type, etc.)/Simply need more land/Other (please describe)]

Q21 Limitations related to seed/cutting availability

[Seed/cutting availability concerns are not a limitation/Knowledge of seed collection or cutting propagation timing/techniques/Storage and processing capacity/Insufficient labor available to collect seed/Environmental constraints (e.g. mast year cycles)/Other (please describe)]

Q22 Limitations related to logistics:

[Logistical concerns are not a limitation/Insufficient space for packing/processing/storing orders, either incoming or outgoing/Higher demand for delivery than can be met/Proximity to customers (i.e., customers are too far away or too scattered)/Other (please describe)]

Q23 Shown below are the limitations you selected from the previous section of questions. Please rank them from most significant limitation to least significant limitation. You can drag and drop them to re-order.

Q24 As we make the case for increasing nursery capacity in Vermont, we would love to know how you view the importance of locally-grown/sourced plant material. How would you articulate to a customer or a funder the importance or value of sourcing plant material locally?

[Open response]