Prepared for:

Cleveland Neighborhood Progress

Cleveland Tree Coalition

BUSINESS PLAN: URBAN TREE NURSERY IN CLEVELAND

Prepared by:

Davey Resource Group, Inc.
295 S. Water Street, Suite 300
Kent, OH 44240
800.828.8312

Davey Resource Group

In Partnership with:

Tree Pittsburgh Heritage Nursery
32 62nd Street
Pittsburgh, PA 15201

Tree Pittsburgh Heritage Nursery

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Introduction

INTRODUCTION

Background

Trees are vital to everyday life in the Cleveland area. Those growing along city streets, in parks, around playgrounds, and in backyards not only provide shade and beauty, they also create a sense of place and supply real benefits to those who live in the city. Trees enhance the quality of life in Cleveland by moderating temperatures, reducing air pollution and energy use, improving water quality, promoting human health and well-being, and bringing natural elements and wildlife habitat into the urban environment.

Cleveland, once nicknamed the Forest City, has lost more than half of its tree canopy cover over the last 75 years. This loss has reduced the environmental, economic, and social benefits trees provide, impacting the quality of life and health of Cleveland's residents. In 2015 the Cleveland Tree Plan (CTP) was released, which recognized this loss and the important role that trees play in the city's revitalization (Davey Resource Group, 2015). The plan serves as a roadmap to rebuild Cleveland's urban forest through partnership; and establishes a unified vision, goals, and actions to achieve it. In 2017, the Cleveland Tree Coalition (CTC) set a goal to reach 30% tree canopy coverage by the year 2040 - which will require a substantial increase in tree planting efforts.

The CTC recognizes that an increase in planting efforts to reach the canopy goal will also increase the demand and availability of trees from local nurseries. A reduction in supply and availability can have an impact on the ability of CTC members to plant trees and achieve the canopy cover goal. One idea that CTC members have been considering is the creation of a nursery in Cleveland to fulfill the tree planting needs of CTC members and regional partners who are actively involved in tree planting efforts. The successful development of a nursery could supply cost-effective, climate appropriate nursery stock, while also producing workforce development opportunities, and repurpose some of Cleveland's vacant land.

To explore the creation of an urban tree nursery - the CTC selected Davey Resource Group, Inc., and Tree Pittsburgh (Project Team) to conduct a feasibility study and develop a business plan for an urban tree nursery in Cleveland. The project was funded by the Cuyahoga County Healthy Canopy Grant Program.

The nursery feasibility and business plan project consisted of two phases. Phase 1 - the discovery phase - focused on understanding the needs, gaps, and opportunities around acquiring tree stock in the Cleveland area. Using information gathered during the discovery phase, Phase 2 was geared toward identifying a model in which the Nursery would be built on and development of a business plan.

Phase 1 - Discovery

The Project Team interviewed organizations and groups that are actively involved in tree planting in Cleveland, including government agencies, conservation and restoration organizations, development, and non-profit organizations. The interviews identified the needs, demands, opportunities, and challenges faced in planting trees in Cleveland.

The second task in Phase 1 was to understand the availability and gaps in tree stock in the Cleveland area. The tree stock analysis assessed the availability of tree species listed in the 2015 Cleveland Tree Plan by size and stock type (bare root, balled and burlapped, and containerized) at five commonly used area nurseries (Appendix B). The results of the interviews and tree stock analysis identified a need for small (less than 4-feet tall), native species, with a known local genotype (provenance) - that is currently not being met locally.

Phase 2: Nursery Model Selection & Business Plan

Case studies of three different nursery model types -- municipal bare root, balled and burlapped consortium, and non-profit container were developed to explore different nursery types that may be suitable in Cleveland (Appendix A).

The non-profit container tree nursery was selected as the model to use for the development of the business plan by the project's Advisory Group. The Advisory Group was composed of organizations and agencies actively involved in tree planting in Cleveland. The model was selected because of its flexibility, scalability, opportunities for workforce development, and potential for repurposing vacant land. The model also provided the opportunity to generate revenue, and produce a large number of smaller, specific stock that could be made available to a wide customer base.

Nursery Model Recommendations & Assumptions

The following assumptions and recommendations were used in the development of the business plan.

- **Nursery Model:** Small, containerized tree stock nursery (average tree stock size of 3 gallon)
- **Leadership:** Existing and established Cleveland-based non-profit organization
- **Minimum Nursery Size:** 2 acres (1 acre of production)
- **Production Method:** Trees and shrubs produced from locally sourced seeds

The following is a business plan for an urban tree nursery in Cleveland. It is based on the assumptions and recommendations listed above, however, there are unknown elements and variables that will be determined when a leadership team and site is selected.

BUSINESS PLAN:

Urban Tree Nursery in Cleveland

SECTION 1: DESCRIPTION

The objective of the Cleveland Tree Nursery (Nursery) is to provide tree stock to groups in the greater Cleveland area who are actively working towards the goals of the Cleveland Tree Plan. The Nursery will be unique in that it produces small, containerized native, and climate appropriate plant material grown from local seed sources, ensuring that plant material is adapted to the greater Cleveland area and is genetically diverse. The following document outlines a plan for the development and implementation of the Cleveland Tree Nursery, a non-profit containerized tree nursery.

VISION

The goals set forth in the Cleveland Tree Plan has created demand for plant material by organizations who are actively participating in growing tree canopy cover in Cleveland. The successful development of an urban, non-profit containerized tree nursery will help supply the necessary nursery stock to organizations working towards meeting Cleveland's tree canopy goal, while also producing workforce development opportunities, community revitalization, and the repurposing of vacant land in the Cleveland area.

MISSION

The Cleveland Tree Nursery will produce cost-effective, climate appropriate containerized plant material for local organizations, regional municipalities, community groups, and others working to achieve the goal of increasing tree canopy cover in the Cleveland area.

SECTION 2: LOCATION AND SITE

The first step in establishing a successful nursery operation is selecting the proper location. The following criteria should be considered when searching for property:

- Geographic Location and Proximity to Customer Base
- Access to Infrastructure and Establishing Partnerships
- Land Size and Room for Expansion
- Zoning and Other Restrictions
- Security and Fencing

As the search for a nursery location begins, **partnerships with regional organizations should be explored to find opportunities to collaborate, provide resources, and share institutional knowledge.**

GEOGRAPHIC LOCATION & PROXIMITY TO CUSTOMER BASE

The most likely customers for the Nursery are non-profit organizations and community groups who engage in restoration type plantings and private property planting programs.

Nine of the groups interviewed during the Feasibility Study disclosed that they plant over 100 trees per year: City of Cleveland, Chagrin River Watershed Partners, Cleveland Metroparks, Cuyahoga Soil & Water Conservation District, Cuyahoga Valley National Park, Northeast Ohio Regional Sewer District, Slavic Village, West Creek Conservancy, and Western Reserve Land Conservancy. Of these 9 groups, 6 are located east of downtown Cleveland, 2 are located west, and one is located south. Based on the location of this potential customer base, the east side of Cleveland should be explored for potential properties.

It should be noted, however, that the client landscape can change rapidly. Prior to selecting a nursery location, it is recommended that an updated market assessment be conducted to identify potential regional customers. Once a full list of potential customers is created, a geographic location that is centrally located for the regional customer base can be determined.

ACCESS TO INFRASTRUCTURE AND ESTABLISHING PARTNERSHIPS

Access to an unlimited water supply and utilities such as electricity, sewer, and reliable cell phone and internet service are required to operate the Nursery. Gas may be needed but can be substituted for propane, if local codes allow, in situations where gas is not available.

To meet the transportation needs of potential employees and facilitate the movement of tree stock and materials in and out of the nursery - access to major roads, public transportation and sufficient maneuvering space for tractor trailers must be considered. Restroom facilities and basic amenities will also be needed for people working on-site.

New infrastructure is costly and time-intensive to build. **Partnerships with organizations who have property with existing infrastructure in place would be very beneficial in saving costs on start-up and getting the nursery launched faster.**

Potential Partners Identified During Phase 1 Feasibility Study:

- Rid-All Green Partnership
- Western Reserve Land Conservancy
- West Creek Conservancy
- Holden Forest & Gardens
- Cleveland Metroparks
- City of Cleveland Landbank
- Cuyahoga County Landbank
- Cuyahoga Valley National Park

LAND SIZE AND ROOM TO EXPAND

The Nursery should be a minimum of 2 acres.

- A minimum of 1-acre is required for production
- 8,000-12,000 trees/shrubs in 3-gallon containers can be produced on 1-acre of land
- At least ½ acre is required for structures and facilities
- ½ acre is needed for vehicular movement such as parking, deliveries, and order pick-ups.

Sufficient space for future expansion should also be considered during site selection. A successful nursery can expect to grow by 30-50% every year for the first five years of full-time operation. **Prior to acquiring land, the long-term goals for this nursery should be established and careful consideration should be given to expansion needs.** Future development plans for the surrounding area and impacts they may have on the site and the surrounding neighborhood should also be evaluated.

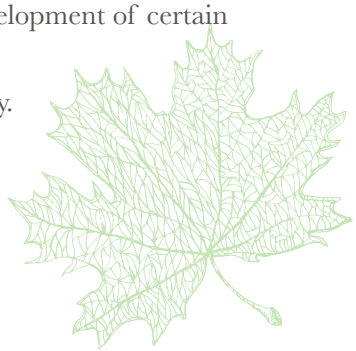
The use of vacant land was listed as a goal for this project by Cleveland Neighborhood Progress and the Nursery Feasibility Advisory Group. Due to the abundance of vacant land, **the east side of Cleveland has been identified as an area to begin the land search.** Opportunities to acquire/lease several lots and develop a larger footprint may exist in this area.

ZONING AND OTHER RESTRICTIONS

Zoning codes and other restrictions should be reviewed before committing to a site.

- Agricultural production often has special requirements and restrictions.
- In residentially zoned areas, there may be difficulty acquiring community support and permits for the nursery.
- Evaluation of noise and traffic regulations is essential in identifying a location. Higher volumes of vehicular traffic may be generated during nursery operations and the sale and transport of tree stock which may impact where the nursery is located.
- The Environmental Protection Agency (EPA) has restrictions in place for the development of certain types of former industrial properties (brownfield sites).

In some situations, it may be necessary to acquire the assistance of a real estate attorney.



SECURITY AND FENCING

Property security should be considered in site selection. All storage buildings and sheds should be lockable. It may be beneficial to install an 8-foot high chain link security fence around the perimeter of the site that has a locking entry gate. A fence of this height can also double as deer fencing, which may be necessary even in urban areas. Additional security may be added with surveillance cameras if deemed necessary.

2A. Site Assessment

Once potential nursery properties have been identified, a site assessment should be performed to evaluate the usability of the site (Figure 1). A site assessment is a thorough study of site conditions including:

- Orientation
- Wind
- Soil, Topography, and Drainage
- Access
- Utilities

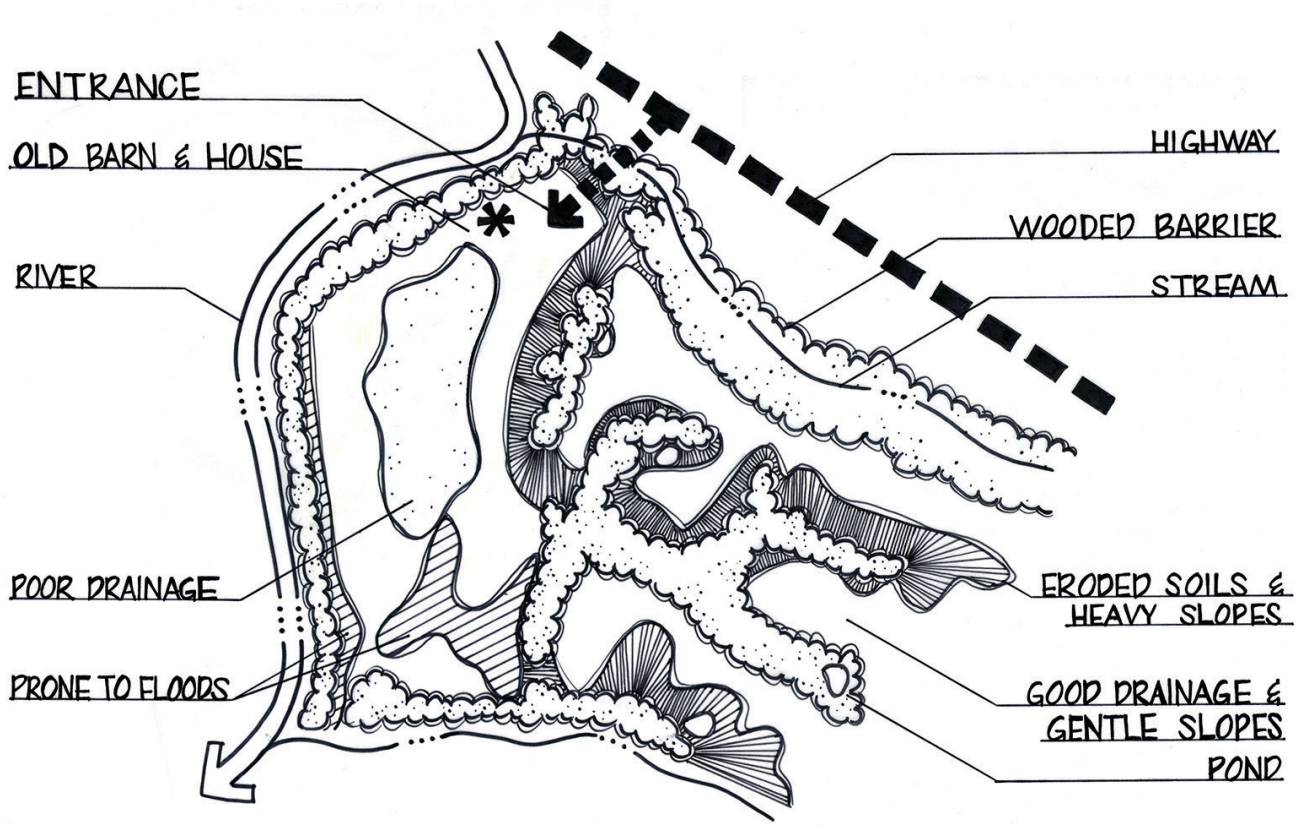


Figure 1. Example Site Assessment Schematic Drawing

Source: Ingram, et al, 2013

ORIENTATION

The **ideal orientation of crop rows and hoop houses is north-south.** This layout provides uniform light exposure as the sun moves through the sky. Greenhouses should also be oriented north-south unless significant plant production is planned for the winter months, in which case east-west orientation can be used to maximize sunlight exposure. Haphazard growing areas can result in uneven plant growth. The site should be assessed for structures, buildings or trees that may cast shade on the growing area. Some plants prefer shade, but the use of trees or buildings is not a dependable source for shade. Shade structures provide consistent and uniform coverage and is the industry standard for creating shade.

WIND

A nursery can face significant setbacks and damage from high winds. **Generally, Cleveland's prevailing winds blow west to east.** However, they can change by location and season. Identify the prevailing winds by studying the wind's direction at the same time each day. Once the prevailing wind direction is established, buildings or vegetative berms can be put in place as windbreaks.

SOIL, TOPOGRAPHY, AND DRAINAGE

A container nursery is most effective on flat ground. Uneven or hilly land can be problematic for water drainage and for efficiency of tree production. Poor drainage can cause ponding of water leading to many problems for a growing operation. The site should be graded flat with a slight pitch to move water runoff to the appropriate location on the site. **If local codes allow, water may be captured, treated, and used for irrigation.** Otherwise, all water runoff will be drained from the site according to local zoning codes. Most cities require a permit to be issued for any grading or building projects. The Project Team may need to engage the services of an engineer or landscape architecture firm who can develop a plan for water runoff and drainage as part of the Land Use Plan.

One major advantage to a containerized nursery is that the stock does not need to be planted in the ground; though it is still important to keep in mind that urban soils can be contaminated with remnants from former structures or industry that took place there. Before digging, the soil should be tested for contaminants.

ACCESS

Evaluate major roads and entry points to the site. Tractor trailers are the most common mode of delivery for supplies and materials that will be needed to operate the Nursery and can be up to 80-feet long. The route that tractor trailers would use to get to the property should be mapped out to ensure that local roads surrounding the site have a sufficient turning radius and clearance to accommodate trucks of this size.

There should be sufficient space on the Nursery property for tractor trailers to maneuver, along with space for parking, deliveries, and plant material pick up.

UTILITIES

The Nursery will need access to an unlimited water supply, and utilities such as electricity and sewer. An OHIO811 call should be made to identify all existing utilities including water, electricity, sewer, fiber optic/cable/telephone, and gas lines. An assessment of their accessibility and usability should be made.

Costs will be incurred to tap into and run utility lines to the site. The budget (Table 3) provides general estimates of these costs, but they cannot be definitively determined until a site has been selected.

Table 1 provides the estimates of utility usage based on Tree Pittsburgh's Heritage Tree Nursery's historical usage.

Table 1. Estimated Utility Usage

Utility	Estimated Usage (Annual)*
Water	200,000 gallons
Sewer	**
Electricity	20,000 kWh
Gas/Propane	500 gallons (propane)

*Estimates based on Tree Pittsburgh Heritage Tree Nursery's historical utility usage. They are provided for planning purposes only and do not reflect actual usage for the Cleveland Nursery.

**Tree Pittsburgh's nursery is not hooked up to the City sanitary sewer system – however, typical sewer rates are based on the amount of water used. Current Cleveland Sewer rates are $78.05 per MCF (1 MCF = 1,000 cubic feet of water or 7,480 gallons).

Note: Sanitary sewer rates are based on water consumption. However, since irrigation will be the primary use of water at the Nursery and that water does not enter the sanitary sewer system – contact should be made with the Northeast Ohio Regional Sewer District (or sewer authority) to discuss sanitary sewer rates based on this situation.

2B. Land Use Plan

If the site assessment determines a property is suitable for the Nursery, the next step is to create a land use plan (Figure 2). This plan determines the best **location for the primary structures and elements of the Nursery and studies the flow patterns of workers and plant material between these facilities.** It may be necessary to engage a professional landscape architect or consultant who has experience with laying out a nursery operation to develop the land use plan.

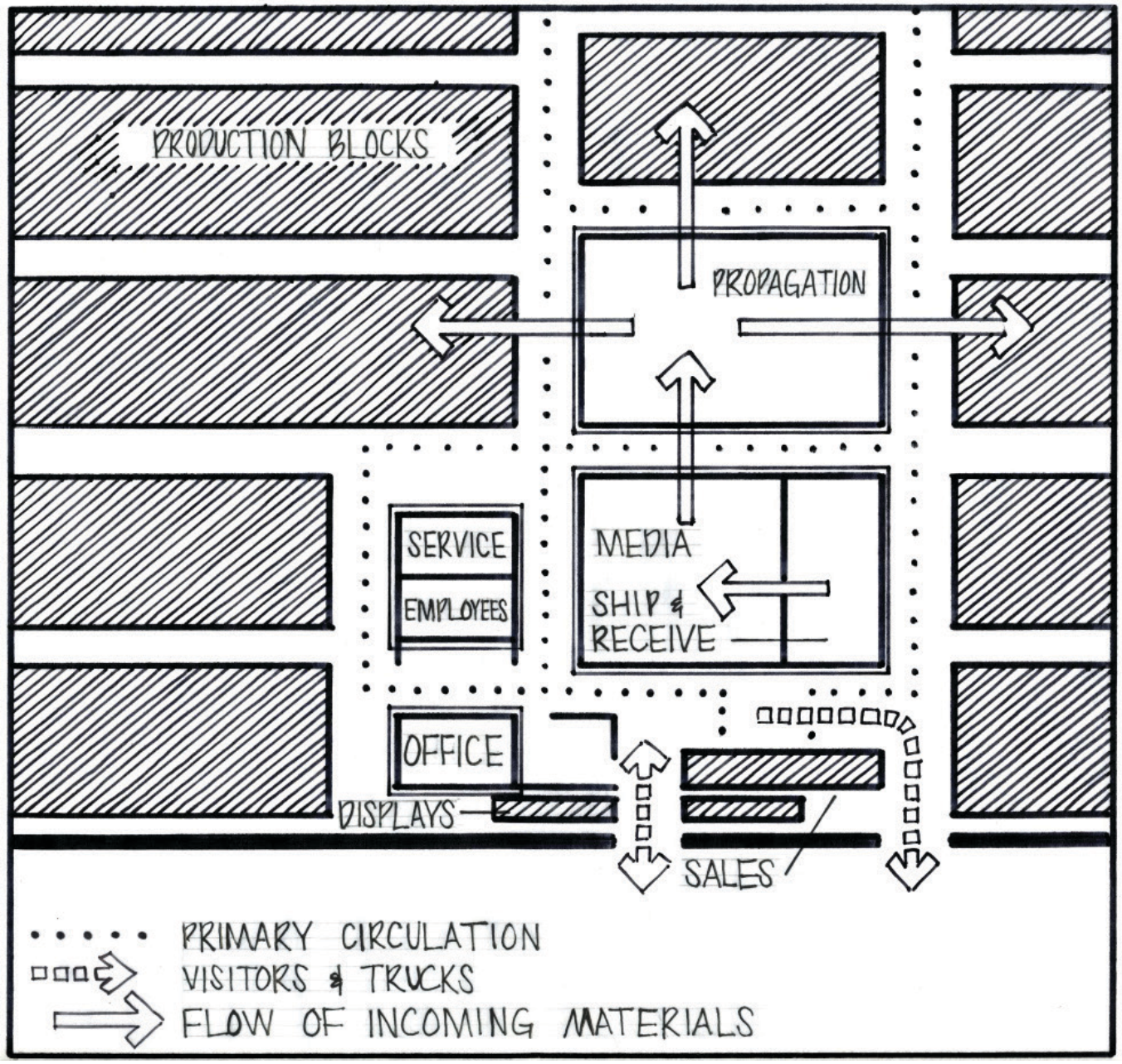


Figure 2. Example Land Use Plan

Source: Ingram, et al, 2013

LAYOUT CONSIDERATIONS

When developing the land use plan - the following elements of an operational nursery should be considered. (Note: Structures may be combined and used for more than one purpose).

- Entry/Signage
- Office/Restrooms
- Garage and Tool Washing Area (Tub)
- Protected/shaded area for employees and volunteers to gather/eat meals
- Parking
- Secure storage building
- Potting area
- Irrigation/Rainwater Harvesting
- Soil media storage
- Growing facilities: Greenhouse, cold frames
- Growing areas: Grow rows, shade structures
- Overwintering structures
- Staging area for loading and shipping (shipping and receiving)
- Security/deer and rodent fencing
- Compost/leaf mold pile

A well-managed nursery should be thought of as an assembly line for producing plants. When laying out the land use plan, consider how each stage of operation supplies the next (see Production and Operations). Once the land is acquired and a land use plan is created, the development phase of the Nursery can begin.

SECTION 3: PRODUCTION AND OPERATIONS

NON-PROFIT CONTAINER NURSERY

The non-profit containerized nursery model was selected as the best fit for the Cleveland Tree Nursery based on the findings of the feasibility study and review of the nursery model case studies (Phase 1 and 2). **The Nursery will be unique in that it will produce small, containerized native plant material grown from local seed sources**, ensuring that plant material is adapted to the greater Cleveland area and is genetically diverse.

- All plant material will be grown above ground in pots averaging 3-gallon in size.
- Pot sizes and style are determined based on species growing requirements and desired results; however, the average size will be 3-gallon.
- The majority of plants will be started from seed, and some may be grown from cuttings or liner stock. Plant material will be gradually transplanted into larger containers until the ideal size for planting is achieved. Finished sizes will vary by species and may be 1 to 3 feet in height for shrubs and up to 6 feet tall for trees.
- Seed will be locally collected or sourced by nursery staff and will be cleaned and stored on-site prior to planting.
- Germination will primarily take place in a greenhouse or outside in cold frames.

Most seedlings will be transplanted into larger pots and maintained in the Nursery until they are established and ready to be planted. **For some species, this may be as short as one year and for others as long as 5 years.**

- While in the Nursery, trees will require irrigation, fertilization, pest management, and continual pruning and staking to develop trees of the highest quality.
- The Nursery will utilize current best practices, strive to achieve the highest quality nursery standards, and will maintain careful records to continuously improve growing methods.
- Staff and volunteers will be trained to ensure that high quality standards are met.
- Because this style of nursery is less prevalent, professional partnerships with other similar nurseries across the country will be essential for information sharing and establishment of best practices.

SEED PROCESSING AND STORAGE

Most of the tree stock produced in the Nursery will be propagated from locally sourced seed. After the seed is collected it must be cleaned and stored based on the species requirements. An indoor workstation should be created that includes a utility sink with running water, counter tops or work benches, wire shelves for seed drying, and a refrigerator to store the seed until it is ready to be planted.

PROPAGATION

The first stage in nursery plant production is the initial propagation phase in which plants are started from seed, cuttings, or liner stock. For maximum efficiency, seeds should be started in a temperature-controlled greenhouse, but this can also occur in cold frames. At a time deemed appropriate, seedlings are then transplanted into containers. Seed sowing and transplanting occurs in a potting shed or at soil benches. The propagation/transplanting facility is the heart of a nursery operation and can be located in a barn or greenhouse, or outdoors in close proximity to the main growing areas and soil storage area. A conditioned space provides the ability to work in the cold months. Potting bench locations should provide sufficient access for soil loading by a tractor or skid steer bucket.

Cold Frame: An enclosure with a transparent roof, used to protect plants from excessive cold or wet weather. The transparent top allows sunlight to enter and prevents heat from escaping. At night, the heat keeps the plants warm.

Liner Stock (Liners): Small plant stock grown at a wholesale nursery that is then sold to other nurseries to grow out to a larger size. **The Cleveland Nursery may want to consider purchasing some liner tree stock to grow out to the 3-gallon size while ramping up production of their seed propagated trees.**

CONTAINER YARDS

Once plant material is transplanted, they can be taken outdoors to container yards or "grow-rows" where they are allowed to mature to the finished product. As they grow, plants may need to be transplanted into progressively larger containers – a mobile potting bench with shade cover for workers should be constructed to reduce travel distances. Based on the plant's light requirements, they should be spaced evenly and placed either under shade structures such as hoop-houses or put out in the open. Depending on spacing requirements, **one acre of growing area can fit between 8,000 and 12,000 2-3-gallon containers.**

Container Yard at Tree Pittsburgh's Heritage Nursery

Image Credit: Tree Pittsburgh Heritage Nursery

IRRIGATION

Reliable access to clean pressurized water is critical to the success of a nursery operation. Municipal water will likely be the source for an urban nursery. However, some nurseries use collected water from retention ponds or treated river water to irrigate. Water lines will need to be installed to direct the main water source to the various growing locations throughout the Nursery. Flow and volume calculations should be taken into consideration when designing the irrigation lines. **Every plant in the Nursery should be within 100' of a functional hose bib.** This includes staging areas, potting benches, and loading zones. Rainwater harvesting systems could be created to supply irrigation to areas of the nursery that would not require a constant supply of water.

Greenhouses and propagation areas benefit from mist systems that regulate water density and frequency. Hand watering is the most reliable way to control the level of moisture that each plant gets, though this can be time consuming and labor intensive. There are many forms of automated irrigation systems that can be implemented, such as overhead sprayers, drip irrigation, spray stakes, and misters. Consult an irrigation company for the proper equipment and layout for the Nursery.

Rainwater Harvesting: The capture and storage of rainwater from building rooftops that can be used to irrigate landscaping. GrowNYC provides resources on developing a rainwater harvesting system at www.grownyc.org/gardens/rainwater-harvesting.

SHIPPING AND RECEIVING

When plants reach their desired finished size, they can be made available for purchase. To publicize the available tree species, seasonal availability lists should be developed and sent to customers. When order fulfillment occurs, plants are retrieved, processed, and delivered or made available to the end customers.

A shipping and receiving area should be designated for plant material to be organized, labeled, and prepared prior to pick-up or shipment. Sufficient space and ground surface should be provided for the maneuvering of trucks, forklifts, and tractor trailers. Approximately ½ acre should be provided for shipping and receiving, and should consider way-finding signage, traffic access, and parking. Access to water and shade should also be considered if orders will remain in this area for several days.

OVERWINTERING

Overwintering is an important concern for maximizing plant survival. Since containerized stock is above ground, plant roots are more susceptible to cold damage than stems and foliage. Therefore, it is important to protect them from extreme temperatures. Overwintering can take place in the same hoop house structures that are used for shade in the summer. This is the most common form of overwintering and provides the most protection for plants. In the winter, hoop houses are covered with 4- to 6-mil, white polyethylene plastic. White poly-plastic is preferable to clear because solar radiation is reflected out, reducing extreme heat buildup. Plants should be completely dormant or hardened off, packed tightly together, and well-watered before covering and sealing off the hoop-houses for the winter. An alternative cost-effective, but labor-intensive, overwintering method is to keep plants outdoors and cover the root zones with a thick layer of wood chips or mulch.

Hoop House prepared for winter

Image Credit: Ingram, et al, 2013

EQUIPMENT STORAGE AND INDOOR WORKSPACE

The Nursery will need a pole barn structure, shed, or garage for an indoor workspace and for storing non-enclosed utility vehicles such as a tractor, skid steer, tools, supplies, and bagged amendments. These buildings can be used for rainwater harvesting. Chemicals should be kept in a separate locked room in accordance with USDA regulations.

Equipment and Supplies

The tools and supplies needed for regular nursery operations are as follows:

- Tools (shovels, rakes, pitchforks, pruners, basic construction tools)
- Pots and trays
- Soil
- Pesticides and fertilizers
- Tags and labels
- Office supplies: Computer, printer, phone, internet
- Greenhouse benches
- Potting benches
- Watering Equipment and supplies: hoses, wands, breakers
- Shade Cloth - Woven shade cloth is available in various percentages of light filtering so that the appropriate amount of shade is provided for your plants. 63% shade is standard, though some growers prefer less or more depending on their crop's needs.
- Over-wintering plastic (4- to 6-mil white)
- Weed barrier
- Skid steer or tractor
- Delivery vehicle

SPECIES

Table 2 provides a list of species that could be grown in the Nursery. Many of the plants listed are native to Ohio. However, some are considered "climate appropriate" meaning, although they are not native, they perform well in the modern urban conditions of Cleveland. The list is a compilation of species which are easily sourced and grown from seed, in demand locally, and on the CTP list, LEAP climate adaptability list, used in Northeast Ohio Regional Sewer District projects, or useful for restoration work.

Table 2: Potential Nursery Tree Species

Species	Common Name	Cleveland Tree Plan List (2015)	Produce Fruit/Nut	Shrub	Conifer	LEAP (Climate Adaptability)*	Northeast Ohio Regional Sewer District Green Infrastructure Projects
Acer nigrum	Black maple					X	
Acer rubrum	Red maple					X	X
Aesculus flava	Yellow buckeye	X					
Aesculus glabra	Ohio buckeye	X				X	X
Aesculus parviflora	Bottlebrush buckeye			X			
Aesculus pavia	Red buckeye	X					
Alnus serrulata	Smooth alder			X			
Amelanchier arborea	Downy serviceberry					X	X
Amelanchier laevis	Allegheny serviceberry	X				X	X
Amelanchier x grandiflora	Serviceberry	X	X			X	X
Asimina triloba	Pawpaw	X	X				X
Betula allegheniensis	Yellow birch					X	
Betula nigra	River Birch	X					
Carpinus betulus	European hornbeam	X					
Carpinus caroliniana	American hornbeam	X					X
Celtis occidentalis	Hackberry	X				X	X
Cephalanthus occidentalis	Buttonbush			X			
Cercis canadensis	Redbud	X				X	X
Cladrastis kentukea	Kentucky yellowwood	X					X
Cornus florida	Flowering dogwood	X				X	X
Cornus kousa	Kousa dogwood	X					

Species	Common Name	Cleveland Tree Plan List (2015)	Produce Fruit/Nut	Shrub	Conifer	LEAP (Climate Adaptability)*	Northeast Ohio Regional Sewer District Green Infrastructure Projects
Cornus racemosa	Gray Dogwood			X			
Cornus sericea	Red Osier Dogwood			X			
Diospyros virginiana	Persimmon		X				
Gymnocladus dioicus	Kentucky coffeetree	X					X
Halesia tetraptera	Carolina silverbell	X					
Hamamelis occidentalis	Witchhazel			X			
Juniperus virginiana	Eastern red cedar	X			X		X
Liquidambar styraciflua	Sweetgum	X				X	X
Liriodendron tulipifera	Tulip poplar	X				X	X
Maclura pomifera	Osage-orange					X	
Magnolia acuminata	Cucumber magnolia	X				X	X
Magnolia tripetala	Umbrella magnolia	X					
Metasequoia glyptostroboides	Dawn redwood	X					
Myrica pennsylvanica	Bayberry			X			
Nyssa sylvatica	Blackgum					X	X
Ostrya virginiana	Hop hornbeam	X				X	X
Pinus rigida	Pitch pine	X			X		
Pinus strobus	White Pine				X		X
Pinus virginiana	Virginia Pine	X			X	X	
Platanus occidentalis	Sycamore					X	X
Prunus americana	American Plum		X				
Prunus serotina	Black Cherry					X	
Quercus alba	White Oak					X	X
Quercus bicolor	Swamp white oak	X					X
Quercus coccinea	Scarlet oak					X	X

Species	Common Name	Cleveland Tree Plan List (2015)	Produce Fruit/Nut	Shrub	Conifer	LEAP (Climate Adaptability)*	Northeast Ohio Regional Sewer District Green Infrastructure Projects
Quercus imbricaria	Shingle oak	X				X	X
Quercus macrocarpa	Bur oak	X				X	X
Quercus michauxii	Swamp chestnut oak					X	
Quercus muehlenbergii	Chinkapin oak	X				X	
Quercus palustris	Pin oak	X				X	X
Quercus prinus	Chestnut oak					X	
Quercus rubra	Red oak	X				X	X
Quercus shumardii	Shumard oak	X					X
Quercus velutina	Black oak					X	
Salix nigra	Black willow					X	X
Sambucus canadensis	Elderberry		X	X			
Symphorocarpos orbiculatus	Coral Berry			X			
Taxodium distichum	Bald cypress	X					X
Thuja occidentalis	Eastern arborvitae	X			X		X
Tilia americana	American basswood	X				X	
Ulmus americana	American elm					X	X
Ulmus rubra	Slippery elm					X	
x = On List							
* Species predicted to have no change, an increase, or small decrease in habitat due to climate change. Source: Lake Erie Allegheny Partnership for Biodiversity https://www.leapbio.org/biodiversity-plan/climate							

RISK MANAGEMENT

Despite all efforts for quality control, crop failures and plant defects do occur. In these rare instances, staff will work with customers to identify a suitable substitute for the product or determine appropriate action for replacement.

The Nursery shall enact a safety plan to mitigate risk of injury and illness to staff and visitors to the site.

The Nursery will mitigate the risk of catastrophic losses by having all appropriate insurances in place, including general liability. **Insurance options should be investigated during the establishment phase of the Nursery.**

LICENSES, PERMITS & REGULATIONS

The Nursery shall be properly registered and certified to sell nursery stock according to the Ohio Department of Agriculture.

The Nursery, as proposed, will not be growing cultivated varieties or patented material. In the case that the Nursery chooses to grow patented plant material, royalty fees and appropriate licenses shall be obtained. The cost of these royalty fees/licenses is dependent on the variety being grown and has not been included in the budget.

Permissions shall be obtained from the appropriate land managers or owners prior to seed collection.

SECTION 4: MANAGEMENT AND ORGANIZATION

LEADERSHIP

Strong leadership will be essential in the development phase of this Nursery. It is recommended that an **existing, established 501(c)3 with strong relationships to funders** and experience with urban forestry, horticulture, or land conservation should serve as the umbrella organization and fiduciary for the Nursery project during its establishment. The selected **organization will provide management, fundraising efforts, strategic planning, and administration to the program, as well as explore partnership opportunities with other organizations for long term leadership of the program.**

The organization will provide a Management Team that will assume leadership roles in a part-time capacity in addition to their primary roles within the greater organization. After the successful establishment of the Nursery program, long-term fiduciary and leadership responsibility of the Nursery will be determined and, if handed off to another group, the initial Management Team can gradually reduce their involvement. It is recommended that the Management Team use the following structure:

Executive Director

The ED oversees fundraising initiatives for the Nursery program and will also supervise strategic planning for the program. The CFO and Program Manager report to the ED, and the ED is ultimately in charge of overall organizational administration.

Chief Financial Officer

The CFO is responsible for providing financial expertise and oversight to the Nursery operation. The CFO helps to develop budgets, financial models, and forecasts, and provides oversight to ensure financial health and sustainability.

Nursery Program Director

The Nursery Director will administer fundraising efforts, program planning, and implementation of the Business Plan for the Nursery and will ensure that the Nursery's program goals are in alignment with those of broader organizational goals. The Program Manager will also oversee hiring of the Nursery Manager in year 1 of operation.

Communications Assistant

The CA will assist in publicizing the Nursery sales and events on social media and web platforms as well as recruit new hires and volunteers via online postings.

Project Partners and Stakeholders

Partners and stakeholders who have a key role in the development of the Nursery should be engaged from the beginning in order to build strong and trusting relationships, resource sharing, and program collaboration.

Board of Directors

The lead organization's Board of Directors will oversee the Management Team and approve the Nursery program budget and strategic plan. The Board will ultimately decide if the program is achieving its goals within the greater organization and meeting its financial projections.

NURSERY STAFFING

In addition to the Management Team, the Nursery will engage both paid and volunteer labor for its operations. Their duties will be determined by need and ability and may include seed collection and cleaning, plant propagation, repotting of trees, attending the irrigation, pest/disease monitoring and treatment, assisting with volunteer events and management, facilities maintenance, and other responsibilities related to running the Nursery. Some positions will require former experience, though training will be provided on the job with additional opportunities for continuing education. Outlined below is a list of positions that will be required for the Nursery operation:

Nursery Manager

The Nursery Manager oversees the build-out and day-to-day operations of the Nursery. The Nursery Manager reports to the Program Manager and will be hired in year 1. The Nursery Manager must have prior experience working in a nursery and direct experience in nursery management and sales. The Nursery Manager will be responsible for meeting production goals, ensuring quality standards, and maintaining best management practices. The Nursery Manager ensures that all Nursery operations meet the schedule and will work with the other staff and volunteers to complete tasks.

Candidates should have the following qualifications:

- Prior experience in nursery production or agriculture
- In-depth knowledge of planting, potting, propagating, grow straightening, pruning, suckering, tying, irrigating, taping tops, transplanting, and culling plants to ensure marketable products
- Knowledge of inventory management including tagging, spacing, pulling orders, stacking, packing, and shipping trees, shrubs, conifers, and containerized plant material inside poly house and in outside growing areas
- Knowledge of common tool and equipment use in a nursery operation
- Basic carpentry and building experience
- Ability to operate equipment, including driving pick-up trucks

Seasonal Nursery Workers

After initial establishment, and if budget allows, Seasonal Nursery Workers or Interns can be hired to support the Nursery Manager with day-to-day operations such as seed sowing, transplanting, watering, and site maintenance. These positions provide opportunities for green job training and workforce development. This seasonal position runs from March through November. Seasonal Nursery Workers report to the Nursery Manager.

Volunteers

Volunteer labor will be critical to the success of the Nursery, especially before the budget allows for hired staff. Many elements of nursery operation are labor intensive and time consuming. In addition to recurring individual volunteers, the Nursery can also host volunteer events for individuals and groups to assist in large seasonal tasks such as moving inventory, installing irrigation, and winterization. Engaging volunteers at the Nursery serves a secondary function of public education and the building of greater awareness about Cleveland's urban forest.

Professional Development

Professional development and training is essential to ensure that staff are up-to-date on the latest nursery industry best management practices, technologies, and propagation methods. An annual budget should be allocated for staff to attend industry conferences and training.

The Ohio Nursery and Landscape Association offers the Ohio Certified Nursery Technician (OCNT) Grower certification that staff can achieve to help build their nursery knowledge and skills. The program also offers study materials and manuals that can be useful tools to increase the knowledge of staff and volunteers.

Workforce Development

Workforce development programming is a long-term goal for the Nursery. During the strategic planning process, the Management Team can establish partnerships with existing workforce development programs in Cleveland that support recruitment, training, and placement of unemployed and underemployed people, especially those with barriers to employment, low income individuals, and people of color. The Nursery can provide these individuals with training and work experience necessary to obtain full-time, sustainable employment in the green industry. For example, **the Nursery can assist workforce development program participants in preparing for the OCNT Grower certification exam by providing hands-on training opportunities.**

Potential Workforce Development Partners:

- Rid-All Green Partnership
- Cleveland Metro School's Washington Park Environmental Studies Academy
- Urban League of Greater Cleveland
- Tri-C

Professional Services

Technical consultants may be needed to implement elements of the Business Plan. Some examples of professional services may include:

- **Property acquisition** - A real estate agent and/or attorney may be necessary to acquire the land necessary to build the Nursery.
- **Site Planning and Development** - Engineers, landscaping company, and/or landscape architect may be hired to assist in laying out the Nursery site as well as providing detailed plans for infrastructure installation and a corresponding budget.
- **Construction** - Experienced contractors may be needed to build structures such as greenhouses, garages, and office space.
- **Graphic Design** - A graphic design and advertising consultant may be hired to develop a brand and marketing materials for the Nursery.

SECTION 5: MARKETING PLAN

Target Market

The CTC has taken a leading role in the effort to grow, maintain, and protect Cleveland's urban forest. In doing so, they have fostered a network of partners including environmental non-profit organizations, community organizations, municipal departments, landscape architects, developers, hospitals, and commercial tree nurseries. This network provides the initial customer base for the Nursery. In addition to nurturing existing relationships, the Management Team should regularly conduct outreach and fundraising activities for the Nursery in order to garner new awareness and support for the program. Although the Nursery will mainly supply plant material to the organizations involved with achieving the CTP planting goals, there may be opportunities to sell trees at public events or online sales that target the local homeowner/land-owner market. Additionally, the Nursery should build a strong working relationship with the commercial tree nursery in order to establish itself as a resource rather than a competitor. Because of the unique nature of the plant material that will be grown by the Nursery, there may be opportunities to provide liners to commercial nurseries who are growing larger stock.

In the early phase of the Nursery, the focus will likely be on meeting the tree stock needs of the existing partners and stakeholders in the CTC who are implementing the CTP planting goals. As the Nursery grows, the Management Team can continue to foster new relationships with other potential partners who plant trees locally.

Market Segments

Market Segment	Names of Segment Customers	Marketing Strategy
Municipal, Institutional, Public Entities	City of Cleveland, regional municipalities in northeast Ohio, Cuyahoga Soil & Water Conservation District, Northeast Ohio Regional Sewer District	Direct solicitation to key staff, outreach to Council of Governments, provide educational workshops to municipal staff; Couple with arboreal consultation services
Public Parks and Institutions	Metro Parks, Cuyahoga Valley National Park, Holden Forest & Gardens, Cleveland Museum of Natural History	Work closely with these organizations to understand their long-term planting goals and species needs so that plants may be grown in advance for projects
Community Groups	Slavic Village, Rid-All Green Partnership	Direct solicitation to key staff; Host open house; Offer contract growing; Couple with arboreal consultation services
Non-Profit Partners/ Restoration Groups	West Creek Conservancy, Chagrin River Watershed Partners, Inc., Lake Erie Allegheny Partnership, Western Reserve Land Conservancy	Direct solicitation to key staff; Host open house; Offer contract growing; Couple with arboreal consultation services
Retail/Direct to Consumer	Large land-owners, residential customers, individuals.	Utilize existing marketplaces such as farmers markets and public festivals and sales. Online sales.
Landscapers/ Design & Engineering Services	Forest City Ecological Services, L.A.N.D. Studio	Host exclusive reception for select designers, engineers, landscapers, and landscape architects at nursery. Give tours. Host lectures that provide continuing education credits.
Private Companies	Lake View Cemetery	Offer a list of species to be planted as memorial trees for customers.

Competitive Advantage

Several aspects of the Nursery will set it apart from other growers and vendors. These unique factors will create a competitive advantage and shape the marketing message.

- Trees are grown locally which reduces the carbon footprint and contributes to the local economy.
- Trees are grown from seed which yields a stock that is an adapted genotype and promotes greater genetic diversity compared to the typical cloned tree.
- Species offered consist of greater variety, with limited or no availability to purchase regionally – contributing to greater biodiversity locally.
- The Nursery will be staffed by tree experts, offering a superior product with capacity to provide technical support to customers.
- The Nursery is tied to the CTP goals and functions to support its achievement.

These factors offer considerable marketing opportunities that will set the Nursery apart from its competitors and drive sales.

SECTION 6: FINANCIAL PLAN

The following section is an explanation of the project projections which can be found in greater detail in the budget table that follows this section (Table 3). Budget estimates are based on Tree Pittsburgh Heritage Nursery historical performance and industry averages.

Establishment Phase

The Nursery will begin with an establishment phase. During this time, the Lead Organization and Management Team will be identified. It is expected that the Management Team will dedicate hours to this project on a part-time basis in addition to their primary roles within their greater organization, as outlined in the budget table. A fundraising campaign will be launched to acquire the funds necessary to develop the Nursery. The Management Team will develop a strategic plan and work plan that will guide implementation of the steps outlined in the Business Plan. Once funds are acquired, a Nursery Manager can be hired, and development of the Nursery can begin. This will include finding the appropriate land, buildout of the necessary infrastructure, and setting in place the elements to begin nursery operations. As the Nursery becomes operational, the Management Team can scale back their involvement to an as as-needed basis.

Year One

The first year of operation should begin in January with crop planning, supply ordering, and preparations for the growing season. During the first year of operation, the Nursery will produce its first plant material. If grown from seed, most will not be ready to sell until year two. However, liners can be purchased and potted up in spring of the first year. Many of these plants will be ready to sell in the fall of the first year. The financial projections set the goal of selling 1,000 plants in the first year.

Years Two through Four

The nursery will scale up production by 50% in the second and third year, and by 25% in the fourth and fifth year. During this time, seasonal staff will be brought on and work force development programs may begin.

Year Five: Breakeven Scenario

By the end of the fifth year of operation, the goal is for the Nursery to sell 8,000 plants. If operations follow the forecasted budget, a breakeven scenario is estimated to occur at this time.

Sustainment and Revenue Generation

Following the Year 5 (breakeven scenario), the Nursery should continue to sustainably scale-up production while identifying efficiencies in operations to lower costs. This will allow the Nursery to generate unrestricted revenue which can be funneled back into Nursery investments or into other unfunded programs such as tree planting initiatives, workforce development, or educational programming. It is recommended that the Nursery continue to seek supplemental funding even after the breakeven scenario is achieved in order to optimize revenue generation.

Reforecasting

There will be many learning opportunities in the first few years of operation, and unforeseen circumstances will almost certainly arise. **The budget should be re-forecasted on a regular basis to align any shortfalls or surplus with financial goals.**

Fundraising

From the establishment phase through the breakeven scenario, significant fundraising will be needed in order to cover the costs of the Nursery.

FUNDRAISING GOALS

A detailed breakdown of estimated costs can be found in the budget table (Table 3). Based on the financial projections for this project, **a total of $604,400 will be needed to sustain the Nursery from the Establishment phase through Year 5 (Breakeven Scenario).***

Fundraising may be done in segments.

- **Establishment and Year 1:** An estimated $387,200 will be needed to operate the Nursery program through the establishment phase and the first year.
- **Year 2 – 4:** An estimated $217,200 will be needed to operate the Nursery.
- **Year 5:** It is estimated that the Nursery will breakeven at the end of this year if 8,000 trees are sold.
- If less funding is available, the project should be scaled back proportionately.
- In-kind support may provide opportunities for cost-savings in the form of shared infrastructure, volunteer labor and materials, and program collaborations.

**These projections do not include rent/mortgage or land acquisition costs.*

Budget

Budget estimates provided in Table 3 are based on Tree Pittsburgh Heritage Nursery historical performance and 2020 industry averages.

Table 3: Budget Cleveland Urban Tree Nursery

BUDGET: CLEVELAND URBAN TREE NURSERY	Establishment	Year 1	Year 2	Year 3	Year 4	Year 5
INCOME						
Foundation Grants/ Fundraising	$ -	$ -	$ -	$ -	$ -	$ -
Total Income: Foundation Grants/Fundraising	**$ (307,200)**	**$ (80,000)**	**$ (103,130)**	**$ 69,330**	**$ (44,740)**	$ -
Tree Sales						
Volume (Number of trees sold)	0	1000	2000	4000	6000	8,000
Average Rate (Price per tree)	$ -	$ 20	$ 20	$ 20	$ 20	$ 20
Total Income: Tree Sales	$ -	$ 20,000	$ 40,000	$ 80,000	$ 120,000	$ 160,000
INCOME GRAND TOTAL	$ -	**$ 20,000**	**$ 40,000**	**$ 80,000**	**$ 120,000**	**$ 160,000**
Gross Profit	**$ (307,200)**	**$ (80,000)**	**$ (103,130)**	**$ (69,330)**	**$ (44,740)**	**$ 286**
Expenses*						
***Does not include rent/ mortgages or land acquisition costs**						
PERSONNEL						
Salary - Executive Director (Management Team ~ 2 hrs/week)	$ 8,000	$ 5,000	$ 2,000	$ 1,000	$ 1,000	$ 1,000
Salary - CFO (Management Team ~ 1 hr/week)	$ 4,000	$ 3,000	$ 2,000	$ 1,000	$ 1,000	$ 1,000
Salary - Program Director (Management Team ~ 6 hrs/week)	$ 15,000	$ 12,000	$ 10,000	$ 8,000	$ 8,000	$ 8,000
Salary - Nursery Manager (Full-time 40 hrs/week)	$ 20,000	$ 40,000	$ 42,400	$ 45,000	$ 47,700	$ 49,131
Salary - Communications Assistant (Management Team - as needed)	$ -	$ 2,000	$ 1,500	$ 1,500	$ 1,500	$ 1,500
Part-Time Program Assistant - (Part-time - 24 hrs/week for 40 weeks per year)	$ -		$ 14,400	$ 14,400	$ 14,400	$ 14,400
Part-Time Program Assistant - (Part-time - 24 hrs/week for 40 weeks per year)				$ 14,400	$ 14,400	$ 14,400
Part-Time Program Assistant - (Part-time - 24 hrs/week for 40 weeks per year)					$ 14,400	$ 14,400
Staff Professional Development			$ 500	$ 1,000	$ 1,500	$ 1,500
Payroll taxes and insurance	$ 4,700	$ 6,200	$ 7,230	$ 8,530	$ 10,240	$ 10,383
Total Personnel	**$ 51,700**	**$ 68,200**	**$ 80,030**	**$ 94,830**	**$ 114,140**	**$ 115,714**
PROFESSIONAL FEES						
Legal	$ 5,000					
Site Planning and Development	$ 10,000					
Graphic Design/ Marketing Plan	$ 8,000	$ -	$ -	$ -	$ -	$ -
Grading	$ 10,000	$ -	$ -	$ -	$ -	$ -
Contractor	$ 8,000	$ -	$ 4,000	$ 2,000	$ 1,000	$ -
Total Professional Fees	**$ 41,000**		**$ 4,000**	**$ 2,000**	**$ 1,000**	**$ -**
PROGRAM SUPPLIES						
Seeds	$ -	$ 300	$ 500	$ 600	$ 700	$ 800
Plant Material	$ -	$ 1,000	$ 2,000	$ 3,000	$ 4,000	$ 5,000
Soil	$ -	$ 2,000	$ 3,000	$ 4,000	$ 5,000	$ 6,000
Pots	$ -	$ 800	$ 1,000	$ 1,200	$ 1,500	$ 1,600
Labels/ Printer	$ -	$ 1,000	$ 400	$ 500	$ 600	$ 600
Fertilizer	$ -	$ 300	$ 400	$ 500	$ 600	$ 600
Pesticides	$ -	$ 300	$ 400	$ 500	$ 500	$ 500
Tools	$ -	$ 1,000	$ 800	$ 600	$ 600	$ 600
Hoses and Accessories	$ -	$ 1,000	$ 800	$ 600	$ 600	$ 600
Other Supplies	$ -	$ 1,500	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Total Program Supplies	**$ -**	**$ 9,200**	**$ 10,300**	**$ 12,500**	**$ 15,100**	**$ 17,300**
CAPITAL INVESTMENTS						
Greenhouse	$ 30,000	$ -	$ 5,000	$ 1,000	$ 800	$ -
Hoop House	$ 5,000	$ -	$ 5,000	$ 5,000	$ 5,000	$ -
Irrigation	$ 10,000	$ -	$ 5,000	$ 4,000	$ 1,000	$ 500
Truck	$ 35,000	$ -	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Tractor or Skid Steer	$ 35,000	$ -	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Seed Processing Workspace (Refrigerator, Sink, Countertops, Shelving)	$ 8,000	$ -	$ -	$ -	$ -	$ -
Benches/ Shed	$ 5,000	$ -	$ 2,000	$ 1,000	$ 500	$ -
Pole Building	$ 30,000	$ -	$ 1,000	$ 1,000	$ 1,000	$ -
Soil Media/ Compost Storage Area	$ 10,000	$ -	$ -	$ -	$ -	$ -
Security/ Deer Fencing	$ 21,000	$ -	$ 1,000	$ -	$ -	$ -
Other	$ 10,000	$ -	$ 5,000	$ 3,000	$ 1,000	$ 1,000
Total Capital Investments	**$ 199,000**	**$ -**	**$ 26,000**	**$ 17,000**	**$ 11,300**	**$ 3,500**
UTILITIES AND INSURANCE						
Utility Tapping Fees:	$ 15,500	$ -	$ -	$ -	$ -	$ -
Water	$ -	$ 1,000	$ 1,200	$ 1,400	$ 1,600	$ 1,600
Electric	$ -	$ 800	$ 800	$ 800	$ 800	$ 800
Natural Gas/ Propane	$ -	$ 800	$ 800	$ 800	$ 800	$ 800
General Liability Insurance	$ -	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000
Total Utilities/ Insurance	$ 15,500	$ 22,600	$ 22,800	$ 23,000	$ 23,200	$ 23,200
GRAND TOTAL EXPENSES	**$ 307,200**	**$ 100,000**	**$ 143,130**	**$ 149,330**	**$ 164,740**	**$ 159,714**
NET INCOME	**$ (307,200)**	**$ (80,000)**	**$ (103,130)**	**$ (69,330)**	**$ (44,740)**	**$ 286**

Exit Strategy

The financial performance of the Nursery will be monitored on a monthly basis as part of regular financial reviews by the Board and Management Team. When projections are missed, corrective action will be determined for course correction. Toward the end of Year 1, a budget for Year 2 will be created with reference to the pro forma statements contained herein and re-forecasted if necessary. Out-years will also be adjusted with any new information available at the time. If the Nursery is under performing, the following corrective actions will be used:

- Exercise tighter oversight of day to day operations to identify inefficiencies
- Fundraise to supplement losses if a clear path to breakeven is anticipated
- Reassigning more functions of the Nursery to the Lead Organization's other programming (i.e. education, training, or outreach programs)
- Utilize the Nursery facility for rental income or consider contract growing for either non-profit partners or commercial nurseries
- Consider diverting operating resources to the Nursery

If the following corrective actions do not provide a clear path to sustainability, the Lead Organization will take steps to wind down the Nursery to a level that can be sustained.

SECTION 7: APPENDICES

Please find these appendices on the following pages:

- Appendix A: Nursery Model Case Studies
- Appendix B: Tree Stock Availability Analysis
- Appendix C: References & Resources

APPENDIX A: NURSERY MODEL CASE STUDIES

Cleveland Nursery Feasibility Study
Nursery Model Case Studies

As part of the Cleveland Nursery Feasibility Study, the Davey Resource Group (DRG)/Tree Pittsburgh project team developed case studies on three different nursey models that could be used in Cleveland.

- Municipal Bare Root Tree Nursery (Columbus, OH)
- B&B Nursery Consortium (West Cook Suburban Tree Consortium)
- Non-Profit Container Tree Nursery (Tree Pittsburgh & Northwest Oregon Restoration Partnership)

The models were selected to provide a broad understanding of how different organizations have addressed their tree stock needs. As the case studies present, each of these models have similarities and differences in size, stock type, customer base and the level of resources and funding needed to establish and operate.

The following provides the DRG/Tree Pittsburgh team's analysis of each of the nursery models. Based on the purposes of this project to meet gaps in available tree stock; re-purpose vacant lands; and provide work force development opportunities, and feedback from stakeholder interviews and the nursery stock analysis the project team recommends Cleveland pursue the non-profit container nursery model. We hope this information is helpful to the Advisory Group in selecting the nursery model for the business plan.

City of Columbus Municipal Nursery (Bare Root)

The City of Columbus, OH operates a 45-acre bare root nursery just south of the city. The nursery exclusively supplies tree stock for the city's street tree planting efforts.

- Produce ~2,000 1.5-1.75" caliper bare root trees per year
- Estimated annual budget: $260,000

Analysis:

The City of Cleveland utilizes contractors for their street tree planting program. The contractors both purchase and plant the balled-and-burlapped (B&B) stock used for street tree planting.

Opportunities

- Re-purpose vacant lands
- Workforce development opportunities (partnerships with other organizations)
- Scalable

Limitations

- With current tree planting efforts conducted by contractors, the City of Cleveland does not see a need for a City-operated nursery
- City funding and resources to establish and run a nursery are limited
- The ability of the City of Cleveland to offer or sell trees to other organizations may not be feasible because it could be interpreted as competing with commercial nurseries.
- Bare root stock was not utilized by Cleveland stakeholders (however different stock type could be grown depending need)
- Not revenue generating

Based on current conditions and the stock needs of interviewed stakeholders, the municipal nursery model is not a good fit for Cleveland.

Funding for this project provided by the
Cuyahoga County Healthy Canopy Grant program

West Cook Suburban Tree Consortium (B&B)

The West Cook Suburban Tree Consortium (STC) operates out of the Chicago metropolitan region. The STC is made up of 40 municipalities and 5 regional nurseries with the goal of providing high-quality B&B tree stock at affordable prices for its members. Municipalities are required to submit a tree order that cover 5-years.

- Municipal Investment: $500/year plus the cost to purchase trees
- Trees Provided: 12,000 per year

Analysis:

Stakeholders interviewed stated that many of their projects are planned and implemented in the same year and planning out, even 2 years, would be a challenge

Opportunities

- Significant investments in land and equipment is not required
- Scalable

Limitations

- Stakeholder interviews found the gap in tree stock in the Cleveland was small containerized stock (1-3 gallon)
- Stakeholders typically do not plan out more than 1 year
- This model would not re-purpose vacant lands
- Limited opportunities for work force development
- Not revenue generating

Based on the stated project goals to produce nursery stock to meet gaps in need, repurpose vacant land and provide work force development opportunities, the Consortium model is not a good fit for Cleveland.

Tree Pittsburgh Heritage Nursery and Northwest Oregon Restoration Partnership (Container)

Tree Pittsburgh Heritage Nursery and the Northwest Oregon Restoration Partnership (NORP) are non-profit organizations that have developed container nurseries to meet demand/need for smaller, containerized tree stock.

- Annual Budget: $160,000 (TPHN); $200,000 (NORP)
- Trees Produced Annually: 12,000 (TPHN); 60,000 (NORP)

Analysis:

Interviewed stakeholders were most supportive of a non-profit nursery model focused on growing quality native tree stock and supporting workforce development opportunities.

Opportunities

- Re-purpose vacant lands
- Workforce development opportunities
- Meets the tree stock gap needs (1-3 gallon, containerized stock) of interviewed stakeholders
- Revenue generating potential
- Potential for a broad customer base
- Scalable

Limitations

- Need to identify a lead organization to establish and operate the nursery
- Need to secure a commitment from customer base to grow plant material

Based on the stated project goals to produce tree stock to meet gaps in need, repurpose vacant land and provide work force development opportunities, **the non-profit, container nursery model is the best fit** for Cleveland.

City of Columbus Municipal Bare Root Nursery

HISTORY AND MISSION

To produce nursery stock for the City of Columbus to meet the goal of planting 2,000 street trees on an annual basis.

The City of Columbus Recreation and Parks Division operates a 45-acre bare root tree nursery in Lockbourne, Ohio just south of the city. The nursery was established in 1962 on 50-acres adjacent to the City's wastewater treatment plant within the Scioto River floodplain. In the 1970's the wastewater treatment plant used 5-acres of the nursery for an expansion, which brought it to its present size of 45-acres. When the nursery was established ground irrigation and a 5-acre pond were installed to irrigate the trees.

The nursery initially started as a ball-and-burlap tree nursery but the root balls would not stay together due to the sandy/loam soil. After attempts to grow large tree stock (1.5 - 1.75" caliper) were unsuccessful, they switched to growing bare root tree stock which they have been successfully growing since the 1990's.

Today the nursery provides 2,000 bare root trees per year for street tree planting conducted by City of Columbus Forestry staff.

LAND

45 acres including a man-made 5-acre pond for irrigation

Adjacent to the floodplain of the Scioto River

Soil is sandy/loam glacial till

STOCK/INVENTORY

Bare root tree stock grown to 1.5-1.75"caliper

Nursery capacity is 11,830 bare root trees - current inventory 7,000 trees

Tree stock is grown from purchased whips (70%) and seeds propagated from local sources (30%)

2,000 trees are dug and planted on an annual basis

Variety of species are currently grown, City is moving towards growing species that are not commercially available.

Quick Facts

Municipal Bare Root Nursery

$260,000 Estimated Annual Budget

2,000 trees harvested each year

Size: 45 acres

Workforce: City of Columbus Staff

Funding for this project provided by the
Cuyahoga County Healthy Canopy Grant program

City of Columbus Municipal Nursery

CUSTOMER BASE

City of Columbus, exclusively

WORK FORCE OPPORTUNITIES

6 full-time staff & 4 seasonal staff employed by the City of Columbus

- Gardener Supervisor - Manager of nursery operations and planting
- Horticulturist Specialist - Assistant to the Supervisor, tree propagation
- Gardeners - Tree planting and maintenance, nursery operations
- Seasonal staff - aid in all efforts

FUNDING/BUDGET

The City of Columbus Recreation and Parks Forestry Division does not have a line item in their budget exclusively for nursery operations.

FY20 Forestry Budget: $2.6 million which funds the planting, pruning, and removal of over 127,000 street and parks trees and nursery operations (staff and equipment). Tree whips are purchased using the Plant Material Fund, which comes from fees collected for the removal of city trees by other city departments and outside entities. Estimated annual nursery budget: $260,000

EQUIPMENT

Skid steer - $15,500
Truck - $25,000
Dump Trailer - $8,000

BUILDINGS/INFRASTRUCTURE

Greenhouse
Hoop-houses
Irrigation Lines in all fields

West Cook Suburban Tree Consortium

HISTORY & MISSION

To maintain and improve the urban forest within the Chicago metropolitan region, thereby enhancing the quality of life for the region's residents, by fostering cooperation and communication at the municipal level; supporting cost-effective means of acquiring and installing trees; and offering technical assistance and information regarding municipal forestry.

In the early 1980's municipalities in the Chicago metropolitan area were struggling to find high-quality, reasonably-priced nursery tree stock for their street tree operations. These communities were required to use the lowest-bidder for tree planting and tree stock which led to poor quality stock and high mortality. To address this concern, a group of municipalities worked with the West Central Municipal Conference to establish the Suburban Tree Consortium in 1985. The Consortium fosters partnerships amongst municipalities that improves tree stock quality, economics and increases networking. Today, the consortium has over 40 member cities and 5 participating nurseries.

LAND

The Suburban Consortium does not own land for nursery production, instead they have arrangements with five area nurseries:

Wilson Nurseries, Inc.
Beaver Creek Nursery, Inc.
Beeson's McHenry County Nursery, Inc.
Hinsdale Nurseries, Inc.
Possibility Place Nursery

STOCK/INVENTORY/SOURCE

Balled and burlapped (B&B) trees grown to a minimum of 2" caliper

12,000 trees are supplied annually to Consortium members

Available tree species lists are provided to Consortium members each year by participating nurseries

Quick Facts

Balled & Burlap (B&B) Nursery Consortium

$500/year + Cost to purchase trees

12,000 trees purchased annually

Size: N/A

Workforce: N/A

Funding for this project provided by the Cuyahoga County Healthy Canopy Grant program

West Cook Suburban Tree Consortium

CUSTOMER BASE

Municipalities – currently, 40 municipal members in west and northwest Cook County

To participate in the program an organization:

- pays a $500 annual membership fee to the Consortium
- submits an annual resolution supporting participation in the Consortium passed by their governing body (e.g. City Council, Board of Directors) along with a 5-year tree order to the Consortium with the quantity, species, size and nursery to supply stock

FUNDING/BUDGET

Municipalities participating in the Consortium pay a $500 annual membership fee to cover management and administration and then purchase trees through the nursery, at already established prices, when the trees they ordered have been grown to size and specifications.

Participating nurseries provide all necessary funding to carry out nursery operations

EQUIPMENT

The Suburban Consortium does not own any equipment for nursery production. The participating nurseries provide all of the necessary equipment to carry out B&B tree nursery production.

WORK FORCE OPPORTUNITIES

One staff person administers program on a part-time basis. Limited work force development opportunities with the Consortium.

Opportunities for employment may exist among participating nurseries or tree planting contractors

Tree Pittsburgh Heritage Tree Nursery

HISTORY AND MISSION

The Tree Pittsburgh Heritage Nursery (TPHN) is a non-profit wholesale nursery specializing in native trees and shrubs grown from locally harvested seed. The nursery is a program of the environmental non-profit organization Tree Pittsburgh. In 2011, after difficulty finding appropriate plant material for their projects, Tree Pittsburgh sought funding from the local Sprout Fund to launch a small seedling nursery. This funding, leveraged with donations and in-kind support, allowed Tree Pittsburgh to reclaim a ½ acre vacant lot and construct one hoop house, a shed, deer fencing and drip irrigation. The site had access to city water and the local water authority agreed to provide water to irrigate the nursery free of charge. In its first year of operation the nursery hired a part -time seasonal nursery attendant and produced 1,700 1-2 gallon containerized trees which were used for Tree Pittsburgh plantings.

In 2012 the nursery produced excess material and offered stock for sale to partner organizations; selling ~ 250 trees and generating $5,215 in revenue. By 2013, the ½ acre site was filled to capacity with 6,000 containerized plants of 70 species and sales that exceeded $13,000 in revenue.

Building on the program's success, Tree Pittsburgh sought $265,000 in investment funding from a local foundation to expand the nursery and fund operations for two years. During the same time a nursery business plan was developed which has served as a guiding document for the program. Partnering with the Urban Redevelopment Authority of Pittsburgh, Tree Pittsburgh leased a former industrial parcel along the Allegheny River to develop a larger nursery and eventual office and education space. In 2014 Tree Pittsburgh hired a full time Nursery Manager who has built out the new site and implemented the business plan. Each subsequent year, the TPHN has scaled up production and operations by ~10%. By 2019 the nursery produced 12,000 2-3 gallon containerized trees and generated $135,000 in revenue from plant sales.

LAND

2-acre former industrial site

STOCK/INVENTORY

Containerized tree stock (2 gallon - 80% of stock; 3 gallon - 10% of stock); Plant band or liners (10% of stock)

12,000 containerized plants are currently grown on the 2-acre site, comprised of 60 species of trees and 20 species of shrubs

Quick Facts:

Non-Profit, Wholesale Container Nursery

12,000 containerized plants grown annually

2 Acres of Post-industrial land

Workforce: Staff and Volunteers

Funding for this project provided by the
Cuyahoga County Healthy Canopy Grant program

Tree Pittsburgh Heritage Tree Nursery

STOCK/INVENTORY (CONT.)

Stock is primarily native but some non-native, non-invasive, urban-tolerant species are grown

Inventory is grown from locally collected seed, however some 1 year bareroot seedlings are purchased locally, up-potted and grown-on for one season to meet demand.

CUSTOMER BASE

Wholesale-only nursery. Customers are required to purchase 10 or more trees and must be a business, organization or public entity. Twice annually, excess stock is made available to the public for a limited time. The customer base is comprised of:

- 45% Internal Projects (Tree Pittsburgh)
- 45% Non-Profit Restoration Groups and Partners
- 5% Institutional, Commercial, Private; 5% Retail Sales

EQUIPMENT, BUILDINGS & INFRASTRUCTURE

Skid Steer Loader: $15,500

Hoop Houses: $4,000 each
(four 14'x48' structures)

Greenhouses: $25,000

Irrigation System: $14,000

Solar Array: $25,000 (grant funded)
(10,000 kWh per year system)

WORK FORCE DEVELOPMENT

Staffing for *establishment 2012-2014:* 1 Part-time seasonal Nursery Attendant, 1/2 Director of Community Forestry time

Staffing starting in 2019: 1 Full-time Nursery Manager,1 Full-time Nursery Assistant, 2 Part-time Seasonal Assistants (March- November)

Volunteers: The TPHN relies on approximately 600 hours of volunteer assistance per year, or $10,000 in-kind volunteer support)

Operating Budget 2013:

Personnel:	$30,700
Supplies/ Materials:	$4,500
Equipment/ Infrastructure/ Operations:	$9,400
Total Costs:	$44,600
Tree Sales Income:	$15,300
Grant Funding:	$30,000
Net Income:	$700

Operating Budget 2019:

Personnel:	$125,000
Supplies/ Materials:	$16,000
Equipment/ Infrastructure/ Operations:	$15,000
Total Costs:	$160,000
Tree Sales Income:	$134,000
Grant Funding:	$64,000
Net Income:	$38,000

Northwest Oregon Restoration Partnership

HISTORY AND MISSION

In 2002, a small partnership for watershed restoration was formed in Tillamook, Oregon. Today the Northwest Oregon Restoration Partnership (NORP) includes over 40 partners and has grown to become one of the country's most successful models for restoration partnerships. The primary objective of this cooperative is to promote healthy forest and riparian ecosystem conditions by collecting and growing native plant seeds and cuttings to develop genetically adapted and locally appropriate planting stock. The stock is then provided at low cost to the partners in the NORP.

LAND

5-acres owned by adjacent correctional facility

STOCK/NVENTORY

Containerized tree stock - tublings or 1-gallon tree pots

60,000 tublings or containers are grown each year, comprised of 30 tree species, 26 species of shrubs and 6 species of sedges and forbs.

CUSTOMER BASE

NORP Partners - plants are valued at $4 each, however the NORP offers them to partners within the collective for $1- $3 per plants, so plants may be used as an in-kind match to leverage grant funding.

After all collective members receive their requested plant material, the remaining stock available is made available or $4 each to other groups and individuals.

Quick Facts:

Non-Profit Container Nursery

Grows 60,000 plants annually

Land: 5 acres correctional facility owned land

Workforce: Incarcerated youth and volunteers

Funding for this project provided by the
Cuyahoga County Healthy Canopy Grant program

Northwest Oregon Restoration Partnership

BUDGET/FUNDING

Annual operating budget is approximately $200,000

Sources of Funding

- Local Oregon Watershed Enhancement Board (primary source)
- Bureau of Land Management and US Forest Service
- Local state and private funding
- Tree Sales (small portion)

WORK FORCE DEVELOPMENT

The nursery program employs one full-time nursery manager who oversees production, planning and operations of the nursery.

The NORP nursery formed a partnership early on with the Tillamook Youth Correctional Facility and employs 8 trained incarcerate youth corps for 20 hours per week (160 hrs). The youth corps are paid the state's highest allowable rate for incarcerated labor. The NORP also engages approximately 50 volunteers per year.

EQUIPMENT/INFRASTRUCTURE/LAND

Greenhouse

Storage outbuilding

Hoop Houses

For more detailed information on the history and operations of NORP, see attachment.

Northwest Oregon Restoration Partnership: A Model for Successful Watershed Restoration

Kurt Heckeroth

Botanist, U.S. Department of the Interior, Bureau of Land Management, Tillamook, OR

Abstract

In Tillamook, OR, a partnership for watershed restoration began in 2002 with several partners. By 2011, the project had grown to become the Northwest Oregon Restoration Partnership and now includes nearly 35 partners. The primary objective of this cooperative effort is to promote healthy forest and riparian ecosystem conditions by collecting and growing native plant seeds and cuttings to develop genetically adapted, large planting stock that is able to withstand vegetative competition and thrive after planting. Providing this type of plant stock is useful for meeting management plan goals and implementing restoration activities on lands administered by the U.S. Department of the Interior, Bureau of Land Management (BLM) and on lands of interest to the various watershed organizations. The effort was designed to encourage the application of innovative solutions to forest and riparian health conditions on an ongoing basis across the landscape. These actions support the Oregon Plan for Salmon and Watersheds and meet multiple BLM strategic goals and planning objectives, including but not limited to community support, partnerships, education, youth, fish and wildlife habitat, water quality, and biological system integrity.

History

In the mid-1990s, Tillamook Bay on the Oregon Coast was included as a National Estuary Project. Input from teams of researchers and numerous local community public outreach efforts resulted in the creation of a Comprehensive Conservation and Management Plan for the Tillamook Bay area and associated watersheds (Trask, Wilson, Tillamook, Kilchis, and Miami watersheds) (Tillamook County Performance Partnership 1999). The plan identified more than 400 mi (644 km) of riparian habitat degraded because of lack of vegetation. The degradation raised concerns for fish and wildlife habitat and water quality. At the same time efforts to analyze stream conditions for many of the other northwest Oregon coast range watersheds identified similar issues, such as fish passage, stream temperatures, bank stability, invasive species, and lack of appropriate native vegetation.

The restoration and protection of natural watershed processes are the foundation for achieving watershed health. Since natural watershed processes have been eliminated, altered, or reduced in many areas, habitat restoration activities are the primary method for reintroducing critical ecosystem functions to watersheds important to threatened and endangered fish and wildlife that have been negatively impacted by past management practices or disturbance events. Restoration activities are intended to address the watershed functions necessary to support natural processes that are indicative of healthy watersheds. This effort includes, but is not limited to, improving water quality, habitat complexity, floodplain interaction, vegetation structure, and species diversity. The Oregon Department of Environmental Quality's total maximum daily load studies, the North Coast Basin Water Quality Management Plans, the Watershed Council Action Plans, the Tillamook Bay Comprehensive Management Plan, and the 35 BLM watershed analyses have all concluded that native vegetation is needed in riparian zones to reduce pollutants, stabilize stream banks, and lower stream temperatures.

As implementation for restoration efforts began in the late 1990s, it soon became recognized that locally adapted native plant material was not readily available on the open market. Desired plant species could be purchased, but not with the appropriate local genetics. Most reproductive materials used by nurseries to propagate native plants were collected from the Willamette Valley east of the Oregon coast range and the associated foothills. Before watershed coordinators became educated on the importance of genetic variation and local adaptation, they purchased and planted off-site plant stock. Because of their intolerance to coastal environments, however, plants genetically adapted to the Willamette Valley did not always do well, showing low vigor and high mortality. In addition, most of the native plant material available was small bareroot stock types that were not very competitive and hard to maintain because of their relative size to the competing vegetation already dominating the site. Common competing issues were browse, overtopping, moisture competition, and matting.

Most organizations involved with restoration efforts on the Oregon coast did not have adequate funding to purchase plants. The main source of plant material came from donations of surplus upland reforestation conifer stock that were acquired through a variety of sources, including; the U.S. Department of the Interior (USDI), Bureau of Land Management (BLM); U.S. Department of Agriculture (USDA), Forest Service; Oregon Department of Forestry and several private timber companies. A typical bareroot upland reforestation conifer, such as western hemlock, Douglas-fir, western redcedar, and Sitka spruce grown for the Oregon coast has a height range of 14 to 20 in (35 to 50 cm), a 0.2- to 0.3-in (5- to 7-mm) stem diameter, and a fibrous root mass 10 to 11 in (25 to 28 cm) in length. These stock type dimensions are not ideal for planting in riparian habitat as most sites are dominated by aggressive, nonnative species or overtopped by an existing stand of hardwoods or shrubs. In these habitats, underground competition is extremely important; for example, planting a 10-in (25-cm) rooted bareroot tree seedling into reed canarygrass (*Phalaris arundinacea* L.) with root systems 14 in (35 cm) deep is not practical for survival. In these conditions, site preparation and maintenance is extremely costly to assure survival, an expense for which most watershed restoration efforts did not have adequate funding.

Donated bareroot conifer species were available only late in the planting window; sometimes well into the spring root development stage for conifers. Planning efforts were difficult because no indication existed of what stock would be available or when. These donated surplus conifers usually had problems because of moisture stress after long-term cooler storage that led to higher mortality rates. Considering most planting efforts occur on private lands, high mortality rates did not appeal to these private landowners, thereby making it difficult to recruit neighboring landowners for participation in the watershed restoration program. Landowner participation is the key to treating watersheds as a whole; thus, plant survival and vigor is crucial for successful restoration efforts

Tillamook Native Plant Cooperative

Recognizing the need to use locally adapted native plant material and create a larger more competitive stock type, a small group of restoration coordinators in the Tillamook area created a plan. In 2001, they took the entire donated seedling surplus they could get and, instead of outplanting them, they transplanted the trees back into the soil at the Oregon Youth Authority (OYA) Camp Tillamook Work Study Center, for 1 additional year, thereby creating a 3-year-old bareroot stock type (figure 1). In theory, this approach would reduce

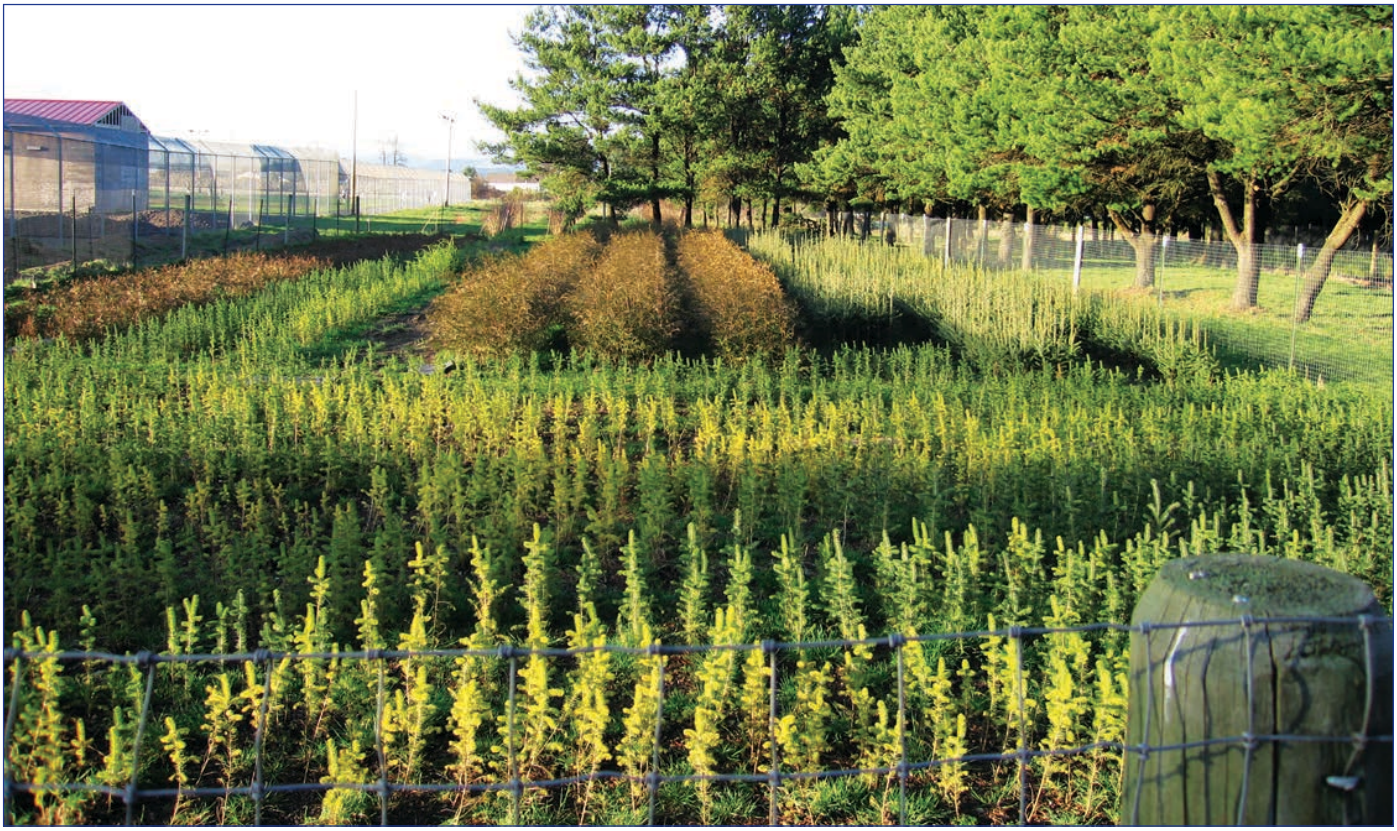


Figure 1. Initial bareroot nursery established at the Oregon Youth Authority Camp Tillamook Work Study Center. (Photo by Kurt Heckeroth 2002)

mortality issues, create a larger, more competitive plant, and provide an inventory for planning purposes. A collaborative effort began and was called the Tillamook Native Plant Cooperative. No funding initially was available to support this effort. An agreement was established between the Tillamook Soil and Water Conservation District and the OYA Camp Tillamook Work Study Center, a State Agency that allowed the partners to use State land for their project. A local farm digester cooperative donated compost to amend the soil, a local farmer donated time and equipment to till the land, the youth from Camp Tillamook donated the labor to transplant the donated seedlings, and the BLM-donated cooler space for bareroot tree storage.

Establishing the transplant nursery created an inventory of available plants and enabled the partners to control their lifting window. Limitations still existed, however. The effort to manage the nursery without chemicals led to weed control issues because the OYA labor force was not always available for manual weed removal. The OYA inmates manually did all the nursery work, and wet weather on the coast provided only small windows of opportunity to lift seedlings for outplanting. It was difficult to remove the wet soil from the roots, and, because of the lack of weed control, roots were damaged when the workers separated the target plant from the weeds. The lifted plants had to be bagged or boxed and stored in a cooler, but the 3-year-old plants were quite large and difficult to package properly. Also, because the ideal planting window for dormant bareroot plants coincides with high streamflow events, seedling storage was needed late into the spring. This storage duration meant that the cooperative was still dealing with long-term storage issues and possibly missing spring root development.

Given the difficulties in handling and storage of bareroot plant material, the partnership decided to pursue container plant production. In 2003, all 2-year-old bareroot tree seedlings were transplanted into 1-gal (3.8-L) Tall One Treepots™ (Stuewe and Sons, Inc., 4 in [10.2 cm] wide and 14 in [35.6 cm] deep) and grown for 1 additional year. A small test area was developed and was so successful that holding racks for containers were built (figure 2), and the entire nursery area was converted to containers in 2004. Transplanting into containers resulted in larger, more competitive stock, less weeding needed, longer planting windows, and less root disturbance (figure 3) while still benefitting from the OYA labor force (figure 4).

The next issue to be addressed was species diversity. Planting solely conifers did not meet all the streamside restoration objectives (such as shade to reduce stream temperature, bank stabilization, nutrient input, etc.). Some of these objectives could be met sooner by incorporating deciduous tree and shrub species that were not available through donations. In 2002, BLM's Horning Seed Orchard (Colton, OR) had three commercial-sized greenhouses that were being used at only one-third capacity for upland conifer plug production. The BLM received a grant from the National Fish and Wildlife Foundation that was used to improve the middle greenhouse span to accommodate an area for the restoration partnership to start containerized seedling production (figure 5). To formalize this relationship, a memorandum of understanding (MOU) was constructed among BLM, 7 Watershed Councils, Tillamook County Soil and Water Conservation District, OYA, and Tillamook Estuaries Partnership, all of which were within the geographic boundaries of the Tillamook Resource Area of the BLM's Salem District. Watershed councils from the

Figure 2. Holding racks were built (left) to convert the Camp Tillamook Nursery from bareroot to container seedling production (right). Each rack holds 90 plants and will last up to 15 years. (Photos by Kurt Heckeroth 2003)

Figure 3. Western redcedar (left) and sedge (right) growing in containers at Camp Tillamook Nursery (Photos by Kurt Heckeroth 2012)

Figure 4. Oregon Youth Authority Camp Tillamook Work Study Center workers applying fertilizer to newly potted western redcedar seedlings. (Photo by Kurt Heckeroth 2012)

Figure 5. A greenhouse at the Bureau of Land Management's Horning Seed Orchard was placed into production for the Restoration Partnership. (Photo by Kurt Heckeroth 2003)

Willamette Valley were also invited to partner, which created the need to separate seed collections from coastal and valley watersheds. Because Federal dollars were now being used to fund restoration on private lands, the Wyden Amendment was used as the authority, which limited partnered projects to only watersheds that could show benefit to public lands. The Horning Seed Orchard started approximately 40,000 seedlings and grew 12,000 plants in 1.0-gal (3.8-L) Tall One Treepots™ for outplanting on a yearly basis. Trees to be outplanted were shipped to 4 drop points along the Oregon coast (figure 6).

In 2010, the BLM began a process to reorganize their tree improvement program, which would eventually reduce and eliminate the partner's ability to use the greenhouses at the Horning Seed Orchard. To adapt to this change, the partnership secured funds to build a commercial-sized greenhouse in Tillamook (figure 7) located at the OYA Camp Tillamook Work Study Center. The partnership also worked with school districts and partners throughout the northwest corner of Oregon to revitalize greenhouses in disuse from underused or unfunded

Figure 6. Trees being delivered to the U.S. Fish and Wildlife Service wildlife bird refuge just south of Pacific City, OR, one of four drop points along the Oregon coast. (Photo by Kurt Heckeroth 2005)

Figure 7. A new greenhouse was constructed at the Oregon Youth Authority Camp Tillamook Work Study Center in 2012 for seedling production after the Horning Seed Orchard greenhouse was no longer available. (Photo by Kurt Heckeroth 2012)

agriculture programs and created 13 additional satellite nurseries (table 1). These geographically dispersed nurseries significantly reduced the cost for plant distribution.

Restoration Through Education

To efficiently collect reproductive material and develop community involvement, the partnership established a workshop program in 2004 that focused on 20 different native riparian plant species including conifers, hardwoods, and shrub species. The workshops are provided to coordinators, teachers, youth corps, and volunteers (figure 8). Workshops have been offered through Oregon State University Extension offices, the BLM office in Tillamook, Lewis and Clark National Park in Astoria, or one of the partner's facilities. An additional workshop was developed for grade school and high school classes in which the students learn about plant propagation in a classroom setting (figure 9) and during hands-on sessions (figure 10). In some schools, students grow plants in a native plant nursery at the school (figure 11) and plant them 2 years later on restoration sites with the local watershed councils. All of the education sessions emphasize nonprofit, community-based restoration efforts for riparian and wetland habitats. Information provided through the workshops includes plant identification, seed collection, seed extraction (if needed),

Table 1. List of satellite nurseries in Oregon built to help educate local communities and create a sustainable supply of genetically adapted plant material; any surplus plant material is made available to all partners if the genetics are appropriate.

Site in Oregon	Infrastructure	Production capacity		Primary beneficiaries (county)
		1.0-gal (3.8-L) Tall One Treepots™	16-in³ (262-cm³) Ray Leach Cone-tainers™	
Camp Tillamook (Tillamook)	1 greenhouse		50,000	All partners
	Outdoor growing area	25,000		Lincoln, Tillamook, Clatsop
Ecotopia (Cloverdale)	Outdoor growing area	4,000		Lincoln, Tillamook
Lewis and Clark National Park (Astoria)	Emergent shade house		20,000 wetland species	Clatsop
	Outdoor growing area	2,000		
Rainier High School (Rainier)	1 greenhouse		5,000	Columbia
	Outdoor growing area	2,000		Clatsop
St. Helens High School (St. Helens)	1 greenhouse		To be determined	Columbia
	Outdoor growing area		To be determined	
Columbia River Youth Corps Campus (Warren)	Outdoor growing area	4,000		Columbia
Scappoose High School (Scappoose)	Outdoor growing area	2,000		Columbia
Vernonia High School (Vernonia)	1 greenhouse		30,000	Columbia, Tillamook, Washington
	Outdoor growing area	2,000		
Trillium Forest Nursery (Vernonia)	Outdoor growing area	2,000		Columbia, Tillamook, Washington
Newberg High School (Newberg)	3 greenhouses		5,000	Washington, Yamhill
	Outdoor growing area	2,000		
Miller Woods (McMinnville)	1 greenhouse		1,000 or more	Yamhill
Eddyville Charter School (Eddyville)	1 greenhouse		5,000	Lincoln
	Outdoor growing area	1,000		
Westwind (Lincoln City)	Outdoor growing area	2,000		Lincoln
Taft High School (Taft)	Outdoor growing area	2,000		Lincoln

Figure 8. Workshops provide partners training on seed collection, seed extraction, seed storage, and propagation techniques. (Photo by Alex Sifford, Nestucca/Neskowin/Woods Watershed Council 2010)

Figure 9. Educational programs include classroom learning and demonstrations about plant propagation. (Photo by Alex Sifford, Nestucca/Neskowin/Woods Watershed Council 2010)

Figure 10. Hands-on plant propagation is part of the educational workshop program. (Photo by Alex Sifford, Nestucca/Neskowin/Woods Watershed Council 2010)

Figure 11. At some schools, students propagate and grow plants at a native plant nursery at the school. (Photo by Alex Sifford, Nestucca/Neskowin/Woods Watershed Council 2010)

seed storage, sowing techniques, and vegetative propagation methods under controlled greenhouse environments and outdoors at the project site. The importance of genetic diversity is emphasized throughout each workshop. After a full day in a classroom setting, a field day is offered to gain hands-on experience and follow-up to the information presented in the classroom. These workshops are provided upon request by the partners and usually held in the fall when many of the native tree and shrub species are readily available to collect.

The partnership has also established relationships with several youth corps and provides them with the opportunity for natural resource conservation training. The youth help collect seed, propagate and transplant seedlings, perform site preparation and planting techniques, and provide maintenance at the project site. Their participation has been crucial to the success of this cooperative effort. Educating youth is important as they are the next land stewards and, through education and hands-on experience, will be able to make wiser choices by understanding how their activities on the landscape affect fish and wildlife habitat and impact water quality.

In addition to workshops, each partner has incorporated volunteer activities that provide opportunities for hands-on education (figure 12). These activities promote local community interest and landowner participation.

Figure 12. Partner volunteers potting tree seedlings for restoration plantings. (Photo by Kurt Heckeroth 2005)

Collection And Propagation

The partnership model initially was to provide education and to have each partner be in control of his or her community-based collection of reproductive plant material. The material was batched with other partners' collections according to seed zone and elevation or by watershed, and then propagated and returned to the appropriate location for planned restoration projects. It was soon recognized, however, that without tight control of the collection process, plant viability could be compromised because of poor collection timing and seed handling before sowing. Since 2012, all the seed that is collected for the coop is overseen by the partnership coordinator and direct sown. The seed collection protocol for a particular species batch calls for a minimum of 15 parent plants from 15 separate locations spaced at least 0.5 mi (0.8 km) apart, with each parent contributing no more than 15 percent to the batch. This protocol is also recommended for vegetative collections. Elevation bands of 500 ft (152 m) are also observed although most of the project sites are below 500-ft (152-m) elevation.

The partners produce approximately 40,000 shrub and hardwood plants annually. All seed are direct sown immediately after collection into 16-in^3 (262-cm^3) Ray Leach Cone-tainers™ and left outdoors through the winter to go through a natural stratification (figure 13). The trays and tubes are covered tightly with shade cloth to prevent predation from birds and rodents. The next spring, they are moved into the greenhouse to encourage germination. Plants are grown in the greenhouse for 4 to 6 months (figure 14) and then transplanted into 1.0-gal (3.8-L) Tall One Treepots™ in July or August, just in time to take advantage of the fall root development period and set up the plant for vigorous growth the next spring. Initially, the partnership used smaller containers to conserve greenhouse space but found transplanting was required earlier than desired, resulting in capacity issues with the outdoor nursery. For educational purposes or when the seed collection window is missed or not available based on environmental conditions, vegetative propagation is used. For some species, it is quicker to create a larger, more robust plant from cuttings than from seed. Both hard and soft tissue cuttings are used (figure 15). Cuttings are struck into Ray Leach Cone-tainers™ and transplanted to Tall One Treepots™ after adequate root growth occurs. Most shrubs and hardwoods are grown at the nursery for 2 years before outplanting.

Figure 13. Shade house being constructed at the Oregon Youth Authority Camp Tillamook Work Study Center to use for direct sowing and outdoor natural stratification over the winter. The shade cloth protects seed from bird and rodent predation yet allows for ambient temperatures and rain. (Photo by Kurt Heckeroth 2012)

Figure 14. Black twinberry seedlings being grown for restoration plantings. (Photo by Kurt Heckeroth 2013)

Figure 15. Several native plant species, including stink currant, are grown from cuttings. (Photo by Kurt Heckeroth 2013)

In addition to the shrub and hardwood plants, more than 30,000 conifer seedlings are grown as plug+1 stock at private nurseries in the Willamette Valley and then transplanted into containers at one of the established partnership nursery sites on the coast (table 1). The bareroot seedlings are lifted in mid-January and held in the BLM cooler at Tillamook until they can be transplanted in mid-to late February. The main conifer species used are Sitka spruce (*Picea sitchensis* [Bong.] Carrière), western hemlock (*Tsuga heterophylla* [Raf.] Sarg.), grand fir (*Abies grandis* [Douglas ex D. Don] Lindl.), western redcedar (*Thuja plicata* Donn ex D. Don) and Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco). All conifers are transplanted into 1.0-gal (3.8-L) Tall One Treepots™. These container dimensions force the root mass to develop to a depth that makes it more competitive underground when outplanted and provides the plant with more stability. Outside growing areas have been constructed throughout the northwest corner of Oregon to grow 45,000 of these containerized conifer and hardwood seedlings per year.

Northwest Oregon Restoration Partnership

A new partnership, the Northwest Oregon Restoration Partnership (NORP), has recently been created through a new MOU that builds upon the success of the Tillamook Native Plant Cooperative. The NORP includes the original partners plus approximately 20 additional agencies, organizations, and schools that want to share resources to restore not only riparian and wetland habitats but also prairie, Oregon white oak, high-elevation meadows, and other important habitats in and around Oregon's north coast range.

Because of the growth in the partnership, the Tillamook Bay Watershed Council (TBWC) agreed to apply and become the recipient of an Oregon Watershed Enhancement Board grant to fund a NORP coordinator and also manage Federal funds through a 5-year Cooperative Assistance Agreement with the BLM. All BLM funds that support the NORP are used to purchase supplies required to operate the partnership nurseries (such as soil, pots, fertilizers, and additional infrastructure costs such as propane, water, and electricity). The TBWC has hired the NORP coordinator as an employee with the objective to act as the central point of contact, to research funding opportunities, coordinate educational workshops, identify and coordinate seed collection windows for each plant species, and manage the plant production and dispersal for the entire partnership on an annual basis. Each fall, the partners provide the NORP coordinator with a plant request based on project needs. Plant material that is not readily available through the cooperatives, current plant inventory will be purchased from private nurseries if the appropriate genetics can be found.

This partnership has been successful for several reasons:

1. The BLM has provided essential funding and technical support for the plant propagation that has contributed to low mortality rates.
2. The partners are able to use the cost of plant material to secure grant funding for planned projects.
3. The partners are key to project implementation. They outplant the nursery plants onto the landscape, mostly on private lands, and restore approximately 20 to 25 mi (32 to 40 km) of degraded riparian areas each year.
4. The partners make the necessary landowner contacts, educate landowners why streamside restoration is important for fish, wildlife and water quality, and write grants to support the project work (site prep, planting, fencing, caging, and maintenance).
5. The process of providing plants is based on, and adjusted for, meeting partners' needs; this will continue into the future.

Using BLM funding sources that are targeted for native plant restoration through this partnership has shown recognizable benefit to whole watersheds that benefit from restoration efforts completed on public lands. In addition to using BLM funds, NORP partners are pursuing grant opportunities with the U.S. Fish and Wildlife Service, National Fish and Wildlife Foundation, Oregon Watershed Enhancement Board, Oregon's Department of Environmental Quality, and other sources to integrate funds for plant propagation so that the BLM is not the sole funding source for the propagation part of the project.

Everyone understands the importance of having a diverse funding stream that reduces the risk of failure if the BLM does not have the budget to continue funding the partnership. The contributions of BLM, however, allow the partners to use Federal contributions as match for grants, a concept that has built and maintained this partnership for more than 10 years. Partners use the initial investment by BLM to raise large amounts of additional funds for the project, bringing in more than $3 for every $1 spent by BLM. This project has made significant improvements to watershed health, and the partnership looks forward to continuing to work together to improve degraded habitats and water quality throughout the northwest corner of Oregon.

Accomplishments

From 2002 to 2011, significant landowner participation, education events, and miles of planting along streams occupied by federally listed endangered fish has occurred (table 2). Because of this level of local involvement established through the partnership, entire communities have raised their awareness concerning the benefits of healthy riparian conditions affecting fish and wildlife habitat and water quality. These efforts encourage and generate respect for good stewardship on both private and public lands. The emphasis for BLM's participation in this partnership is to support restoration projects that address problems and implement recommendations identified in 32 watershed analyses covering the north coast range completed as part of Salem District's land use planning. All these watershed analyses recognize that continuity of watershed health is needed to sustain and stabilize the resources that use or are part of BLM lands and the communities that BLM serves.

It does no good to fix just a portion of a problem that may exist only on BLM-administered lands when other parts of a watershed are unraveling or are not properly functioning. NORP is instrumental in restoring the whole watershed through all the partners working on all land ownership types. This partnership has been recognized as a successful working model to restore ecosystem function and has garnered awards in recognition of its achievements from the American Fisheries Society, the Public Lands Foundation, and from former BLM Director Robert Abbey for excellence through stewardship in BLM. NORP continues to draw interest and grow because of its success in addressing on-the-ground needs, providing community-based education, and encouraging public participation. The actions undertaken by NORP support the Oregon Plan for Salmon and Watersheds, the Oregon Conservation Strategy, Oregon Coast and the Coho Conservation Plan, and

Table 2. Summary of Tillamook Resource Area riparian restoration accomplishments.

Activity	FY 2011	Total FYs 2002–2011
Streams planted (mi)	27	256.27
Wetlands planted (ac)	22	114.03
Riparian fences constructed (mi)	4.26	51.47
Project maintenance (mi)	42.14	353.27
Number of landowners involved	411	1,937
Number of future landowners contacted	354	1,903
Number of plants propagated (other than at Horning or Camp Tillamook)	6,750	58,680
Number of education sessions or tours	43	291
Number of people attending education sessions or tours	879	7,813
Monitoring (mi)	76.6	467.93
BLM/NFWF funds expended	$115,000	$799,671
Partner donation value (includes OWEB funding)	$187,262*	$1,840,937*

BLM = Bureau of Land Management. FY = fiscal year. NFWF = National Fish and Wildlife Foundation. OWEB = Oregon Watershed Enhancement Board
*These numbers reflect only the amount reported by partners as a match for the project. When we surveyed the partners regarding total contributions, we found that they bring approximately $350,000 per year to the project. Throughout the 9 years of implementation, the Tillamook Resource Area Riparian Restoration Effort watershed organizations have contributed more than $3 million to the project.

meets multiple BLM strategic goals and planning objectives, including, but not limited to, threatened and endangered species recovery, community support, partnerships, youth, fish and wildlife habitat, water quality, and biological system integrity. In addition to providing shade and water filtering to improve salmon habitat and water quality, much of the riparian planting also helps to control invasive species such as reed canarygrass, Scotch broom (*Cytisus scoparius* [L.] Link), English ivy (*Hedera helix* L.), Himalayan blackberry (*Rubus armeniacus* Focke), and knotweed (*Polygonum* L.) that occupy many project sites.

Summary

NORP's work will make it possible to restore thousands of acres of native plant communities in riparian, wetland, and rare upland habitats at priority sites throughout watersheds in northwest Oregon. NORP supports partners' resource management plans, watershed analyses, and restoration activities by providing locally adapted native plant materials. NORP's efforts play a central role in the restoration of threatened and endangered salmonid streams and rivers and improvement of water quality throughout northwest Oregon.

NORP has transformed the geographic region in the northwest corner of Oregon from an area where a wide variety of efforts were competing to achieve the same goals into a more cohesive, cooperative effort for riparian restoration. The program

has created a transition from plant material being sought out by individual entities to a collaborative effort that has created a sustainable supply of locally adapted native plant materials. In addition to sharing plant materials, technical advice is shared regarding seed collection, vegetative propagation, site preparation, planting techniques, animal damage protection, and maintenance. In some cases, proposals for grants are collaboratively written to support these cooperative efforts. Previously abandoned agriculture program greenhouses at schools are being rejuvenated to support restoration. Partners have greater opportunities to receive and give education to their local communities. This program is a working model of successful cooperative watershed management where boundaries can be crossed and restoration can be identified on an entire watershed scale.

Address correspondence to—

Kurt Heckeroth, Botanist, Bureau of Land Management, 4610 3rd Street, Tillamook, OR 97141; e-mail: kheckero@blm.gov; phone: 503–815–1132.

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APPENDIX B: TREE STOCK AVAILABILITY ANALYSIS

An analysis of the availability of tree species listed in the 2015 Cleveland Tree Plan at five regional Cleveland nurseries.

	STOCK TYPE AVAILABLE AT EACH NURSERY (B&B = balled and burlapped)				
	X= Available		= Unavailable at 3 or more nurseries		
	BROTZMAN NURSERY	**KLYN NURSERY**	**LOSELY NURSERY**	**RUSTY OAK NURSERY**	**WILLOWAY NURSERY**
Species (Botanical)	Container, B&B and Bare Root	Container and B&B	B&B	Container and B&B	Container and B&B
Abies concolor	X	X	X	X	
Abies nordmanniana					
Acer buergerianum			X	X	
Acer campestre		X		X	
Acer griseum	X	X	X	X	X
Acer miyabei 'Morton'		X	X		X
Acer triflorum		X	X		X
Acer x freemanii 'Jeffersred'		X		X	X
Aesculus flava	X	X			
Aesculus glabra		X		X	
Aesculus pavia	X	X			
Amelanchier laevis		X		X	X
Amelanchier x grandiflora		X		X	
Asimina triloba	X	X	X	X	
Betula nigra		X	X	X	X
Carpinus betulus 'JFS-KW1CB'					X
Carpinus caroliniana		X	X	X	

	STOCK TYPE AVAILABLE AT EACH NURSERY (B&B = balled and burlapped)				
	X= Available		= Unavailable at 3 or more nurseries		
	BROTZMAN NURSERY	**KLYN NURSERY**	**LOSELY NURSERY**	**RUSTY OAK NURSERY**	**WILLOWAY NURSERY**
Species (Botanical)	Container, B&B and Bare Root	Container and B&B	B&B	Container and B&B	Container and B&B
Celtis laevigata				X	
Celtis 'Magnifica'					
Cercidiphyllum japonicum	X	X	X	X	X
Cercis canadensis	X	X	X	X	X
Chionanthus retusus		X	X		
Cladrastis kentukea	X	X	X	X	X
Cornus florida 'Appalachian Spring'					
Cornus kousa	X	X	X	X	X
Crataegus viridis 'Winter King'				X	X
Diospyros virginiana	X	X	X	X	X
Fagus sylvatica		X	X	X	X
Ginkgo biloba	X	X	X	X	X
Gleditsia triacanthos var. *inermis* 'Impcole'		X		X	
Gleditsia triacanthos var. *inermis* 'Shademaster'		X	X	X	
Gleditsia triacanthos var. *inermis* 'Skycole'		X		X	X
Gleditsia triacanthos var. *inermis* 'Draves'	X	X			X

	STOCK TYPE AVAILABLE AT EACH NURSERY (B&B = balled and burlapped)				
	X= Available		= Unavailable at 3 or more nurseries		
	BROTZMAN NURSERY	**KLYN NURSERY**	**LOSELY NURSERY**	**RUSTY OAK NURSERY**	**WILLOWAY NURSERY**
Species (Botanical)	Container, B&B and Bare Root	Container and B&B	B&B	Container and B&B	Container and B&B
Gymnocladus dioicus 'Espresso'		X	X		X
Gymnocladus dioicus 'J.C. McDaniel'					
Halesia tetraptera	X	X	X	X	X
Juniperus virginiana 'Corcorcor'					
Koelreuteria paniculata	X	X	X	X	X
Liquidambar styriciflua 'Moraine'		X			
Liquidambar styriciflua 'Variegata'	X				
Liriodendron tulipifera	X	X	X		X
Maackia amurensis 'JFS-Schichtel1'		X			
Maackia amurensis 'Starburst'					
Maclura pomifera 'White Shield'		X			X
Magnolia acuminata	X	X			
Magnolia 'Butterflies'		X			
Magnolia 'Coral Lake'					
Magnolia 'Daybreak'		X			
Magnolia 'Elizabeth'					
Magnolia 'Golden Gift'					

	STOCK TYPE AVAILABLE AT EACH NURSERY (B&B = balled and burlapped)				
	X= Available		= Unavailable at 3 or more nurseries		
	BROTZMAN NURSERY	**KLYN NURSERY**	**LOSELY NURSERY**	**RUSTY OAK NURSERY**	**WILLOWAY NURSERY**
Species (Botanical)	Container, B&B and Bare Root	Container and B&B	B&B	Container and B&B	Container and B&B
Magnolia stellata		X	X		X
Magnolia tripetala		X			
Magnolia virginiana	X	X	X	X	X
Magnolia x brooklynensis 'Yellow Bird'	X				
Magnolia x loebneri		X	X	X	
Malus 'Bob White'		X			
Malus 'Prairifire'		X	X	X	X
Malus 'Jewelcole'				X	
Malus 'Sutyzam'		X	X	X	X
Metasequoia glyptostroboides	X	X	X	X	X
Nyssa sylvatica	X	X	X	X	
Ostrya virginiana		X	X		X
Parrotia persica 'Vanessa'	X	X	X		X
Picea orientalis	X	X	X		
Pinus rigida					
Pinus rigida x taeda					

	STOCK TYPE AVAILABLE AT EACH NURSERY (B&B = balled and burlapped)				
	X= Available		= Unavailable at 3 or more nurseries		
	BROTZMAN NURSERY	**KLYN NURSERY**	**LOSELY NURSERY**	**RUSTY OAK NURSERY**	**WILLOWAY NURSERY**
Species (Botanical)	Container, B&B and Bare Root	Container and B&B	B&B	Container and B&B	Container and B&B
Pinus virginiana	X			X	
Platanus x acerifolia 'Morton Circle'	X	X	X		X
Quercus bicolor		X		X	X
Quercus imbricaria		X	X	X	
Quercus macrocarpa		X		X	X
Quercus muehlenbergii		X		X	X
Quercus palustris		X		X	X
Quercus palustris 'Pringreen'		X		X	
Quercus prinoides					
Quercus robur x bicolor 'Nadler'	X	X	X		X
Quercus rubra		X	X	X	X
Quercus shumardii		X		X	X
Quercus x warei 'Long'	X		X	X	X
Styphnolobium japonicum 'Regent'				X	
Styphnolobium japonicum 'Pendulum'					
Syringa reticulata 'Ivory Silk'		X	X	X	
Taxodium distichum	X	X	X	X	X

	STOCK TYPE AVAILABLE AT EACH NURSERY (B&B = balled and burlapped)				
	X= Available		= Unavailable at 3 or more nurseries		
	BROTZMAN NURSERY	**KLYN NURSERY**	**LOSELY NURSERY**	**RUSTY OAK NURSERY**	**WILLOWAY NURSERY**
Species (Botanical)	Container, B&B and Bare Root	Container and B&B	B&B	Container and B&B	Container and B&B
Thuja occidentalis	X	X	X	X	X
Thuja 'Green Giant'	X	X	X	X	X
Thuja plicata 'Grovepli'					
Tilia americana	X	X		X	
Tilia cordata 'Greenspire'		X		X	
Tilia cordata 'Hulka'					
Tilia tomentosa	X	X		X	X
Tilia x euchlora					
Ulmus 'Frontier'		X	X	X	
Ulmus 'Morton Glossy'		X		X	X
Ulmus 'Patriot'					
Ulmus americana 'Princeton'		X	X	X	X
Ulmus americana 'Jefferson'		X			
Ulmus americana 'New Harmony'		X	X		
Ulmus davidiana var. *japonica* 'JFS-Biebrich'			X		X
Ulmus parvifolia 'Emer II'				X	

	STOCK TYPE AVAILABLE AT EACH NURSERY (B&B = balled and burlapped)				
	X= Available		= Unavailable at 3 or more nurseries		
	BROTZMAN NURSERY	**KLYN NURSERY**	**LOSELY NURSERY**	**RUSTY OAK NURSERY**	**WILLOWAY NURSERY**
Species (Botanical)	Container, B&B and Bare Root	Container and B&B	B&B	Container and B&B	Container and B&B
Zelkova serrata 'Green Vase'	X	X		X	
Zelkova serrata 'JFS-KW1'					
Zelkova serrata 'Musashino'	X	X		X	
Zelkova serrata 'Village Green'					X

APPENDIX C: REFERENCES & RESOURCES

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