Nursery Production- *Joe Barley, Owner, Clear Ridge Nursery.*
Joe Barley, owner of Clear Ridge Nursery, spoke about his perspective as a Maryland Landscape, Nursery, and Greenhouse Association member. Joe discussed what consumers need to know, what they need to do, trends in ownership, how growers think, the difference between propagation and production, owner specialization, and how availability works.

Small family-owned nurseries are declining because owners are at retirement age and need a person to succeed them. Another difficulty that nurseries are facing is finding labor. There are challenges in finding both skilled (managers) and physical work. Nurseries need to have a great administrator to get the labor they need for a season. There are a couple of different federal programs that are used to get labor (especially physical labor),; these programs tend to be complex and political, leading to much work to get folks to the nursery. Politics have caused a crisis with these programs and other dependent businesses without qualified workers.

Nurseries are businesses! They need to be making a profit; this is crucial in retaining employees and allowing them to grow with a company. Successful nurseries are thinking in the long term and planning around what will be most profitable. Nurseries are the most comfortable when they know what they can sell, and figuring out what to sell requires advanced planning.

Joe talked about the two main types of nurseries:

1. Propagation growers start plants from seeds, cuttings, Scion wood, and tissue culture to produce a liner plant.
2. Production growers take liner plants and grow them to larger sizes before selling them o customers.

Nurseries are highly specialized, meaning they will grow Containers vs. B&B or Root Bag, Trees vs. Shrubs, Evergreens vs. Deciduous, Ornamentals vs. Natives.

Clear Ridge is a slight mix of the two. They propagate about five species from seed or cut; all other plants are from a producer. Clear Ridge has a seed bank that will both send to producers or grow themselves. Seed sourcing essential; some customers have requirements knowing about the seeds and where they come from. The nursery industry has pushed seed sourcing on people's rad; healthy seeds from the right region can help in the long run. Seed sourcing can be narrowed to tree-sourcing region.

Joe talked about what nurseries need from customers you're a state, a landscaping company, or just buying for your own property). You as a customer can find the best success by following the below steps:

1. Match your expectations with national nursery standards.
2. Provide a list of wants and needs to the nursery.
3. Find nurseries that match your list of wants and needs. Narrow down your list, and then visit! Visiting allows you to tell what type of nursery they are operating and if they even have what you want.
4. Build a professional relationship with the nursery that best fits you. Ensure that you are matching your expectations to American Standard for Nursery Stock ANSI-Z60.
5. Prepare yourself to make a financial commitment. Make a budget so you know what you can commit to.
6. ORDER AT THE RIGHT TIME.

A great way to find and meet and greet producers, nurseries etc. is by attending the Mid Atlantic Trade Show (MANTS) It makes it easy to talk to everyone.

Clear Ridge Nursery has been in business for 25 years, they have been perfecting this list both for themselves and for customers.

Today's Seeds – Tomorrow's Trees - *Alexis Dickerson, Potomac Conservancy*

Alexis Dickerson talked about how indigenous, native seed-stock is critical to creating a future Chesapeake Bay watershed that has cleaner air, cleaner water, and more green spaces for all. Alexis discussed how the Conservancy's volunteers who collect acorns are a large part of making this future possible.

Alexis showed "The help grow future forest" location banner and then went over the steps to collecting seeds at their pre identified sites. These sites are set up to help get members of the community to collect seeds and other tree data.

Today's Seeds Tomorrow's Tree's Program (or just Tomorrow's Tree's) is a program that is a reboot of the Growing Native program. In 2008 and 09 the Growing Native program lost the funding for seed collection. Right before the pandemic, the program got a reboot and turned into Tomorrow's Tree's.

The Potomac Conservancy saw a need for trees and understood that there are challenges for getting trees in the ground and keeping them in the ground, along with knowing how many we have planted. Some of those challenges include development pressures, lack of reporting, old trees are not getting replaced. The Potomac Conservancy focuses on the Potomac, but these issues are impacting the whole watershed.

There is increased demand for trees in the watershed. States are seeking more trees to legislation that requires more trees to be planted. Nurseries have also started to see demand from consumers (people want native trees increase). The tree supply in the is struggling to keep up with the demand.

Through the seed collection process, some of the seeds are grown into seedlings for the Potomac community. The Seedling sales from the Conservancy have been a HUGE hit, consumer have shown a great deal of enthusiasm for native seedings.

Alexis talked about using community memebers to collect seeds as a tool to help expand capcity and gets communities engaged in their local nature. Alexis showed some photos of communty members sorting through seeds. The seeds are dived by species and put into bags. Bags only contain one type of seeds to make it easier for producers to plant and grow into trees to sell.

Alexis talked about how there are 3 levels of engament a person can do to be a part of the Tomorrow's Tree Program:
Volunteering at a public event- Volunteers come out to a prescheduled event and collect seeds that will be given to partners.
Host a kiosk- have a kiosk in a community spot to get people in your local communty to collect seeds. Hosting a kiosk means that you are the point of contact and supply the things needed for the collection. There is a need to get kiosks in places like libraires or other public spaces.

Volunteer as a seed collection leader- hosting your own private event with people and leading them in the charge of collection.

Volunteers can go online and or look in the kiosks for useful information on why collect and how to collect along with seed identification instructions. The Conservancy has started doing training with folks to help with seed identification. When folks are doing identification on their own sometimes it helpful to also include a branch with leaves to help nursires double check the seedling type.

Alexis ran through events that happen in MD, VA, and DC area that help people learn about seed collection. The Conservancy has learned that they need to de-centralize events to help make sure that seeds can be collected when a major event is canceled. Mast years are also an issue when it comes to viable seeds. The Potomac Conservancy will be focusing on creating hubs to help with de-centralizing to ensure that events can occur even when things like weather get int the way.

The Potomac Conservancy has made seed collection more accessible through their kiosks and programming. However, they recognize there is more work to be done. For example, when folks go out on their own, they might not know where to go or what trees to collect from, there is a need to create maps for folks to show them where to go and what trees to collect form.

Alexis than talked about how the program works from seed to planting:

- Seed collection- this is where the community engament is crucial and a way to get folks outside for an important cause.
- Germinate and grow- This is a broader part of the program that is an important step in creating pathways for nursrey success (quantity, quality, and distribution of seeds)
- Reforest and maintain critical areas- The Conservancy uses applied data with partner to make connections to support capcity, viability of seeds, and ensuring that seeds are being equitably shared across communites.
- Healthy forests for clean water: ensure achievability of conservation goals.

Questions:
Funding: The Potomac Conservancy has done fundraising and has funds through NFWF, The Bay Trust, and other grants. Partnership with other organizations like Dog Walk ALX (Alexandrea) have also helped with fundraising and seed collection.
How do you get seeds from bins to nursery?
An intern was picking up and ferrying seeds. The Potomac Conservancy is looking for volunteers to help with shuttling work and identifying mass drop off sites.
Is there a way to get landscapers to collect the seeds that people don't want and get to Conservancy?
They are looking into that on a small scale. Also looking into a system where like leaf removal, seeds ae collected and bagged and left for pick up.

Growing Native - *Frank Rodgers, Cacapon Institute with: Victoria Lusk, Watershed Educator, Cacapon Institute and Elise Sheffield, Boxerwood Outdoor Education Center*
Growing Native is a Meaningful Watershed Educational Experience for elementary school students. At a dozen schools in WV and VA, students learn about tree biology and running micro-tree nurseries distributing hundreds of potted trees into their communities.

Frank opened this agenda item by talking about the importance of getting kids involved in their own watershed health through planting trees. MEWEEs are much more beneficial and impactful when kids get to do go outdoors and plant their own trees.

Part 1
Elise Sheffield of Boxerwood Outdoor Education Center spoke about trees and kids and how they can help move our outcomes forward. Boxerwood is a local arboretum that services a local community through a public/private partnership. Nature centers and arboretums can work in partnership with sates in helping advancing progress. The way that Boxerwood advance progress is through their Project NEST (nurturing, environmental, stewardship together) partnership. Project NEST is linked with three school divisions Rockbridge County, VA to ensure that there is systemic (meaning all kids, in all classes, in all grades) watershed educational experiences. The goal with this systemic partnership is to help grow the next generation of earths stewards.
Due to the systemic nature of the work Boxerwood does they are able to meet with 2800 students annually from 17 different pre-schools,7 elementary schools, 3 middle schools, and 2 high school.

Boxerwood is in the Appalachian Mountains, so how do educators convey how they are connected to the Bay from the mountains? The answer: Through meaningful watershed engagement by showing them their local watersheds. Getting kids connected to the watershed is crucial. Kids are guided to ask meaningful questions and to understand the needed actions. The needed action component can be met through the Growing Native Project. Growing Native Project is done in partnership with Cacpon inst.

The Growing Native Project helps introduce watersheds and how students fit into them. One way to do that is through explaining the power of trees. MEWEEs help guide kids with understanding and interaction of trees and watersheds.

Boxerwood and Cacpon have spring planting days. Boxerwood provides the trees planting materials staff and a plan. Kids in pairs plant trees, and it is once class per time slot. It makes it all manageable, about 306 trees planted in containers.

The trees that students grow have a couple ways that get out in the community:

- Tree giveaways
- Family led community plantings.
- School led community-based plantings.
- Aspire to do reforestation projects- the hope is that the trees will be used for reforestation projects.

Elise noted that they are open to suggestions on how to scale up successful plantings.

Boxerwood is also partnered with CORE works, a caron offset marketplaces to help pay for their tree plantings.

Part 2

Victoria talked about the Cacapon Institute model for student tree engagement. Cacapon Inst. Uses schools as grows out stations or micro tree nursires to grow trees and engage students. These micro tree nurseries have use MEWEEs to teach and MWEEs at their core are education and action. MEWEEs are not required in WV, but Cacapon has been working with schools in WV that have been showing intrest in MWEEs. Cacapon works with 4 counties, 7 schools, and work with all ages of students to plant trees. In the 2022 season the micro nurseries were able to plant about a thousand trees.
Victoria went through the program timeline (in the order of a school year) for micro tree nurseries.

- Fall- new students get introduced to maintenance, winterizing, and planting seeds.
- Winter- admin work, program renewal, ordering trees, and scheduling.
- Spring- potting and hands on education
- Summer-school is out but Cacpon is doing inspections on watering systems, aesthetics, weeds, invasive species, and pests.

Trees are not on school timeline, so staff to take care trees does not match the school timeline.

Victoria than what they need to set up a micro nursery:
Cacapon institute provides the following:

- Fencing,
- Sprinkler + water timer
- Two-gallon pots
- Soil
- Tree
- Mulch tarps

The school provides the following:

- Accessible location
- Water
- Students
- And support staff, especially facility crew

Victoria then went through what happens in the fall and spring in a little more detail.
In the fall maintenance + tub grow out stations occurs. Winterizing also occurs: Weed pots, removes dead trees, weed trees, apply mulch, disconnect water. This is the time to understand how the trees are doing and what is need for spring.

In the spring potting and education occurs. Students are taught how to properly pot trees. The water systems are turned on and the trees grow until they are ready to be distributed and planted.

Cacapon helps with tree distribution: Some of the trees are planted on school campus, while others are solid for school fundraising or giveaways.
Victoria than talked about challenges of the micro nurseries. The biggest challenges include survival and invasive species. Other challenges include: watering (not enough or too much), establishment of trees (quality of trees, storage and care for trees), school staff and lack of time on the side teachers (outside pressures from administrations), monitoring of trees (getting someone in the community to connect to with you can help with monitoring).

School staff can really make or break this program. You need them to make a micro nursery thrive.

Questions:
As you learn over time are you seeing things get better?
Yes, a lot of work has been done to get things back to where they were pre covid. Lot of new teachers have been getting involved, but a lot of good teachers are going to go elsewhere. Good teachers care about things like this!! With schools you must bring an opportunity not a workload.

Panting for a Future Forest. *Lara Lacher, Owner, Seven Bends Nursery*

Lara discussed how our forests are changing. As we move forward, in order to protect forest function and the services they provide, forest managers must adapt to change and implement forward thinking regeneration practices. What factors are at play—climate change, pest and disease, land use?

Lara opened her talk with stating the purpose of her talk: Share with the group some of the issues and their solutions and show the science that back it all up. Our collective goal is to sustain and create healthy forests.

Lara asked the group "what is a healthy forest"? The group shouted out that a healthy forest is one that can regulate itself and is resilient, has layers, has leaf litter, has a diverse array of species. Lara went on to talk about the official definition of a healthy forest: defined by the production of forest conditions which directly satisfy human needs and by resilience, recurrence, persistence, and biophysical processes which lead to sustainable ecological conditions. Our definitions and understanding of forest health are also dependent on spatial scale.

However, "healthy forest" has been historically defined in two different ways: Ecological and utilitarian. Ecological perspective defines healthy as one with good ecosystem function, while a utilitarian is one where management goals are met. A truly healthy forest definition has evolved into one that is an overlap of the two perspectives. There has been a real shift towards adaptive or resilient notions of complexity.

Both perspectives are trying to reach sustainable resources, and balanced ecosystem services. A healthy forest is a diverse forest. Multiple studies have found that a natural mixed forests are more productive and are more likely to withstand environmental changes such as pests/disease. As species richness increases so does productivity. Biomes across the globe have different productivity rates.

It is very clear that our forests are changing. Lara ran through the example of the American Chestnut and its downfall to chestnut blight. Impacts on forests include climate change, invasive species, disease, land use change, and habitat shift.

Climate Change:

Studies show that there is an upward movement of trees in the us. If you are a plant who is experiencing climate change you have the option to either move north, adapt where you are, or simply die. Climate change also means indirect impacts on pests, diseases, and forest composition. There are increased risks to drought and extreme rain.

Invasive Species and Diseases:

Relatively healthy forests are being invaded by invasive species i.e gypsy moths, chestnut blight, white pine blister rust. Invasive species are the second leasing cause of extinction in the US and are costing about 120 BILLION dollars annually. Invasives species can reduce native diversity, alter forest structure, and negatively impact ecosystem services and human health.

Land Use Change:

Human land use change may make it harder for species to move in response to climate change. Simulations suggest that land use in the human dominated east coast slows species dispersal rates by 12-40% and may prevent plants from keeping up with climate change.

Lara went on to talk about "wicked problems" which are problems where complexity, uncertainty, and value divergence all overlap. Solutions will need to be creative, considerate, and adaptive. Solutions need to consider broader context and management can not occur in isolation and there is a need to think at a larger geographic scale. We need to be managing for resilience, the whole system needs to be considered. It is important to plan and use mitigation strategies to combat disease. In 2012 the USFS created new planning regulations under the National Forester Management Act (or the planning rule) that include the first requirements in U.S. public land management history for National Forests to evaluate, protect, and/or restore ecological connectivity as they revise their land management plans. These regulations help foresters think at larger geographic scales. Lara then highlighted some studies that have been published or that are in reviewed that highlight the importance of thinking at larger geographic scales.

Lara went on to talk about managing for resilience. Forests need to have both functional diversity and redundancy to ensure that functional traits will be maintained in a stand. It is also important to actively consider other species within the forest ecosystem. Having diverse both in species and age helps promote growth and create resilience to mortality. Using appropriate interventions to increase tree vigor and lower pathogen and insect pest impacts under predicated climate scenarios is crucial. Increasing tolerance and resistance to pathogens as part of breeding programs designed to increase species tolerance to environmental stressors is another way to get at the resiliency.

Intervening to address dispersal and tolerance limitations was than talked about. It can be a controversial topic because we might not know of pathogens or insects that might follow. Some of these interventions include assisted population migration, assisted range expansion, and assisted species migration. Lara talked about some examples including study that found sourcing seedlings from southern seed zones and planting them in more northern zones can be successful. The results suggest that state seed sourcing guidelines should be reexamined to permit plantings across seed zones, a form of assisted migration.

Monitoring and forecasting might not be as fascinating as the other solutions mentioned, but it is crucial in understanding how our forests are changing. Another solution that is crucial is partnership and bridging the collaboration and partnership gap. Lara highlighted the Climate Change Response Framework as a partnership that is doing the work.

Lara moved into discuss the challenges of reforestation. There are challenges with species sourcing and availability, workforce development, and with pre and post planting practices. Lara went into the

specifics of the challenges with plant seed material sourcing. Successful forests and landscape restoration depends on genetic diversity and origin of seeds used. The few genetic studies that have been done on restored forests suggest that practitioners lack awareness of the importance of genetic diversity. This is because projects often use seed that is either not adapted to the planting site or has strongly reduced diversity with collection from very few parent trees. There is a need nursery stock to facilitate reforestation and restoration goals. By current estimates, to meet goals, we need to make significant advances in seed collection, propagation, and planting.

Lara then went over some actions that can be taken to help address the reforestation pipeline limitations:

- Identify seed shortages.
- Improve and expand see processing.
- Develop climate smart seed zones.
- Bring existing nurseries to full capcity.
- Reduce market risk and incentivize scaling up nurseries.
- Improve transportation and storage to maintain seed quality.
- Establish regional best practices.
- Implement assisted migration.
- Apply appropriate post planting treatments.
- Monitor growth.
- Expand workforce and develop training programs.
- Establish funding and financing mechanisms.
- Partnerships

Lara then ran through the numbers of what is needed to help move the reforestation pipeline along. Some of those numbers include needing 26 million hectares more of reforest able area. We need to be collecting 0.3 billion to 2 billion seeds from local ecoregions. Expanding federal nursery capcity to 151%, state nurseries to 74% and private nurseries to 21%. The coast to do this work will be about $511 per acre.

So, the big question is what is in store for us in the future?

Scientific advance may help us restore lost systems. However, we need to consider our starting point. Our healthy might be different from generations before us, so we need to be clear about what we are restoring to. We need to be preserving and managing at the same time. We want to better by both our forests and communites and one major way to do that is conserve old growth forests. Lara went through some examples of stories where people are trying to protect old growth. Lara then showed a figure of Percent of protected lands in each country exhibiting climate connectivity failure (backward analogs). Some of the shifts that have happened are permanent and have resulted in permanent ecosystem changes.

So, what is next for science?

- A need to understand the impact of climate-influenced disturbances on productivity.
- How diversity in species' functional traits influence productivity?
- Understanding of impact and forecasting for future pests and disease
- Landscape-level evaluation and prioritization for management efforts (e.g. invasive species)
- Impacts of "drastic" management decisions such as assisted migration
- Best ways to communicate and integrate research and efforts with other organizations.
- Incentives for increased production of ecotypic nursery stock

Question?

What do you mean by productivity on the “future understanding is need” slide?

Productivity can mean both silvicultural and through Co2 drawdown.

As we heard in the first presentation, we know that nurseries are risk adverse. Do you have any thoughts on how we can make it more attractive for them to invest in pest/disease resistant stock or new species/genetics to support plant migration.

The growth potential for the market of sustainably produced plant stock that is suitable for local ecosystems or for reforestation efforts is HUGE. If you are not investing in those plants is riskier.

Judy Okay made a comment about how a nursery she interacted with a couple of years ago still sells invasives like English ivy. She asked the owner why he sells it, and he said if there is demand he will have it. Lara noted that yes, it’s an economic thing, but it is also about values. There is room for nonnatives, but not for invasives.

Protecting old trees is important, but so is locally sourced wood products. If we do not cut our own trees it is going to come down from somewhere else.

Old growth is different from old trees. There is a communication aspect to this to ensure that people understand the difference. There is room for logging and room to use timber as a renewable source (if it is done well). Education is key to ensure that we are prioritizing the right things.

How can we learn from this presentation and healthy forests and apply it to urban forests?

Urban scenarios are not focused on creating “healthy” forests. But you can manage urban forests in similar ways to how you manage healthy forests such as increase diversity and incorporation of shrubs.