Oregon Department of Agriculture and Oregon Association of Nurseries

Nursery Research Grant Proposal 2026

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TITLE: Developing sterile forms of economically important nursery crops

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BACKGROUND:

Many nursery crops on which growers and landscapers rely have spread from cultivation by seed and in some cases become invasive to the point of regulation. These often are important crops such as maples, cherrylaurels, and barberries that can make up large portions of growers' sales. As such, these crops can impact our state's whole industry. We have been developing seedless forms of maples, althea (*Hibiscus syriacus*), cherrylaurels, japanese barberry (*Berberis thunbergii*) and japanese spirea (*Spiraea japonica*) with considerable progress on all. Another important consideration is how states regulate resulting cultivars. I received funding from HRI to develop a framework for assessment and recommendations for policy that AmericanHort is going to promote to regulators. In this way, we are helping create an outlet for cultivars to support growers. This paper is in press at the time of writing and I would be happy to share pre-print PDF versions upon request.

Maples. Oregon is the leading producer of shade trees for the US and maples are among the highest selling. However, several maple species have are considered invasive and some have been banned including amur and Norway maples. Other economically important maple species also produce copious amounts of seed, such as trident maple and hedge maple. These species are not yet regulated but the potential remains unless sterile forms can be identified. I propose that development of sterile forms prior to regulation by government agencies will allow producers to continue to grow and market each of these species.

Norway maple. Due to the prevalence of verticillium at the Lewis Brown Farm, I have been planting tetraploids and triploids at the Smith Hort Farm (aka Veg Farm) where pressure appears to be low. Previously planted tetraploids have been growing since 2016 and most show little pressure. I secured additional funding through another source and worked toward optimizing micropropagation of Norway maple to expedite deploying triploids to the industry as well as providing a means to propagate on own roots to re-introduce to previously banned regions. We began testing plants from TC in 2022 and have found them to be vigorous and overall amenable to production. Replicated trials were established in Corvallis to evaluate growth form and fertility. Meanwhile, we continue to collect more seed to generate additional triploids for future development. All new triploids of susceptible species (Norway and Amur) will be first planted at the Smith Farm for initial trials and propagation before testing for disease resistance.

Amur maple. During 2018, we field planted 157 confirmed triploids of Amur maple and between 2018-2024 we observed several hundred flowering events (a tree flowering during one year is a flowering event) and none have set viable seed. We collect and sow all that hangs on the trees but clearly none is viable. **Our observations are essentially 100% reduction in fecundity among our triploids.** One genotype (118.14) of three put into TC was superior in multiplication and has been sent to cooperators in Illinois, Iowa, Minnesota, Ohio, Oregon, and Tennessee and was also planted in a replicated trial at OSU during 2024. We already have information back on

plants that were grown in Minnesota that they experienced no winter damage. While that is not surprising, it is good to confirm. Ten selections were submitted to grower cooperator for evaluation alongside NC State triploids and cultivars and evaluation is ongoing in 2025-26.
Trident maple. We have a single trident maple triploid that flowered for the first time in 2020. During 2020, a triploid trident maple flowered and had more than 25,000 seeds based on replicated 100ct weight. After stratification and sowing, we recovered six (6) seedlings. This is germination of 0.02% compared to 25.7% for diploid, which is 0.08% relative fertility or a reduction of 99.92% - these data along with the Amur maple observations provide strong evidence of reduced fertility among triploids. Additional triploids were derived from tetraploids in 2020, and field planted during September 2021. These trees have remained symptom free, whereas nearby Amur maples are highly diseased. During 2024 we identified plants that appeared to be hybrids of Amur and trident maples based on morphology and flow cytometry data. These are being further investigated using molecular markers. Most are unremarkable aesthetically, but one does have good branch angles and form. It may have potential, but I have not seen it flower, nor have I propagated it. I will fall plant during 2025 for observation. The promise of verticillium resistance, seedlessness, and combined adaptability of these species is exciting.
Hedge maple. Tetraploid hedge maples were fall planted 2020 and remain disease free. Among the parent rows there is one excellent diploid form growing next to a tetraploid. We will collect seed from both and identify triploids in 2026. This brings us to 4 species of maples for which we are making solid progress on developing sterile triploids: *Acer buergerianum*, *A. campestre*, *A. ginnala*, and *A. platanoides*.

Our goals for maples are 1) to continue developing more triploids from which superior clones may be selected that exhibit various trait combinations such as leaf colors (new growth, growing season, fall color), growth forms (fastigiate, standard, columnar, etc.), and Verticillium resistance; 2) continue testing fertility of our triploids including through more recent plantings at the Smith Hort Farm and via cooperators nationally to help re-introduce to historic markets; 3) continue working with growers to move forward selections we have propagated via stem cuttings and TC.

Cherrylaurels. **Our goals are to 1) develop sterile forms of common cherrylaurel that exhibit the typical phenotype that consumers are used to and 2) develop sterile hybrids of common cherrylaurel x Portugese cherrylaurel that exhibit shothole disease resistance that are also sterile.** We have developed polyploids of both species and we had a single inflorescence from a Portuguese polyploid (16x) in 2019. This plant did not flower during 2020-2022, but when it returns to flower we will begin crossing 'Otto Luyken' and 'Schipkaensis' with this polyploid. Additionally, some of our 'Schipkaensis' induced polyploids have been relatively free of shothole. This is interesting and perhaps promising for one aspect of the project and observations continued to be positive in 2023. During 2021, we identified novel haploids of common cherrylaurel with low chromosome numbers that may be our best chance at successful crosses. We made several hundred pollinations during 2021 using pollen from some of these plants and recovered 3 seed, but none were hybrids. However, more haploids (11x) of common cherrylaurel were identified and now have been field planted. None flowered in 2022, but in 2023 we made several hundred crosses and recovered 8 seed but no hybrids. During 2025 I made ~200 pollinations and collected 15 seeds that were well-formed and have reached maturity. These are the first crosses made in this direction (using common cherrylaurel as female) and this

ploidy levels (using 12x common cherrylaurel and 16x Portuguese cherrylaurel). This work is just reaching maturity and I have great confidence I will successfully develop hybrids.

Rose-of-sharon (althea).

Work over the past 10 years confirmed ploidy level is effective to reduce fertility and that improvements in form are feasible. In 2022 we released 'ORSTHIB5x1' Petite Pink Flamingo™, which is a compact, pink, seedless 5x. In 2019, we made several hundred crosses of 4x x 8x plants to generate more diversity at the 6x level – currently we are limited to 'Azurri Satin' and 'Pink Giant'. These crosses led to a population of ~2,500 hexaploids that was reduced to 500 plants that were field planted during September 2021, and further reduced to ~150 during 2023 based on performance. There are several plants that have great promise as seedless cultivars that I plan to introduce. Additionally, in 2024 we will use some of these 6x plants to cross with existing cultivars to generate more 5x plants and we also made many crosses using a hybrid blue accession in combination with 8x plants. The resulting progeny are being greenhouse forced during 2025 to phenotype for flower and seed production to reduce initial screening to 1 year.

A project previously not included for funding is the development of "tree form" hibiscus. Currently, grafting or intense training is required to produce althea on standard. We identified backcrosses of 'Lohengrin', 'Resi', and 'Tosca' yielded extremely vigorous progeny that exhibit a range of phenotypes and could be valuable for the trade. I include during 2026 to further evaluate these selections for potential future release and to illustrate our success, as four of these (double white, single white, single pink, and single lavender) are being introduce late 2025.

Barberry. Other programs including UConn and NCSU have introduced seedless barberries prior to us but considering the relative size of the market, we believe there remains opportunity. We have developed tetraploids that we have evaluated for five years flowering and obtained no seed. Additionally, we have grown out a large population of seedlings collected from 2x plants and identified one triploid – a phenomenon previously thought not possible due to the so-called triploid block. The tetraploid appears to be a viable selection – it is not terribly remarkable but is a decent grower and performs on par with other standard purple-leaf cultivars in my observation. I think it warrants introduction but have yet to commit. Industry input is that we need the various novel phenotypes for it to gain market traction and that is where we are going with our work. During spring 2024, developed tetraploids derived from 'Orange Rocket' that are highly variable in form and color (compact, upright, round, yellow, green, orange, red/purple). These did not flower in 2025 but will be field planted during fall 2025 for observation.

Spiraea. I developed tetraploids of 'Goldmound' and 'Little Princess' a number of years ago and then backcrossed these to develop triploids. During 2021, we field planted these and have been making observations. We propagated 9 selections during spring June-July 2024 based on input received at our June field day and observations of seedling production during 2023. During 2025 there was an irrigation outage that prevented "fair" observation, but several selections were still attractive despite days of drought in containers. I have kept these in containers for further evaluation. Open-pollinated seed will again be collected at the end of summer 2025 to grow another population of triploids.

Budget Summary

Salary

FRA Support (6 months)	$25,002
Other payroll expenses	$15,751
Undergraduate student labor	$8,000
Services and Supplies	$7,000
Total	**$55,753**