Experiences with Cones:
A seed education at Iseli Nursery

by Peter Gregg

Photos by Randall C. Smith courtesy of Iseli Nursery

Large production nurseries may inherently bring to mind images of uniform, homogeneous crops. From a propagator's platform, ideally, the nursery is an image of large beds filled with identical plants having known characteristics. Homeowners and landscape architects alike rely on the known specifications of clonally propagated plants. However, we "plant geeks" and "passionistas" of the world continue to revel in the discovery of new and rare plant varieties. Seed propagation aimed at diversifying our

Chamaecyparis nootkatensis 'Jubilee' with current year immature green cones at the bottom and the mature, ready-to-pick, brown cones above. Also, pollen cones at the ends of the sprays of foliage for the next years cones that will be ready to pick in the fall of 2011.

Picea orientalis 'Aureospicata' with maturing cones almost ready to pick along with the remnant pollen cones that are a sure sign of fertilization; however, we are hoping some *Picea orientalis* 'Skylands' nearby also shed some pollen into the mix.

plant palette holds that same allure. Most everyone in the plant world loves the new and unusual varieties that seedlings generate.

My hope in writing this article is to impart a basic framework and inspiration for propagating seedlings derived from collected cones in order to help beautify the world and increase plant diversity. In addition, I hope to motivate others to enjoy and learn about conifers as they go through the cycle of the seasons and the cycle of life.

The beauty and excitement of seed propagation is the diversity of the resultant seedlings and also the expectations of the unknown. Each seedling has a different genetic makeup altering its visual characteristics. Some seedlings are "true to type," meaning they look very much like their parents. However, most seedlings have an array of visual differences. The thrill for me is imagining the possibilities of offspring from outstanding cultivars, witches'-brooms, or controlled crosses. These seed parent sources yield the most diversity, and are the cones and seed sought after by seed propagation enthusiasts.

An example of this type of enthusiasm is the work of the late Dr. Sidney Waxman who collected and produced seedlings from cones derived from witches'-brooms. From the hundreds of thousands of seedlings grown by Dr. Waxman, many of his best seedling selections have now become cornerstone landscape conifer selections used in the best of today's landscapes. A few of his notable cultivars that we grow and sell at Iseli are *Larix decidua* 'Varied Directions', *Pinus strobus* 'Blue Shag', and

Sciadopitys verticillata 'Wintergreen'.

Personal Experience

I began my practical propagation skills training at Iseli Nursery in Boring, Oregon, under the mentorship of Paul Halladin, a fixture in the world of conifer propagation. Paul has nearly 30 years of experience working with conifers at Iseli Nursery, and is a recipient of the ACS Award of Merit for Development in the Field of Conifers. Over the last five years, I have gleaned valuable understanding from his vault of propagation knowledge and skills. Mentors are a wonderful way to learn and I have been fortunate to have one of the best.

After a few years of gaining experience and confidence with the basics of a large-scale production nursery, I was encouraged to begin seed collection for the nursery. It quickly became evident that my knowledge base in the collection process was lacking. From that moment I realized that seed collection is not only a skill, but is also an art in itself. Growing and learning through the process is and continues to be invaluable.

Hard Lessons Learned

Research on seed collection and propagation is the starting point, with the goal to gain the basic knowledge of the chosen plant. However, reference information does not provide the finer points needed for successful growing. These details are refined from experience including trial and error. As with most new learning experiences, expect but don't be discouraged by failure. I have had my fair share of failure, for example getting excited for a crop of seed to germinate, only to

Picea purpurea var. *balfouriana* with a developing cone not quite ready to pick but with a good sign of pollen cones, meaning fertilization.

A Pinus parviflora 'Aoi' cone ready to pick at the right time. Notice how the cone scales are cracked open slightly and the resin (pitch) is seeping out. The color begins to change from green to brown.

realize it was not viable seed after none sprouted. Or, another example is planting a good crop of seed and losing many to birds just as the seeds were sprouting. Finally, having the most promising looking seedlings unexpectedly die. One of my more frustrating lessons learned with conifer seed propagation is that a mistake made in the process can leave you without seed for two or more years. This is due to the span of time between coning periods.

On the Hunt…Collecting

Start planning in spring for cone collecting later in the year. First, in spring, look for remnant male pollen cones on the plant. These will be a good indicator that female cones have been fertilized when you pick them later in the year. It is a good idea to study the genus you are collecting to know the morphological differences between the two cone types.

Later in the summer, look for ripening cones. The goal is to pick the cones when the seed is ripe but prior to the cones opening, before wind dispersal. A common mistake in the inexperience and zeal of the process is picking too early. If done, this earliness makes the processing of the cones much more time intensive and difficult. In addition, the seed may be immature, with the possibility of poor results. This step is where record keeping and experience are needed. The clues I use are color and size of cones, with a ripening cone beginning to turn brown. I also use a cut test, where I cut the cone in half and look at the seed to determine if it is viable.

I begin checking cone maturity weekly in late summer. The season starts here in Oregon with *Pinus parviflora* in August. Other species and genus groups have different ripening times stretching into late November. After a few seasons you can more accurately record times to look for seed ripening in your area.

Processing Seeds

After the ripe cones are collected, they are laid out in boxes with screen bottoms in a warm room to dry. A warm area with no direct sun is preferable. If the cone is ripe, most conifers I have dealt with open and seed is easily extracted. Some, such as *Pinus parviflora,* are more troublesome with the seeds needing to be pried out of the closed pitchy cones. The seed is then cleaned of chaff and debris. Most seeds are floated in water; the heavy viable seeds that sink are kept while the light empty seeds that float are discarded. The good seed is dried and stored in a refrigerator. When all seed for the year has been processed, cleaned, and recorded the next step is to determine the germination requirements.

A *Pinus parviflora* 'Kinpo' shot with cones not quite ripe. If picked now, the cones would stay glued shut even with mature seed, due to the pitch. This is known as "hard casing"

Germinating Seedlings

Most conifers being temperate woody plants have a need for the seeds to be treated by a moist, cold period or stratification to break dormancy and germinate uniformly and reliably. This process mimics nature's winter. There are exceptions such as *Picea* and *Cedrus* that do not need a pregermination treatment and can be planted directly from dry cold storage. However, it does not hurt and may even increase your success due to more uniform crop emergence. I take the seed and mix it with moist peat moss and place that in a plastic bag in the refrigerator. After the stratification period, the seeds are planted in a potting mix. At Iseli, we use a fine Douglas fir (*Pseudotsuga menziesii*) bark potting mix, incorporated with time-release fertilizer. The seed is planted, and then topped with just enough fine grade pumice to cover it. Depending on the end product, and the reliability at which it germinates, the seed can either be planted in a bulk flat or in a plug flat. Plug flats have the advantage of easy transplanting with little transplant shock to the seedlings. Bulk flats are used for less reliable seed, because they are a more economical mode of planting. Also, beware of pests such as birds, rodents, and slugs; they can undo all your hard work in harvesting, processing, and planting of your seed in short order. I watch the progress of germination carefully, cover the crop for birds and put out slug bait and rat poison as precautions to these problems.

In my experience it is beneficial to have the seedlings in a controlled environment, such as a greenhouse. In the controlled environment you can start the seed earlier in the year, and decrease some of the factors that inhibit success. Constant monitoring of the newly planted seed is imperative. If I cannot use a greenhouse, I try and use an area that has some environmental factors I can control, such as shading.

Approximately one month after germination, the seedlings are liquid fed with a water-soluble fertilizer. Some plants may need to be bumped up to a larger pot size during the first growing season but most will be potted the following spring. Reducing nitrogen and water in late summer so that new growth is not too succulent helps harden off these seedlings.

One of my goals here at Iseli is to take advantage of the incredible diversity of rare and desirable cultivars, using their genetics and selecting offspring with improved qualities for our customers and the gardening world in general. Therefore, I collect the seed from the most de-

sirable plants bearing in mind their size, color, and form. One of my early promising seedling crops is from *Thuja occidentalis* 'Zmatlik'. Around one thousand initial seedlings and four years later, we have identified three seedlings that have promise. In another ten years of evaluation and multiplication from cutting propagation and with luck, one of these will be considered good enough to be selected for the next Collectors Conifer of the Year! A few previous CCOY were chance seedlings found by discerning nurserymen. The *Picea omorika* 'Pendula Bruns' and *Metasequoia glyptostroboides* 'Gold Rush' are two such gems gleaned out of seedling crops.

Wrapping up

Here are a few suggestions if you are motivated to start collecting seed. Above all, find a fellow "plant geek" or "passionista" to share in the learning. Realize that failing is part of the process so don't be afraid to do it. Take notes for future reference: they are invaluable. Know your plants and be able to identify the different cones. Then collect and grow your seed. Good Luck!

A *Tsuga canadensis* 'Kelsey's Weeping' with pollen cones on the left and later in the fall ripening cones to the right.

About the author: Peter Gregg began his calling in horticulture killing trees. He was fascinated with the art of bonsai and, early on, destroyed many of the trees he touched. This piqued his interest, and he began his journey of horticultural discovery. This led him to Oregon State University where he earned degrees in Horticulture and History. In addition, he did a nine-month internship at Iseli Nursery in Boring, Oregon. After graduating he began his career at Iseli Nursery, working in the propagation area. Peter enjoys seed propagation due to the exciting variability. He continues to work multiplying plants, providing cultural care for specific genus groups, and coordinating the internship program for the nursery.

Some helpful texts that have aided me in the process have been;

***Seeds of Woody Plants in North America* by James and Cheryl Young**

***Practical Woody Plant Propagation for Nursery Growers* by Bruce Macdonald**

Both provide excellent references.
Peter Gregg