George O. White State Park Forest Nursery—Licking, Missouri

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Bareroot seedlings, soil management, shrubs, native plants, wildlife

The George O. White State Forest Nursery is owned and operated by the Missouri Department of Conservation. Our agency is responsible for the management of the fish, forest, and wildlife resources of the state.

This paper will address the George O. White State Forest Nursery. It will discuss where we are, a little of our history, and our growing conditions. It will then demonstrate how we grow shrubs and small trees that Missouri landowners use for a variety of plantings.

Compared to many other nurseries presented at this conference, we might appear old-fashioned. We just take seeds, put them in the ground, and grow trees!

History of George O. White State Forest Nursery

The George O. White State Forest Nursery is located in south central Missouri, in growing zone 6. Statewide, we cover growing zones 5, 6, and 7. The site for our Nursery was chosen in the early 1930s by the U.S.D.A. Forest Service to primarily grow shortleaf pine (*Pinus echinata*) to reforest the new lands being obtained on newly created national forest land.

The nursery opened in 1935 as a Civilian Conservation Corps (CCC) Camp. At one time there were over 200 men living on site doing the work to run the nursery. There were barracks, a mess hall, and recreation facilities for the camp. World War II shut the CCC program and the nursery down. In fact, the irrigation system was dismantled and taken to a rubber plantation in California to help grow rubber for the war effort.

In 1945 the Forest Service reopened a small portion of the nursery. However, in 1947 both the land and buildings were leased to the Missouri Department of Conservation for twenty-five years. Since then, the facility has operated and greatly expanded. In the early 1970s, the Department assumed ownership of all the land and buildings that had previously belonged to the Forest Service.

During the 1950s and 60s, the nursery reached its peak when we distributed more than 10 million trees a year. But now, about four and a half to five million/year is typical.

We take orders from late November until May 1st. Order forms are sent to about 25,000 addresses each fall, and we typically receive 11,000 to 14,000 orders/year. We are now on the Internet and customers can place orders via our web page. Each order must be for a minimum of 25 trees of a species. Nearly all of our trees are shipped to the customers using USPS and UPS. Only a small percentage of our trees are delivered or picked up at the nursery.

Site of Nursery

The site of our nursery was chosen in the 1930s to grow pine, and it is a relatively good site for that species.

Located in a narrow valley along a creek, our nursery is spread out over nearly 1.25 miles north to south and it is less than a 0.25 mile wide. The site is very flat with a maximum 1% slope.

Soil and Soil Management

While sand or sandy loam seems to be desirable for best nursery soil, this nursery is different. Ours is silty clay loam soil, mostly—heavy on the clay.

Since heavy clay soil dominates, wet soil at seeding time and lifting time creates problems. Our soil is slow to dry out, and compaction is also a problem. Hardpan has developed in many areas and we annually use a large dozer and deep subsoiling (to about 30 inches) to break the hardpan.

We try to idle at least one-third of our seedbed space annually. Traditionally, we used a cover crop of sorghum x sudan grass and disked or plowed under the residue. Part of our hardpan problem was the plowing. During this past summer (2000) we used Roundup Ready soybeans as our cover crop. It is more expensive, but allows us to do excellent weed control within our cover crop. The soybeans were much easier to disk into the soil than sorghum x sudan, and as a legume it will fix nitrogen. Our first attempt at using the soybeans looks very promising. The beans did great and our weed control was wonderful.

We do use methyl bromide, which is applied in September by a contractor. It works very well for us, and we have not yet tried any of the alternatives.

We have both permanent and temporary irrigation systems on the nursery. Both have their advantages and disadvantages. We water for temperature control as much as for watering the plants. We have three wells of over 1000 feet deep that bring us high pH water—very cold—but raises pH. We fertilize using ammonium sulfate, 21-0-0-24, to put some acid back in the soil.

Species

Initially shortleaf pine and a few other species were all that was grown. From 1960 through 1980 we were heavy into exotic trees and shrubs. Scotch pine and autumn-olive were two of our biggest sellers. We grew Nanking cherry, European black alder, autumn-olive, lilac, tartarian honeysuckle, mimosa, and some natives. But by the late 80s and early 90s, we phased out nearly all non-natives and we now grow mostly native trees and shrubs.

Approximately 60 species of trees and shrubs are now grown annually. This includes conifers (Missouri has only 2 native conifers), shortleaf pine, and eastern redcedar (*Juniperius virginiana*). But we also grow or purchase six other pine species—red, white, jack, Austrian, and French and Belgium Scotch pines. Our conifer sales amount to about 1 to 1.25 million a year, and shortleaf pine and white pine (*P. strobus*) are about 90% of this.

We grow about 35 species of hardwood trees which include thirteen species of oak (*Quercus*), with pin, bur, northern red, black, swamp white, and white the main oaks, black walnut (about 250,000 to 500,000 per year), and our native pecan (about 250,000 per year) are among our more popular hardwoods. We grow many other species including silver maple, sycamore, river birch, tulip poplar, bald cypress, sweetgum, green and white ash, and cottonwood.

Wildlife Shrubs

We grow 15 to 18 species of shrubs and small trees that are mainly for wildlife habitat improvement, wetland restoration, windbreaks, and erosion control.

Nearly all of the seed for all our shrubs are locally collected or bought from within 30 miles of our nursery. We clean, dry, and store all of this locally purchased seed.

We plant all our shrubs in gassed ground; most are planted using a seven-row LOVE seeder. All beds are mulched with sawdust to a depth of 0.25 to 2 inches, depending on species and time of year. All seedbeds are then covered with hydromulch to hold the sawdust in place from wind erosion.

Dogwood (*Cornus* spp.)

We grow three species of dogwood, occasionally four.

- Flowering dogwood—*Cornus florida*
- Roughleaf dogwood—*C. drummondii*
- Gray dogwood—*C. racemosa*

We handle all three species of dogwood the same. They are planted in late September or first week of October, at the latest. Since it is planted so early we rarely, if ever, have fresh seed to plant. We use dogwood that has been in freezer storage, and have had success with *Cornus* seed stored for over 12 years. We do nothing to the seed except take it out of freezer storage and plant it. However, one key thing we do with the dogwoods is keep the soil damp after seeding until winter.

We do not keep the ground soaked, but we do water it when needed. We clean all of our dogwoods using a Dibvig macerator.

Sumac (*Rhus* spp.)

We grow two, sometimes three, species of sumac:

- Fragrant (or Aromatic) sumac—*Rhus aromatica*
- Smooth sumac—*R. glabra*

We plant these very differently.

Aromatic

The seed is soaked for 45 minutes in hydro sulfuric acid (H_2SO_4), washed thoroughly with water, and then let dry. It is kept at cooler storage (34 °F) until planted, after October 15th and before October 30th. Planting before mid-October can cause problems. In the past, planting in early October risked receiving lots of rain and warm weather, resulting in this species germinating in early November. It was then killed several weeks later when hard freezes occurred. This seed ripens early in the summer and is purchased locally in June and July.

Smooth sumac

The seed is soaked for 60 minutes in hydro sulfuric acid. Unlike aromatic sumac, this species is not planted until mid to late May and the later in May the better. If planted too soon after the last frost they can grow very large (over five feet) by fall. Treatment has been soaking it in boiling water, but this is very slow and germination is not as good as an acid treatment.

Redbud (*Cercis canadensis*)

This species is also soaked in H_2SO_4, but for only 30 minutes. Like smooth sumac, it is also planted in the spring, usually May 1st to 15th, after the last killing frost. Planting any earlier could result in the species being frosted (and this species is very intolerant of frost), and it also gets too big if planted earlier. Because there has been some trouble getting redbud to harden off in fall or even leafing back out in late October, it is not watered in September or fertilized after mid or even early July. This is one of the few shrub species where we do buy our seed commercially, but we also collect and clean our own seed.

Blackberry (*Rubus* spp.)

Blackberry is sowed in the first week of July. This species seems to require a long period of warm then cold then warm weather to germinate in the following spring. To help get this species to flow properly through our seeder, the seed is mixed one to one by volume with sifted sawdust. It is sown very shallow and covered with sawdust. The seed can be acid treated, but it did not work well at this nursery, and the small seed size made it very difficult to work with in the acid. All seed is purchased at the nursery from locally picked berries and a macerator is used to clean the seed.

Wild plum (*Prunus* spp.)

There are seven or eight species of wild plum native to Missouri. All but one species is native to the county where our nursery is located. Wild plum is one of the easiest plants to grow. The seed is hand sown in early October and by mid April it is already six inches tall—way before many other seeds have yet to germinate. Late frosts don't faze it a bit. By summer's end, with little fertilizer and water, they are three to four feet tall. It is very popular for wildlife planting, and the fruit also makes a great jelly. Plum is a seed that stores very well, and really good seed crops occur only every three to five years. When there is a good seed crop, thousands of pounds—as much as we can get—are purchased to help get us through the lean years of poor seed crops. We clean the plum using our macerator.

Washington hawthorn (*Crataegus phaenpyrum*)

This is a low growing, small tree/shrub, and is a very good wildlife cover and food. The hawthorn is the Missouri state flower, and there are about 50 native hawthorn species in Missouri; Washington is one of the most widespread. Like dogwood, it is easy to grow and sowed early—late September to first part of October. This seed is watered if there is not much rain before winter. In the past, the seeds planted in late October have done poorly, demonstrating that this species needs a warm weather period before cold weather in order to germinate well the following spring.

Ninebark (*Physocarpus opulifolius*)

This small shrub grows very well on dry, gravelly creek bottoms and wet areas, but it is tolerant of a wide variety of sites. It is becoming widely used in wetland projects and for wildlife habitat, and is also good for stream side restoration. A large, matted root system forms in seedbeds. This small

seed is planted in mid-October, and it is very important to plant it at a shallow depth. As with blackberry, the seed is mixed at a one to one ratio by volume with sifted sawdust to aid in getting through the seed drill. The seed pods are then collected in August and allowed to dry in order to extract the seed.

Witch hazel (*Hamamelis vernalis*)

This shrub grows to about ten feet tall and gets bushy. The fruit is picked slightly green and put on screens to dry. The screens must be covered to protect the seed, which explodes out of the fruit. Even with the screen boxes covered, seeds can still be found 30 feet away. The seeds are sown in early to mid October with no other treatment. This is a slow growing seedling.

Red mulberry (*Morus rubra*)

This is a small tree and it can only grow up to 50 feet. It is planted solely for wildlife, and has very little timber value. It is planted in mid to late October. This seed is also small and mixed on a one to one ratio by volume with sifted sawdust. The fall sown seeds have growth rates of three to six feet in one year. But if planted in April, the seeds germinate slowly. Usually even the fall sown seed does not germinate until late April or early May.

Deciduous holly (*Ilex decidua*)

This grows on both wet and dry sites and averages 15 to 20 feet tall with a wide span. Red berries that grow on the female plant attract wildlife in the late winter. The seed is planted in September and lies dormant for 19 months; it then germinates in April. Nothing can break dormancy but time and it takes at least three years to become a deciduous holly.

Shrub lespedeza (*Lespedeza thunbergii*)

This is a native of Asia and is excellent for quail food and cover. It is sown in mid-May and great big seedlings appear in the fall. There is no inoculation or treatment of seeds.

Hazelnut (*Corylus americana*)

Also called American filbert, this seed is loved by squirrels and deer. The nuts have a leaf-like structure. Approximately 10,000 pounds of seed are purchased in the husk from local collectors. After drying and cleaning, this seed reduces to only 2,000 pounds. The drying process takes several months, and a macerator and hammer mill are used to clean the seed. However, it has been found that a brush drum seed cleaner does the best job. The acorn seed drill and fall plant are used in mid October and the seed is then collected in late August while it is still green.

Buckbrush (*Symphoricarpos orbiculatus*)

Approximately 20,000 of these plants are sold per year. It is planted at the same time (July) and manner (sifted sawdust) as we do blackberry. Likewise, it seems to do best if given three or four months of warm weather before the winter sets in.

Other Plants

A few other plants that we grow include: slender lespedeza (*Lespedeza virginica*), persimmon (*Diospyros virginiana*), Ohio buckeye (*Aesculus glabra*), serviceberry (*Amelanchier arborea*), smoketree (*Cotinus obovatus*), and dwarf hackberry (*Celtis tenuifolia*) along with three shrub willows (all cuttings—not seedlings).

Conclusion

The demand for shrubs by landowners of Missouri has not decreased. Shrubs are used on many projects—wetland, wildlife habitat plantings, windbreaks, erosion control. Over the last few years, over a million shrubs have been sold annually. In the future, the amount purchased and sold may cause an increase in the variety of shrubs that are grown in this nursery.