Conifer Seedling Choices in Wildfire Reforestation Eastside Perspectives

Larry S. Shaw[1]

Shaw, L. S. 1996. Conifer Seedling Choices in Wildfire Reforestation-Eastside Perspectives. In: Landis, T D.; South, D. B., tech. coords. National Proceedings, Forest and Conservation Nursery Associations. Gen. Tech. Rep. PNW-GTR-389. Portland, OR: U. S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 207-210. Available at: http://www.fcanet.org/proceedings/1996/shaw.pdf

Abstract-Wenatchee National Forest in Washington State's Cascade Mountains experiences high wildfire frequencies on its dry eastern slopes. Over 40,000 acres of these wildfires have been planted in the past 25 years. This has created a need to develop ponderosa pine and Douglas-fir planting stock that can survive the hostile environment that follows an intense wildfire on these dry slopes. Auger planting in deep trench scalps with emphasis on natural micro-sites is used to compare containerized and bareroot seedling survival, growth and site capability.

Forest Districts have spent twenty years working with Forest Service and private industry nurseries to develop seedlings with dense fiberous root systems that can survive and grow in the strong competition of native pine grass and vegetation introduced by post fire rehabilitation efforts. 2-0, 1 -1 bareroot, 1 -0 containers and plug-1 seedlings have been tried extensively. Survival and growth statistics show that even though 1 -1 bareroot and plug-1 transplants are expensive, their high survival and growth potential make it possible to order less seedlings, use less seed, transport and plant less seedlings and replant less often. Recent improvements in containerized seedling root development are reflected by a recent outplanting of 1 -0 containers on over 2000 acres of dry sites. Survival of over 80% after one growing season is encouraging. Sample plots of these seedlings are being monitored to further track survival, growth and site capability. The tall, spindley growth characteristics of containerized seedlings are a potential problem in resisting being physically covered up by heavy competing grasses and wheat as they cure and are laid over by winter snow.

INTRODUCTION

Dense dry forest stands have developed along the far east slopes of Wenatchee National Forest in the Cascade Mountains in north central Washington State over the past 90 years due to man's continual fire suppression efforts. Tree numbers and fuel accumulations are no longer in tune with inherent fire disturbance regimes.

In the past 26 years over 80 thousand acres of these stands have burned in wildfires (Figure 1). In the past 25 years tree planting has been done on over 40,000 acres in these burns. This has created the need to develop planting stock that can survive a hostile environment of intense radiation and sometimes desertlike conditions. Many different stock types have been used to develop reforestation programs in these areas.

Figure 1. Dry site planting created by 1994 Tyee Creek Fire.

THE PLANTING SITES

The sites were occupied with scattered to dense stands of ponderosa pine, Douglas-fir and

grand fir. Common plant associations are mostly dry Douglas-fir -PSME/CARU and dry grand fir-ABGAR/CARU. Site productivity classes are mostly class five and some class six marginal. Slopes range from 10 to 80% and are commonly 30 to 50%. Elevations are from 1800 to 5000 feet. Precipitation ranges from 12 to 20 inches annually but comes mostly as snow. There is little prospect of summer precipitation. Soils are from shallow to rather deep and in general have fairly good water retention.

Very hot and dry micro-site conditions develop after a fire due to increased radiation and blackened surfaces. Most of the forest debris is consumed by the fire. Many sites develop dense stands of native grasses (mostly pine grass) that were only a minor component in the understory before the fire (Figure 2).


Figure 2. Heavy grass competition.

Introduced grasses and wheat plus applications of fertilizer as part of emergency fire rehabilitation efforts complicate planting site evaluations

THE PLANTING APPROACH

Plant sites where moisture competition is severe first, such as sites with heavy stands of introduced grasses or wheat and where native grasses or brush are still established.

Auger planting is done in deep trench scalps in an attempt to get seedling roots into soil that has the potential to maintain moisture through the summer and to can collect any unlikely runoff throughout the growing season. We use a 5" wide 5" deep and 12" long scalp. This scalp also provides a loose mineral soil surface that readily absorbs water. Planting contracts are written to require contractors to plant trees in the most favorable micro-sites such as north sides of stumps, snags or logs or In low spots.

PLANTING OBJECTIVES

Forest plans call for developing healthy stands of low density ponderosa pine and Douglas-fir that are sustainable. Reforestation goals include having 100 to 250 surviving seedlings per acre three years after planting, keeping planting costs low, and having no replants.

THE SEEDLINGS

Since the big wildfires of 1970, we have tried planting most types of seedlings on these dry sites, starting with mostly 2-0 bareroot stock from Forest Service nurseries. In the mid to late 1970's work was done with private industry to develop 1 -0 containers for these sites. As with the 2-0's there were problems developing good root systems. During the early 1980's, the Entiat and Chelan Districts went back to bareroot nurseries to develop a more open grown 2-0 seedling. They were unsuccessful. By 1985 even though seedling survival was slightly better, Districts were still frustrated with outplanting results on these dry sites. Poor root systems were a constant problem with either bareroot or containerized stock was used. In 1985, Districts started thinking about a target seedling without cost considerations. They felt

dense fibrous root systems planted deep were essential to resisting summer drought and large caliper was needed to resist intense summer radiation where the stem contacts the soil and to help the stem resist being physically bent over and covered by competing vegetation as it was laid over by winter snows. During the late 1980's and early 1990's, some Districts went back to private industry and were successful in developing containerized stock with dense fibrous root systems. In 1989, the year after the Dinkelman Ridge wildfire, another dry forest situation, the Entiat and Chelan Districts focused on further development of 1-1 transplants at our own nurseries. Survival rates of 85% to 95% after one year were typical and growth was good to excellent considering the dry sites and many areas where red stem ceanothus or pine grass competition was serious.

In the Spring of 1996, in an effort to get ahead of competing vegetation on our most recent fire, the 1994 Tyee Creek, the Entiat District planted over 2,200 acres on dry sites with 1-0 containers grown by four private growers. Preliminary first year exams during the first week of August were promising with 75% to 85% survival. But unit survivals in mid-September had dropped to a disappointing 45% to 75%.

Comparisons:
2-0 bareroot-Low initial cost but if grown at high densities, large tops with poor root systems may develop. This may result in the need to do higher density planting or culling 50-70% of the seedlings resulting in high total planting costs not to mention the wasted seed, transportation costs and potential replant costs.

Transplants-High initial cost and more handling risk but their higher survival and growth potential make it possible to order less seedlings, use less seed, transport and plant less seedlings and replant less often.

Containers-Low initial cost and less lead time, but still questions about their survivability and growth on these dry sites.

SEEDLING STORAGE

* Plan to get all seedlings late fall lifted and freezer stored.
* Plan to keep seedlings frozen and thaw just in time for planting.
* Keep all thawed seedlings at 33-34^{o}F.
* Monitor seedling health from lift through storage.

CONCLUSIONS

* 1-0 containers- will monitor the 1996 plantations.
* 1-1 transplants have a good track record. They do provide the dense fiberous root systems and large provi caliper stems that we feel are the key to excellent survival and growth on these difficult sites (Figure 3).

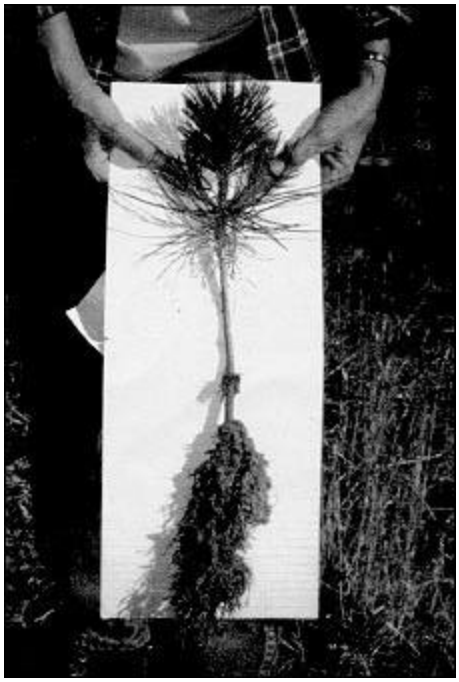

Figure 3. 1-2 transplant - one year after outplanting.

* Seedling development and storage are critical issues in developing successful reforestation programs.
* Don't jeopardize seedling dormancy by rushing fall lifting for freezer storage. Very high mortality can occur in freezer storage if dormancy is not adequate.
* Plan for spring lifting and hot plant as a contingency plan if dormancy and required fall lifting dates conflict.

RECOMMENDATIONS TO NURSERYMEN

* Visit planting sites.
* Spend more time on telephone with clients.
* Make special invitations to clients to review seedlings.
* Learn each others language.
* Keep records of seed-lot performance.
* Re-evaluate seed/need formulas.
* Pack seedlings so there is room for them to breath. Don't fill boxes full. We had serious mold problems last spring on a containerized seedlings lot that we assume was packed before proper cooling and boxes were filled too full.
* Spend less time computer modeling and more time growing root systems.

[1]*Entiat Ranger District, Wenatchee National Forest, USDA Forest Service, 2108 Entiat Way, Entiat, WA 98822; Tel: 509/784-1511.*