TREE SEED ZONES

by
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Introduction

I feel quite humble following two skilled geneticists. This "dirt forester" is in pretty fast company when he shares a platform with George and Dick. Nevertheless, here goes!

First of all, I wish I had a bunch of slides to show you. I don't!! Hence, I'll try to substitute brevity for slides.

Getting back to genetics. Mother Nature is a pretty fair geneticist herself. She has been practicing natural selection among tree species ever since the last Ice Age. Slowly and inexorably nature has been adapting the various tree species to local climatic conditions. As the ice receded northward, ecological change followed. Grass, fortis, brush, and trees succeeded each other over time. Fire, either natural or man-caused, would interrupt this succession or reinitiate it.

George and Dick could explain the mechanics of this whole procedure much better than I. My knowledge of genetics pretty much stops with the "survival of the fittest." This in brief is what tree seed zones are all about.

As foresters began the job of getting land back into production, a number of problems developed. In the old days in the Northwest, they logged the best and left the rest. They may have been guilty of some very slight negative genetic selection. The seedlings that did develop this way were, however, well adapted to the area. Natural selection had seen to that.

Provenance

When fire or extensive clearcutting removed all potential seed sources, the fun began. In the early days of Northwestern reforestation there was little or no recognition of the role of provenance. A Douglas-fir seed was a Douglas-fir seed. If you wanted to reforest an area to Douglas-fir, you went out and bought some Douglas-fir seed; preferably the cheapest you could get. The tree seed vendors, in turn, collected seed where it was easiest to collect. We learned to our sorrow, that this simply wouldn't do. The Western Forest Tree Seed Council came into being. The maps over there are a second edition of some first issued in 1966. Tom Greathouse and a committee put these maps together.

Tree Seed Zone Maps

As you can see, there are three main divisions in each State, coastal, western Cascades and eastern Cascades. These three major areas were then further subdivided on the basis of what those boys knew of climate, elevation, drainage patterns, and in some cases soils. Their goal was to provide foresters with a tool for typing down their seed sources. These maps are such a tool. We are now learning that these are only a rough, but useful, first approximation.

Dr. Silen tells me there are provenance changes within the McAndrews Experimental Forest. A far smaller area than the smallest shown here.

Following map publication, the Northwest Forest Tree Seed Certifiers Association developed. This was the logical next step. First you had to describe your tree seed zones (seed origins). Second, it was important that vendor and user recognize a competent third party who would certify seed origins. In Oregon and Washington this function is vested with the Seed Certifiers Association. Buyers pay so much per pound or bushel for this important service (50/bushel for source identified cones or 10/pound for audit class seed).

Pm indebted to "Pete" Theisen for much of the rest of the information Pm passing along today.

The Forest Service supports tree seed certification. The Service is now having all its collections certified by the Northwest Forest Tree Seed Certifiers Association. The reason is simple. As with anything else, the human element is involved in cone collection. Tree seed certification helps correct human errors. The minimum tree seed standard the Forest Service will now accept is Source Identified Subclass A. This subclass is defined as one where the cones are obtained from personally supervised collections. Subclass B is defined as "procedurally supervised collections." The Forest Service has in the past tried subclass B collections and rather surprisingly, found little difference in overall collection costs between the two. ("A" is definitely the better choice.)

Financial Losses From Off-Site Seed

"Pete" Theisen has developed a conservative estimate of the losses chargeable to off-site seed.

The amount of financial loss can be substantial when the wrong seed is used for reforestation. Growth loss could range from a minor loss to complete failure of a plantation at some point in time without a harvest of a merchantable product. A pound of misidentified Douglas-fir seed can produce sufficient seedlings to reforest 40 acres. Let us take a look at the potential loss on a 40 acre tract:

Item	Cost
1. Plantation failure (planting cost $100/acre)	$ 4,000

2.	Scheduled for replant 3 years after original planting; site preparation needed at a cost of $50/acre.	$ 2,000
3.	Growth loss at $50/acre/year for 3 years	6,000
4.	Replanting - This is considered a cost because with limited financial resources, needed silvicultural work on other acres must be delayed. Growth loss on delayed acres if planting is involved and a 1 year delay occurs.	$ 2,000
		$14,000 ($350/acre)

You needn't accept Pete's figures as gospel. You know what site preparation and planting costs you. Use your own figures and see what the wrong seed source will cost you!

If the plantation failure became evident in the twentieth year after original planting, the loss, using the same figures as above and without interest would be $48,000. These are direct *losses;* indirect losses to the economy, if calculated, would substantially increase these figures. Even at $100/pound, certified Douglas-fir seed would be a bargain when compared to the risks inherent in off-site plantings.

Seedling Certification

Certification should not stop with the tree seed. It should carry through to the reforestation site or it will be only a partial job. Tree seed and seedling certification are silvicultural tools that can aid the user to obtain quality results. Like any tool, they can be mishandled. The final use should be in the hands of the user, but he should be fully informed of the risks involved. The risks are common knowledge. Yet I still get requests from otherwise competent foresters asking if it would be O.K. to use coastal Douglas-fir from Oregon in the Washington Cascades and vice versa.

The Forest Service feels very strongly about the dangers inherent in using off-site seed. So strongly, in fact, that they destroyed 3,000 pounds of forest tree seed rather than risk using it. This was seed known to have been collected from non-indigenous plantations or from those where the risk existed that much of the seed lot could possibly have come from non-indigenous plantations.

Pathology

Early off-site losses often are the result of pathogens. Some harmful pathogens are endemic in any forested area. Through natural selection, the existing timber stand is little damaged by these pathogens. Seedlings from the existing stand normally can be expected to exhibit similar immunity from damage.

When off-site seedlings are introduced it is a different story. Endemic populations of both pathogens and insects build up and frequently either damage or wipe out the newly introduced seedling strains (either soon after planting or within the first two decades). The population of insects and disease is vastly increased in both numbers and vigor. In many cases, following the demise of off-site plantations, these insects and diseases then become a threat to existing stands.

Case Histories

Theisen has a number of well documented case histories to support his statements. One of the most dramatic and well documented involved the Knobcone-Monterey hybrid. This hybrid was developed to incorporate the fast growth of the Monterey with the frost hardiness and drought tolerance of the knobcone. Fifty-three closely controlled tree:plantations were established in the 1963-67 period. By 1971, 19 plantations were of no more value due to insects, disease, and competition. In 1964 the first insect and disease troubles appeared. An insect hit the plantations. This was followed by western gall rust. In another area grass was allowed to build up on an undamaged plantation to test for drought resistance. The trees were wiped out. They weren't sufficiently vi--gorous to survive really severe competition.

Fearing western gall rust damage, after 1961 all crosses were done only after high intensity genetic selection for resistance to this disease. Only parents exhibiting phenotypic resistance were crossed. The rust caused severe damage to resultant seedlings anyway.'

In the Spring of 1972 field personnel reported that a number of the remaining plantations did not look healthy. Four of these plantations were subsequently visited by a pathologist and Theisen. In the plantations, ninety-eight percent of the hybrids were infected with western gall rust, with many having more than 100 cankers/tree and all of them with needle cast fungi. Of the 1661 hybrid trees examined, 1109 trees were severely affected by needle cast fungi, 431 trees were moderately damaged, and 121 trees had minor damage.

Bynam's Blight(Lothodermella Morbida) is a pathogen frequently found on off-site ponderosa pine plantations. This may not show up until as much as twenty years after initial establishment. The end result is loss of vigor and growth rate. Frequently, secondary attack by an insect finishes the job. A formerly vigorous plantation on State land down near Keno, Oregon is now going this route. There are in excess of 10,000 acres of off-site plantations on the Umpqua National Forest. These are 10-20 years old and are now rapidly fading. In a number of cases the pine served as a nurse crop for other conifers, which came in over a period of years; and even though now stocked, a substantial growth loss was incurred. In view of the dollar values given previously, think of the losses!!

Pete noted that many off-site plantations on the Siskiyou have been severely damaged by snow bending and snow break. This is a common fate of off-site Douglas-fir plantations.

He mentioned some well documented cases of both on-site and off-site Douglas-fir and ponderosa pine plantations on the Siskiyou N.F. that go back to 1910. A local source of ponderosa pine yielded 12 M board feet/acre in thinnings in the 1960's while plantations of non-local sources had no merchantable volume. Another interesting case involved 1910 local Douglas-fir planted next to seedlings "source identified" only by seed company name. In 1966 the local Douglas-fir averaged 38" DBH. The off-site seedlings averaged two inches. Their height was under ten feet.

Jack Wanek of the State of Oregon mentioned that most seedling plantations on the Tillamook burn came from seed indigenous to the burn. The resultant plantations are excellent. Unfortunately there wasn't sufficient local seed to use on the many 12,000 to 20,000 acre aerial seeding projects done in the burn. Hence, today, vigor losses are becoming increasingly evident. The mistakes of one generation will weigh heavily on the future. Were funds available it would be wise to wipe these out and begin anew. They will occupy the site over time but will not make optimum or even merely adequate use of the area.

In the long run, it is probable large areas will suffer heavy losses due to disease, insects and mechanical failures (snow break and ice damage). It would require considerable cash, competence and commitment to do the job over.

Silen's studies of the Wind River Arboretum show some exotic species have lasted 40-60 years. When most Northwest species are planted off-site they usually exhibit vigor loss, chlorosis, and needle cast within 20 to 35 years of planting.

In a 1969 talk to the Western Forest and Conservation Association, Dr. Roy Silen summed up old fashioned seed-tree reforestation rather neatly. To quote, "We conveniently ignore the fact that genetics works both positively and negatively. Up to World War II, much of the cutover land was regenerated by cull trees too sick to sell. Also, for nearly two decades after World War II, our expanding planting program often employed off-site seed. Both practices provided strong possibilities for negative selection. The acreage involved and the percentage of loss per acre will never be accurately known. Our experiences indicate that such losses begin to show up in the 35-50 year period after planting when the forester is left with the unenviable choice between cutting his loss or riding out the rotation with poor yields." Roy summed up by saying it would be just about impossible to estimate our losses from the "sins of negative selection."

One final note - Pete observed that when seed is moved to a nursery distant from seed origin, adverse nursery influences have lasted as long as 10 years. In sum, landowners cannot tolerate off-site seed.