

PROCEEDINGS

THIRD LAKE STATES FOREST TREE IMPROVEMENT CONFERENCE

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APPLYING FOREST TREE IMPROVEMENT PRACTICES
IN THE LAKE STATES

Forest Tree Improvement--First the Seed

by R. G. Hitt^{1/}

The idea of using good quality seed as the source of stock for reforestation has long been advocated. European forestry is replete with examples of the desirability of carefully selecting the seed source for plantation forestry. Sweden has a vast forest industry dependent upon maximum volume production. As such, Sweden is utilizing, wherever possible, seed of the highest quality to furnish the stock for reforestation work. Those practices are not advocated, they are a must and are strictly enforced. Similar programs exist in Germany, Denmark, Norway, etc.

In this country too, prominent foresters, conservationists, plant breeders, and others have advocated the use of seed of known, and desirable origin in reforestation programs. Failure to heed their warnings has resulted in losses of both time and money to the forest industry. Concurrent with these losses have been the additional losses resulting from continued exploitation of natural stands which represented potential reservoirs of both seed and germ plasm.

In the South a number of forest tree seed production areas have been established. State, Federal, and private industrial areas have been set aside for seed production in Texas, Mississippi, Georgia, Florida, Alabama, and North Carolina. Undoubtedly there are other areas which are contemplated or which have been established recently.

In considering the situation in the Lake States, it can be said that the best stands of many of our indigenous species are now probably gone. We must be satisfied for the present with having to labor, in most cases, with remnants. Further, not all of the remaining virgin or good second-growth stands are in the public domain. Generally these areas do not

^{1/} Forester-in-Charge, Forest Genetics Research, University of Wisconsin, Madison, Wis.

involve large acreages. They are not all of the best type, do not form pure stands, and often lack proper isolation for seed production. Many of the plantations now attaining the age for seed productions can be used only as a last resort as seed sources because of their unknown seed origin.

Recognizing these facts and the need for immediate action to insure that our future forests will be of the best genetic quality possible, the Genetics Department of the University of Wisconsin in 1952 recommended to the Wisconsin Conservation Department that a program for the Certification of Forest Tree Seed be established. This proposal was not acted upon until 1956 when, in November, the Wisconsin Conservation Department in cooperation with the University of Wisconsin undertook a program for the Verification of Forest Tree Seed in Wisconsin. I would like to discuss briefly with you this general plan.

The program was set up under the following three general objectives: (1.) An adequate number of forest stands and plantations should be selected, reserved, and managed as seed production areas, (2) Seed derived from these seed tree reservations should be separately collected, extracted, and grown in nurseries, and the resulting stock distributed for planting. (3) An adequate system of seed orchards of the more important forest tree species should be established to provide seed of proven genetic value for future reforestation.

Let us consider each of these objectives in a little greater detail.

(1) An Adequate number of forest stands and plantations should be selected, reserved, and managed as seed production areas.

Scattered sparingly throughout central and northern Wisconsin as well as in other parts of the Lake States are stands of virgin and good second-growth forest tree species. These stands are both privately and publicly owned. On the publicly owned stands full cooperation regarding measures to be taken to convert certain of these areas to seed tree reservations is expected. It is hoped that purchase, lease, or harvest rights can be obtained on private lands to utilize their seed crops. The locations of some of these areas are known already to us, and undoubtedly additional areas will be brought into the program as they are found. The assistance of Federal, State, and industrial foresters in locating and recording these additional areas is sought. University of Wisconsin Tree Improvement Project personnel will arrange to meet with the foresters on the proposed areas. The work to be carried out for the conversion of each area would be discussed on the spot in order to properly appraise and prepare each area.

Let us consider a hypothetical one so for each type of ownership. The boundary of a desirable stand on State or Federal lands would be clearly marked. In some cases an isolation strip would be necessary around the desired area. This too would be designated. Then the trees to be removed would be carefully marked. Crooked or misshapen trees would be removed. Insect infested or diseased trees would be marked for cutting. Tree form,

rate of growth, fecundity, spacing, etc., would also be considered in selecting the individuals to be left as seed trees.

In plantations of known seed origin essentially the same procedures would be followed. Here, however, we may experience greater ease in management because of even age, spacing, and favorable crown types. Only as a last resort should plantations of unknown seed source be used. These plantations should all have attained the age which would allow for the first cut of a merchantable product (pulp, box bolts, posts, poles, etc.). This gives some assurance that the particular seed source is adapted to local growing conditions and that offspring arising from this seed source probably would produce sufficient high-quality plantation growing stock in the future to warrant its use.

Following the selection and preparation of the area, management practices would be conducted to encourage increased and sustained seed production. Such procedures as growth retardation by mechanical means and fertilization would be used.

On privately owned lands the area either would be purchased or leased, or cone harvesting rights would be obtained. In the latter case it would be necessary also to obtain permission to prepare the area for seed production according to prescribed standards. In addition, management practices would have to be clearly defined. It is recognized that these arrangements might be difficult to make in some cases; however, there are a number of such areas that have seed tree reservation potentials and as such should be utilized.

Another possibility exists for the use of privately owned areas. Owners of these areas could be contacted and the program outlined to them. Should they feel that they would not want to lease the area or grant harvest rights, they might instead be induced to carry out on their lands the necessary cultural operations to qualify their stand for inclusion as a privately owned and managed seed tree reservation. Cones derived under supervision from these areas then might be brought into the program.

- (2) Seed derived from these seed reservations should be separately collected, extracted, and grown in nurseries, and the resulting stock distributed for planting

The procedure to be followed in the collection of cones in the seed-tree reservations undoubtedly would vary. Procedures used in mature stands might well vary from those used in plantations and, eventually, seed orchards. It will be necessary to test various methods and equipment before deciding on any procedure. Trained cone-picking crews might be employed on an hourly or piecework basis. They would be under the supervision of a local supervisor or would be provided with a full-time supervisor to travel with them during the cone-picking season. Cones should be bagged and properly sealed at the collection site. They should then be delivered to one of the extractories for processing. Again caution should be exercised in the handling of the cones by lots so that their identity is

maintained and that contamination does not occur. The seed thus obtained would be designated "Verified Forest Tree Seed", the term "verified" indicating that the seed is of known origin. In addition, the seed would be tested for germination percent and purity.

Much of the Verified Forest Tree Seed thus obtained would be used by our State forest nurseries. The identity of these seed lots must be maintained throughout their nursery culture. As the program develops, sufficient seed might be obtained to devote the entire facilities of one forest nursery to the production of "Verified stock". The increased cost of procurement and production of such stock could be offset by a higher price for the stock when marketed.

It should be pointed out that this stock will be "Verified" as to origin and purity only. Eventual introduction of "Certified Forest Tree Seed" will follow adequate progeny testing of selected parent trees. This certified seed will be derived from seed orchards established for that purpose from grafts of the selected and field-tested parent trees. The genetic value of certified seed will be known.

The distribution of verified stock should correspond to seed origin in so far as possible. That is to say, stock should be furnished for planting on areas near the source of the seed. If this is not possible, other stock should be furnished from nearby sources or from sources within the general seed zone where the planting is to be done. Since the actual operation of certain phases of this work is without precedent, the best procedures to be followed will have to be worked out in practice.

- (3) An adequate system of seed orchards of the more important forest tree species should be established to provide seed of proven genetic value for future reforestation

Simultaneous with the development of the seed-tree reservation program should be another program directed toward the establishment of a system of seed orchards. These seed orchards will be composed of cloned, selected forest trees of various species. For Wisconsin, the areas for these orchards should be in the central and southern parts of the State. They should have isolation from other trees of the same species of at least $\frac{1}{4}$ to $\frac{1}{2}$ mile with greater distances of isolation more desirable. Spacing in the orchards should be wide (20x20 or 24x24 feet) to allow for good crown development and ease in managing the stand and harvesting the cone crop. Cultural practices to insure abundant and continuous flowering will be carried out on these areas.

Success to date with field grafting of red pine lends optimism to the plans which call for the establishment in Wisconsin of an adequate system of seed orchards of red pine within 5 to 10 years. We have been able to graft scion material from old trees (40 years and older) onto plantation stock ranging in age from 7 to 10 years with successful graft take for individual lots running from 5 to 100 percent and an average success of 50 to 65 percent.

The details of seed orchard establishment as well as the development of seed tree reservations have been omitted from this discussion. Each area as it is developed will have special merits or requirements and must be handled accordingly. Further, many of the details will have to be worked out on the area inasmuch as there are no patterns to follow.

Your attention is directed to the map which shows the seed zones to be used in Wisconsin in the designation of seed collected under the Verified Seed Program (fig. 1).

There you have it, gentlemen. On paper it looks good! This fall we tried to make it work. Here are some of the results to date--all very hurriedly assembled and quite incomplete.

Four good second-growth stands of Norway or red pine ranging in age from 40 to 75 years were selected as seed-tree reservations. Three areas were in northeastern Wisconsin and one was in the northwestern part of the State. Seed trees were marked, consideration being given to spacing, tree form, crown development, stand density after undesirable trees were removed, general tree vigor, branching, etc.

Next our efforts were directed toward finding collecting crews. It was anticipated that this might prove to be somewhat of a problem and it was. Certain state regulations prevented hiring anyone less than 16 years of age. We could not pay on a piecework basis because of the lack of satisfactory insurance coverage on that basis. Summer jobs today are plentiful, hence many teen-agers are relatively "wealthy" by the end of the summer. Why then should they work for us picking cones for \$7.50 a bushel when they could wait 2 weeks longer and let the squirrels do the cutting after which they could collect these squirrel-cut cones and still get \$6 a bushel! In reality we did get some cones. High school boys did not work out satisfactorily for cone collecting this year. Undoubtedly some of their poor performance, however, was due to inexperience, lack of sufficient climbing equipment, and trees which did not contain 6 bushels of cones each!

Briefly, here are a few of the statistics at the end of the sixth inning. We still have a few men collecting; consequently the score will change. Five experienced pickers worked for a total of 116 hours climbing 70 trees to harvest 754 pounds of cones. Figuring 35 pounds of cones to the bushel in the early season, they collected 21.5 bushels at a cost of \$9.12 a bushel. Undoubtedly their harvest rate would have been greater had we not insisted that they pick cones from some excellent phenotypes which were not flowering as abundantly as certain other trees in the stand.

Most of the trees from which the cones were harvested ranged in height from 60 to 75 feet. Three to five 10-foot sections of a Swedish Cone Picking ladder were needed to enter the trees, The men were instructed to pick in their trees until such time as they felt they could no longer pick cones profitably. They harvested for the most part in the upper

WISCONSIN COLLECTION ZONES
for
VERIFIED FOREST TREE SEED

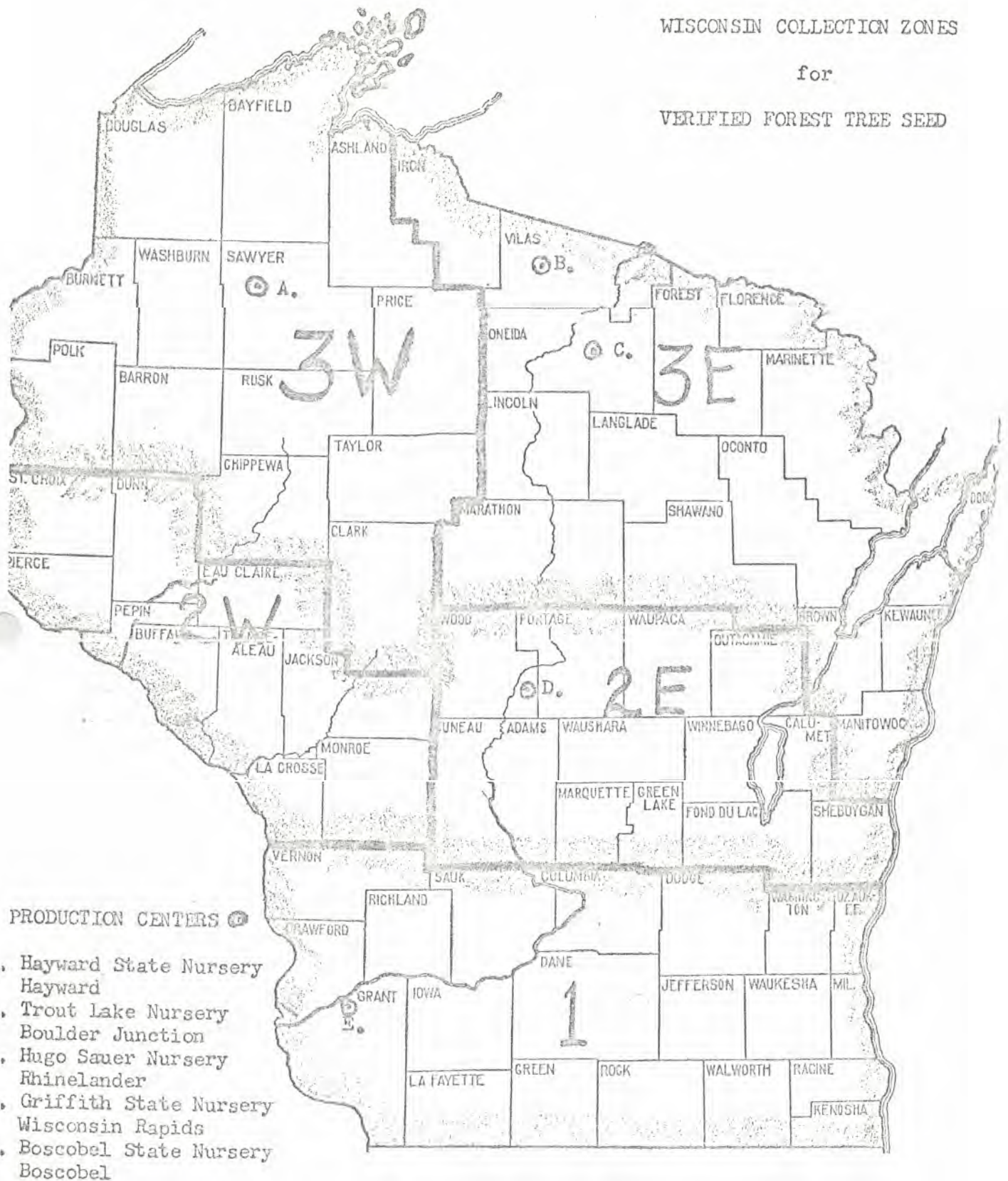


Figure 1.--Wisconsin collection zones for verified forest tree seed.

one-third of the tree's crown, where picking is generally good. A man can remain in one position in the upper crown often for 5 or 10 minutes and be kept busy picking all that time, I have charged travel time, ladder erection time, climbing time, etc., against the per-bushel cost.

Let us contrast this situation. Five high school boys, inexperienced in cone picking but presumably willing workers, climbed 28 trees in a total of 30 hours to collect 80 pounds or 2 1/3 bushels of cones. These cones cost \$24,20 a bushel. They harvested their cones from the middle one-third of the crown and obtained very few cones per tree. They put in their time that day going up and down, getting situated, breaking off branch tips, and comparing ideas on how they were going to spend all the money they made collecting cones for us. Needless to say, their services were terminated at the end of the day.

I do not wish to infer by these remarks that we are discouraged by the results of our first attempt to harvest Verified Forest Tree Seed. Actually, we did not expect to have the operation go smoothly. We anticipated that we would learn a great deal but that we would do so at some expense. We also recognize, however, that the most insignificant cost item in the total unit production cost of forest tree planting stock is the cost of the seed. Even a doubling or tripling of the initial cost of the seed would not greatly increase the cost of the final planting stock. In fact, the improved quality of the seedling stock derived from the Verified Seed might result in more vigorous seedlings with less cull, thereby reducing the per-unit cost of production. The information which we will obtain from this season's collecting will be of great value in planning future cone collections in Wisconsin. Our Verified Forest Tree Seed Program, although now started on a rather meager scale, is a reality and will continue to grow.

Viewing the situation in the Lake States, there is at the present time a large tree planting program in progress. Nursery facilities are being expanded and utilized to full capacity. There is a great demand for forest tree seed, and unfortunately a high percentage of this seed is being harvested from genetically undesirable sources. We may expect that the quality of the trees in many of tomorrow's forest plantations will be inferior. Fortunately, enough interest has been generated by tree improvement research activities nationwide to insure that this situation will not continue indefinitely. Locally, steps are being taken to overcome this problem through the introduction and use of Verified Forest Tree Seed. Even though we in Wisconsin have had to pay an average price (at the end of the sixth inning) of \$10.50 per bushel for our Verified Forest Tree Seed, this cost is insignificant in the overall unit cost of production of forest tree planting stock. I am confident that we have turned the corner and are now on the right road!