Applying Forest Tree Improvement Practices in Silviculture

by Zigmond A. Zasada1/

Two statements from recent publications indicate the lack of tree improvement guidelines available to the forest manager. One is from the preface of the publication "Guide for Selecting Superior Forest Trees in the Lake States",2/ "Trees especially desirable silviculturally usually will be desirable for tree improvement purposes." Another from a report given at the Northeast Tree Improvement Conference in 1956 states, " Genetical marking at present can be hardley more than the best silvicultural mar king. Silvicult urists need more detailed information than this from the forest geneticists if we are to make more rapid progress in the improvement of our present forest stands.

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2/ Prepared by Paul O. Rudolf with the assistance of the Subcommittee on Tree and Stand Selection, and published by the Lake States Station (Sta. Paper 40, 1956).

Silviculture is the art of producing and tending a forest. Forest tree improvement, genetics, tree breeding, whichever term is used, should be considered an auxiliary science to silviculture as are soil science, entomology, botany, and economics. Geneticists should present their material as it relates to silvicultural practice.

To my knowledge forest tree improvement work to date has emphasized improvement through reforestation. The studies have dealt with seed origin, seed-tree selection, delineation of races and strains of species, and adaptability of exotics. The emphasis on these studies and the approach through reforestation lead foresters to think that progress will be exceedingly slow, and there is little enthusiasm for the tree improvement program.

Actually forest tree improvement practices can begin right now. In carrying out their program the geneticists have developed information which can be applied by silviculturists now in managing our present stands. However, it needs to be presented in a manner that points up its application, in obtaining natural, regeneration, in the silvicultural improvement of young stands, and in the management of older stands.

It is the job of the geneticist to define and describe good and poor tree characteristics. When he has done so, the silviculturist can apply the knowledge in managing the timber stands. An example of what can be done is the change in thinking on the qualities of a good seed tree. Seed trees have been selected primarily for their large bushy crowns, indicating a large capacity for seed production. On the basic of information developed by the forest geneticist, however, seed trees should be selected on form, growth rate, and branching habits. This type of information should, be pointed out more specifically.

Studies of seed origin show that locally grown seed generally produce the best forest plantations. Geneticists have also found that distinct races and strains develop within species on the basis of environment. This information points up the importance of getting the best stands reproduced naturally; yet nowhere are these recommendations made specifically. We have not been too successful in getting natural regeneration in our conifers even though we know many of the basic requirements. When the silviculturist understands the importance of local origin, the job of natural reproduction becomes even more important, especially where high quality stands are involved. Any time we permit our good stands to be replaced by brush or off-site species we are adding to an already difficult problems of forest improvement.

Forest improvement through silviculture can begin in very young stands. Release cuttings, weedings, and thinnings can be used to control stand composition and, in some cases, tree quality. Those practices can in many instances maintain the right species on the right site, which is very important in forest tree improvement. Selective and partial cutting during the middle life of the stand allow us to rogue out the poor trees before they become effective seeders. Theoretically, intensive forest practices should permit us to end up with the best quality trees in the stand for a

seed source and stand regeneration. But the ability to recognize good and poor tree qualities that are hereditary is necessary.

Forest management systems have never been analyzed or studied in relation to tree or stand improvement. Forest management studies show that good growth can be maintained over a wide range of stocking and cutting conditions. For example, pine, aspen, and black spruce arc adapted to even-aged management. Partial cutting during intermediate ages is often practicable. There is some indication that cutting from above (taking out trees in the upper part of the crown canopy) during this period has little effect on total wood production. What effect does this cutting method have genetically? Can we get by with this system and not, hurt future crops? Those questions need answering. They can be answered best by the forest geneticist.

We must recognize that many conditions exist which do not permit intensive management or the retaining of the biggest and best trees in the stand. Foresters are faced with the problem of getting the highest wood volume of a specific product such as pulpwood or logs from present stands. The economics of logging require the cutting of a specific volume per acre or certain size trees to meet merchantability requirements. Extensive management is applied in these instances. Large areas are clear cut, leaving cull trees and suppressed unmerchantable trees as a seed source. Cutting systems such as stick limits and diameter limits are applied, which in most cases leave the poorest trees in the stands. How much future forest degrading is being done by these practices? No concrete evidence is available for or against these practices. Here the genetic appraisal must be on a stand basis and not a tree basis.

Summing up on the subject of applying tree improvement in silviculture.

1. Forest genetics should be considered an auxiliary science to silviculture.

2. The forest geneticist has developed a considerable volume of information valuable to the forester. A job remains to present this information in such a way that it will be usable to the the fieldman.

3. Silviculture has the tools, such as release cuttings and thinnings, to get tree improvement information applied.

4. Where stands are marked for cutting and intensive management is applied, we are getting forest stand improvement and tree improvement, but in an indirect way; most foresters do not have genetic information to guide their marking. A better job of tree improvement work could be done if the forest geneticist would define tree qualities so that they can be identified and measured.

5. In the field of extensive management it is probable that no forest improvement will take place until it is shown that damage is being done. Studies are needed to get the answers.

6. Management studies do show that good growth can be maintained over a wide range of stocking and by several methods of cutting. But we need a genetic appraisal of management practices: It is highly possible that we can maintain good growth but would be degrading the quality of present and future stands.

These are important questions and should receive the attention of the forest geneticist soon.