Fifty Years Of Progress In American Silviculture

by R. H. WESTVELD

Chairman, Department of Forestry, University of Missouri

In spite of numerous unfavorable factors, silviculture has made notable progress during the fifty years that it has been applied in the United States. Although some silviculture was practiced more than fifty years ago, it was not until nearly the turn of the Twentieth Century that conscious efforts were made to produce or perpetuate timber on moderate areas of land.

Early Efforts in Silviculture

Silvicultural practice was initiated by several different agencies during the fifteen-year period from 1890 to 1905. The establishment of the first Biltmore Plantations in North Carolina in 1890 was probably the initial effort in silviculture. On the national forests silviculture began with the enactment of the National Forest Use Act in 1897. When the Yale Forestry School got underway, the New Haven Water Company made arrangements with the school to manage their lands. As a result of this agreement, excellent demonstrations of silvicultural practice have been developed over a period of nearly a half century. In 1908 the Harvard Forest was established. The silviculture of eastern white pine has had special emphasis here for 40 years.

It is difficult to determine when the first conscious effort to practice silviculture on large tracts of privately owned land began; however, at a meeting of the Society of American Foresters in New Orleans in 1931, the late Henry T. Hardtner stated that his company had become interested in handling its lands on a continuous basis in 1905.

The foregoing is only a partial list of the early beginnings that were made in the application of silviculture to the forests of the United States. During the first twenty-five years of practice, silviculture was limited largely to its application to publicly owned lands and small areas of both public and private educational institutions. Beginning with the second twenty-five year period, silviculture became applied more generally to privately owned lands. During the Twenties there were numerous examples of lands in private ownership on which crude forms of silviculture were being initiated. The amount of acreage involved in these lands has gradually increased, especially in the past five or ten years. As the acreage has expanded the intensity of the practice has increased.

In 1930, the report of the committee on industrial forestry of the Society of American Foresters showed that twenty-one million acres, or 9% of the privately owned land, other than farm forests, was under some form of conscious management. By 1945, the amount of area in this category had reached seventy-eight million acres. This is an increase of 271%. In connection with this expansion in forestry practice, it is significant to note that forestry has made the greatest progress on lands in relatively large ownership. The reappraisal reports of the U. S. Forest Service show that good forest management practices are in effect on a much smaller proportion of lands in small ownership than on those in large ownership.

Legislative Attempts to Enforce Silvicultural Practice

When the Snell and Capper bills were introduced into Congress in the early Twenties, it was evident that there was a feeling among some foresters and laymen that the application of silviculture on privately owned lands was not making the progress that it should. These bills were the first attempts at getting some form of public regulation for the handling of forest lands in private ownership. When these bills failed to receive adequate support in Congress, the Clark-McNary Act, which was passed in 1924, was substituted. This act was aimed at securing better forestry on private lands through cooperation rather than regulation. The purpose of the fire protection section of this law was to stimulate silvicultural practice indirectly through improved fire protection. The sections of the law which provided for extension work and for low-cost forest planting stock had an expanded program of silviculture on the wooded areas on farms as their objective. By the late Thirties and early Forties, silviculture was gaining a good foothold on privately owned lands. In spite of this, some foresters were advocating public regulation of privately owned lands. Their efforts led to the introduction into Congress of various bills which were designed to regulate the practice of forestry on privately owned lands. During the same period, several states passed laws which would require a private land owner to practice at least a simple form of silviculture. Most of these laws required that seed trees should be left when mature forests were cut.

Factors That Have Influenced Progress in the Application of Silviculture

Many inter-related factors have been responsible for the progress which has been made in the application of silviculture in the United States. It is not difficult to understand why private land owners were not particularly receptive to the idea of practic-

Soil erosion in forest land that had been misused by attempting to make farm land out of a timbered area. (Photo courtesy Dr. McComb)

ing silviculture on their land fifty years ago. Virgin timber was still abundant, and it, therefore, did not seem necessary to give attention to the production of new crops of timber. Not only was marketable timber abundant at that time, but protection of the forest resources was not adequately provided for. There were few fire protection organizations in existence and destructive fires were frequent. Under these circumstances the possibility of bringing a new timber crop to maturity was uncertain. In some instances, diseases or insects represented an almost equally great hazard. In some parts of the country the forests were very complex. The valuable species were in the minority, and means of perpetuating these species in competition with less valuable species had not been developed. These conditions represented natural draw-backs for the private land owner in investing money in timber growing. Inasmuch as natural factors seemed to militate against timber growing, many land owners developed the philosophy that it would be better to dispose of their lands for other use. In several of the eastern forest regions, numerous attempts were made to dispose of cut-over forest lands for agriculture. It soon became evident that this was not the solution of the problem since agriculture failed to succeed on the limited areas of land that were sold for that purpose. This instability in land ownership was obviously a deterrent to the application of silviculture. Once it became evident that the virgin timber would not last indefinitely, that fire protection facilities were becoming more dependable, and that forest land rarely could be utilized profitably for agriculture, private land owners turned their attention toward effective use of their

land. They started to think in terms of reforestation of lands that had been so badly treated that they could not re-seed themselves, and to cutting methods which would perpetuate the stands which had not yet been cut over. These developments were taking tangible form in the early Twenties. At about the same time, the use of tractors in logging came into being. This was important in the application of silviculture because it made logging cheaper, and it increased the flexibility of operation. Soon thereafter trucks came into use in transporting logs and other timber products. This development still further increased the flexibility of logging. This was significant inasmuch as a greater opportunity was provided for carrying on salvage operations economically whenever destructive forces such as fire, insects, disease, wind storms, and hail storms struck a piece of timber. The practice of silviculture was, therefore, stimulated by improvements in logging equipment and in the methods by which this equipment was used. The most recent improvement in equipment which is having a profound influence upon the application of silviculture is the development of numerous types of planting machines for handling forest tree seedlings. It is evident that the availability of this equipment is going to have an effect on reforestation work.

The lack of factual information resulting from research was

Tractor logging helps the application of silviculture by making logging conditions more flexible. (Courtesy of Caterpillar Tractor Company)

Lawther Tree Planter. Use of tree planting machines lowers costs of planting in reforestation work. (Photo courtesy Lawther Company)

one of the early deterrents to the development of silviculture in this country. A good example of this may be found in the complete discontinuance of direct seeding when the first attempts, which were poorly executed, were failures. Research in recent years has demonstrated that direct seeding can succeed under certain conditions when properly applied. The first forest experiment station in the United States was established at Fort Valley, Arizona, in 1908. Soon thereafter similar stations were established at Priest River, Idaho, and at Wind River, Washington. These stations were manned by staffs of only one or two men. Because of this, research in silviculture made slow progress. However, the information which has accumulated during the past forty years is providing a sound basis for developing better timber-growing methods in the regions covered by these stations. During the early Twenties, when it appeared that forestry practice on privately owned lands was not likely to make much progress for some time, expansion of the facilities for forest research occurred. This was augmented in 1928 by the passage of the McNary-McSweeney Act, which provided the funds for the framework of the twelve federal forest experiment stations which are now in operation. During the past five years, the effectiveness of the federal experiment stations has been greatly improved through the funds which Congress has provided for the establishment of field stations known as research centers. This provides a greater

opportunity for developing demonstrations of good silviculture in the varied forest types which are found throughout the United States. Although the federal government has taken aggressive action in the development of an adequate research program which can help to point the way to good silvicultural practice in the United States, the states have been slow to assume their responsibilities in forest research programs. With few exceptions, the state governments are financing the time of only one or two persons in a forest research program, only a part of which is devoted to silviculture. One of the great needs, therefore, in silvicultural research is an adequate program sponsored and financed by the state governments chiefly through the agricultural experiment stations.

Persons Who Have Guided the Development of Silviculture

The kind of silviculture that has been practiced in the United States in the past has been dictated, in a large measure, by economic conditions. This has not been so true on publicly owned land as on the privately owned land because on public lands pressure to secure maximum profit has not been so pronounced as on privately owned lands. Silviculture on the national forests, for example, has generally given greater emphasis to silvicultural considerations with particular reference to improving the stand for the future.

Personalities, too, have played an important part in the development of silvicultural practices in the United States. Henry S. Graves, best known as an able administrator and educator, pioneered in the field of silviculture through the publication of the first American textbook on silviculture, *Principles of Handling of Woodlands,* which was published in 1911. As the problems in reforestation appeared to be of major importance, nursery practice and planting became the subject of a textbook by the late James W. Toumey. Later—1923—R. C. Hawley's *Practice of Silviculture* was the first textbook published in the United States based on American experiences in cutting practices. The ecological basis for silviculture became the subject of a textbook by the late J. W. Toumey in 1916. These, together with F. S. Baker's *Theory and Practice of Silviculture* and the author's *Applied Silviculture in the United States,* which were published in the early Thirties, are all products of the past twenty-five years. More recently (1942 and 1946) the publication of *Forest Soils,* one book by S. A. Wilde and another by H. J. Lutz and R. F. Chandler, completes the coverage of subjects that bear directly on the development of silvicultural practice. These books have helped to

crystallize viewpoints on silviculture and to focus attention on the problems in silviculture in the country.

Silviculturists have not been alone in contributing to the development of applied silviculture. Such persons as H. H. Chapman and Emanuel Fritz, men whose primary interests have been in other phases of forestry, have made notable contributions to the progress of silviculture in the United States. Chapman's contribution to the development of cutting and burning practices for longleaf pine and for loblolly pine and Fritz's contributions to the progress of redwood silviculture, are too well known to require any comment. In the field of ponderosa pine silviculture, G. A. Pearson, T. T. Munger, R. H. Weidman, Duncan Dunning, and S. B. Show have been the leaders. These men have been responsible for interpreting the local conditions in their respective regions, thereby developing the details of cutting methods which, although dealing with the same forest types, differ in the details of application. Although these men, on the basis of their research, have been leaders in developing cutting methods for ponderosa pine, many persons who are not well known have been or are doing a good job in interpreting these methods in their application in the woods. The author had the privilege of working with one such person, namely Walter J. Perry, who, 25 years ago, was a timber sales administrator on the Carson National Forest in New Mexico. Although Perry was not a technically trained forester, he was undoubtedly one of the best silviculturists in the country because of his keen powers of observation. He made several contributions to the *Journal of Forestry* in the early Twenties, one of which was a resume of his observations on the factors influencing the regeneration of ponderosa pine. It is significant that the conclusions which Perry reached from his observations were essentially the same as those resulting from G. A. Pearson's ten or twelve years of research which were recorded in a bulletin of the U. S. Department of Agriculture in 1923. If all foresters entrusted with applying silviculture in the forests had the keen power of observation and the ability to interpret those observations in terms of good silviculture that Walter J. Perry had, silvicultural work would be in good hands. Perry's influence on good silviculture was not limited to the work which he, himself, did. For many years, the Forest Service in Region 3 sent its newly acquired forest assistants and junior foresters to work under Perry in order that they might learn the details of ponderosa pine silviculture under his direction.

The late Austin Cary and the late Wilbur R. Mattoon likewise had a broad influence on the development of silviculture in this country through their wide contacts with land owners who

were interested in practicing forestry. It would be difficult to appraise the extent of the influence of these men.

Investigators who have contributed in large measure to the progress of silviculture in various regions include the late R. T. Fisher and A. C. Cline (eastern white pine), J. A. Larson (western white pine), E. H. Frothingham and J. S. Illick (oaks), Leo Isaac (Douglas-fir), M. Westveld (spruce-fir), J. Kittredge (Lake States forests), and C. F. Korstian.

During the past twenty years the development of silviculture in the United States has fallen into the hands of a large number of young men. Most of them are not so well known nationally as in the regions where they work, but many of them will undoubtedly have their names indelibly associated with the development of various phases of silviculture.

Education As a Factor in Better Silviculture

Although the development of silvicultural practice and the extent of its application have been influenced by changing economic conditions and by the development of a sound factual basis, many other factors have contributed, at least indirectly, to its development. Education has been an important factor in getting better forestry practice into the woods. The work of the extension foresters, state forestry officials, and certain individuals of the U. S. Forest Service has been responsible for expanding the work in silviculture. In recent years, the farm foresters financed by the Norris-Doxey Act have carried the educational work to an increasingly large number of land owners who own farm forests. The influence of foresters connected with various forestry associations and with railroads cannot be overlooked in its effect upon better forestry practices. Legislation, or the threat of legislation, has been an influencing factor in wide application of crude silviculture. The government subsidies which have been paid for stand improvement and for tree planting likewise have contributed toward an increase in the amount of acreage upon which silviculture is being applied. Marking rules, as well as forest practice rules, have been useful in designating in a specific manner the type of silviculture which is best suited to various forestry conditions.

Current Developments in Silviculture

Current activities in silviculture show an expanding program of forest planting, stand improvement, direct seeding, and a more refined system of cutting methods in mature timber. Practically every section of the country reports an expansion in forest tree production at the state nurseries of two to three times the amount

produced prior to the war. The fact that this large expansion is taking place in the face of high planting costs is significant inasmuch as it indicates a concrete commitment on the part of land owners to the growing of more timber. The development of planting machines will tend, of course, to reduce planting costs somewhat in those regions where their use is practicable. It is apparent that this country is entering a period of increased activity in the field of tree planting. This, however, is essential if we expect to make any noticeable progress in the rehabilitation of some seventy-five million acres of forest land which cannot reproduce itself naturally because of a lack of seed trees.

On the national forests, funds made available under the Knutson-Vandenberg Act of 1930 have stimulated activity in the improvement of stands on cut-over lands. It is now possible to carry on improvement work in deteriorated stands which, without such cultural work, would continue to deteriorate. On privately owned lands, it is significant to note the investments which the land owners are making in timber for the future. It is not uncommon to find private land owners spending an average of two to three dollars an acre for stand improvement, and, in some instances, spending as much as seven or eight dollars per acre over limited areas. Obviously, the forest lands of the United States will gradually become more productive as a result of these activities. As a result of research, it has been demonstrated that certain species under certain conditions can be reproduced successfully by direct seeding. This is in contrast to the results which were secured in the first direct seeding in 1907 when, because a seeding technique had not been developed through research, direct seeding was a complete failure. This is merely fur-

Reforestation in submarginal farm land. (Photo courtesy Dr. McComb)

ther evidence of the importance of research in developing effective silvicultural practices. Through improvements in logging equipment and through a sounder knowledge of the requirements of various species learned through research, a sounder basis for the application of more intensive and refined silviculture to forests of the United States is being developed. Further advances in silvicultural practices must await progress in the wider and more economical utilization of low-quality wood. In the final analysis, silviculture can reach its highest refinement only when uses for wood are complete and diversified.

Silviculture will continue to develop and expand in the United States in proportion to the development of forest research and the conviction on the part of the land owners that the growing of trees is as sound a business as any other form of business activity.

FACTS ABOUT THE AUTHOR

R. H. Westveld, one of the country's leading silviculturalists, is Chairman of the Department of Forestry at the University of Missouri.

He received his B. S. Degree from Michigan State College and after two years as a Junior Forester went to Yale and earned his Master of Forestry degree.

Westveld was employed as an Assistant Silviculturist for three years prior to entering teaching. Before taking his present position, he taught at Michigan State College, University of Missouri and the University of Florida.

He is the author of *Applied Silviculture in the United States,* and *Forestry in Farm Management.*