

TREES FOR RECLAMATION IN THE EASTERN UNITED STATES

THE CHANGING PERSPECTIVE

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Ten years ago a typical Eastern U.S. reclamation project was pictured with a prominence of trees on a bench in front of a wall with little or no ground cover evident.

That typical picture today has changed a great deal. Present surface mine reclamation is generally pictured as a thickly-grassed "inslope" if contour mining, or a wide expanse of level, heavily-vegetated land in the case of mountain-top mining. Trees are no longer prominent.

Why the difference?

There are a number of reasons. They involve economics, logistics, changes in laws, methods of operation, differing characteristics of trees, and manpower availability. Some of these may seem unrelated to tree use, but when considered in the vernacular of the mining industry, they are intricately related.

I do not mean to imply that trees are never used in reclamation today. They are and they are used extensively. However, they are no longer the prominent ingredient. The use of trees has been overshadowed, not discouraged, by the use of grasses and legumes as the dominant component in a reclamation plan.

Neither do I mean to imply that the use of trees is not important in the reclamation and stabilization of surface mined land. I have always felt they have an important part and I continue to profess their significance. To exemplify my feelings, I can point to more than 20,000 acres of land which I have reclaimed or overseen the reclamation of in West Virginia, Virginia, and Kentucky. On those acres, I have planted more than 40 million trees, either by direct seeding or seedling plantings. That estimate may sound exaggerated, but I have practiced reclamation in all types of terrain, which were mined by all methods of mining ever known to the industry over the past 30 years. Trees were an absolute necessity.

Being a strong supporter of tree use in reclamation, I maintain hope that their use will once again gain prominence. Nevertheless, it has changed over the last decade and I wish to briefly discuss my observations as to why they have been de-emphasized as well as offer recommendations which might increase their use.

As I mentioned, I have dealt with all types of mining by all sorts of methods. In reclaiming those lands, I have planted trees, both seeds and seedlings, in every conceivable manner: by hand, conventional machine, hydro-seeder, helicopter, and tree spades. Overall success has been excellent, but some methods, species, and types of stock have outdistanced others.

For instance, in 1968, we direct seeded some 6,500 acres by helicopter. This was the largest helicopter direct seeding project ever undertaken on mined land in this country. It may, perhaps, be the largest single reclamation project undertaken at any one time on mined land in the world. The 6,500 acres were located in Raleigh and Boone Counties in southern West Virginia.

On that project, we used a varied mixture, but the dominant tree species were locust, white birch, and a mixture of Virginia, pitch and white pine. Besides the locust, which of course, was most effective, the white birch was most successful with the pine doing quite well. Although it was several years before we could actually evaluate the effort, we were exceptionally pleased with the overall results.

With the magnitude of that particular project and the accessibility of the sites, as well as spring weather uncertainty, the helicopter was the logical and most economical means of direct seeding. Today, however, the methods of mining and emphasis on concurrent reclamation do not lend themselves to helicopter application.

In another project we hired 32 high school students for a planting crew. In a three-month period, they planted 700,000 Virginia pine (1.0) seedlings. That effort was quite successful. The problem with that sort of effort today is the availability of manpower, however, in West Virginia, we are fortunate in that the Soil Conservation Districts maintain planting crews, although their capacity may be limited. Nevertheless, these crews are available for planting trees where they are needed or desired.

These two projects were undertaken in the late 60's and early 70's. During that period, the use of trees in reclamation in West Virginia was at an all time high. The methods of mining, regrading, and overall overburden handling techniques made the use of trees more desirable than concentrating on ground cover.

Since that time, an intertwining change in laws, methods of mining, equipment, and reclamation standards have caused the emphasis to shift from trees to ground cover. Although trees were still encouraged on slopes, grasses and legumes provided a quicker means of stabilizing disturbed lands.

As the decade proceeded, increased attention was placed on erosion and sediment control. The logical tool to enhance control was grass and legume cover. Of course, with a permanent cover of grasses and legumes being acceptable for bond release, the shift was accelerated because ground cover was effectively established before direct seeded trees could ever be evaluated for survivability, much less long-term success. This meant the bond could be released in shorter time. That was an advantage to the industry.

With all the changes in every aspect of the surface mining industry, there has been a considerable refinement of technology and methods of operation. Such refinement has provided a more acceptable medium for plant growth, both grasses and trees. Today, I feel that any herbaceous or woody species suitable to the area and its climate will have a high rate of survival under normal conditions.

This improved medium provides an advantage to tree planting. For instance, we have found that three pounds of locust seed, instead of the six pounds we used to apply, is more than adequate. Also, we have been able to introduce

other seedling species into West Virginia with a good rate of livability. For example, we have had good success with 2.0 Aspen seedlings from Minnesota. Although not alien to West Virginia, the local source of supply is non-existent. That is why we had such a difficult time obtaining the stock.

While discussing refinement and the advantages it has offered to revegetation, I will mention one other matter which has enhanced tree life on modern surface mining operations. That is, we have found that tall growing legumes such as *sericea lespedeza* inhibit tree growth and development through undue competition. Therefore, in areas where we plant trees, we use a lower growing species such as birdsfoot trefoil. The result has been noticeably good.

Recent Agricultural Research Service investigators have noted a possible problem relating directly to this increased refinement. That is particularly true in steep slope areas, where compaction of the "backstack" is required or on a mountain-top operation where compaction is inherent to the haulage of material, tree growth may be inhibited by this overcompaction. It is not overcompacted from a stability standpoint, but it may be from a tree planting, growth, and development standpoint. Our problem--how do you resolve the stability question v. optimum tree growth conditions and satisfy the regulatory agencies? If compaction continues to be noted as an inhibitor to tree growth, it is one area that should warrant the immediate consideration of the forestry profession in concert with the regulatory agencies.

As the methodologies have changed and the refinement of soil manipulation has progressed, so have the types of equipment organic to a surface mine operation. There are those which practically every surface mine operator has, such as a hydroseeder, and there are those which are unusual, but seem to have a place in surface mine reclamation.

Throughout the decade, the use of the hydroseeder has increased substantially. Because of more emphasis on concurrent reclamation and the availability of water, it has been a logical means of applying seed, fertilizer, and mulch. It is quick, cost effective, and highly mobile. The results with hydroseeding have been most successful, particularly with the grass/legume mixtures. The

disconcerting factor with such increased hydroseeder use is the availability of seed stocks which can be effectively applied with this machine. Other than the typical, i.e., locust and a few species of pines, there are few that can be direct seeded successfully. This is an area in which we need to also direct our concerted research efforts. If a greater variety of seed stock was available and proven successful with hydroseeder application, there would be greater tree usage in surface mine reclamation. It is a question of adaptability and it is incumbent on all of us to provide such information.

There is one other method of tree planting that I recently experimented with on mountain-top operations near Beckley in Raleigh County, West Virginia. It was the "tree spade." It is an unusual piece of equipment to find on a surface mine operation, but it seems that it might certainly have a place in the reclamation community. It would be particularly effective in areas which are to be developed for a more intensive use, such as housing or industrial development. The "spade" is a hydraulically powered inverted cone which cuts (or digs) a cone of earth from the place designated for tree planting. The soil is then removed from the area. Once the hole is prepared, the "spade" moves to the local surrounding woodland, which is usually near a surface mine, and the tree is removed in the same manner as the hole was dug. The inverted cone comprises the root ball for the tree and the size of the cone governs the size of the tree which can be effectively transplanted. The tree, with root ball or cone, is then transported to the original hole and placed in the ground. Of course, more expensive nursery stock can be used if local sources are not available.

As I mentioned, I feel the "tree spade" has a place in today's refined reclamation industry. It permits the use of native species which are generally readily available from the adjacent woodland. Also, it prepares a planting hole and root ball of the same dimensions so that it can be used on an area already stabilized with grasses and legumes without fear of destroying the vegetation. Although unique to the mining industry today, we may see more of these "spades" in the next few years. Our experiment was successful.

Additionally, there are two other points I feel worthy of mention in the context of

this paper. One is discouraging and relates more to a by-product use of trees than to tree planting. The other is encouraging and is related to the new West Virginia Surface Mining Control and Reclamation Act's recognition of woodland as an acceptable post-mining land use. Both of these issues erupted with the enactment of the federal surface mining enforcement program.

The first point is the federal program's prohibition of placing trees on the outside edge of the lowest coal seam being mined. For years, we "windrowed" this woody material along the outside perimeter of the haulroads for enhancement of sediment and drainage control, protection and encouragement of new growth, as well as providing escape habitat and browse for wildlife. It had been pioneered by the U.S. Forest Service in the mid-sixties, yet the Office of Surface Mining, in their regulations, prohibit the placement of this cleared material below the haulroad. That prohibition disturbs me because they are neglecting a most beneficial use of non-merchantable timber and woody material without any justifiable explanation. It is my hope that OSM will consult with the Forest Service and resolve this matter to the benefit of the industry and the environment.

The other point is "upbeat" in that it recognizes woodland as an acceptable post-mining land use. The federal government's program (OSM) would not permit private woodland as a goal of reclamation capable of bond release. West Virginia's new law, which was written to achieve primacy of the federal program, recognizes commercial woodland as an acceptable post-mining land use for surface mine reclamation in our state. To do otherwise would have been a total disregard for many people and agencies, such as the University's College of Forestry, the Department of Natural Resources' Division of Forestry, the state's hardwood forestry industry, the U.S. Forest Service, the Soil Conservation Service, as well as years of beneficial experience in stabilizing our state's lands. That inclusion in our state law is being opposed by the federal government. Why? The only reason we can find is that it does not read the same as the federal law because the federal law does not specify that particular use. We feel that its silence on the subject should not be interpreted as a prohibiting it, particularly when history has reflected such an effective use of trees

in reclamation. As the state holds firm in its position, I am encouraged that it will increase the use of and attention to trees.

Through the years, we have had vast experience with tree planting on Eastern U.S. reclamation projects. Since the mid-fifties, the West Virginia surface mining industry has cooperated with practically every agency involved in the use of trees for land stabilization. Those years have proven beneficial toward improved technology.

In spite of the beneficial experiences of the past years, much has changed in the surface mining and reclamation history. Trees are no longer the prominent ingredient in a reclamation effort. Many things have contributed to this decline in prominence, as I have briefly described. However, there are many things which we, the industry, in concert with you, the professional foresters and regulators, must do to regain the significance of trees in reclamation.

Above all, we must concentrate on adapting trees, their sources, and their use to the revised and refined methods of reclamation now practiced in the East. Although still in use, we must move from the "planting mattock" and "dibble bar" era to the age of the hydroseeder and automatic machines. We must make tree planting as economical and available as it once was. We must research and experiment with alternatives to increase the availability of planting methods which are cost competitive. We must provide adequate seed sources of differing species which have been proven successful by automatic application in our region. And, there must be greater planning and direction to insure that tree survivability and growth are enhanced, not inhibited through unnecessary competition or inappropriate soil preparation.

It can be done. We did it before and, with all the technological armament we have today, we can do it again.