MINE AND ROADSIDE REVEGETATION IN MONTANA

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ABSTRACT

Presently in Montana and surrounding states, revegetation research and development activities are being concentrated on the rehabilitation of surface mined lands, while little research is being directed toward roadsides. Rapidly expanding mining activities and increased public concern for the environment have resulted in increasingly high standards for land rehabilitation. These developments are creating numerous challenges and business opportunities for nurserymen and related professions.

INTRODUCTION

I was requested to speak about roadside and mineland revegetation projects and recent developments in Montana. Roadside revegetation research has received little attention and project procedures have remained relatively unchanged during the past three years. However, coal mining related activities in the Western states have increased at an exponential growth rate during the last several years. Consequently, I will direct most of my comments toward the development trends and immediate needs of mining related reclamation programs. Never before has land rehabilitation expressed a greater need for the professional services of nurserymen, landscape architects, botanists, ecologists, and other land rehabilitation specialists. The increasing amounts of land disturbance combined with greater public concern for proper land management practices has resulted in a new era of land rehabilitation. We as a professional group are directly involved and are responsible to meet the higher standards of this new era by developing improved techniques and materials to successfully and economically rehabilitate disturbed lands. Modern land rehabilitation has evolved to a precise scientific field which demands specific procedures and high caliber training.

Recent data indicate that the intermountain area is and will continue to be subjected to extensive mining activity. An Associated Press release summarized the situation as follows. "The states of North Dakota, South Dakota, Colorado, Montana, Wyoming and Utah will be producing 30 percent of the nations coal by 1985, up from 10 percent only five years ago. The region's electric generating capacity will have doubled from 1975 to 1985, increasing from 3 to 5 percent of the nations total. Some 60 percent of the country's uranium will come from the region by 1985, more than

doubling the current 10,000-ton-per-year output. By 1990, half the oil produced in the six states is expected to come from oil shale." The above statistics indicate that the need for land rehabilitation will substantially increase.

CURRENT AND FUTURE EXPECTATIONS

In recent years stringent Federal land rehabilitation requirements have been implemented which require the states experiencing surface coal mining activities to develop and implement equally restrictive requirements (U.S. Office of Surface Mining, 1977). Many western states have developed proposed regulations which are now being acted upon at the Federal level in the near future I believe many of these restrictive requirements will influence reclamation standards of other projects such as roadsides, utility corridors and urban development. As an example of what may soon confront us, I will read to you selected requirements included in the recently proposed Montana Surface Mining Control and Reclamation Act (State of Montana, 1980).

Please keep in mind, that the primary reason Montana imposed these laws was to prevent the Office of Surface Mining (OSM) and Environmental Protection Agency (EPA) from controlling Montana resource development.

Montana regulations now require that a diverse, effective, and permanent vegetative cover of the same seasonal varieties native to the area of land to be affected be established.

Several of the guidelines used to determine if the above standard for revegetation has been met include the following:

1. Success of revegetation shall be measured on the basis of unmined reference areas approved by the department. The department shall approve the estimating techniques that will be used to determine the degree of success in the revegetated area. At least one reference area shall be established for each native community type found in the mine area.

2. The revegetated areas and their respective reference areas will be evaluated for at least two consecutive years prior to application for bond release and shall include the last two consecutive years of the bonding period. Application for final bond release may not be submitted prior to the end of the tenth growing season.

3. These operators shall initiate a study approved by the department which will demonstrate that the revegetated areas are capable of withstanding grazing pressure.

4. The stocking of trees, shrubs, half-shrubs and the ground cover established on the revegetated area shall be comparable to the stocking and ground cover on the reference area and shall utilize local and regional recommendations regarding species composition, spacing and planting arrangement. The stocking of live woody plants shall be comparable to the stocking of woody plants of the same life form on the reference area. When this requirement is met and acceptable ground cover is achieved, the 10 year responsibility period shall begin.

5. The operator shall utilize seed and seedlings genotypically adapted to the area when available in sufficient quality and quantity.

6. Where tree species are necessary the permittee shall plant trees adapted for local site conditions and climate.

7. The permittee shall consult with appropriate state and federal wildlife and land management agencies and shall select those species that will fulfill the needs of wildlife, including food, water, cover, and space. Plant groupings and water resources shall be spaced and distributed to fulfill the requirements of wildlife.

8. Weighted productivity shall be determined for each of the following morphological classes; annual grasses, perennial grasses; annual forbs; biennial and perennial forbs; and shrubs. The production of each class on the revegetated area shall be comparable to the weighted production for that morphological class.

9. The number of species occupying 1% or more of the ground cover in the revegetated area shall be equal to or greater than the number of species occupying 1% or more of the canopy cover in the reference area.

The above is only a brief introduction to the many challenges facing the land rehabilitation profession. Also keep in mind that similar requirements must be implemented by most states, otherwise OSM will implement their own Federal program.

To date in Montana, we have made excellent progress towards developing techniques for establishing stands of native grasses. Our present "state of the art" can enable us to establish native grass stands which comply with the new standards. However, I feel we are still in the dark ages when it comes to reestablishing suitable stands of native forbs, shrubs and trees. I will comment on five areas of work which will require added effort if we are to comply with the new land rehabilitation standards.

1. Ten years of revegetation research in Montana has shown that many native forb, shrub and trees cannot be successfully established if seeded with grass species. Many of the natives are difficult to establish from seed if competition from other species is not reduced or eliminated. If direct seeding techniques are not successful and the species are required for successful land rehabilitation, then transplanting techniques must be implemented. This requires that large quantities of high quality native plant species not commonly available will need to be produced. This is not an easy task because many of the most desirable species do not readily lend themselves to present day propagation and production methods. Persons entering this field will require a substantial amount of information and training regarding individual species characteristics. Management methods necessary to produce native plant materials will become more complex. Most native plant production will require long-term contracts to insure production of the required number of each species, to specify plant sizes, to designate source of parent material and to insure proper delivery time. Presently within the intermountain region there are several nurserymen producing native plant material for large scale land revegetation. Although these businesses have had their share of problems they are expanding these services and will be capable of supplying plant material not available from other suppliers.

2. A second area requiring additional effort is that of developing efficient handling and planting methods for large numbers of plants. Although transplanting of bare rootstock has been successfully practiced for many years, it is labor intensive, produces variable establishment rates and has resisted total mechanization. Presently this method is considered inadequate for large scale revegetation projects. Recent emphasis on development of containerized transplant stock for reforestation and land revegetation has resulted in a wealth of new techniques and materials. Much of this work directly applies to our need to establish native species on mine spoils.

Containerized planting system development has resulted in numerous container types and propogation methods. I believe it is still too soon to make final decisions as to which systems are most suitable. All these innovative systems must be intensively field tested to determine advantages and disadvantages. Most likely there will be no single type and size of container propagation method and planting procedure which is best for all conditions. More cooperative research and system evaluation is needed to help define what methods perform best under specific conditions.

At Montana State University we have concentrated our efforts on developing what we call the dryland tubeling (Jensen and Hodder, 1979). This method was developed primarily for establishing shrub and tree species in semiarid harsh environments. The 2 inch diameter by 24 inch long paper and plastic container is designed to position the root system of a well developed juvenile shrub or tree deep in the soil where soil moisture is more readily available and where root system competition is reduced. This method has proven successful in semiarid eastern Montana. We have now progressed to the point where planting is completely mechanized. Working in cooperation with the Missoula Equipment Development Center (U.S. Forest Service) a machine has been developed which will plant a dryland tubeling within a one minute cycle time. The machine attached to a tractor's 3 point hitch, is basically simple in design and should prove to be highly reliable. We hope to have this machine perfected to enable manufacturing by the spring of 1981.

3. Earlier I mentioned that direct seeding of many native species has not proven highly successful. However, this does not mean there is not or will not continue to be a need for seed of native plants. Presently the demand for native plant seed greatly exceeds the supply. Large quantities of native grass and forb seed are being produced on agricultural lands and harvested from native stands. With the implementation of the new land rehabilitation standards demand for native seed supplies is bound to increase at an exponential rate. Presently there is urgent need to have more seed grown or collected within a reasonable distance of the major soil disturbing projects. Also smaller quantities of seed for site specific species will need to be collected for the propagation of the required transplant stock. In short, a need still exists for more people to be involved in native seed production and collection.

4. A fourth area requiring additional work by land rehabilitation professionals is that of developing improved methods and capabilities for salvaging and reestablishing mature native plant materials. Land disturbances destroy vast quantities of native plant material that is irreplaceable by conventional standards. In areas such as eastern Montana, development of mature shrubs and trees may require 10 to 20 years. Destroying such material is an inexcusable waste if methods are available to salvage and reestablish the vegetation. Salvaging mature trees and shrubs with the tree spade is becoming a routine practice at many strip mines in Montana, Wyoming and Colorado. In recent years transplant survival rates have improved because handling techniques have been refined, species requirements are becoming better known and above-ground plant size is being balanced in relation to rootball size. Research and development work completed at Montana State University has produced two methods of salvaging and reestablishing shrubs. One method referred to as rootpad transplanting involves preparing the shrub for transplanting by first mowing the tops off the shrubs to within approximately 4 inches of the soil surface. A large capacity front-end loader is then used to carefully excavate at a depth of approximately 12 inches by scooping horizontally underneath the rootpad until the bottom of the bucket

is covered. The shrub pad is lifted and transported to the planting site. The bucket is gradually tipped as the loader moves backward, thus sliding the rootpad off the bucket and into the planting depression. Following unloading of the shrub rootpad, topsoil is filled in around the edges of the pad and into all cracks that developed while unloading. The soil can be pressed in place by running a light rubber tired vehicle around the perimeter of the pad or by packing with the bottom of the bucket. Rootpad transplanting establishes masses of shrubs such as native snowberry and rosebush within one year of transplanting. This method is excellent for landscaping around rest areas or for establishing erosion resistant vegetation in drainage ditches. The second method of transplanting shrubs is called shrub root sprigging. This method was developed to use rhizomatous root systems capable of withstanding disturbances. Root sprigging is generally used for planting large areas of low density plants. The first step in root sprigging is to locate sources of desirable plant material on terrain suitable for equipment operation. Next a flail or rotary type mower suitable for cutting brush is used to remove top growth to within approximately 4 inches of the soil surface. The remaining top growth and rhizomatous root systems are then excavated with an agricultural type plow or similar implement and a front-end loader. No effort is made to keep the roots and soil consolidated. The root-soil mixture is then trucked to the planting site where it is uniformly spread over the planting area. The root systems are then completely covered with approximately 4 inches of good quality topsoil. An improved method of shrub sprigging is presently being developed by Montana State University, Reclamation Research Unit and the Vegetative Rehabilitation and Equipment Workshop. A machine, similar to a potato picker has been designed to separate root systems from the soil. The root systems are loaded directly into a modified manure spreader which is used to transport and spread the roots over the planting area. A scraper then covers the root systems with 6 inches of topsoil.

Both shrub root sprigging methods have established excellent stands of the shrubs, woods rose and common snowberry on roadside and on mine spoil research plots. This method can be easily implemented using commonly available construction equipment or the more recently developed root harvesting machines. Implementation of this technique should prove useful for rapidly stabilizing critical drainage areas with an erosion resistant stand of shrubs.

Progress is being made toward the ultimate goal of salvaging and reestablishing all desirable native plant material before an area is disturbed. However, I believe we have only scratched the surface toward what can ultimately be accomplished in this area.

5. A fifth area of importance is the need for a program emphasizing information exchange and continuous education. In order for professionals and businesses to attain up-to-date expertise and maintain a high level of performance in this rapidly progressing science a strong self-education program must be implemented. It is the responsibility of every professional to seek the latest in technology and to inform others of their capabilities. The above needs can be partially fulfilled by attending professional meetings, reading professional publications and exchanging ideas with other progressive scientists and businessmen.

SUMMARY

In summarizing what I have commented on it becomes clear that the role of nurserymen and related professionals must be expanded to include rehabilitation of disturbed lands. These people will ultimately be expected to provide many of the services required to meet the new reclamation standards. Personally, I believe you are entering a challenging era which will provide profitable business opportunities for those willing to pursue land rehabilitation projects.

PUBLICATIONS CITED

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