IMPLEMENTATION OF THE SURFACE MINING LAW WITH REGARD TO REFORESTATION IN NORTHWEST OHIO[1]

by

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Abstract. This project was initiated to encourage quarry operators to plant trees on reclaimed areas and especially in areas where the visual impact would be greatest. The first plantings were to provide good sample plots for perspective cooperators and to exert peer pressure. Plantings of ten (10) tree species on seven (7) limestone mine sites were monitored and evaluated over a four year period. Black locust (Robinia pseudoacacia), eastern red cedar (Juniperus virginiana), and autumn olive (Elaeognus umbellata) show the best survival rates. Results of the evaluation indicate that the success or failure of plantings is directly related to other factors, in addition to spoil characteristics. These factors include: environmental conditions at time of planting, proper tools, and knowledge and attitude of the planters. With proper planning and management, survival rates can be increased. A survey of participating operators indicate a willingness to continue the project.

Additional Key Words: soil pH, ground cover.

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Introduction

This project was initiated to encourage quarry operators in Northwest Ohio to plant trees and especially in areas where the visual impact will be the greatest, in screening mining operations. Trees are being taken out, but not being replanted.

Some background on Northwestern Ohio will help to bring the area into focus. Situated in the temperate region on the eastern edge of the corn belt, the four seasons are defined by moderately warm and humid summers, and seasonably cold winters. The average winter temperature is 23.6°, average summer 73.6°. There are extremes of as low as -19.0° and as high as 110.0°. The average year round temperature is 51.1°, with an annual rainfall of approximately 39.39 inches. The average length of the growing season is 157 days. The terrain in this area is mostly level, with poorly drained glacial till soils. This part of Ohio was once covered by glaciers, large lakes and eventually the "Black Swamp". Drainage of this swamp and lake plain area started in the mid-1800's and has continued to the present through the use of open ditches and systematic tiling.

When adequately drained, the soils for the most part, are highly productive. Agriculture accounts for approximately eighty-eight percent of the land use and represents a significant contribution to the economy. The bulk of this contribution comes from the production of corn and soybeans. Other common crops include sugar beets, tomatoes, wheat, and hay.

In addition to draining the area, the early settlers removed most of the natural decidious forest. The primitive forest was tall, dense and timbered with common varieties, most of which still grow in the remaining small woodlands. These

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varieties include American elm, American beech, burr oak, white ash, red maple, sugar maple, American basswood, American sycamore, black oak, northern red oak, white oak, black ash, ironwood, Ohio buckeye, black walnut, eastern white pine, yellow-poplar, and American chestnut. The understory is often dogwood, elder, black haw, plum, choke cherry, wild crab, prickly ash, paw paw, and sumac.

The forest stood between the pioneers and subsistence agriculture. Until a plot had been cleared and food crops planted, the threat of starvation was ever present. It is understandable how a tremendous forest resource was wantonly destroyed under these conditions. Even such a scarce and valuable species as black walnut was cut for fencing. Today only about eight (8) percent of the area remains in tree cover. Cropland, industrial and other land usage increases annually, as forestland decreases.

In large areas of most counties a mantle of glacial till, which ranges from a few feet to over a hundred feet in thickness, overlies limestone bedrock. Consequently throughout Northwest Ohio, where high-quality limestone is fairly near the surface, there are large limestone operations supplying agriculture and industry. Because of the level, almost treeless aspect of the surrounding landscape, the visual impact of the hills created by the mining process, is dramatic. This reforestation project is targeted toward these limestone quarry operations.

Mining Law

When a company decides to mine an area, it must deposit "bond money" with the state. If the mining company does not reclaim the land properly, the money is forfeited. Even if reclamation is properly begun, the bond is not returned to the company until a certain high percentage of ground cover is established.

According to the "Ohio Surface Mine Law" the mine operator must "establish a diverse vegetative cover of grass and legumes or trees, grasses and legumes, capable of self regeneration and plant succession, wherever required by the plan" (Ohio 1976). The legal requirements cover at least two pages and boil down to:

1. A cover must be planted - usually a mixture of 2 grasses and 2 legumes.
2. Trees are not required.
3. Trees may be planted in conjunction with grasses and legumes.

Grass is easier and cheaper to establish and offers erosion control much more quickly than trees. Therefore, zero to few trees are normally planted, thereby contributing to the decrease in area forestland.

Problems and Presuasions

One of the initial obstacles in persuading some operators to plant trees is the reluctance to deal with government. About half of the participants asked for assistance. The rest needed to be persuaded. Incentives to plant include:

1. Future value of land increased - particularly where recreation is planned.
2. Cost of reclamation is less if done while mining is still in progress. The bald, greyish white hills created by mining, are not exactly scenic and stick out like a sore thumb.
3. The screening effect - to enhance neighborhood relationship.
4. Aesthetic value - trees are pretty.

Once convinced of the validity of the idea the major concern is cost, including:

1. Price of trees - usually insignificant - ie. fifty-six dollars per thousand from our state nursery. However, seedling mortality usually requires additional planting.
2. Fertilizer-(forest-starter pellets) 22-8-2 slow release. Cost is also minimal, approximately fifty dollars ($50) per 1000 pellets. Fertilizer is recommended on each site - two operators are now utilizing it.
3. Planting cost - the real money factor. Most mines do not want to use high salaried employees to plant trees, and union restrictions prohibit using cheaper labor. This is always the biggest concern. We discuss ideas and options at length, with the following results. Planting crews have included:
   A. company employees on company time
   B. company employees on own time
   C. vocational agriculture classes
   D. Boy Scouts
   E. other volunteers - volunteer labor does most of the planting for this project

When the decision is made to go ahead, the next challenge is what to plant. A long-range plan is developed for each site. The idea is to utilize a variety of species each year, monitor their progress and change recommendations as needed, until the areas are revegatated to a degree necessary to fulfill the legal requirements and/or the requirements of the operator.

Spoil Characteristics

All sites are limestone quarries. Spoil areas and banks vary in age and content of spoil. Age ranges from one (1) to twenty-five (25) years. The sites consist of refuge from the production of:

1. stone aggregates
2. cement
3. high quality calcium
4. crushed limestone (dolomite)
5. lime

In addition to refuge from the production of these materials, stumps, miscellaneous debris, and other waste make up the site composite. On one site the refuge consists of the dust collected from the process of burning limestone to produce lime (calcination). In most cases, a six (6) inch layer of overburden or strippings covers the refuge. This overburden contains: top soil, glacial till, sand, clay and granite rock, in various sizes. Where no soil selection is made the top soil is mixed in. The pH on all mine sites ranges from 7.6 to 8.3.

Ground cover is spotty, with areas of dense and sparse growth and areas of zero growth. The grasses are mixtures of clover, birds foot, annual and prennial rye, fescues, Kentucky 31, alfalfa, and crown vetch. It is not advisable to plant crown vetch with trees. It tends to spread over

and choke them out. Chemical control was recommended but not implemented. Few trees survived in those areas with crown vetch.

In addition to the soil composition, the lack of good top soil, the high pH and existing vegetative covers, other variables and detriments affecting tree survival include:

The Human Components

1. Methods of handling trees, from delivery through planting, (protection of roots from drying out).
2. Timing of planting - early spring before bud break is best.
3. The supervisor and planting crew - attitude and expertise.
4. Tools utilized - planting bars work best - potato spades, shovels, heavy home-made bars were all used.

Weather Variables

1. The weather on the day of planting - ie. wind, cold, heat, etc. The worse the elements, the lower the survival rate.
2. Rainfall in the weeks following the planting and the remainder of that spring or summer. (A drought has occurred each summer for the past three years).

Tree Species

Given that all the seedlings suffered stressful conditions, had the same chances for mishandling, poor soils, high pH, environmental stresses (drought conditions), competing vegatation and no follow-up, their overall survival rates are indicated in Table I.

Table I. Survival of Tree Species

Species	# of Sites	# of Trees Planted	% of Total Survival After Four Years
Black locust Robinia peudoacacia	4	2250	83
Red cedar Juniperus virginiana	4	2650	65
Autumn olive Elalognus umbellata	4	1100	43
Black alder Alnus glutinosa	2	250	40
Imperial poplar Populus imperial	2	750	40
Austrian pine Pinus nigra	1	450	40
Silver maple Acer saccharinum	1	500	20
Arborvitae Thuja occidentalis	1	350	05
Norway spruce Picea abies	2	600	03
Red oak Qurcus rubra	1	500	01

Survey

Results of a survey of the seven (7) participating mine operators with regard to the reforestation project.

Questions and Responses

1. Can you recall your initial response to working with a government agency?

   The respondents indicated that because they already knew and had worked with both the Reclamation Inspector and myself, that they were more willing to get involved and less inclined to dismiss the project as just another government intrusion. All cooperators indicated a willingness to continue the project.

2. What were you hoping to accomplish with the tree planting?

   General site and/or border improvement, erosion control, cover overburden, beautification, protect the land, raise the land value, and be a good neighbor are all goals given by the respondents.

3. Do you envision a larger role for trees now and in the final land use?

   Most of the answers indicated that because of the projected use of the land, trees were a valuable asset. However, one site will be returned to farming. Another operator feels that grass is cheaper and needs less attention. He will continue the project, but on a limited basis.

4. Suggestions for improving survival rates.

   The persons involved with the planning, planting and periodic checks of sites now understand the importance of proper stock selection, the impact of weather and poor soil, care in handling of trees and the value of doing the job properly. Suggestions reveal that although they now know the problems involved that the outcome is worth the investment.

5. Comments on project.

   Overall those involved have a better appreciation of the challenges of revegatating with trees. One respondent said that "the program got them involved and made them aware of the surrounding agriculture community". It also helped them develop new community relations. A local high school agriculture class did their tree planting. All respondents indicated a favorable impression and an appreciation of the positive aspects of the tree planting project.

Summary

Conclusions

Results of this study and observations made on the sites suggest that with improved planning, survival rates will increase. Over nine-thousand

trees have been planted and an average of thirty-four (34) percent are alive after four years. Considerations of the following factors will be given for improvement of this on-going project.

Fugitive dust. Limestone dust from active mining operations is a factor in survival, especially with evergreens. When planted away from mining activity, tree survival rates go up. Red cedar seems to be the evergreen least affected by the dust.

Wind effect. Trees on east slopes did best while those on the top of banks and those on west and/or south facing slopes did least well. Prevailing winds are from the west-south-west and the drying effect is a definite detrimental factor.

Fertilizer. On the sites where forest-starter pellets were used, all surviving trees have outgrown duplicate plantings on other sites. With these disturbed soils, the addition of fertilizer is definately beneficial.

Tree selection. Certain trees will do better on high pH soils. This fact is now understood by the cooperators, since they have seen personal favorites such as red oak and various evergreens die or do poorly. We will continue to introduce a variety of species to establish a more natural environment and to avoid a mono-culture. The high survival of black locust could produce just such a situation.

Soil pH. Soil pH ranges from 7.6 to 8.3, with the average pH being 8.02. Although this is considered high, the trees that survive and are doing well are on sites in the upper range, as well as the lower pH of 7.6. Therefore, high pH does not seem to be a severe dibilatating factor.

Ground cover. Except for control of crown vetch, no concern will be given to ground cover. Trees are doing equally well in all vegetative situations. In fact, some of the best red cedar survival is occurring in dense stands of fescue.

Human components. Many times in an effort to be a good neighbor and/or accomplish too much at one time, operators attempted to plant more trees than they had man-power or time to handle. This can have a very negative impact, whether with paid employees or with volunteers. All cooperators now see the advantages in planting fewer trees, doing a better job and therefore maintaining a positive attitude for all concerned. Proper training, tools, and timing are now appreciated for the part they play in the success of the project.

Weather variables. Although weather cannot be controlled, the importance of this factor is obvious. Extreme cold, high winds or high temperature all have a negative effect on both the planters and the trees. This factor is so important that in the future, secondary or back-up bad weather days will be scheduled. The low survival rate of trees planted under any of the above adverse conditions, makes it obvious that waiting for better planting conditions is well worth the inconvenience of rescheduling.

Legally, land is considered reclaimed once a herbaceous cover is established. Thus any efforts to plant trees on such land amount to "unnecessary costs" from the point of view of some mining companies. The companies involved in this project are showing a willingness to experiment in developing reclamation techniques, and in their efforts have gone beyond what is required by law. Their cooperation and interest is having a positive influence in their area and within the industry. "If tree growing and stripmining reclamation ever are to be compatible, a higher sense of trust needs to be cultivated among all parties involved" (Conrad 1985). This trust is already established in Northwestern Ohio and the benefits are becoming obvious.

Literature Cited

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