

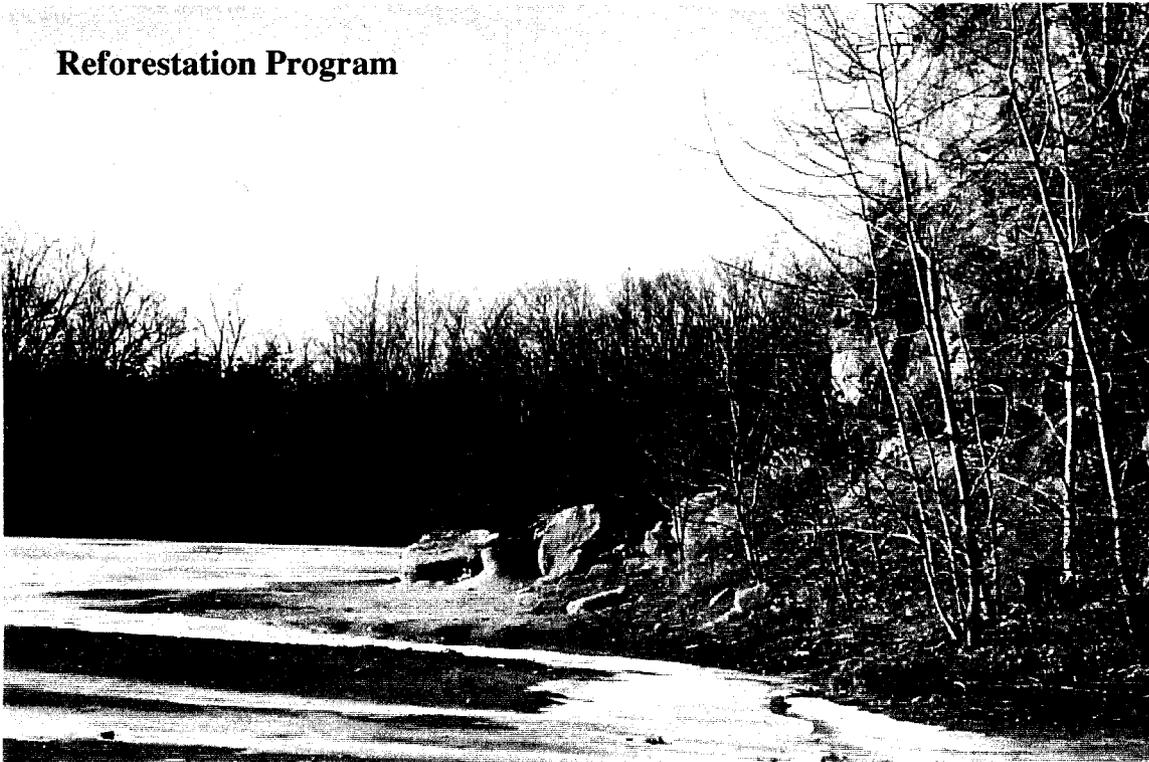
OHIO

Dept. of Natural Resources

Division of

Mines & Reclamation

Reforestation Program



Name of Project: Ohio Reforestation Program
Location of Project: Southeast Ohio – 391 Sites – 3,465 Acres
Organization: Ohio Department of Natural Resources, Division of Mines and Reclamation
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Start/Completion Date: 1981 to Present
Construction Cost: \$1,100,900
Contractor: Contract Planters, Volunteers, ODNR Division of Civilian Conservation
Date of Submission: February 23, 2000

OHIO REFORESTATION PROGRAM

OVERVIEW

Ohio has over 370,000 acres of abandoned mine land (AML) that were not reclaimed to current standards. Of this amount, approximately 17,000 acres of AML remain barren or sparsely vegetated.

As a result of the extent of pre-law mining, the Ohio Division of Mines and Reclamation initiated and maintains a large scale reforestation effort as part of its abandoned mine land program. Although similar planting efforts are being conducted in the country, Ohio established this methodology during the infancy of the AML program and it continues to be the nation's leader in the quantity of seedlings successfully planted on coal mine spoils.

REFORESTATION PROGRAM HISTORY

In the late 1970's, two major developments occurred in the reforestation field that allowed Ohio to progress with the adoption of a large scale reforestation program. First, a major pharmaceutical firm developed a procedure to produce an ectomycorrhizal fungi, Pisolithus tinctorius (P.t.), in large quantities. P.t. is a fungus that grows over a seedling feeder root surface on conifers and certain hardwoods. It allows the seedling increased water and nutrient absorption. Prior to this development, inoculating seedlings with P.t. had been limited to greenhouse studies and small experimental plots in nurseries. Secondly, a machine was developed by the U.S. Forest Service to simultaneously apply inoculum and sow seed in nursery seedbeds. With the knowledge that these two processes had been developed, Ohio's AML Program began preparation for large scale operational outplantings.

EARLY OBSERVATIONS AND OPERATIONAL OUTPLANTINGS

In the spring of 1981, the Office of Surface Mining Reclamation and Enforcement, the U.S. Forest Service and the States of Ohio and Indiana initiated research to evaluate the effectiveness of nursery procedures in the production of P.t. inoculated seedlings. In association with this, a demonstration project to evaluate the viability of planting P.t. seedlings on abandoned mine land was undertaken in Ohio.

Due to the evaluations and the success of the demonstrations, Ohio's first operational outplantings began in 1982. Between 1982 and 1987, 1,092,145 trees seedlings were planted on 809.8 acres of abandoned mine land.

At the outset of the early reforestation effort in Ohio, a variety of sites were selected to determine the site conditions most receptive to P.t. inoculated seedlings. The

Reforestation Program's intentions were to focus on areas unlikely to be funded for traditional reclamation. At the same time, there was growing interest in the potential use of P.t. seedlings on alternative resoiling materials or treated spoils. By selecting a wide range of sites, at least for test plots, Ohio determined guidelines for future planting areas.

Several significant conclusions were drawn a result of these early plantings. As research had suggested, P.t. inoculated seedlings responded exceptionally well on barren spoil material. However, sites that were poorly drained, alkaline (above pH 6.3), or contained phytotoxic refuse and/or sludge amendments inhibited or killed both the P.t. ectomycorrhizae and the host seedling. High fertility sites, especially those with high phosphorous levels, tended to mask P.t. benefits. Also, competing ground cover hindered the establishment of tree seedlings.

As a result of the early success, Ohio's Reforestation Program has continued unabated. Through 1999, 4.5 million seedlings have been planted on 3,465 acres at 391 abandoned mine land sites (See Table 1). This has been accomplished at a cost of approximately \$1 million in federal and state funds. About 70% of the seedlings planted have been inoculated with P.t.. These have been grown at an ODNR nursery. The P.t. seedlings planted include Virginia pine, white pine, pitch-loblolly pine, red pine, northern red oak, chinkapin oak, burr oak and black oak. In addition, to increase ecological diversity, non-P.t. inoculated species planted include black and bristly locust, black alder, green ash, white ash, sawtooth oak, tulip poplar, shumard oak, white oak and several shrub species.

Ohio has achieved an 80% survival rate since program inception through the use of P.t., proper site selection and appropriate species planted. As a result, ground closure is achieved in five to eight years.

In many aspects, the developmental and implementation stages of annual reforestation efforts are similar to traditional reclamation projects. Sites must be selected that meet program criteria, including site-specific traits that will enhance seedling survivability. Rights-of-entry must be obtained from landowners. Coordination with the ODNR nursery for stock diversity, quality and availability must be maintained. Planting bid documents must be distributed and contracts executed. Eventually, the planting work is inspected and the results monitored for research and program refinements (see Table 2).

BENEFITS OF REFORESTATION PROGRAM

Considering the extent of abandoned mine lands in Ohio, a cost effective and technically sound reclamation alternative to traditional efforts was developed. This reforestation program has resulted in the following benefits:

- ❖ Lower priority environmental and public health and safety related abandoned sites are restored utilizing a low maintenance and low cost reforestation alternative. This results in increased site stability, provides improved watershed protection and heightens air quality.

- ❖ The planting of a variety of trees and shrubs results in increased vegetative diversity and enhances wildlife habitat. The latter, in turn, increases recreational opportunities.
- ❖ The reforested sites serve as a laboratory for research and education programs.
- ❖ Forty percent of the seedlings planted are mast producing oaks and other species desired by the timber industry. If selectively harvested, in accordance with environmentally sound harvesting practices, an economic resource is created without impact to the restoration effort.
- ❖ Reforestation limits land disturbance associated with more traditional reclamation measures. Access roads do not need to be placed. Sediment controls are not constructed and establishing borrow sites is not required.

REFORESTATION SITES

As indicated previously and as noted in Table 1, Ohio has reforested 391 sites through 1999. Three sites that epitomize the program's effort and success follow.

The **Paxton** reforestation site is an eight acre tract of AML located in Perry County, Ohio, three miles north of the Village of New Lexington (see photographs).

Surface mining occurred at the site during the late 1940's and early 1950's when the #5 Lower Kittanning and #6 Middle Kittanning coal seams were mined. The site was partially graded leaving a small 1/4 acre impoundment in the area of the final mining cut. The spoil is black in color, consisting of sandstone and shale with some mixed coal particles. The pH of the spoil is 2.8. The site was devoid of vegetation except for small patches of poverty grass, one Black Oak, and several aspen trees.

The site was hand planted in March 1986 with P.t. inoculated Virginia and White Pines, and non-inoculated European Black Alder, Black Locust, Silky Dogwood, Gray Dogwood and Tartarian Honeysuckle. All seedlings were planted in a five foot by five foot spacing. The P.t. inoculated pines comprised 70 percent of the seedlings and were evenly distributed throughout the site. One Black Locust was planted for every eight pines and 1000 Black Alder were planted adjacent to the impoundment. The dogwoods and honeysuckle were planted in pockets to provide diversity and a wildlife food source.

The initial first year observations showed all species to be surviving well. However, by the spring of 1987, the dogwoods and honeysuckle showed signs of stress, while the pine, locust, and alder continued to thrive. By the spring of 1988, nearly all of the 1500 dogwoods and honeysuckle were dead. Conversely, nearly 100 percent of the P.t. inoculated pines were alive along with 75 percent of the alder and locust. A permanent circular study plot was established in January, 1988 to monitor the growth and survival of the pines. Data collected on this plot in March, 1992 showed that after six years the tree

survival was 98 percent, with an average basal diameter of 5.14 cm (2.02 inches), and an average height of 289.6 cm (9.5 feet).

The **Bailey Run** reforestation site is an example of where P.t. inoculated pines were successfully planted on untreated coal refuse having a pH of 3.0 (see photographs). The planting occurred on 17.5 acres of coal refuse located in Athens County in 1990. The planting consisted of the following species: 3,700 Black Locust, 2,000 Black Alder, 1,500 Red Oak, 17,000 Virginia Pine, 2,000 Pitch Pine, and 1,000 White Pine. Today the site has achieved total crown closure with the pine species having the best success.

The **Mt. Ephraim** reforestation site consisted of planting 70 acres of barren sandstone spoils having a pH of 3.2 (see photographs). The site is located in Noble County where the Meigs Creek #9 coal was strip mined in the 1950's and early 1960's. The planting occurred between 1991 and 1993 with an experimental planting of Paulownia trees in 1996. The following species were planted: 14,500 Black Alder, 10,500 Black Locust, 115,000 Virginia Pine, 8,000 Red Oak, 1,500 Sweet Gum, and 500 Paulownia. The site has now achieved nearly 100 percent crown closure.

SUMMARY

The Ohio AML Reforestation Program spans nearly two decades. During this period, Ohio's reforestation efforts have grown from limited field trials to annual outplantings that average 235 acres since 1985. The program has become an integral part of Ohio's AML reclamation effort and a model to states and tribes interested in emulating its success.

TABLE 1

ODNR -DMR TREE PLANTING

<u>YEAR</u>	<u>NUMBER OF SEEDLINGS</u>	<u>NUMBER OF SITES</u>	<u>ACRES PLANTED</u>
1982	59,000	8	33.5
1983	120,000	10	72.4
1984	125,095	9	69.5
1985	149,250	15	166.3
1986	327,400	14	245.0
1987	311,400	19	223.1
1988	305,750	12	195.5
1989	342,250	19	235.0
1990	295,600	21	181.5
1991	324,500	18	190.5
1992	268,700	22	164.0
1993	334,000	26	222.7
1994*	287,000	25	196.1
1995	291,500	22	205.7
1996	357,844	30	298.0
1997	327,000	52	290.0
1998	339,375	34	242
1999	315,225	33	225
2000*	550,000	22	550
TOTALS	5,430,887	413	4,015 AC

- LETS SEE TREES PROGRAM PLANTED AN ADDITIONAL 433,000 TREES ON ON 369 ACRES
- THE LAST TWO YEARS OVER 80,000 TREES HAVE BEEN PLANTED ON NON-COAL AML SITES OF ABANDONED OR POORLY RECLAIMED CLAY, LIMESTONE, SAND AND GRAVEL, SHALE , SANDROCK AND DOLOMITE AREAS

* PLANNED PLANTING FOR SPRING OF 2000

TABLE 2

REFORESTATION DATABASE INPUT FORM

Project Number ZO 38 86 Project Name. Synder

Location :
 County: Noble
 Township: Jefferson
 Section 24

U.S.G.S. Quad: Dazzell Mining Date: 1960's
 Site Conditions (Abandoned or Reclaimed): Abandoned
 Landowner (S) George Schneider Joe Schott
 Right of Entry Obtained Yes NO

Planting Date" 03/01/86 Acres Planted: 12.00
 Planting Method (Hand or Machine): Hand
 Spoil Type: Sand, Shale
 Aspect: NA
 Outsoles: 30% Bench: 70%

Soil Analysis: pH -3.8
 Phosphorous -3
 Potassium-120
 Calcium- 168

SEEDLINGS PLANTED

Non P.T Species

P.T. Species

2000 E. Black Alder
 0 Black Locust
 0 Washinton Hawthorne
 0 Wilky Dogwood
 0 Grey Dogwood
 0 Tatarian Honeysuckle
 1000 Black Chokeberry
 0 Sycamore
 0 Sweetgum
 0 Tuplip Poplar

6500 P.T. E. White Pine
 6500 P.T. Virginia Pine
 0 P.T. Pitch-Lob. Pine
 1000 P.T. Red Oak
 0 P.T. Black Oak
 0 P.T. Red Pine
 0 P.T. Chinkapin Oak
 0. P.T. Pine Oak

3000 Total Non PT Species

14000 Total P.T. Seedlings

Total Seddlings Planted : 17000