

REVEGETATION OF SURFACE-MINED LANDS IN PENNSYLVANIA¹

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BACKGROUND

The reforestation of surface mines in Pennsylvania became prevalent in the middle 1940's with enactment of state legislation to regulate surface mining of bituminous coal. Though this early legislation did not provide for intensive environment protection standards in comparison to state legislation which followed in the early 1960's and early 1970's and in contrast to today's standards, it did establish the beginning of large scale surface mine reclamation activities. The planting of trees became a significant part of the reclamation process. Tree planting continues to be a land reclamation practice for providing permanent, long-term vegetation for watershed protection, wildlife habitat and timber production.

The trend with regard to changes in land use as a result of surface mining are not readily discernable because of the unavailability of statistics for making such a determination. However, a statewide land use report for Pennsylvania showed that for the period from 1958 to 1974 there was a 9.7% increase in woodland acreage while pastureland and cropland acreage showed decreases of 26.6% and 15.7%, respectively. Though these figures do not directly reflect changes in land use patterns as a result of surface mining, the figures do indicate the general trend for land use changes in Pennsylvania. Over 17 million acres or more than 60% of the land surface in Pennsylvania is covered by forest growth. A large portion of the mineral resource in Pennsylvania is overlain by forests, so it is reasonable to assume that extraction of these minerals by surface mining would have a significant impact on the overall forested acreage

within the state. State land-use studies indicate that forestland management policies should assure a continuous and adequate supply of timber to meet projected demands. Pennsylvania is expected to experience about a 50% increase in demand for timber by the year 2000. Pennsylvania recognizes the importance of forestland for timber, for protection of other forest related resources including water and wildlife, and for the benefits derived from forestland for aesthetics and recreational purposes.

Most of the mine land reclamation in Pennsylvania is performed in conjunction with the active surface mining of coal under the legal requirements which regulate such mining. Pennsylvania has had an abandoned mine land reclamation program since 1968 following the enactment of the Land and Water Conservation and Reclamation Act. This Act provided funding for acid mine drainage abatement, extinguishing of underground mine fires and burning refuse banks and backfilling of open mine shafts. The acreage reclaimed in the state's abandoned mine land reclamation program is small in comparison to acreage reclaimed on active surface mining operations as required by the Pennsylvania Surface Mining Conservation and Reclamation Act and the Federal Surface Mining Control and Reclamation Act of 1977. The requirements with respect to revegetation of active surface mine operations is to revegetate with grasses, legumes, trees, shrubs or any combination of these which provides permanent vegetation capable of soil stabilization, control of erosion and sedimentation and supporting the postmining land use. The accepted revegetation practice for soil stabilization and erosion and sedimentation control is to establish a herbaceous vegetative cover. Consequently, all surface mine sites are initially established with herbaceous species and tree and/or shrub planting is accomplished in combination with herbaceous vegetation if required for soil stabilization, erosion and sediment control, permanent vegetative cover, or for development or improvement of land for commercial forestland, wildlife habitat, recreational land uses or any other land use requiring trees and shrubs in the plant community.

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The sources of tree seedlings for planting on surface mine sites has been primarily the state forest tree nurseries and private nurseries located within the state. The greater portion of the tree seedlings planted on mine sites are obtained from the state forest tree nurseries. During the past three years, the number of tree seedlings, from the state nurseries and planted on surface mine sites, has ranged between 2 and 2½ million seedlings per year. During this same three year period the demand for tree seedlings from the state forest nurseries has exceeded the supply. It has been difficult for the state nurseries to determine the demand for tree seedlings from year to year and to establish production levels accordingly. The standard application form for ordering seedlings from the state forest tree nurseries for planting on surface mine sites has been revised to provide more information by the landowner as to acreage anticipated to be planted in the future and the projected year of planting.

REVEGETATION PRACTICES

Tree planting practices with regard to species selection, establishment techniques and recommended timing of planting have changed somewhat over the years. It was once the recommended practice to plant tree seedlings during the Spring and Fall seasons. The U.S. Forest Service research conducted during the 1960's evaluated Fall and Spring planting of tree and shrub seedlings on surface mine spoil in the Bituminous region of Pennsylvania (Davis 1973). Results of that research study showed consistently higher survival rates of seedlings when planted during the Spring season. The advantages of Spring planting were greater on the sites with the more acid spoil. Current state regulations require seedlings to be planted during the Spring planting season and no later than May 15 except where cold storage nursery stock is utilized. The planting season may be extended to June 1.

Most reforestation on surface mine sites has been with planted seedlings. Nursery stock is generally 1-0, 2-0 or 3-0 bare-rooted seedlings with the exception of hybrid poplar which is planted as an unrooted cutting. Some efforts have been made to establish trees by direct seeding. However, with the exception of black locust (Robinia pseudoacacia), direct seeding has been unsuccessful. There is substantial interest among wood-using industries which own surface mined land to establish commercial hardwood species by direct seeding.

Since planting requirements and practices changed to require the initial planting of herbaceous vegetation following backfilling and grading, there were concerns that those sites which would also be planted with trees would be adversely affected by the competitiveness of the herbaceous vegetation. We initially shared these concerns. Currently, we do not see this as a significant problem if herbaceous species and rates of application are carefully selected and timely planting of the trees is accomplished. We recommend low-growing, non-aggressive herbaceous species and planting of the tree species at the same time or as soon as planting conditions and the planting season permits following seeding of the herbaceous species. Some of the planted herbaceous species we have observed which are extremely competitive with trees includes crownvetch (Cornonilla varia), sericea lespedeza (Lespedeza cuneata), flat pea (Lathyrus sylvestris), white sweet clover (Melilotus alba), and yellow sweet clover (Melilotus officinalis). Weeping lovegrass (Eragrostis curvula) when seeded in excess of 2 lbs./acre can become competitive with tree seedlings. Of the herbaceous legume species, birdsfoot trefoil (Lotus corniculatus), particularly the lower-growing empire variety, has been commonly planted in conjunction with tree seedlings.

The establishment of trees on surface mines by interplanting with black locust (Robinia pseudoacacia), European alder (Alnus glutinosa) and Autumn olive (Elaeagnus umbellata) appears to have some significant benefits. Such leguminous tree and shrub species planted as nurse trees has improved the growth rate of the other tree species interplanted with the nurse trees. A 7 year old planting of black locust (Robinia pseudoacacia) and hybrid poplar (Populus spp.) in alternate rows at a spacing of 8 feet within the row and 10 feet between rows has been documented with having hybrid poplar (Populus spp.) with dbh's as large as 9.5 inches and 60 feet in height. The planting was performed on acid mine spoil without the benefit of soil amendments.

The tree species commonly planted on surface mined land in Pennsylvania include red pine (Pinus resinosa), Eastern white pine (Pinus strobus), Japanese larch (Larix leptolepis), Austrian pine (Pinus nigra), Norway spruce (Picea abies), European alder (Alnus glutinosa), black locust (Robinia pseudoacacia), hybrid poplar (Populus spp.) and northern red oak (Quercus rubra).

In summary, Pennsylvania recognizes the importance of tree species for surface mine land reclamation and the potential these reforested lands have for timber and

enhancement of other forest related resources and Pennsylvania encourages revegetation of surface mined land to maximize resource productivity.

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