Powell River Project Series
*Information for the Virginia Coalfields*

# Mine Permitting to Establish Productive Forests as Post-Mining Land Uses

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Due to recent advances in reclamation science and regulatory policy, Virginia coal mining operations can establish high-value, highly productive hardwood forests on reclaimed mine sites during reclamation. The forest sites produced by this process will be of superior productivity, compared to native forests on steep mountain soils and forested areas produced by conventional reclamation procedures.

Mine reclamation practices capable of re-establishing productive forests are described in other Powell River Project publications (see VCE Publications 460-123, 460-136, and 460-138).

This publication suggests language that may be used by Virginia mine operators in mine permit applications, when it is their intention to produce native hardwood forests of superior productivity during reclamation. The procedures may be applied if the post-mining land use is designated in the permit as either managed or unmanaged forest. The procedures described are consistent with both Powell River Project reforestation recommendations and Virginia Division of Mined Land Reclamation (DMLR) regulations.

## Important Considerations

The language in this publication describes reclamation practices that have not been used commonly prior to this writing. It has been developed in consultation with Virginia DMLR and should be used in mine permits only if appropriate to site conditions, and only if it accurately describes intended reclamation procedures. Permit writers are encouraged to modify the following language as needed to represent site conditions and reclamation intentions clearly.

The language below was developed in reference to Virginia Department of Mines, Minerals and Energy, DMLR publications, "Application for Coal Surface Mining and Reclamation Operations General and Technical Information" (DMLR-PT-034e) and "Application Guide," (DMLR-PT-034eg), and Virginia DMLR "Memorandum to Operators" #3-96 (issued dated 7/9/96) and Guidance Memorandum No. 2-01 (issued 5/29/01).

This publication deals only with those sections of the mine permit that describe reclamation techniques necessary to produce a highly productive forest site with native hardwood vegetation. For further detail, readers may refer to VCE Publication 460-123.

## Permit Section IX – Soils and Revegetation

### 9.3 Soil Salvage and Redistribution Plan

In addition to providing other required information, the following language may be used where appropriate to site conditions:

> Where available at reasonable cost, soiling material, which includes both native soils and overburden suitable for trees, will be redistributed over the overburden at a thickness of 18 inches or more. Brown sandstone (weathered overburden) will be used for the soiling material and for the near-surface overburden.

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Where weathered brown sandstone overburden can be removed in association with surface soils at reasonable cost, such materials will be mixed with surface soils during excavation and transport and used as a soiling material. Surface grading will be minimized, creating a rough, uncompacted surface in areas where surface compaction is not necessary to achieve slope stability. The uncompacted soiling material and weathered overburden will create a post-mining soil which will equal or exceed the depth characteristics of the adjacent undisturbed soil.

Further soil tests will be taken, as necessary, during and after redistribution to determine specific soil amendment requirements. The results of the analyses will be used as an aid in recommending use of soil additives such as lime or fertilizer. If such soil test results fail to identify adverse soil conditions, amendments will be applied at the following elemental rates:

50-75 lbs./acre Nitrogen
80-100 lbs./acre Phosphorus
50- 75 lbs./acre Potassium

To achieve these N, P, and K rates, 200 lbs/acre concentrated super phosphate will be blended with 300 lbs/acre 19-19-19 fertilizer, or equivalent.

## 9.4 Revegetation Plan

The following text may be used in permits for either managed or unmanaged forest post-mining land use, but the correct land use should be designated.

Permit areas intended for (unmanaged or managed) forest post-mining land use are identified in Section 7.7 of this application. This land use will produce commercially valuable timber, and will provide a diversity of habitat for wildlife and groundcover to control erosion. The post-mining land use will be achieved by following the revegetation plan.

Disturbed areas will be seeded within 30 days after final grading during normal planting periods. Backfilled areas prepared for seeding during adverse climatic conditions will be seeded with an appropriate temporary cover until permanent cover can be established.

Optimum seeding dates are from February 15th to May 15th, and after a good rain in August until October 15th. The optimum planting period for weeping love grass, orchard grass, birdsfoot trefoil, ladino clover, and annual perennial ryegrass is from early March to mid-May. From early May to mid-September, foxtail millet will be substituted for annual ryegrass. The described seeding mixture will also be used to protect any stockpiled soiling material.

Permit areas intended for (unmanaged or managed) forest post-mining land use are identified in Section 7.7 of this application. At least five of the following timber species will be used within any given area, with the species used within each area and their placement determined by site characteristics: northern red oak, black oak, chestnut oak, white oak, post oak, scarlet oak, white ash, green ash, tulip poplar, sugar maple, pignut or mockernut hickory, white pine, black cherry, and sycamore. Species will be selected and mixed to accommodate soil and site characteristics and to achieve a silviculturally-sound timber stand and wildlife habitat. About 550 timber trees and 50 nurse trees/shrubs will be planted per acre at a spacing of about 8 feet by 10 feet to allow for future management and harvesting. Nurse trees/shrubs will be interplanted with the timber species. Nurse trees/shrubs will be comprised of bicolor lespedeza, bristly locust, black alder, and indigobush. For wildlife habitat, sawtooth oak, gray or silky dogwood, and crab apple will be planted at a combined rate of 50 trees per acre on average for the permit area. Wildlife trees and shrubs will be planted in small scattered areas (about 1/4 acre) and along drains in narrow strips to create wildlife corridors and sources of food and shelter. A total of about 650 trees and shrubs will be planted per acre.

Colonization of the mined site by native forest tree species compatible with the post-mining

land use will be encouraged through use of fresh soil, where available, in the soiling material and through use of the tree compatible ground cover mix listed below; it is intended that unplanted "volunteer" seedlings of suitable native species, which colonize the mine site via natural processes, will be encouraged by the revegetation plan, and those volunteers that attain adequate size prior to the bond release inspection will contribute to the reclaimed site's post-mining land use. Trees and nurse trees / shrubs will be planted during the first spring following seeding (See Table 1).

*Post-Mining Land Use Management – Unmanaged Forest:*
Beyond normal husbandry practices, no special management practices are necessary to achieve the proposed unmanaged forest land use.

*Post-Mining Land Use Management –Managed Forest:* If a managed forest post-mining land use designation is requested in the permit, a forest management plan must be submitted with the permit application. If the post-mining forest is to be managed by the landowner in association with other holdings, a management plan prepared by the landowner to describe such procedures may be submitted to meet this requirement. Advice and assistance with forest management plans can also be obtained from the authors of this publication.

*Table 1. Revegetation species and materials, with planting and application rates.*

| Type | Species | Rate/acre |
|---|---|---|
| Permanent Grass | Orchardgrass (steep slopes only) | 5 lbs. |
| | redtop | 5 lbs. |
| | perennial ryegrass | 2 lbs. |
| | weeping lovegrass | 2 lbs. |
| Legumes | Kobe lespedeza | 5 lbs. |
| | birdsfoot trefoil | 5 – 10 lbs. |
| | ladino and/or white clover | 3 lbs. total |
| Annuals | Annual Ryegrass (fall or late winter seeding only) | 20 lbs. |
| | Foxtail millet (summer seeding only) | 5 lbs. |
| Timber Trees | Red Oak, White Oak, Post Oak, Black Oak, Chestnut Oak, Scarlet Oak, Sugar Maple, White Pine, Green Ash, White Ash, Pignut or Mockernut Hickory, Tulip Poplar, Black Cherry, Sycamore* | Approximately 110** each of 5 species, or approximately equal numbers totaling 550 if more than 5 species are used within a given area. |
| Wildlife trees | Sawtooth Oak, Crab Apple, Silky Dogwood | 50 total** |
| Nurse trees / shrubs | Bicolor Lespedeza, Indigobush, Bristly Locust, Black Alder | 50 total** |
| Fiber, Mulch | Cellulose or Wood Fiber | 1,500 lbs. |

* Planted trees shall be selected from among these groupings. If any of these species are unavailable from conventional sources or priced at excessive levels at the time of planting, that species may be eliminated from the revegetation plan.

** These figures are cumulative averages for the entire permit area. Species composition of areas will vary throughout the site in response to factors such as soil properties, slope and aspect orientation. Thus, the specified planting rate for each tree type can vary from acre to acre as long as these averages are attained. The combination of timber trees, wildlife trees, and nurse trees/shrub planted stems shall total 650 per acre, but per-acre species distributions shall vary across the job site.

# XIII – Backfilling / Regrading

## 13.1 Backfilling and Grading:

In addition to other language used to describe specific practices, language similar to the following may be used:

> Backfilled spoils shall be handled and placed in a manner necessary to achieve a long-term static safety factor of 1.3 and to ensure against settlement-induced highwall exposure (permit should describe specific practices).
>
> Soiling materials shall be obtained as described in section 9.3 and applied over backfilled spoils. On areas where engineering calculations or on-site observations indicate that surface compaction of soiling materials is necessary to achieve slope stability or to assure that eventual settlement does not expose highwalls, such materials shall be graded and compacted as necessary to achieve stability. On areas being reclaimed to (managed or unmanaged) forest that do not require compaction, soiling materials shall be graded loosely, in most cases with a single pass of the dozer[1], so as to assure a soil medium capable of supporting a productive timber stand. Rocks or woody debris that may be present on such surfaces after such grading will be left in place, unless such debris will hinder forest management activities described in this permit or eventual forest harvest. On such areas, "tracking in" or "walking in" of slopes shall not be practiced.
>
> Where compaction of overburden materials is not required to achieve a long-term static safety factor of 1.3 and/or to ensure against settlement-induced highwall exposure and where soiling materials are to be applied at less than 4 feet of thickness, the overburden surface beneath the soiling medium shall be left in an uncompacted condition so as to achieve at least a 4 feet depth of loose rooting medium.

# Conclusions

This publication contains language describing reclamation practices that may be used in preparing mine permits for submission in Virginia. The language was developed in cooperation with Virginia DMLR with the expectation that permit writers will revise and modify as needed, based on reclamation intentions and site conditions. It is not intended to describe a "one size fits all" approach to reclamation.

Mine reforestation with hardwoods using procedures designed to achieve superior site productivity will be an appropriate reclamation procedure on some mining sites, including sites where such reclamation is requested by the landowner in the permit and site conditions are favorable; such procedures are described in VCE Publication 460-123. On other Virginia mining sites, conventional reclamation / reforestation procedures are likely to remain in use and, assuming all legal standards are met, are likely to be acceptable to Virginia DMLR.

# References


How to Restore Forests on Surface-Mined Land. J.A. Burger. Virginia Cooperative Extension Publication 460-123. www.ext.vt.edu/pubs/mines/460-123/460-123.html

Commercial forestry as a post-mining land use. J.L. Torbert, J.A. Burger, and J.E. Johnson. Virginia Cooperative Extension Publication 460-136. www.ext.vt.edu/pubs/mines/460-136/460-136.html

Maximizing the value of forests on reclaimed mined land. J.A. Burger, Dan Kelting, and C. Zipper. Virginia Cooperative Extension Publication 460-138. www.ext.vt.edu/pubs/ mines/460-138/460-138.html

Virginia Department of Mines, Minerals, and Energy, Division of Mined Land Reclamation. 1996. Guidelines for Husbandry and Reclamation Practices Appropriate to Forestry Post-Mining Land Uses. Memorandum to Operators 3-96 (Available from www.mme.state.va.us/Dmlr/default.htm and www.mcrcc.osmre.gov/tree/state_guidelines.htm). 7/9/96.

Virginia Department of Mines, Minerals, and Energy, Division of Mined Land Reclamation. 2001. Reforestation Reclamation Practices. Guidance Memorandum No. 2-01. 5/29/01.


1 On steep slope areas, cable dragging may be an appropriate and cost-effective grading procedure and preferable to single-pass dozing. See Virginia DMLR Guidance Memorandum 2-01, issued 5/29/01.



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