

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

LAND RECLAMATION, CURRENTLY MINED LAND

(Ac.)

CODE 544

DEFINITION

Reclamation of currently mined land to an acceptable form and planned use.

PURPOSE

- Prevent negative impacts to soil, water and air resources in and near mined areas
- Restore the quality of the soils to their pre-mining level
- Maintain or improve landscape visual and functional quality

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to currently mined land. It includes the identification, removal, stockpiling and replacement of soil materials, and revegetation. This practice also applies to nearby non-mined areas adversely affected by the mining activities.

CRITERIA

General Criteria Applicable to All Purposes

Plans must comply with all applicable Federal, State and local laws and regulations relating to mining and mined land reclamation. Applicable laws and regulations include, but are not limited to, the following.

Texas Regulations

Coal:

- Coal Mining Regulations (16 Texas Admin. Code § 12.1 et seq.) as provided by the Office of the Secretary of State.
- Texas Surface Coal Mining and Reclamation Act (Tex. Nat. Res. Code Ann. § 134.001 et seq.) as provided by the Texas Legislative Council.

Uranium:

- Substantive Rules- Uranium Mining (16 Texas Admin. Code § 11.71 et seq.) as provided by the Office of the Secretary of State.
- Texas Uranium Surface Mining and Reclamation Act (Tex. Nat. Res. Code Ann. § 131 et seq.) as provided by the Texas Legislative Council.

Iron Ore:

- Iron Ore/Iron Ore Gravel (Tex. Nat. Res. Code Ann. § 134.012 et seq.) as provided by the Texas Legislative Council. Coal Mining Regulations, Title 16, Texas Administrative Code, Chapter 12; Railroad Commission of Texas.

Federal Regulations

- Surface Mining Control and Reclamation Act of 1977 (SMCRA), 30 U.S.C. 1201 et seq.
- Federal regulations related to the reclamation of prime farmland, including, 30 CFR 785.17, 816.22, and Part 823.
- Federal Register Vol. 64, No. 124, Tuesday, June 29, 1999/Notices, pages 34770-34778.
- 30CFR780.15 - Air pollution control plan
- 30CFR701.5 - Definitions: Fugitive dust

Develop a reclamation plan that is consistent with the site capability, the planned land use and the landowner's conservation objectives. Include the practices necessary to reclaim and stabilize the mined areas to prevent further degradation of soil, water, air, plant and animal resources.

Dust control. Control the generation of particulate matter and fugitive dust during removal and replacement of soil and other materials. Detail the practices and activities necessary for dust control in the plans and specifications.

Site preparation. Properly identify areas for preservation including those containing trees, vegetation, historic structures, stream corridors, natural springs or other important features.

Remove trees, logs, brush, rubbish and other debris from disturbed areas that will interfere with reconstruction and reclamation operations. Dispose of these undesirable materials so they will not create a resource problem or interfere with reclamation activities and the planned land use.

Land Shaping and Erosion and Sediment Control. Shape the land surface to provide adequate surface drainage and to blend into the surrounding topography. Use erosion control practices to reduce slope lengths where sheet and rill erosion will exceed acceptable levels.

Use sediment trapping practices such as filter strips, riparian forest buffers, contour buffer strips, sediment basins or similar practices to trap sediment before it leaves the project site. Establish drainage ways with sufficient capacity and stability to carry concentrated runoff from the reclaimed area into receiving streams without causing erosion.

Establishment of vegetation. Do site preparation, planting, and seeding at a time and in a manner to ensure survival and growth of the selected species. In the plans and specifications, identify the criteria for successful establishment of vegetation such as minimum percent ground/canopy cover, percent survival or stand density.

Apply soil amendments and/or plant nutrients as appropriate, according to the requirements of Conservation Practice Standard 590, Nutrient Management. If the recommended fertilizer rate exceeds the criteria in Conservation Practice Standard (590) Nutrient Management, use appropriate mitigating practices to reduce the risk of nutrient losses from the site.

Select plant materials suitable for the specified end land use according to local climate, site conditions, and local NRCS criteria. Identify, in the plans and specifications, the species, rates of seeding or planting, minimum quality of planting stock, such as PLS or stem caliper, and method of establishment. Use only viable, high quality seed or planting stock.

Use local NRCS criteria for seedbed preparation, seeding rates, planting dates, depths and methods.

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Additional Criteria to Restore the Quality of Soils to Their Pre-mining Level

Removal of soil material for reconstruction. Complete a detailed soil survey of the proposed mine area if suitable soils information is not available. Use the soil survey information to determine the extent and location of prime farmland soils.

Remove all upper soil horizons from the project area that are suitable for reconstruction before blasting, mining or any surface disturbance other than removal of woody plants and debris.

If the area is prime farmland, follow a reclamation plan prepared according to 30 CFR Part 823, and all appropriate Railroad Commission of Texas (RCT) rules.

For soils that are not prime farmland, develop a reclamation plan prepared according to 30 CFR Parts 780 and 816 and all appropriate (RCT) rules.

Separate soils identified with high electrical conductivity, calcium carbonate, sodium or other restrictive properties, and treat if practicable.

Removal of overburden material for use as topsoil – Prime Farmland (as defined by RCT).

The A horizon or other suitable soil material (having a greater productive capacity than that which originally existed prior to mining) which will create the final soil shall be removed and stockpiled separately. Analyze overburden materials for pH, sulfide content, organic matter, nitrogen, phosphorus, potassium, sodium absorption ratio, electrical conductivity, texture and available water holding capacity. The B horizon and/or part of the C horizon or other underlying layers suitable for root development shall be removed and segregated for use as subsoil. The amount of soil removed and stored will be sufficient to meet the requirements stated in the replacement of soil material-prime farmland section of this standard.

Storage of soil materials - Prime Farmland. If not utilized immediately, A horizon or other suitable material will be stockpiled separately from the spoil and all other excavated material. If not utilized immediately, B and/or C-horizon or other suitable material will be stockpiled separately from the spoil and all other excavated materials. Where combination of such soil materials has been shown to be equally or more favorable for plant growth than the B-horizon, separate handling is not necessary. Stockpiles will be placed where they will not be disturbed or subject to excessive erosion. If stockpiles are left in place for more than 30 days, a temporary cover of non-noxious quick-growing annual herbaceous vegetation will be established on the stockpile. Unless approved by the RCT, the stockpiles will not be moved until they are to be placed in their final location.

Replacement of soil material – Prime Farmland. The physical and chemical characteristics of the reconstructed soils and soil descriptions containing soil horizon depths, soil densities, soil pH, and other specifications will be such that reconstructed soils will have the capability of achieving levels of yield equal to, or higher than, those of non-mined prime farmland in the surrounding area. The minimum depth of the soil and the soil material to be reconstructed shall be 48 inches (122 cm) or equal to the depth of the subsurface horizon in the natural soil, whichever is less. If root-inhibiting layers, such as bedrock or fragipan, underlie the natural soil, the reconstructed depth shall be no less than the rooting depth of the original soil.

The soil material will only be replaced on land that has been first returned to final grade and scarified according to the RCT rules, unless site specific evidence is provided and approved by the RCT showing that scarification will not enhance the capability of the reconstructed soil to achieve equivalent or higher levels of soil productivity.

The soil horizons or other rooting zone soil material will be replaced and re-graded in a manner that:

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- Insures that the position and thickness of each horizon is equivalent to those in the undisturbed soil.
- Prevents excess compaction. The bulk density and soil strength of the reconstructed soil when moist must permit the soil to support plant growth at a level equivalent to that of a similar layer in undisturbed soil.

The B-horizon, C-horizon, or other suitable soil material will be replaced to meet the minimum depth requirements stated previously in this section. The A-horizon or other suitable soil materials shall be replaced as the final surface layer. This surface material shall equal or exceed the thickness of the original surface layer, as determined by the detailed pre-mined soil survey. This material will be placed in a manner that protects the surface layer from wind and water erosion before it is seeded or planted. Recommended nutrients or soil amendments to achieve quick cover will be applied at this time according to Nutrient Management Standard (590).

When placing cover materials, treat graded areas to eliminate slippage surfaces and promote root penetration before spreading topsoil.

Restoration of Soil Productivity-Prime Farmland.

- Prime farmland soil productivity shall be initiated within 10 years of the completion of soil replacement.
- Soil productivity will be measured on a representative sample or on all of the mined and reclaimed prime farmland area using a reference crop. A statistically valid sampling technique at a 90% or greater statistical confidence level shall be used as approved by the RCT in consultation with the NRCS.

The measurement period for determining average annual crop production will be a minimum of 3 years prior to the release of the operator performance bond. The level of management during the measurement period will be the same as that used on non-mined prime farmland in the surrounding area.

Restoration will be considered achieved when the average yield during the measurement period equals or exceeds the average yield of the reference crop established for the same period on non-mined soils of the same or similar texture or slope phase of the soil series in the surrounding area under equivalent management practices.

The reference crop on which restoration of soil productivity is proven shall be selected from the crops most commonly produced on the surrounding prime farmland. Where row crops are the dominant crops grown on prime farmland in the area, the row crop requiring the greatest rooting depth shall be chosen as one of the reference crops.

Reference crop yields for a given crop season are to be determined from:

- The current yield records of representative local farms in the surrounding area, with concurrence by the NRCS; or
- The average county yields recognized by the USDA, which have been adjusted by the NRCS for local yield variation within the county that is associated with differences between non-mined prime farmland and all other soils that produce the reference crop.

The average reference crop yield may be adjusted, with concurrence of the NRCS for;

- Disease, pest, and weather induced seasonal variations; or

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- Differences in specific management practices where the overall management practices of the crops being compared are equivalent.

Removal of overburden material for use as topsoil – Non-Prime Farmland (as defined by RCT).

The A horizon shall be removed for use as surface soil on disturbed areas. If the A-horizon is less than 6 inches (45 cm) thick, material (other than bedrock) immediately below the A- horizon shall be removed and used to obtain this thickness. If the total thickness of the available material is less than 6 inches (15 cm), all unconsolidated material shall be used.

Soils identified with high electrical conductivity (EC), calcium carbonate, sodium or other restrictive properties shall be separated and treated if practical.

Selected overburden material can be substituted for or added to the material in the A and B-horizons. Before this is done, field observations and/or chemical and physical laboratory analyses must be done which demonstrate that the overburden material, or a mixture of overburden and original topsoil, is better suited to restoring the capability and productivity than the original A and B-horizon material. Analyses shall include determination of pH value; sulfide content; percentage of organic material; nitrogen, phosphorus, and potassium contents; sodium absorption ratio (SAR); electrical conductivity (EC); texture; and available water capacity. Field-site trials or greenhouse tests shall be conducted if needed to ascertain the feasibility of using overburden material.

If the overburden material is determined to be suitable, it must be removed, segregated and replaced according to the requirements specified in this standard.

Storage of soil materials – non-Prime Farmland. If it is impractical to spread the material immediately after the land is regraded, it must be stockpiled. Stockpiles shall be selectively located and protected against wind and water erosion, unnecessary compaction, and contamination by undesirable materials. If stockpiles are left in place for more than 30 days, a temporary cover of non-noxious quick-growing annual herbaceous vegetation will be established on the stockpile.

Replacement of soil material – non-Prime Farmland. Before spreading topsoil, the regraded areas must be scarified or otherwise treated to eliminate slippage surfaces and to promote root penetration.

Topsoil shall be spread in a manner that:

1. Insures that the position and thickness of each horizon is equivalent to those in the undisturbed soil.
2. Prevents excess compaction. The bulk density and soil strength of the reconstructed soil when moist must permit the soil to support plant growth at a level equivalent to that of a similar layer in undisturbed soil.

Nutrients and soil amendments. After the topsoil has been spread on the disturbed areas, nutrients and soil amendments shall be applied according to Texas NRCS standard 590- Nutrient Management.

Additional Criteria to Reduce Erosion and Sedimentation

For all post-mining land uses, develop a resource management system that reduces water and/or wind erosion to acceptable levels.

Revegetation Requirements. Perennial vegetation will be established on regraded and on all other disturbed areas except water areas and surface areas of roads that are approved as part of the post mining land use and in accordance with the RCT permit and reclamation plan.

The vegetation will be:

- Diverse, effective, and permanent;
- Comprised of species native to the area or introduced species where desirable and necessary to achieve the approved postmining land use and approved by the RCT;
- At least equal in extent of cover to the natural vegetation of the area;
- Capable of stabilizing the soil from erosion.

The reestablished plant species shall:

- Be compatible with the approved post-mining land use;
- Have the same seasonal characteristics of growth as the original vegetation;
- Be capable of self generation and plant succession;
- Be compatible with the plant and animal species of the area; and

See [Appendix 1](#) of this standard for herbaceous seeding rates and dates that may be used with this standard. Other practices such as wildlife upland habitat management, wildlife wetland habitat management, tree planting, or other appropriate standards should be consulted if woody species are to be established as part of the approved reclamation plan.

Permanent seeding/planting will be established during the first normal planting period following the final shaping and grading of the site. If shaping and grading is completed outside the normal range of permanent species planting dates and there is a significant erosion hazard, a temporary cover of annual grasses or legumes will be established until a permanent cover is established. When temporary cover or dead litter crops are needed prior to seeding permanent cover, refer to [Appendix 2](#).

The resource management system shall consider buffer practices, such as filter strips, riparian forest buffers, contour buffer strips or similar practices that will reduce sediment delivery off the reclamation site.

As a minimum the reestablished vegetation will meet the intended post mining land use and the following conditions:

- For areas developed as grazing land, pastureland, or underdeveloped land use, the ground cover and production of living plants on the re-vegetated area will be at least equal to that of a reference area or other standards approved by the RCT;
- For areas developed as cropland, crop production on the re-vegetated area will be at least equal to that of reference area or other standards approved by RCT;
- For areas to be developed for fish and wildlife habitat, recreation, shelterbelts, or forest products, success of vegetation will be determined on a basis of tree and shrub stocking and vegetative ground cover.

- Minimum stocking and planting arrangements will be specified by the RCT on the basis of local and regional conditions in consultation with state agencies responsible for wildlife and forestry.
- Trees and shrubs that will be used in determining the success of stocking and the adequacy of the plant arrangement shall have utility in the post mining land use. Trees and shrubs counted in determining such success will be healthy and have been in place for not less than 2 growing seasons; and
- Vegetative ground cover will not be less that required to achieve the intended post-mining use.
- For areas developed for industrial / commercial or residential land use less than 2 years after re-grading is completed, the vegetative ground cover will not be less than that required to control erosion; and
- For areas previously disturbed by mining that were not reclaimed to the requirements of this standard, and are that re-mined or re-disturbed by surface coal mining, the vegetative ground cover will not be less than the ground cover existing before re-disturbance and shall be adequate to control erosion.

Additional Criteria to Maintain or Improve Landscape Visual and Functional Quality

Reclaim the site to maintain or improve visual quality based on the scenic quality of the reclaimed site as well as the function of the site for the end land use. Plan the reclamation to be compatible with the topography and land cover of the adjacent landscape. Focus on areas of high public visibility, and those offering direct or indirect human and wildlife benefits.

Grade and shape spoil piles and borrow areas to blend with the adjacent landscape topography to the extent practicable.

Develop a planting plan that mimics the species, arrangement, spacing and density of plants growing on adjacent landscapes. Choose native species of erosion control vegetation and other plant materials where practical. Arrange plantings to screen views, delineate open space, act as windbreaks, serve as parkland, wildlife habitat or protect stream corridors.

CONSIDERATIONS

Prior to mining, develop a conservation plan that can be used by the landowner as a guide for the development of a reclamation plan with the mining company.

Improper locations for the storage of soil material, access roads and permanent impoundments can cause serious erosion and sedimentation problems. Locate these activities where runoff and sedimentation can be more easily controlled before it enters streams or leaves the site.

Soil permeability is often a problem on reclaimed soils. Improve soil permeability after placing backfill material by using tillage or deep ripping to decrease compaction and promote infiltration and root development when. Do not plan practices that promote infiltration if seepage through cover materials has the potential to increase acid mine drainage.

Overburden materials are often toxic to plants. To determine the best materials to plant, conduct field-site or greenhouse grow-outs to determine the feasibility of using overburden materials.

The reclamation of mined lands provides an opportunity to increase carbon sequestration. Choose species such as deep rooted perennial grasses and trees to increase the carbon sequestration potential of the reclaimed site.

Maintenance activities will need to be done on a regular basis after the initial reclamation to ensure success. Include stabilized access roads to allow access to the site without causing erosion problems

Reclaimed mine areas can provide important wildlife habitat. Improve the potential for wildlife habitat by establishing diverse vegetation types, including water in the reclaimed landscape, increasing edge effect and diverse land forms.. Avoid monocultures of vegetation if possible.

Reclaimed soils are often low in organic matter. The use of organic soil amendments such as manure, compost, mulch or sewage sludge can contribute to the success of vegetative establishment by increasing soil organic matter.

Every effort should be made to utilize native, non-invasive vegetative species. Consideration should be given to washing all equipment utilized in the project activities before leaving the site.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for each treatment unit according to the Criteria, Considerations and Operation and Maintenance sections of this standard.

As a minimum include the following information in the plans and specification for the reclamation area:

- Location of the reclamation area
- Plans showing the final grading to take place on the reclamation area
- The location of topsoil stockpiles
- The location of erosion and sediment control practices
- Detail information for the installation of erosion and sediment control practices
- Detail information on the soil amendments to be applied to the site
- Detail information on the species and arrangement of plant materials to be planted on the site

OPERATION AND MAINTENANCE

Prepare an Operation and Maintenance plan that provides specific details concerning conservation practices identified in the reclamation plan. As a minimum include the following items in the operation and maintenance plan.

- Periodic checking of the site for areas where settlement may adversely affect drainage and land use.
- Periodic checking of the site for bare spots, eroded areas, areas of excessive settlement and other areas where initial attempts to establish vegetation were not successful.
- Periodic soil testing and checking of vegetation to determine if additional soil amendments are needed.
- Maintenance of access roads.
- Maintenance of drainage structures and channels.
- Periodic checking of the site for noxious weeds and invasive species.
- Control of vehicular traffic to minimize disturbance to reclaimed areas.

REFERENCES

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