THE THREE R'S OF SURFACE MINING IN THE 1990'S[1]

by
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Abstract. Reclamation is defined as "the process of procuring a usable substance from a waste product." Western Energy Company's business is coal, and spoil banks are a waste product left from surface mining. Reclamation has been accomplished and is proof that the mined land will be useful for future generations. State and federal rules and regulations were established to assure citizens that the mining industry would have a proper reclamation program. After 20 years of mining and reclamation, following state and federal rules and regulations, the goals of reclamation are being achieved. Land for grazing, agriculture and wildlife has been "reclaimed" for future land users. When grazing and agriculture concerns are considered, most would agree that our state and federal rules and regulations are being interpreted correctly. In most cases with grazing lands, the land has been reclaimed to a higher and better use. Slopes are reduced and topsoil is more evenly distributed. Sparse vegetation cover, bare ground and erosion are at a minimum. Present regulations are difficult to apply to "restoration of some wildlife habitat." Restoration is defined as "to bring back to a previous normal condition." There are cases when an area should be restored to its previous condition. In some instances, it may not be an economically or environmentally sound decision to restore land to its previous condition. Most times its best, when possible, to reclaim to a higher and better use. In fact, many of the existing rules and regulations conflict with restoration. Regulations regarding slopes, soil depth and vegetation cover are very restrictive when considering restoration projects. Sound, wise decisions must be made in order to benefit future citizens and their land use needs.

Introduction

By 1970, a potential energy shortage became a national issue. Coal was one of the answers to the energy problem. As "Big Coal" began to tie-up leases in western states, citizens became concerned about environmental degradation. Surface mining had historically left ugly scars on the land throughout eastern and midwestern states. At Colstrip, Montana, surface mining for coal from 1923 to 1958 left 1,000 acres of land in rows of barren spoil banks. Montana developed initial reclamation regulations in 1973 to stop the ruination of land through surface mining. The Department of State Lands (DSL) Coal Bureau was assigned the responsibility for regulatory authority. When the federal Office of Surface Mining (OSM) was developed in 1979 (Federal Register, 1979), DSL changed their regulations to conform with OSM (MT 1980).

During this same time, researchers were busy developing equipment and methods to reclaim surface mined land in an economical and environmentally compatible manner, (DePuit 1978). After a decade or more of research, good standard reclamation methods had been achieved (Munshower, 1984).

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Reclamation plans varied from mine to mine dependent on mining methods, location, and corporate commitment to the environment.

At Western Energy Company's (WECO) Rosebud Mine, located in Southeastern Montana, near the town of Colstrip, the major focus of reclamation was rangeland (i.e. grazing land for livestock). Rangeland encompasses a myriad of plant communities which include grasslands, shrub-grassland and pine-savanah grasslands. Interspersed among the rangeland types were small parcels of cropland.

Although one of the main objectives of rangeland reclamation was grazing for livestock, wildlife habitat was also an important consideration. Reclamation plans were developed to reclaim grassland, shrub-grassland, pine-grassland and croplands. They provide good wildlife habitat, especially when interspersed among the undisturbed environment.

In 1983, DSL approved a WECO mine permit with a stipulation to develop a plan to establish elevated and exposed, highly weathered clay (gumbo) knobs.

This type of reclamation plan may not be regarded as a "higher and better use" by some factions. Differences of opinions developed as plans were prepared as to whether a plan of this fashion was reclamation or restoration. Several reclamation rules may actually prohibit the type of work required to accomplish restoration projects. Examples are listed below:

- 26.4.501(3)(a) Backfilled material must be placed to minimize erosion and sedimentation both on and offsite.
- 26.4.501(4)(a) The permitee shall backfill to ensure stability and grade all spoil material to eliminate all spoil piles.
- 26.702(6) Soil must be redisturbed in uniform thickness.
- 26.4.721(1) When rills deeper than 9" form, the rills must be filled, graded or stabilized and reseeded.

The permit stipulation left WECO in a difficult situation. Strictly adhering to the present rules to meet the obligation would require a different interpretation of the rules mentioned above.

If the result of the project was to imitate as closely as possible, the natural features desired, rules regarding regrading, topsoiling, revegetation cover and production would require new interpretations.

History

Colstrip was founded in 1923 when coal was mined for use in Northern Pacific railroad locomotives. Mining lasted until 1955 and during this period, 1,000 acres of land was left in rows of spoil banks. WECO reopened the mine in 1968 prior to the development of reclamation rules. Slopes were left at 3:1 and soil salvage was minimal. Much time and effort was placed on surface manipulation and seed mixes consisted entirely of introduced cool season grasses. WECO began a reclamation research program that it still enjoys today. Research

contracts at Montana State University in Bozeman provided information on soils, native seeding trials, fertilization, and grazing practices to name a few. Research with the University of Montana in Missoula provided much needed information on the establishment of ponderosa pine (Pinus ponderosa). These research efforts led to the reclamation program employed today.

WECO's research program and practical experience led to a consistent reclamation program which has been used since 1984. In general, the program appears successful as partial bond release has been received for regrading, topsoiling and revegetation on approximately 3,000 acres.

Present Reclamation Procedures

WECO stockpiles soil only when regraded areas are not available for direct placement. Soil is salvaged by scrapers and pushcats in a two-lift operation. Topsoil is salvaged to a depth of 6-12" and subsoil is salvaged to a depth of 1-2'. When stockpiled, the soil is piled separately and seeded to prevent loss of soil through erosional processes.

Dozers regrade the spoil ridges by pushing the material into the empty pit. Regrading is done to the approximate original contour (AOC). Prior to placement of soil, the regraded surface is ripped to a depth of 12" to provide a good interface between soil and spoil. Once a regraded area is available, stockpiling ceases and the "direct haul" soil program is enacted (i.e. all soil is salvaged and hauled directly across or around the pit to the regraded area and laid down). This method allows for all the viable native seeds to germinate and helps to diversity the plant community. Mycorrhizae and other organisms are retained, making the soil a much more suitable planting medium. It also reduces soil salvage costs, since the soil is only handled once.

After placement of the soil, the fields are ripped with a farm subsoiler to loosen soil compaction, disced and cultipacked to produce a firm seedbed in which to seed the native seed mixes.

WECO uses four different seedmixes, the uplands seed mix and supplemental seed mix, are used in the majority (90%) of WECO's reclamation. A conifer seed mix is drill seeded wherever ponderosa pine and/or skunkbush sumac are desired and a lowland seed mix is drill seeded in major drainages.

The uplands mix is drill seeded as a rate of 7 1/2 pounds per acre and immediately following, the supplemental seed mix, is broadcast seeded at a rate of 15 pounds per acre. After the grass/forb mixes have been seeded, areas designated as shrub and pine areas, silver (Artemisia cana) and big sagebrush (Artemisia tridentata), skunkbush sumac (Rhus trilobata), ponderosa pine and Rocky Mountain juniper (Juniperus scopulorum) seedlings are planted using a three point tractor-mounted tree planter. Rates vary from 100 - 500 per acre.

In addition to the native seedings, some former cropland areas are seeded back to dryland winter wheat, or spring wheat (Triticum aestivum), and alfalfa, (Medicago sativa). Seeding and harvesting is done by local farmers.

After seeding, the reclamation is monitored and managed during the responsibility period which lasts a minimum of ten years prior to Phase III final bond release. No fertilizer or irrigation is used. Management consists of mowing, burning, spraying and grazing. Most first-year growth is mowed to eliminate the residual skeletal plants such as Russian thistle (Salsola kali). Mowing also occurs in later years where grazing is not possible because of field size or lack of stock water. Mowing places litter on the ground where it can readily decompose. Burning is used on small sites where grazing is not yet practical due to field size or location. Chemical spraying is used only to control noxious weed infestations. Noxious plants only occur near roadsides and railroad lines.

Grazing is the primary management tool employed. At present, WECO grazes 500 cattle each year. Livestock from four adjacent ranches are used. WECO has 3900 acres of reclamation of which 3,000 are fenced for grazing. Using a prescribed grazing system, the cattle herds are rotated through the pastures to obtain WECO's goal of establishing an esthetic, diverse, healthy, permanent rangeland condition.

Methods used since 1984 have given WECO a consistent reclamation program that in our opinion has been to a higher and better use. The goals of the reclamation rules written by DSL and OSM are being achieved. The reclaimed land is stable, revegetated and has a good land use (i.e. livestock grazing). Revegetation efforts appear to be successful, at least in terms of stability, native species establishment and ground cover. Reclamation is not the mystery as it once was, and the reclamation methods described here appear to be a straight forward approach to successful reclamation. Webster's definition of reclamation is defined as "the process of procuring a usable substance from a waste product." WECO's primary business is mining coal and spoil banks are a waste product. Reclamation is being accomplished and the land will be useful for generations to come.

Recommended Restoration Procedures

Some environmental groups contend that reclamation as done today will not address all wildlife issues. Some wildlife habitat is lost through mining (Figure 1). In southeastern Montana, draglines have a "smoothing" effect on the erosionally-formed landscape. Reclaimed surfaces are smooth and gently rolling. The rough, steep breaks and badlands are replaced by a gently rolling terrain.

WECO's permit stipulation, "to develop a reclamation plan to establish, reclaim, or more correctly "restore" elevated and exposed highly weathered clay (gumbo) knobs, habitat deemed essential to wildlife, required new methods.

In WECO's early attempts to comply with the permit stipulation, the fatal flaws were always excessive costs and contradictions with some reclamation rules. Current reclamation rules do not always apply to restoration projects, (26.4.501, 702, 721). Restoration is defined by Webster as "to bring back to a previous normal condition." There are cases when an area should be restored to its previous condition. At other times, it may be wise to reclaim to a higher and better use.

Figure 1. Undisturbed Natural Thin-Breaks Habitat

Figure 2. Proposed Thin-Breaks Restoration Site

In order to comply with the permit stipulation, WECO developed a draft plan (Figure 2). Prior to developing a final plan, much debate occurred between WECO and the regulatory authorities. Decisions had to be made on whether this type of habitat was indeed critical to wildlife. Opinions differ greatly between various special interest groups. WECO did not believe this type of habitat warranted the expense required to reconstruct or to rebuild the necessary topography needed by using scrapers and dozers. Dragline placement of spoil seemed to be the most sensible method to obtain the natural topography that was desired.

Natural features such as gumbo knobs have parameters similar to a spoil ridge. Old spoil banks left from early mining have many of the same characteristics. Both have steep slopes (greater than 20%), sparse vegetation (70% bare ground) and barren ridges with weathered shale. WECO's latest draft plan appears acceptable to the state regulatory authorities, but several rules had to be interpreted in a new light to allow for the desired topography. For example, most natural slopes on these exposed elevated sites are steeper than 20% and the restored area should be allowed to simulate the natural features desired Also, rills greater than 9" occur at the natural sites and at the restored site, spoil material will probably wash onto topsoiled areas. Topsoiling will only be done up to the base of the ridges. The natural sites were void of soil having only weathered shale. All of these situations contradict previously established reclamation practices. However, these methods appear to be a realistic way to "restore" the features that most closely resemble the natural habitat requested by the permit stipulation.

Revegetation will be done by hydro-seeding, hand seeding and/or aerial seeding. A new seed mix will be designed to replace vegetation similar to the natural sites. The objective of the revegetation plan, if the goal is to duplicate the natural features of this type, is to at least establish a sparse stand of trees and shrubs with only a limited stand of grasses and forbs. Trees and shrubs will be hand planted except at the base of the slopes where a tree planter will be used.

In order to approve the plan, which seems to contradict rules 26.4.501, 26.4.702 and 26.4.721, both DSL and OSM have recommended a different permitting approach. For OSM approval, the restoration must be done on an experimental basis. For DSL approval, the restoration must be submitted as an alternate reclamation plan.

In summary, this type of "restoration" should adequately address the permit stipulation without increasing reclamation costs. The resulting features will be highly similar to natural sites and wildlife, the ultimate beneficiary, should readily use the habitat. Whether it is critical to any species remains to be seen.

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