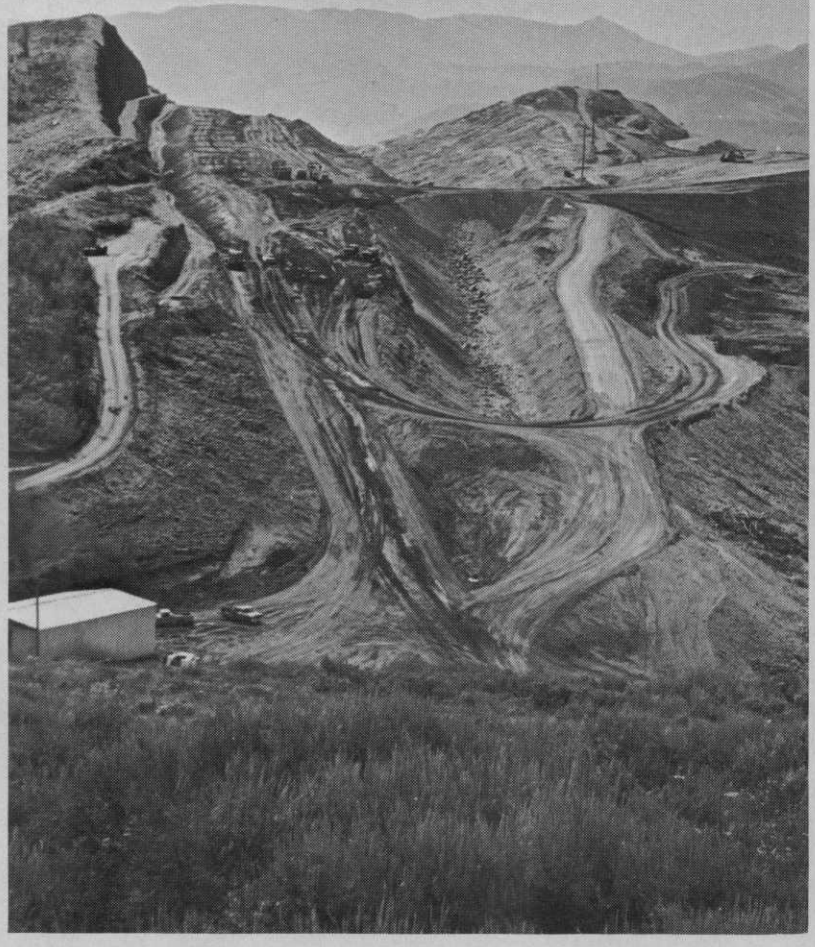
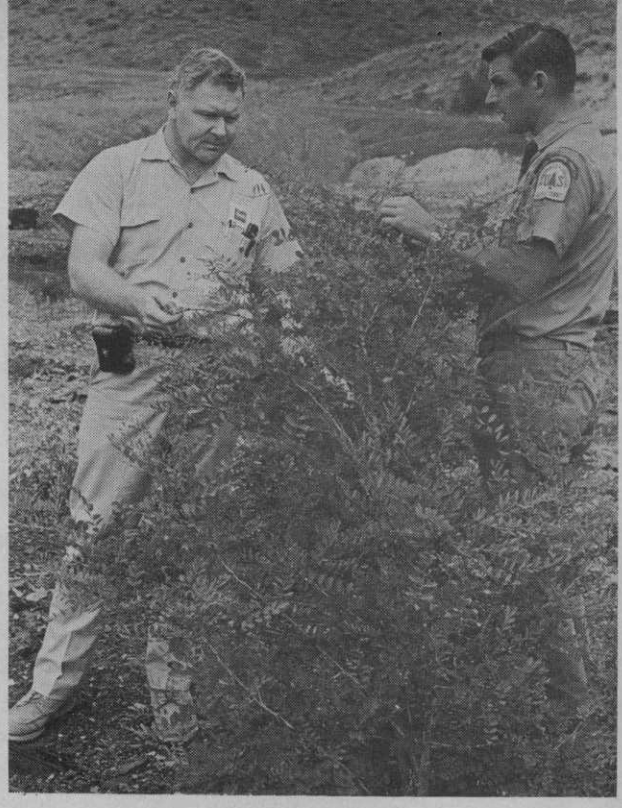
What Plants Are Best

TO HEAL WOUNDS OF STRIP-MINING





By RALPH BRANSON
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DONALD A. SCHULTZ, Supervisor of the Caribou National Forest, in southeastern Idaho, reports that the USDA project of growing trees, shrubs and grasses on phosphate cleared land has met with some success despite the short time the project has been under way.

Objectives are to protect the quality of the water coming out of the water sheds, to provide stabilization of soil on surface mined areas, to return the mined areas to production and make them aesthetically acceptable.

Phosphate companies supporting the project financially are: The Monsanto Company, J. R. Simplot Company, El Paso Products Service Company, and FMC Corporation.

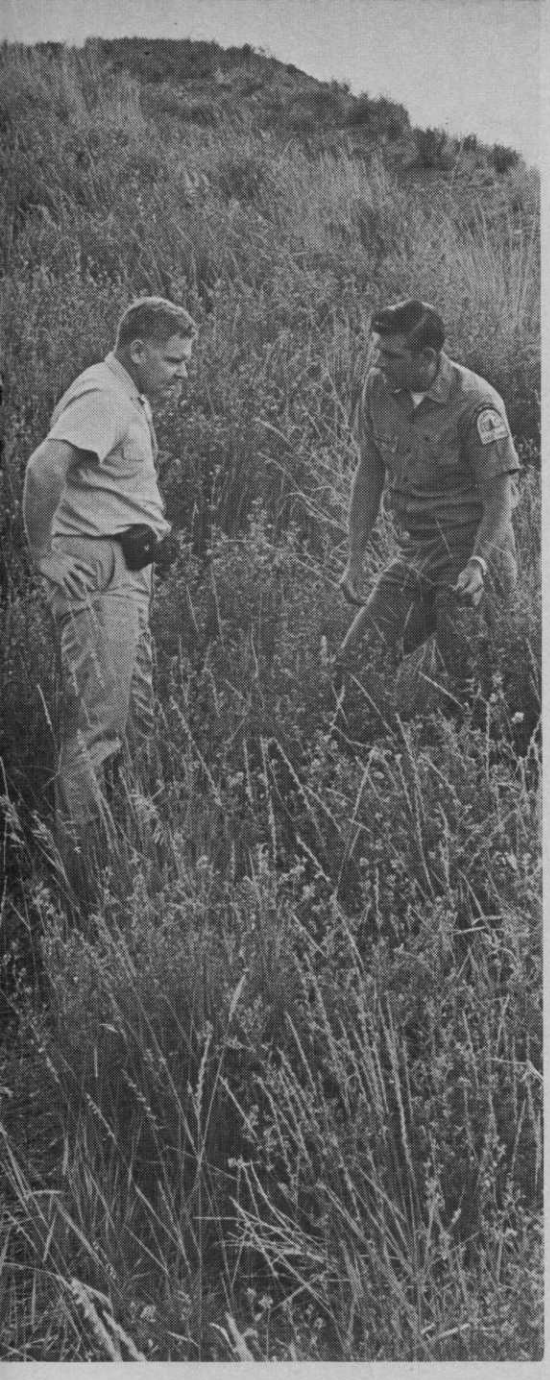
The complete report was released in March. A limited supply of copies are available by writing Caribou National Forest, P.O. Box 4189, Pocatello, Idaho 83201.

Accumulated data indicate which species of trees, shrubs and grasses are the best adapted to the revegetation of surface mined areas in southeastern Idaho and which treatments are the most beneficial and feasible. Information resulting from this study should prove to be of incalculable value to anyone who may be confronted with the problem of revegetating land that has been stripped of its top soil, or anyone who may be interested in stabilizing the soil on steep slopes.

The Project in Capsule

Here is a brief resume of the five-year study. A total of 716 plots for plantings have been established on three mine sites and 11,213 trees and shrubs have been planted. Plantings consist of: 1—tree and shrub, seedlings and cuttings plantings, 40 species; 2—grass, seed plantings, 12 species; 3—forb, seed plantings, 6 species; and 4—tree and shrub, seed plantings, 17 species.

Various treatments tried and evaluated were: 1—Hydroseeding: a mixture of water, seed, fertilizer and other ingredients, formed into a slurry, spread under pressure; 2—Fertilizer: N20-P10-K10 was applied by hand broadcasting at the rate of 200 lbs. per acre; 3—Mulch: straw was spread on the surface after seeding to provide stabilization and protection; 4—Water was supplied



Long before environmental issues reach a boiling point, industries involved in surface mining of phosphate deposits recognized the problems of scalping a mountain and leaving it to bleed. Four companies helped begin a study five years ago on revegetating surface-mined areas in Caribou National Forest. They worked with the U.S. Forest Service. The typical surface mine, far left, was contour-graded, soil was worked, fertilized, seeded and planted. George Atwood, left, of Monsanto Company, and Ken Dittmer of Caribou National Forest, are examining plantings. At upper center is a locust tree, lower center is crownvetch, and at right is a mixture of grasses and forbs, including alfalfa, wheat, rye, clover and fescue.

at each initial planting of trees and shrubs; and 5—Canadian and Charlottetown barley was planted to provide a temporary nurse-crop for protection and stabilization.

The seedbed was prepared by dragging the plot by tractor to create ripples and, then the area was raked to provide seed cover.

Broadcast seeding by helicopter also was tried. Unfortunately, due to personnel changes and prior job commitments, many of the plantings did not receive all of the treatments. This was particularly true of mulching, watering, raking and fertilizing.

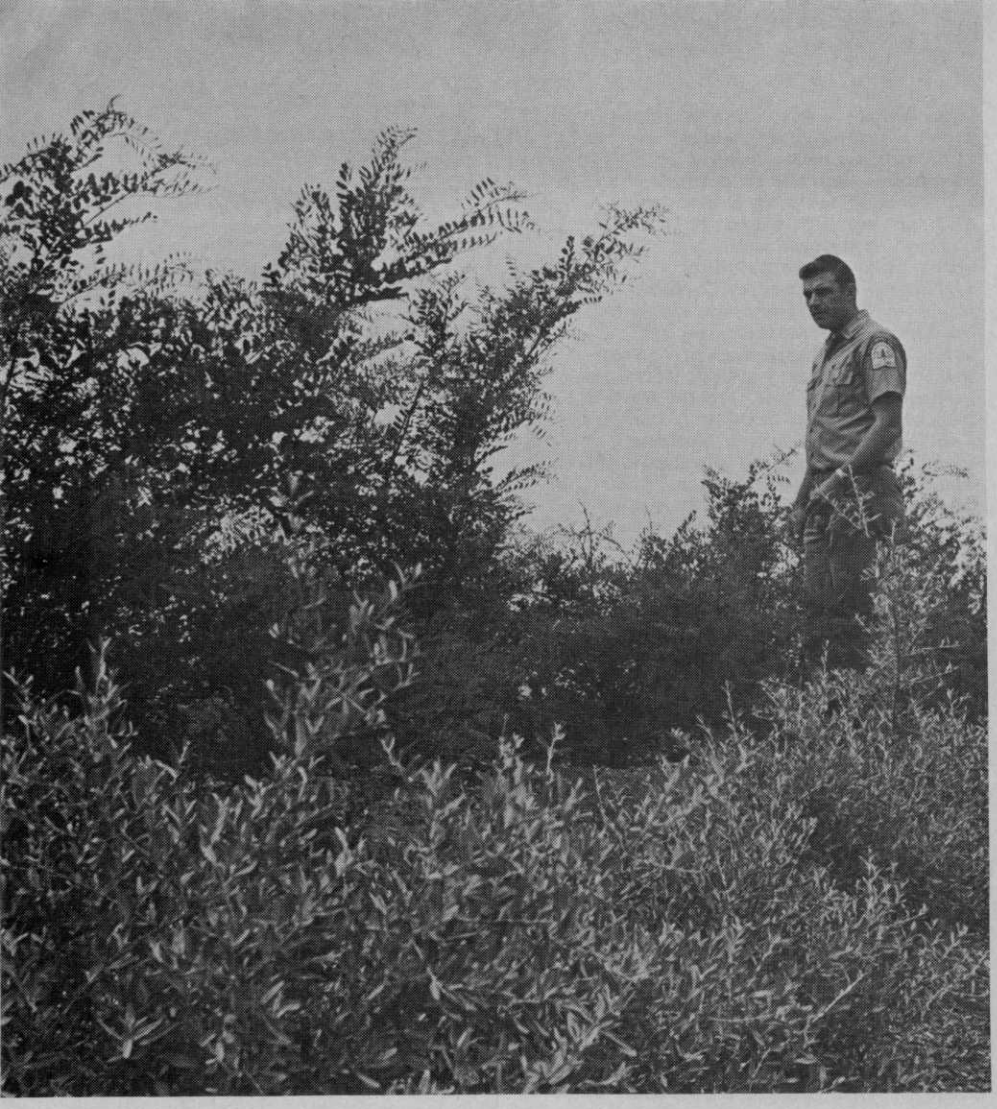
Vegetation Most Successful

At the present time, findings indicate the greatest success has been with trees and shrubs grown from seedlings and cuttings. Based on the criteria—survival, growth and vigor, 10 of the best adapted trees and shrubs are: Russian Olive, cottonwood, dark locust, American elm, cotoneaster, box elder, pea shrub, honey locust, choke cherry and blackberry. Based on germination, density and vigor, the best adapted grasses were: Intermediate wheat, smooth brome, hard fescue, pubescent wheat, and crested wheat grass. Of the six forbs tried, the three that showed the best growth performance were Ranger alfalfa, yellow clover and crownvetch.

As for trees and shrub plantings by seed, the results were unsatisfactory. Very poor germination was experienced with the 17 species tried, indicating this method is not practical. In general, it was found that trees and shrubs do better on the flat gentle slopes. This observation was made on all mine sites.

Of course, there were some exceptions, but for the most part, grasses did better on the slopes. The chances for seed cover and germination were better on the slopes, because the material on the slopes was looser than it was on the flatter areas. Broadcast grass seeding by hand was the most effective method tried, while hydroseeding and broadcast seeding by helicopter were the most unproductive methods employed.

Scarification was beneficial in compacted areas for germination and growth. Compaction of material on flat areas, posed the most difficult revegetation problems. Often rainfall is heavy during stripping operations; this together with the movement of heavy equipment over finer material, while dumping waste, caused extreme compaction. In fact, some of these flat areas were so compacted that water would not penetrate or infiltrate more than ½" to ¼" below the surface. When some standing pools were ex-

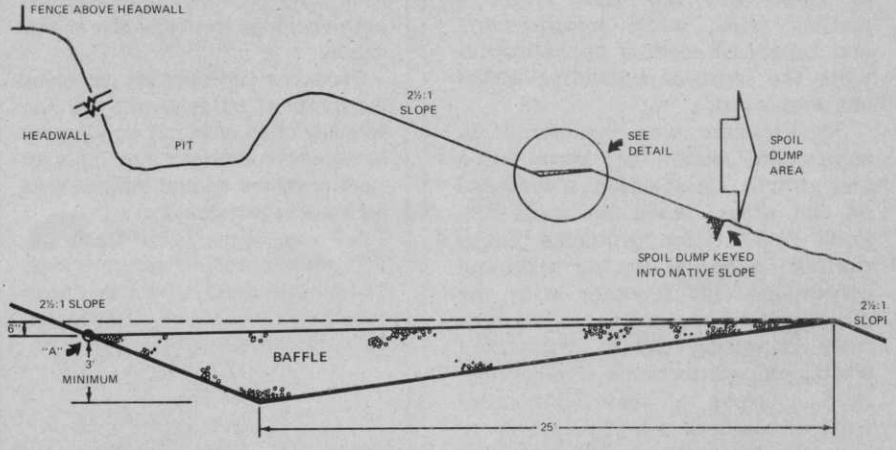


Dittmer has learned that deciduous plants outperform coniferous species.

amined, it was found the soil 4" below the surface was dry. This condition prevents the plants from developing healthy roots. The scarification method that got the best results was the one where top material was ripped by tractor to a depth of at least 10".

Another factor which affects revegetation is color of the soil. It was discovered that black soil inhibited plant growth, while other colors appeared to have no significant effect. Darker soil absorbs heat readily, drying the surface material to a depth of a few inches within a few days after receiving moisture.

Texture of the soil—too fine or too coarse—is also an important consideration in revegetation. Fine material becomes compacted and cuts off water percolation. This inhibits germination and plant growth. Porous soil, on the other hand, has very little water-holding capacity and provides a poor seedbed. A mixture of both fine and coarse materials provides optimum water penetration and holding capacity and allows root development on established plants.



This is a typical mine profile. A bench, 25 ft. wide, is constructed at contour intervals of 25 or 50 ft. The bench is tipped so the inside edge is three feet below the outside edge. Check dams are placed at 50 to 100 ft. intervals.

As for the application of 20-10-10 fertilizer at the rate of 200 lbs. per acre, it was beneficial to the growth of trees, shrubs and grasses, but was not necessarily essential to plant establishment. During the first growing season, the fertilized trees were much greener and more vigorous than unfertilized. Once grasses had been established, success depended on development of density and vigor and here is where fertilizer was of assistance.

One of the most important factors affecting revegetation is stability of the material on slopes. The lack of stability on steep slopes may make revegetation impossible, or at least extremely difficult. It is advised that where ever possible, slope angles should be constructed on a minimum of 2½ to 1, or 40%. Slopes constructed 1½ to 1, as a rule, do not provide needed slope stability.

Stabilization cannot be accomplished by planting alone. Rill and gully development, as well as mass movement of waste material may prevent satisfactory revegetation. Excessive run-off and soil movements begin to take place immediately after waste material, from the stripping operation, is laid down. In many cases, plants are not able to establish themselves, because of the movement of this material. Other plants are swept away or are buried, when sides are eroded away. Even after grasses have been established and natural reseeding begins, much of the seed produced is washed off these steep slopes. If the slope is constructed to insure stability, then plant establishment is likely to be achieved.

Contour trenching in intervals of 25′ and 50′ has been partly successful in stabilizing 1½ to 1 slopes. However, contour intervals of 75′ or 100′ have proved unsatisfactory due to excessive run-off down steep long slopes.

One disadvantage of contour trenches is that they tend to fill up with fine material washed down from the slopes, adding to the mass weight of the material and causing sluffing. Contour trenching should be regarded as a measure to reduce outside damages in the event the slope angle cannot be flattened.