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POWELL RIVER PROJECT

RECLAMATION GUIDELINES FOR SURFACE-MINED LAND

Management of Cow-Calf Production on Reclaimed Surface-Mined Land

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Introduction

Many surface-mined lands in southwestern Virginia have been revegetated with grasses and legumes that are suitable for the production of beef cattle. Livestock production on such lands can provide a rapid return on investment and a yearly income. Because the beef cattle are being produced in Virginia's coalfields and a larger industry exists in neighboring areas, suppliers and markets necessary to support efficient cattle production are accessible to mined-land cattle producers in southwestern Virginia. With proper management, the grazing of cattle actually enhances the persistence of grass and legume vegetation on reclaimed lands. After an initial establishment period, the legumes and grasses seeded for pasture and hayland provide abundant feed reserves for grazing livestock or hay production (figure 1).

Cattle Production Systems

There are several systems for producing cattle on either reclaimed mines or unmined areas. The simplest is known as "stocker production." Stocker producers purchase young animals, feed them on forages grown on the land, and sell the grown steers. If good fencing has been installed, a sustained water source is available,

Figure 1. A productive beef cow-calf herd grazing on reclaimed mine land in Wise County, Va.

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and forage growth is adequate, stocker production can be successful without intensive management. Producers using this system must purchase young animals, usually in the spring. Thus, profitability is dependent on how the spring per-pound prices for young animals compare to prices received for fattened steers, as well as the weight gained by grazing animals. Successful stocker operations typically operate where forages of high quality allow substantial growth.

The alternative to stocker production is a cow-calf herd. Cow-calf producers maintain a herd of breeding cows (heifers) year-round. Although cow-calf production is more management intensive than stocker production, it also has a greater potential for profitability because the young steers that are eventually sold do not need to be purchased – they are produced on site. The cow-calf production system has been used successfully on mined land at Powell River Project for more than 20 years.

In western Virginia, female cattle (cows and heifers) are bred in early summer using either a bull or artificial insemination (A.I.). Calves are born early the following spring and grazed for six to 10 months prior to being sold. Cow-calf production is management intensive, and skillful management is necessary in order for this production system to be profitable. This publication describes management procedures that can be applied in cow-calf beef-production operations on reclaimed mines.

Cow-Calf Operations Management

Feed

The capacity of the site to produce forage during all seasons of the year is an important factor that determines herd size. The herd can be sized so as to fully utilize forage being grown on the site while minimizing the need to purchase supplemental feed. Research conducted by the Powell River Project along with the experience of private operators have demonstrated that forages produced on surface-mined land can be adequate in quantity and quality to provide 90 percent or more of the feed required by a producing beef cow and her calf on a year-round basis. This conclusion is supported by experiences extending over more than 20 years.

At Powell River Project, 5 to 6 acres of pasture have been required per cow-calf pair for year-round grazing on reclaimed surface-mined land, with about half of that acreage reserved as stockpiled fall and winter feed for pregnant cows. During years when cattle were grazed only from spring to fall, half that amount (2.5-3 acres) per female was needed. Yearling steers or heifers will require about 1 to 1.5 acres per head for the grazing season (May-October). However, the amount of forage required to sustain cattle on mine sites will vary widely due to variations in pasture productivity.

Management of forages on reclaimed mines is reviewed in University of Kentucky Extension publication ID-157 (see references). Because mined landscapes and climate in southwestern Virginia is similar to eastern Kentucky, information reviewed in that publication can also be applied when raising cattle on mined lands in Virginia's coalfields.

When active coal mines are being preparing for grazing use after mining, reclamation practices can have a major influence on the forage production capacity of the reclaimed site. See Virginia Cooperative Extension (VCE) publication 460-121 for a description of mine-soil preparation procedures that can be used to prepare reclaimed mine sites as productive pastures, while the establishment of forage vegetation on such sites is reviewed in VCE publication 460-122.

Supplemental Feed

Supplemental feeding will generally be minimal for beef cows during the normal grazing season. If forage becomes limited because of drought or overgrazing, cattle should be moved to other areas where feed is more abundant or they should be fed supplementally. If adequate lands are available and forages are managed effectively, cows wintered on reclaimed surface-mined pastures will generally do quite well through mid-gestation – and in some years even until calving – on accumulated forage alone. However, producers need to be prepared to feed hay or other supplements during winter when heavy snow or ice covers forage for more than a day or two.

Experience gained from the Powell River Project supports the feeding of small amounts of concentrate (2 pounds per head per day) to cows during the calving season (Feb. 15-April 15). This will require about 100 pounds of concentrate per cow at a minimum, but the added energy and protein provided appears to be beneficial in assuring prompt rebreeding and maintenance of a short calving interval. It is also helpful from a management perspective because the daily feeding of the supplement makes it easier to check on cows that are close to calving and to render assistance if needed. For

these reasons, the added cost of supplemental feed is justifiable. A mixture of ground corn and protein supplement formulated to contain 20 percent crude protein has proved adequate. An alternative, inexpensive supplement is 2 pounds per head of whole shelled corn per day. At Powell River Project, where pasture fertility is maintained and calving success and weaning weights have exceeded area averages, about 200 pounds of concentrate per cow per year have been used.

Supplemental feeding of hay will be needed during adverse weather conditions or if there is, during dry conditions, a shortage of accumulated forage sufficient for the entire winter. The experience with the Powell River Project beef herd suggests that 700 pounds of hay per cow will generally be adequate for this reserve.

New growth of fescue will generally be sufficient to provide for the needs of the cow-calf herd by April 15. Legumes will generally not be ready for grazing until about May 15. Therefore, pastures consisting primarily of fescue should be available for early spring grazing.

Water Supply

An adequate supply of drinking water for cattle is an absolute necessity and generally will be supplied by springs, streams, or constructed ponds. Several watering sites should be provided so as to distribute grazing pressure over the pasture area and minimize overgrazing close to water. Where possible, pastures should be located so that the maximum distance cattle must travel to water is 800 feet.

Water quality in ponds constructed on reclaimed sites is generally satisfactory for animal use, especially if the water origin is from surface runoff. However, ponds in new pastures and ponds receiving water from deep mines should be tested so as to assure that quality is adequate before moving cattle onto the reclaimed mine site.

One water-quality measurement of special concern on coal surface mines is pH. Generally, water used to support livestock should have a pH that is no less than 6.0. Highly acidic (low pH) water from coal mines can often be recognized visually from the red-yellow coloration that occurs with iron contamination. However, a water source's suitability should be based on pH analysis, not appearance, because some acidic discharges run clear. Iron discoloration in itself should not disqualify a potential water source from use if other water-quality elements are suitable. At the Powell River Project site, an iron-bearing water source is being used successfully for livestock watering (figure 2); the water was made available by pumping into a large open tank, enabling most of the iron to oxidize and settle out prior to livestock consumption. Despite its lack of aesthetic appeal, this water source was used successfully to support the

Figure 2. A water source in use at Powell River Project Research and Education Center. Waters that accumulate in an abandoned deep mine located several hundred feet below the pasture are pumped through a well into the steel tank in the photo's right side. The waters are nonacidic, but during some seasons they contain high concentrations of iron. The tank is not airtight, which allows the iron to oxidize and settle out in the tank. Clear water is decanted from the surface and flows via gravity feed through tubing (visible in the photo emerging from the left side of the tank) into the drinking basin constructed from a tractor tire. The water is maintained at an adequate level in the basin using a float valve.

herd during times of the year when water in conventional ponds was not available.

Total dissolved solids (TDS) or conductivity should also be measured for water originating from coal-mining sources. TDS is a measure of the inorganic minerals that are dissolved in the water. Waters from freshly disturbed mining materials are often high in TDS. Unless sulfur-bearing minerals are present, TDS concentrations in mine sites' surface-water runoff commonly decline measurably after a few years of exposure to weathering, but this is not always the case for waters originating from deep mines or from surface-mine seeps, such as those that occur at the base of hollow fills. Waters with TDS concentrations of less than 1,000 milligrams per liter (mg/L) can be considered to be of excellent quality for livestock use. The water's electrical conductivity can be easily measured with a hand-held meter and can serve as an indicator of TDS.

Sulfate concentrations are another water-quality constituent of concern to cattle producers on coal surface mines because their weathering can give rise to waters high in sulfates; waters with sulfate concentrations of less than 500 mg/L can be considered to be of excellent quality. If TDS are less than 1,000 mg/L, sulfates are unlikely to be a problem.

A wide range of other water-quality constituents is also of potential concern to livestock producers. However, if the waters in question are of excellent quality for pH and TDS, other problems are unlikely to be present. If the waters to be used have pH or TDS levels beyond the range defined above as excellent, they may still be usable but should be checked for a wider range of potential problem constituents.

Salt and Minerals

Salt and/or salt-mineral mixtures can be used to control and manage cattle in extensive grazing situations. If salt is provided on a continuous basis, it should be placed in areas of light grazing to encourage more uniform grazing patterns. An alternative procedure is to hand-salt cattle at weekly intervals. This helps to keep cattle tame and aids inspecting and counting the cattle that may not otherwise be observed on a frequent basis. In winter, it is desirable to feed a complete mineral mixture because mineral content of forage will be lower at this time of year. A suggested mixture for free-choice feeding in a suitable mineral feeder is equal parts, by weight, of (1) trace mineral salt, (2) dicalcium phosphate, (3) magnesium oxide, and (4) soybean meal. This mixture contains phosphorus, magnesium, and trace minerals in addition to sodium and chloride; is palatable; and is readily consumed by cattle. It has been shown that this mixture is effective in preventing grass tetany – a disorder of beef cows caused by low magnesium availability. Commercial salt-mineral preparations are also commonly available, and good quality ones will meet the needs of cattle very well without the hassle of mixing minerals by hand.

Reproduction

Producers should select cows from breeds that are moderate in size and milk-producing ability, such as Angus X Hereford crossbred cows. Cows should be bred to calve in late winter or early spring (February-April) to reduce the winter feed requirements to that of the dry, pregnant beef cow for most of the winter. During this time of year, the nutritional adequacy of unharvested forage reaches its lowest level and harvested feeds may be required. At all other times of the year, the quality of feed available in most reclaimed-mine pastures is more than adequate to sustain the cow and her offspring.

In order to have a high percentage of cows become pregnant in a confined calving season, three conditions must be met:

1. A high percentage of cows must be reproductively cycling at the beginning of the calving season;

2. Cow fertility (the likelihood of conceiving at each breeding) must be high throughout the breeding season; and

3. Bull fertility or A.I. fertility must be high.

Factors that influence the chances of reproductive cycling include:

- Time since the previous calving;
- Fat reserves or body condition;
- Age (very old and first-calving younger cows have a greater challenge);
- Suckling of the calf; and
- Presence of a bull.

Cow fertility is affected by:

- Time since the previous calving; and
- Nutritional status, such that cows that are gaining weight are much more fertile than ones that are losing weight at the time of breeding.

Bull fertility is a function of:

- Production of large numbers of normal sperm cells;
- Sex drive or libido of a bull; and
- Physical ability of the bull to mate with cows.

A reproductive management program can be fairly simple but must provide for the fulfillment of these conditions in order to ensure good reproductive outcome.

A fall calving system is generally not recommended because the greater nutritional requirements of the lactating cow will be difficult to meet without providing expensive supplemental feed such as hay or concentrates during a time of year when pasture feeding is generally relied upon. Also, the young calves produced by a fall calving cycle will be vulnerable to winter weather extremes.

A short breeding and calving season should be practiced. Provision should be made to start breeding on about May 15 by introducing bulls to the herd at that time or by use of A.I. followed by use of a clean-up bull to breed cows not settled to A.I. Bulls should be removed from the herd, preferably at 60-75 days (July 15-Aug. 1) and certainly by 90 days (Aug. 15). Cows should be examined for pregnancy when calves are weaned (October-November), and nonpregnant cows should be culled at that time by sending them to market. Maintenance of a controlled, short breeding season is a most important management practice that significantly affects management of the herd, weaning weights, and finally, profitability of the beef cattle herd.

In most instances, calves should be weaned and sold or moved to other locations where stored feed is available in late fall. There is no need to wean before November, and research at Powell River Project has shown that calves make satisfactory gains until about Dec. 1. However, pasture quality declines after that date to the point that satisfactory growth of weaned calves cannot be expected without substantial supplemental feed. Steers and heifers not needed as replacements can be weaned and marketed at this time or held over. Replacement heifers should be removed to a more favorable environment for adequate winter feeding and subsequent breeding the following spring.

It is not absolutely necessary to maintain the cow herd on the surface-mined land year-round. Some producers may find it more practical to utilize the forage available only during spring, summer, and fall. In these cases, they may choose to remove the herd in late fall or early winter to a farm location where the cows can be fed and cared for through the winter and subsequent calving season. In such instances, the cow herd should be returned to the reclaimed surface-mined pastures at about the time breeding begins (May 15). By that time, sufficient new growth will be available to sustain the herd for the remainder of the season. However, experience at Powell River Project has shown that cow-calf herds can be overwintered successfully on reclaimed mine sites, although they typically require more care during the winter season than during spring, summer, and fall when forages are actively growing.

At Powell River Project, the above procedures have proved successful. Cows have weaned an average calf crop in excess of 95 percent, and the 205-day adjusted weaning weight has exceeded 550 pounds.

Animal Health

A calendar for major health and management inputs is listed in table 1. While all procedures listed are not essential to profitable beef cattle production, they are all tested and researched practices that have a high probability of returning profit to an operation.

Cattle grazing on pastures on surface-mined land are generally healthy. Due to the extensive nature of the grazing pattern, parasite and disease problems are minimal. Nevertheless, an adequate health program is a must.

Marketing

Several options for marketing calves and yearlings exist. Organized feeder sales are an excellent outlet and should be considered. If one or more owners can put trailer-load lots of calves together, a system that gets a competitive bid for these larger groups will usually bring better prices than single-producer sales that draw fewer buyers. Weekly auctions or order buyers are other possibilities if organized sale options are not readily available.

Uniformity is a major factor in marketing beef calves. If a crop of calves is produced that is similar in age, weight, and conformation, the highest price can be secured for this finished product.

Having an identified market for a year's worth of cattle production is critical to the operation's viability. The beef producer should understand the market climate. Every operation must take steps to supply calves that are being sought in the local market or develop a plan to market them where there is a demand.

Table 1. Calendar for animal management on cow-calf operations in southwestern Virginia.

Mid-winter	• Treat cows for lice in January/February as needed with organophosphate or pyrethroid
Feb. 15-April 15: Calving	
February-April	• Castrate bull calves • Apply 7-way injectable selenium, Vitamin A & D, dip navel, growth promotant implant* • ID calves at birth
March 1	• Vaccinate replacement heifers (Brucellosis, Leptospirosis, 4-way viral, etc.) • Deworm yearling replacements prior to breeding • Conduct breeding soundness exam on bull
May 5	• Plan to breed heifers by bull or A.I. • Vaccinate all **open** cows/bull (IBR-PI3-BVD-BRSV, Leptospirosis) using MODIFIED LIVE VACCINE. • Deworm first calf heifers
May 15	• Begin insemination of cows or turn bulls in • Apply fly control (pour-on)
May 15-July 15: Breed	
June 1	• Consider additional fly control for summer
July 15	• Deworm spring-born calves • Implant growth promotantsVaccinate calves (7-way clostridial vaccine) • Remove bulls from cows • Apply fly pour-on for cows and calves
Sept. 20	• Vaccinate calves prior to weaning (7-way; IBR-PI3-BVD-BRSV and Pasteurella) • Conduct pregnancy checks on cows • Use systemic organophosphate for lice and grubs for cows • Vaccinate cows with Leptospirosis booster • Check cows' eyes, teeth, feet, legs, and udders
Oct. 15-Nov. 1	• Wean calves • Deworm calves

*Heifer calves not destined for replacements should also be implanted. Heifers that could be selected for replacements should not be implanted. The single exception would be the use of an implant approved for use in replacement heifer calves.

Record Keeping

It is essential to maintain accurate records as an aid to good management. At minimum, a record for each producing heifer should include its age and origin, calving success, and the sale weight of calves sold. Heifers and calves can be tagged to aid record keeping. This information can be referenced when making decisions about which heifers should be culled and which offspring should be retained as replacements.

Summary

Reclaimed surface-mined land can support beef cattle. Studies conducted by the Powell River Project demonstrate that cattle can do well and be profitable on mined lands when skillful management is applied.

In this publication, we have summarized a number of cattle management issues that are important to mined-land cattle producers. Additional information on cattle production in Virginia is available through VCE, either at the local Extension office or online at *www.ext.vt.edu/resources/.*

References

Powell River Project/Virginia Cooperative Extension (VCE) Publications: Available from Powell River Project (*www.cses.vt.edu/PRP/*) and Virginia Cooperative Extension (*www.ext.vt.edu*).

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