



## Reclamation Guidelines for Surface Mined Land

Powell  
River  
Project

# 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 hay land provide abundant feed reserves for grazing livestock or hay production (see Figure 1.).



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

## 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, 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 the how 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. Calves are born early in the following spring and grazed for 6 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 and the experience of private operators have demonstrated that forages produced on surface-mined land can be adequate in quantity and quality to provide 90% 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 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 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 preparing mined lands 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 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 [Virginia Cooperative Extension 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 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 lbs/head/day) to cows during the calving season (February 15 to April 15). This will require about 100 lbs of concentrate per cow, as 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% crude protein has proven adequate. An alternative, inexpensive supplement is 2 lbs 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 lbs 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 lbs 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. Generally, this 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 run-off. However, ponds in new pastures and ponds receiving waters from deep mines should be tested so as to assure that quality is adequate before moving cattle on to the reclaimed mine site.



**Figure 2.** A water source that is 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-hand side. The waters are non-acidic, but during some seasons they contain high concentrations of iron. The tank is not air tight, which allows the iron to oxidize and settle out in the tank. Clear waters are decanted from the surface and flow via gravity feed through tubing (visible in the photo emerging from the left-hand side of the tank) into the drinking basin constructed from a tractor tire. The water in is maintained at an adequate level in the bas using a float valve.

One water quality measurements of special concern on coal surface mines are pH. Generally, water used to support livestock should have a pH no less than 6.0. Highly acidic (low-pH) water from coal mines can often be recognized visually from 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 (see 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 lack of aesthetic appeal, this water source was used successfully to support the herd during times of year when waters in conventional ponds were not available.

Total dissolved solids or conductivity should also be measured for waters originating from coal-mining sources. Total dissolved solids (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' 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 1000 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 1000 mg/L, sulfates are unlikely to be a problem.

A wide range of other water-quality constituents are 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 consumed readily 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:

- A high percentage of cows must be reproductively cycling at the beginning of the calving season.
- Cow fertility (the likelihood of conceiving at each breeding) must be high throughout the breeding season
- Bull fertility or A.I. (artificial insemination) fertility must be high

The 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),
- the suckling of the calf and
- the presence of a bull.

Cow fertility is affected by:

- time since the previous calving and
- the 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:

- the production of large numbers of normal sperm cells,
- the sex drive or libido of a bull and
- the 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 about May 15 by introducing bulls to the herd at that time or by use of artificial insemination (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-August 1) and certainly by 90 days (August 15). Cows should be pregnancy examined when calves are weaned (October-November) and non-pregnant 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 cowherd.

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 December 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 cowherd 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 mine pastures 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%, the 205-day adjusted weaning weight has exceeded 550 lbs.

## **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.

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

Mid-Winter	<ul style="list-style-type: none"> <li>• Treat cows for lice in January/February as needed with organophosphate or pyrethroid</li> </ul>
<i>Feb. 15 -- April 15 (Calving)</i>	
February - April	<ul style="list-style-type: none"> <li>• Castrate bull calves.</li> <li>• Apply 7-way injectable selenium, Vitamin A &amp; D, dip navel, growth promotant implant*</li> <li>• ID calves at birth</li> </ul>
March 1	<ul style="list-style-type: none"> <li>• Vaccinate replacement heifers (Brucellosis, Leptospirosis, 4-way viral, etc)</li> <li>• Deworm yearling replacements prior to breeding</li> <li>• Conduct Breeding Soundness Exam on bull</li> </ul>
May 5:	<ul style="list-style-type: none"> <li>• Plan to breed heifers by bull or artificial insemination</li> <li>• Vaccinate all <b>open</b> cows/bull (IBR-PI3-BVD-BRSV, Leptospirosis) using MODIFIED LIVE VACCINE.</li> <li>• Deworm 1<sup>st</sup> Calf Heifers</li> </ul>
May 15:	<ul style="list-style-type: none"> <li>• Begin insemination of cows or turn bulls in</li> </ul>
	<ul style="list-style-type: none"> <li>• Apply fly control (pour-on)</li> </ul>
<i>Breed: May 15 – July 15</i>	
June 1	<ul style="list-style-type: none"> <li>• Consider additional fly control for summer</li> </ul>
July 15:	<ul style="list-style-type: none"> <li>• Deworm spring born calves</li> <li>• Growth promotants implant</li> <li>• Vaccinate calves (7-way clostridial vaccine)</li> <li>• Remove bulls from cows</li> <li>• Fly pour-on for cows and calves</li> </ul>
Sept. 20:	<ul style="list-style-type: none"> <li>• Vaccinate calves prior to weaning (7-way; IBR-PI3-BVD-BRSV and Pasteurella)</li> <li>• Pregnancy check cows</li> <li>• Systemic organophosphate for lice and grubs for cows</li> <li>• Leptospirosis vaccine booster cows</li> <li>• Check cows eyes, teeth, feet, legs, and udders</li> </ul>
Oct. 15 – Nov. 1:	<ul style="list-style-type: none"> <li>• Wean calves</li> <li>• Deworm calves</li> </ul>

\* 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.

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.

## 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 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 do well and can 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 Virginia Cooperative Extension, either at the local Extension office or on the internet at <http://www.ext.vt.edu/resources/>

## References

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

Creation and Management of Productive Mine Soils. W.L. Daniels and C.E. Zipper. Virginia Cooperative Extension Publication 460-121.

Revegetation Species and Practices. J. Skousen and C.E. Zipper. Virginia Cooperative Extension Publication 460-122.

### **Other References**

Publications and Educational Resources. Virginia Cooperative Extension. <http://pubs.ext.vt.edu/>

Managing Livestock Forage for Beef Cattle Production on Reclaimed Mine Land. Kentucky Cooperative Extension Publication ID-157. <http://www.ca.uky.edu/agc/pubs/id/id157/id157.pdf>