leases contain provisions reserving the right to the state to grant rights-of-way and permits and leases for the purpose of extracting oil, gas, coal, ores, minerals, fertilizer and fossils of every kind, or prospecting therefor. Necessarily then, the rancher has no right to prevent hunters, or other third persons, from gaining entry on state lands by locked gates or otherwise.

In an opinion requested by the Pinal County Attorney of Wade Church, the Attorney General, in 1959, the question was posed, "Does the hunter or any other third person have the right to knock down, remove, or lay over a fence for the purpose of gaining entry to state land for the purpose of hunting, moving equipment, or for any other purpose?" The Attorney General's opinion stated in part, "As above pointed out, many persons have a right to enter upon state lands for proper purposes, but this does not carry with it the right to molest, injure or destroy any of the improvements thereon. Two wrongs do not make a right. If one having a right to enter state lands is denied that right, he cannot take the law into his own hands but must resort to the remedies provided by the law for gaining entry together with damages accruing because of the wrongful interference with the right. It follows that a hunter or other third person has no right to knock down, remove, or lay over a fence for the purpose of gaining entry to state land."

Summary

In summation, Federal and State legislation and regulations concerned with the administration of the public lands, with few notable exceptions, recognize the paramount jurisdiction in the State to manage wildlife resources within the confines of its borders and the rights of the individual citizens to have access to those public lands for the purpose of appropriating game species. In all instances, however, there is retained by the Federal Government the essential authority for the protection and preservation of its property and property interests, State laws to the contrary notwithstanding. Therefore, as a practical matter game management policies and their relation to range management necessitates and involves cooperation between the appropriate State and Federal authorities.

The individual hunter, without whose participation there could be no controlled management of game species, is most significantly affected by the application of state legislation and regulations establishing the times, places, manner and devices permissible for pursuing and taking game species. He is unaware and probably unconcerned as to why or under what circumstances he might make use of the public lands as his right to such use has probably never been challenged. He does, however, have the obligation to comply with all pertinent criminal statutes of the state and may not damage or destroy private property even on public lands without fear of consequences. The vandal may not claim sanctuary under such circumstances.

Robert J. Spillman
President, Arizona Game Protective Assn.
8502 E. Vernon St.
Scottsdale, Arizona

Mineral Consumption Related to Improved Cattle Management Systems in Georgia

RALPH H. HUGHES AND BYRON L. SOUTHWELL

Range Conservationist, Southeastern Forest Experiment Station and Head, Animal Husbandry Department, Georgia Coastal Plain Experiment Station, Tifton, Georgia.

The wiregrass-pine range type furnishes an abundance of forage for cattle, but the main forage species are generally low in protein, phosphorus, and calcium (Williams et al., 1955). Even with the advantages of winter burning, the native herbage seldom contains the minimum mineral requirements for cattle suggested by the National Research Council (1958). For these reasons adequate mineral nutrition has been an integral part of forest grazing studies at the Alapaha Experimental Range in south Georgia since 1942.

Studies in Georgia (Halls and Southwell, 1954) showed that a mixture of two parts steamed bone meal to one part salt by weight, self-fed from mineral boxes, induced steers and heifers on range to eat enough bone meal to satisfy their needs for both phosphorus and calcium. For nursing cows, however, feeding of other supplements, such as cottonseed meal, in addition to bone meal and salt, appeared essential to fully overcome lack of minerals, particularly phosphorus. A later study indicated that improved pasture might be more economical than protein concentrates for supplementing range during the spring and summer (Southwell and Halls, 1955). Even with the advantages of winter burning, the native herbage seldom contains the minimum mineral requirements for cattle suggested by the National Research Council (1958). For these reasons adequate mineral nutrition has been an integral part of forest grazing studies at the Alapaha Experimental Range in south Georgia since 1942.

Studies in Georgia (Halls and Southwell, 1954) showed that a mixture of two parts steamed bone meal to one part salt by weight, self-fed from mineral boxes, induced steers and heifers on range to eat enough bone meal to satisfy their needs for both phosphorus and calcium. For nursing cows, however, feeding of other supplements, such as cottonseed meal, in addition to bone meal and salt, appeared essential to fully overcome lack of minerals, particularly phosphorus. A later study indicated that improved pasture might be more economical than protein concentrates for supplementing range during the spring and summer (Southwell and Halls, 1955).
110 HUGHES AND SOUTHWELL

FIGURE 1. Typical cows and calves at mineral feeder used during the 6-year test.

The minerals supplied through improved forage plants would be expected to help balance deficiencies in the native forage. This paper examines the mineral consumption of several herds of cattle when assigned various rations of native range, improved pasture, and protein supplements.

Methods

In a 1953-1958 Alapaha herd management study, cows were supplied a higher level of year-round nutrition than had been tried previously. Five spring-summer grazing systems were tested by ten groups of cattle—a total of 80 cows each year for six years. Cattle grazed winter-burned forest range during the spring (March 15-July 5) and summer (July 6-October 15) according to the following procedures:

A. Unsupplemented forest range, spring and summer
B. Unsupplemented range, spring; improved pasture, summer
C. Forest range supplemented with protein, season-long (two pounds, 41 percent cottonseed meal per head daily in spring, one pound in summer)
D. Forest range supplemented with improved pasture (0.6 acre per head), spring and summer
E. No forest range; improved pasture, spring and summer

Calves were weaned October 15 and cows were maintained until the following March 15 in two herds as follows:

1. "High" level of nutrition.
   Cows grazed oat or rye pasture or were fed 23 to 26 pounds of Coastal bermuda hay per head daily in dry lot.
2. "Moderate" level of nutrition. Cows were fed two pounds 41 percent cottonseed meal on range until about January 11, and 17 to 19 pounds Coastal bermuda hay in dry lot thereafter.

Cattle had free access to a mineral mixture of two parts steamed bone meal to one part salt by weight during the first three years of the study. In 1956, the mixture was modified to include an appetizer and minor elements. The percentages of various ingredients used in the mineral mixtures fed during the 3-year periods were:

<table>
<thead>
<tr>
<th>Simple mixture</th>
<th>Complex mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1953-55)</td>
<td>(1956-58)</td>
</tr>
<tr>
<td>Steamed bone meal</td>
<td>66.67</td>
</tr>
<tr>
<td>Common salt</td>
<td>33.33</td>
</tr>
<tr>
<td>Defluorinated phosphate</td>
<td>—</td>
</tr>
<tr>
<td>Red oxide of iron</td>
<td>2.20</td>
</tr>
<tr>
<td>Cobalt carbonate</td>
<td>—</td>
</tr>
<tr>
<td>Potassium iodide</td>
<td>—</td>
</tr>
<tr>
<td>Copper sulphate</td>
<td>—</td>
</tr>
<tr>
<td>Magnesium sulphate</td>
<td>—</td>
</tr>
<tr>
<td>Cane molasses</td>
<td>—</td>
</tr>
</tbody>
</table>

During the first three years the mixture contained an equivalent of 20.00 percent calcium and

Table 1. Average consumption of mineral supplements and intake of calcium and phosphorus, March 15 to October 15

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Simple mixture (1953-1955)</th>
<th>Complex mixture (1956-1950)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total mixture</td>
<td>Calcium</td>
</tr>
<tr>
<td>Forest range only</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Forest range in spring; improved pasture in summer</td>
<td>5.45</td>
<td>1.09</td>
</tr>
<tr>
<td>Forest range plus protein meal</td>
<td>4.08</td>
<td>.82</td>
</tr>
<tr>
<td>Forest range plus limited improved pasture</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Improved pasture only</td>
<td>3.27</td>
<td>.65</td>
</tr>
<tr>
<td>Improved pasture only</td>
<td>5.62</td>
<td>.72</td>
</tr>
</tbody>
</table>
9.27 percent phosphorus; the second mixture furnished an equivalent of 13.06 percent calcium and 5.94 percent phosphorus. Consumption of minerals from sheltered feeder boxes was measured at 28-day intervals (Figure 1).

Available for comparison of mineral needs were chemical analyses of forage samples approximating the cattle diet and data on cattle performance for the several herd management systems from other Alapaha studies.

Consumption In Relation To Management Systems

Minerals eaten by cows on unsupplemented forest range varied from 4.50 pounds in March to 11.47 pounds in October (Figure 2). A similar trend, from 3.10 pounds in the spring to 6.57 pounds in the fall, was registered by cows on range supplemented with cottonseed meal. Cows on range with access to a limited amount of improved pasture ate 4.74 pounds of mineral in March. In May, when clover was in peak production, these cows ate only 3.27 pounds of mineral. The trend thereafter was upward, to a high of 4.81 pounds in October. Consumption of minerals by cows on a full ration of improved pasture, not shown in Figure 2, was similar to the consumption curve shown for the range cows on limited pasture.

Average annual mineral consumption varied from 69 pounds for cows assigned to unsupplemented forest range during the spring and summer to 48 pounds for those having access in spring and summer to a limited amount or to a full ration of improved pasture. During the fall and winter, consumption averaged about the same for cows given moderate or high maintenance rations. Intake at both levels increased sharply as soon as cows calved.

The shift to a mineral supplement containing molasses was followed by a 54 percent average increase in amount of materials taken from mineral boxes by cattle on the various spring-summer grazing treatments (Table 1). Rise in consumption was greatest (94 percent) by herds on forest range supplemented with cottonseed meal and was least (34 percent) by cattle grazing solely on improved pasture. The increase on unsupplemented range was 61 percent and by herds on range with access to 0.6 acre per head of improved pasture was 54 percent.

Although cattle consumed more of the complex mineral supplement, actual intake of calcium and phosphorus averaged about the same for the two kinds of mineral mixtures, both during the spring and summer grazing period and during the fall and winter. In other words, greater consumption of the more appetizing mixture tended to no more than balance its lower mineral content.

After the shift to a complex mixture, cattle on unsupplemented forest range consumed more calcium and phosphorus in early spring and late fall and less in May and June. Where cattle on forest range were fed cottonseed meal supplement, intake of calcium and phosphorus from mineral boxes increased both spring and summer following the shift in mineral mixtures. These cows ate enough additional mineral mixture to increase calcium intake 27 percent and phosphorus intake 24 percent. This increase provided a combined intake from mineral boxes and protein meal of 0.93 pound of calcium and 0.89 pound of phosphorus per month per cow. The minimum requirements suggested by the National Research Council (1958) for lactating cows per month during the first three to four months from calving are 2.05 pounds of calcium and 1.57 pounds of phosphorus. For these groups of cows, therefore, about half their mineral requirement was obtained from mineral and meal supplements and the remaining half from native herbage or from body reserves. All remaining groups of cows had access to improved pasture during the sum-

![Figure 2. Average monthly consumption of mineral supplement by cows that were on range during the spring and summer, 1953-1958.](image-url)
mer, or during the spring and summer. They obtained large quantities of mineral from improved forage species. For these cows, a shift from one mineral mixture to the other gave no increase in the net intake of calcium and phosphorus.

**Seasonal Consumption Of Mineral Mixtures**

Minerals eaten by the 80 cows on test fluctuated greatly from year to year, but seasonal trends were not altered appreciably by the shift from one mineral mixture to the other. During the March 15–October 15 grazing period, the trend was for lowest consumption in the spring and highest in late summer and early fall. Starting from 4.06 pounds per cow per month in March, the average intake increased gradually as the forage became more mature to a high of 6.45 pounds per cow in October (Figure 3).

The trend toward greater consumption of mineral mixtures during the summer grazing period apparently reflected an increasing intake by calves (and cows) and a downward trend in mineral content of the native and improved forage. Samples of pine-wiregrass range forage representing the cattle diet from the work of Halls, Hale and Knox (1957), and samples of improved forage taken during the present work both revealed a declining amount of calcium and phosphorus as the season advanced (Table 2). Minerals in the native forage were deficient seasonlong, and by September, minerals in the improved forage had approached the minimum of 0.25 percent calcium and 0.18 percent phosphorus suggested for lactating cows. High calcium intake in April from improved pasture was attributed to an abundance of clover in the diet. As hot weather approached, production of clover declined sharply and by June grasses were contributing the bulk of improved forage in the cattle diet.

As soon as calves were weaned and herds were shifted to moderate and high levels of nutrition, starting October 15, average intake dropped sharply to a low of 2.88 pounds. This drop was probably caused by a combination of the following factors: (1) elimination of consumption by calves, (2) reduced requirement by cows following cessation of lactation, and (3) higher mineral content of the animal diet during the fall wintering period. The trend during the winter period again was upward to a high of 4.81 pounds in March. The upward trend was evident, notwithstanding moderate to high levels of nutrition furnished cows in fall and winter, and, therefore, reflected the increasing body requirements of cows for minerals before and during the calving period. The main calving season was in January and February; average calf crop was 76 percent and average weaned weight of 446 pounds at eight months, for the 6-year test. Hence, most cows were in the final three months of pregnancy in the fall and by March were nursing newly-born calves.

**Conclusions**

In these observations, information on mineral needs was limited to chemical analyses of forage samples approximating the cattle diet, records of consumption from mineral boxes and data on cattle performance.

Forest range and improved pasture during the spring-summer grazing period were suc-
cessfully combined with hay or green grazing the rest of the year to give a moderate to high level of nutrition throughout the year. Cows on the average produced 76 percent calf crops and calves that weighed 446 pounds when weaned at eight months of age. If cows were forced to draw upon body reserves during critical periods to satisfy their requirements for minerals, the deficiency apparently was corrected during another stage of the maintenance cycle. Cows have the facility to store a considerable reserve of some of the essential mineral elements during periods of adequate intake and then later to draw on this reserve during periods of shortage (Becker et al., 1953).

Supplying a complex mineral mixture to cattle does not necessarily insure an adequate intake of minerals deficient in native forages. Addition of an appetizer to a mineral mixture stimulated greater consumption from mineral boxes. Actual intake of calcium and phosphorus, however, depends upon the amount of these minerals contained in the mixture as well as total mixture consumed. One pound of a two to one mixture of steamed bone meal and salt contains as much phosphorus (9.27 percent) as about one and one half pounds of a complex mixture containing only 5.94 percent.

Mineral requirements by cows grazing forest range, as evidenced by trends in consumption from mineral boxes, may be satisfied to a greater degree by improved pasture than by a protein meal supplement. Clover in an improved pasture mixture provides additional insurance against possible mineral deficiencies, especially calcium. Steamed bone meal is an excellent source of phosphorus. Cottonseed meal, as fed in these tests at the rate of one to two pounds per head daily, reduced average consumption from mineral boxes and encouraged greater net intake of phosphorus.

LITERATURE CITED

Some Plant-Soil Relationships on an Ungrazed Range Area of Southeastern Idaho
H. B. Passey and V. K. Hugie
Range Conservationist and Soil Scientist, Soil Conservation Service, Salt Lake City, Utah

A problem encountered in range site delineation is that of confusing sites with range condition classes. This problem arises most frequently when too much reliance is placed on the present vegetation and too little on soil and climatic factors in the identification of sites on ranges subjected to heavy grazing or other disturbance.

The effect of disturbance on plant communities was aptly described by Dyksterhuis (1958) as follows: "The physical environment, with all of its climatic and edaphic factors and their innumerable interactions and gradients, supports many measurably different plant communities in apparent stability with local site conditions. When grazing by domestic livestock is superimposed by thousands of owners with tens of thousands of pastures grazed in various ways, the climax pattern tends to be obscured, and there is an overall increase in the number of plant communities."

Because of such disturbance, the vegetation of a high producing site in fair or poor range condition may closely resemble that of a low producing site in excellent or even pristine condition. Under such circumstances, two dissimilar areas may be mistakenly referred to as the same range site. Likewise, two similar areas may be interpreted as two different range sites because of difference in present vegetation. A potential source of error in range site delineation lies in the need for differentiating between plant communities which express the inherent site potential and similar communities resulting from disturbance.

Soil and climatic factors known to be associated with specific natural plant communities, because of their permanence, thus become more reliable indicators of range sites than does the nature of an altered plant community.

The methods used on areas of relict vegetation in determining the relationship between potential plant communities and their associated environmental factors are described elsewhere (Passey and Hugie 1962).

The natural plant communities of two distinctly different but