pine. During the rest of the year, from about October 1 to April 1, all cows gleaned hayfields or were fed high quality Coastal Bermuda hay. Important forage species in the native range were pineland threeawn (*Aristida stricta* Michx.), Curtiss dropseed (*Sporobolus curtissii* (Vasey) Small ex Scribn.), and creeping bluestem (*Andropogon stolonifer* (Nash) Hitchc.). Trees comprising the forest type were slash pine (*Pinus elliottii* Engelm.) and longleaf pine (*P. palustris* Mill.).

We knew that cattle damage trees in a variety of ways. They may actually eat the foliage or buds of trees, or they may bruise or break the stem branches or new shoots by trampling or rubbing on trees.

In considering gains made by cattle, we took into account that the forage was an additional product recovered from an area devoted chiefly to the production of trees. Seedling pine was planted on “fresh” burns in January and February, and cattle were turned into the plantation areas in late March. In this situation some trampling losses were inevitable. Losses were rather heavy in isolated areas where cattle concentrated. Most of these trampling losses occurred the year the seedlings were planted. A few trees 2 to 4 ft tall were damaged by rubbing. Damage by browsing was negligible.

Total losses, however, were not serious. Several factors prevented excessive cattle damage and at the same time had a favorable bearing on production and use of native forage in pine plantations. Cattle had access to a wide variety of forage: wiregrass range, cypress-hardwood swamps, swamp margins, old field carpetgrass, and a limited amount of improved pasture. The improved pasture, where cattle spent 60% of their grazing time, tended to draw cattle away from the pine plantings. Overall grazing intensity of the range varied from very light to moderate. In the naturally regenerating pine stands, most trees were more than 1 year old, and damage by cattle was negligible.

**Partial Budgeting for a Range Man**

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**Highlight**

The information for making economic evaluations of range practices often is available but is seldom used. Partial budgeting is a brief method for analyzing the potential economic returns of alternative range practices. This procedure is suitable for field use by ranchers or range technicians.

Technical range men who work with ranchers on private land should ask themselves “Will the improvement techniques that I suggest be good investments for the rancher?” The rancher often depends upon his technical advisor to help him make such decisions. The technician should be able to assist the rancher in making decisions which are economically sound.

Returns from range improvement practices can come in several forms: (a) additional productive capacity of the range which can be converted into marketable products, (b) reduced operating costs for the rancher, (c) improved conservation of the natural resource. The rancher can usually recover some or all of the returns in (a) and (b). However, he may not be able to directly receive economic gain from (c).

Improvements and management practices are sometimes recommended which do not offer adequate returns to compensate the rancher for his investment. Additional fencing or water developments will not increase grazing capacity if a range is already fully stocked. More uniform grazing will occur, thus saving soil. However, this benefit may have little economic significance to the rancher in the short run. Unless gains are increased sufficiently to cover all of the increased costs, the improvements are a poor bargain.

When increases in livestock production or reduced ranch costs are used to justify a range improvement, they should be carefully identified and evaluated. Difficulty in ascertaining costs is no justification for ignoring them. Nor is difficulty in determining economic benefits an excuse for making exaggerated claims for them.

An economic evaluation of any range improvement practice can be made with a partial budget (Fig. 1). Two types of data are needed: (1) good estimates of the physical responses of livestock and range to the improvement practice and (2) good estimates of the costs involved in applying the practice.

With these data the budgeting procedure is accomplished by totaling costs and returns. Increased returns and reduced costs are added together, since both have a positive effect on income. Likewise, reduced returns and increased costs are
Range Improvement Evaluation (cont'd)

<table>
<thead>
<tr>
<th>Ranch unit</th>
<th>Ranch location</th>
<th>Owner</th>
<th>Present range situation</th>
<th>Proposed improvements</th>
<th>Anticipated increase in production</th>
<th>Estimated cost of improvements</th>
<th>Improvement budget (annual basis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joncn Hen.e&amp;trd~ Owner A.L. Jones</td>
<td>Seven miles southwest of Bean Creek, Humboldt on the Slippery Creek cut off. Area to be improved is the summer unit (5120 acres).</td>
<td></td>
<td>Range is mainly in fair condition. Major range sites are rocky. Precipitation at 11 - 13&quot;. Blue grama is major grass species with western wheatgrass and needle-and-thread. Present stocking = 2040 AUM's.</td>
<td>Need ten division fences to permit deferred rotation grazing (approximately four miles of fence). Two additional reservoirs are needed to water cattle on north ends of pastures 1 and 2.</td>
<td>Stocking rate will not increase.</td>
<td>Four miles boxed nine less (four miles needs more work)</td>
<td>Increased returns $148 steak cuts $5 = $740. Amortized fence cost $117.05. Fence repair $40.00. Amortized reservoir cost $188.48. Four days riding time $40.00.</td>
</tr>
</tbody>
</table>

| | | | | | | | Increased costs Amortized fence cost $117.05. Fence repair $40.00. Amortized reservoir cost $188.48. Four days riding time $40.00. | 

| | | | | | | | Reduced costs | 

| | | | | | | | Reduced returns | 

| | | | | | | | Total $218.00 | Total $249.53 |

| Difference $131.53 |

| Comments | The change in income of $131.53 represents a return arising from better distribution of livestock. Additional increases in income will be forthcoming if range condition improves. |

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Fence cost to rancher = $1240 amortized at 7% for twenty years = $117.05. 
Reservoir cost to rancher = $400 amortized at 7% for ten years = $28.48. 
Increased time spent moving cattle between pastures. 
Reduced time necessary to gather cattle in fall.

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A hypothetical example of partial budgeting to evaluate additional fencing and water developments will be used to demonstrate the procedure.

An evaluation of a range unit showed the area to be in fair condition, but there was a definite downward trend. The present stocking rate was 2040 AUM's of grazing on 5120 acres of range.

A deferred-rotation grazing system was proposed to maintain or possibly improve the range condition while leaving the stocking rate at 2040 AUM's. It would require the building of four miles of fence to initiate this system. Two small reservoirs would have to be built to get use in the rougher portions of the pastures.

Based on previous experience of the technician and the rancher, it was anticipated that calf weights could be increased by a minimum of five pounds per calf. Any increase above this amount would, of course, also be to the rancher's benefit.

The estimated cost of fencing was $620 per mile. The two reservoirs could be built for $400. In this example, it was assumed that Federal cost sharing through the A.C.P. program would amount to 50 percent of the total cost. The total cost to the rancher was $1440.

Increased returns attributable to improved livestock distribution amounted to $346.20. Reduced costs were $32.00.

Increased costs included the amortized values for fences and reservoirs, repair costs and additional riding. The increased annual costs due to the physical improvements and management changes were estimated to be $249.53.
In the example given, there would be an annual net return of $128.67 to the rancher for initiating and managing the fencing and water developments. In addition to this return, his capital investment will be earning seven percent interest. The capital invested in the reservoir will be recovered in ten years and the capital invested in the fencing will be recovered in 20 years. The annual net return ($128.67) and the seven percent return on investment are over and above the long range benefits which may accrue as a result of stabilizing or improving the range condition.

Compensation for practices that have long term effects of importance to all of society is provided by payments through the A.C.P. or Great Plains program. In many instances these payments greatly influence the feasibility of range improvements.

More refined techniques are available for evaluating a flow of income through time. However, the partial budget serves well as a "first approximation."

Successful ranchers are becoming increasingly aware of alternate opportunities for increasing ranch income. The range man should be able to talk "dollars and sense" to the rancher.

BOOK REVIEWS

Ozark Range and Wildlife Plants.

The purpose of this handbook is to provide a field guide to Ozark plants and related importance for range managers, public and private, and other interested ecologists and conservationists.

Two excellent volumes used in the past, Flora of Missouri by J. A. Steyermark and Grasses of Missouri by C. L. Kucera, provide comprehensive treatment of the Ozark flora, but are not readily adaptable as field guides. This handbook fulfills the need for a concise and rapid key easily adapted for field use.

In maintaining the USDA Handbook theme, 179 genera are arranged in alphabetical order and into three groups: grass and grasslike plants, forbs and miscellaneous lower plants, and woody plants—excluding trees. Genera were selected on the basis of abundance, distribution, ecological, or economic values. The key to these genera consists of three parts: a summer key, a winter key, and a winter key to selected species of oaks (Quercus). The key is based primarily on vegetational characteristics; field technicians may encounter some initial difficulty in using a key of this type. Once the technique is mastered, however, it will prove easier and more reliable than keys based on floral characteristics. Simplicity and clarity were the rules adhered to in key construction. A key based on vegetational characteristics requires a larger number of descriptive terms than a key based on floral characteristics. This can cause inconvenience to some and may be interpreted as ambiguity in the key, but by liberal use of the glossary, most of these terms will become clear and meaningful.

A brief preliminary explanation on use of a key plus descriptive illustrations of plant characters will assist those unfamiliar with taxonomic principles.

Information describing the Ozark region and the associated geology, soil formations, climate, and dominant vegetation types is presented in the introduction. Plant synopses contain additional information on distribution, site characteristics, important species, and ecological or economic values. Plants with poisonous properties are noted along with symptoms of poisoning and class of livestock affected.

Discussions of individual genera are generally short except for large or important genera such as Panicum or Andropogon. Identifying descriptive characteristics and accompanying illustrations of important species are presented in each genera discussion; however, some are vague and useful only as a general description. Family names and common names are provided in addition to genera and some species. Authorities for nomenclature are A. S. Hitchcock, Manual of the Grasses of the United States; E. I. Little, Jr., Check List of Native and Naturalized Trees of the United States (including Alaska), and J. A. Steyermark, Flora of Missouri.

In view of the complexity of the Ozark flora, due to intermixing of floras from surrounding geographical regions, this handbook should be applicable over a wide area. Technicians and interested laymen will reap the most benefits from this manual; however, professionals should find it useful as a preliminary guide to the more comprehensive manuals on Missouri flora. George E. Probasco. Columbia, Missouri.


The editors, in seeking to give both the technical and nontechnical reader insight into the resources and problems of arid environments, have chosen a broad-spectrum approach for this collection of papers. The authors of thirty-one papers have served this end well. The scope of the papers ranges from physical conditions in arid environments, the major concern of at least eight papers, to social institutions, water-resource engineering, and research programs and frontiers.

There is geographic breadth as well. Examples from nearly every continent are included; although, there is a distinct and justifiable bias toward the problems and research in the United States and Australia. A number of authors treat their topics with a well-written broad overview of arid lands from the particular perspective of their