The Economics of Seeding Crested Wheatgrass : A Synthesis and Evaluation

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ABSTRACT: Various types of range improvements such as seedings of crested wheatgrass were extensively used during the period 1955-1970. Since 1970 the number of improvements implemented has declined dramatically. Reasons for this decline are suggested. Studies that have estimated the benefits and costs of seeding an area to crested wheatgrass indicate that the economic value of this range improvement practice is variable, ranging from very profitable to very costly. Reasons why the "payoff" for seedings are variable are reviewed and evaluated.

INTRODUCTION

The deterioration and remedial treatment of America's rangelands have been issues for nearly a century. Various measures have been taken to increase their productivity, including several types of range improvements after World War II. Data are not available that can be used to show results of improvements implemented before the early 1960s, but insight can be gained from the data available since that time. For example, data in Figures 1 through 5 show that the number of range improvements (seedings, brush control, reservoirs, springs, and fencing) on lands administered by the Bureau of Land Management (BLM) reached a maximum in the late 1960s. The implementation of such improvements declined thereafter, and are nearly nonexistent at the present time. The limited amount of data available for the Forest Service (Figures 6 through 9) show a similar pattern. Data are generally not available for improvements on private or state-owned lands but it is believed that a similar pattern exists (Godfrey 1972). This raises the question concerning why this pattern has occurred and represents the focus of the remaining discussion.

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REASONS FOR REDUCED USE OF IMPROVEMENTS

Although numerous reasons could be given why range improvement practices have been reduced over time, they can generally be classified into one or more of the following: 1) no potential, 2) insufficient funding, or 3) they don't "pay". Let us therefore briefly evaluate each of these reasons.

No Potential

The suggestion that all of the sites having improvement potential have already been treated would be rejected by any range scientist familiar with western rangelands. Agency documents are replete with examples of potential range improvements, especially EIS statements that have been prepared during the last five years (Schuster 1979). Some would argue that the best sites have been improved and that viable (profitable) alternatives no longer exist, but this opinion is not accepted by most range managers. One would, therefore, have to reject this as a viable reason for the above trends.

Insufficient Funding

It is generally conceded that agencies administering most of the federal rangeland do not have sufficient budgets. However, the data in Fig. 10 and 11 suggest that the amount of money available for range improvements on federal lands has increased in real terms over time. This increase in funds has occurred at the same time that the number of range improvements has declined. This indicates that agencies have spent these funds for nonstructural items instead of for "on-the-ground" improvements. While this practice or policy could be questioned, these data indicate that budget constraints cannot be used as a primary reason for the reduction in improvements that has occurred over time.

They Don't Pay

If potential sites still exist and if funding is not a problem, then one must assume that other investments have a higher "payoff". While every suggested improvement must be evaluated on its own merits, some insight into the possible benefits and costs of seeding an area to crested wheatgrass can be obtained by reviewing the studies that have been conducted in the past. Table 1 lists a number of studies that have estimated the benefits and costs of seeding crested wheatgrass and indicates the general conclusions reached by the author(s). The conclusions outlined in Table 1 suggest that the returns from seeding are generally variable and depend on several interrelated factors.

REASONS FOR VARIABILITY IN RETURNS

The variability in returns reported by several of the authors shown in Table 1 can be attributed to the factors discussed below.

Response

Some seedings did not pay simply because the seeding failed--i.e., a viable stand was not established. In many cases, the increased production was not sufficient to offset the costs incurred. One of the reasons for this result stems from the fact that areas of low production were seeded before areas having high potential but relatively high current production--a "worst first" site selection criterion. For example, a site with a current capacity of 33 acres per AUM with a potential of 5 ac/AUM would be seeded before an area having a current capacity of 7 ac/AUM with a potential increase to 3 ac/AUM. The second has the greatest potential increase in forage production even if the percent increase is smaller. This suggests that greater attention needs to be paid to the expected response and to put funds where they yield the largest return. A fixed investment must result in a difference in use and not just improve the condition of a site if the investment is to pay.

Intensity

One of the most common reasons why a seeding may not pay stems from the fact that too much is spent for the response obtained. For example, Kearl and Brannan (1967) reported that seeding costs varied more than three fold depending on the brush removal method used. As a result, some seedings paid while others did not. This may also occur when the overstory is difficult to control. For example, few studies indicate that the removal of juniper trees

Table 1.--Synoptic review of selected studies on the economics of seeding crested wheatgrass.[1]

Author(s)	Year study published	Location of area studied	Net returns positive?
Pearce and Hull	1943	Intermountain West	Yes
Short	1943	Montana	Unknown
Meik	1950	Bitter Root/Montana	Yes
Caton, McCorkle, and Upchurch	1955	Intermountain West	Yes
Pingree and Dortignac	1959	Northern New Mexico	Questionable
Caton and Beringer	1960	Southern Idaho	Unknown
Lloyd and Cook	1960	Utah	Variable
Gardner	1961	Colorado	Yes
Gray and Springfield	1962	New Mexico	Unknown
Gray, Stubblefield, and Roberts	1965	Southwest	Variable
Kearl	1965	Central Wyoming	Yes
Rader	1965	Intermountain West	No
Nielsen, Brown, Gates, and Bunch	1966	Eastern Oregon	Variable
Kearl and Brannan	1967	Central Wyoming	Variable
McCarthur, Nielsen, and Andersen	1971	Southeastern Utah	Yes
Araji and Godfrey	1972	Southern Idaho	Variable
Brown, O'Connell, and Hilbert	1974	Northern Arizona	Variable
Daley, Olsen, and McAfee	1974	Wyoming	Yes
Cordingly and Kearl[2]	1975	Central Wyoming	Yes
Workman and Kienast	1975	Central Utah	Variable
Stevens and Godfrey	1976	Eastern Oregon	Variable
Heady and Bartholome	1977	Eastern Oregon	Variable
Godfrey, Sharp, and Sellasie	1978	Southern Idaho	Yes
Kearl	1979	Wyoming	Variable

[1]This list is not intended to be inclusive of all studies that have estimated the benefits/costs of seeding an area to crested wheatgrass but it does include most of the studies that have been conducted. The reader should also recognize that these studies are based on the principles of benefit/cost analysis. Readers interested in this methodology should review Nielsen (1977), Gittinger (1972), Prest and Turvey (1965) or one of the many other texts that are available.

[2]Also Kearl and Cordingly (1975).

and subsequent seedings pay because juniper is more costly to control than is sagebrush.

A related, but all too common problem involves the installation of other improvements (e.g., fencing, water developments) with a seeding--a practice the author has called "including a silk purse with a sows ear"--that have few, if any, benefits.[1] For example, the BLM Wells District EIS[2] suggested that $2.3 million dollars be spent to obtain approximately 5,000 AUM's of forage, an expenditure of about $485 per AUM or nearly $29,500 per operator. This suggests that too much can be spent on range improvements. It also suggests that each of the suggested parts of an "improvement package" should pay, and that each should be evaluated to determine if it is a worthwhile practice.

Grazing Use

There is probably no factor that has a greater impact on the "payoff" associated with a seeding than how it is used. For example, Godfrey (1979) has shown that the returns from a crested wheatgrass seeding are highest if it is used at relatively heavy rates during the spring. Some have suggested that light grazing will make the stand last longer but this additional life would probably not be worth the loss of benefits foregone as long as society has any positive rate of time preference (see Baumol 1968 for a discussion of this issue). Furthermore, a serious question can be raised concerning the need for long periods of deferment, and their associated costs, while seedings become "established". Research is also needed on the use of crested wheatgrass seedings during the winter as a substitute for expensive hay.

Associated Uses

One of the major reasons why seedings have not recently been implemented stems from a belief that they are detrimental to wildlife. This belief has been questioned by some writers (Recher 1969, Heady and Bartolome 1977). The major reason for these differences of opinion arises from the lack of quantitative evidence of the positive or negative impact of a seeding on wildlife populations. The effects of seedings on wildlife are only one of several impacts that have not been quantitatively measured. For example, some evidence indicates that livestock gains on crested wheatgrass seedings used in the spring are greater than they are on native pastures. Some workers view seedings as a major source of erosion and resultant siltation, but these impacts have not been quantified. Furthermore, the economic evaluation of seedings for environmentally related uses will await further study because no methods are available to either value or assess damages to wildlife species or watershed considerations such as siltation and riparian habitat (Nielsen and Hinckley 1975, Godfrey 1983, Schuster and Jones 1983). As a result, seedings are not implemented because values are viewed as too high--or damages too large--as subjectively evaluated by range land decisionmakers.

Social Values

One of the most controversial issues associated with the establishment of seedings concerns their "social acceptability". Some interest groups view them as a "biological desert" while livestock operators generally view them very favorably. There may be biological reasons why the establishment of a monoculture[3] may be undesireable but there has been no quantitative evaluation of the social acceptance of seedings from an aesthetic point of view--except in the view of particular individuals. Evaluation of questions such as, 'Who objects to seedings and why?' needs to be carefully done.

Measurement of Benefits and Costs

Unfortunately, one reason for the variability in the reported results from seedings stems from the improper use of economic methodology (Godfrey and Torell 1984). For example, Gardner (1963) reviewed four of the early studies and concluded that much of the reported variability was due to the use of improper methods of economic analysis.

It must be remembered however, that seedings are only one of many types of forage used by wild and domestic animals and that the need for other types of forage may be greater. This suggests that any economic evaluation of the payoff from seeding an area must be done within a framework that considers the need for this type of forage as opposed to other types (see Torell et al. [1985] for an example of this issue).

CONCLUSIONS

The economic studies that have evaluated the benefits and costs of seeding an area to crested wheatgrass indicate there is considerable variation in the "payoff" that could be expected from a seeding, and that some of the information for a complete analysis has been and remains unknown. Most studies do indicate however, that the benefits are greater than the costs if seedings are used in a manner that captures their comparative advantages.

While crested wheatgrass seedings should not be viewed as a panacea, they tend to be relatively profitable investments.

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[1] This is generally referred to in the economic literature as diminishing marginal productivity--capital in this case.

[2] This is only one of many cases that could be cited and should not be interpreted as a particular criticism of the managers of the Wells, Nevada District.

[3] Some may question whether a crested wheatgrass "monoculture" is better or worse than a sagebrush or juniper "monoculture".

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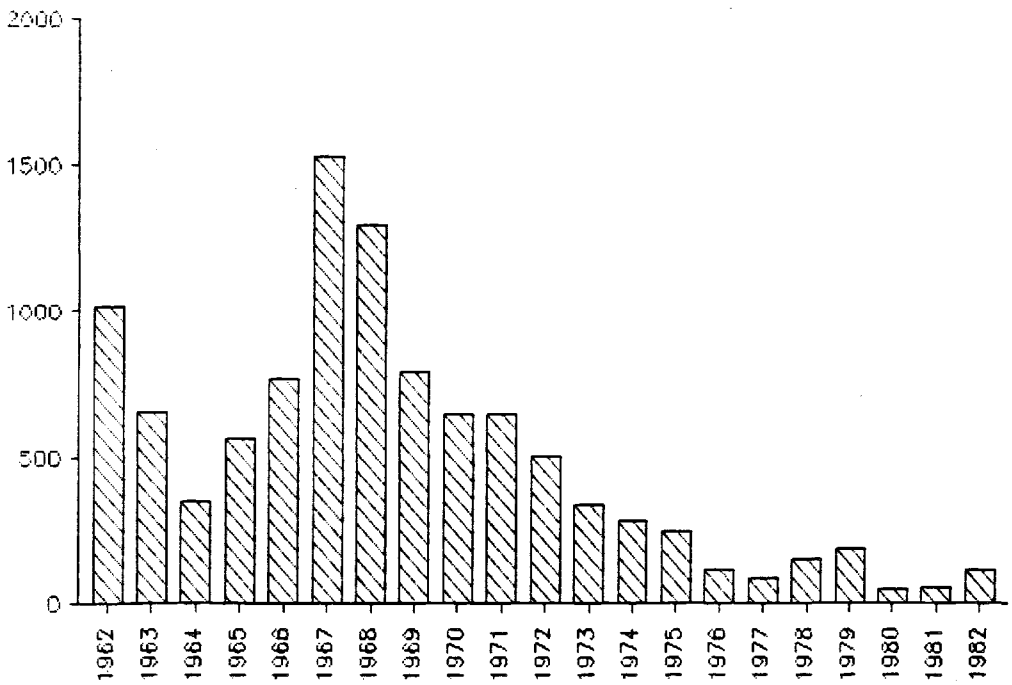

Figure 1.--Number of reservoirs on BLM lands, 1962-1982 (USDI Bureau of Land Management 1962-82).

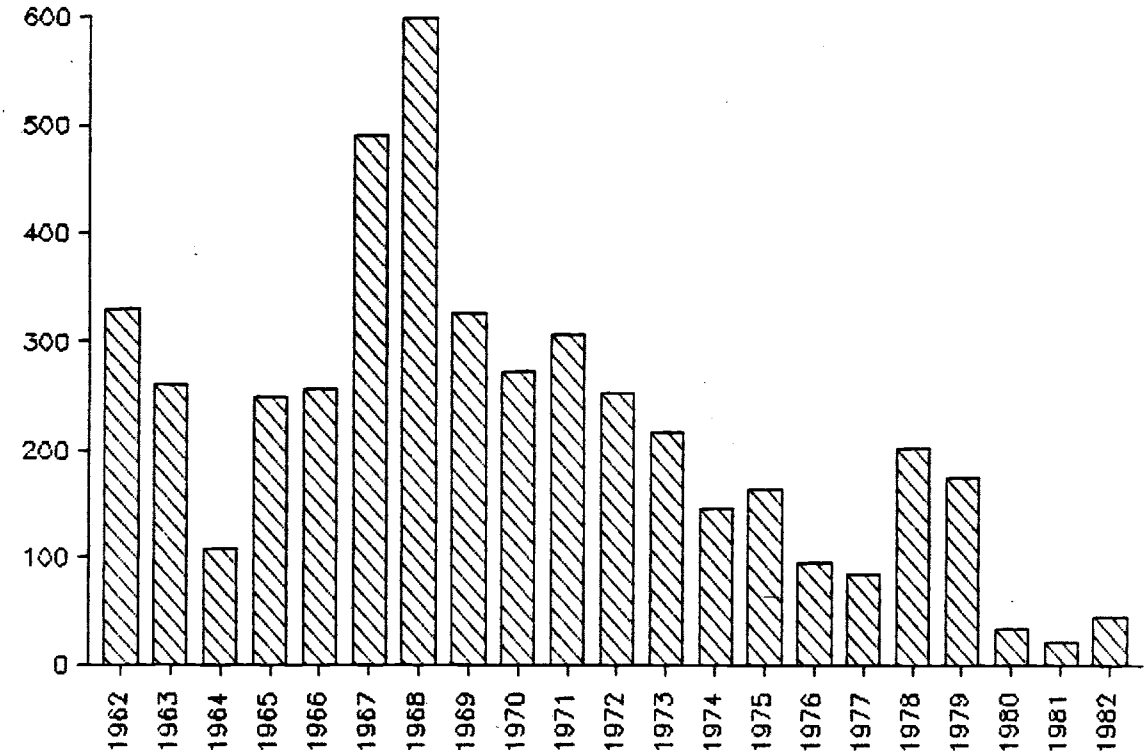

Figure 2.—Number of springs on BLM lands, 1962-1982 (USDI Bureau of Land Management 1962-82).

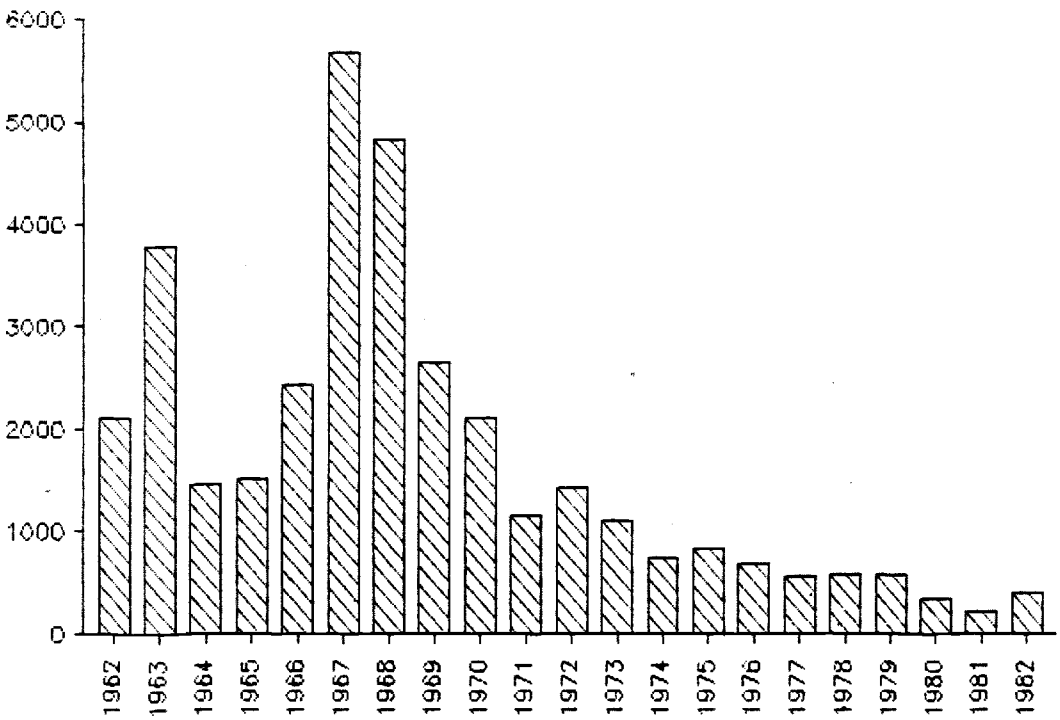

Figure 3.—Miles of fencing on BLM lands, 1962-1982 (USDI Bureau of Land Management 1962-82).

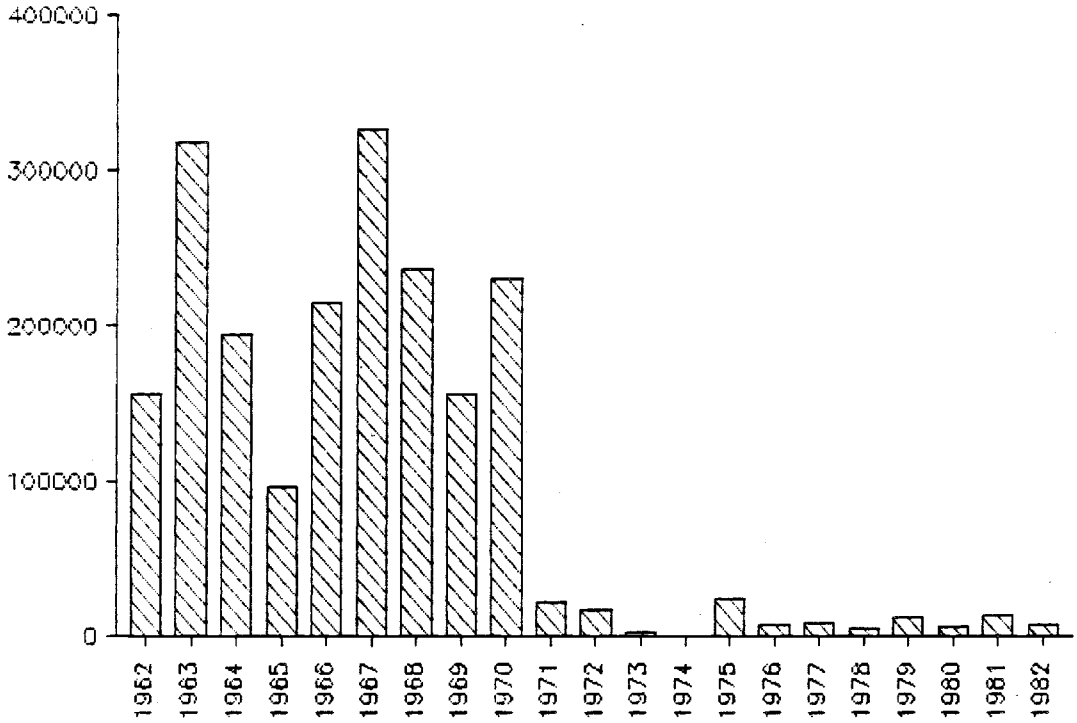

Figure 4.--Acres of brush control on BLM lands, 1962-1982 (USDI Bureau of Land Management 1962-82). Data not available for 1974.

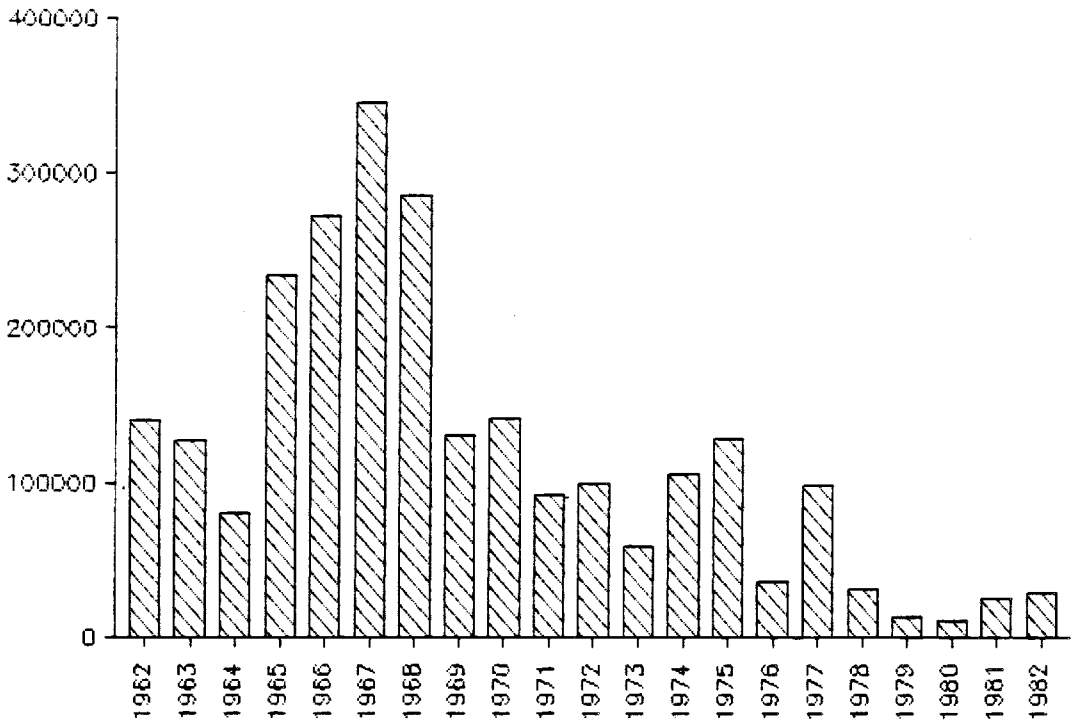

Figure 5.--Acres of seeding on BLM lands, 1962-1982 (USDI Bureau of Land Management 1962-82).

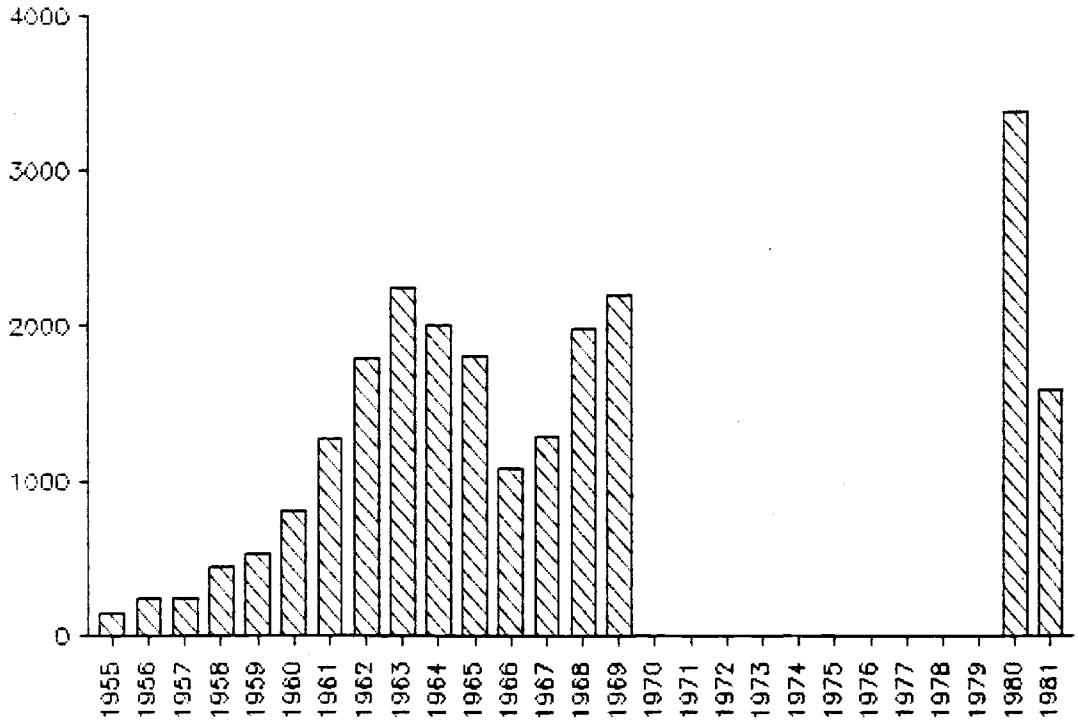

Figure 6.—Miles of fencing on Forest Service lands, 1955-1981. (USDA Forest Service 1955-81). Data not available for 1970-79.

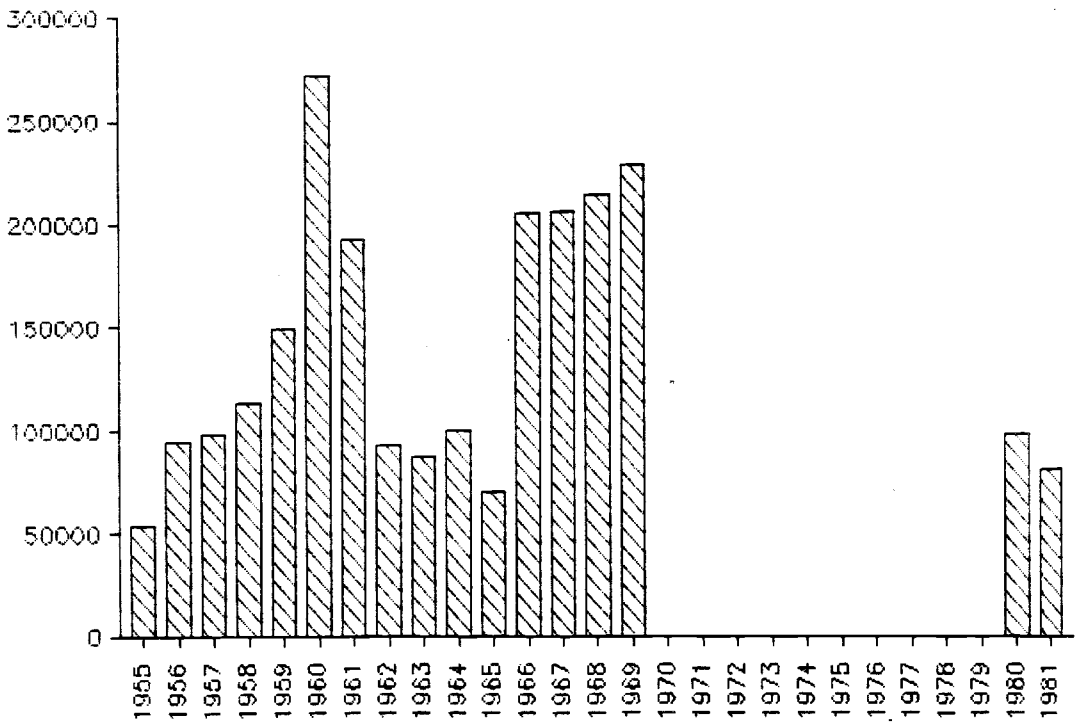

Figure 7.--Acres of cover manipulation on Forest Service lands, 1955-1981. (USDA Forest Service 1955-81). Data not available for 1970-79.

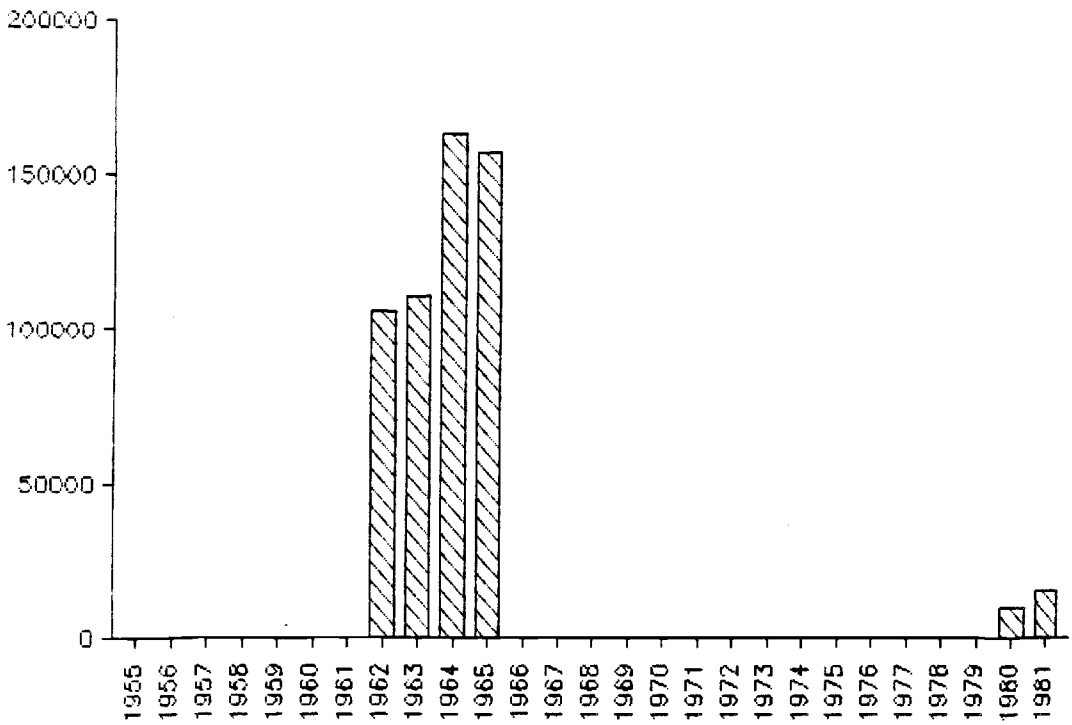

Figure 8.--Acres of range plant control on Forest Service lands, 1955-1981. (USDA Forest Service 1955-81). Data not available for most years.

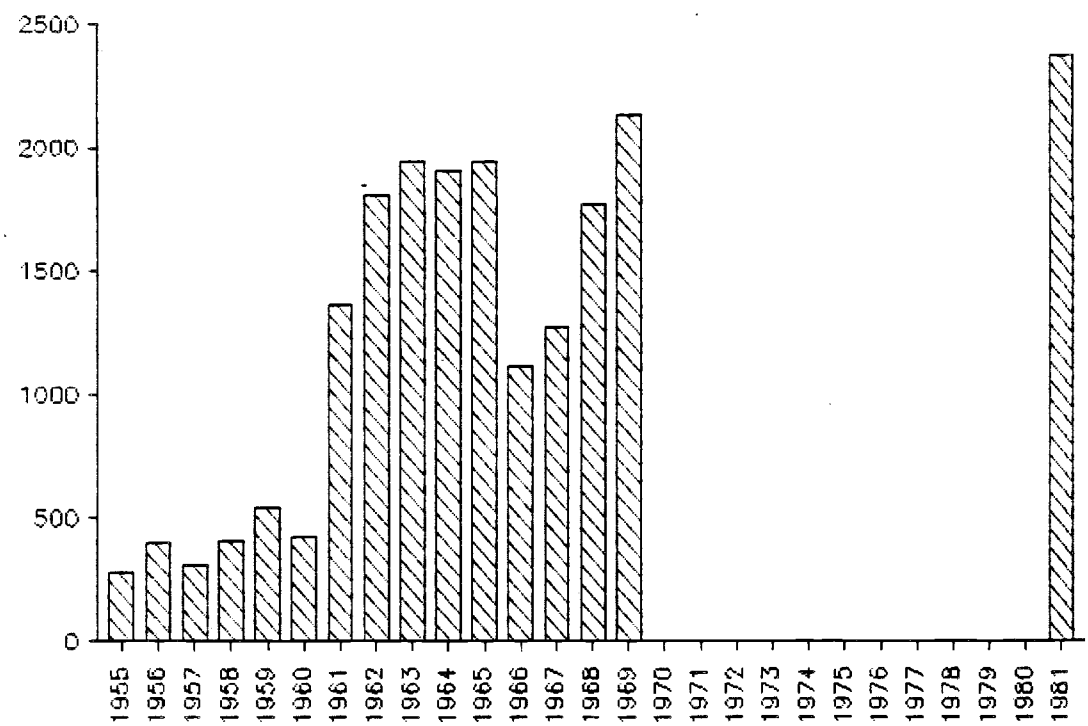

Figure 9.--Number of water developments on Forest Service lands, 1955-1981. (USDA Forest Service 1955-81). Data not available for 1970-80.

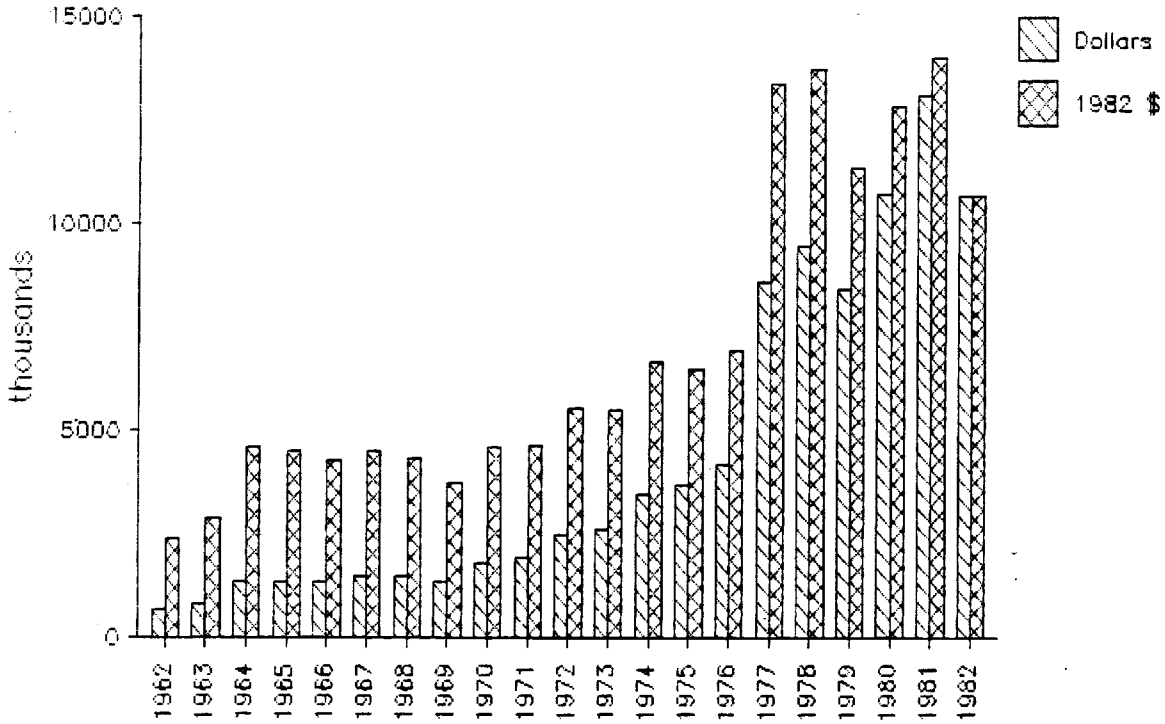

Figure 10.--Appropriations for range improvements on BLM lands (USDI Bureau of Land Management 1962-82).

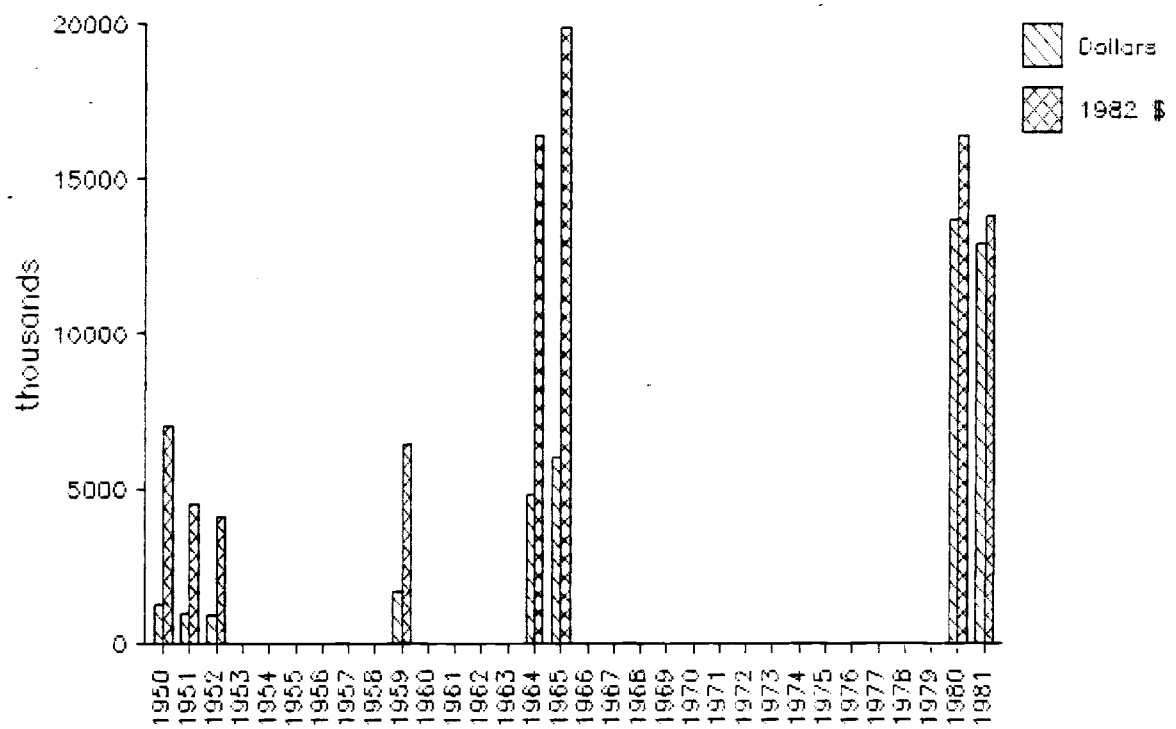

Figure 11.--Appropriations for range improvements on Forest Service lands (USDA Forest Service 1950-81). Data not available for most years.