

# Comparison of forage value on private and public grazing leases

LARRY W. VAN TASSELL, L. ALLEN TORELL, NEIL R. RIMBEY, AND E. TOM BARTLETT

*Authors are professor, Dept. of Agricultural Economics, University of Wyoming, Laramie, Wyo. 82071, professor, Dept. of Agricultural Economics, New Mexico State University, Las Cruces, N.M. 88003, professor, Dept. of Agricultural Economics and Rural Sociology, University of Idaho, Caldwell, Ida. 83605, and professor, Dept. of Rangeland Ecosystem Science, Colorado State University, Ft. Collins, Colo. 80523.*

## Abstract

Federal land grazing fees have been set by a formula that uses a base rate developed from a 1966 study comparing total grazing costs on private and public lands. A similar market comparison was recently conducted in Idaho, New Mexico, and Wyoming. Total grazing costs were gathered through personal interviews from 258 ranchers using 245 public grazing permits and 149 private leases. Public land grazing permit values were also estimated in each state. This study demonstrated that many public land ranchers have been willing to pay more for grazing than the apparent value implied from the private forage market. With the 1992 grazing fee of \$1.92/animal unit month (AUM), 34% of Bureau of Land Management (BLM) cattle producers, 62% of U.S. Forest Service (USFS) cattle producers, 60% of BLM sheep producers and 92% of USFS sheep producers paid more for grazing public lands than did those grazing privately leased lands. Estimated forage values averaged \$3.63/AUM for cattle grazing BLM land, and were negative for cattle using USFS lands and for sheep using both BLM and USFS allotments. Using a 3.35% interest rate to amortize permit value, the annual value of public land forage was estimated to be from \$3 to \$5/AUM. Doubts were cast about the standard assumptions that ranchers have profit maximization as their primary goal, that permit value measures only excess forage value, and that sufficient private leases are available for a valid comparison between private and public forage markets.

**Key Words:** grazing fees, permit value, profit maximization, public land policy, land use

Fees for grazing public lands were first assessed in 1906 by the U.S. Forest Service (USFS) and in 1936 by the Bureau of Land Management (BLM). The authorization to graze livestock on federal lands was controlled by issuing grazing permits to those who could meet the "prior-use" and "commensurability" requirements. To encourage use and private investment on the range-

lands the original permits were freely given to ranchers, with grazing fees set at low levels. The difference between the cost of utilizing federal rangelands and the value of the forage was quickly capitalized into the value of the base ranch (Roberts 1963).

Since the first administered grazing fee, numerous attempts have been made to establish a fair market price for public land forage (Kearl 1989). Because federal grazing fees are set by a formula and are not open market transactions between willing buyers and sellers, no direct estimate of market value is obtainable and indirect valuation procedures are necessary. One method frequently used is to compare grazing fees on public lands to private land lease rates. Private land lease rates were used to imply the value of National Forest lands as early as 1915 (Rachford 1924). Recent federal grazing fee studies have relied on market price comparisons to establish forage value. Grazing fee studies conducted during the 1960's (USDA/USDI 1977) and 1980's (Obermiller 1992) compared the total cost of grazing public and private lands. Studies conducted in the 1980's (USDA/USDI 1986) and updated in 1992 (USDA/USDI 1992) used a market rental appraisal of private land leases to imply forage value. LaFrance and Watts (1995) also used the private grazing market to examine forces that influence private grazing fees across western states and draw implications to public grazing policy. A main inference of these studies was that considerable variation exists in forage value both within and between selected areas.

The objective of this study was to examine the value of public forage in Idaho, New Mexico, and Wyoming by comparing the total costs of grazing public and private leases (total cost approach). A further objective was to examine the value of federal grazing permits in each state and compare the capitalized value of permits with the forage value obtained from the total cost approach. This second objective not only provides an estimate of the rancher's "willingness-to-pay" for federal forage, but also provides a verification on the theoretical "correctness" of the total costs approach.

## Theoretical Justification

The theoretical justification for using the private forage market to imply equitable federal land grazing fees is founded in economic models developed in the 1960's at Utah State University (Roberts 1963, Jensen and Thomas 1967, Nielsen and Wennergren 1970). The "Utah model" assumes private and public

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land forage are direct substitutes and that the marginal productivity of the 2 inputs are equal (Nielsen and Wennergren 1970). This implies the amount a profit maximizing rancher should be willing to pay for the 2 types of forage would also be equal.

The marginal factor costs of grazing leased land are comprised of fee (FEE) and non-fee (NFEE) costs. Fee costs are the fees paid to the lessor for the forage utilized and services provided. Non-fee costs are supplementary costs incurred by the lessee to utilize the leased forage. Examples of non-fee costs are transportation of livestock to the lease site, maintenance of fences and facilities, and care of livestock while on the lease.

The total cost approach of determining the value of federal forage compares the fee and non-fee costs of grazing both private and public rangelands. Theoretically, it is the marginal factor costs of the forages, or the amount the rancher was willing to pay for grazing the last unit of forage, that should be equated. What is obtainable from ranchers is their current level of production and the total cost of grazing the allotment. Grazing fees derived from the total cost approach have therefore been based on average rather than marginal costs (USDA/USDI 1977).

To apply the total cost method, total costs of grazing public lands (excluding the grazing fee) are subtracted from the total costs of grazing private lands (including the lease rate) to estimate the grazing fee that equates total grazing costs on private and public lands. This is equivalent to equating costs of utilizing public grazing to private grazing costs by adjusting the public land grazing fee. The estimated grazing fee would be

$$FEE_{public} = (FEE_{private} + NFEE_{private}) - (NFEE_{public}). \quad (1)$$

Estimation of the variables defined in equation [1] resulted in the \$1.23/AUM base charge established in the Public Rangeland Improvement Act of 1978 (PRIA) fee formula<sup>1</sup>. The estimated difference in total grazing costs (\$1.23/AUM) was considered to be the "average" grazing fee that should be charged to equate grazing costs (USDA/USDI 1977).

It should be noted that valuing forage by comparing total grazing costs does not provide a direct estimate of net forage value, but rather an estimate of the net value of public land grazing. Total private grazing costs define the amount willingly paid for the total grazing package, including services. Subtracting non-fee grazing costs on public lands from this amount results in an estimate of the amount that could be paid for public land forage while maintaining total private and public grazing costs at the same level.

The fee charged to graze public land has historically been less than the value of its marginal product and the rancher who had access to federal land grazing realized a surplus economic value known as permit value. Permit value (PERMIT) is said to be the capitalized cost advantage that public land ranchers have over those grazing on private lands or

$$PERMIT_{public} = \frac{(FEE_{private} + NFEE_{private}) - (FEE_{public} + NFEE_{public})}{r} = \frac{COSTADV}{r} \quad (2)$$

This capitalization formula calculates the present value of a perpetual flow of any cost advantage (COSTADV) that may accrue from grazing on public lands. This formula is sensitive to the capitalization or interest rate, *r*, that is assumed. The greater the *r*, the smaller the present value of the perpetual flow. The cap-

italization formula also assumes the decision maker has an infinite planning horizon and determines the permit value accordingly. A finite planning horizon would suggest a smaller permit value. An infinite planning horizon is typically justified even when a rancher maintains the permit for a finite time since the rancher can sell the rights to utilize the permit. The capitalization formula would not be valid if the rancher anticipated the grazing rights would be appropriated by the federal government without just compensation.

Because access to grazing is embodied in the grazing permit, the surplus value became a marketable item that was transferred when the permit was sold (Nielsen and Wennergren 1970). As the cost differential between grazing public and private lands fluctuates, in the presence of a competitive market, the changing value of the grazing permit theoretically eliminates the cost advantage that public land ranchers have. When a public land rancher buys the grazing permit, total grazing costs are equated and the cost advantage is eliminated (Workman 1988; Torell and Doll 1991).

Obermiller (1992) argued that permit value is not a capitalized cost advantage, but rather the capitalized value of cost savings realized through economies of size when federal grazing permits are attached to the ranch unit. Complementarity between different seasonal forage sources is also cited as a reason for permit value. Some combination of these factors may be appropriate.

Because grazing permits can be purchased and sold<sup>2</sup>, a direct estimate of the annual value of public land grazing can be obtained by computing a rate of return on grazing permit investment and adding this to the current grazing fee (Nielsen and Wennergren 1970). This can be seen by rearranging equation [2] as

$$COSTADV = PERMIT_{public} \times r \quad (3)$$

and then adding COSTADV to the current grazing fee to obtain the annual value of public land grazing. This procedure gives a site-specific estimate of forage value while directly considering the costs, forage quality, level of improvement, and characteristics of specific public land ranches. More productive and/or lower cost ranches should theoretically have a higher valued grazing permit, implying a higher forage value.

### Theoretical Inference

If permit values arise only because of a capitalized cost advantage for public land grazing, determining the annual forage value from permit values should provide a verification of the forage value determined from the total cost approach. However, if permit values are influenced by factors other than expected livestock returns, valid estimates of forage value will not necessarily be obtained using this method. Jensen and Thomas (1967) found that factors associated with grazing cattle on public ranges explained only 55% of the variation in permit sales value. Similarly, Torell and Doll (1991) found that permit values have not provided a consistent estimate of the value of public land forage. They found that permit values contributed more to the value of the ranch in the early 1980's than the capitalized cost advantage of public land grazing would justify. After 1987, public lands contributed less to the value than the simple capitalization formula would suggest. Thus, permit values may not be a sensitive and consistent indicator of forage value.

## Approach

To identify public and private grazing costs, a survey of ranchers in Idaho, New Mexico, and Wyoming was conducted. Non-fee grazing cost data were gathered on the cost items identified in the 1966 grazing fee study (Refer to Table 1 for a listing of cost items. A more detailed variable description of the study design is provided in Torell et al. (1993) and Bartlett et al. (1993)).

Range improvement investments (development depreciation) on public lands were determined from BLM and USFS records and from the interview process. Only the rancher's share of cost was considered and investments on non-federal land were prorated by the percentage of time or use on the federal allotment.

### Sampling Procedures

A random sample of public permittees and private lessees in the 3 states were personally interviewed to solicit estimates of fee and non-fee grazing costs. Lists of public land permittees were obtained from BLM and USFS records for each state. Lists of private forage lessees were available from prior grazing lease surveys, from USDA/National Agricultural Statistics Service, stock-grower organizations, and County Extension faculty.

Surveys were conducted in the 3 states during October through December 1992. The grazing cost data were obtained from 77 ranchers in Idaho, 85 ranchers in New Mexico, and 99 ranchers in Wyoming. The three-state data base included information on 173 BLM allotments, 72 USFS allotments, and 151 private leases.

Of the federal allotments surveyed, 44 provided grazing for sheep. Sheep grazing on private rangeland was not common. The survey included only 3 private sheep leases in Idaho, 3 in New Mexico, and 9 in Wyoming. Recognition of limited sample size should be given when interpreting sheep grazing costs and forage values.

### Statistical Analysis

Total grazing costs were calculated for each lease using the labor and mileage rates and other assumptions detailed in Bartlett et al. (1993). Total costs were converted to a \$/AUM value and non-fee grazing costs were spread over all AUMs on the allotment or lease, regardless of land ownership.

Grazing cost calculations and analysis were completed using appropriate statistical routines found in the SAS statistical program (SAS Institute, Inc. 1988). Variation in grazing costs were analyzed using an unbalanced analysis of variance (ANOVA) with a three-way design and interaction. Differences in the size of leases and sample size between states and classes of livestock were accounted for in the least squares means (LSM) computed with the statistical models. Forage value estimates are presented as mean values followed by 90% confidence limits about the mean. A more complete description of the model used in the analysis is given in Bartlett et al. (1993).

### Permit Values

Ranch sales data were collected in Idaho and Wyoming from Farm Credit Services (FCS) for the period 1986 through 1992. Summary statistics were compiled from 129 BLM and 38 USFS permit ranch sales in Idaho, and 290 BLM and 35 USFS sales in

Wyoming. Sales data compiled included an appraiser's allocation of the contribution that public and state AUMs made to the market value of recent ranch sales. These estimates of permit value were recorded from FCS sales sheets and averaged over the 1986-92 period. The reported averages were weighted by the number of federal AUMs leased.

A previously developed land value model was used to estimate New Mexico grazing permit values. The model used FCS ranch sales data for 1987 through March 1993. Average 1992 permit values were determined using the estimated regression equation developed from 378 ranch sales (Torell and Kincaid 1996). This was done by estimating the January 1992 market value of a 300 AUY ranch totally dependent on BLM or USFS for grazing capacity. The regression model has historically given permit values consistent with the appraisers values used to obtain permit values for Idaho and Wyoming (Torell and Fowler 1986).

Using the permit value approach, annual forage value was estimated by multiplying average permit values by a capitalization rate of 3.35% and adding this to the 1992 grazing fee of \$1.92/AUM. The result is the annual amount that ranchers have paid in the market place for public land grazing (Torell and Doll 1991). The 3.35% capitalization rate is consistent with long-term rates of return realized from western public land ranches (Agee 1972, Madsen et al. 1982, Workman 1986). Obviously, annual forage value will vary considerably depending on the interest rate. This is a limitation of using permit values to imply forage value.

## Results

### Three-State Average Grazing Costs

Grazing costs were estimated for BLM and USFS allotments, and compared to costs for private leased lands in the 3 states (Table 1). Different cost categories are shown for both cattle and sheep. They were estimated across states after adjusting for differences in lease size through the ANOVA process. Total non-fee grazing costs were estimated to be \$15.41/AUM for cattle on BLM, \$21.89 for cattle on USFS, \$23.23 for sheep on BLM, and \$32.68 for sheep on USFS. By comparison, the same costs on private leased lands totalled \$19.04/AUM for cattle and \$20.46/AUM for sheep, including the private land lease rate.

Nearly all cost categories were significantly higher on public lands than on private leased lands (Table 1). This is consistent with the perception commonly expressed by public land ranchers that non-fee costs for grazing public lands are higher than on private lands. Major cost items for private and public land grazing included lost animals, moving and herding livestock, salt and feed, and range improvement maintenance. The private lease rate averaged \$7.71/AUM for cattle producers and \$7.18/AUM for sheep producers. The lease rate was a major part of the total cost of grazing on private leased lands, accounting for over 34% of total grazing costs. Total grazing costs were statistically different between private and public cattle producers and between private and USFS sheep producers (Table 1).

### BLM vs. USFS

As previously noted, cattle grazing costs were estimated to be higher on USFS land than BLM administered land (Table 1). This is similar to what Obermiller (1992) found for eastern Oregon

**Table 1. Average grazing costs per AUM on BLM, USFS, and private leased lands in Idaho, New Mexico, and Wyoming combined (adjusted for differences in lease size), 1992.**

	Cattle			Sheep		
	BLM	USFS	Private	BLM	USFS	Private
Sample size (n)	141	60	134	32	12	15
Lost animals	3.09 <sup>a</sup> (0.31)	4.49 <sup>b</sup> (0.41)	2.10 <sup>c</sup> (0.28)	5.16 <sup>b</sup> (0.69)	6.05 <sup>b</sup> (0.95)	2.63 <sup>a,c</sup> (0.87)
Association fees	0.20 <sup>a</sup> (0.08)	1.07 <sup>c</sup> (0.10)	0.01 <sup>b</sup> (0.07)	0.17 <sup>a</sup> (0.17)	0.00 <sup>b</sup> (0.24)	0.00 <sup>a,b</sup> (0.22)
Veterinary	0.08 <sup>a</sup> (0.03)	0.12 <sup>a</sup> (0.04)	0.12 <sup>a</sup> (0.03)	0.16 <sup>a</sup> (0.07)	0.37 <sup>b</sup> (0.10)	0.20 <sup>a</sup> (0.09)
Moving livestock	2.61 <sup>a</sup> (0.29)	4.49 <sup>b</sup> (0.38)	1.93 <sup>c</sup> (0.26)	3.97 <sup>b</sup> (0.64)	5.97 <sup>d</sup> (0.88)	2.51 <sup>a,b,c</sup> (0.81)
Herding	3.63 <sup>a</sup> (0.37)	5.00 <sup>c</sup> (0.49)	2.94 <sup>a</sup> (0.33)	7.30 <sup>b</sup> (0.83)	13.49 <sup>d</sup> (1.13)	3.05 <sup>a</sup> (1.04)
Misc. labor and mileage	0.61 <sup>a</sup> (0.08)	0.77 <sup>a</sup> (0.10)	0.18 <sup>b</sup> (0.07)	0.73 <sup>a</sup> (0.17)	1.13 <sup>c</sup> (0.23)	0.34 <sup>a,b</sup> (0.21)
Salt and feed	1.41 <sup>a</sup> (0.27)	1.12 <sup>a</sup> (0.36)	1.80 <sup>a</sup> (0.24)	1.81 <sup>a</sup> (0.60)	1.06 <sup>a</sup> (0.82)	1.53 <sup>a</sup> (0.75)
Water	0.47 <sup>a</sup> (0.07)	0.24 <sup>b</sup> (0.09)	0.11 <sup>b</sup> (0.06)	0.51 <sup>a,b</sup> (0.16)	0.38 <sup>a</sup> (0.22)	0.16 <sup>a,b</sup> (0.20)
Horse	0.22 <sup>a</sup> (0.03)	0.45 <sup>b</sup> (0.04)	0.15 <sup>a</sup> (0.03)	0.34 <sup>a</sup> (0.07)	0.78 <sup>c</sup> (0.10)	0.22 <sup>a</sup> (0.09)
Improvement maintenance	2.86 <sup>a</sup> (0.29)	3.41 <sup>a</sup> (0.37)	1.84 <sup>b</sup> (0.25)	2.33 <sup>a,b</sup> (0.63)	2.26 <sup>a,b</sup> (0.86)	2.22 <sup>a,b</sup> (0.79)
Development depreciation						
Federal land	0.30 <sup>a</sup> (0.03)	0.39 <sup>d</sup> (0.04)	0.00 <sup>c</sup> (0.03)	0.14 <sup>b</sup> (0.07)	0.24 <sup>a,b,d</sup> (0.10)	0.02 <sup>b,c</sup> (0.09)
Private land	0.16 <sup>a</sup> (0.05)	0.07 <sup>a</sup> (0.06)	0.15 <sup>a</sup> (0.04)	0.11 <sup>a</sup> (0.11)	0.02 <sup>a</sup> (0.15)	0.22 <sup>a</sup> (0.13)
Other costs	0.23 <sup>a</sup> (0.09)	0.50 <sup>c</sup> (0.11)	0.11 <sup>a</sup> (0.08)	1.01 <sup>b</sup> (0.19)	1.89 <sup>d</sup> (0.26)	0.35 <sup>a</sup> (0.24)
Private land lease rate	—	—	7.71 <sup>a</sup> (0.34)	—	—	7.18 <sup>a</sup> (1.07)
Total cost	15.41 <sup>a</sup> (0.99)	21.89 <sup>b</sup> (1.30)	19.04 <sup>c</sup> (0.88)	23.23 <sup>b</sup> (2.19)	32.68 <sup>d</sup> (3.00)	20.46 <sup>b</sup> (2.74)
Forage Value	3.63 ± 2.42 (1.47)	-2.86 ± 2.59 (1.58)		-2.77 ± 6.22 (3.71)	-12.22 ± 6.94 (4.07)	

**Note:** Means on the same row followed by the same letter are not statistically different at P = 0.10. The number in parenthesis is the standard error of the mean. Individual cost items may not add up to the total cost because the mean for each cost item was estimated using an independent linear statistical model and is not the simple average for the cost category. Least-squares or adjusted means are presented which give the average value had there been a balanced design for class variables and with all covariates set at their mean value (SAS 1989, p. 948). Forage value is shown as the mean value with 90% confidence limits about the mean.

where, on average, utilization of USFS land was the most expensive lease, followed by private land, and then BLM. The 1966 grazing cost survey did not find USFS grazing costs to be higher than private land leases when averaged across all forests and BLM districts. Part of the reason for this insignificance was the considerable variation that was found within a forest and region. The 1966 study found the average cost of grazing USFS land was \$0.62/AUM higher than BLM land, but again, this difference was not statistically significant (Houseman et al. 1968. Special report on the grazing fee survey. Unpublished Report. USDA/Statistical Reporting Service).

Major cost categories explaining the higher cost of grazing USFS lands included lost animals, association fees, moving and herding livestock, miscellaneous labor, vehicle expenses, and horse costs. Other cost categories, including miscellaneous expenses and development depreciation on federal lands, were significantly higher on USFS administered lands in some cases but contributed little to the higher cost of USFS grazing.

Several explanations are possible for the relatively high cost estimated for grazing USFS lands and the negative estimate of forage value for these lands.

1. Private leases included in the grazing cost survey were considered comparable to BLM and state trust lands with respect to proximity and physical characteristics. However, few leases were found that were directly comparable to USFS lands with respect to vegetation types, climate, and water resources. Had similar substitutes been identified for USFS grazing, the value of private lease costs might have been higher than the non-fee costs of using USFS grazing.
2. If the estimated cost of using USFS lands is correct, USFS permittees are spending more to graze than ranchers who use private lands. This would suggest that USFS permits should have low or zero value. The total cost approach, though, may not capture all elements of value associated with USFS permits. For example, USFS permittees may be willing to pay higher costs to graze in scenic remote areas and maintain a

way of life or accept a below-market wage rate and return on investment (Bartlett et al. 1989, Harper and Eastman 1980, Smith and Martin 1972).

3. In New Mexico, some of the cost increases could be explained by culture and the high value placed on the agrarian way of life. Of the 21 USFS ranchers interviewed in New Mexico, 10 had relatively small herds and were Hispanic ranchers, mostly in north-central New Mexico. Grazing costs, especially the value of unpaid family labor, were higher for these individuals.
4. Market-price comparisons for valuing forage assumes ranchers have numerous alternatives available to them. Private and public forage are assumed to be direct substitutes. In reality, most private forage sources remain leased and federal leases are not accessible to the general public unless transferred with the base ranch. Ranchers are therefore forced to use higher-cost alternatives (e.g., USFS allotments) if they want to be in the livestock business. However, this does not mean that ranchers who utilize USFS forage are losing money or are not profitable, only that their costs are higher on average.

### Cattle vs. Sheep

The total cost of grazing sheep on public lands was significantly higher than for cattle. When the values in Table 1 are weighted by the number of AUMs and averaged for federal lands, the total cost of grazing sheep on public land was estimated to average \$7.72/AUM more than grazing cattle on public land and \$1.42/AUM more for private-land sheep producers compared to private-land cattle producers.

Sheep grazing costs were also the most variable. Because of this variability and the relatively small sample size for sheep producers, especially on private lands, the confidence intervals estimated for sheep forage values are over twice that estimated for cattle production. As shown in Table 1, some of the variability is explained by differences between BLM and USFS.

### Permit Value

Table 2 shows estimated permit values for Idaho, New Mexico, and Wyoming and the 1992 forage value implied from these values. Average permit values ranged from \$36/AUM for BLM in Wyoming to \$89/AUM for BLM in New Mexico. BLM and USFS permit values were significantly different in Wyoming but not in Idaho or New Mexico. Implied forage value using the permit valuation method was highest in New Mexico (\$4.90/AUM for BLM and \$4.33/AUM for USFS). Forage value was estimated to be from \$3.00 to \$3.50/AUM for the permits in Idaho and Wyoming. Permits in New Mexico may be more expensive because of their yearlong use compared to the seasonal permits found in Idaho and Wyoming.

If, as economic theory suggests, permit value constitutes a surplus economic value created because the fee charged to graze public land has been less than the value of the marginal product (VMP) of the forage, the forage value obtained from the total cost approach should equal the amortized value of the permit (yearly surplus) plus the federal grazing fee. The theory appears to hold for BLM cattle permits as the forage value obtained from the total cost approach approximates the total value ranchers were willing to pay for the permit while also paying the federal grazing fee. For the remaining public leases, the total cost approach shows that public lands do not have a capitalized cost advantage over

**Table 2. Grazing permit value and forage value implied from average permit values in Idaho, New Mexico, and Wyoming (\$/AUM).**

State	Permit Value		Forage Value <sup>1</sup>	
	BLM	USFS	BLM	USFS
Idaho	37a (1.31, 129)	42a (2.71, 38)	3.16	3.32
New Mexico	89a	72a	4.90	4.33
Wyoming	36a (1.01, 359)	47b (3.47, 43)	3.13	3.50

**Note:** Permit value means in the same row that are followed by the same letter are not statistically different at  $P = 0.10$ . Means in the same column are not compared statistically. The numbers in parenthesis are the standard error of the mean and the sample size. The standard error is not shown for New Mexico because the mean value is estimated from a regression model.

<sup>1</sup> Estimated as permit value  $\times 3.35\%$  + \$1.92/AUM 1992 grazing fee.

grazing on private lands. By comparison, the permit value approach demonstrates that ranchers were willing to pay a premium for federal grazing permits in the land resource market. This dichotomy suggests permit values are comprised of more than a capitalized cost advantage for public land. As previously discussed, cost savings realized through economies of size, complementarity between different seasonal forage sources, or the utility a rancher receives from managing cattle in scenic remote areas may also contribute to permit value.

Theoretically, grazing fees equal to the forage value estimates in Table 2 should eliminate permit value. Yet, permit value estimates in New Mexico for state trust lands indicate this may not always be the case. Torell and Doll (1991) estimated that as New Mexico state land grazing fees went from \$1.60/AUM in 1986 to \$3.13/AUM in 1989 the value of state land grazing permits decreased by about \$30/AUM for every \$1/AUM increase in the fee. State land permits went from the most valuable permit to the least valuable permit in 6 years. New regression estimates indicate that New Mexico state land permits have recently increased in value relative to BLM and USFS (Torell and Kincaid 1996). This is true even though New Mexico state land fees are nearly double those on federal lands and USFS total grazing costs were estimated to be considerably higher than those on BLM land. Security of lease and certainty concerning fee policy and other public land policies, then, may be important considerations in determining the price paid for a public grazing permit.

### Discussion and Conclusions

A comparison to the private forage market has historically been used to estimate the value of public land forage. Results of this study indicate grazing values that equate public and private lease costs fall, with  $P = .10$ , between \$6.05 and \$1.21 for BLM cattle permits, -\$0.27 and -\$5.45 for USFS cattle, \$3.45 and -\$8.99 for BLM sheep, and between -\$5.28 and -\$19.16 for USFS sheep permits.

Theoretical justification for the total cost valuation method comes from the standard economic models and principles that describe the motives of profit maximizing firms (ranches). These methods are justified based on certain limiting assumptions: 1) ranchers are profit maximizers, 2) ranchers have at their disposal numerous alternative forage sources and leasing alternatives, 3) private and public forage are direct substitutes, and 4) rational and profit-motivated livestock producers are willing to pay a

price equal to the value of forage in production. If the competitive forage market were efficient, the capitalized value of the grazing permit would theoretically eliminate any cost differentials, thus equating the total cost of public and private grazing.

If only forage values for cattle grazing BLM land are considered, this economic scenario would appear to hold. Non-fee grazing costs on BLM lands were found to average \$3.63/AUM less than grazing costs on private leased lands after adjusting to the same lease size and averaging across all 3 states. Given the 1992 public land grazing fee of \$1.92/AUM, an excess value of \$1.71/AUM ( $\$3.63/\text{AUM} - \$1.92/\text{AUM} = \$1.71/\text{AUM}$ ) was apparently capitalized into a grazing permit value and ranchers were paying equal amounts for grazing public and private lands<sup>3</sup>. The implied permit value is consistent with the value found for BLM grazing permits using a capitalization rate of about 4.75% for Idaho and Wyoming, and 2% for New Mexico.

Negative forage value estimates for USFS and BLM sheep allotments do not support the total cost approach whereby grazing permit value is the factor that equates total grazing costs. In these cases, grazing costs were found to be higher, on average, than for private lands. Theoretically, profit-motivated ranchers should not be willing to pay more for grazing public lands if private leases are available at a lower cost. The fact that USFS permits and some sheep permits<sup>4</sup> continue to have a market value furthers the argument that comparison with the private market fails to account for several factors. The total cost approach requires one to make several assumptions that apparently are not valid. First, profit may not be the most important motive of public land ranchers. This is consistent with the results of Bartlett et al. (1989), Harper and Eastman (1980), Young and Shumway (1991), and Smith and Martin (1992). The implication is all livestock producers cannot be treated as profit maximizers since ranch resources generate both production and consumption outputs. Second, private leases may not be directly comparable to public leases in attributes that affect value. For example, the limited number of private leases that were truly comparable to USFS lands leads one to question the validity of the total cost approach in determining forage value for USFS lands. Third, in many areas of the west, private land is in short supply, leaving few economical alternatives to public land forage. Rejecting the total cost approach as a method of valuing forage does not mean that grazing cost comparisons that were made between private and public land ranchers are not useful. The cost differential for public and private leases has changed since the 1966 Western Livestock Grazing Survey. It was estimated that with the 1992 grazing fee of \$1.92/AUM, 34% of cattle producers on BLM land, 62% of USFS cattle producers, 60% of BLM sheep producers and 92% of USFS sheep producers paid more for grazing public lands than did those leasing private lands (Bartlett et al. 1993; Torell et al. 1993). Additional investments were also made to buy the grazing permit. The common belief that public land ranchers pay less on average than those leasing private lands is not true.

This study confirms results by Houseman et al. (1968). Special report on the grazing fee survey. Unpublished Report. USDA/Statistical Reporting Service), Obermiller (1992) and LaFrance and Watts (1995) that no singular value exists for federal forage. Results suggest that forage value varies by season of use, type of use, and other variables. As a result, any effort to determine a single value for federal forage is futile. Approaches that allow the value of forage to vary such as competitive bidding

have been suggested (Gardner 1963). LaFrance and Watts (1995) recommended the permanent transfer of grazing rights to current permit holders. They suggest privatization of permits would provide incentives for good stewardship and allow permits to be sold to parties who value them most.

Other methodologies such as linear programming or budgeting could be used to determine the value of specific forage types in an area, but results are sensitive to assumptions concerning the rate of return given to other resources used on the ranch. An effort to determine public grazing fees on a site-by-site basis using such modeling approaches would also be very expensive and time consuming.

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1. The PRIA fee formula is:


$$\text{Fee} = \$1.23 \left( \frac{\text{FVI} + \text{BCPI} - \text{PPI}}{100} \right)$$

The \$1.23 base forage value is the estimated difference in total fee and non-fee costs of grazing private and public rangeland using data collected by a 1966 Western Livestock Grazing Survey (USDA/USDI 1977, p. 2-22). The base is adjusted by annual changes in private grazing land lease rates (FVI), costs of beef production (PPI) and prices received for beef cattle (BCPI).

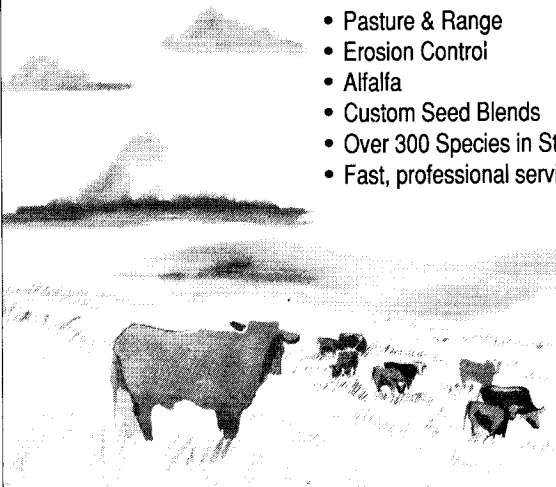
2. Gardner (1962) hypothesized that transfer restrictions for grazing permits including commensurate property and priority requirements impeded the market for grazing permits. Nielson and Wennergren (1970) and Torell and Doll (1991) concluded that even given these transfer restrictions a reasonable amount of competition exists and that a relatively free market exists for permits to graze public lands.

3. Much variability was found, however, and grazing cost estimates for individual grazing allotments ranged from -\$74/AUM to + \$20/AUM (Bartlett et al. 1993, Torell et al. 1993). Permit values also vary considerably.

4. It appears that some sheep permits do not have economic value. Vacant sheep allotments exist in nearly all of the western states. The uncertainty about grazing fee policy and other public land policies has reduced permit values (Torell and Doll 1991).



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