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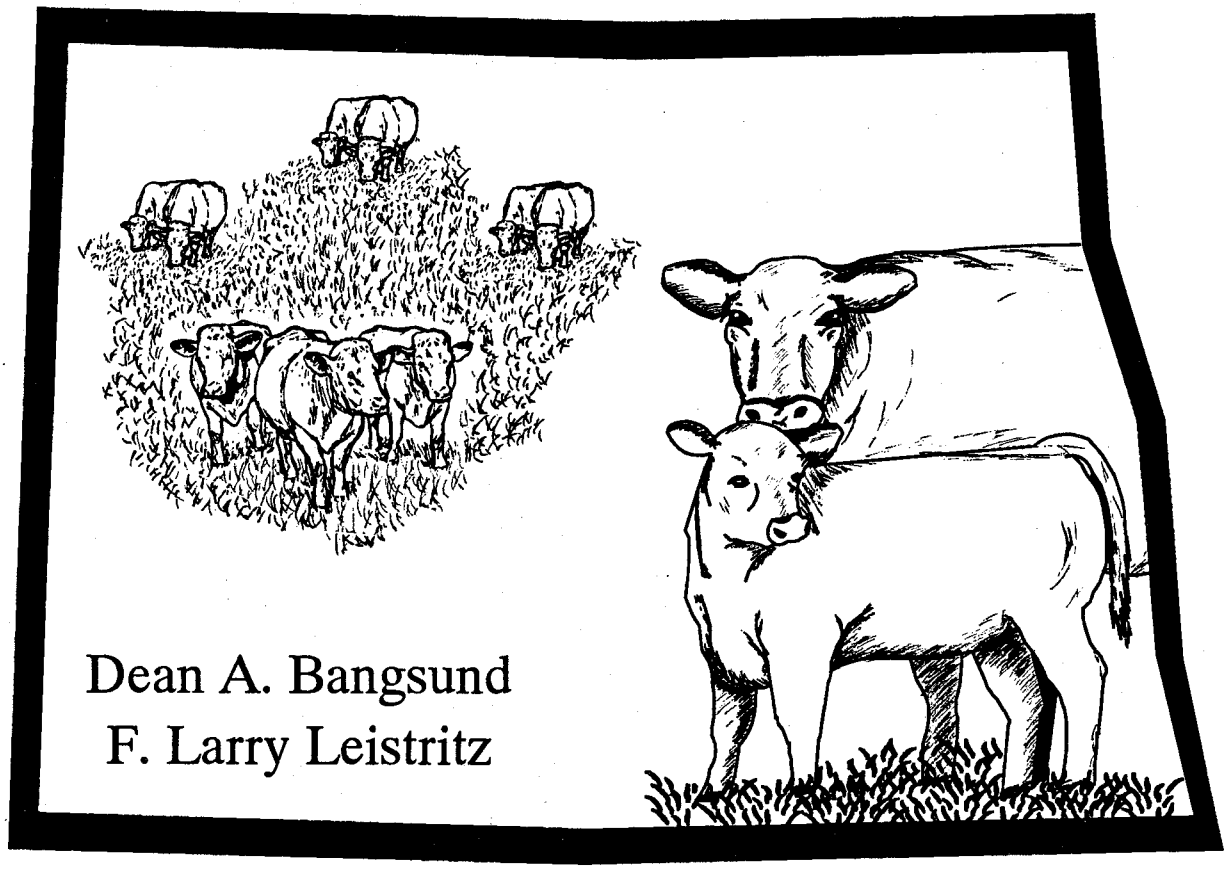
Contribution of Public Land Grazing to the North Dakota Economy



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HIGHLIGHTS

Agriculture has continued to be the single most important basic sector in the North Dakota economy, with 41 percent of total sales to final demand from 1985 to 1989. Sometimes forgotten in the importance of agriculture to the North Dakota economy is the contribution of the livestock sector, which is dominated by beef cattle production. A large portion of the state's cattle industry is dependent upon federal and state grazing land.

North Dakota had about 1.2 million acres of federally owned grazing land and 695,000 acres of state-owned grazing land in 1991. The U.S. Forest Service and the North Dakota State Land Department controlled over 93 percent of all public grazing land and over 95 percent of all public animal unit months (AUMs) in North Dakota in 1991. Most public grazing land, which provided over 14 percent of all AUMs in the state, is concentrated in the western third of North Dakota, with 65 percent of all public grazing land located in Billings, Bowman, Golden Valley, McKenzie, and Slope counties.

Public grazing land in North Dakota in 1991 supported 108,184 cows, which produced about 77,802 calves (excluding those retained for breeding stock), 20,364 replacement heifers, and 5,142 bulls. Based on selling half the calf crop at weaning and backgrounding the other half to 700 pounds, rancher returns to labor, management, and equity were estimated at about $17.6 million. An additional $32.1 million was generated in direct outlays for production inputs. Total direct economic impacts from public grazing in North Dakota in 1991 were estimated at $49.8 million.

The North Dakota Input-Output Model was used to estimate secondary economic impacts. The $49.8 million of direct impacts ($65/AUM grazed) generated an additional $103.6 million in secondary business activity and household income ($135/AUM grazed). Total economic impacts from public land grazing in North Dakota in 1991 were estimated at $153.4 million ($200/AUM grazed).

The livestock industry is an important economic base for many rural North Dakota communities and for the state economy. A substantial part of the livestock industry's economic activity can be attributed to public land grazing. The use of public land for grazing does provide economic activity for the livestock industry and, more importantly, provides substantial economic activity for many other sectors of the economy. The economic consequences of public land use alternatives are important in allocating public land outputs among multiple and/or competing uses.

Contribution of Public Land Grazing to the North Dakota Economy

Dean A. Bangsund and F. Larry Leistritz*

Agriculture has been the largest single component of North Dakota's economic base for several decades. During the 1980s, in the face of severe drought, reduced commodity prices, and reduced government program payments, agriculture continued to be the single most important basic sector in the North Dakota economy. The importance of agriculture to the North Dakota economy should not be overlooked, even though substantial real (effects of inflation removed) economic growth has occurred during the last 30 years in the energy ($24.8 million in 1959 to $1,187.9 million in 1989) and federal activities sectors ($213.7 million in 1959 to $2,646 million in 1989).

Even though other sectors of North Dakota's economy have increased dramatically, agriculture still comprised over 41 percent of total sales to final demand from 1985 to 1989 (Leistritz and Coon 1991). As a result, the economy of North Dakota still depends upon the agriculture sector for a large portion of its economic activity.

Often forgotten in the importance of agriculture to the North Dakota economy is the contribution of the livestock sector, which accounted for one-fourth of all agricultural sales to final demand or over 10 percent of all sales to final demand in the state from 1985 to 1989 (Leistritz and Coon 1991). Since beef cattle production dominates the livestock sector, the beef cattle industry is important to North Dakota's economy. Adjusted gross sales from beef cattle production comprised over 74 percent of all livestock sales from 1986 to 1990 (North Dakota Agricultural Statistics Service 1991).

A substantial portion of the state's cattle industry depends upon federal and state grazing land. Public grazing land comprises about 17 percent of all grazing land and supplies over 14 percent of the available animal unit months** (AUMs) of grazing in North Dakota. The economic importance of public grazing can be put into perspective since the cattle industry has averaged about $600 million of gross sales yearly in the state

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**An animal unit month (AUM) is an average figure of the amount of forage needed to feed one animal unit (AU) for one month. An AU is typically considered a mature cow weighing approximately 1,000 pounds or an equivalent grazing animal(s) based on an average feed consumption of 26 pounds of dry matter per day (Shaver 1977).

from 1986 to 1990 (North Dakota Agricultural Statistics Service 1991).

The importance of public grazing land to the cattle industry can be clearly seen; however, public land generates a number of products or potential products. Public land managers and policymakers are forced to balance competing demands on the resource. Effective management of public land requires information on the value of the products resulting from potential uses, as well as the trade-offs among competing uses.

Traditionally, public rangeland and national grasslands have been used primarily for livestock grazing; however, the land has other uses (e.g., tourism, recreation, wildlife habitat, energy development, minerals) which may be competitive, but not mutually exclusive. The allocation of public land to livestock grazing and other uses is determined through interested citizens interacting with the respective land agencies. Effective management of public land requires awareness of the benefits of public land grazing to the cattle industry and the benefits accruing to other sectors of the economy. Thus, information obtained from measuring the value of grazing on public land is important for managing and allocating scarce public resources among competing uses.

OBJECTIVES

The general objective of this study was to examine the economic contribution of public land grazing on the North Dakota economy. Specific objectives include:

1) quantifying the amount of public land grazing in North Dakota,

2) estimating the economic value of public land grazing to the livestock industry, and

3) estimating the total (direct and secondary) economic contribution of public land grazing to state and local economies.

PROCEDURES

The purpose of this study was to estimate the economic contribution of grazing public land to the North Dakota economy. An economic contribution analysis, as defined in this study, represents an estimate of all local expenditures associated with an industry (i.e., economic activity from grazing public land). An economic contribution analysis differs from an economic impact analysis, since the latter represents a net change in economic activity, versus a measure of total economic activity. The

economic contribution approach to estimating economic activity has been used for several similar studies in North Dakota (Coon and Leistritz 1988; Coon and Leistritz 1986; Coon et al. 1986; Mittleider and Leitch 1984).

Analysis of public land grazing in North Dakota required several steps. Discussion of the procedures used in this report was divided into four parts: (1) compilation of federal and state grazing acres, AUMs, and lease rates; (2) estimation of a cow herd supported by public grazing; (3) estimation of rancher income and production expenditures; and (4) application of input-output analysis to generate secondary impacts.

Public Grazing Capacity

First, the number of grazing acres leased by county, animal unit months (AUMs), and lease rates was obtained from federal and state government agencies. Second, since some agencies could not provide the number of AUMs grazed, rangeland carrying capacities obtained from Thompson et al. (1990) were applied to lease acres to estimate the number of AUMs grazed. Third, estimated AUMs were added to reported AUMs for each county to estimate the number of total AUMs. Finally, lease rates were used in conjunction with available AUMs to determine a value per public AUM by agency.

Cow Herd Production

The number of cows that could be grazed on the public AUMs was estimated using typical North Dakota cow-calf herd characteristics. The cow herd that could be supported from grazing public land represented a key component in the economic analysis. The method to estimate the cow herd size assumed three key factors: (1) availability of grazing land [i.e., available AUMs] is a major determinant of cow herd size; (2) ranchers will not substitute supplemental forage [i.e., baled hay, corn silage] for public grazing AUMs to maintain herd size in the absence of public grazing over extended periods; and (3) since predominately cattle graze public grazing land, all AUMs produced on public land were assumed to be used by cow-calf herds.

Several regulations affect the number of animals that can be grazed on United States Forest Service (USFS) land. In addition to limits on the number of animals grazed on USFS land, explicit terms and rules of management between the USFS and private parties include the amount of private land holdings of permittees, rules on ownership of animals, eligibility requirements of permittee applications, and transfers of grazing permits (Sheyenne Valley Grazing Association-United States Forest Service 1982). Similar agreements exist between other agencies

and private parties. The method of estimating cow herd size was assumed to be not influenced by agency grazing regulations.

Budget Analysis

A cow-calf enterprise budget analysis was used to estimate the production outlays associated with the herd(s) grazed on public land. The budget analysis included estimating livestock sales; feed expenses; variable production costs; fixed costs; and returns to labor, management, and equity. A cow-calf budget generator developed by Hughes et al. (1989) was used to estimate specific production expenses and returns.

The budget generator contains cash flow and economic cost sections for all expenses. Cash flow expenses represent actual "out-of-pocket" costs, and economic costs represent the opportunity cost of the resources used by the beef cow herd. For example, if a producer raises oats to feed the herd in a winter feeding program, the cost of raising the oats (tillage, seed, chemical) would be the cash flow expense. The price the producer could receive for oats at the local elevator would be the opportunity cost of using the oats for feed. Opportunity costs generated by the budget were used in this analysis.

Another budget was developed for backgrounding (i.e., the process of feeding weaned calves for a period to add weight before selling the animals) calves (i.e., those directly linked to grazing public land). Since the yearly calf crop may also be backgrounded, expenses and returns from those operations were estimated using information from the NDSU Extension Service (Aakre and Hughes 1991). Aakre and Hughes (1991) developed budgets for alternative marketing strategies involving the 1991 calf crop. The backgrounding budgets were based on different weaning weights, various rates of gain, and projected selling prices.

Input-Output Analysis

Input-output (I-O) analysis is a mathematical tool that traces linkages among sectors of an economy and calculates the total business activity resulting from a direct impact in a basic sector (Coon et al. 1985). The North Dakota I-O Model has 17 economic sectors, is closed with respect to households (which means that households are included in the model), and was developed from primary (survey) data from firms and households in North Dakota.

Economic activity from a project, program, or policy can be categorized into direct and secondary impacts. The direct impacts are those changes in output, employment, or income that represent the initial or direct effects of the project or

program. The secondary impacts (sometimes further categorized into indirect and induced effects) result from subsequent rounds of spending and respending within the economy. This process of spending and respending is sometimes termed the multiplier process, and the resultant secondary effects are sometimes referred to as multiplier effects (Leistritz and Murdock 1981).

Production expenses and returns from the cow-calf and the backgrounding enterprises were used as inputs for the North Dakota I-O Model. Actual production expenses were allocated to various economic sectors. The model was used to estimate the secondary effects on the various sectors of the North Dakota economy.

RESULTS

The following section is divided into three parts: (1) public grazing capacity, (2) direct economic impacts, and (3) secondary economic impacts. The amount and location of public grazing acres and AUMs in North Dakota are presented in the public grazing capacity section. Information on the direct impacts to ranchers and information on the total impacts (direct and secondary) to the state economy are included in the last two sections.

Public Grazing Capacity

Several state and federal agencies lease land for public grazing in North Dakota. Since no single agency had information on the extent of all leasing activity in the state, several government agencies were contacted. Federal agencies leasing land for public grazing in North Dakota include the U.S. Bureau of Land Management (BLM), U.S. Forest Service (USFS), U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, and U.S. Bureau of Reclamation. State agencies leasing land for grazing include the Parks and Tourism Department, Game and Fish Department, Forest Service, and State Land Department.

Two sources for acreage of grazing land in North Dakota were examined (U.S. Bureau of the Census 1989; U.S Department of Agriculture 1987). Estimates of grazing land acreage from the two sources were averaged because both sources contained obvious errors in county level estimates. North Dakota has approximately 11.5 million acres of grazing land (Appendix A). State and federal grazing land comprised about 17 percent of all grazing land in North Dakota in 1991 (Table 1). Federal and state agencies leased 64 percent and 36 percent of all public grazing land, respectively, in North Dakota in 1991. The USFS and the State Land Department collectively leased to others about 93 percent of all public grazing acres in North Dakota in 1991.

Public grazing accounted for 14.2 percent of the available AUMs in North Dakota in 1991 (Table 1). The State Land Department and the USFS collectively accounted for about 95 percent of the approximately 765,500 AUMs produced on public grazing land in North Dakota in 1991.

TABLE 1. PRIVATE, STATE, AND FEDERAL GRAZING ACRES AND ANIMAL UNIT MONTHS BY GOVERNMENT AGENCY, NORTH DAKOTA, 1991

Agency/Ownership	Acres	AUMs	Percent of Total Acres	Percent of Total AUMs
PRIVATE	9,572,467	4,626,485	83.3	85.8
STATE GOVERNMENT				
Parks and Tourism Department	342	235		
Forest Service	1,870	573		
Game and Fish Department	11,375	5,261		
State Land Department	681,858	354,370		
Total State	695,445	360,439	6.05	6.68
FEDERAL GOVERNMENT				
Bureau of Reclamation	1,334	880		
Army Corps of Engineers	16,470	4,922		
Fish and Wildlife Service	30,173	16,452		
Bureau of Land Management	67,030	9,164		
Forest Service	1,105,046	373,625		
Total Federal	1,220,053	405,044	10.62	7.51
TOTAL PUBLIC	1,915,498	765,483	16.70	14.20
TOTAL PRIVATE AND PUBLIC	11,487,965	5,391,968		

Public grazing acres are primarily concentrated in the western third of North Dakota (Figure 1). As evidence of the concentration of public grazing, the five counties with the most public acres (Billings, Bowman, Golden Valley, McKenzie, and Slope) had 65 percent of all public grazing acres in 1991 (Appendix B).

Although most of the public grazing land is located in the western third of North Dakota, public grazing acres comprise a large percentage of available grazing acres in several areas of the state (Figure 2). Public grazing acres, measured as a percent of total grazing acres, comprise an important share of available grazing land in Richland, Ransom, and Towner Counties, in addition to Billings, Golden Valley, McKenzie, and Slope Counties. Federal grazing land is primarily located in western areas of North Dakota (Appendix C) and state grazing land is located in the west and central areas of the state (Appendix C).

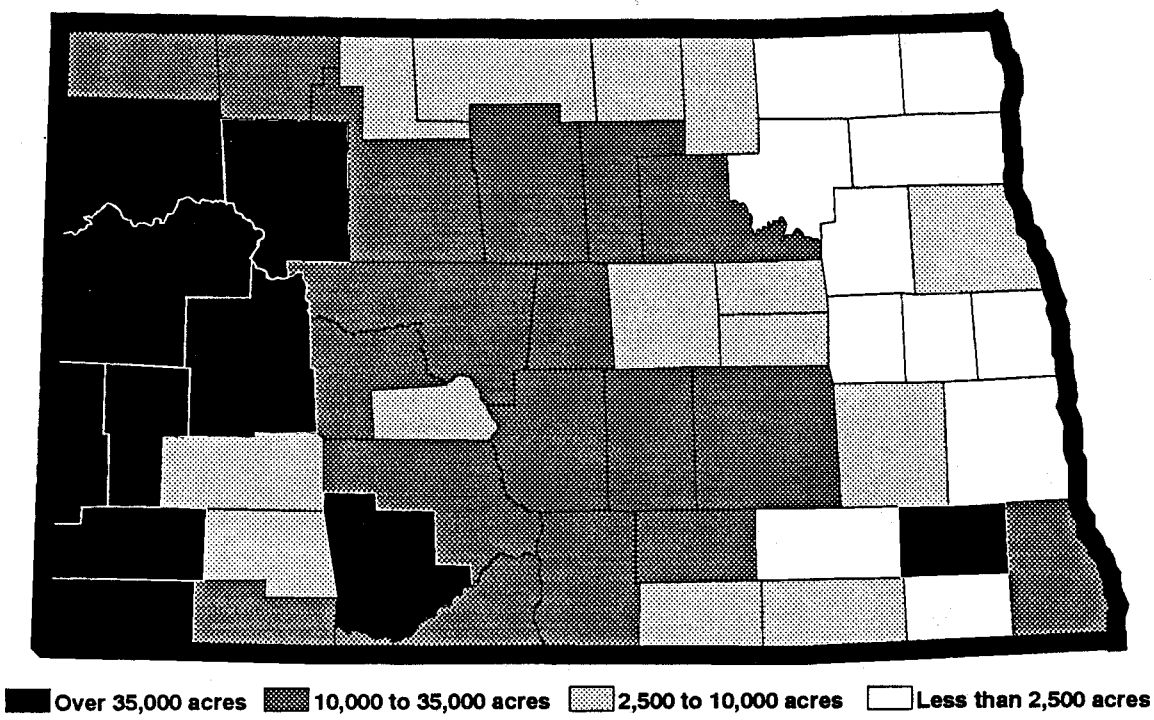

Figure 1. Public Grazing Acres in North Dakota, 1991

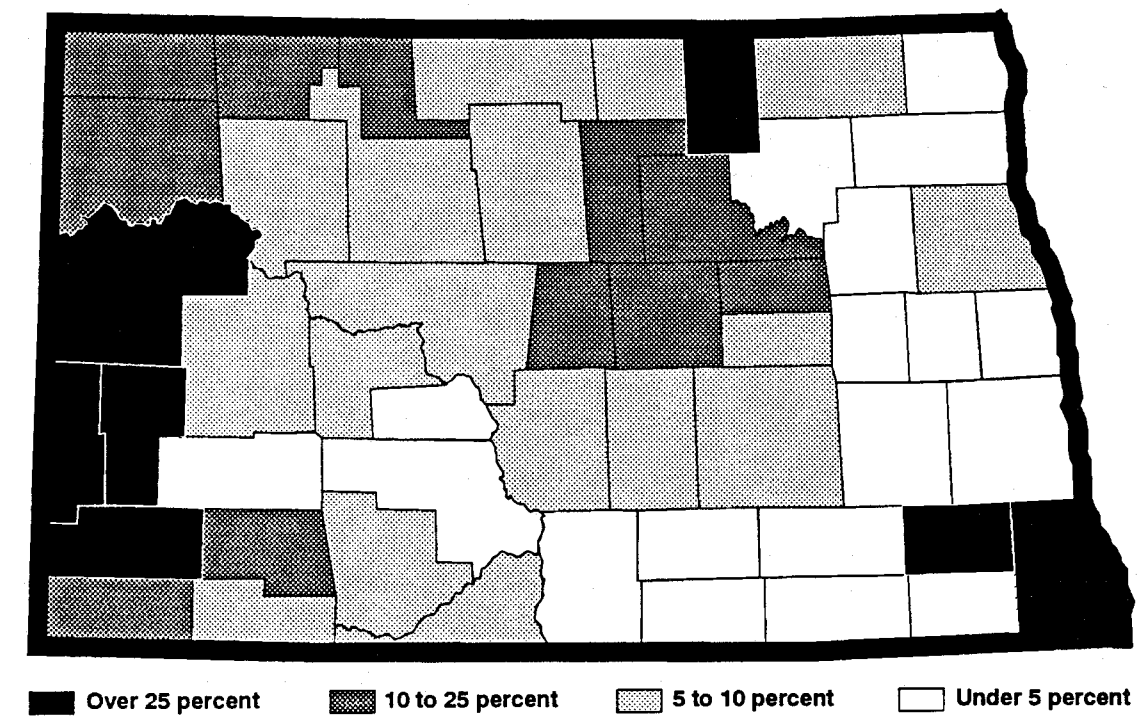

Figure 2. Public Grazing Acres as a Percent of Total Grazing Acres, North Dakota, 1991

Although public grazing capacity is often measured in acres, AUMs provide a more accurate measure of grazing output. AUMs from public grazing land represent an important share of total AUMs in several areas of North Dakota (Figure 3). Public grazing AUMs comprised about 14.2 percent of all AUMs statewide in North Dakota in 1991; however, public AUMs represented much higher shares of available AUMs in several counties of the state (Appendix D). Although public AUMs were, as a percent of available AUMs, high in many areas of the state, public AUMs were also concentrated in a few counties, as the top five counties (Billings, Golden Valley, McKenzie, Ransom, and Slope) had 51.5 percent of all public grazing AUMs (Appendix E).

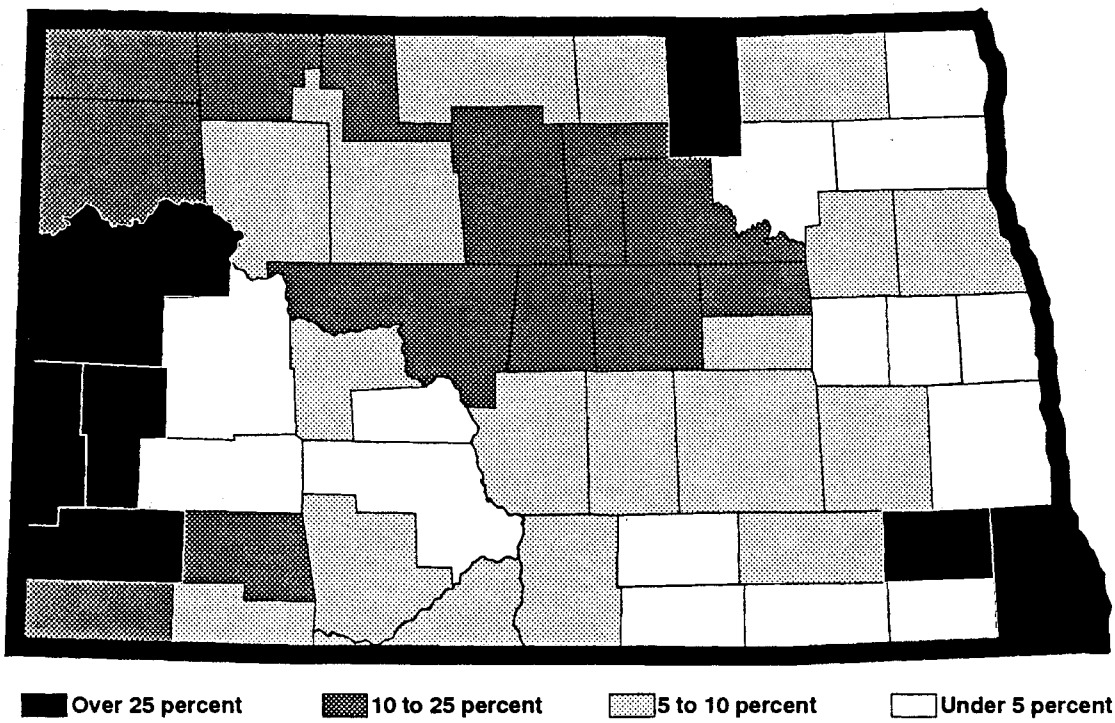

Figure 3. Public Animal Unit Months as a Percent of Total Available Animal Unit Months, North Dakota, 1991

Direct Economic Impacts

From an economic perspective, direct impacts are those changes in output, employment, or income that represent the initial or direct effects of a project, program, or activity. The direct impacts from public land grazing in North Dakota are changes in (1) rancher incomes [those derived from the use of public land], (2) expenditures for cow-calf production inputs, and (3) expenditures for backgrounding production inputs.

Rancher incomes and production expenditures were based on a cow herd that could be supported on the public AUMs and

subsequent backgrounding of the herd's calf crop. Public grazing occurs in all but two counties of North Dakota; thus, public grazing is geographically dispersed throughout North Dakota. Although no single herd can graze all the public grazing land, public AUMs were combined to estimate a cow herd (i.e., cows and calves, replacement heifers, and bulls) that theoretically could be grazed on all the available public AUMs.

Based on typical cow-calf production coefficients for North Dakota (Hughes et al. 1989), a 108,184 cow herd could have grazed on the public AUMs in North Dakota in 1991 (Appendix F). Grazing requirements for the herd included 180 days on pasture with individual animal allotments of 1 AUM per mature cow and nursing calf, 1 AUM per bull, and 0.7 AUM per replacement heifer. The cow herd also produced 77,802 calves (not counting heifers retained for breeding stock), of which 50 percent were assumed to be backgrounded to 700 pounds.

Costs of production used in this report for the cow herd were representative of expenses published in Hughes et al. (1989) and those in North Dakota Farm and Ranch Business Management (1991). Both sources contained similar values for revenues, production expenditures, and returns. Production costs and returns used in this report represent typical, medium-sized operations grazing private rangeland (Appendix F). Grazing costs on public rangeland are similar to, if not higher than, grazing costs on private rangeland (Nielsen 1991; Public Lands Council et al. 1991).

The budget generator developed by Hughes et al. (1989) was used to calculate the herd's calf crop, production expenses, and returns to labor, management, and equity. Production expenses and returns to labor, management, and equity generated by Aakre and Hughes (1991) were used to estimate the direct impacts from backgrounding half of the herd's calf crop (Appendix G).

Beef Cattle Industry

The grazing industry in North Dakota benefits directly from the use of public grazing land. There are several measures, some monetary and some nonmonetary, of the impacts to the grazing industry. Having access to public grazing land improves the efficiency of grazing small tracts of private land that are intermingled among federal and state land tracts. Another nonmonetary impact to the grazing industry would be the additional livestock grazed on public land, which increases herd sizes, provides greater earning capacity, and provides western North Dakota with additional ranchers. This provides the grazing industry with a healthier economic contribution to the state economy and a stronger voice in political arenas.

Two popular measures of monetary impacts to the grazing industry from public grazing land are livestock sales and rancher incomes. Livestock sales can be used to estimate direct and secondary impacts in an economy; however, gross livestock sales were not used directly to estimate secondary impacts in this study. Public land grazing in North Dakota in 1991 generated about $71.5 million in gross livestock sales, which was used to estimate returns to rancher labor, management, and equity.

The direct impacts to the grazing industry used in this study were returns to labor, management, and equity. Outlays for hired and owner-operator labor, which were not specifically measured in the budget analysis, were included in returns to labor, management, and equity. Also, return on investment was implicitly included in the returns to labor, management, and equity. Labor and investment estimates, if calculated separately, would affect the same basic sector (i.e., both represent income to the **households** sector). Direct impacts of public land grazing to the grazing industry, measured in returns to labor, management, and equity, as defined in this study were about $17.6 million.

North Dakota Economy

The direct impacts from public land grazing in North Dakota in 1991 were about $49.8 million with $17.6 million in operator/owner returns and about $32.1 million in production expenditures (Table 2). The annual direct impacts (returns and expenditures) were based on a 108,184 cow-calf herd that could be attributed to grazing public AUMs and on backgrounding 50 percent of the herd's 77,802 calves from weaning weight to 700 pounds.

TABLE 2. LIVESTOCK ENTERPRISES AND CORRESPONDING DIRECT IMPACTS LINKED TO PUBLIC LAND GRAZING IN NORTH DAKOTA, 1991

Public Land Grazing Activity/Enterprise*	Direct Impacts: Expenditures for Production Inputs	Direct Impacts: Returns to Management, Labor, & Equity
Cow-calf Enterprise 108,184 cows 20,364 replacement heifers 5,142 bulls 49,083 steer calves 28,719 heifer calves	$29,253,418	$16,690,530
Backgrounding Enterprise 24,555 steers 14,367 heifers	$2,884,355	$952,680
Total Direct Impacts	**$32,137,773**	**$17,643,210**

*Activities were based on public land grazing generating about 765,500 AUMs.

Secondary Impacts

The secondary impacts of grazing public land in North Dakota were estimated by using the North Dakota Input-Output Model (Coon et al. 1985). The first step in calculating the secondary impacts was to allocate the direct impacts into the appropriate economic sectors (Table 3). Eight of the 17 sectors of the North Dakota Input-Output Model were used to allocate the direct impacts.

TABLE 3. ALLOCATION OF THE DIRECT ECONOMIC IMPACTS TO THE APPROPRIATE BASIC SECTORS OF THE INPUT-OUTPUT MODEL

Economic Sector Number/Name		Itemization of Direct Impacts
1	Ag Livestock	Bull Depreciation
2	Ag Crops	Hay, Oats, Barley, and Bedding Expenses
3	Nonmetal Mining	NA[a]
4	Construction	NA
5	Transportation	Shipping and Marketing Expenses
6	Communications and Public Utilities	Utilities and General Farm Expenses
7	Ag Processing and Misc Manufacturing	NA
8	Retail Trade	Veterinary Care and Medicine, Mineral and Salt, Power and Fuel, Protein Supplement, Miscellaneous Supplies, and Bull Semen Check Expenses
9	Finance, Insurance, and Real Estate	Bull Insurance, Cow Herd Insurance, and Interest on Feed, Bull Purchases, and Variable Livestock Expenses
10	Business and Personal Service	NA
11	Professional and Social Service	NA
12	Households	Returns to Labor, Management, and Equity
13	Government[b]	Public Grazing Land Leases and AUM Charges
14	Coal Mining	NA
15	Electricity Generation	NA
16	Petroleum Exploration and Extraction	NA
17	Petroleum Refining	NA

[a]Not applicable--no direct impacts were allocated to these sectors.

[b]All revenue collected from state land grazing was included; however, only 62.5 percent of federal grazing revenue was included (United States Forest Service 1991).

Bull depreciation, which represents net purchases in the livestock sector, was included in the **agricultural livestock** sector. Hay, oats, barley, and bedding expenses were included in the **agricultural crops** sector. Shipping and marketing expenses were included in the **transportation** sector. Utilities and general farm expenses were allocated to the **communication and public utility** sector. Veterinary care and medicine, mineral and salt, power and fuel, protein supplement, miscellaneous supplies, and bull semen check expenses were included in the **retail trade** sector. Insurance for bulls and cows, along with interest on feed, bull purchases, and variable livestock expenses, were allocated to the **finance, insurance, and real estate** sector.

Returns to labor, management, and equity were allocated to the **households** sector. The dollars allocated to the **households** sector, even though they were an estimate of direct impacts to the beef cattle industry, were used in the **households** sector because the money represents net income to ranch operators' households.

Public land leases and AUM charges were allocated into the **government** sector. All revenue from public grazing collected from state agencies remains in the state's economy; however, the amount of federal revenue collected from public grazing that remains in the state's economy varies according to local grazing conditions, federal mandates, and federal agency. In recent years, 62.5 percent of money collected from the National Grasslands has remained in the North Dakota economy (United States Forest Service 1991).

The normal distribution of grazing revenue is 50 percent of the total to the district to be used for range improvement, 25 percent of the remaining balance to the respective counties in the USFS district, and the remaining funds to the Federal Treasury. Since grazing revenue from the USFS represented over 81 percent of all federal grazing revenue collected in North Dakota in 1991 (Appendix H), all federal revenue was re-allocated according to USFS guidelines.

Direct impacts on the North Dakota economy were greatest in the **agricultural crops** ($18.4 millon), **households** ($17.6 million), **retail trade** ($5.4 million), **government** ($3.9 million), and **finance, insurance, and real estate** ($2.6 million) sectors (Table 4).

Total economic activity was greatest in the **households** ($52 million), **retail trade** ($37.5 million), and the **agricultural crops** ($19.8 millon) sectors. In addition to $153.4 million of total economic activity, public grazing in North Dakota in 1991 generated about 1,897 additional jobs. Each public AUM grazed in North Dakota in 1991 generated about $65 in direct impacts and generated about $200 in total economic activity to the state's economy.

TABLE 4. DIRECT, SECONDARY, AND TOTAL ECONOMIC CONTRIBUTION OF PUBLIC LAND GRAZING TO THE NORTH DAKOTA ECONOMY, 1991

Basic Economic Sector	Economic Impacts		
	Direct	Secondary	Total
	000s of dollars		
Agricultural Livestock	1,445	3,521	4,966
Agricultural Crops	16,944	2,898	19,842
Nonmetal Mining	0	265	265
Construction	0	3,528	3,528
Transportation	822	485	1,307
Communications and Public Utilities	939	4,212	5,151
Ag Processing and Misc. Manufacturing	0	4,773	4,773
Retail Trade	5,447	32,072	37,519
Finance, Insurance, and Real Estate	2,648	6,924	9,572
Business and Personal Service	0	2,687	2,687
Professional and Social Services	0	3,383	3,383
Households	17,643	34,368	52,011
Government	3,883	4,474	8,357
Coal Mining	0	0	0
Electricity Generation	0	0	0
Petroleum Exploration/Extraction	0	0	0
Petroleum Refining	0	0	0
TOTAL BUSINESS ACTIVITY	**49,771**	**103,590**	**153,361**
Secondary Employment			1,897
	dollars		
TOTAL ECONOMIC IMPACTS in $/AUM	65	135	200

SUMMARY AND CONCLUSIONS

Public land is important in providing grazing opportunities for many western states. North Dakota is not unique in the importance of its public grazing land, considering that public grazing land comprised about 17 percent of all grazing land and over 14 percent of all available AUMs in the state in 1991. Federal and state grazing land generated 23.3, 6.0, and 29.6 percent of all available AUMs in neighboring Montana, South Dakota, and Wyoming in 1990, respectively (Bangsund and Leistritz 1991). Other western states also have considerable amounts of public rangeland (Public Lands Council et al. 1991). The

contribution of public land grazing to the livestock industry should not be overlooked, because livestock industries are an important economic base in many rural areas of North Dakota.

Most of the public grazing land in North Dakota is concentrated in the western third of the state, with a small concentration of acreage in southeastern North Dakota. Public grazing land generated 35 percent or more of all AUMs in at least seven counties of North Dakota in 1991. Thus, several areas of North Dakota relied on public grazing for a substantial amount of the economic activity generated by the grazing industry.

Public grazing land in North Dakota generated about 765,500 AUMs in 1991. Based on typical cow-calf enterprise characteristics and requirements, AUMs on public grazing land supported a 108,184 cow herd, which produced over 77,800 calves (not including heifers retained for breeding stock). Assuming normal cow-calf enterprise expenses, production outputs, and backgrounding half of the calf crop, the 108,184 cow-calf and backgrounding enterprises generated about $17.6 million in operator/owner returns to labor, management, and equity and another $32.1 million in direct expenditures to other sectors of the economy. Total direct economic impacts of public land grazing in North Dakota in 1991 were estimated to be $49.8 million.

The direct impacts were allocated to various sectors of the North Dakota Input-Output Model to estimate the secondary impacts. The $49.8 million of direct impacts ($65/AUM grazed) generated about $103.6 million in secondary business activity ($135/AUM grazed) to the state's economy. The $103.6 million of secondary impacts represented additional business activity within the economy that resulted from the initial impacts. Total economic activity in North Dakota from public grazing in 1991 was an estimated $153.4 million ($200/AUM grazed) and generated about 1,900 additional jobs (Figure 4).

Public land grazing in North Dakota made substantial contributions to the livestock industry in 1991. More important, public grazing supports more than local ranchers; it also supports the local economies in rural North Dakota, which rely heavily on agriculture for their economic well-being. In addition to providing an important source of local economic activity, public land grazing provides substantial overall economic activity, including state tax revenue, to the state economy. For every $1 that was generated on public grazing land, an additional $2 were generated within the state's economy.

Public land potentially can be used for a variety of outputs. Land managers and decision makers of agencies controlling public land must balance the use of the land among competing options. These decisions should involve the outputs and constituents and how those decisions will affect other areas

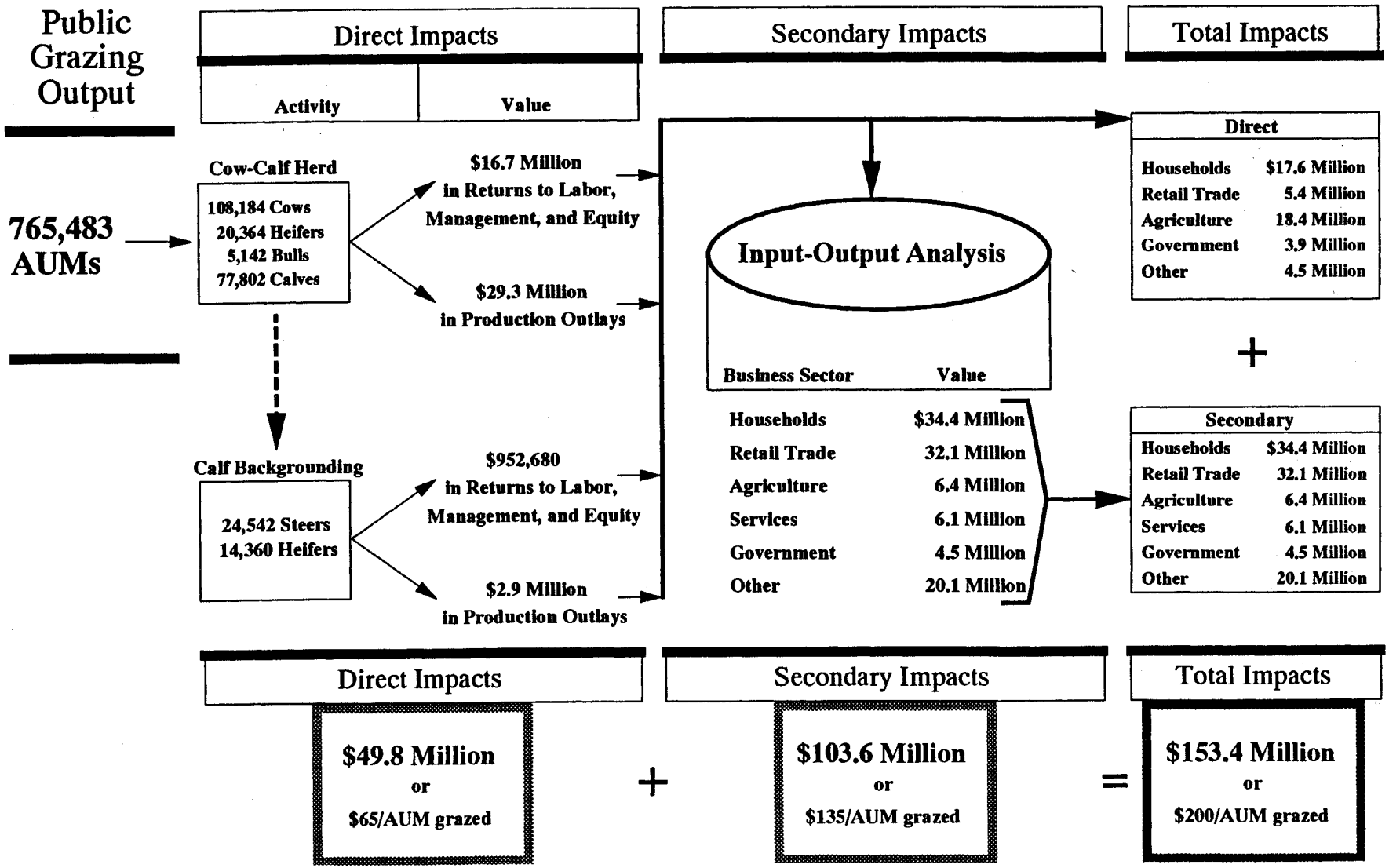

Figure 4. Direct and Secondary Economic Impacts of Public Land Grazing in North Dakota, 1991

of the state's economy. The use of public land for grazing provides economic activity for the livestock industry, but more importantly, it provides substantial economic activity for many other sectors in the economy. Benefits from grazing public land extend beyond the individual using the land to the overall economy. Thus, the economic consequences of land use alternatives should be considered in determining the alternative uses of public land.

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Doug Howie, Land Manager, North Dakota Game and Fish Department, Bismarck.

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Richard Scheuneman, Park Ranger, U.S. Army Corps of Engineers, Valley City.

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APPENDIX A

Estimation of Total Grazing Acres by County in North Dakota, 1991

APPENDIX TABLE A1. ESTIMATION OF TOTAL GRAZING CAPACITY BY COUNTY, NORTH DAKOTA, 1987[a]

County	Grazing Land Estimates				
	Federal[b] Grazing Land	NRI[c] Grazing Land	NRI & Federal	Census[d] of Agriculture	Combined Estimate
	(a) +	(b) =	(c)	(d)	(c + d)/2
ADAMS	40	228,600	228,640	221,876	225,258
BARNES	466	61,100	61,566	60,963	61,264
BENSON	389	95,600	95,989	110,126	103,058
BILLINGS	290,706	197,300	488,006	664,469	576,238
BOTTINEAU	320	41,100	41,420	61,480	51,450
BOWMAN	33,905	346,200	380,105	360,814	370,460
BURKE	2,387	233,500	235,887	95,994	165,941
BURLEIGH	2,600	476,300	478,900	346,787	412,844
CASS	75	33,700	33,775	21,973	27,874
CAVALIER	309	22,400	22,709	16,874	19,792
DICKEY	245	112,000	112,245	93,880	103,063
DIVIDE	2,087	167,900	169,987	116,742	143,365
DUNN	18,585	721,600	740,185	898,910	819,548
EDDY	54	87,600	87,654	72,164	79,909
EMMONS	1,882	357,300	359,182	263,950	311,566
FOSTER	160	57,900	58,060	33,375	45,718
G. VALLEY	96,262	308,800	405,062	252,390	328,726
G. FORKS	2,398	88,100	90,498	29,763	60,131
GRANT	520	659,100	659,620	482,652	571,136
GRIGGS	609	33,900	34,509	45,721	40,115
HETTINGER	0	87,700	87,700	100,492	94,096
KIDDER	1,852	388,500	390,352	264,549	327,451
LAMOURE	486	4,900	5,386	63,348	34,367
LOGAN	2,250	325,300	327,550	220,189	273,870
MCHENRY	5,957	332,500	338,457	267,859	303,158
MCINTOSH	903	171,600	172,503	139,890	156,197
MCKENZIE[e]	508,741	627,100	1,135,841	587,910	1,135,841
MCLEAN	3,734	340,300	344,034	193,241	268,638
MERCER	623	325,100	325,723	252,703	289,213
MORTON	728	579,000	579,728	598,474	589,101
MOUNTRAIL	7,808	548,000	555,808	303,208	429,508
NELSON	0	63,300	63,300	36,920	50,110
OLIVER	38	195,200	195,238	180,182	187,710
PEMBINA	0	43,300	43,300	19,033	31,167
PIERCE	280	102,000	102,280	78,226	90,253
RAMSEY	0	49,700	49,700	19,089	34,395
RANSOM	42,397	32,400	74,797	108,123	91,460
RENVILLE	4,183	15,900	20,083	35,123	27,603
RICHLAND	28,860	99,100	127,960	33,796	80,878
ROLETTE	0	83,100	83,100	64,214	73,657

- continued -

APPENDIX TABLE A1. CONTINUED[a]

County	Grazing Land Estimates: Federal[b] Grazing Land		NRI[c] Grazing Land		NRI & Federal	Census[d] of Agriculture	Combined Estimate
	(a)	+	(b)	=	(c)	(d)	(c + d)/2
SARGENT	362		60,200		60,562	47,431	53,997
SHERIDAN	2,063		214,200		216,263	121,247	168,755
SIOUX	6,237		474,100		480,337	524,984	502,661
SLOPE	138,656		258,900		397,556	439,037	418,297
STARK	0		253,700		253,700	234,749	244,225
STEELE	0		25,600		25,600	13,233	19,417
STUTSMAN	2,426		391,600		394,026	241,945	317,986
TOWNER[f]	0		0		6,003	20,732	13,368
TRAILL	40		49,900		49,940	8,086	29,013
WALSH	108		26,500		26,608	24,116	25,362
WARD	3,876		234,700		238,576	189,341	213,959
WELLS	320		23,900		24,220	72,398	48,309
WILLIAMS	3,126		382,300		385,426	307,572	346,499
TOTALS	1,220,053		11,139,600		12,365,656	10,062,343	11,487,965

[a]Obvious discrepancies were found in both sources of grazing land in North Dakota. The *Census of Agriculture* estimate, by definition, was to include all federal and state grazing land under exclusive use of a grazing association; however, the acreage of grazing land in McKenzie County, based on the definition of what should be included in the estimate, was underestimated by about 500,000 acres. Likewise, the estimates from the *National Resources Inventory* contained obvious errors. The estimate for grazing land in Towner County was zero nonfederal grazing acres; however, the North Dakota State Land Department reported over 6,000 acres of public grazing land in Towner County. Since the degree and frequency of errors in both estimates (*Census of Agriculture* and *National Resources Inventory*) were unknown, and since alternative estimates of grazing land by county were not readily available, the two estimates were averaged. The combined average estimate of total grazing land was used for all analyses in the study.

[b]Estimates of federal grazing land were compiled from information obtained by contacting federal agencies leasing public land for grazing in North Dakota in 1990 and 1991.

[c]U.S. Department of Agriculture (1987)-National Resources Inventory (NRI). Estimates of nonfederal pasture and rangeland were based on an inventory of land cover/use categories conducted in 1987.

[d]U.S. Bureau of the Census (1989). Estimates were based on pasture and rangeland grazed and not to include cropland and woodland grazed. "All grazing land, except land used under government permits on a per head basis, was included in 'land in farms' provided it was a farm or ranch. Land under the exclusive use of a grazing association was to be reported by the grazing association and included in 'land in farms'." Estimates of grazing land for Dunn, Oliver, Kidder, Eddy, Foster, and Traill counties were from the 1982 *Census of Agriculture* and estimates for Adams, Sioux, and Divide counties were from the 1978 *Census of Agriculture*.

[e]Independent investigation revealed that McKenzie County has in excess of one million grazing acres. The estimate of grazing land in McKenzie County was not averaged since the average of the two sources was considerably below one million acres. Thus, acres of federal grazing land and the *National Resources Inventory* estimate of nonfederal grazing land were used for McKenzie County.

[f]State grazing land in Towner County was over 6,000 acres; however, the *National Resources Inventory* estimate (which was to included state grazing land) was zero acres. Thus, the estimate of total grazing capacity for Towner County was an average of state grazing land and the *Census of Agriculture* estimate.

APPENDIX B

Public Grazing Acres by Agency and County in North Dakota, 1991

APPENDIX TABLE B1. PUBLIC GRAZING ACRES BY AGENCY AND COUNTY, NORTH DAKOTA, 1991

County	Total Public Grazing Acres	Federal Agencies					State Agencies			
		Army Corps of Engineers 1990	Fish and Wildlife Service 1990	Bureau of Land Management 1990	U.S. Forest Service 1991	Bureau of Reclamation 1991	State Land Department 1991	Game and Fish Department 1990	N.D. Forest Service 1991	Parks and Tourism Department 1991
ADAMS	17,156			40			17,116			
BARNES	2,831	145	316	5			2,366			
BENSON	10,576		340	49			10,187			
BILLINGS	321,758			640	290,066		31,052			
BOTTINEAU	3,959		320				2,389		1,250	
BOWMAN	62,679	805		33,100			28,774			
BURKE	18,225		2,387				15,838			
BURLEIGH	27,857		1,600	1,000			25,257			
CASS	75		75							
CAVALIER	1,827		70	239			116	1,402		
DICKEY	3,364		245				3,119			
DIVIDE	22,724		522	1,565			20,637			
DUNN	49,297	3,012	98	15,475			26,129	4,583		
EDDY	9,628			54			9,574			
EMMONS	14,999	1,283		599			13,117			
FOSTER	3,093		160				2,933			
G. VALLEY	124,605				96,262		28,343			
G. FORKS	4,472			2,398			2,074			
GRANT	35,432			40	480		32,219	2,693		
GRIGGS	1,925	26		583			1,315			
HETTINGER	9,881						9,881			
KIDDER	30,216		172	1,680			28,364			
LAMOURE	1,609		486				1,123			
LOGAN	11,406		1,727	523			8,979			177
MCHENRY	27,774		2,844	3,113			21,817			
MCINTOSH	7,093		690	213			6,190			
MCKENZIE	574,494	4,486		1,098	503,157		64,848	905		
MCLEAN	24,230	337	2,798	599			19,786	710		
MERCER	15,395	164		459			13,749	1,023		
MORTON	17,982	603		125			17,254			

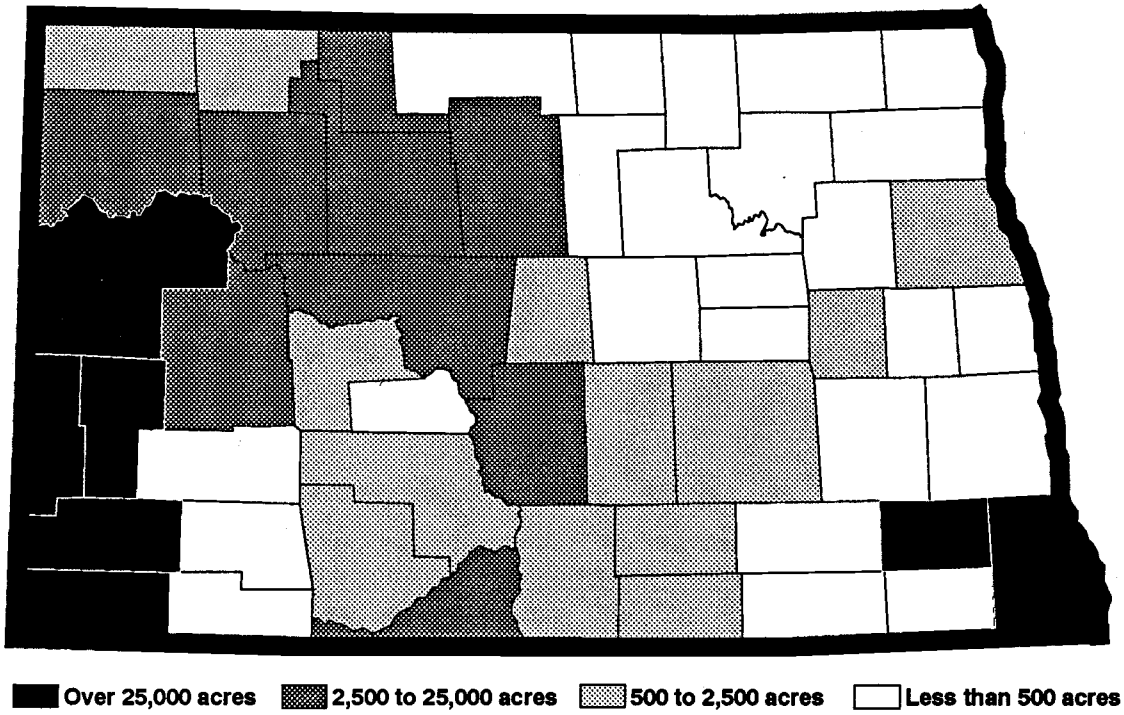
- continued -

APPENDIX TABLE B1. CONTINUED

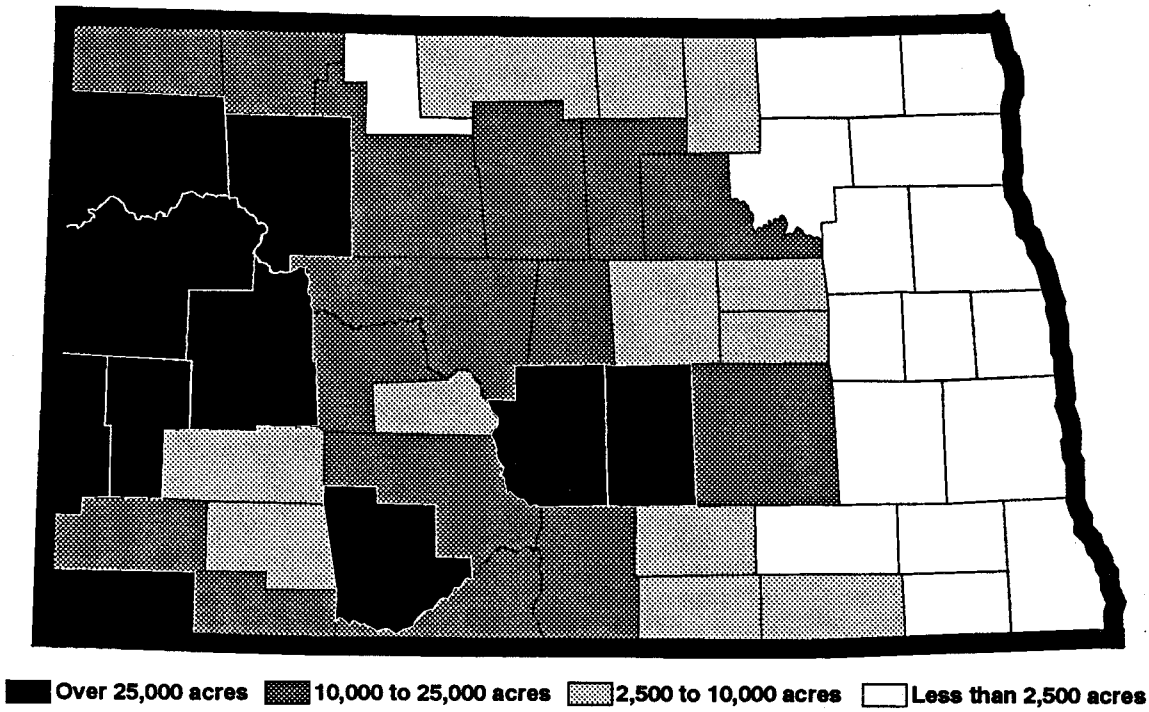
County	Total Public Grazing Acres	Federal Agencies					State Agencies			
		Army Corps of Engineers 1990	Fish and Wildlife Service 1990	Bureau of Land Management 1990	U.S. Forest Service 1991	Bureau of Reclamation 1991	State Land Department 1991	Game and Fish Department 1990	N.D. Forest Service 1991	Parks and Tourism Department 1991
MOUNTRAIL	39,641	4,139	2,632	1,037			31,609	59		165
NELSON	1,865						1,865			
OLIVER	7,315			38			7,277			
PEMBINA	0									
PIERCE	13,588		114	166			13,308			
RAMSEY	825						825			
RANSOM	43,366		344		42,053		969			
RENVILLE	6,068		4,105	78			1,885			
RICHLAND	29,344		650	5	28,205		484			
ROLETTE	6,877						6,257		620	
SARGENT	1,305		362				943			
SHERIDAN	26,462		1,685	378			24,399			
SIOUX	29,593				6,237		23,356			
SLOPE	162,261		70		138,586		23,605			
STARK	6,095						6,095			
STEELE	0									
STUTSMAN	16,681		1,012	80		1,334	14,255			
TOWNER	6,003						6,003			
TRAILL	40		40							
WALSH	308		44	64			200			
WARD	14,835		3,610	266			10,959			
WELLS	5,303		320				4,983			
WILLIAMS	41,163	1,470	335	1,321			38,037			
TOTALS	1,915,498	16,470	30,173	67,030	1,105,046	1,334	681,858	11,375	1,870	342
Percent of Total		0.86%	1.58%	3.50%	57.69%	0.07%	35.60%	0.59%	0.10%	0.02%

APPENDIX C

Maps of Federal and State Grazing Acres in North Dakota, 1991



Appendix Figure C1. Federal Grazing Acres in North Dakota, 1991



Appendix Figure C2. State Grazing Acres in North Dakota, 1991

APPENDIX D

Public Grazing AUMs as a Percent of Total AUMS by County in North Dakota, 1991

APPENDIX TABLE D1. PUBLIC GRAZING ACRES, PUBLIC ANIMAL UNIT MONTHS, TOTAL GRAZING ACRES, AND TOTAL ANIMAL UNIT MONTHS BY COUNTY, NORTH DAKOTA, 1991

County	Animal Unit Months			Grazing Acres		
	Public	Total	Percent Public	Public	Total	Percent Public
ADAMS	8,735	100,299	8.71	17,156	225,258	7.62
BARNES	2,197	40,763	5.39	2,831	61,264	4.62
BENSON	7,939	59,729	13.29	10,576	103,058	10.26
BILLINGS	92,095	204,066	45.13	321,758	576,238	55.84
BOTTINEAU	1,740	28,335	6.14	3,959	51,450	7.69
BOWMAN	14,551	128,430	11.33	62,679	370,460	16.92
BURKE	11,172	85,029	13.14	18,225	165,941	10.98
BURLEIGH	15,586	208,079	7.49	27,857	412,844	6.75
CASS	50	18,397	0.27	75	27,874	0.27
CAVALIER	981	11,580	8.47	1,827	19,792	9.23
DICKEY	2,251	68,052	3.31	3,364	103,063	3.26
DIVIDE	13,063	73,384	17.80	22,724	143,365	15.85
DUNN	15,812	354,723	4.46	49,297	819,548	6.02
EDDY	6,900	46,258	14.92	9,628	79,909	12.05
EMMONS	8,331	156,615	5.32	14,999	311,566	4.81
FOSTER	2,319	26,188	8.85	3,093	45,718	6.77
G. VALLEY	38,391	113,915	33.70	124,605	328,726	37.91
G. FORKS	1,945	33,114	5.87	4,472	60,131	7.44
GRANT	17,292	253,001	6.83	35,432	571,136	6.20
GRIGGS	1,120	22,507	4.98	1,925	40,115	4.80
HETTINGER	5,138	36,298	14.16	9,881	94,096	10.50
KIDDER	15,916	164,533	9.67	30,216	327,451	9.23
LAMOURE	1,219	22,839	5.34	1,609	34,367	4.68
LOGAN	6,532	137,764	4.74	11,406	273,870	4.16
MCHENRY	18,381	172,596	10.65	27,774	303,158	9.16
MCINTOSH	3,902	78,454	4.97	7,093	156,197	4.54
MCKENZIE	181,691	428,684	42.38	574,494	1,135,841	50.58
MCLEAN	13,988	136,192	10.27	24,230	268,638	9.02
MERCER	6,744	127,224	5.30	15,395	289,213	5.32
MORTON	8,219	259,512	3.17	17,982	589,101	3.05
MOUNTRAIL	20,791	215,724	9.64	39,641	429,508	9.23
NELSON	1,455	28,472	5.11	1,865	50,110	3.72
OLIVER	3,571	82,945	4.30	7,315	187,710	3.90
PEMBINA	0	18,388	0.00	0	31,167	0.00
PIERCE	9,269	52,201	17.76	13,588	90,253	15.06
RAMSEY	644	19,442	3.31	825	34,395	2.40
RANSOM	33,451	65,194	51.31	43,366	91,460	47.42
RENVILLE	3,780	15,839	23.86	6,068	27,603	21.98
RICHLAND	22,580	56,593	39.90	29,344	80,878	36.28
ROLETTE	3,504	42,905	8.17	6,877	73,657	9.34

- continued -

APPENDIX TABLE D1. CONTINUED

County	Animal Unit Months			Grazing Acres		
	Public	Total	Percent Public	Public	Total	Percent Public
SARGENT	993	35,770	2.78	1,305	53,997	2.42
SHERIDAN	15,146	94,831	15.97	26,462	168,755	15.68
SIOUX	13,655	221,805	6.16	29,593	502,661	5.89
SLOPE	56,898	151,631	37.52	162,261	418,297	38.79
STARK	3,108	107,885	2.88	6,095	244,225	2.50
STEELE	0	10,873	0.00	0	19,417	0.00
STUTSMAN	11,681	210,541	5.55	16,681	317,986	5.25
TOWNER	4,923	9,268	53.12	6,003	13,368	44.91
TRAILL	22	16,247	0.14	40	29,013	0.14
WALSH	173	14,955	1.15	308	25,362	1.21
WARD	9,181	120,690	7.61	14,835	213,959	6.93
WELLS	3,667	27,751	13.21	5,303	48,309	10.98
WILLIAMS	22,789	175,457	12.99	41,163	346,499	11.88
TOTALS	765,483	5,391,968	14.20	1,915,498	11,487,965	16.67

APPENDIX E

Public Grazing AUMs by Agency and County in North Dakota, 1991

APPENDIX TABLE E1. PUBLIC GRAZING ANIMAL UNIT MONTHS BY AGENCY AND COUNTY, NORTH DAKOTA, 1991

County	Total Public Grazing AUMs	Federal Agencies					State Agencies			
		Army Corps of Engineers 1990	Fish and Wildlife Service 1990*	Bureau of Land Management 1990	U.S. Forest Service 1991**	Bureau of Reclamation 1991*	State Land Department 1991	Game and Fish Department 1990*	N.D. Forest Service 1991	Parks and Tourism Department 1991
ADAMS	8,735			5			8,729			
BARNES	2,197	96*	209	1			1,892			
BENSON	7,939		190	7			7,742			
BILLINGS	92,095			87	81,450		10,558			
BOTTINEAU	1,740		179				1,051		510	
BOWMAN	14,551	243		4,525			9,783			
BURKE	11,172		1,194				9,978			
BURLEIGH	15,586		800	137			14,649			
CASS	50		50							
CAVALIER	981		41	33			80	827		
DICKEY	2,251		162				2,090			
DIVIDE	13,063		261	214			12,588			
DUNN	15,812	663	43	2,116			10,974	2,017		
EDDY	6,900			7			6,893			
EMMONS	8,331	642*		82			7,608			
FOSTER	2,319		90				2,229			
G. VALLEY	38,291				29,604		8,786			
G. FORKS	1,945			328			1,618			
GRANT	17,292			5	314		15,787	1,185		
GRIGGS	1,120	15*		80			1,026			
HETTINGER	5,138						5,138			
KIDDER	15,916		86	230			15,600			
LAMOURE	1,219		321				898			
LOGAN	6,532		864	72			5,477			120
MCHENRY	18,381		1,593	426			16,363			
MCINTOSH	3,902		345	29			3,528			
MCKENZIE	181,691	1,322		150	155,827		23,994	398		
MCLEAN	13,988	83	1,399	82			12,070	355		
MERCER	6,744	44		63			6,187	450		
MORTON	8,219	265*		17			7,937			

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APPENDIX TABLE E1. CONTINUED

County	Total Public Grazing AUMs	Federal Agencies					State Agencies			
		Army Corps of Engineers 1990	Fish and Wildlife Service 1990*	Bureau of Land Management 1990	U.S. Forest Service 1991**	Bureau of Reclamation 1991*	State Land Department 1991	Game and Fish Department 1990*	N.D. Forest Service 1991	Parks and Tourism Department 1991
MOUNTRAIL	20,791	1,171	1,316	142			18,017	29		115
NELSON	1,455						1,455			
OLIVER	3,571			5			3,566			
PEMBINA	0									
PIERCE	9,269		64	23			9,182			
RAMSEY	644						644			
RANSOM	33,451		227		32,449		775			
RENVILLE	3,780		2,299	11			1,470			
RICHLAND	22,580		429	1	21,764		387			
ROLETTE	3,504						3,441		63	
SARGENT	993		239				754			
SHERIDAN	15,146		944	52			14,151			
SIOUX	13,655				4,079		9,576			
SLOPE	56,898		26		48,138		8,734			
STARK	3,108						3,108			
STEELE	0									
STUTSMAN	11,681		668	11		880	10,121			
TOWNER	4,923						4,923			
TRAILL	22		22							
WALSH	173		26	9			138			
WARD	9,181		2,022	36			7,123			
WELLS	3,667		179				3,488			
WILLIAMS	22,789	379	168	181			22,062			
TOTALS	765,483	4,922	16,452	9,164	373,625	880	354,370	5,261	573	235
Percent of Total		0.64%	2.15%	1.20%	48.81%	0.12%	46.29%	0.69%	0.07%	0.03%

*AUMs were not available from the agencies; however, AUMs were estimated by using an average rangeland carrying capacity for the county.

**AUMs for individual counties were determined by either 1) converting Animal Months of Grazing into AUMs of grazing using USFS conversion rates, 2) obtaining direct estimates of AUMs grazed, or 3) combining estimates of converted Animal Months of Grazing with actual reported AUMs of grazing.

APPENDIX F

Cow-calf Enterprise Characteristics and Budget for North Dakota, 1991

This appendix lists the herd characteristics and assumptions used in the cow-calf budgets.

Due to lack of current information on owner-operator debt, cow-calf budgets were generated assuming no debt. Replacement heifers were assumed to be raised, not purchased.

Hughes et al. (1989) provided investment figures for land, equipment, and buildings. Hughes et al. (1989) provided depreciation rates, repairs, taxes, and insurance on equipment, buildings, and land, along with investment per cow and heifer.

Selling prices for steers, heifers, cull bulls, cull cows, and cull heifers, along with feed costs, livestock expenses, and all miscellaneous costs, were provided or determined from the budget generator or from average estimates of actual ranch budgets in North Dakota (North Dakota Farm and Ranch Business Management 1991).

Cow-calf Herd Characteristics

- 1.0 AUM for cows and bulls
- 0.7 AUM for heifers
- 91.0% calf crop
- 15.0% replacement rate
- 1.0% cow loss
- 25 breeding animals (cows and heifers) per bull
- 3 years useful bull life
- 180 days grazing period
- Steer calves sold at 522 lbs.
- Heifer calves sold at 493 lbs.
- Cull cows sold at 900 lbs.
- Cull heifers sold at 875 lbs.
- Cull bulls sold at 1700 lbs.

Beef Cow-calf Production Budgets for North Dakota
Estimation of Direct Impacts -- 108,184-COW HERD

RECEIPTS

		-- Hd --		
Steers	49,083	522 lbs.	$0.97/lb	= $24,846,973
Heifers	28,719	493 lbs.	$0.91/lb	= $12,886,296
Cull Cows	15,146	900 lbs.	$0.49/lb	= $6,679,386
Cull Heifers	4,136	875 lbs.	$0.70/lb	= $2,533,300
Cull Bull	1,714	1,700 lbs.	$0.53/lb	= $1,544,314
			Total Income Per Herd	= $48,490,269
			Total Income Per Cow	= $448

FEED EXPENSES

				Opportunity Costs
		180 Days of Summer Grazing		
108,184	Cows @ 1 AUM =	649,104 AUMs @ $5.71/AUM	=	$3,704,871
20,364	RHfr @ 0.7 AUM =	85,529 AUMs @ $5.71/AUM	=	$488,170
5,142	Bulls @ 1 AUM =	30,852 AUMs @ $5.71/AUM	=	$176,085
Mineral and Salt		1067.1 Tons @ $400/Ton	=	$426,851
		185 Days of Winter Feeding		
Oats	281,488	Bushels $1.30/Bu	=	$365,934
Protein	3,228	Tons $189.00/Ton	=	$610,105
Hay	290,526	Tons $50.00/Ton	=	$14,526,319
Mineral and Salt	1,096.8	Tons $400.00/Ton	=	$438,708
			Total Feed Costs Per Herd	= $20,737,049
			Total Feed Costs Per Cow	= $192

LIVESTOCK EXPENSES

		Rate Per Hd	Opportunity Costs
Veterinary and Medicine		$10.00/Cow	= $1,081,840
Supplies		$9.45/Cow	= $1,022,339
Bull Semen Check		$20.00/Bull	= $102,838
Utilities and General Farm		$8.68/Cow	= $939,037
Power and Fuel		$9.95/Cow	= $1,076,431
Bedding		$2.00/Cow	= $216,368
Marketing		$4.00/Cow	= $432,736
Miscellaneous		$5.00/Cow	= $540,920
Bull Insurance	(Estimated at 1% of Total Bull Value)		= $89,984
Interest Expense	(10% @ 6 mnths x Lvstck & Feed Exp)		= $1,311,977
Bull Depreciation	(Purchase Price - Salvage Value)/Years of Use		= $1,455,163
		Total Livestock Expenses Per Herd	= $8,269,633
		Total Livestock Expenses Per Cow	= $76

Beef Cow-calf Production Budgets for North Dakota
Estimation of Direct Impacts -- 108,184-COW HERD

FIXED EXPENSES

	Investment	Repairs Depreciation Insurance & Taxes		Opportunity Costs
Land	$0	1%	=	xxxxxx
Buildings	$5,409,200	7%	=	$378,644
Equipment	$10,818,400	12%	=	$1,406,392
Investment per Cow	$800	1%	=	$865,472
Investment per Heifer	$700	1%	=	$142,548
Bull Investment	$8,998,500	1%	=	xxxxxx
		Total Fixed Costs Per Herd	=	$2,793,056
		Total Fixed Costs Per Cow	=	$26

Opportunity costs for land investment and bull investment were only recognized in the budget generator in the "cash flow" portion of the budget.

Insurance for cow herd was extracted from fixed costs. Since insurance rates vary by herd value, cow herd insurance was considered a variable cost that changes with the number of cows. Cow herd insurance was calculated with the following formula ((Number of cows x Investment per cow)/100 x $0.50).

COSTS/RETURNS SUMMARY
(No backgrounding expenses or returns)

	Opportunity Costs
Receipts	$48,490,269
Less Feed and Livestock Expenses	$29,006,683
Returns Above Variable Costs	$19,483,586
Less Fixed Expenses	$2,793,056
Returns to Labor, Management, & Equity Capital for the Herd	$16,690,530
Total Receipts Per Cow	$448.22
Less Total Expenses Per Cow	$293.94
Returns to Labor, Management, & Equity Capital Per Cow	$154.28

APPENDIX G

Calf Backgrounding Enterprise Budget for North Dakota, 1991

Background Budget - North Dakota - 1991
Medium Rate of Gain

Weaning Weight	517 lbs.
Average Daily Gain	1.77 lbs.
Days on Feed	103
Market Weight	700 lbs.
Number of Calves	38,901
Expected Selling Price	$84.48 cwt.

		TOTAL	$/HD
Total Revenue		$23,004,495	$591.36
Beginning Value	$94.87 cwt.		
less shrink if sold	4%	$18,111,969	$465.59
Gross Margin		$4,892,526	$125.77
Feed Cost	$0.47 per day per hd $0.26 per lb of gain	$1,871,621	$48.11
Return Over Feed Cost		$3,020,906	$77.66
Non-Feed Expenses			
Interest on Beginning Value	10%	$513,246	$13.19
Vet and Medicine		$110,479	$2.84
Lot Cost		$402,359	$10.34
Trucking		$136,154	$3.50
Marketing		$252,857	$6.50
Shrink	2%	$460,090	$11.83
Death Loss	1%	$193,042	$4.96
SubTotal		$2,069,334	$53.17
Total Cost of Gain per Pound			$0.55
Returns to Labor, Management, and Equity		$952,680	$24.49

Ration for Backgrounding Enterprise

Feed	Price	Lb/Hd/Day	Cost day/Hd	Total Cost
Alf-Grass Hay	$35/Ton	9.84	$0.17	$692,862
Oats	$1.00 bu	6.33	$0.21	$848,978
Barley	$1.75 bu	2.0	$0.07	$293,387
TM Salt	$190/Ton	0.011	$0.001	$4,205
Vit ADE premix	$1.00/lb	0.008	$0.008	$32,189
			$0.46	$1,871,621

SOURCE: All information was extracted from Aakre and Hughes (1991).

APPENDIX H

Revenue Received from Public Grazing Leases and AUM Charges by Agency and County in North Dakota, 1991

APPENDIX TABLE H1. REVENUE FROM PUBLIC GRAZING LEASES AND ANIMAL UNIT MONTH CHARGES BY AGENCY AND COUNTY, NORTH DAKOTA, 1991

County	Total Public Grazing Acres	Federal Agencies					State Agencies			
		Army Corps of Engineers 1990	Fish and Wildlife Service 1990	Bureau of Land Management 1990	U.S. Forest Service 1991**	Bureau of Reclamation 1991	State Land Department 1991	Game and Fish Department 1990	N.D. Forest Service 1991	Parks and Tourism Department 1991
		dollars								
ADAMS	91,580			11			91,569			
BARNES	18,403	*	2,221	1			16,181			
BENSON	51,857		2,028	13			49,816			
BILLINGS	314,245			172	228,129		85,704			
BOTTINEAU	9,861		1,908				5,829		2,124	
BOWMAN	94,092	2,595		8,915			82,582			
BURKE	70,204		12,711				57,494			
BURLEIGH	151,742		8,520	269			142,952			
CASS	527		527							
CAVALIER	4,353		440	64			652	3,197		
DICKEY	18,907		1,722				17,185			
DIVIDE	90,907		2,780	421			87,705			
DUNN	122,566	4,224	459	4,168			111,569	2,145		
EDDY	50,851			15			50,836			
EMMONS	90,169	5,012		161			84,995			
FOSTER	26,911		954				25,957			
G. VALLEY	141,109				82,918		58,104			
G. FORKS	11,678			646			11,032			
GRANT	193,873			11	881		185,258	7,724		
GRIGGS	7,154	*		157			6,997			
HETTINGER	66,205						66,205			
KIDDER	157,653		916	452			156,284			
LAMOURE	11,095		3,416				7,679			
LOGAN	77,101		9,196	141			65,817			1,947
MCHENRY	143,684		16,962	838			125,884			
MCINTOSH	46,068		3,674	57			42,336			
MCKENZIE	625,587	11,808		296	436,467		174,440	2,136		
MCLEAN	121,905	2,324	14,899	161			102,690	1,831		
MERCER	74,984	463		124			70,808	3,590		
MORTON	88,141	3,388		34			84,719			

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APPENDIX TABLE H1. CONTINUED

County	Total Public Grazing Acres	Federal Agencies: Army Corps of Engineers 1990	Fish and Wildlife Service 1990	Bureau of Land Management 1990	U.S. Forest Service 1991**	Bureau of Reclamation 1991	State Agencies: State Land Department 1991	Game and Fish Department 1990	N.D. Forest Service 1991	Parks and Tourism Department 1991
					dollars					
MOUNTRAIL	134,458	10,170	14,015	279			108,736	350		908
NELSON	9,924						9,924			
OLIVER	41,705			10			41,695			
PEMBINA	0									
PIERCE	78,177		680	45			77,452			
RAMSEY	4,389						4,389			
RANSOM	100,027		2,418		90,885		6,628			
RENVILLE	34,532		24,482	21			10,029			
RICHLAND	68,900		4,569	1	60,957		3,308			
ROLETTE	41,390						37,230		4,160	
SARGENT	8,993		2,544				6,449			
SHERIDAN	141,416		10,049	102			131,265			
SIOUX	83,841				11,422		72,404			
SLOPE	199,452		276		134,830		64,206			
STARK	35,227						35,227			
STEELE	0									
STUTSMAN	109,496		7,113	22		4,996	97,365			
TOWNER	37,221						37,221			
TRAILL	239		239							
WALSH	1,422		276	17			1,128			
WARD	94,918		21,530	72			73,316			
WELLS	35,292		1,908				33,384			
WILLIAMS	135,806	2,819	1,784	356			130,848			
TOTALS	4,369,126	42,803	175,219	18,053	1,046,459	4,996	3,051,485	20,973	6,284	2,855
$/AUM	5.71	8.04	10.65	1.97	2.80	5.67	8.61	3.99	10.97	12.15

*No cash transaction. Land was leased to lessee in exchange for weed control on the leased land.
**Revenue was based on $3.58 per Animal Month of grazing, except revenue in McKenzie County was estimated by converting AUMs of grazing into Animal Months of grazing; then applying $3.58 per Animal Month of grazing to obtain revenue. Total revenue was summed and divided by total AUMs to obtain a $/AUM estimate.