

*A Bawtree
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GRASMERE PASTURE MANAGEMENT PROJECT

Report on DATE project #2

July 1975

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Cont'd - Grazing System

TABLE A NORTH GROUP - RANGE USE 1973

Pasture	Acreage	Season of Use	A.U.M.	Acres/A.U.M.
Elkmouth	4,080	May 10 - July 7	536	7.61
Corral Lake	4,880	July 8 - Sept 5	588	8.30
Phillips	3,080	Sept 6 - Oct 15	367	8.39
Totals	12,040		1,491	8.1

TABLE B SOUTH GROUP - RANGE USE 1973

Pasture	Acreage	Season of Use	A.U.M.	Acres/A.U.M.
Adolph's	5,240	May 10 - July 6	564	9.29
Loon Lake	4,800	July 7 - Sept 15	704	6.82
Bagley's	3,160	Sept 16 - Oct 31	423	7.47
Totals	13,200		1,691	7.8

The seasons of use shown for each pasture are approximated in some instances.

The A.I. pasture, which was not grazed in 1973, is the smallest of the seven pastures with 2,120 acres. *2850 ha*

Tables C and D show the numbers of livestock on each pasture through the season. A maximum of 290 head of cattle and 16 horses were in the north group and 350 head of cattle and 20 horses in the south group. It should be noted that these figures do not include calves. The herds consisted primarily of cows with calves and the balance included bulls, replacement heifers and yearlings steers.

TABLE C

NUMBERS OF CATTLE AND HORSES AND SEASON OF USE IN 1973

NORTH GROUP

Date	Pasture	Cattle	Horses
May 10	Elkmouth	121	4
May 11	"	121	16
May 13	"	144	16
May 14	"	180	16
May 21	"	182	16
May 24	"	194	16
May 29	"	204	16
June 3	"	206	16
June 15	"	258	16
June 17	"	290	16
June 30	"	289	16
July 7	Corral Lake	289	16
Sept 16	Phillips	289	16
Oct 15	"	---	--

History

The area studied is Crown range which has been administered by the Forest Service for many years. The area shows a history of logging and burning. Forage and Christmas trees have been harvested annually for many years. In 1972, the Forest Service instituted a rotation grazing system following the fencing of the range into seven pastures. The seven pastures are named A.I., Bagley's, Adolph's, Loon Lake, Corral Lake, Elkmouth and Phillips. Two holding grounds known as Edwards Lake and Traska are strategically located on 160 and 250 acres respectively. Approximately 1,000 head of cattle from thirteen different ranches were grazed as one herd from early May to mid-October, 1972. Each pasture was grazed for a limited period varying from two to six weeks depending on the size of the pasture.

The cattlemen and Forest Agrologists recognized that much of the range was in poor condition. In the spring of 1972, the Grasmere Grazing Association and the Forest Service co-operated in clearing and seeding 286 acres in the Bagley pasture. Crested wheatgrass at 4 pounds per acre and Rambler alfalfa at 1.2 pounds per acre were seeded in alternate rows fourteen inches apart. Ammonium phosphate (16-20-0-14) was broadcast at the rate of 90 pounds per acre at the time of seeding. Approximately 1.75 miles of fence was built to protect the seeded area from grazing during the establishment period. Total cost of the project was \$8,426.05 or \$29.46 per acre.

In the fall of 1972 forty acres of bitterbrush (*Purshia tridentata*) in Adolph's pasture was cleared and broadcast-seeded with 3.75 pounds crested wheatgrass and 1.25 pounds Rambler alfalfa per acre. No fertilizer was applied and the area was not fenced. Cost of this project was \$39.54 per acre.

D.A.T.E. Project

In April, 1973, a D.A.T.E. (Demonstration of Agricultural Technology and Economics) Project was approved by the Department of Agriculture to measure range condition, forage production, range improvement and beef production with particular reference to the grazing system. The project was approved for a two-year period with an annual budget of \$4,200.00. Mrs. M. Specht was employed on the project from mid-May until the end of August, 1973, and Mr. John Kidder was employed for a similar period in 1974.

Costs:	<u>1973-74</u>		<u>1974-75</u>	
	Expenses	\$1,323.50	Expenses	
	Salary	<u>2,196.21</u>	Salary	
	Total	\$3,519.71	Total	\$3,830.33

Grazing System

The grazing system was altered in 1973 at the request of the ranchers. Cattle and horses from thirteen ranches were split into two groups with each group using three pastures. A.I. pasture was not grazed. The two groups of livestock are referred to as the south and north groups. Tables A and B show the acreage, season of use, amount of use in animal unit months (A.U.M.) and acres per A.U.M. for each pasture used in 1973. All cattle aged six months or over at the start of the grazing season are considered as one animal unit. Each horse over six months of age is calculated at one and one-quarter animal units.

Cont'd - Grazing System

It is assumed that 289 head of cattle and 16 horses remained on range in the north group until October 15th.

TABLE D

NUMBERS OF CATTLE AND HORSES AND SEASON OF USE IN 1973

SOUTH GROUP

<u>Date</u>	<u>Pasture</u>	<u>Cattle</u>	<u>Horses</u>
May 10	Adolph's	55	20
May 13	"	174	20
May 14	"	200	20
May 23	"	213	20
June 8	"	332	20
June 20	"	350	20
July 7	Loon Lake	350	20
Aug 24	" "	171	20
Aug 31	" "	169	20
Sept 5	" "	142	20
Sept 15	" "	---	--
Aug 24	Bagley's	175	--
Sept 15	"	317	20
Oct 15	"	---	20
Oct 31	"	---	--

A part of the group (175 head of cattle) were moved from Loon Lake to Bagley's pasture August 24th.

Map

A map of the range was prepared using base material supplied by the Forest Service. Four types of range were delineated based on density of forest cover. Aerial photographs were obtained and used extensively in the mapping project in conjunction with ground checks.

Production and Condition

Thirty-three cages were borrowed from the Fish and Wildlife Branch and the Forest Service. The cages were wire mesh with a four-foot square base and pyramidal shape which facilitated stacking and transportation. Cages were placed on selected range types in each pasture in the latter part of May after removal of growth from the previous year. In the latter part of July and early August, the cages were lifted and a metal ring approximately 42 inches in diameter laid on the ground which the cage had covered. All vegetation within the circumference of the ring was clipped to ground level and placed in individual paper bags. The bags of forage were transported to the Canada Department of Agriculture Research Station at Kamloops where they were oven-dried and the forage weighed. The weight in grams represented pounds of forage per acre when multiplied by ten.

The forage species were identified at the time of clipping and an estimate made of the percent (by weight) of each species in the clipped forage. Following clipping, the cages were replaced in the same position in order that fall regrowth might be measured.

Cont'd - Production and Condition

After growth was completed in the fall, all cages were picked up and taken to Elko Ranger Station for storage. No regrowth took place under any of the cages except those two on crested wheatgrass in 1973. This regrowth was clipped and similarly dried and weighed at the Research Station.

Some shattering of leaves and seeds had occurred by the time the first clippings were made. This was particularly true of alfalfa leaves on the seeded area. Some additional growth of crested wheatgrass may have taken place after clipping October 4th, 1973, but it is believed to be negligible.

Table E shows the production, in pounds of forage per acre, and species composition of the forage clipped under each cage. Two additional clippings from non-caged and non-grazed seeded range were taken on July 19th and are included in Table E. An estimate of range condition, based on the relative abundance of the plant species present, was made for each site.

TABLE E
FORAGE PRODUCTION AND MAJOR SPECIES ON SIX RANGE TYPES

OPEN GRASSLAND TYPE					
Cage	Pasture	Condition	Species	Percentage	lbs/Acre
2	Northwest	poor to fair	Columbia needlegrass Junegrass Idaho fescue bitterbrush	84 7 5	238
7	Adolph's	poor	Columbia needlegrass downy brome bitterbrush	54 35	204
12	Corral Lake	poor	thin-leaved orthocarpus yarrow Junegrass	39 30	90
17	A.I.	fair	needle & thread	100	160
21	Bagley's	fair	needle & thread	98	123
24	Bagley's	fair	needle & thread western wheatgrass fleabane bitterbrush	55 30 9	182
28	Phillips	poor	Sandbergs bluegrass Junegrass Columbia needlegrass	45 30 10	103

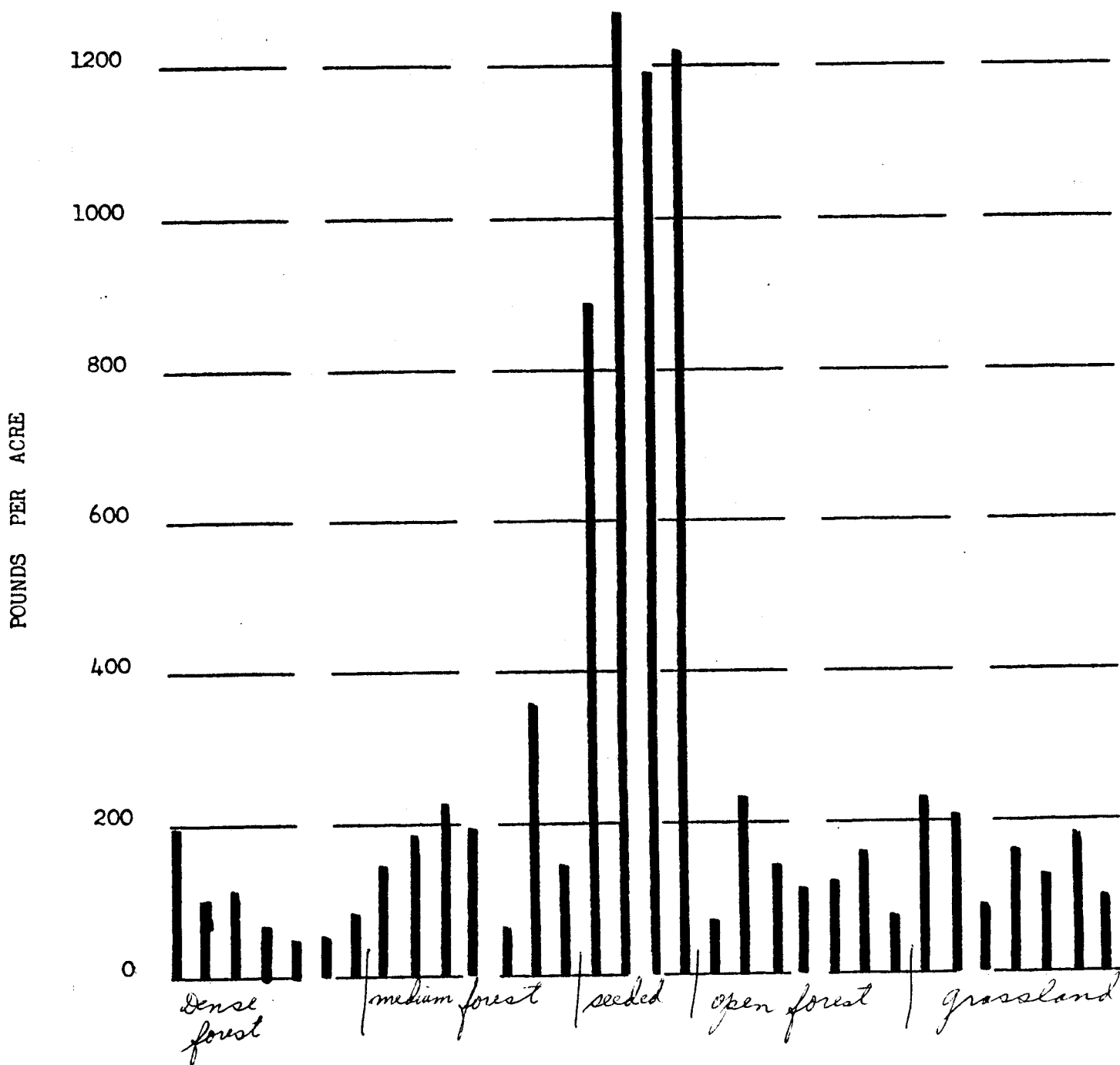
The association of bitterbrush with cages 2, 7 and 24 indicates these are not truly grassland sites. The absence of trees may be due to a combination of logging and fire. It is noted that forage production within this type is highest on the three sites where bitterbrush is present.

Average production of all "open grassland" sites was 157 lbs/acre in 1973

Average production of all "open grassland" sites was 655 lbs/acre in 1974

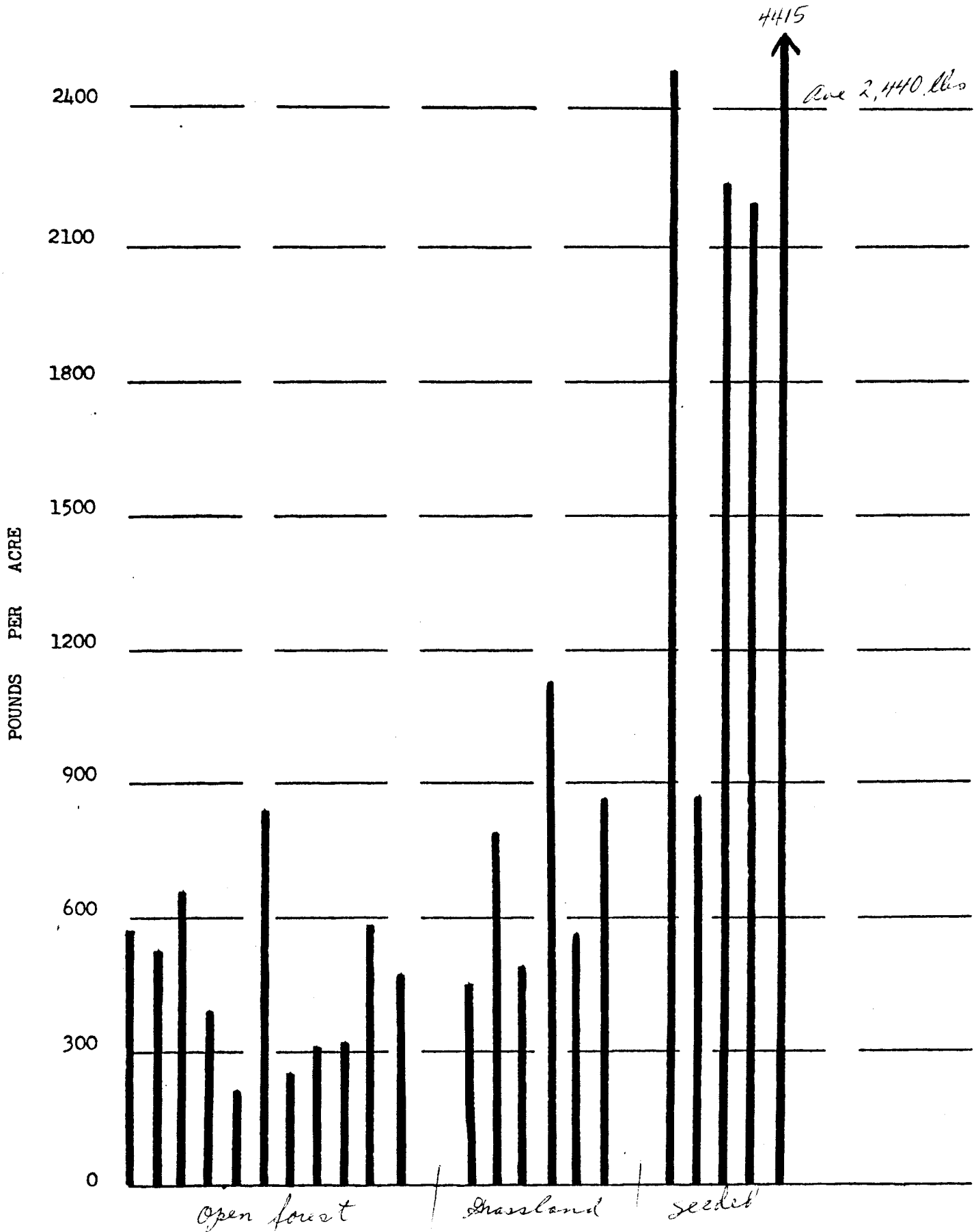
FORAGE PRODUCTION 1973

Precipitation October 1, 1972 to June 30, 1973 -- 10.44 Inches



FORAGE PRODUCTION 1974

Precipitation October 1, 1973 to June 30, 1974 -- 20.50 Inches



INTERMEDIATE TYPE

Cage	Pasture	Condition	Species	Percentage	lbs/Acre
3	Northwest	good	pinegrass Idaho fescue	57 40	136
5	Adolph's	fair to good	Columbia needlegrass yarrow sedge	76 5 5	189
9	Corral Lake	fair	Columbia needlegrass	94	222
13	Loon Lake	fair	Columbia needlegrass Junegrass	84 14	200
20	A.I.	fair	Columbia needlegrass sedge Junegrass	25 25 25	62
27	Phillips	excellent	pinegrass bluebunch	90 6	360
32	Bagley's	good	pinegrass Idaho fescue bluebunch wheatgrass	90 5 5	139

Average production on all "intermediate" sites was 187 lbs/acre in 1973

Average production on all "intermediate" sites was 300 lbs/acre in 1974

DENSE TYPE

1	Northwest	good	rose pinegrass vetch	35 40 20	200
8	Adolph's	fair	pinegrass timber milk vetch strawberry sedge	17 26 17 17	97
10	Corral Lake	fair	pinegrass	82	150
16	Loon Lake	fair to poor	pinegrass penstemon strawberry	50 13 13	62
19	A.I.	poor	needle & thread grass fleabane penstemon	35 35 20	43
23	Bagley's	poor	pinegrass	90	52
26	Phillips	good	pinegrass	97	75

Average production of all "dense" sites was 97 lbs/acre in 1973

BLUEGRASS SOD

Cage	Pasture	Condition	Species	Percentage	lbs/Acre
4	Northwest	fair	Canada bluegrass Junegrass	93 4	422
15	Loon Lake	fair	Canada bluegrass crested wheatgrass	96 3	415

Average production of two "bluegrass sod" sites was 418.5 lbs/acre in 1973

CRESTED WHEATGRASS AND ALFALFA SEEDING

29	Bagley's	excellent	crested wheatgrass alfalfa	93 5	879 + *100
30	Bagley's	excellent	crested wheatgrass alfalfa	95 4	1257 + *90
--	Bagley's	excellent	crested wheatgrass	93	1170**
--	Bagley's	excellent	crested wheatgrass alfalfa	96	1207**

Average spring production four seeded sites was 1128 lbs/acre in 1973

* Fall regrowth

** Fall regrowth not measured

Weather

Weather, particularly precipitation, is a major determinant of range forage production. The production of annual grasses and forbs is more dependent on seasonal precipitation than the deeper rooted perennial bunchgrasses. However, even the production of bunchgrass will vary 100 percent or more from one year to another as a result of precipitation.

Climatic conditions on the study area are characteristic of climate elsewhere in range areas of the southern interior. Precipitation is low, summers are hot and winters are cold. Long term weather records are available from Elko which is situated seven miles north of the north end of the study area and twenty miles from the south end of the study area. Shorter term weather records are available from the Grasmere station located three miles east of the study area. The two stations are approximately fifteen miles apart. A study of recent annual climate records shows that Grasmere is drier and warmer than Elko indicating that precipitation increases from south to north whereas temperatures decrease.

Monthly precipitation figures were obtained from the Grasmere station for the period from October 1, 1972 to August 31, 1974 (see Table 1). Late fall, winter and spring precipitation is significant in forage production. Precipitation in summer is generally not significant but September and October precipitation is sometimes sufficient to promote fall regrowth of forage. Precipitation was vastly different during the two

Cont'd - Weather

years of this study and probably represent close to the extremes encountered. Precipitation from October 1, 1972 until June 30, 1973 was 10.44 inches. From October 1, 1973 until June 30, 1974, the precipitation was 20.50 inches. Annual precipitation figures for Grasmere in recent years show variations from 10.71 inches (1962) to 26.51 inches (1968). Average precipitation from 1962 to 1971 inclusive was 18.75 inches.

Temperature extremes recorded at Grasmere are 100° and -45° F. Summer temperatures in the high nineties are common. Winter temperatures below -25° F are rare. Mean annual temperature at Grasmere in recent years has varied between 43° and 45° F. The frost-free period approximates 95 days.

TABLE 1

Monthly Precipitation in Inches at Grasmere Station

October, 1972	1.50	} Period of effective precipitation for 1973 forage production <u>10.44 inches</u>
November, 1972	0.20	
December, 1972	3.38	
January, 1973	1.03	
February, 1973	1.12	
March, 1973	0.42	
April, 1973	0.47	
May, 1973	1.77	
June, 1973	0.55	} Period of effective precipitation for 1974 forage production <u>20.50 inches</u>
July, 1973	0.15	
August, 1973	1.18	
September, 1973	1.41	
October, 1973	0.45	
November, 1973	6.85	
December, 1973	0.92	
January, 1974	3.20	
February, 1974	1.25	
March, 1974	0.88	} Period of effective precipitation for 1974 forage production <u>20.50 inches</u>
April, 1974	2.60	
May, 1974	2.08	
June, 1974	2.27	
July, 1974	2.48	
August, 1974	0.48	

Soil and Vegetation Zones

Grassland

The true grassland range in the study area is represented by Huff's Prairie in the Loon Lake Pasture and between the Indian Reserve and W. Phillips' ranch along the north boundary of Bagley Pasture. See photo 1 and 2. This range is characterized by the absence of trees or shrubs. It appears to correspond well with Saha Silt Loam and Plumbob Silt Loam shown on the soil map. These soils are dark brown. They represent a very minor part of the total study area but are important for spring range. The seeding in Bagley Pasture is largely on Saha Silt Loam soil. It appears that bluebunch wheatgrass, rough fescue and Idaho fescue are the principal native species present on range in prime condition. Needlegrass has become dominant over most of the grassland zone as a result of heavy grazing. With prolonged heavy grazing, the needlegrass is replaced by weedy forbs and grasses. Results of soil analysis from three areas on the Saha Silt Loam sampled March 26, 1974 are shown in Table 2.

Cont'd - Soil and Vegetation Zones

Grassland

TABLE 2

Organic Matter %	pH	Salts Mmhos/Cm	Available Plant Nutrients - lbs/2M					
			Nitrates NO ₃ -N	P	K	Ca	Mg	S
6.4	7.5	0.38	7	34	656	5839	370	4.4
4.6	7.9	0.36	5	26	589	5510	372	2.3
5.2	7.3	0.34	1	17	734	5178	397	3.6

Ponderosa Pine - bitterbrush - bunchgrass

This vegetation is characterized by the presence of ponderosa pine. Through logging, burning and grazing, this type has been considerably altered on much of the study area. Some of this type presently lacks tree cover although occasional pine trees and seedlings can usually be found. In other areas - e.g. A.I. Pasture - this type has become heavily overstocked with young pine so that both the shrub and grass layers are absent. The Ponderosa pine-bitterbrush-bunchgrass type appears to be closely associated with the brown wooded Flagstone Sandy Loam. This soil type covers virtually all of the A.I. Pasture and major portions of Bagley's and Adolph's Pastures. This zone is illustrated in photo 4.

Douglas Fir - pinegrass vegetation

This type of vegetation predominates on the five northerly pastures. Logging and fire has had considerable effect on this type. In extreme instances - e.g. the west central portion of Adolph's Pasture, the trees have been virtually eliminated. See photo 3. Rapid recovery to trees can be expected. The absence of trees has allowed bitterbrush and bunchgrass to invade. Christmas tree cutting has been profitable on much of this type in recent years. Larch and lodgepole pine occur frequently and pinegrass is the predominant grass. A variety of shrubs occur but not in abundance.

It appears all of the brown wooded Wycliffe Silt Loam soil is in the Douglas fir-pinegrass association. In addition, a large percentage of Elko-Saha soils (undifferentiated brown wooded and dark brown soils) support the same vegetation.

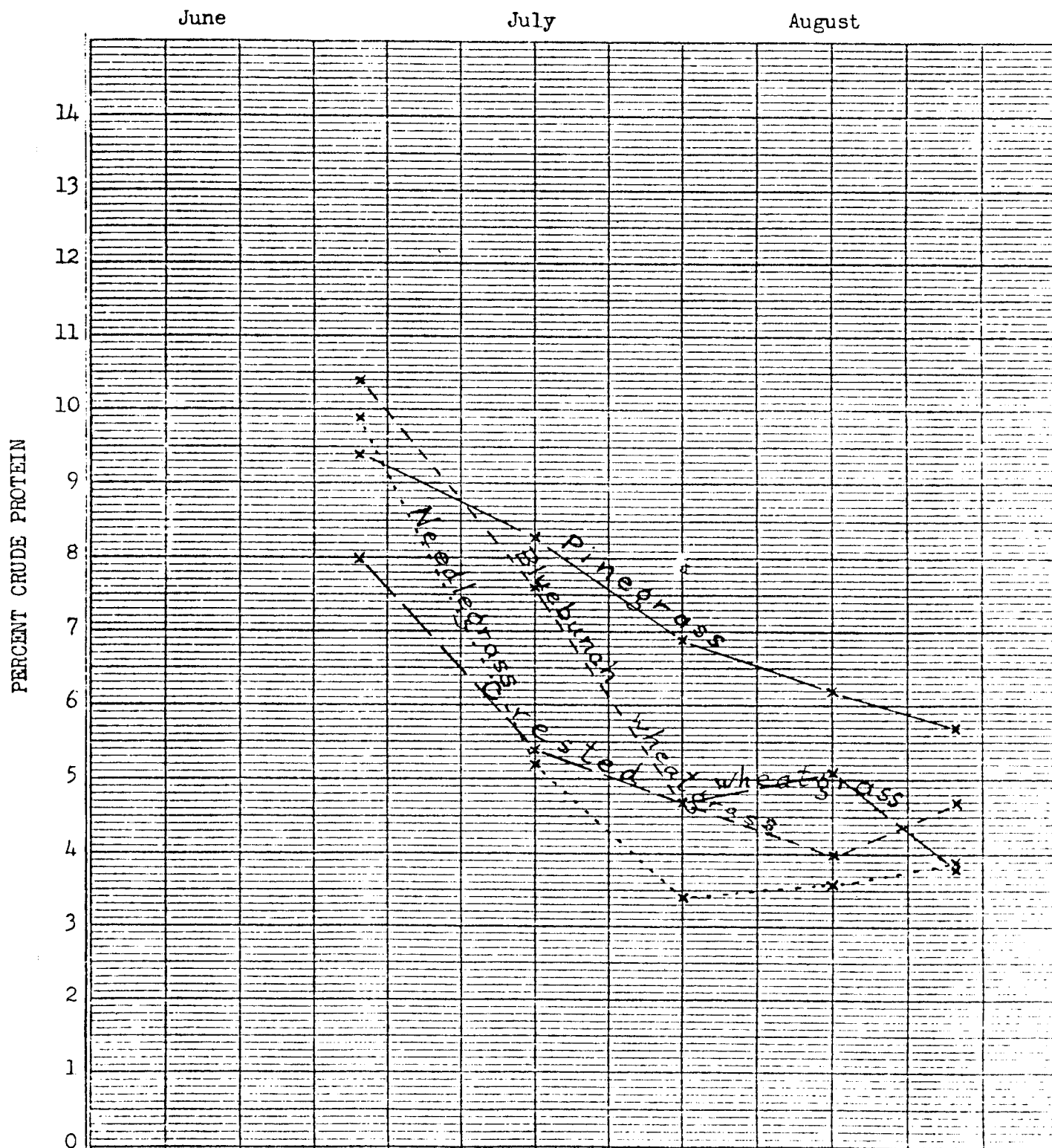
Range Types Mapped

On the accompanying map, the range has been separated into four types based on forest cover. This is useful for short-term range management purposes. Long-term range management plans and improvement projects should be correlated with other desired uses of the land and based on vegetation zones (habitat types) and soils.

Open Grassland Range (colored yellow on the map) includes natural grassland areas and areas where trees are absent due to logging and/or fire. See photos 1, 2 and 3. In top condition it is characterized by the presence of wheatgrass and fescue. This type has suffered most from grazing due to the presence of preferred grass species, their early spring growth and sensitivity to grazing. However, in some instances, e.g. Huff's Prairie, farming attempts have been responsible for destruction of the original vegetation. Heavy grazing has resulted in a reduction of the fescues and wheatgrass and an increase in

PROTEIN CONTENT OF FOUR GRASSES

1973



CALCIUM AND PHOSPHORUS CONTENT IN FOUR GRASSES

1973

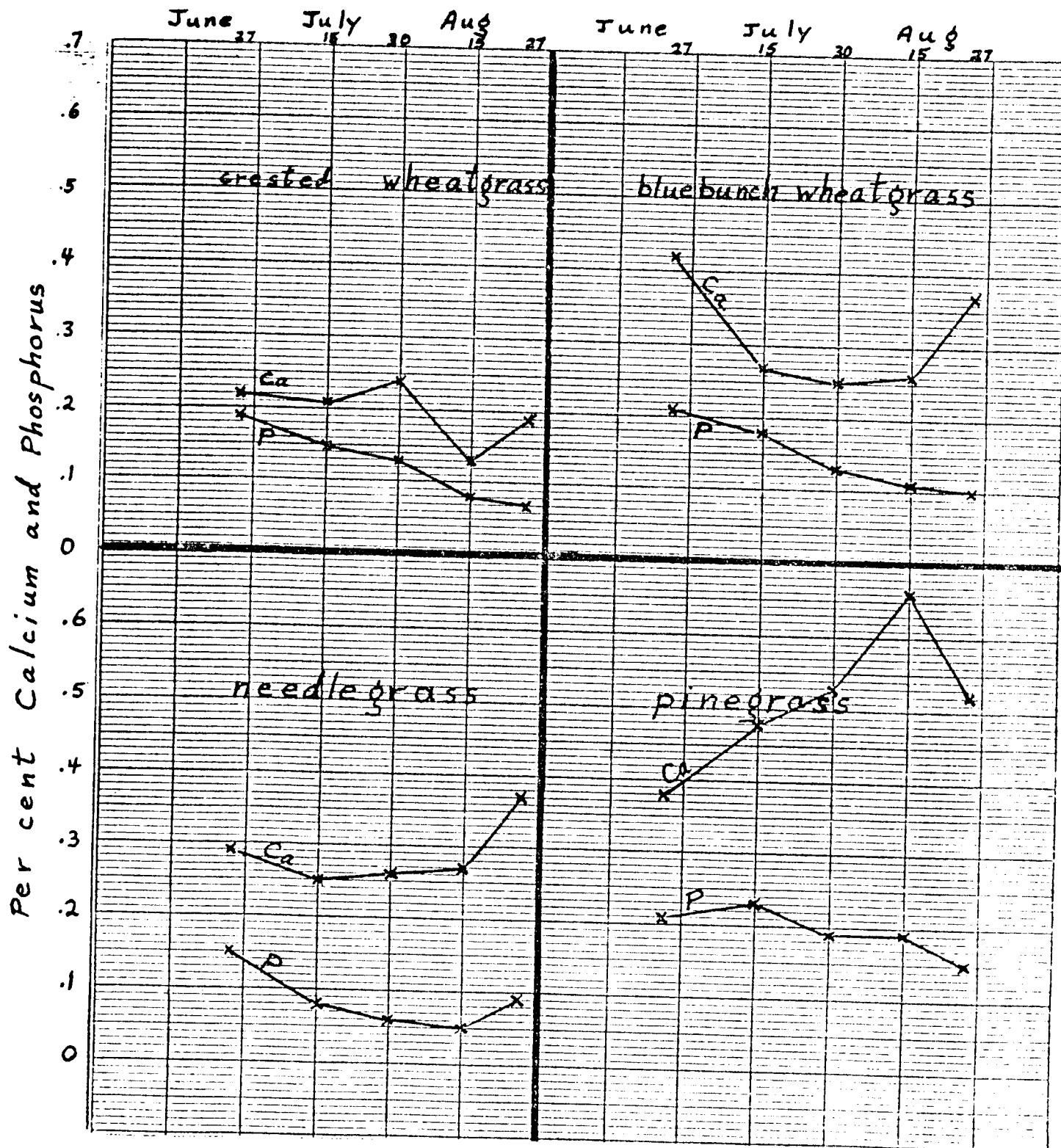


PHOTO 1



Grassland range on A.I. Pasture. Note occasional bluebunch wheatgrass or rough fescue plants. Dominant grass is relatively unproductive needle-and-thread. Photo taken in fall 1973.

PHOTO 2



Grassland range on A.I. Pasture. Note relative abundance of highly productive bunchgrasses as compared to Photo 1. Photo taken in fall 1973.



A field day with range users and Forest Service representatives. Grassland range in Adolph's Pasture. Bitterbrush was cleared and piled and the area broadcast seeded with crested wheatgrass and alfalfa in fall of 1972. This area was grazed in spring of 1973. Photographed August 21, 1973.



Open forest range is illustrated in right background.



Open forest range is illustrated in this picture taken in A.I. Pasture in October, 1973. In this type of range the trees are generally well spaced with a minimum of clumping such as is illustrated in the center foreground.



Intermediate forest type range dominated by lodgepole pine and pinegrass. Some bunchgrasses in foreground.



Intermediate forest type range dominated by larch. A wide variety of grasses and forbs provide forage.



Dense forest type range is illustrated in background of this picture taken in A.I. Pasture in October; 1973. Livestock avoid use of this type of range when they have a choice.



1

Seeded area on Bagley Pasture just after grazing started in 1974. Photographed May 28, 1974.



1

Seeded area on Bagley Pasture August 19, 1974. Little growth occurred after removal of livestock on July 5th. Note uneven grazing. Heavier grazing in early spring or fall is required to avoid this situation.



Cattle grazing Bagley seeding October 3, 1973. Green regrowth at base of plants is faintly visible. Seeding was done in spring of 1972 and was protected from grazing until this time.



Bagley seeding May 28, 1974 two years after seeding. Production of alfalfa is low in comparison to crested wheatgrass. Numerous crested wheatgrass seedlings established between the rows in the spring of 1974.

Cont'd - Range Types Mapped

needlegrass on most of this type. In a few instances overgrazing, abandoned cultivation or other soil disturbance has resulted in a cover consisting of relatively unproductive and unpalatable annual grasses and forbs. This range type is preferred by livestock for early spring, late fall and winter grazing. The natural grasslands are the driest sites. Other non-forested areas within this map type are less arid and on these we can expect gradual restocking to trees. Much of the area typed as grassland on the 1951 Forest Service range reconnaissance is now forested.

Four clippings on natural grasslands in 1973 showed production of 160, 123, 103 and 90 lbs of forage per acre. Three clippings on open grassland in combination with bitterbrush showed production of 238, 204 and 182 lbs per acre. The average of these clippings is 157 lbs per acre. A better moisture regime on the unnatural grasslands (grass-bitterbrush sites) might be responsible for the higher production or it might indicate better range condition. It is believed that a combination of these factors is responsible.

1974 production averaged 655 lbs per acre or 4 times as much as in 1973. One site, a small opening in the fir forest, produced 1,100 lbs per acre. Observations on range condition indicated the sites clipped in 1974 were in somewhat better condition than those clipped in 1973.

Open Forest Range (colored light green on the map) is widely distributed throughout the study area with the least amounts in the Corral Lake and Loon Lake Pastures. (See photos 4 and 5). Trees in this type are either Douglas fir or Ponderosa pine or a mixture of the two. Douglas fir predominates on this type in the northerly pastures and Ponderosa pine predominates in the southerly pastures. Bitterbrush is frequently found in this type. Bluebunch wheatgrass, fescues and needlegrasses are decreasers under heavy grazing. The bitterbrush discourages grazing by domestic livestock so that the native bunchgrasses are commonly associated with bitterbrush plants whereas less productive grasses and weeds replace the native bunchgrasses between the bitterbrush plants.

Seven clippings were taken in 1973 on areas described as open forest. Bitterbrush is recorded as a component of the vegetation on the three sites which are in the northerly pastures. Average production from these three sites was 187 lbs per acre. The average of three sites on the southerly pastures where bitterbrush was not recorded was 99 lbs per acre. Average production for the seven sites clipped in 1973 was 139 lbs per acre. Six of the sites were classed as poor condition and the seventh was classed as fair. Variations in production on this range type are believed to be a factor of moisture availability as much as range condition. Greater effective moisture is indicated by the presence of bitterbrush and the general pattern of increasing precipitation from south to north.

The condition of this range indicates its high preference for grazing by livestock. The high producing and palatable bunchgrasses and their early season growth makes them highly preferred by domestic livestock and range condition is similar to that on the grasslands. But here again fire and logging, in addition to grazing, may be responsible for the present range condition.

1974 production averaged 424 lbs per acre or 3 times 1973 but it is believed the sites chosen in 1974 were in somewhat better condition than those selected in 1973.

Intermediate Forest Type Range (colored dark green on the map) is distributed over the entire map area. Photos 6 and 7 illustrate the forest density on this range type although they were not taken in the Grasmere area. In the northern portion the tree cover is predominantly Douglas fir whereas in the south it is Ponderosa pine, but there is considerable mixing of these species. Lodgepole pine is also common in the northerly

Cont'd - Range Types Mapped

pastures. Bitterbrush is not present on these sites. Rose, kinnikinnik and soopalallie occurs frequently. Columbia needlegrass and pinegrass are the principal grasses. Numerous forbs are found including aster, strawberry, yarrow, and anemone. In general, the intermediate forest type would occur in the Douglas fir-pinegrass zone. Areas of Ponderosa pine perhaps represent temporary overstocking of pine on areas which would eventually become open pine forest or possibly open Douglas fir forest.

The intermediate forest type range is less preferred by livestock than the open forest and grassland types. The shaded forage starts growth later so livestock congregate on more open areas in the spring. In addition, pinegrass is usually the dominant grass species and is less preferred than the grasses on more open ranges. The forest canopy is not considered to be a barrier to the movement of livestock on this range type and, in very hot weather, livestock may prefer this type for its shade and the fact that the forage remains green later into the summer.

Lower preference for this range type probably explains why it is in better condition than the more open range. See Table E. Average forage production from seven sites in 1973 was 187 lbs per acre. This was the highest producing range type in that year. Higher production seems to be due to slightly better moisture and range condition but potential forage production is limited by tree cover.

In 1974 two sites sampled in the intermediate forest type in excellent condition, with pinegrass the dominant forage, produced approximately 300 lbs per acre. The percentage increase in production in 1974 was much less than on the grassland or open forest types. Forage production on the more open (bunchgrass) sites considerably surpassed production in the intermediate forest (pinegrass) type in the wetter year.

Dense Forest Type Range (not colored on the map) is an unnatural state characterized by dense stocking of trees due to the previous history of logging and fire. (See photo 8). Tree cover may be either Ponderosa pine or Douglas fir. Over a period of many years these dense stands will gradually thin out to intermediate forest range in the case of Douglas fir and to intermediate or open forest range in the Ponderosa pine zone. Forage production in the dense forest is dependent on forest density rather than available moisture. Pinegrass is the predominant forage.

This range type is quite undesirable for livestock. In some instances tree growth is sufficiently dense to form a physical barrier to livestock. All of this type is avoided by livestock when forage is available on less heavily forested areas. Livestock management is most difficult on this type of range because livestock are difficult to see and virtually impossible to herd. The tree cover competes with forage species for soil nutrients and light and additionally the needle litter built up from the trees prohibits forage growth. Seven sites within this range type yielded an average of 97 lbs of forage per acre in 1973. No capacity has been given to this range type as it is virtually unused where it occurs in conjunction with preferred range types. No clippings were made on this type in 1974 but production would not be expected to be significantly different than 1973 as precipitation is not the limiting factor.

Range Seedings

Range seedings (colored brown on the map) have been carried out on Bagley's pasture in the spring of 1972. Crested wheatgrass and Rambler alfalfa were seeded in alternate rows at the rate of 4 and 1.25 lbs per acre respectively. See photos 9 and 10. This seeding has been remarkably successful. Its success appears to be due to

Cont'd - Range Seedings

good seedbed preparation and better than average precipitation following seeding. The seeding is primarily on the dark brown Saha silt loam which supported a very scattered stand of Ponderosa pine. It is estimated that the crested wheatgrass provides 85 to 90 percent of the total forage with the alfalfa providing most of the remaining 10 to 15 percent. Native grasses and forbs are scarce. Cost of this seed, including fencing on two sides, was \$29.46 per acre.

Crested wheatgrass is noted for its early growth, longevity, fall growth, ability to withstand early grazing, drought and cold resistance, high forage production, and high production of viable seed. Crested wheatgrass on the Bagley seeding established rapidly. Four random clippings taken from mature forage on July 19, 1973, yielded an average of 1,128 lbs per acre. Precipitation in late August and September was sufficient to provide fall regrowth yielding approximately 100 lbs per acre. Thus total average production exceeded 1,200 lbs per acre. Three clippings on natural grassland range in poor condition but on similar soils yielded 124 lbs per acre. In 1974 five random clippings on the Bagley seeding yielded an average of 2,440 lbs per acre. Seven clippings on grasslands in fair condition yielded an average of 655 lbs per acre in 1974. No regrowth occurred on either native or seeded species in 1974 and only on crested wheatgrass in 1973. Yield figures indicate production was increased 155 tons in 1973 and 255 tons in 1974 by this seeding.

A 40-acre seeding was carried out in 1972 in Adolph's Pasture. See photo 3. Crested wheatgrass and Rambler alfalfa were broadcast seeded at the rate of 3.75 and 1.25 lbs per acre respectively. The soil on this site is a brown wooded Wycliffe silt loam. Vegetative cover was characterized by occasional young Douglas fir trees, dense bitterbrush, and mixed grasses. Bitterbrush was cleared and piled using a TD 15 Caterpillar equipped with a land clearing blade with teeth spaced eight inches apart. No fencing was done in connection with this seeding. Cost was calculated at \$39.54 per acre. This seeding was much less productive than the Bagley seeding in 1973 and 1974 although no measurements were made. Its limited initial success appears to be due to the failure to completely remove existing vegetation, particularly grass. The effect of grazing during the first year or two after seeding would also increase the establishment period. However, this seeding may still prove successful.

A third seeding of crested wheatgrass and alfalfa was carried out in Loon Lake Pasture in the fall of 1973. This seeding of 118 acres was on a Saha silt loam similar to the Bagley Pasture seeding. The seeding rate was approximately $3\frac{1}{2}$ lbs per acre of crested wheatgrass and $\frac{3}{4}$ lbs per acre of alfalfa. This area was rototilled and the seed subsequently drilled in twelve-inch rows. Examination of this seeding in 1974 indicated poor success although dryland seedings such as this frequently require two or more years to become established. If this seeding fails to establish satisfactorily, it is probably due to the loose seedbed resulting in seeding too deeply.

Grazing System

The preferred range types at Grasmere have been overgrazed. The reason is not so much because of too many livestock but rather because of poor distribution of livestock and season-long grazing. The division of the Grasmere Unit into seven pastures provided the opportunity to graze a limited area for a short period or provide complete rest. With the construction of fences, the two most important reasons for overgrazing could be eliminated.

1. the season of use could be reduced to a few weeks which would permit maximum growth of forage either before or after the short grazing season.
2. the concentration of livestock on a relatively small pasture would increase utilization of less preferred range areas which are scattered throughout the Unit

Cont'd - Grazing System

Livestock belonging to each range user were grazed together as one herd in 1972. The fact that this system proved unacceptable to the range users illustrates that the immediate effect of more intensive range management can be higher costs.

The grazing system in effect in 1973 and 1974 was an alternative proposed by range users. Livestock were divided into two herds. Each herd used three pastures during the grazing season and the seventh pasture was not grazed. This system seems to be acceptable to the range users. The improvement of range condition would probably be slower under the three-pasture system but the principle of reduced period of use and improved distribution is the same. With a grazing season of five to six months, each pasture is grazed for nearly two months on the average. Under this system, the first pasture is grazed through most of the growing season. Heavy grazing throughout the growing season severely weakens plants and can result in severe reduction in forage production the following year. In 1973 and 1974 Elkmouth Pasture was grazed from May 10 to July 7 and May 7 to July 14 respectively. These periods could have been extremely damaging were it not for the fact the livestock obtained considerable forage from the former farmlands not included in the study area and which, in the summer of 1974, were permanently lost to grazing under Kootenai Lake. The south group used Adolph's Pasture from May 10 to July 6, 1973 and A.I. Pasture from May 7 to July 5, 1974. Adolph's is the largest of the seven pastures and many cattle were not turned out at the start of the season so that utilization was relatively light (9.3 acres per A.U.M.). The 1974 use of A.I. Pasture was greatly relieved by use of the seeded range in Bagley Pasture which was used in conjunction with A.I. Pasture from May 27 to July 5. Use was not sufficiently concentrated on any of the pastures to obtain good distribution of livestock and utilization of all range types. However, something less than the desired distribution is necessary with a two-month grazing period or severe overgrazing of preferred areas would result.

After the end of June, the major forage species are sufficiently matured so that grazing will not seriously affect their future productivity. Heavier grazing after mid-summer and during the fall is much less damaging to future forage production. Consideration should be given to obtaining a lower stocking level or a shorter season of use on the pasture used first during the season unless seeded range suitable for spring grazing contributes a significant portion of the available forage. A relatively low stocking level could be obtained through earlier removal of livestock, delayed turnout or reduced livestock numbers. Earlier removal of livestock from the first pasture would appear to be the most acceptable alternative. This action would result in heavier use on the remaining two pastures which, because of the season of use, would be acceptable.

Administration

The Forest Service is responsible for the administration of range and forest products on the Crown lands in the study area. Most of the land lies within the Elk Forest Reserve. Control of fire and the harvesting of wood products have been the function of the Forest Service for many years. However, some control of range livestock has also been exercised through the issuance of grazing permits. Since 1949 two Forest Agrologists at Nelson have been primarily responsible for range administration throughout the Nelson Grazing District. Assistance on range matters in the Grasmere area has been provided by field staff located at Elko.

The Forest Service recognized, from the earliest days of range administration, that many ranges were in a seriously overgrazed condition. In the late forties and early fifties administration in the East Kootenays was directed toward authorizing existing use

Cont'd - Administration

of Crown range, removing unclaimed and trespass horses, and obtaining estimates of the resource available. These measures were obvious first steps in range administration and basic to management. However, they were not always supported by the range users who had relatively unrestricted use of the Crown range until that time. The need for such measures was not apparent to many of the livestock owners. Since the fifties, the Forest Service has endeavored to obtain better range management. In general, their efforts have been opposed by the users. The Forest Service position has been that it was responsible for maximizing forage production, controlling fire, and maximizing forest cover without manipulation of the vegetation. The range users saw this stand as an inevitable reduction in use of Crown range coupled with increased management costs. The Forest Service appears to have failed to recognize their position would result in overly dense forest cover on the extensive fire-induced grassland ranges it was attempting to improve. The range users on the otherhand apparently did not recognize the extent to which the range had deteriorated and the resultant lack of productivity. Lack of adequate communication, confidence and respect have caused administration difficulties for the Forest Service and seriously delayed improved management practices.

Forest Service efforts toward range management and improvement were primarily directed to limiting numbers of livestock and season of use prior to 1970. During the late fifties and sixties the condition of the natural grassland range probably remained static or improved slowly. The grasslands created by logging and fire regenerated to trees. Dense tree regeneration has excluded forage production from many areas mapped as grassland in 1951. In the late sixties some effort was directed toward development of more watering sites as an aid to livestock distribution. Since 1970, the Forest Service and range users have co-operated in the construction of many miles of fence and the seeding of many acres of overgrazed range. The fences have made better range management practices possible. The Bagley seeding has greatly increased production at that site. These improvements have made more sophisticated range management possible but at the same time they necessitate more intensive management in order to realize their potential, justify their cost to the range user and prevent misuse. This will necessitate a high level of management input through co-operation between administrators and range users.

User Organization

The Roosville-Grasmere Grazing Association is a legally constituted association formed as a subsidiary of the Waldo Stockbreeders' Association. The Waldo Stockbreeders' Association in turn holds membership in the B.C. Cattlemen's Association. The Roosville-Grasmere Grazing Association includes range users on the Grasmere and Roosville Units of the Waldo Stock Range. The Grasmere range users divide the Crown range between the north and south groups and manage their livestock on Crown range in two herds. The Forest Service sets spring turnout dates based on range readiness estimates carried out each spring by the local Ranger staff. Range readiness is based on measurement of new growth on important grass species. Turnout date is flexible between May 1 and May 15 at the discretion of the Forest Ranger. Similarly the movement of livestock from one pasture to another and final removal date are somewhat flexible. Numbers of livestock and season of use is specified on the annual grazing permit issued to each range user. Adjustments in range management plans may be made through meetings of the Grasmere Grazing Association with Forest Service personnel.

The Grasmere Grazing Association appears to have some essential functions such as the following:--

Cont'c - User Organization

1. to co-operate with the Forest Service in developing and implementing short and long term range management plans
2. to suggest range improvement projects which will improve the management and condition of the range
3. to foster co-operation between range users
4. to organize labour and equipment as necessary to ensure range management and improvements are carried out in an efficient manner
5. to ensure costs and responsibilities associated with use of Crown range are fairly shared between range users

The last-mentioned function requires further explanation. In community use of Crown range it is essential that all livestock be handled as one herd. Costs of herding, salt, salt distribution, fence maintenance, and other services must be provided equally to all livestock without regard to ownership. It appears essential that one person be solely responsible for providing services on the Crown range. This person might be hired by the Grasmere Grazing Association to provide services to all users on Crown range within their area of influence (Roosville-Grasmere Units) or the individual might be a range user providing services for all livestock within his group. The important point is that the day-to-day action regarding range and livestock management, such as salt and bull distribution, are ineffective unless co-ordinated by one person. The importance of livestock and range management must be recognized and the costs shared by all range users in relation to their livestock numbers.

Other Land Uses

On any Crown lands public demands will have a bearing on the use to which the land is put. In this study, it was recognized that the area has potential for other uses which must be considered in improvement and management plans. No attempt was made to assess the area for uses other than domestic livestock grazing. However, it is recognized that vegetation changes caused by grazing of domestic livestock, or for the purpose of increasing grazing values, may adversely affect other uses of the land. There appears to be a desperate need for official recognition of all present and potential uses of the land. Long-term land use policies need to be stated. It would then be possible to manage the land and vegetation for the stated use or uses.

Conclusions

Historic over-grazing of the range has resulted in greatly reduced forage production. Present production on the limited acreage of true grassland range is estimated at 25% of potential. Natural regeneration of tree species is responsible for a major reduction in the potential forage production which existed following logging and fires in the twenties and thirties. Improvement in range condition can be accomplished under the rotation grazing system employed in 1973 and 1974, but some further loss of range can be expected due to forest regeneration. The rate of range recovery will be slow. A similarly over-grazed (Py) grassland site at Skookumchuk fenced and protected from grazing since 1950 recovered to maximum productivity about 1972. The Bagley seeding shows crested wheatgrass can be successfully seeded. Production from crested wheatgrass is at least as high as from native grasses in top condition. Crested wheatgrass is valued higher than native species because it can be grazed about 65% as compared to about 50% on native species. In addition, crested wheatgrass will grow earlier and withstand early grazing and regrow in fall better than native grasses. Crested wheatgrass may establish a good stand in one

Cont'd - Conclusions

year after seeding and protection from grazing but two or three years may be required: or seedings may fail. Experience elsewhere has shown that crested wheatgrass stands can remain productive for over forty years. Average production on the Bagley seeding was about 1,200 lbs per acre in 1973 (an exceedingly dry year) and 2,400 lbs per acre in 1974 (an exceedingly wet year) for an average of 1,800 lbs per acre in the two years. The 1,800-pound average compares favourably with less than 400 lbs per acre from adjacent native range in fair to poor condition. Pinegrass is more nutritious than crested wheatgrass or other native grasses in mid-summer.

In 1973 and 1974 the permitted grazing use amounted to about eight acres/A.U.M. Average production from all native range sites in 1973 indicated a proper stocking rate of about eight acres/A.U.M. Observations showed little evidence of overuse in 1973. Considerable progress toward improvement in range condition would occur in wet years such as 1974. Livestock distribution, although vastly improved as a result of fencing, is still the major problem.

In order to obtain maximum values from crested wheatgrass seedings they should be heavily grazed for a short period in early spring. Grazing of crested wheatgrass in late spring is more detrimental and is wasteful of the attributes of this grass.

The objectives of range improvements need to be clearly defined. If forage production is increased, will stock numbers be increased or an earlier turnout allowed?

Nutritional analyses indicate inadequate phosphorus and protein levels for growing animals after mid-summer. Phosphorus can readily be supplemented on range but protein supplementation is less practical. Other alternatives might be irrigated pastures, early weaning of calves, seeding of specialized grass and legume species for late season grazing, etc.

Productivity studies indicate the greatest economic increases could be obtained by seeding of depleted grasslands and dense coniferous forest.

Knapweed presents a threat to range and continuing chemical control measures are required to prevent its spread throughout the range. Goatweed, or St John's-wort, also exists on this range but hopefully is being controlled biologically.

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