Gallup, New Mexico,
August 3, 1938.

MEMORANDUM TO MR. T. L. REGGIE

FROM : Marc T. Kindred

SUBJECT : Utilization Surveys for the Grazing Year 1937 - 1938.

The demonstration area utilization studies for the 1937 - 1938 grazing period have been completed. Attached is a detailed account of each demonstration area, also a tabulated summary sheet for each area by years on which a utilization survey has been taken.

The method used was in a nature similar to previous surveys. A forage type map together with a unit map were used for each area. One write-up was made in some cases for each grazing unit, however, where it was felt necessary, grazing use zones were set up and drawn on the map, and two or more write-ups for each unit were written. The utilization estimate sheet was used for these write-ups. Where more than one write-up was taken for a unit, a weighted utilization percent was calculated by using the established forage acres from the grazing survey estimates. Also, this weighted utilization was calculated for the entire area where grazing units have been established.

The formula used to determine the forage acre requirement for the year is as follows:

$$\frac{FA}{SYL : EU = X : PU} = F.A.R.$$

FA = Total forage acres in area (from range survey).

SYL = Number of sheep grazed on a year-long basis (from stocking records).

EU = Estimated utilization for the area in percent (from utilization survey)

X = Number of sheep that would have used the area 100% of proper utilization if grazed for the entire year.

PU = Proper utilization in percent (100%).

FAR = Forage acre requirement for the year.

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At the end of the growing season, a forage survey was made, which was in a sense a utilization survey. This survey shows at that time of year the amount of feed that has been used and the amount still available. After the field data was taken and results tabulated, a ratio could be set up showing the stocking rate that should prevail for the rest of the season. Two ratios can be used showing this condition:

$$\frac{\text{UP}}{\text{No. Mos. of Use}} : \text{Actual} = \frac{\text{PP} - \text{UP}}{\text{Mos. of Use Left}} = \text{I, or Stocking Rate for remainder of the use period.}$$

$$\frac{\% \text{ Used}}{\text{No. Mos. Used}} : \text{Present Stocking} = \frac{\% \text{ Left}}{\text{No. Mos. Left}} = \text{I, or Rate of Stocking for the remainder of the use period.}$$

This latter formula was used in the attached computations. The results are shown on the summary sheet as a comparison with the Spring utilization results.

In four areas, panel exclosures were visited in order to base the current seasons volume growth; in the other areas, this condition was based on strictly estimation. These small portable panel exclosures are felt to be necessary in all areas where utilization surveys are made.

It is felt necessary to formulate fundamental concepts pertaining to utilization and forage surveys, and define them for clarification purposes. Also, utilization indicators and standards should be accepted and worked out for the necessary types and conditions. Under present methods, the human element enters into the picture making results not too conclusive. With standards set up, then different estimators can arrive at nearer the same results.

Accurate use records by each unit and area will have to be kept in order to arrive at any definite conclusions. Because what difference does it make what the fall or spring utilization estimates are if we do not know how many head of stock it took to use the forage up to that point.

From the present available data, it might seem well that some few species palatability ratings should be changed. As an example, blue grama - which is low in vitality and volume growth - produces very little forage as compared to normal for this species.

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The rating for this species could be lowered, but however, if and when this species again produces its normal growth, then the reverse procedure would have to take place. Possibly a better method could be used until more data is available, in that the Forage Acre Requirement can be changed for these types in which the questioned species occur.

Ward T. Kindred
Junior Range Examiner

WTKrucks

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UTILIZATION SURVEYS SUMMARY

	Spring 2936		Spring 1937		Fall 1937			
	% Util.	FAR	% Util.	FAR	% Util.	Rate of Stocking for Remainder of Year	Spring 1938 % Util.	FAR
Chilchinbito					38.8	222	60.6	7.7
Cove			78.9	5.56	37.9	649	97.4	4.2
Fort Wingate			83.5	1.90	42.1	1,751	80.7	2.1
Fraser	56.6	4.67	111.7	4.84	62.2	118	89.6	3.21
Ganado	79.07	3.79	103.6	2.99	62.	346	125.3	3.73
Kayenta			65.4	3.99	51.8	1,007	77.3	3.48
Klag-e-toh*					63.5	42	108.8	13.18
Mexican Springs							81.	3.39
Steamboat					30.9	[illegible]	[illegible].	3.15

*This area calculated for horses. All other areas converted to sheep units.

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CV-6417-201 NN004293

UTILIZATION SURVEY OF
CHILCHINBITO DEMONSTRATION AREA

The average annual precipitation for this area can be figured as being fairly close to 8.43 inches. For the past grazing year, it is estimated that the precipitation had been somewhat normal. No records are available between March 1936 and February 1955.

The former range condition was very unsatisfactory. Some small areas were fair, but many, due to denudation by overgrazing, had been badly wind-eroded and valuable forage species had been largely replaced by spring; muhly, snake weed, rabbit brush and annual weeds. The density of palatable species was generally below what it should be for that environment, plant vigor and volume growth was low due both to overgrazing and to drouth. The woodland types were in very poor condition, sheet and gully erosion had reached the destructive stage because of the steep slopes without vegetative cover and the highly erodible soil.

Wind erosion in the northeast portion of the area has been nearly stabilized. Black grama has come back to a very great extent to a point where it makes up quite a large percentage of the palatable vegetation.

Areas of blue grama are now producing larger volumes due to the protection and increased vigor of the plants.

Many of the small structures have retained silt and both natural and artificial revegetation has been established. Diversion of runoff from waterways has augmented the normal wetting from precipitation,

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holping the ground cover as well as keeping runoff and silt out of the lower drainages.

The woodland types still are rather slow in showing very great improvement, and under the present low rate of stocking should be given entire protection.

The volume growth has come nearer to average production with galleta furnishing the majority, blue grama produced below normal for this environment.

This area was turned into a buck pasture and was stocked with 131 head of bucks which is about one-fourth of the total carrying capacity. Part of this herd went out of the area on December 5th for use in Indian herds and came back into the area January 15th. Two head of horses were reported to be used in the area, but several head were counted in the area at the time of the survey. From signs around fences, some trespass has been noted. From these conditions, use as noted is inadequate to give a true picture of the conditions. From our records, 48,905 sheep days feed were used or 134 sheep year-long. Utilization for the spring survey showed 61% as compared to 38.8% for the fall survey.

By substitution in the formula

$$\frac{\text{F.A.}}{\text{S.Y.L.} : \Sigma U = X : P U} = \text{F.A.R.}$$

$$\frac{1708.8}{134 : 60.6 = X : 100} = \text{F.A.R.}$$

$$7.73$$

By solving first for X, we find that 221 head would have used the range to proper utilization. And by completing the formula, it was

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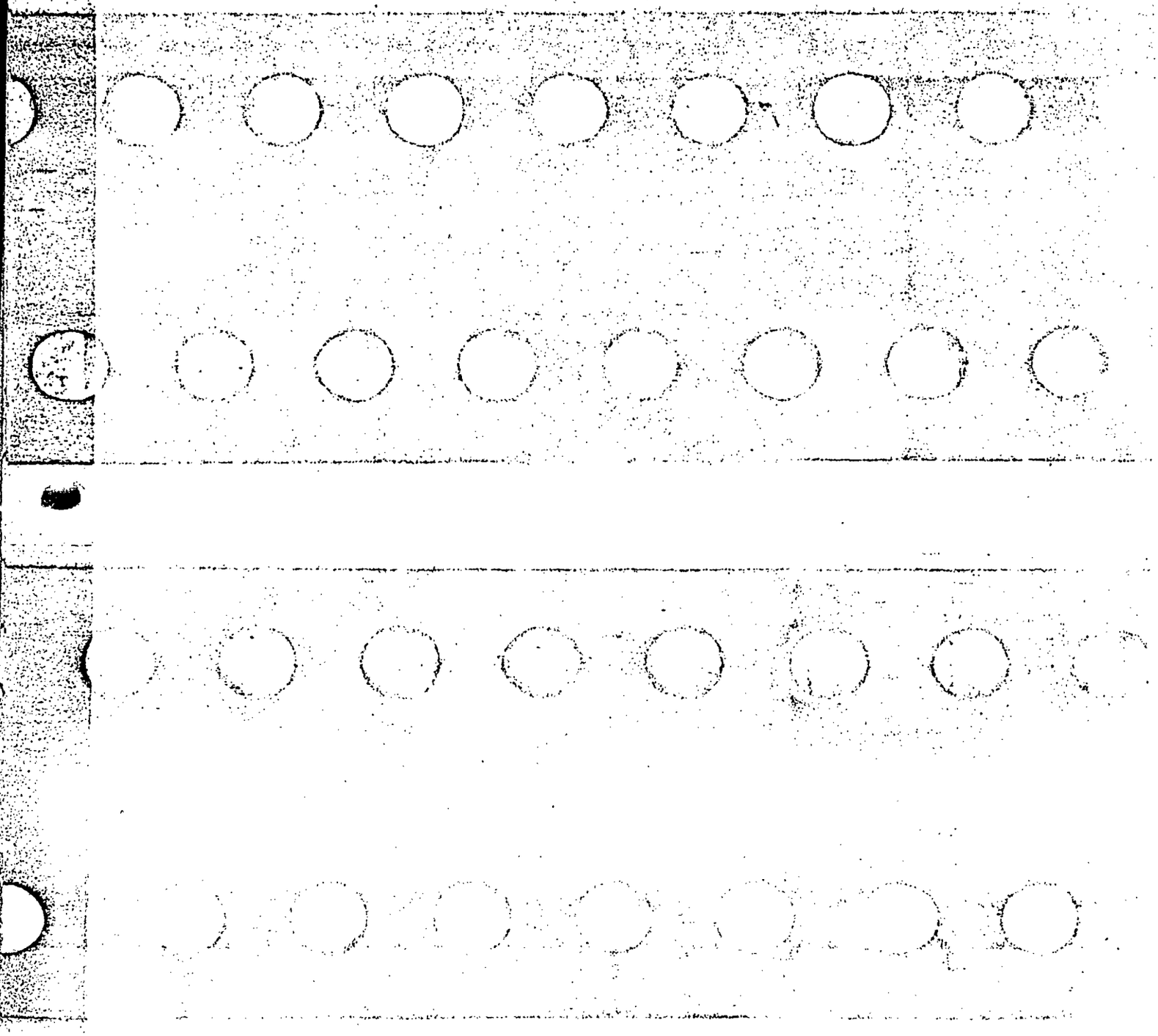
NN004295

found that P. A. R. was 7.73, or the number of forage acres that were actually used by the herd of runs and horses.



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CV-6417-201 NN004296

CHILCHINBITO

UNIT NO. 1

Erie-up No.	Type No.	Formula Acres	% Total	% Utilization	Weighted Utilization
10	K-17	113.4			
	K-16a	10.7			
	K-15	41.4			
	K-16	6.7			
	K-14	15.8			
	K-13	10.5			
	K-12	5.5			
		204.0	27.9	17	4.7
9	K-32	24.1			
	K-18	21.1			
	K-33	.5			
	K-19	21.1			
	K-20	89.2			
	K-24	11.2			
	K-29	55.5			
	K-27	234.4			
	K-28	37.3			
		394.4	54.0	71	38.3
7	K-26	11.9			
	K-25	9.3			
	K-23	4.9			
	K-22	15.8			
	K-21	10.5			
		52.2	7.2	100	7.2
6	K-39	6.5			
	K-33	17.3			
	K-37	31.0			
	K-36	24.7			
		79.3	10.9	62	6.8
Total		729.9	100		57.0

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CHILCHINBITO

UNIT NO. 2

Write-up No.	Type No.	Forage Acres	% Total	% Grazed	Weighted Utilization
1	W-44	30.6			
	W-55	20.1			
	W-52	9.8			
	W-12	3.2			
	W-40	44.6			
	W-7	59.4			
		157.7	21.0	36	7.6
4	W-45	3.9			
	W-54	5.7			
		9.6	1.3	102	23.3
11	W-46	30.0			
	W-2	11.9			
	W-1	10.2			
	W-5	2.5			
	W-3	7.5			
	W-4	52.0			
	W-6	4.9			
	W-7	12.3			
		133.5	17.6	36	6.5
5	W-11	64.6			
	W-41	76.5			
	W-42	41.3			
	W-43	12.3			
	W-33	19.1			
	W-34	75.2			
	W-8	8.8			
	W-9	4.2			
	W-10	4.6			
	W-12	1.9			
	W-30	85.4			
		416.9	55.8	35	19.5
6	W-35	31.9	4.3	55	23.7
TOTAL		747.6	100		70.4

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CHILCHINBITO

UNIT NO. 3

Write-up No.	Type No.	Forage Acres	% Total	% Utilized	Weighted Utilization
2	W-49	58.3			
	W-50	15.8			
		73.1	31.9	49	15.6
3	W-49a	10.2			
	W-49a	17.6			
	W-48	11.5			
	W-47	9.9			
	W-47	1.9			
	W-50	1.2			
	W-52	3.6			
	W-52	1.4			
	W-52	.5			
	W-52	1.2			
	W-52	6.0			
	W-51	5.4			
	W-54	6.5			
	W-54	3.7			
	W-53	8.9			
	W-47	1.4			
	W-47	5.9			
	W-48	.6			
	W-46	1.8			
	W-49a	20.0			
	W-49a	37.2			
	W-47	.2			
		157.5	68.1	37	25.2
TOTAL		231.3	100.0		40.8

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GEILCHIBITO

SUMMARY

Unit	F. A.	% Total	% Utilized	Weighted Utilization
1	729.9	42.7	57	24.3
2	747.6	43.8	70.4	30.8
3	231.3	13.5	40.8	5.5
TOTAL	1,708.8	100		60.6

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CHILCHINBITO

FALL UTILIZATION

Write-up No.	Type No.	F. A.	% of Total	% Utilization	Weighted Utilization
Lower	W-4	4.9			
	W-7	12.5			
	W-11	64.6			
	W-8	6.8			
	W-4	22.5			
	W-7	59.4			
	W-14	30.9			
	W-10	14.5			
	W-12	31.6			
	W-13	12.5			
	W-14	12.2			
	W-41	78.5			
	W-33	19.1			
	W-35	31.9			
	W-30	85.4			
	W-10	4.6			
	W-9	4.2			
	W-12	3.2			
	W-12	1.9			
	W-17	113.4			
	W-16a	10.7			
	W-15	41.4			
	W-16	4.7			
	W-14	15.8			
	W-13	10.5			
	W-12	5.5			
	W-32	24.1			
	W-18	21.1			
	W-31	.5			
	W-19	21.1			
	W-20	89.2			
	W-24	11.2			
	W-29	55.5			
	W-27	134.4			
	W-28	37.3			
	W-26	11.9			
	W-25	9.3			
	W-23	4.9			
	W-22	25.6			
	W-21	10.5			
	W-39	6.3			
	W-38	17.3			
	W-37	34.0			
	W-36	24.7			
TOTAL		1,233.9	72.21	46.7	33.7

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CHILCHINBITO

Write up No.	Type No.	F. A.	% of Total	% Utilization	Weighted Utilisation
Upper	W-1	5.4			
	U-1	4.8			
	W-2	.8			
	U-2	11.1			
	W-3	7.5			
	W-4	29.5			
	W-5	2.5			
	W-44	44.3			
	W-46	30.8			
	W-49	30.1			
	W-55	20.1			
	W-52	9.5			
	U-52	.3			
	W-42	29.7			
	W-44	38.4			
	W-54	3.7			
	W-45	3.9			
	W-49	58.3			
	W-50	15.5			
	W-49a	20.8			
	W-49a	17.6			
	W-48	11.5			
	W-47	9.9			
	W-47	1.9			
	W-50	1.8			
	W-52	3.6			
	W-52	1.4			
	W-52	1.2			
	W-52	.5			
	W-52	6.0			
	W-51	5.4			
	W-54	6.5			
	W-54	3.7			
	W-53	8.9			
	W-47	1.4			
	W-47	5.9			
	W-48	.6			
	W-46	1.8			
	W-49a	20.9			
	W-49a	37.2			
	W-47	.2			
TOTAL		474.9	27.79	18.5	5.1
GRAND TOTAL		1,708.8	100.		38.8

WR 8392

For the fall utilisation survey 25,803 sheep days feed were used up to the last of September when this survey was made.

By substituting in the formula:

$$\frac{\% \text{ Used}}{\text{No. Mos. of Use}} : \text{Actual} = \frac{\% \text{ Left}}{\text{No. Mos. of Use Left}} : X$$

$$\frac{38.8}{6} : 141 = \frac{61.2}{6} : X$$

It is found that $X = 222$ or the number that could be grazed during the rest of the year.

WR 8393

CV-6417-201 NN004303

UTILIZATION SURVEY
ON THE COVE DEMONSTRATION AREA

The average annual precipitation for this area can be estimated at around twelve or thirteen inches. The precipitation for the last three grazing years is as follows: 1935 to 1936 was 11.57 inches with fair average during entire year; 1936 to 1937 with the summer being fairly dry and then increasing for the fall months with a large amount of snow during the winter, the total being 17.87 inches for the year; for 1937 to 1938, there were 13.14 inches with the summer having fair rains, but the winter being open, the spring moisture being only fair.

Before the fencing of this area, the area as a whole was over-grazed with few exceptions, these being the steeper mountain slopes. All of the more level country had been badly over-used. The open sage-brush types were in the best condition but were showing signs of the overgrazing.

Under the prolonged protection and the later carrying capacity stocking, the vegetation has recovered in vitality very well, and possibly a slight increase in density is noted. Seeding and plantings in some few favorable places have become established and partially controlled erosion. Volume growth was close to normal.

The area has been used as a pasture for a breeding herd. 119,210 sheep days feed were used or a total of 326 sheep yearlong.

The average utilization for the area was estimated as being 97.4% as compared to 37.9% for the fall estimation.

WR 8394

By substitution in the formula:

$$\frac{FA}{SYL + EU = X + FU} * FAR$$

$$\frac{1,409}{326 + 974 = X + 105} * FAR$$

By solving the first part finding X, or 334 sheep that would have used the area to proper utilization. Solving for the rest of the formula, FAR = 4.2 - the number of forage acres required.

1936 SPRING UTILIZATION

Unit No.	Write-up No.	F. A.	% of Total F. A.	% Utilization	
1	1	203	14.41	70.6	10.2
2	2	1,206	85.59	101.9	87.2
TOTAL		1,409	100.		97.4%

1937 FALL UTILIZATION

Unit No. & Write-up No.	F. A.	% of Total	% Utilization	Weighted Utilization
1	203	14.41	23.5	3.38
2	1,206	85.59	40.4	34.57
TOTAL	1,409	100.		37.95%

Up to the fall utilization survey, 73,206 sheep days feed had been used or 404 sheep. 37.95% utilization for fall estimate.

WR 8395

CV-6417-201 NN004305

By use of the formula, it can be determined the rate of stocking for the remainder of the grazing year:

% Used / No. Mos. Used	:	Present Stocking	=	% Left / No. Mos. Left	:	Rate of Stocking for remainder of the Use Period.
$\frac{37.95}{5.95}$	:	404	=	$\frac{62.05}{6.05}$	:	X

$$X = 404 \times \frac{62.05}{6.05} \times \frac{5.95}{37.95}$$

$$X = \frac{149,155.79}{229.5975}$$

X = 649 or the number that would properly use the range for the remainder of the year.

WR 8396

CV-6417-201 NN004306

UTILIZATION SURVEY ON FORT WINGATE AREA

The average annual precipitation for this area is 14.45 inches. The precipitation for the past year can be estimated as being approximately normal. The summer rains coming at a time for fair plant growth. The winter was dry and open, with very little snow, the spring having more moisture than usual.

Vitality or the condition prior to this grazing season shows poor vigor and a declining forage yield. In general, this range was in fair condition with most of the improper use falling on the browse species.

The density of the vegetation has remainded approximately the same as it was at the time of the survey. An increase in density is expected due to the seeding and plantings that have been made in the area.

Blue grama has not produced the average volume growth, but other species have responded well to the regulated grazing.

There has been a total of 290,413 sheep days feed taken off the area during the 1937-1938 grazing period. However, there was some supplemental feeding during this time which makes the F. A. R. low for the area. Some trespass has occurred on this area as noticed along fences, and by better fencing this can be controlled.

It is recommended to maintain the present rate of stocking, because of the supplemental feeding, and also to give added protection to the rejuvinating plants.

WR 8397

UTILIZATION SURVEY ON FORT WINGATE AREA

The average annual precipitation for this area is 14.45 inches. The precipitation for the past year can be estimated as being approximately normal. The summer rains coming at a time for fair plant growth. The winter was dry and open, with very little snow, the spring having more moisture than usual.

Vitality or the condition prior to this grazing season shows poor vigor and a declining forage yield. In general, this range was in fair condition with most of the improper use falling on the browse species.

The density of the vegetation has remainded approximately the same as it was at the time of the survey. An increase in density is expected due to the seeding and plantings that have been made in the area.

Blue grama has not produced the average volume growth, but other species have responded well to the regulated grazing.

There has been a total of 290,413 sheep days feed taken off the area during the 1937-1938 grazing period. However, there was some supplemental feeding during this time which makes the F. A. R. low for the area. Some trespass has occurred on this area as noticed along fences, and by better fencing this can be controlled.

It is recommended to maintain the present rate of stocking, because of the supplemental feeding, and also to give added protection to the rejuvinating plants.

WR 8397

The average utilization this spring was 80.7% as compared to 42.1% at the end of the growing season.

Summary of Utilization on Fort Wingate Area - Spring 1938

Unit No.	Forage Acres	Proportion of Total	Utilization Estimate	Weighted Utilization
A or 3	818	39.52%	62.4	24.7
C or 4	678	32.75	96.0	31.4
D or 1	496	23.96	86.2	20.7
E or 2	78	3.77	105.4	3.9
Total	2,070	100.		80.7%

Actual use 287,347 sheep days feed or 787 sheep yearlong reduced from number grazed to a yearlong basis. By substitution in the formula:

$$\frac{FA}{SYL : EU = X : PU} = FAR$$

$$\frac{2,070}{787:80.7 = X : 100} = FAR$$

Solving for X, or the number that would have used this area to proper, we would have 975 yearlong. And solving the rest of the formula, we find that FAR = 2.1, the number of forage acres that were actually required per head.

WR 8398

CV-6417-201 NN004309

Utilization Summary - Fall 1937

Unit No.	P. A.	Proportion of Total	Utilization Estimate	Weighted Utilization
A	818	39.52	12.5%	4.9
C	678	32.75	66.7%	21.8
D	496	23.96	56.8%	13.6
E	78	3.77	48.9%	1.8
Total	2,070	100.		42.1

$$\frac{\text{\% Used}}{\text{No. Nos. of Use}} : \text{Actual} = \frac{\text{\% Left}}{\text{No. Nos. of Use Left}} : X$$

$$\frac{42.1}{7.59} : 740 = \frac{57.9}{4.41} : X$$

$$X = 740 \times \frac{57.9}{4.41} \times \frac{7.59}{42.1}$$

$$X = \frac{325,201.14}{185.661}$$

X = 1,751 head that can be grazed for the remainder of the grazing year.

WR 8399

CV-6417-201 NN004310

UTILIZATION SURVEY OF THE FRAZER DEMONSTRATION AREA

Average annual precipitation for this area is approximately 8.75 inches. Precipitation for last year is not available but it is estimated to be approximately normal, but falling at a rather late time for very much growth.

Before this area was fenced, all types were in poor to very poor condition, all edible forage was utilized and all forage plants were low in vitality. Density was below that which should be found in this environment. Although overgrazing was severe, there was only a small percentage of overgrazing indicator plants as: yellow brush, snake weed and rabbit brush.

The densities of species have remained approximately the same except in small favorable spots where reseeding has taken place. Gully plantings have met with fair success and have approximately established themselves. Under continued proper use, blue grama has not improved any appreciable amount, but galleta and sacaton has responded well in volume growth. As a whole, the vegetation has increased considerably in vitality.

This area has continued to be used as a buck pasture. Two horses have been used on the area for handling purposes. During January, 50 head of Government owned bucks were added to the area, making the total 202 bucks. A total of 56,107 sheep days feed were used from the area or 153 sheep yearlong.

WR 8400

It was found that the utilisation for the area was 89.6% as compared with 62.2% for the fall utilisation.

By substituting in the formula:

$$\frac{PA}{WL : EU = X : PU} = F.A.R.$$

$$\frac{547}{153 : 89\% = X : 100} = F.A.R.$$

Solving for X or the number that would have used the range properly, we would have 179 sheep yearlong. By solving the rest of the formula, the Forage Acre Requirement is 3.21.

WR 8401

CV-6417-201 NN004312

FRAZER DEMONSTRATION AREA
SPRING UTILIZATION COMPILATION 1938

Utilization No.	Type No.	F. A.	% of Total	% Utilization	Weighted Utilization
1	W-50	19			
	W-51	2			
	W-52	1			
	W-54	60			
	W-55	24			
	W-58	10			
		116	21.2	96	20.4
2	W-52A	2			
	W-53	108			
	W-56	51			
		161	29.4	98	28.8
3	W-62	80	14.6	79	11.5
4	W-60	11			
	W-61	4			
	W-57	3			
	W-64	10			
	W-65	24			
	W-60	11			
	W-66	14			
	W-63	3			
		70	12.8	92	11.8
5	W-63	77	14.1	90	12.7
6	W-59	43	7.9	56	4.4
TOTAL		547	100.		89.6

WR 8402

CV-6417-201 NN004313

FALL UTILIZATION - FRAZER DEMONSTRATION AREA

Write-up Number	Type No.	F. A.	% of Total	% Utilization	Weighted Utilization
2	M-50	15			
	M-51	2			
	M-52	1			
	M-54	68			
	M-55	24			
	M-58	10			
		116	21.2	26.0	5.51
1	M-52A	2			
	M-53	105			
	M-56	51			
	M-62	88			
	M-60	11			
	M-61	4			
	M-57	3			
	M-64	20			
	M-65	14			
	M-60	11			
	M-66	14			
	M-63	3			
	M-63	77			
	M-59	43			
		432	78.8	72.0	56.7
TOTAL		547	100.0		62.2

By substitution in the formula:

$$\frac{\text{\% Used}}{\text{No. Mos. Used}} : \text{Present Stocking} = \frac{\text{\% Left}}{\text{No. Mo. Left}} : \text{Rate of Stocking for the remainder of the use period.}$$

$$\frac{62.2}{74} : 164 = \frac{27.8}{46} : X$$

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$$X = 164 \times \frac{27.8}{4.6} \times \frac{7.4}{62.2}$$

$$X = \frac{33,738.08}{286.12}$$

X = 118 or the number that should have used the area for the remainder of the grazing year.

WR 8404

CV-6417-201 NN004315

UTILIZATION ON GANADO DEMONSTRATION AREA

The average annual precipitation at Ganado is 10.5 inches. Accurate records are not available for the past growing season, but it is believed that the precipitation was approximately normal for the year. However, the summer rains fell at a late time offering very little to the growing season. Spring conditions were good even though the winter had been open.

The top of the mesa was in fair condition with a good stand of blue grama as the understory of the fair stand of sage. The blue grama was low in volume growth and in vitality. The woodland types were all in a deplorable condition with very little forage in any of the types, erosion has been severe. The erosion has been severe in the lowlands with large gullies formed. The density of palatable species is below normal for this environment.

Overgrazing indicator plants are abundant, such as: yellow brush, pingue, and rabbit brush.

Densities of vegetation show slight increase, mostly due to the seeding and planting areas. The volume growth was below average due to the late precipitation. This was particularly noticeable in blue grama and sagebrush, although bluestem, galleta, and dropseed were nearly normal. These three species bear the blunt of the season's grazing.

WR 8405

This area has been used for a breeding herdwith the bucks being herded in another area. For the year, 151,136 sheep days feed were used or 414 sheep yearlong.

The utilization for the spring survey was 125% as compared to 62% for the fall utilization.

By substituting in the formula:

$$\frac{FA}{SYL : EU = X : PU} = FAR$$

$$\frac{1,237.0}{414 : 125 = X : 100} = FAR$$

Solving first for X, we find 331 sheep would have used the area to proper. Further calculation shows the Forage Acre Requirement to be 3.73

WR 8406

CV-6417-201 NN004317

Write-up No.	Type Number	Net F. A.	Proportion of Total F. A. %	Type Utilization	Weighted Utilization
1	H-41	1.7			
	H-42	3.9			
	H-43	2.6			
	H-35	4.8			
	H-33	14.8			
	H-41	16.1			
	H-32	12.0			
	H-38	16.2			
	H-34	26.1			
		98.2	6.7	113	7.6
2	H-37	27.6			
	H-36	6.8			
	H-27	25.2			
	H-28	97.4			
	H-26	54.7			
	H-24	274.9			
	H-23	12.8			
	H-25	22.1			
		521.5	35.8	130	46.5
3	H-7	2.0			
	H-8	1.7			
	H-20	1.3			
	H-21	89.4			
	H-31	94.8			
	H-29	7.7			
	H-5	.5			
	H-3	1.1			
	H-29	20.2			
	H-9	8.2			
	H-4	13.3			
	H-45	11.3			
	H-22	2.3			
	H-1	1.2			
	H-7	11.9			
	H-1	8.1			
	H-6	1.9			
		216.9	14.9	110	16.4
4	H-14	11.4			
	H-18	14.2			
	H-16	17.2			
	H-19	15.7			
		58.5	4.1	200	8.2

WR 8407

Write-up No.	Type Number	Net F. A.	Proportion of Total F. A. %	Type Utilization	Weighted Utilization
5	H-17	184.1			
	H-11	5.3			
	H-10	17.2			
	H-15	17.4			
	H-8	39.4			
	H-6	41.3			
	H-5	7.5			
	H-2	10.1			
	H-2	19.4			
	H-2	34.7			
	H-30	79.2			
	H-40	13.8			
	H-44	5.2			
	H-12	66.0			
		560.8	38.5	121	46.6
TOTAL		1,455.9	100.		125.3

Full Utilization

Write-up No.	F. A.	% of Total	Type Utilization	Weighted Utilization
1	521.5	35.8	63%	22.5
2	315.1	21.6	45%	9.7
3	619.3	42.6	70%	29.8
TOTAL	1,455.9	100.		62.0

Up to the fall utilization survey, 7,924 sheep days feed had been used, or 418 sheep.

By use of the formula, it can be determined the rate of stocking for the remainder of the grazing [illegible]

WR 8408

CV-6417-201 NN004319

% Used / No. Mos. Used	: Present Stocking	=	% Left / No. Mos. Left	: Rate of Stocking for Remainder of the Use Period
62 / 6.9	: 418	=	38 / 5.1	: X

$$X = 418 \times \frac{38}{5.1} \times \frac{6.9}{62}$$

$$X = \frac{109,599.6}{316.2}$$

X = 346 or the number that would use the area to proper use for the remainder of the year.

WR 8409

CV-6417-201 NN004320

Utilization Survey of
Kayenta Demonstration Area

The average annual precipitation of this area is estimated as being 8.43 inches. The records turned in for this area leave off on March 1936. From some reports, there was very little rainfall during the summer and fall with the winter little better - it being mostly open, the spring having a little more moisture.

Previous condition of the vegetation was poor, with much of the climax types being changed. Quite a number of the species were being killed out by overuse. In many cases, an influx of overgrazing indicators were coming into the area. Much of the chamise was being killed out, greasewood was very much stunted. Sagebrush was being entirely used with many plants being killed. The canyons have been used heavy with the grass species being grazed out entirely. The density and composition of forage species were very much lower than should be for this environment. Blue grama types were broken in turf. Most all species seemed to be low in vitality.

Due to the sandy nature of the soil and the lack of the vegetative cover, wind erosion was severe, in places reaching the destructive nature. Head cutting was progressing in most all parts of the area, and sheet erosion was severe.

Under the light stocking, the vegetation has improved to a great extent. Annuals were in evidence throghout the area, especially the wind swept sand dunes. In two areas, Alfilaria is becoming established. Annual fescue could be seen throughout the area. Seeding and planting

WR 8410

areas have come in good, but the drouth had its effect in killing quite a number of plants. Densities have increased to a slight extent, but the most change can be seen in the increased vitality and volume growth. Volume is below normal but is greatly improved over previous years.

The numbers of stock have been changing, due to difficulty in keeping the area stocked. Some 264,923 sheep days feed were used from the area or a total of 726 sheep yearlong. The area has continued to be used for a breeding herd.

The spring utilization survey showed 77.3% use, as compared with 51.8% for the fall survey.

By substitution in the formula:

$$\frac{FA}{SYL : EU = X : PU} = FAR$$

$$\frac{3,281}{726:77 = X : 10} = FAR$$

By solving for the first part finding X or 942 sheep that would have used the area to proper utilization. Solving for the rest of the formula, we find that the Forage Acre Requirement was 3.48.

WR 8411

CV-6417-201 NN004322

Utilization No.	Type No.	Forage Acres	% Total	% Grazed	Utilization (Weighted)
Unit No. 1					
14	W-80	2			
	W-79	3			
	W-78	43			
	W-77	1			
	W-75	5			
	W-77	10			
	W-76	8			
	W-74	1			
		73	76.8	80	61.4
13	W-71	7			
	W-73	1			
	W-72	1			
	W-74	2			
	W-69	1			
	W-67	10			
		22	23.2	95	22.0
Total		95	100		83.4
Unit No. 2					
3	W-136	5			
	W-105	6			
	W-105	3			
		14	1.2	126	1.5
8	W-139	92			
	W-101	91			
	W-138	30			
	W-138	9			
	W-101	48			
	W-137	13			
		283	24.8	91	22.6

WR 8412

CV-6417-201 NN004323

Utilization No.	Type No.	Forage Acres	% Total	% Grazed	Weighted Utilization
Unit No. 2 (Contd)					
9	W-104	87			
	W-106	1			
	W-104	45			
	W-100	33			
	W-102	22			
		188	16.5	92	15.2
10	W-138	4			
	W- 96	43			
	W- 97	31			
	W- 99	63			
	W- 97	27			
	W- 99	23			
		191	16.7	88	14.7
11	W-95	62			
	W-98	68			
	W-94	32			
	W-93	45			
	W-91	88			
	W-95	17			
	W-92	58			
	W-84	23			
	W-85	35			
	W-86	6			
	W-87	8			
	W-90	1			
	W-88	3			
		446	33.7	85	28.6
12	W-80	64			
	W-82	15			
	W-83	2			
		81	7.1	100	7.1
Total		1,203	100.		89.7

WR 8413

CV-6417-201 NN004324

Utilization No.	Type No.	Forage Acres	% Total	% Grazed	Weighted Utilization
Unit No. 5					
4	W-129	13			
	W-130a	40			
	W-112	8			
	W-126	5			
	W-130	70			
	W-129	3			
	W-128	10			
	W-129	24			
	W-127	13			
	W-115	44			
		214	65.6	83	54.4
5	W-114	19			
	W-115	1			
	W-114	28			
		48	14.7	100	14.7
6	W-123	6			
	W-122	43			
	W-105	2			
	W-105	1			
		52	16.0	73	11.7
7	W-105	12	3.7	100	3.7
Total		326	100.0		84.5

WR 8414

CV-6417-201 NN004325

Utilization No.	Type No.	Forage Acres	% Total	% Grazed	Weighted Utilization
Unit No. 4					
2	W-112	5			
	W-131	40			
	W-112a	24			
	W-112	4			
	W-113	3			
	W-112	25			
	W-112a	9			
	W-112	5			
	W-112	2			
	W-124	5			
	W-109	12			
	W-111	12			
	W-109	14			
	W-109	4			
	W-111	2			
	W-109	684			
	W-109	12			
	W-109	9			
	W-109	47			
	W-109	71			
	W-109	4			
	W-109	13			
	W-104	9			
	W-108	34			
		1,027	63.5	65.	41.2
2	W-116	152			
	W-120	63			
	W-117	96			
	W-118	7			
	W-116	21			
	W-116	8			
	W-132	25			
	W-137	12			
	W-138	9			
	W-121	53			
	W-119	103			
		549	34.0	70.	23.8

WR 8415

Utilization No.	Type No.	Forage Acres	% Total	% Grazed	Weighted Utilization
Unit No. 4 (Cont'd)					
3	W-105	7			
	W-135	12			
	W-136	12			
	W-136	9			
		40	2.5	126	3.2
Total		1,616	100.0		68.2
Unit No. 5					
-	W-133	20			
	W-134	14			
Total		34			
Unit No. 6					
-	W-136	5			
	W-137	1			
	W-137	1			
Total		7			

SUMMARY

Unit No. 1	95	3.0	83.4	2.5
Unit No. 2	1,203	36.6	89.7	32.8
Unit No. 3	326	9.9	84.5	8.4
Unit No. 4	1,616	49.3	68.2	33.6
Unit No. 5	34	1.0	0	-
Unit No. 6	7	.2	0	-
TOTAL	3,281	100.		77.3

WR 8416

CV-6417-201 NN004327

Fall Utilization

Write Up No.	F. A.	% of Total	% Utilization	Weighted Utilization
1	95	3.0	50.33	1.5
2	1,203	36.6	44.66	16.3
3	326	9.9	61.69	6.1
4	1,616	49.3	56.56	27.9
5	34	1.0	-	-
6	7	.2	-	-
Total	3,281	100.0%		51.8%

Up to the fall utilization survey, 143,988 sheep days feed had been used on 620 sheep. By use of the formula, the rate of stocking for the remainder of the year can be determined.

$$\frac{\text{\% Used}}{\text{No. Mos. Used}} : \text{Present Stocking} = \frac{\text{\% Left}}{\text{No. Mos. Left}} : \text{Rate of Stocking for the remainder of the grazing year}$$

$$\frac{51.8}{7.63} : 620 = \frac{48.2}{4.37} : X$$

$$X = 620 \times \frac{48.2}{4.37} \times \frac{7.63}{51.8}$$

$$X = \frac{228,011{,}920}{226,366}$$

X = 1,007, the number that could graze the area for the remainder of the use period.

WR 8417

CV-6417-201 NN004328

UTILIZATION SURVEY OF THE HIACKTCH DEMONSTRATION AREA

The average annual precipitation for this area can be estimated at being approximately 10.5 inches. No accurate precipitation data are available, but it is believed that it was below average for the past growing season.

The area had considerable gully cutting, with sheet erosion moderate except for some places where it was quite severe, wind erosion was slight. The range vegetation was fair prior to the fencing of the area. Use had been, in the past, quite heavy due to the large amount of cultivation on this area and to the close proximity of the trading post. Unpalatable species had been making their way into the area, and annuals were increasing.

Under the protection of the fencing and controlled grazing, there is a slight increase in density of the blue grama. Volume growth has been below average both in blue grama and galleta. Species in the open flats and valleys have been utilized more so than in the woodlands.

The vitality of the plants has increased even though the precipitation has been below normal. Volume production has been below normal, with very few seed stalks being put out by any species.

No accurate stocking records are available due to the influence of the cultivated areas. Permit for the use of 63 head of horses on the area was divided among 25 owners. Possibly this number had not been run continually on the area. However, use has been approximately all that should be used on the area. Some sheep and goat trespass was

WR 8418

noted in several places of the area.

It was estimated that 108.8% of proper use had been obtained from the area, while 63.5% had been obtained at the time of the fall utilization survey.

By substituting in the formula:

$$\frac{\text{F.A.}}{\text{H.Y.L.} : \text{E.U.} = X : \text{P.U.}} = \text{F.A.R.}$$

$$\frac{633}{55 : 108.8 = X : 100} = \text{F.A.R.}$$

and solving for X, it is determined that 48 horses would have used this area properly. By solving for the rest of the formula, it is found that the Forage Acre Requirement is 13.18.

WR 8419

CV-6417-201 NN004330

KLAGETOH

Utilization No.	Type No.	F. A.	% Total	% Utilization	Weighted Utilization
1	S-21	6			
	S-21	5			
	S-21	5			
	S-16	5			
	S-20	4			
	S-21	12			
	S-16	1			
	S-16	1			
TOTAL		37	5.9	105	6.2
2	S-23	36			
	S-22	35			
	S-22	58			
	S-18	89			
	S-17	4			
	S-19	8			
TOTAL		260	25.3	108	27.3
3	S-14	26			
	S-10	58			
	S-9	32			
	S-9	2			
TOTAL		118	18.6	105	19.5
4	S-2	2			
	S-4	1			
	S-2	11			
	S-7	8			
	S-1	1			
	S-2	2			
	S-7	1			
	S-7	5			
	S-8a	7			
	S-8	33			
	S-8a	6			
	S-12	5			
	S-13	17			
	S-11	40			
	S-19	7			

WR 8420

KLAGETOH

Utilization No.	Type No.	F. A.	% Total	% Utilization	Weighted Utilization
4	S-13	27			
	S-13	27			
	S-11	13			
	S-13	12			
	S-21	5			
	S-6	2			
	S-6	14			
	S-5	11			
TOTAL		237	37.4	111	41.5
5	S-4	70			
	S-5	11			
TOTAL		81	12.8	112	14.3
GRAND TOTAL		633	100		108.8

WR 8421

In the fall survey it was estimated that 63.5% of proper had been used. By using the formula:

$$\frac{\%\text{ Used}}{\text{No. Mos. Used}} : \text{Present Stocking} = \frac{\%\text{ Left}}{\text{No. Mos. Left}} : \text{Rate of Stocking for remainder of the use period}$$

$$\frac{63.5}{7} : 33 = \frac{36.5}{5} : X$$

it is found that 42 head would have used the area to proper for the remainder of the year.

CV-6417-201 NN004333

UTILIZATION SURVEY
MEXICAN SPRINGS DEMONSTRATION AREA

The average annual precipitation ranges from 9.3 inches for the lower area, to 13.67 inches for the central portion, to 16.39 inches in the upper Yellow Pine region. These averages are for the past four years and might be somewhat different for a longer period. The precipitation report shows 10.60 inches for the past grazing period, with most of the precipitation coming in the 1937 growing season. The past winter was fairly open, with the spring moisture being fair.

Previous ranges have been overstocked and as a result, forage plant vitality was low, volume growth was far below normal. In places, overgrazing indicators, as yellow brush, rubbit brush, and snakeweed have started to dominate the types.

Along the south fence in the units A, B and C, wind erosion is sweeping the sand from outside overgrazed areas onto the area, accumulating in hummocks. The same can be said of units 4 and 5 in the lower end. Unit No. 6 has been wind-swept for some time and even under protection shows no great improvement. Total exclusion or use only in most favorable times should greatly improve the unit.

Densities of vegetation over the area as a whole has greatly improved, vitality has gained considerably, and volume growth is normal in places. Blue grama is greatly improved but still shows the stress of the previous overgrazing. Galleta has quite normal growth for natural precipitation areas, and has produced great amounts of volume under the water spreading areas. But this brings up a

WR 8423

CV-6417-201 NN004334

question of whether this great amount of volume growth is beneficial for sheep feed when it is dry. It seems as though it should be cut when in the flower stage for hay, or grazed when green.

Horses, cattle and sheep have been grazed on the area. Records that we have do not seem adequate enough to calculate exah for each unit. However, there were approximately 1,400 sheep yearlong on the entire area (all stock converted to sheep units).

The spring utilization survey shows 50.6% use for the entire area.

By substitution in the formula:

$$\frac{FA}{A/L \times EU \text{ g } X \times PU} = F.A.R.$$

$$\frac{5,879.5}{1,400 \times 50.6 \text{ g } X \times PU} = F.A.R.$$

By solving first for X or the number that would have used the area properly, we would have 1,732 sheep. Completing the formula, the Forage Acre Requirement is 3.39.

WR 8424

CV-6417-201 NN004335

SUMMARY OF UTILIZATION ON MEXICAN SPRINGS AREA - SPRING 1938

Unit No.	Forage Acres	Proportion of Total	Utilization Estimate	Weighted Utilization
A	152.8	2.6	90	2.3
B	117.4	2.0	79	1.6
C	473.1	8.0	79	6.3
D	58.5	1.0	89	.9
F	940.4	16.0	103	16.5
G	545.0	9.3	84	7.8
H	98.7	1.7	71	1.2
J	126.5	2.2	105	2.3
K	577.5	9.8	85	8.3
L	214.8	3.7	65	2.4
M	472.7	8.0	82	6.6
N	269.3	4.6	65	3.0
2	398.7	6.8	82	5.6
2	516.3	8.8	55	4.8
3	234.8	4.0	70	2.8
4	456.2	7.7	72	5.5
5	183.6	3.1	84	2.6
6	43.3	.7	43	.3
Total	5,879.5	100.		80.8

WR 8425

STEAMBOAT

Average annual precipitation for this area is approximately 10.5 inches, with the greatest amount occurring in July, August and September in the form of rain. No definite data is available for the past year but it is believed that the precipitation in the summer of 1937 was about normal and occurred at a time favorable for vegetative growth.

Due to the previous continued overstocking the plants are low in vitality, browse species faring the worst due to great amount of winter grazing. The vigor of the plants has been improved under the continued proper stocking during the past year.

Density of the grasses has been well noted particularly in blue stem, both in the seeded and natural areas. Crested wheatgrass has come in good and seems to be establishing itself very well. Rye that was planted near the windmill has come in good but had not some adverse condition due to the fact that water at the well was badly needed.

Most all species seem to have produced near normal volume growth. The principle forage species being: Blue grama, Galleta, Blue Stem, Sacaton, Chamise, Big sage, and Winter fat.

During the past grazing season 251,361 Sheep days for were used off the area or 696 on a yearlong basis.

Better distribution should be had in this Demonstration Area as types and areas close to permanent water shows the stress of use. Watering facilities are inadequate for the area as a whole. Where there is water available troughs should be large enough to accomodate a large band of sheep. The small springs under the boundary rims are of no use to a large band of sheep under their present conditions.

WR 8426

The average utilization has been computed for the entire area and found to be 78 % of proper for the Spring, 1938 estimate as compared to 30.9 % for the fall, 1937 estimate.

By substitution in the formula:

$$\frac{F\ A}{S.Y.L.:EU = x\ :\ FU} = F.\ A.\ R.$$

$$\frac{2837}{696\ :\ 78 = x\ :\ 100} = F.\ A.\ R.$$

By solving the first part finding x we have 872 Sheep that would have used the area to proper utilization. Solving for the rest of the formula we find that F.A.R. = 3.18 the number of forage acres that were actually required per head.

WR 8427

CV-6417-201 NN004338

UNIT # 1

Write-up No.	Type No.	F. A.	% of Total F. A.	% Utilization	Weighted Utilization
1	N-43	14			
	N-40	5			
	N-39	11			
	N-43	2			
	N-44	29			
		59	5.71	37	2.1
2	N-36	27			
	N-37	32			
	N-34	74			
	N-31a	2			
	N-31a	3			
	N-31a	1			
		139	13.43	88	11.8
3	N-33	77			
	N-35	1			
		78	7.54	100	7.5
4	N-30	10			
	N-32	2			
	N-30	46			
	N-27	2			
	N-25	1			
		61	5.89	104	6.1
5	N-35	26			
	N-35	2			
	N-110	13			
	N-109	6			
	N-26	5			
	N-26	4			
	N-29	17			
	N-26	1			
	N-26	2			
	N-26	21			
	N-26	1			
	N-21a	4			
	N-23	9			
	N-22	6			
	N-21	7			
	N-24	18			
		144	13.91	91	12.7

WR 8428

UNIT # 1 (Cont'd)

Write-up No.	Type No.	F. A.	% of Total F. A.	% Utilization	Weighted Utilization
6	W-19	5			
	W-18	5			
	W-17	22			
	W-20	4			
	W-17	37			
	W-20	1			
	W-15	8			
	W-101	39			
	W-13	12			
	W-11	2			
	W-12	18			
	W-3	8			
	W-11	11			
	W-11	12			
	W-10	17			
	W-9	17			
	W-5	4			
	W-9	4			
	W-9	7			
	W-6	10			
		243	23.48	99	23.2
7	W-45	14			
	W-46	16			
	W-1	5			
	W-100	27			
	W-14	18			
		80	7.73	101	7.8
8	W-8	10			
	W-4	23			
		33	3.19	86	2.7
9	W-80	25			
	W-82	23			
	W-81	8			
	W-5	3			
	W-5	27			
		76	7.34	72	5.3
10	W-83	3			
	W-88	3			
	W-78	72			
	W-52	7			
	W-52	3			
	W-52	2			
	W-49	2			
	W-60	4			
	W-43	3			
	W-49	9			
	W-43	1			
	W-42	5			
		114	11.01	53	5.8

WR 8429

UNIT # 1 (Cont'd)

Write-up No.	Type No.	F. A.	% of Total F. A.	% Utilization	Weighted Utilization
11	K-2	3			
	K-99	5			
		8	.77	107	.8
		1035	100		85.8

WR 8430

CV-6417-201 NN004341

UNIT # 2

Write-up No.	Type No.	P. A.	% of Total P. A.	% Utilization	Weighted Utilization
12	W-53	61			
	W-54	44			
	W-55a	9			
		114	11.33	22	2.5
13	W-55	12			
	W-56	4			
	W-56	28			
	W-56	2			
	W-55a	92			
	W-55	39			
	W-55	3			
	W-56	10			
	W-58	4			
	W-58	9			
	W-59	6			
	W-57	9			
		198	19.68	21	4.1
14	W-57	150			
	W-55	7			
	W-56	7			
	W-56	15			
	W-55	10			
	W-55	8			
	W-55	13			
		210	20.88	83	17.3
15	W-52	14			
	W-63	74			
	W-63a	17			
	W-108	11			
	W-59	2			
	W-59	1			
	W-65a	2			
	W-64	17			
	W-65	33			
	W-65a	14			
	W-67	4			
	W-68	22			
		211	20.97	106	22.2

WR 8431

UNIT # 2 (Cont'd)

Write-up No.	Type No.	F. A.	% of Total F. A.	% Utilization	Weighted Utilization
16	N-48	72			
		72	7.16	112	8.0
17	N-49	16			
	N-52	36			
	N-47	61			
	N-50	20			
	N-62	26			
	N-61	5			
	N-66	28			
	N-52	9			
		201	19.98	94	18.8
		1006	100 %		72.9

WR 8432

UNIT # 3

Write-up No.	Type No.	F. A.	% of Total F. A.	% Utilization	Weighted Utilization
18	W-70	24			
	W-69	58			
	W-70	4			
	W-70	19			
	W-73	47			
	W-73	3			
	W-90	9			
	W-69	1			
		160	20.10	99	19.9
19	W-66	1			
	W-52	1			
	W-52	90			
	W-78	10			
	W-71	134			
	W-89	5			
	W-91	18			
		219	27.51	95	26.1
20	W-75	28		101	
		28	3.52	101	3.6
21	W-92	3			
	W-98	45			
	W-105	7			
	W-104	19			
	W-105	11			
	W-106	15			
		100	12.55	55	6.9
22	W-93	24			
	W-86	24			
	W-85	2			
	W-84	46			
	W-84	3			
	W-83	21			
	W-79	3			
	W-87	6			
	W-88	10			
	W-89	5			
		144	18.09	46	8.3

WR 8433

UNIT # 3 (Cont'd)

Write-up No.	Type No.	F. A.	% of Total F. A.	% Utilization	Weighted Utilization
23	W-85	6			
	W-93a	8			
	W-85	5			
	W-97	10			
	W-77	15			
	W-96	6			
	W-96	3			
	W-77	9			
	W-76	4			
	W-95	9			
	W-72	6			
	W-74	17			
	W-72	30			
	W-69	19			
		145	18.22	51	9.3
		796	100		74.1

WR 8434

STEAMBOAT SUMMARY

Spring - 1938

Unit	F. A.	% of Total F. A.	Utilization Estimates	Weighted Utilization
1	1035	36.48	55.8	51.3
2	1006	35.46	72.9	25.9
3	796	28.06	74.2	20.8
	2837	100.00		78.0

WR 8435

STEAMBOAT SUMMARY

Fall - 1937

Unit	F. L.	% of Total F. A.	Utilization Estimates	Weighted Utilization
1	1035	36.48	50.5 %	18.4
2	1006	35.46	27.0 %	9.6
3	796	28.06	10.5 %	2.9
	2837	100.00		30.9 %

115,045 Sheep Days feed were used up to this time.

$$\frac{\text{\% used}}{\text{No. Mos. of Use}} : \text{Actual} = \frac{\text{\% left}}{\text{No. Mos. of Use left}} : x$$

$$\frac{30.9}{7.} : 537 = \frac{69.1}{5.} : x$$

x = 1681 or the number that could graze the area for the remainder of the year.

WR 8436

CV-6417-201 NN004347