GENERAL REPORT

COVERING

PRELIMINARY INVESTIGATIONS

ON THE

NAVAJO AREA RESERVATION

BY

[illegible]

[illegible]

Forstry
Grazing
Navajo.

Albuquerque, N. M.
December 23, 1930

Commissioner of Indian Affairs,
Washington, D. C.

Sir:

I have the honor to submit my report on the General Grazing Situation on the Navajo Indian Reservation.

Attached and made a part of this report is a pictorial section.

It has been a privilege to me, to present to the Indian Office, in my poor way, the grazing and range conditions on the Navajo Indian Reservation as I see them. I have endeavored to briefly state such corrective measures as I feel can materially improve the present situation and be of benefit to the Navajo Indian in the future.

Very respectfully submitted:

William H. Zeh
Forester.

WR 8801

I N D E X

1. General Description.

The Navajo reservation lies in the N. E. portion of the state of Arizona and the N. W. portion of New Mexico, together with a small area in S. E. Utah. It is a vast expanse of territory covering approximately 14,360,000 Acres. The elevation varies from 4500 to 8000 feet above sea level with some higher elevations in the Mountain areas running above 10,000 feet. Vast plains, steep mountains and deep canyons present the physiography of this Reservation with fully a fifth of the total area so rugged and forbidding as to be of very little use to the Navajo and his herds.

The geology of this region tells of long periods of erosion and deposits of sedimentary materials forming immense and colorful cliffs of sand and limestone.

Due to the large deposits of sandstone we find much of the soil of this origin and particularly so in the Western part of this immense Reservation. In some localities however heavy clay soil make traveling in wet weather an experience long to be remembered.

In numerous places we find that erosion has turned artist and added a destinct characteristic beauty to this area by cutting grotesque figures into the walls of sandstone and by the formation of the very picturesque Painted Desert.

With the exception of the San Juan River cutting thru the N. E. Corner and the Little Colorado River cutting through the S. W. Corner there are no streams of prominence on the whole Reservation, however there are several large washes, such as the Moencopi, the Oraibi, the Polacca, the Pueblo Colorado, the Chinlee and Chaco which at times attain the strength and ferocity of wild mountain streams during the heavy summer rains. In addition to these are numerous other washes and smaller creeks that play a very important part in the life and travel on this Reservation.

11. Economic Situation.

The population in this area has been given in the last census as 37,969 Navajo and 2,507 Hopi. The Hopi are concentrated in the village of Moencopi on the Western Navajo and in the villages on the various Mesas in the so

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called Hopi Reservations. The Navajo being a nomadic people are scattered over the balance of the territory which is divided into six administrative districts namely: the Northern Navajo, Shiprock, N. Mexico; Eastern Navajo, Crown Point, New Mexico; Southern Navajo, Fort Defiance, Arizona; Western Navajo, Tuba City, Arizona; Hopi, Keams Canyon, Arizona, and Leupp Reservation with headquarters at Leupp. Good roads with the exception of highway No. 666 running from Gallup, New Mexico north and a few comparatively small stretches here and there of improved road, are practically non existant and are greatly needed. There are numerous improved trails traversing the Navajo. With an expert knowledge of the country and a rabbits foot it is possible to negotiate some of the washes and trails by car. The safest, the slower method is by wagon and horse back. This is the mode of travel largely used by the Indians in his travels.

The natural resources of this reservation are several. A good grade of bituminous coal is found in several areas. This coal is cheaply mined. At present, principally due to the lack of transportation coal is only used as fuel for several of the Agencies and schools. Oil has been struck in several places and no doubt when conditions warrant it more oil will be developed in future years. A large body of good yellow pine timber is located on the Fort Defiance Plateau and a smaller body of yellow pine on the east slope of the Chuska Range. With the exception of the above mentioned places very little good timber is found although there are vast areas of scattered pinon pine and juniper. This is used principally by the Indians for fuel and building material in the construction of their hogans. By far the greatest resource of the Navajo is found in the vast areas of good range land which under methods of controlled use will be of the greatest asset to the greatest number of Indians.

The Navajo is inherently a nomad and a stock grower who has for many decades made his living thru his flocks. At the present time the figures show that there are a total of approximately 1,300,000 sheep and goats, 80,000 horses and 27,000 cattle ranging on the Navajo. The stock raising is the principal industry of the Navajo. Some are making their living as silver smiths or in other vocations. Many of the indian women augment the meager income of the family by weaving the famous Navajo rugs.

After deducting the barren and waste lands on this reservation less than twelve million acres remain on which cattle, horses, sheep and goats can be grazed. Taking the sheep and goat population of 1,300,000 head alone only 9 to 10 surface acres per head are available for grazing. In addition to these, there are the cattle and horses who must also find feed to exist. The range cover is composed of the grass type, the sagebrush, the browse type and the range in coniferous timber. In addition to these there are vast areas usually along the washes or other areas in the vicinity of water which can be classed as pure weed range with very little grass remaining and comparatively poor forage value.

The principal grasses are as follows:

Gramma Grass.....Bouteloua (spc)
Galeta Grass.....Hilaria Jamesii
Needle Grass.....Aristida
Muhlenbergia.....Muhlenbergia (spc)
Tacaton.....Sporobolus airoides

Numerous other grasses are also found but not in large enough areas so as to make any appreciable difference in the forage value of the reservation range as a whole. Several of the sages form useful browse for the winter, however, their great virtue lies in the fact that stock can "pull itself thru" on sage during a hard winter when grass and the other more palatable forage plants are not available. Of the browse the principal plants are those belonging to the shadscale family and those known as salt brush, chico, greasewood, etc. Due to the general shortage of feed it is not at all uncommon to see yellow pine reproduction closely cropped and even juniper trees trimmed up as high as goats can reach. The density of the ground cover runs from .1-up to .7 tho the latter areas are very small in area and comparatively few in number. It is estimated that the average cover over the whole area is hardly more than .15-to 2 density. The study of the density in connection with the palatability of the feed will show that not less than 1-15 surface A. are required for one forage acre. Experiments carried on show that it takes from 2½-3½ forage acres to feed a sheep the year round. The exact amount depending upon the type of feed on the ground. The some may be palatable but of such consistenc during certain parts of the year as to render it practically useless as a forage feed for sheep. With only about 9 surface A. to the head without taking into consideration the large number of cattle and horses also using the

range, the seriousness of the over-stocking and the over-grazing on the Navajo Reservation as a whole, is readily visualized. Under the present condition of the range it is estimated that for the Navajo Reservation as a whole 20 to 30 surface Acres are required to properly take care of one sheep.

The Indian office thru the efforts of Special commissioner H. S. Hageman, is consolidating certain lands adjoining the various reservations and thereby materially increasing the available range area. This is a step of vital importance toward the solution of the grazing problem. However, there are also other corrective factors that should fall in step in this great undertaking.

NUMBER OF SHEEP AND GOATS BY RESERVATION

NAME	NO. SHEEP	NO. GOATS	TOTAL	% OF GOATS	ESTIMATED HORSES	ESTIMATED CATTLE
Leupp	45,390	12,444	57,834	21.5	?	?
Hopi	90,926	32,795	123,721	26.5	10,000	6,500
So. Navajo	347,741	137,698	485,389	28.3	10,354	8,000
No. Navajo	193,121	79,403	272,524	29.1	1,000	6,000
E. Navajo	138,469	64,431	202,000	31.7	6,401	2,075
W. Navajo	108,461	46,760	155,221	30.1	7,000	3,500
Total All Navajo	924,108	373,531	1,297,589	28.7	34,755*	26,075*

* Number of horses estimated by Bureau of Animal Husbandry to be in the neighborhood of 80,000 head or better. Their basis for an estimate is from figures obtained during Dourine Control work on the Navajo some years ago.

NAVAJO INDIAN RESERVATION
1930 INSPECTION AND DIPPING STATISTICS - SHEEP AND GOATS

WESTERN NAVAJO JURISDICTION

NAME OF DIPPING VAT	TOTAL DIPPED SHEEP GOATS	TOTAL BANDS	TOTAL SHEEP	TOTAL GOATS	TOTAL INF. SHEEP GOATS	TOTAL INF. BANDS	PER CENT INF. BANDS	PER CENT INF. COUNT	PER CENT GOATS
Shonto	33532	66	21357	12175	1885	2	3.0	5.8	36.3
Red Lake	27867	60	20377	7490	6113	10	16.6	22.0	26.8
Tuba City	20471	57	16323	4148	3030	9	15.8	14.6	20.2
Cap	23010	46	17197	5813	2383	6	13.00	10.3	25.2
Kaycnta	17022	47	8448	8574	--	--	--	--	50.3
Kaibeto	15991	33	12922	3069	3312	4	12.1	20.7	19.1
Old Jato **	10091	20	6496	3595	--	--	--	--	35.6
Cameron **	7237	20	5341	1896	4519	12	60.0	63.4	26.2
Totals	155221	349	100461	46760	21317	43	12.3	13.7	30.1

LEUPP NAVAJO JURISDICTION

Pilkon	20430	51	16341	4089	2494	7	13.7	12.2	20.0
Leupp	14681	40	11365	3316	823	4	10.0	4.2	22.5
Indian Wells	14344	33	11466	2878	373	1	3.0	2.6	20.0
Red Lake	8379	26	6219	2161	--	--	--	--	25.7
Totals	57834	150	45390	12444	3490	12	8.0	6.0	21.5

KEAMS CANON JURISDICTION (HOPI & NAVAJO)

Pinon	44560	107	30001	14559	--	--	--	--	32.6
Jeddito	29905	81	23001	6904	--	--	--	--	23.1
Weepo	17849	54	15089	2760	929	1	1.8	5.2	15.4
Hard Rock	16320	39	11111	5209	--	--	--	--	31.8
Sand Water	15007	41	11724	3283	--	--	--	--	22.3
Totals	123721	322	90926	32795	929	1	0.3	0.7	26.5

Hopi Indians owned sheep and goats total 20511, included in the above figures, of which total 3402 head were goats, or 15%

* Estimated - actual figures not available
** Privately owned vats

SOUTHERN NAVAJO JURISDICTION

NAME OF DIPPING VAT	TOTAL DIPPED SHEEP GOATS	TOTAL BANDS	TOTAL SHEEP	TOTAL GOATS	TOTAL INF. SHEEP GOATS	TOTAL INF. BANDS	PER CENT INF. BANDS	PER CENT INF. COUNT	PER CENT GOATS
Ft. Defiance	91650	179	59516	32134	8756	20	11.1	9.5	35.0
Tohatchi	60253	116	47160	13093	2576	4	3.4	4.2	21.7
Sehili	58904	131	41233	17671*	9981	23	17.5	16.9	30.0*
Ganado	50091	117	33882	16209	7231	14	11.9	14.4	32.3
Chinlee	39849	135	30630	9219	13105	35	25.9	33.7	21.1
Greasewood	29213	58	24103	5110	21323	47	81.0	73.0	17.4
Wide Ruins	26812	49	18649	7163	6183	8	16.3	23.2	20.9
Houck	21185	52	17260	3925	--	--	--	--	18.4
Naschiti	20709	63	15091	5618	3691	9	14.2	17.8	27.1
Salina Springs	12963	49	10684	2279	6034	22	44.9	46.5	17.5
Oak Springs	12160	31	8384	3776*	4003	7	22.5	32.9	31.6
Steamboat	10173	30	7240	2933	453	2	6.6	4.4	28.3
Rough Rock	8372	25	5931	2441	1610	6	24.0	19.2	29.1
Two Wells**	26793	91	15330	11463	1602	3	3.2	5.9	42.8
Garcia**	10760	39	6994	3766	--	--	--	--	35.0
Silversmith**	4231	4	3803	428	3081	3	75.0	71.9	11.1
Rock Springs**	1256	2	1256	--	--	--	--	--	--
Pine Springs**	1165	7	545	620	--	--	--	--	53.2
Totals	485389	1178	347741	137698	89629	203	17.2	18.4	28.3

** Privately owned vats

NORTHERN NAVAJO JURISDICTION

NAME OF DIPPING VAT	TOTAL DIPPED SHEEP GOATS	TOTAL BANDS	TOTAL SHEEP	TOTAL GOATS	TOTAL INF. SHEEP GOATS	TOTAL INF. BANDS	PER CENT INF. BANDS	PER CENT INF. COUNT	PER CENT GOATS
Sweetwater	37467	82	26656	10811	5727	12	14.6	15.2	29.6
Two Grey Hills	36876	103	26224	10652	10848	18	17.4	28.3	29.3
Tocito	36500	90	26551	9949	6244	14	15.5	17.1	27.2
Red Rock	32247	63	20719	11528	2179	5	8.0	6.7	35.7
Shiprock	27648	95	18176	9472	12324	34	37.5	44.5	34.2
Tees Nahs Pahs	26670	57	20875	5795	5419	10	17.5	20.3	21.7
Dene Notesoe	21259	59	14535	6724	8717	16	27.1	41.0	31.5
Fruitland	18369	49	15081	3288	4550	12	24.4	24.6	17.5
Bisti	15974	29	11446	4528	--	--	--	--	20.3
Aneth	12232	26	9405	2827	2409	8	30.7	19.6	28.1
Montezuma	7282	24	3453	3829	--	--	--	--	52.5
Totals	272524	677	193121	79403	58053	129	19.0	21.3	29.1

EASTERN NAVAJO JURISDICTION

Burnham	32424	55	26442	5982	--	--	--	--	18.4
Mariana Lake	28582	74	15267	13315	--	--	--	--	46.5
Farm	24994	47	18188	6806	--	--	--	--	27.2
Pinedate	24627	68	11622	13005	--	--	--	--	52.7
Ramah	19350	36	16214	3136*	--	--	--	--	18.3
Ojo Encino	14272	33*	10704	3568	--	--	--	--	25.0
Bucks	12565	44	8225	4340	--	--	--	--	34.5
Stony Butte	9253	27	6279	2974	--	--	--	--	32.1
Pruitt Vat**	1900	9	1425	475	--	--	--	--	25.0
Kimbato	15584	40	10909	4675	--	--	--	--	30.0
Carson**	18749	51	13124	5625	--	--	--	--	30.00
Canoncito Cojo	100	1	70	30	--	--	--	--	30.0
Totals	202900	485	138469	64431	--	--	--	--	31.7

* Estimated - actual figures not available
** Privately owned vat

The figures shown herein have been compiled from records of Bureau of Animal Industry field inspectors engaged in Navajo Indian Reservation sheep scabies eradication work during 1930.

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III.

Special pertinent facts relative to the present status of the grazing situation on the Navajo.

The primary factor contributing to the overgrazed condition is unquestionably the lack of sufficient water for stock. This shortage of water brings about the necessity of trailing sheep and goats for long distances causing a great loss of forage due to trampling out of the range. The distance that stock can travel in any direction from and to water is limited to a few miles. If stock has to travel too far it results in the concentration of too much stock in the vicinity of water. Also, much of the range now used as summer range on account of the availability of water is grazed year after year during the time that a plant has to develop seed and store food in its roots for vitality in order to continue and bring forth vigorous growth the next year. To crop the grass during the growing season year after year will soon materially weaken the plant to such an extent that many of them die out. This is the first hold erosion gets on a range area which is overgrazed. It is desired and essential that water be developed primarily on areas now only usable for winter range where the stock is using snow to supply its water requirements. Development of water on these areas will make the same available for summer range, and permit the grass on the now overgrazed summer ranges to recover by sending up seed stocks and storing food in their roots. The present summer range would then be used for winter range where possible. Sufficient water should be developed over the entire range so that sheep would not have to travel more than 3 to 4 miles to water. This would minimize the destruction of the range due to trampling.

The development of water is also essential in order to permit the construction of additional sheep dipping vats. During the past year the distance between certain vats was so great as to necessitate the travel of sheep for a distance of over 30-40 miles in order to reach a vat. Dipping the sheep from an area with a radius of this size naturally resulted in the concentration of a very large number of sheep at or near the vat. One vat dipped approximately 90,000 sheep at one dipping. As the sheep had to be dipped twice it meant that 180,000 sheep traveled to and from that vat. The condition of the range near the vat for a radius of

5-6 miles can very easily be visualized. Vats should not be more than about 12 miles apart or should be in sufficient number so that not more than 20-25,000 sheep are dipped at a vat for one dipping. Should two dippings become the rule twice that many vats would be needed. However, it is expected that the efficient work of the scab eradication program as carried out this year will make a double dipping unnecessary in the future. After the eradication of the scabies, the use of the vats will probably be continued as a means of controling mites and lice. In that case, one dipping a year will be quite sufficient.

Another factor to be viewed as contributing to the general overgrazed condition of the range is the type of stock used and the composition of their herds. With the exception of the cases where the efforts of the Superintendent to breed up the sheep has met with some reward, practically all the sheep are long legged, long necked, inbred sheep originally introduced by the Spaniards. These sheep are rather well adopted to the poor range and present methods of herding as used by the Navajo. However, these sheep produce but little wool and only light weight lambs. Consequently the possible income is greatly decreased. An even more important factor directly responsible for the poor condition of the range is the large number of old weathers and nondescript goats found in practically every herd . The principal reasons in favor of eliminating the old weathers and goats are readily enumerated; In the first place weathers and gots have different grazing habits than a ewe with lamb. Dry ewes as well as weathers and goats travel faster over the range; this brings them always in the lead of the herd. The ewes and the lambs who really ought to have the best feed trail along behind and must be content with what is left. The result is poorer lambs because the ewes cannot furnish enough milk for the same. This brings us to the discussion of the great and much used argument by the defenders of the goats. It is claimed that goats are used by the Navajo to supply milk for the lambs which a ewe does not claim on account of lack of milk. It is desired to point out the fact that if it were not for the presence of the goats and weathers as well as dry ewes in the herd that much more feed would be available for the ewes with the probably result that the ewe would have ample milk for the lamb and the necessity for goats would be eliminated.

The greatest use of the goat lies in the fact that the goat is used by the Navajo to furnish them with meat. In some cases the goats are milked to supply the Navajo family. This is a very useful use of the goat and a few good milk goats can easily supply the family with sufficient milk for all use. However, it is not uncommon to find from 50 to 400 goats in a herd. These are just largely the Navajo or Mexican type goat although in some herds an attempt is made to breed them up in order to obtain mohair for the market. This practice is desirable in many cases, however, these Angora herds should be herded separately from the sheep since their feeding habits are different, a mixed band will not work out to the advantage of the sheep which are a greater revenue producing source than the goats.

During the past year much good work has been accomplished toward breeding up the Navajo herd by introducing pure bred bucks and trying to teach the Navajo to handle his flocks in such a way as to get the most good from his herd. As much as has been accomplished this phase still presents a large field of possibilities. The Navajo always keeps his flocks in a corral over night to which they are also returned during the middle of the day. Very often flocks are seen penned up in the corral as late as 10 o'clock in the morning. This practice means that the flock can not be grazed very much more than one or one and a half miles from the hogan and corral. Driving them over and back so often tramples out more grass than is eaten. This excessive traveling which at times is speeded up by boys on horseback with a haywire whip will not produce fat lambs. Invariably the most deploring range conditions are found in the vicinity of hogans or where a supply of water has to be used by a large number of sheep. Usually the predominant weeds on these areas are the Russian thistle and other non palatable plants or other plants of low forage value. It is possible to have a range come back and restock itself after it has been overgrazed for sometime, however, this takes careful management over a period of several years. The greatest damage to the range lands due to overgrazing is caused by erosion. Within the life time of many men who visited the reservation 15-25 years ago, small ditches or stream beds have deepened to canyons 40-60 feet deep and several hundred feet across. These washes and gullies are caused by the water running off from the sparsely vegetated slopes, rapidly cutting into the soil loosened by thousands of sharp hoofs which destroy all the water retaining rootlets.

IV.

The Problem.

When viewing all the above facts which are tending towards the destruction of the range upon which thousands of Indians are depending upon for a living now and in the future, the thought occurs to everyone who has the Indian welfare at heart, "what are the changes necessary to better the present condition and how are the same to be brought about"?

Full recognition must be given the efforts of a comparatively few high class men with vision and forethought who in the past have recognized the importance and seriousness of the existing condition and have paved the way toward more rapid progress in the future. All future plans must be based on a workable and sound foundation so that with unceasing effort every action will point toward the desired goal in order that the same can be attained in the shortest possible time.

The proposed plan of procedure divides itself into two parts. 1st, Those activities which can be inaugurated almost immediately and which will show results within a comparatively short period of time and 2ndly. Those which can also be inaugurated immediately, however, their results will be slower in materializing.

1. Activities which will produce results in a comparatively short time are as follows:

a. Rodent Control
b. Elimination of excess horses
c. Development of water

2. Those activities that will not show results as rapidly as those under #1, but are of great importance to the people are:

a. Education of old Navajos in new methods of handling stock.
b. Education of young Navajos, (the Navajo stock growers of the future) in principles of range management and stock raising.

Rodent Control.

With the facts established by the Biological Survey that less than a dozen prairie dogs can eat and destroy enough range to keep a sheep during an entire year, it is apparent that with the large amount of rodents on the Navajo that a great saving of the range can be effected in a comparatively short time by the eradication of the same. Mr. Gatlin of the Biological Survey office in Albuquerque stated that a crew of six men can in a period of six months work 70-80,000 A. The extent of the rodent infestation on the Navajo is not definitely known, however, a conservative estimate places the area of heavy infestation at about 400,000 A. The eradication of rodents in this area alone would require from $25- $30,000 during the first year. During the second year an appropriation of like amount would be necessary in order to go over the same ground to get those that escaped the first year and then to work additional areas of lighter infestation adjoining the area worked. The work during the third and fourth year would be carried on in a very similar manner. It is estimated that a four year program would be of material assistance in helping out the range situation on the Navajo Reservation. However, if more than four years are needed to complete the project the same should be continued until the desired results are obtained. Too much money has already been wasted in making "starts" and in failing to carry the project through to the end.

b. Elimination of surplus horses.

The reduction of the vast number of useless horses is a difficult problem to solve. Due to the value attached to horses in decades gone by there still is placed a sentimental valuation on the horse which is hard to convert into common sense and dollar valuation necessary in order to show the Indian the uselessness of the numerous poor horses. A horse being able to travel farther from water than a sheep will graze on much of the range needed for winter sheep range. Being larger animals a horse will consume 4-5 times the amount of feed and use much of the water needed for the flocks. For all practical estimates the average daily requirements of water for horses is 10 gallon per day and for sheep, one gallon per day. In a region where water [illegible] where horses do not

represent a means for an income it is readily seen that a large number of useless horses represent a great liability.

c. Water Development.

The development of water will have a very marked bearing on the general method of range management and the profits derived from the flocks. Water has been developed in many of the places where the same was urgently needed and where it could be developed at a nominal cost. Very often the shortage of funds necessitated the construction of such improvements which are not in accordance with the standards of construction desired by the Irrigation Department, but the need of water in some of the areas justified a temporary plant in order to serve the Navajo people with the hope that future funds might make possible a permanent plant. One of the first steps in a proposed plan for water development in connection with the solution of the grave problem of supplying feed for the Navajo stock, which represents the life of the Navajo, is the laying out of a well defined plan of action along the following lines which were discussed with Mr. Neuffer, supervising engineer of the U. S. Indian Irrigation Service.

1st. A survey is to be made by a grazing man with the aid of the local stockman to determine the location of water desirable for the successful management of a given range. One representative of the irrigation division who is well versed in the geology of the country, should pass on the possibility of developing water at that place and recommend the best and logical method of developing the same. This will vary in the different localities due to the geological features of the country. Mr. Neuffer proposes that likewise an engineer be attached to this survey party to plat the location of the proposed development and make a sketch of the type of plant to be used and estimate the cost of constructing the same.

At the completion of this survey there should be on hand a complete plan for water development on the Navajo Reservation showing the class 1, 2, and 3 dams and other water plants necessary. Class 1 constitutes water at places of prime importance. Class 2, those of secondary importance.

These secondary or temporary units will permit the stock to graze further out beyond the immediate limits with

permanent water. In this way the area around the permanent water obtains a rest and is saved for later use after the temporary water has been used up. Temporary dams, especially where the construction cost is low add greatly in the better distribution of the stock and more uniform utilization of the range.

Class 3. Subsidiary tanks to be scattered over the country in addition to the regular tanks so that in case of very localized rains in any one season sufficient number of tanks are filled with water so as not to work undue hardship on the stock and likewise also to conserve the range. Not only the location of the water tanks and wells would be shown but also a fairly reliable set of figures would be available showing the cost of construction and the funds needed for the completion of this project.

All new construction cost should be based on a high standard of construction with a view of building for permanency. This always is the cheapest in the long run.

During the coming fiscal year Mr. [illegible]euffer proposes to spend about 75,000- [illegible],000 on the repair of present plants and to bring the same up to the desired standard. The great need of water and the small allotment of funds has not always permitted the service to construct tanks etc. in the manner desired and consequently necessitated early repairs. Four new "Caterpillar" outfits are needed to expedite the construction of new dams and tanks requiring an additional expenditure of [illegible],000. The need of development of numerous springs [illegible] in the past years and of some very much needed tanks in localities already decided upon will require approximately an additional 100,000. The construction of tanks varies from [illegible]- 1500 while the construction of wells depending upon the depth of the well and the structure of the geological formations will run considerable higher. Wherever feasible, wells are more desirable than surface tanks inasmuch as a positive supply of clean water is always available. However, when wells are impossible or the cost of drilling the same prohibitive, surface tanks serve the purpose to good advantage.

Below is listed the number and the kind of all improvements in the line of water development on the [illegible] [illegible] [illegible] the past years. This

881[illegible]

represents an expenditure of approximately $950,000 to date.

Totals of Completed Water development up to November 1, 1930

Western Navajo	Drilled wells Windmills etc	5
" "	Dirt Reservoirs	21
" "	Dug Wells	26
" "	Springs	57
" "	Tanks Storage	8
" "	Concrete Troughs	46
Eastern Navajo	Drilled wells Artesian	8
" "	Dug Wells	4
" "	Springs	3
" "	Concrete Troughs	11
" "	Dirt Reservoirs	10
Northern Navajo	Drilled wells Artesian	6
" "	Drilled wells Windmills etc.,	11
" "	Dug Wells	41
" "	Springs	117
" "	Storage reservoirs small	2
" "	Concrete Troughs	166
Southern Navajo	Drilled wells Artesian	7
" "	Drilled wells Windmills etc.,	30
" "	Dug Wells	41
" "	Springs	54

Southern Navajo		Troughs	185
"	"	Storage Reservoirs small	7
"	"	Dirt Reservoirs	1
"	"	Windmills at dug wells Galv. Tk	2
Leupp		Drilled wells Windmills etc.,	4
"		Dug Wells	8
"		Springs	17
"		Troughs	29
"		Dirt Reservoir	10
"cp!		[illegible]	4
"		Drilled wells Windmills etc.,	33
"		Dug wells	10
"		Troughs	125
"		Catch Basins	1
"		Storage Reservoirs small	10
"		Springs	20

[illegible]

[illegible]

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Until a survey is made it is difficult to forecast the total amount needed to develop sufficient water on the Reservation in order to carry out definite and well planned methods of range control and utilization.

The above enumerated Projects, 1st the rodent control, 2nd. elimination of surplus horses, and 3rd. the development of water are steps which it is possible to inaugurate almost immediately and whereby beneficial results will be apparent in a comparatively few years, next we come to those steps necessary to round out the plan to improve the grazing situation on the Navajo reservation and insure the success and full benefit of the previously mentioned steps. The plan under the second classification can likewise be incorporated at an early date, however, [illegible] will be [illegible] before [illegible] apparent but nevertheless, will be of very great importance. Education is the big item under this category and without the proper education of the Navajo [illegible] all [illegible] of range [illegible] will [illegible] failure.

[illegible] Education

The education program [illegible] itself into two divisions, 1st. The education of the present [illegible] to improved methods of handling their stock and [illegible], [illegible] the education of the young [illegible], the [illegible] of the [illegible] in range [illegible] and stock [illegible].

[illegible]

which no doubt are fully justified it is desired to point out the harm and the additional handicap imposed upon the willing stockmen. A stockman detailed on police duty is ordered to round up a bunch of Navajo children and take them to the boarding school. It is against the wish of the children and the parents that the children be taken away to school. Yet the stockman follows out his instructions and takes the children to the boarding school. Later when the stockman desires to teach these Indians, a new a different system of grazing or of handling their herds, he is [illegible] with a people caring very little for his advice. It appears to the writer that this double duty not only interferes with the stockman's real duties but defeats [illegible] the [illegible] of [illegible] the Indians. It is my opinion that [illegible] language. [illegible] a people speaking a different language than our own [illegible] language. The fact is [illegible] that an attempt is made to teach the Indian the English language [illegible]

[illegible]

[illegible]

the sheep and the goats be grazed together, since their feeding habits are different. Furthermore, the goat is a faster traveler and natural leader, consequently, the goats are always in the lead while the ewes and lambs who require the best feed must get along with what is left. If goats are desired to furnish milk for the family a few good milk goats can be kept which will amply supply the needs of a family and yet will not be enough in number to work the harm the large number of goats are doing now. In the handling of their herds the necessity of getting rid of all dry ewes and weathers is likewise of great importance. Only a wool crop is obtained from these sheep which will eat as much feed practically as a ewe with a lamb. Some very encouraging progress is made in the breeding up of the grade of sheep which will tend to produce a greater wool crop and heavier lambs. This work should be continued with the same spirit and greater support. But the fact must be borne in mind that the improved stock will not be able to chase over the range as well as the present long legged Navajo sheep, when following the goats. In order that the project meet with success it is essential to eliminate the large number of goats from the bands of sheep.

A possible outlet worthy of development in order to furnish a market for the large number of goats is thru the Indian Boarding school. The Navajo is raised on sheep and goat meat and inherently prefers the same over beef. A very large number of goats for which there is practically no outside market can be sold to the schools to supply them with meat. In fact, Superintendent Walker of the Western Navajo has inaugurated this plan to a certain extent. The Indians are paying for their sheep dipping by selling goats and mutton to the school. This plan has great merits. 1st, It enables the Navajo to pay his debts, which is an essential in good citizenship. 2nd, It supplies the Indian School with cheap meat thereby making a saving. 3rd. It is meat best liked by the children. 4th. It affords the Indian a chance to derive an additional small income. 5th. It enables the Navajo to profitably dispose of a class of stock which has but little market value (25¢ for the hide and you have to kill the goat to get it.) and which is working a great hardship on the sheep and constitutes a direct menace to the range where occuring in large numbers and in mixed bands.

The use of goat and mutton at the school would also offer a market for the great number of weathers often found in the herds. In one band of approximately 1900 head,

the sheep and the goats be grazed together, since their feeding habits are different. Furthermore, the goat is a faster traveler and natural leader, consequently, the goats are always in the lead while the ewes and lambs who require the best feed must get along with what is left. If goats are desired to furnish milk for the family a few good milk goats can be kept which will amply supply the needs of a family and yet will not be enough in number to work the harm the large number of goats are doing now. In the handling of their herds the necessity of getting rid of all dry ewes and weathers is likewise of great importance. Only a wool crop is obtained from these sheep which will eat as much feed practically as a ewe with a lamb. Some very encouraging progress is made in the breeding up of the grade of sheep which will tend to produce a greater wool crop and heavier lambs. This work should be continued with the same spirit and greater support. But the fact must be borne in mind that the improved stock will not be able to chase over the range as well as the present long legged Navajo sheep, when following the goats. In order that the project meet with success it is essential to eliminate the large number of goats from the bands of sheep.

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600 were old weathers and 350 goats. The sheep and the goats coming from the range are usually in pretty fair shape for immediate slaughter until December or the beginning of January. To further use the meat purchased from the Indian on his reservation would necessitate the construction of a small refrigeration plant or the enlargement of the existing refrigeration plants at the schools.

The poor market for lambs during the past year further complicates the grazing problem and adds a large burden on the already overburdened range for this winter and the next year. Due to the low prices offered for lambs many of the Navajo refused to sell or could not sell their lambs, consequently a great portion of the lamb crop remains unsold and is still with the herd. In some areas the traders did not take any lambs or only such lambs as the Indians had to sell in order to clear their indebtedness to the traders. Some areas more favorably located as to markets were able to dispose of 75-80% of the lamb crop while others are carrying over practically the entire lamb crop.

It is not pleasant to visualize the inevitable results of this overstocked condition. Such or similar conditions have occurred in the past and Mother Nature, the great equalizer, has stepped in and reduced the number ruthlessly and impartially during a hard winter or a period of drought. But this method is most pitiable and discouraging to even such stoical and fatalistic people as the Navajo.

In as much as the greatest part of the Navajo population is directly dependent upon the raising of stock for their support and inasmuch as their standard of living is directly influenced by the condition and marketability of their stock and products derived from the same, it appears that the proper management of the range and the proper handling of the stock is of paramount importance to the welfare of the Navajo Indian.

During the past year the average price of wool obtained by the Navajo was about 17¢. The price offered for lambs was 4-4½¢. If equally distributed, each Navajo, man, woman, and child would have about 23+ sheep and 9+ goats and their possible income figured liberally could not be more than $60.00 per annum. With such a small income from their flocks every effort is to be made to help

these people increase their income and their standard of living. The poorer the Indian remains the more time consuming the process of bringing the Indian up to the desired standard toward which the efforts of the Indian Service are directed.

At the present time the range which constitutes the greatest resource upon which the largest number of Navajo people are directly dependent upon, is deteriorating rather steadily and more rapidly each year. It is thru the efficient work of properly trained stockmen that this great asset upon which depends the present and future welfare of a large number of Indians can be brought up to a high state of productivity and maintained there by the practical management of the range resources.

It is not desired to minimize the great importance of the educational, medical or any other phase of the work among the Navajo but it is hoped to bring out the great importance that stock plays in the life of the Navajo and the need for concentrated action which will result in the betterment of the range and stock conditions among the Navajo to whom his stock represents his "bread and butter."

In close sequence to the education of the old Navajo stockgrower of today follows the education of the stock grower of tomorrow. The necessity of this step is very apparent to any thinking person interested in the future welfare of the Navajo people.

Since the Navajo has been a stockman for many decades and his inherent characteristics tend him to lean toward the life of a nomad following his herds over the vast, windblown and sun backed prairies of his great reservation, we will find very many of the youngsters attending the government boarding school to be better fitted for the life of a stock grower than any other occupation. No doubt it is advisable to endeavor to direct the potential carpenter, plumber or mechanic into his respective channels but the potential stockgrower should receive an equal chance to adopt the latest and best methods of raising stock and taking care of the range. A school or schools located within the Navajo territory equipped to teach the young stockman the fundamentals of range management would be a great asset to the Indians and the Indian range. The subjects taught should be practical in every respect and should include such items as; deferred and rotation grazing, proper salting and watering of stock, the bedding out system of herding, the value of rodent control, plants poisonous

to stock of various kinds, the care and maintenance of windmills and other water sources, as well as the basic principles governing the construction of these water plants. In addition to the studies covering range conditions, should be added such valuable subjects as the care and breeding of stock in order to obtain the kind of stock best adapted to the range and most profitable for the Navajo.

If it appears that the writer has stepped out of his scope of territory by mentioning schools and other activities it is desired to assure the reader that the same is not done to cast any reflection upon any division of our Service but the scope of this important work which effects the whole life of the Navajo is so far reaching that it will require the concentrated and harmonious efforts of all branches of the Indian Service to help the Navajo, in order that he may be assured a living in the future and not only an existance.

In connection with this work the great need of a good map was a decided handicap. All superintendents, engineers, foresters, stockmen, roadmen, and telephone men in fact, everybody connected in any way with the Navajo territory expressed himself as to the inaccuracy of the maps available and the great need of a reliable map on which to base plans for developments and other data often called for the by Indian Office. A good map of the Navajo Country is invaluable in the making of a complete range management plan and would be useful to all the stockmen and in fact to everyone connected with the Navajo problems in any way whatsoever.

To make a topographic map of such a large area would require several years of work and a very large outlay of money. Various recent articles published, suggested the possibility of aerial maps of this large territory at a lower cost and a shorter period of time than would be possible by any other method. Information obtained from army officers as to the accuracy of an aerial map was highly satisfactory and since the army is fully equipped to carry out such work it is respectfully suggested that it might be possible to obtain the services of the army in making an aerial map of the Navajo at a very nominal figure. Although the making of a map for the Navajo country is not directly connected with the solution of the grazing problem it is so closely allied that it should receive careful consideration and it is sincerely hoped that it will also receive the approval of the Indian Office.