UNITED STATES
DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

UNM 1611

NAVAJO SERVICE

LAND MANAGEMENT SURVEY

UNIT-8

AGRONOMY BRANCH REPORT

C 16270

T. C. 16271

LAND MANAGEMENT SURVEY

UNIT 8

AGRONOMY DIVISION

Location:

Land Management Unit 8 lies in the north central section of the Navajo reservation. It is bounded on the north by the San Juan river, on the west by No Man's Mesa and Skeleton Mesa, on the south the boundary follows the 36°30' parallel to the Chilchinbito D. A. and runs in a northeasterly direction to where the 36°45' parallel intersects Chinle Creek. The boundary then follows Chinle Creek to its point of intersection with the San Juan River.

Area:

The area of this unit under its present boundaries is 1,424,000 acres, which includes two fenced demonstration areas: Mayanta D. A. with 38,223 acres, and Chilchinbito D. A. with 16,586 acres. The Dennehotso land management unit, which is not a fenced area comprising 331,000 acres, is also included.

The proposed boundary change would increase the area by approximately 27,000 acres, bring the total of the unit to 1,451,000 acres. The proposed change does not materially affect the Agronomy resources for there is only one, three-acre farm within the 27,000 acres.

Topography:

The topography ranges from large flat valleys to rough broken country with steep slopes. Much of the Unit north of Laguna Creek consists of plateau. 65 percent of the area is considered valley and 35 percent as mountain. Of the total Unit

15 percent is waste and 11 percent is under cultivation.

Rainfall:

The only available rainfall records obtainable within the unit are for Kayenta (elevation 5,800 feet). The record extends over a 21 year period with five incomplete records. The minimum annual precipitation recorded was 4.63 inches; the maximum was 11.05 inches. The average for the period is 8.63 inches.

Elevation:

Elevations range from approximately 3500 feet at the San Juan to about 8,000 feet on Black Mesa.

Temperature:

Maximum temperature range at Kayenta varies from 18°F below zero to 104°F above zero. The mean temperature range is 8° below zero to 101° above. The growing season at Kayenta is 169 days.

Erosion:

Wind is the outstanding erosion factor on the area north of Laguna Creek and gully erosion is the outstanding factor on the area south of Laguna Creek. There is, however, some overlapping within each division made. On the farm land both wind and water erosion are active and need control measures.

Agricultural soil is abundant throughout the area but the water is usually the inhibiting factor for agricultural development.

Cultural Practices:

The cultural practices of the Navajos in this Unit vary

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from primitive to modern. Plows are quite common, and mowing machines are found in the alfalfa producing sections. Corn is usually planted by hand using either a stick or a hoe. A horse drawn blade is used for weeding and cultivation. The corn is picked by hand and placed out in the sun to dry before it is stored for winter use.

On most of the fields there is evidence of some effort to border and to utilize as much water as possible. Where irrigation water is not available an effort is made to divert the water from the smaller flood gullies to the farm land.

Dry farming is practiced on a very small acreage, but it is not considered practical on this Unit due to the low annual rainfall.

Population:

The population within Unit 8 is 1666 people or 220 consumption groups. (Figures compiled by the Sociological Division.)

Agricultural plants used:

Corn is the principal agricultural crop grown within the Unit, representing approximately 75 percent of the land now under cultivation.

Alfalfa rates second with about 10 percent and melons and squash come third with about 2 percent. Besides these products there are very small acreages of peaches, beans, barley, oats, sorghum, and vegetables.

Agricultural Concentrations:

Farming in this Unit is concentrated at three locations; Dennehotso, Kayenta, and Segihatsosi Canyon. These concentrated areas are located where permanent water is supplied for irrigation

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by Indian Irrigation Service structures. The cultivated area of these three locations represents approximately 75 percent of the total farming within the unit.

Up to the present time no use has been made of the diversion constructed in the Eagleheard Canyon because the Indians have not cooperated enough to build the ditch to carry the water from the diversion to their farms as was originally agreed. Instead they have continued their old method of constructing an earth diversion which washes out with each large flow of water.

The remainder of the farming is done on small one to ten-acre tracts scattered throughout the Unit. With the exception of a small amount of dry farming, the farms are so located that they will receive flood water irrigation either from sandrock or steep slope drainages.

Agricultural Land Classification:

With the cooperation of the soils and engineering divisions, and by using the previous agricultural survey and water spreading survey notes, and aerial photographs, 231 tracts of present agricultural land were located, making a total of 1633 acres. This is further broken down as follows:

423 acres of irrigated land

430 acres of flood irrigated land

80 acres of dry farming

Besides the present agricultural land 1091 acres of potential land was located. This is divided as follows:

225 acres irrigated farm land
336 acres flood irrigated farm land

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530 acres flood irrigated meadow land.

The potential land is limited principally by available water.

Method of Location:

Each tract was located on the map and given a number to correspond with a number which was nailed on a post on the tract located.

The same numbers used on the previous Agricultural survey and Water Spreading survey were used in this study, with the exception of large areas where more than one farm was included under one number. In these instances the decimal system was used in further breaking down these areas into individual tracts. Additional tracts of Agricultural land not previously located were located on the map and given a number.

Present farm land is represented on the map by green color. Potential land by yellow. Potential meadow land by orange. Revegetation possibilities are shown in blue and water spreading possibilities are indicated by a cross-hatch. ////////

The farm land under the diversion dams at Hayenta and Dennehotso is shown on plane table maps and the tracts are numbered from these.

Yields:

No measurements of the actual production of crops in this unit were made except those made by Mr. Rodgers and listed in his report on the Dennehotso area, which is included with this report. Production at Dennehotso was considered to be above the average of that for the Unit as a whole. Therefore, taking Mr.

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Rodgers estimates as representative of the best fields in the district and judging the others comparatively the average for corn was considered to be 15 bushels per acre, alfalfa to be 2.5 tons per acre. Other crops were produced on a very small scale and grown primarily for home use, therefore no estimates were made for these products.

It is conservatively estimated that corn production could be increased to 20 bushels per acre and alfalfa to 3.5 tons per acre through proper seed selection and by carrying out proper land management principles.

Suggested Crops:

Crops which could be produced in this unit are, corn, alfalfa, wheat, barley, oats, melons, squash, beans, potatoes, and vegetables.

Suggested crops for each individual field can be found in the Agronomy survey notes.

Management Principles Needed:

One of the principal things needed on the farm land throughout the district is proper utilization of the available water. Even at Kayenta and Dennehotso where irrigation systems have been constructed there is very poor utilization. A definite irrigation system does not seem to be practiced. Navajos wanting water will go open the gates and help themselves. It is hoped and expected that this kind of a practice will be corrected by the Unit supervisor.

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In the Segi-hat-Sosi Canyon it is hoped the Indians can be encouraged to complete the ditch from the diversion so they can get proper utilization of the available water.

The farms which are located to receive flood water have to get fairly good utilization of the available water or the crops fail. Some years they will get a little spring run-off but it is not always certain. Otherwise they depend on extra run-off from summer rains to produce their crop.

Erosion on Agricultural land is everywhere noticeable and due largely to improper use and management of water. Small gullies that cut into the fields are often noticeable. The wind also plays an important part in the removal of the top soil.

Cost of Development:

The cost of Agricultural development involving leveling, furrowing, bordering, or terracing, as the case maybe on the farm land is approximately $62,905. Including the potential land. (estimated by Engineer) Cost does not include diversions or ditches. This cost is broken down as follows:

	Acres	Average Cost per acre	Total
Present Irrigated land	1123	$24.80	$27,748
Potential Irrigated land	225	26.00	5,859
Present flood-irrigated land	430	33.80	14,534
Potential flood-irrigated land	336	32.80	11,000
Present dry farms developed to flood	40	53.50	2,142
Potential Meadow Land	530	3.00	1,608
TOTALS	2684	$23.50	$62,905

NOTE: Estimated costs on each tract can be obtained from the Agronomy Land Management Survey notes.

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The following table shows the acreage and percentage of the various crops produced within the various farm area groups.

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Area		Acres & % of Total	Corn Acreage & %	Alfalfa Acreage & %	Peaches Acreage & %	Melons Acreage and %	Squash Acreage and %	Not cult. this yr. Acreage and %	Sorghum Acreage and %	Barley Acreage and %	Oats Acreage and %	Vegetable & Beans Acreage and %
Total for All areas Unit 8	acres	1633	1250	119	9	30	27	190	3	1	2	2
	%	100%	76.5%	7.5%	.5%	2%	1.5%	11.52%	.20%	.01%	.12%	.12%
Dennehotso Area	acres	705	588	89	6	15	10		3			
	%	43.20%	47.04%	74.70%		50.00	37.03%		100%			
Kayenta, Laguna Valley, Eltapitan Divide, Laguna Canyon	Acres	543.50	410.75	23	6	10.75	11.50	80			.75	.75
	%	33.30%	32.86%	19.39%	66.67%	35.83	42.60%	42.10%			37.50%	37.50%
Se[illegible]hotsosi Canyon and upper part of Moonlight wash	Acres	148.75	121.50	4	1	1	1.25	19				1
	%	9.10%	9.72%	3.39%	11.11%	3.34	4.65%	10.00%				50.00%
Chilchinbito	Acres	46.75	27			1.50	1	17			.25	
	%	2.86%	2.16%			5.00%	3.70%	8.95%			12.50%	
Oljeto, Goulding, Douglas Mesa	Acres	67	51.50	3	.50		2	10				
	%	4.10%	4.12%	2.53%	5.55%		7.40%	5.35%				
Monument Valley	Acres	104.50	48		1.50	1.75	1	57				.25
	%	6.70%	3.84%		16.67%	5.83	3.70%	30.00%				12.50%
Black Mesa	Acres	12.50	3.25				.25	7		1	1	
		.79%	.26%				.92%	3.60%		100%	50.00%	
Flute farms and So. East Border near Rough Rock												

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LAND CLASSIFICATION

UNIT 8

Classification of Land	Number of Tracts	Acreage
IRRIGATED	152	1122
Class A	145	957
Class B	7	165
FLOOD IRRIGATED	65	430
Class A	61	265
Class B	4	165
DRY FARM	14	80
Class A	3	14
Class B & C	11	66
POTENTIAL		1091
IRRIGATED	22	225
Class A	19	176
Class B	3	49
FLOOD	34	866
Class A	24	308
Class B	4	28
Class C (meadow land)	6	530
TOTAL CULTIVATED LAND AND POTENTIAL	287	2724
TOTAL PRESENT AND POTENTIAL IRRIGATED	174	1348
TOTAL PRESENT AND POTENTIAL FLOOD IRRIGATED	99	1296
TOTAL PRESENT DRY FARM (NO POTENTIAL)	14	80

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SUMMARY

I. Agricultural development on Unit 8 involves 2700 acres which is broken down as follows:

1. Cultivated land now in use for crop production, 1637 acres.
2. Potential farm land which could be used for crop production, 561 acres.
3. Potential meadow land not suitable for crop production, 550 acres.

II. Estimated cost for the proper subjugation of this land is $62,905, broken down as follows:

1. Work on present farm land, $44,474
2. Development of potential farm land, $11,000
3. Development of potential meadow land, $1,608

III. By carrying out the work proposed in this Unit and observing land management principles the agricultural assets within the Unit can be expected to supply the needs of the people with less importations of agricultural products.

Attached is a copy of Mr. Rodgers report on the Dennehotso farm area, a legend of land classification and definitions of terms used in the Agronomy survey sheets.

(For priority projects see integrated report.)

Approved:

J. O. Woods
Chief Agronomist

Submitted:

H. M. Ivory
Agricultural Aide

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DEFINITIONS OF TERMS USED IN
AGRONOMY SURVEY BLANKS

Tract No.

Each tract or farm is numbered beginning with one on each quadrangle. The number in the notes corresponds to a number on the map and a number placed on each tract. The study will use these numbers as permanent in reference to location of a farm under consideration.

Acres

Number of acres of tract as measured by the Agronomist on the survey.

Topography

The surface conditions of the tract. Expressed in the following terms, ~~s~~ slope, rough, even, irregular, hummocky, rolling.

Soil

Soil texture as defined by Soils man

C = clay, S = sand, L = loam, Li = light, Fn fine

The use of the symbols thus: $\frac{FSL}{Li\ C}$ indicates a fine sandy loam over light clay.

Erosion

The extent of erosion: gully or sheet caused by wind or water.

Classification slight, moderate, severe.

Water

Water available for crop production. Classification : Doubtful, sufficient, excess.

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Expansion

The possibilities of expanding the present farmed land to take in additional adjacent land. Listed as the acreage of potential land.

Present Crop

The crop or crops grown on the tract and acreage of each if more than one.

Suggested Crop

Crops which the Agronomist suggests growing on the tract.

Yield

Estimate of yield for crops grown on tract as compared to other yields within unit.

Treatment

Recommended soil and water conservation practices, such as borders, dikes, terraces, and furrows. (Details of recommended treatment will be found in the Engineers notes on each farm.)

Cost per Acre

Estimated cost per acre for doing recommended work for each tract. (Estimated by Engineer)

Class

The class of land as defined by the legend of land classification.

Remarks

Includes type of land; irrigated, flood irrigated or dry farming, and any features noticeable to the Agronomist. Where more space is needed remarks are continued on the back of the survey sheet.

LEGEND USED IN LAND CLASSIFICATION

FLOOD IRRIGATION

Grade of Agricultural Land

A- B - C and Grass land as classified by Agronomist on Agricultural Land Survey.

A - Grade

1. Will be confined to the following soil textures: Fine sand, very fine sand, fine sandy loam and loam.

2. Will not contain more than .2% alkali.

3. Water must be available for satisfactory growing of tilled crops. (Note all areas where watershed area is large in proportion to cultivated area, for engineering survey).

4. Must not have over 3 per cent slope for above mentioned soil textures.

B - Grade

1. Will be confined to soil textures included in Grade A. Land plus silt loam and clay loam textures.

2. Will not contain more than .4% Alkali.

3. Adequate water available under normal conditions.

4. Slope not over 5 per cent.

C - Grade

Not recommended for Agricultural purposes.

1. Slope too steep or irregular considering type of soil and alkali condition.

2. Presence of over .6% alkali.

3. Excessive erosion conditions.

4. Lack of available water.

5. Deficient drainage.

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IRRIGATED LAND

Existing Projects

A - Grade

1. Will be confined to the following soil textures; fine sand, very fine sand, fine sandy loam and loam.

2. Must have adequate water supply for growing any crop.

B - Grade

1. Will be confined to soils with silt loam and clay loam textures, in addition to soil textures included in Grade A land.

2. Must have adequate water for production of two cuttings of alfalfa.

C - Grade

Not recommended for agricultural purposes.

1. Slope too steep or irregular.

2. Presence of over .4% alkali.

3. Excessive erosion.

4. Lack of available water.

5. Deficient drainage.

Note: The amount of white alkali will not exceed .4% of any irrigatable land. Over .05% black alkali automatically excludes any land from project. Coarse sand, stony land and shallow soil will be considered as non-irrigatable land.

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DRY FARMING

A - Grade

1. Will be confined to soils with fine sand, very fine sand and fine sandy loam textures, when the slope does not exceed 5% and up to soils with loam and silt loam textures, when the slope does not exceed 2%.

2. Adequate seasonal rainfall for the growth of beans and corn.

B - Grade

1. Will include any dry farms which are not classed as A grade, and which would not be recommended to take out of production because of excessive erosion.

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IRRIGATED LAND (Available water supply continuous or nearly so).

Proposed Areas (Under consideration at present)

A - Grade

1. Will be confined to soils with fine sand, very fine sand, fine sandy loam and loam textures when slope does not exceed 5%, and up to soils with silt loam and clay loam textures when slope is not more than 3%.

2. Must have adequate water supply.

3. Must be easily put under ditch.

4. No levelling allowed for this class.

B - Grade

1. Will be confined to silt loam and clay loam soils.

2. An uncertain water supply would justify placing soils of fine sand, very fine sand, fine sandy loam and loam textures in this grade.

3. A slight amount of levelling is permissable.

C - Grade

Not recommended for agricultural purpose.

1. Slope too steep or irregular.

2. Presence of over 4% alkali.

3. Excessive erosion.

4. Lack of available water.

5. Deficient drainage.

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POTENTIAL LAND

Grade A and B

Specifications for grades A and B under this heading are the same as for flood land irrigated land.

Grade C

1. Will include only soils with loam, silt loam and clay loam textures.

2. Area must be large enough to use probable water supply or such as to economically justify control of excess water.

3. Slope must not exceed 3% and preferably not exceed 2%.

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AGRONOMY REPORT OF THE

DENNEHOTSO VALLEY

To: Mr. J. O. Woods,
Chief Agronomist

Introduction

Dennehotso Valley, where proposed development is to take place, is approximately six miles long by one half mile wide, inhabited during the summer by 600 people composed of twenty clans. All the people leave for the winter with the exception of three or four families. There are about 125 families farming in the valley during the summer from as far away as Goulding and Bluff, Utah.

The estimated elevation is about 5300 feet with a twenty-four hour range temperature of fifty degrees. September 15 approximately ninety-seven degrees.

1. Crop History

a. The first families came into the Valley about forty years ago and farmed the area above the present diversion. Thirty years ago they spread into the main part of the valley.

Fourteen years ago a dirt and log dam was constructed by Indians, that served the valley. Now the Indian Service diversion which was constructed six years ago is in use. The Post is eleven years old.

b. Crop Production

Kinds	Per Cent of Each	Acreage	Production per Acre
Corn		585	28 Bu.
Alfalfa		89	6000 lb.
Watermelons		15	Enough for home use
Squash		10	" " " "
Sorghum		3	25 Bu.

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In coming to a yield or production estimate, the ears were counted by rows and divided by 140, this being the number of ears per bushel by actual weight in three average fields. The other method used was to find the average number of sticks to a hill estimating one ear to a stock, planted 7 x 7 feet apart which is 891 hills to the acre. The corn production this season was average.

In estimating the alfalfa, the bales were counted off the press. They get three cuttings of 80 % U.S. No. 1 dairy hay. The hay is sold for $1.00 per bale at Mexican Water or used locally. The alfalfa production was less than average.

There are about six seedling peach trees in the valley. Late ripening, fair production.

c. Cultural Practices

Corn--more or less primitive. Plow and plant in hills 7 x 7 feet. Seldom cultivated after planting. Make a crop in one irrigation if water is available at proper time. Colors - red, white, yellow, black, blue, and combinations, mottled.

Alfalfa--use modern mower, picked from ground with fork, hauled to post and bailed in press with one horse for power. At first they baled by means of stamping hay in rectangular holes dug in the ground and bound with two wires.

Melons -- no new seed or seed selection. Squash planted with corn, melons in small patches for home use.

Cane -- drilled in rows twenty-two inches apart.

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2. Agricultural Survey

a. Classification into types. All land that is now under cultivation is class A.--sandy loam to clay soil over a clay sub-soil.

b. Recommended use and development.

The area farmed is being used to fair advantage with some waste between fields, fence corners, and short cuts with ditches to eliminate a little work. The alfalfa acreage should be doubled, using locally, which would make it possible to flush ewes at breeding time and feed ewes before lambing time. I believe the low lamb crop is a nutritional problem.

The limiting factor is of course water, which if the supply is adequate when developed, an extremely productive valley can be developed.

A dam at the road crossing would make it possible to use clear water for alfalfa, eliminating the hazard of dirty water which kills the plants.

Weeds are taking the valley and should be eliminated.

3. Farm Management plans

The arroyo should be fenced, seeded, planted, leaving but two or three crossings for stock watering purposes or roadways. All land not to be cultivated re-seeded to permanent pasture mixtures. The fences and ditches should be straightened with permanent concrete gates for each lateral opening to regulate water easily and conveniently and to prevent short cuts with ditches.

Fields must be leveled and bordered.

Crops grown should be those locally used. Better methods of storing corn introduced. Present acreage of alfalfa increased three times.

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Fruit trees can be grown the entire length of the valley along the southeast side. Fruit trees should be protected with wire--a net around each plant.

The slick rocks serve as protection and run-off for water which will be caught in crescents and furrows for distribution among the trees. The cover and rock borders on the northwest side can be planted to wood-producing trees.

Wind-breaks following the ditch laterals composed of Russian olive, Chinese elm, Tamarisk, cottonwoods, and Honey Locust.

Tamarisk on the upper alkali or slick land flats.

Hold Cottonwood and Tamarisk out of cultivated area--Cottonwood due to tremendous amount of transpiration and Tamarisk as a soil destroyer.

4. Artificial Revegetation Survey

a. The range is very large with area roughly about thirty-five by forty miles.

Drainage to the north and east.

Area within four miles of Dennehotso entirely denuded.

Estimated present carrying capacity of range--five sheep per section or 7000 sheep in range area.

Range to the north and northeast is 75% rock ledges and sand dunes. To the southwest and south, the range is entirely denuded in a large part, with range come-back possible over portions while in the extreme southeast end the range, a small area, is in fair shape and will re-seed itself without help and a little protection. All the Atriplex is entirely gone in the valley with few scattered plants on the range to the south.

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b. Solid planting is recommended in valley and where sand has started to drift with strip planting running across the watershed over the rest of the area.

On the mesas to the northeast, Black bush is in fair quantities which is the remaining winter forage with Mormon tea still holding its own generally over the range area.

Prevailing winds are from the south, which should be hindered by wind breaks.

Plants and seed needed in the revegetation program:

Shadescale	Russian olive
Winter fat	Cottonwood
Greasewood	Tamarisk
Sage	Chinese elm
Cliff rose	Asparagus
Apache plum	Dune broom
Mormon tea	Luca
Willow	Kayenta oak
Indian rice	Grape
Sacaton	Navajo yucca
Galleta	Peach
Blue stem	Plum
Shimiza	Apricots
Blue grama	Sweet clover
Honey locust	Pears
Apples	Osage orange

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One valley or stream bed in Monument valley was found to be normal and with a tremendous amount of vegetation. Death in the family caused the exodus. It is customary for Indians to stay away three years, but in this case it has been five years and could be resettled. A suggestion for expansion.

Conclusion:

This valley could be made to produce twice its present volume under supervision and with additional land being placed under ditch.

By:

David A. Rogers,
Assistant Agronomist.

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16294

SUPPLEMENTARY AGRONOMY REPORT ON DANNEBROG AREA

Introduction

Since the main Agronomy Report prepared by David A. Rogers includes the greater part of the results of the Agronomy survey, only those things not dealt with in that report will be discussed in this supplementary report.

Present and Potential Land.

At present, the total area being farmed is 702 acres, divided as follows:

Corn	585 Acres
Alfalfa	89 Acres
Melons	15 Acres
Squash	10 Acres
Sorghum	3 Acres

Potential land to the extent of 218 acres exists under the present irrigation system. Of this, 108 acres will require considerable expense to subjugate. The remaining 107 acres is comparatively level.

Analysis of crop production shows that, of the 89 acres of alfalfa being grown, only three acres is grown below the proposed diversion site which is at the crossing east of the day school and about one and one-half miles below the present diversion. It is quite evident that alfalfa production is not equitably distributed over the project largely because clear water is not available for the lower end of the project at present. Alfalfa can not be grown successfully by the use of irrigation water carrying an appreciable amount of silt. Forty-four per cent of the potential land is below the lower proposed diversion while the area below this point is less than twenty per cent of the entire project, indicating that insufficient water is being supplied to the lower part of the project for proper agricultural development.

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Recommendations

1. Realignment of property lines on land now being farmed wherever necessary in order to properly subjugate land and establish an adequate system of laterals for proper distribution of water.

2. Re-subjugate present farm lands where necessary and subjugate potential land suitable for crop production as shown by soil survey, just using the land requiring the least amount of expense to subjugate.

3. Further outline alkali boundaries on areas shown by soil survey to contain harmful amounts of alkali. After boundaries are established, these areas should be used for pasture or hay with artificial re-seeding with suitable grasses.

4. Construction of a diversion on the main wash at a point below the present diversion about one and one-half miles in order to utilize the normal flow which is not now being used and to divert a greater amount of flood water for more adequate utilization of the land below that point and make possible an increase in alfalfa production.

5. Artificial re-seeding of range land in amounts comparable to the quantity of the adapted varieties of seed available, seeding to be done on contour strips covering not to exceed ten per cent of area to be seeded.

6. Make plantings of fruit trees on boundaries of agricultural land and near bare sandstone ledges where excessive run-off may be utilized.

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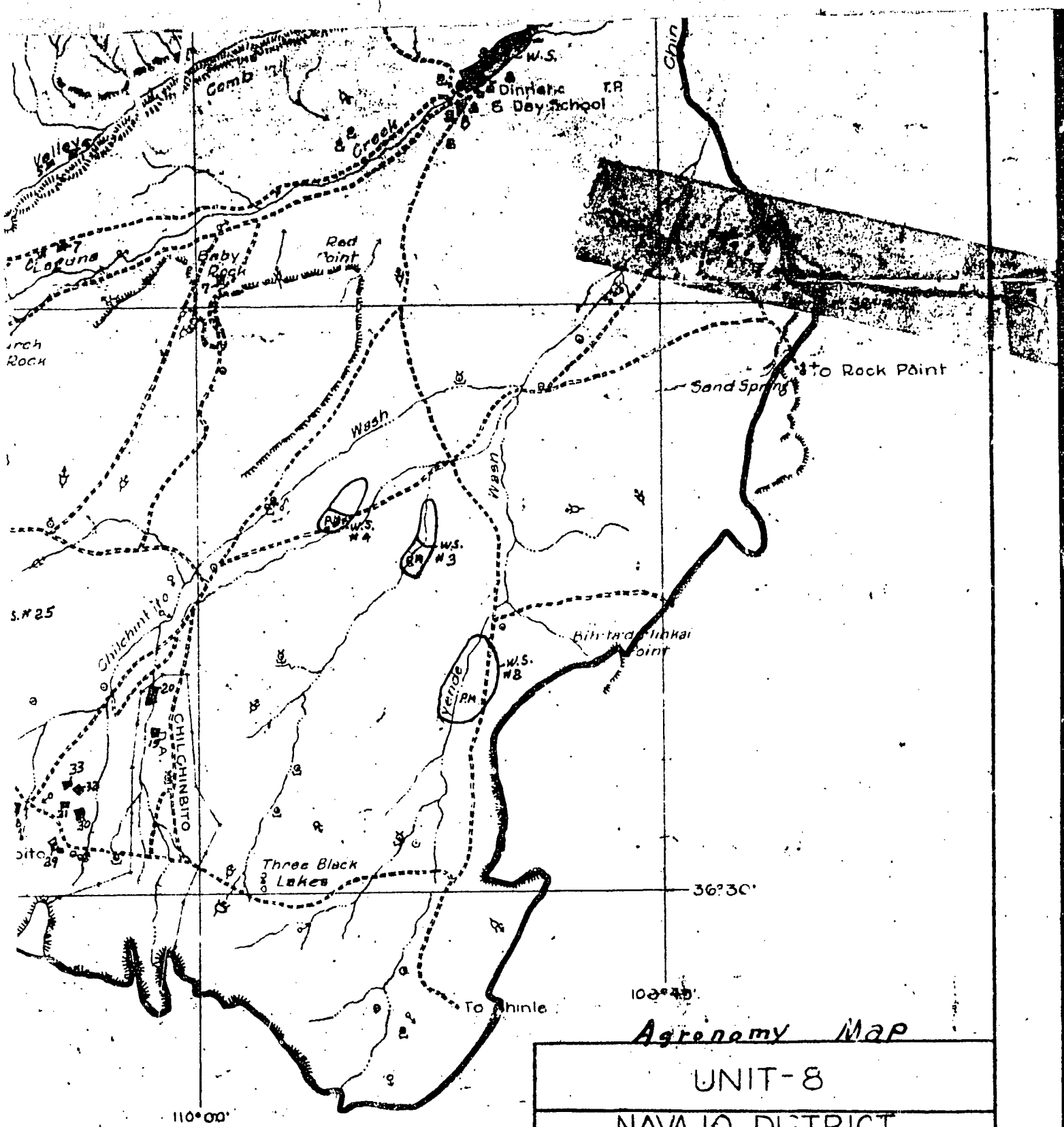

orage Tank

Present Farms

Potential

Revised 9-8-36

SCALE 1/4" = 1 MILE 0 1 2 3 4

Agronomy Map

UNIT-8

NAVAJO DISTRICT

DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
H.H. BENNETT DIRECTOR

REFERENCE			
SUBMITTED Keller		APPROVED J.L. Hayes	
COMPILED Range	TRACED J. Williams	CHECKED Anderson	DATE 8-27-36

R-445

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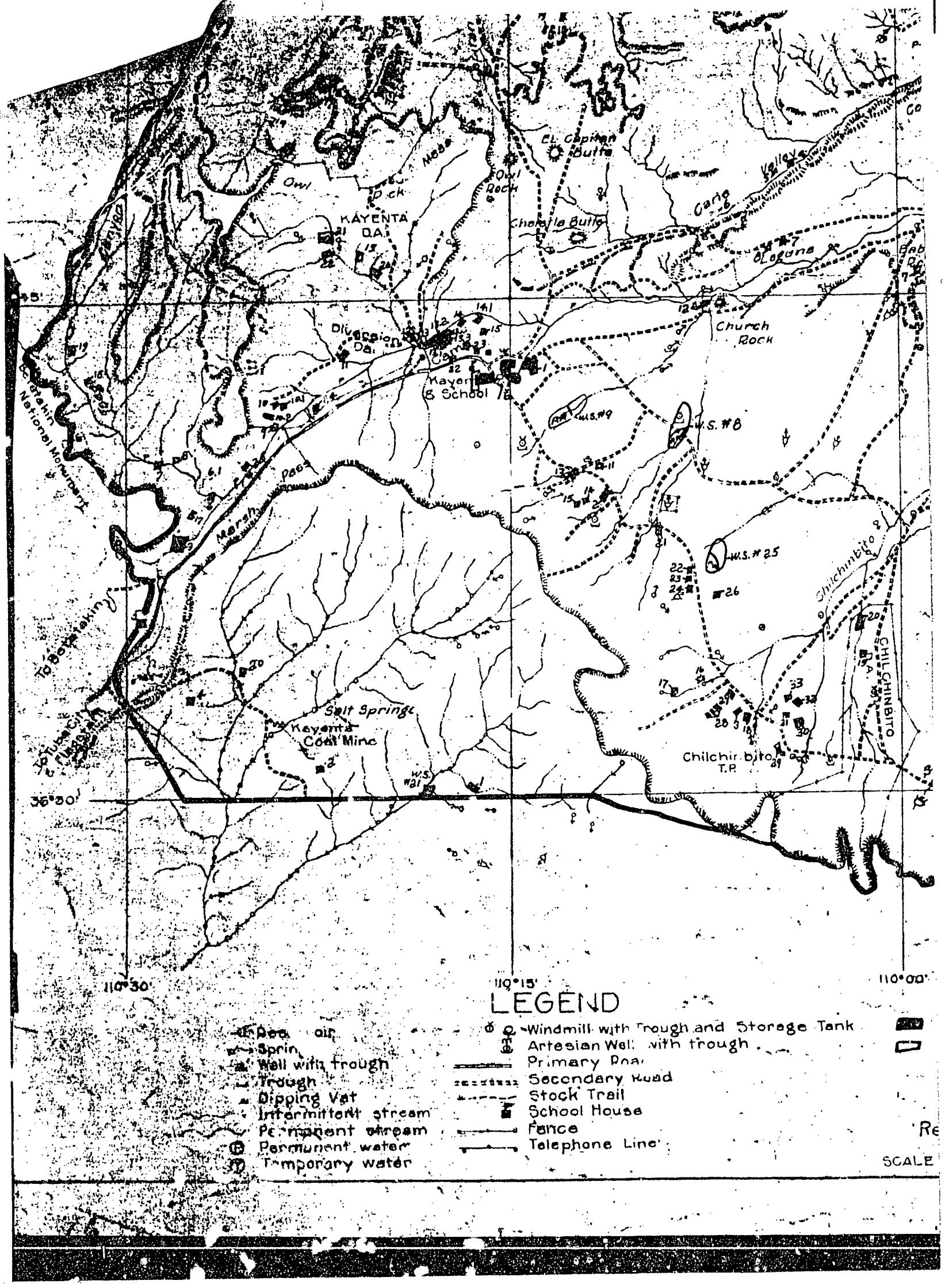
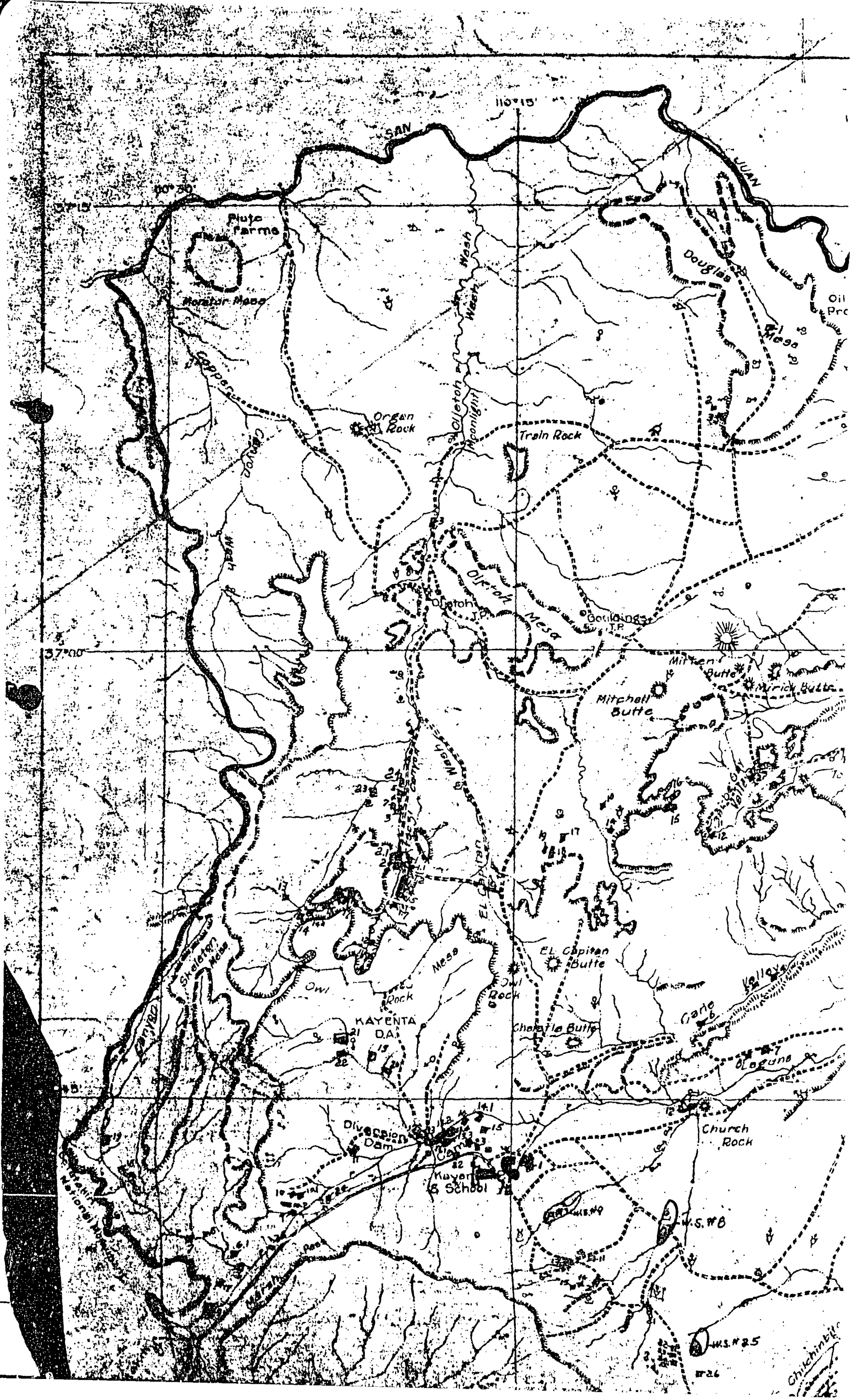
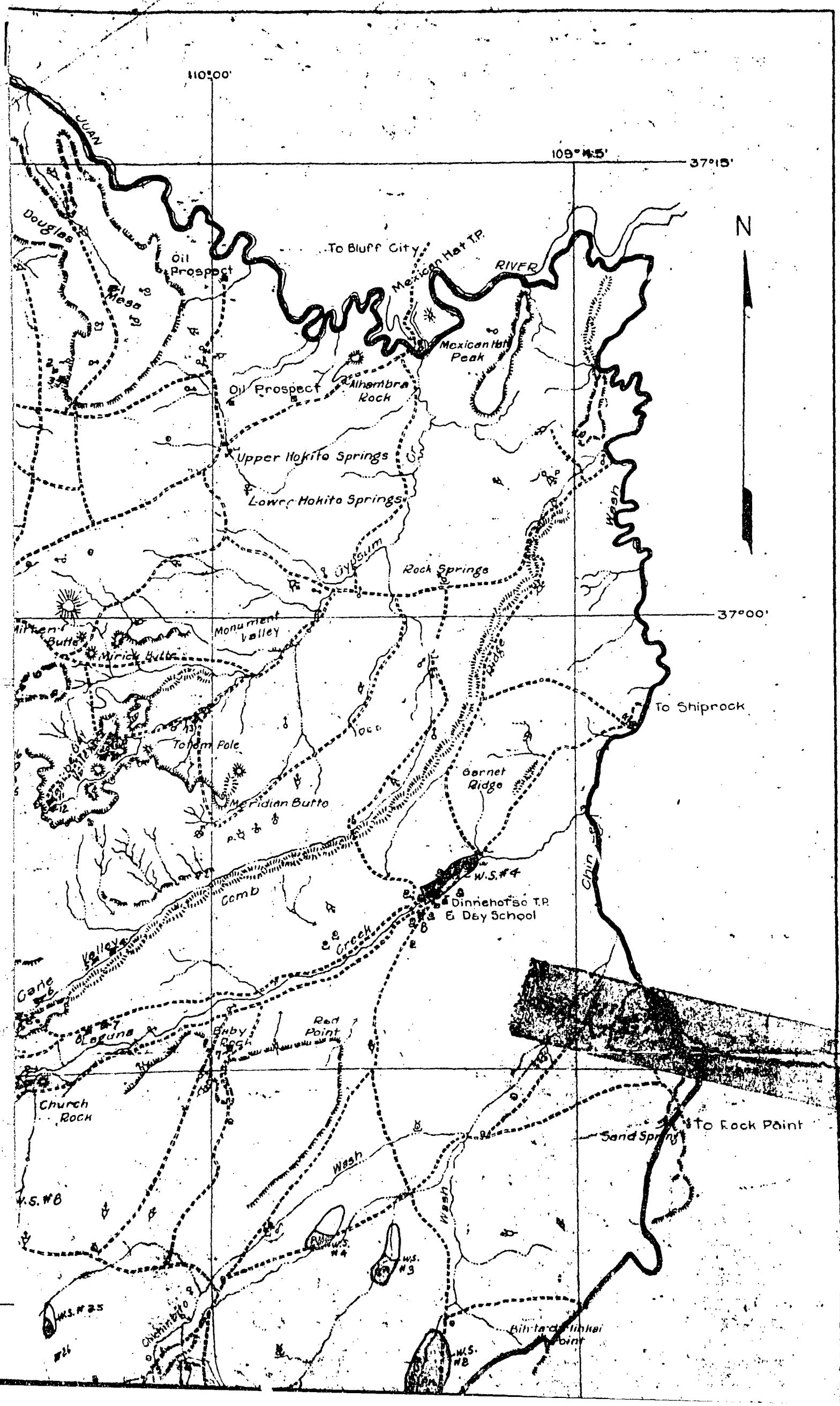


El Capitan Butte
Owl Rock
Owl Pick
Mesa
KAYENTA D.A.
Chalatla Butte
Canyon
Laguna
Church Rock
Diversion Dam
Kayenta School
W.S. #9
W.S. #8
W.S. #25
Marsh Pass
Chilchinbito
CHILCHINBITO
Salt Springs
Kayenta Coal Mine
Chilchinbito T.P.
To Betatakin
To Tuba City & Flagstaff
Betatakin National Monument
36°30'
110°30'
110°15'
110°00'
LEGEND
Reservoir
Spring
Well with trough
Trough
Dipping Vat
Intermittent stream
Permanent stream
Permanent water
Temporary water
Windmill with Trough and Storage Tank
Artesian Well with trough
Primary Road
Secondary Road
Stock Trail
School House
Fence
Telephone Line
SCALE


SAN
JUAN
110°15'
37°15'
37°00'
Pluto Farms
Mortar Mesa
Copper Canyon
Wash
Wash
Douglas
Mesa
Oil Pro
Organ Rock
Moonlight
Train Rock
Oljeto
Oljeto Mesa
Oljeto J.P.
Gooseneck J.P.
Mitten Butte
Merrick Butte
Mitchell Butte
Valley
Canyon
Wash
El Capitan
Skeleton Mesa
Canyon
Owl Rock
Mesa
Owl Rock
El Capitan Butte
KAYENTA D.A.
Chapelle Butte
Cane Valley
Lagune
Diversion Dam
Canal
Kayenta & School
Church Rock
U.S. #9
U.S. #8
U.S. #25
#26
Chilchinbito


110°00'
109°45'
37°15'
37°00'
N
JUAN
RIVER
Douglas
Mesa
Oil Prospect
To Bluff City
Mexican Hat T.P.
Mexican Hat Peak
Oil Prospect
Alhambra Rock
Upper Hokito Springs
Lower Hokito Springs
Gypsum
Rock Springs
Wash
Monument Valley
Mitten Butte
Merrick Butte
Totem Pole
Meridian Butte
Garnet Ridge
To Shiprock
Chin
W.S. #4
Dinnehotso T.P.
& Day School
Comb
Creek
Gane
Valley
Laguna
Baby Rock
Red Point
Church Rock
Sand Spring
To Rock Point
Wash
W.S. #8
W.S. #4
W.S. #3
W.S. #25
W.S. #8