LAND MANAGEMENT UNIT NO. 5

LAND MANAGEMENT SURVEY

Feb. 8 - Mar. 10, 1937

Agronomy Division

BOX
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Jr. Agronomist

WR 5882

LAND MANAGEMENT SURVEY
Unit No. 5
AGRONOMY DIVISION

Land Management Unit No. 5 occupies parts of Navajo and Coconino Counties in Arizona. The Unit lies between 35°0' and 36°0' parallels of latitude, and 110°30' and 111°30' meridians of longitude. The Navajo Reservation boundary extends along the south side of the Unit and along the west side from the southwest corner north to the Little Colorado.

There is not sufficient agricultural land in this Unit to meet the need of the people. It is also true that there is not sufficient potential land within the range of stock shifts. Therefore, it seems that some member from each family should be responsible for the farm land, and devote his time to farming. If this plan is carried out it will help solve the problem of livestock concentrations in the vicinity of farm land during the summer months.

At the present time there is only .58 of an acre of land being farmed per capita. This can be increased to five acres if all the available agricultural land is developed.

This Unit is one of the smallest on the Reservation, comprising only 811,820 acres.

T O P O G R A P H Y

Starting on the lowest side where the Little Colorado leaves the Unit the elevation is 4500 feet and gradually

increases as you go north until at Tolani Lakes the elevation reaches 4938 feet. Along the northern part of the Unit the elevation probably ranges from 5500 to 5800 feet. The variation in elevation is due to the many mesas which are present in this area.

G E O L O G Y

A brief summary of the geology of the Unit has been written by Tom Meeks and is quoted in full:

GEOLOGY OF LAND MANAGEMENT UNIT 5

Tom Meeks

In this unit the geology is represented by strata of Permian, Triassic and Jurassic age with some recent lava flows in the western margin. The Permian is represented by the Kaibab Limestone, the Triassic by the Moenkopi, Shinarump, and Chin Lee formations and the Jurassic by the Wingate, Navajo (?) and Morrison formations.

PERMIAN
Kaibab Limestone

The Kaibab Limestone takes in only the southwestern corner on the unit and is easily differentiated from the other formations since it is the only limestone of any consequence on the entire reservation. It offers a marked contrast to the dark chocolate colored Moenkopi formation which overlies it. The Kaibab consists almost entirely of limestone with numerous bands and nodules of chert. Sandstones are present

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locally. The Kaibab is usually thin bedded and jointed and south of Winslow and Holbrook it has a marked tendency to form sink holes. Wells drilled in this unit show the thickness to be from 200 to 250 feet thick.

TRIASSIC
Moenkopi Formation

The Moenkopi formation is confined to the area west of the Little Colorado south of Leupp but crosses the river just north of Leupp and continues northward to the vicinity of Black Point where its margin again crosses to the west side of the river. Its western margin is clearly defined by the white beds of the underlying Kaibab. The Moenkopi is composed of dark red to chocolate brown sandstones and shales with gypsum present locally. Ripple marks are quite common in the sandstones of the Moenkopi.

Shinerump Conglomerate

The Shinarump conglomerate occupies only a narrow strip between the Moenkopi and the Chin Lee formations north of Leupp but is present on top of many of the low mesas and buttes of the Moenkopi. In many places the Shinarump is entirely absent but its former presence is indicated by the pebbles left after its erosion. The Shinarump is usually a light brown, coarse grained sandstone with pebbles of silica and much petrified wood.

Chin Lee Formation

The Chin Lee forms a wide band which extends entirely

through the district east of the Little Colorado. It forms the first escarpment east of the river and continues to the dark red sandstone cliffs which occur near the northeastern margin of the unit. The Chin Lee is composed of four divisions, all of which are present on the unit. Division A, the upper is composed of dark red siltstones with some shales. Division B, which forms the escarpment is composed of alternating beds of cherty limestones and dark red shale. Division C is composed entirely of soft clays and marle which weather into badland forms. It is variegated in color with blues, grays, purple, and red being the dominant colors. Division D is composed of dark brown and red sandstone and shale which closely resembles the Moenkopi in some places. It weathers into low mesas and buttes caused by the resistant capping of sandstone.

JURASSIC

Wingate and Navajo Formations

The Wingate is a massive, cross bedded red sandstone which forms the cliffs on the northeast margin of the area. It is conformable with Division A of the Chin Lee. Its exposures are confined to the cliff face. It is not certain that the Navajo is present in this locality but if it is it would be extremely difficult to differentiate it from the Wingate.

Morrison Formation

The Morrison overlies the Navajo, Wingate on top of the

red cliffs and easily separated by its color. It is composed of a hard silicious sandstone near the margin but farther north it is a cross bedded, easily friable, fine grained sandstone with some shale lenses of red.

QUATERNARY LAVA FLOWS

The lava flows of the San Francisco field barely penetrate the unit from the west but they have had a marked effect on the channel of the Little Colorado River. At Grand Falls the flow from the west entered the channel of the river by a tributary wash and filled the channel and passed beyond. The stream expanded as a lake and eventually found its way around the flow. A similar blocking of the channel occurred at Black Falls and another flow is reported to have diverted the river south of Grand Falls."

C L I M A T E

There are no weather stations in this Unit, and in order to have something to use as a guide in making our estimations we located similar areas in respects to elevation and vegetation. The stations at Winslow, Tuba City and Keams Canyon are close enough to be used in estimating the amount of precipitation, the length of growing season and the average temperature.

The average precipitation for the Unit is 8 inches, probably varying from 7 inches in the western part of the Unit to 9 inches in the northeastern part of the Unit nearest Keams Canyon. (See Table I)

The average annual temperature is 53°.

The average growing season is about 150 to 155 days, from about May 15-20 to October 20. The temperature during the summer months is mild, averaging about 70°. Strong cold winds during the late winter and early spring cause most of the damage by wind erosion. The spring winds have a very direct effect on planting dates, and should have a very direct effect on farming methods.

The rainfall is of the thunder shower type, although occasional slow rains may be expected.

TABLE I

TABLE I

AVERAGE MONTHLY PRECIPITATION

STATION	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Avg.
Keams Canyon	1.31	.95	.90	.66	.38	.27	2.41	1.81	.70	1.25	.70	1.08	12.43
Winslow	.56	.40	.47	.46	.26	.36	1.62	1.72	.78	.52	.52	.93	8.60
Tuba City	.55	.54	.43	.53	.19	.34	.93	.84	.68	.78	.53	.58	6.92

These records were taken for 16 years at Keams Canyon, 22 years at Winslow, and 29 years at Tuba City.

AVERAGE ANNUAL TEMPERATURE, AND
AVERAGE GROWING SEASON

Station	Average Annual Temperature	Average Growing Season	Years Records Taken
Keams Canyon	50		16
Winslow	55	165	22
Tuba City	54.8	179	29
Unit No. 5	53	150-155	

The latest and earliest killing frost recorded at Winslow is June 2 and September 27.

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DRAINAGES

Of the five main drainages found in this Unit, the Little Colorado is the largest, and receives the run-off from the whole Unit. The Little Colorado runs in a northwest direction across the southwestern part of the Unit, forming part of the Unit boundary for three miles before leaving the Unit. The point where it leaves the Unit is 26 miles north of the southwest corner.

The Dennebito runs in a southwest direction almost parallel to the Unit boundary on the northwest side. The Dennebito empties into the Little Colorado about four miles below Grand Falls.

The Oraibi runs in a southwest direction after entering the Unit close to Shonto Springs for eleven miles before entering Tolani Lakes. The drainage from Tolani Lakes is either northwest to the Dinnebito or southeast to the Polacca.

The Polacca runs parallel to the Oraibi and the Dinnebito. Below the junction of the Polacca and the Jeddito the drainage is called Corn Creek Wash. The junction is eight miles above the Little Colorado.

The Jeddito enters the Unit on the east central side and runs for thirteen miles in a southwest direction before emptying into the Polacca.

ERCSION

Wind erosion is a serious problem on this Unit, not only doing considerable damage to farm land, but to the range

as well. There are no trees, with the exception of the cottonwoods stands along the Little Colorado, and very few high mesas to offer wind break protection.

Farming operations are usually postponed in the spring until after the windy season is over. On a majority of the farm land in this Unit wind erosion was classed as moderate to severe.

Only in a few scattered places is sheet or gully erosion doing any damage. In most places there is a deposition of material by the water and not a removal.

SOILS AND EROSION OF L. M. U. # 5
by
H. F. JOHNSON

The soils of Unit 5 are quite variable because of the wide range of geologic formations from which they have been derived. Residual soils occupy the smooth to undulating uplands of the southwestern part of the Unit and Mesa and Mesa Remenants of the central and northern portions. Wind is the predominating erosion factor upon these soils because sandy textures prevail. Erosion progresses from essentially none in the extreme southwestern portion of the Unit to severe in the northern portions.

The deep alluvial soils along the Little Colorado River and the valleys of the Jeddito, Polacca and Oraibi washes are small in area as compared to the residual soils but are the more important from the standpoint of agricultural adaptation. Sheet and wind erosion are both active on these soils and occasional gullies are present.

RESIDUAL SOILS

The soils of sub-unit 1 and 6, derived from basaltic cinder and lave and Kaibab limestone, are loose and permeable with a medium texture. Water is almost lacking because of the rapid penetration of water. Where 12 inches or more in depth these soils are rated among the better range soils on the Reservation.

The Moencopi Series found extensively in sub-units 1, 2, 5 and 6 and to the northeast of the soils previously mentioned is a soil easily recognized by its maroon color. Very severe erosion has resulted in a shallow intermittent soil cover that is slowly permeable and has a low water holding capacity. Natural geologic erosion is probably responsible in part for this condition. In any event it will be slow to respond to a range improvement program.

Small areas of Shavano soil types located on remenants of the Shinarump Conglomerate formation and associated with the Moencopi Series is permeable to water and is deep enough to effect a high water holding capacity. Erosion is slight to moderate on this series.

On the Uplands and Mesas in sub-units 3 and 4 are soils having a loose, sandy, highly permeable surface soil which is deep enough to have a moderate water holding capacity. However, these same characteristics render them exceedingly susceptible to wind erosion when the vegetative cover is depleted. Active wind cutting and drifting sands are found over a large part of the area. This soil is rated as "B" or "C" range land depending upon the severity of erosion.

ALLUVIAL SOILS

Along the valleys of the Jeddito, Polacca and Oraibi washes are located soils of the Ives and Tolani series. One is red and the other is gray. These soils are friable and range in texture from loamy sand to heavy clay. They are

generally low in alkali. Where the texture is suitable, they can be farmed with favorable results. Sheet and wind erosion are moderately active and occasional gullies are present. Little difficulty should be experienced with earth structures when due consideration is given to texture.

Broad expanses of the Winslow soils, situated on the second benches along the Little Colorado River and at the base of mesas, are too high in alkali and heavy in texture for agricultural purposes. They are adapted to the growing of shadscale and saccaton. These soils are reddish brown in color and slowly permeable. Erosion by wind and water has removed a large part of the surface soil. Many areas of this soil will warrant extreme care in earth construction work.

The river bottom soils known as the Gila series average a clay loam in texture and are generally permeable to water. Alkali is present in many areas in sufficient quantities to limit plant growth. Where this is not the case they are suited to growing most crops adapted to the region. They are subject to deposition of sand from the river bed by wind during dry seasons of the year and to deposition of silt by large floods.

VEGETATION

For all general purposes, the vegetation of Unit No. 5 can be classed into two major types, namely, Grassland and Browse.

Grasses

Blue Grama	Bouteloua gracilis
Black grama	Bouteloua eriopida
Gallata	Hilaria Jamesii
Alkali-saccaton	Sporobolus ariodes
Three awn	Aristida spp.

Shrubs

Chamise	Atriplex canescens
Shadscale	Atriplex confertifolia
Salt bush	Atriplex cuneata
Yellow bush	Crysothamnus greenii
Mormon tea	Ephedra spp.
Greasewood	Sarcobatus vermiculatus
Rayless goldenrod	Haplopappus heterophylus

Weeds

Russian thistle	Salsola pestifer
Loco	Astragalus spp.
Sunflower	Helianthus spp.

The vegetation over the whole Unit is in poor condition except in a few areas in the southwest corner and on some of the mesas. An exceptionally poor condition exists along the Little Colorado and along the valley floor of all the major drainages.

POPULATION

There are approximately 1,184 people grouped in 130 consumption groups resident in Unit No. 5. (See Table II) The population concentrations are in the southern part of Sub-unit #4, Tolani Lakes, and in Sub-Unit #6.

The inhabitants gain their livelihood from the raising of livestock, farming, wage work and weaving.

TABLE II ACRES OF FARM LAND AND POPULATION BY SUB-UNITS

Sub-Unit	Consumption Group & Population	Potential Land	Corn	Beans	Squash	Idle	Total
1 & 2	9 c. g. 87						
3	14 c. g. 108	50	44	1		35	80
4	70 c. g. 536	4500	278	2	20	122	422
5 & 6	37 c. g. 381	900	116	1	6	43	166
Total	130 c. g. 1184	5450	438	4	26	200	668

There are 668 acres of land being farmed in this Unit, or .08% of the total 811,870 acres.

AGRICULTURAL PLANTS USED

Corn is the principal crop grown in this unit, representing 65% of the land now under cultivation:

Corn 65%
Melons & squash . 4%
Beans 1%
Idle 30%

There are numerous small areas along the main drainages that are farmed during favorable years. These areas are not

fenced and are only temporary. For instance, the Indian plants corn on the sand bars along the Little Colorado and takes chances with the floods, drought, and the wind. Chances are the crop will never reach maturity. However, if it does it is almost all profit as it requires very little work besides the planting process. For several years previous to the time this survey was made the precipitation was low and these submarginal temporary farms were not planted, and that accounts for so much idle land during the summer of 1936.

A L K A L I

There are traces of alkali found over a large part of the Unit but not in sufficient concentrations to be harmful to agricultural plants except along the Little Colorado, and the Dinnebito.

High concentration of alkali salts are found in many places along the Little Colorado, and the Dinnebito. Some black alkali was found along the Dinnebito at farm #7, Quad 17.

No farm improvement nor intensive vegetative work should be carried out in these doubtful areas until a complete study of the alkali situation has been made.

FARM PRACTICES

Farming practices vary considerably from one part of the Unit to the other. At Tolani Lakes, for instance, you can see

a gradual adjustment taking place. Conditions are such at Tolani Lakes that an intensive type of farming is possible and will pay. No doubt the Indians will gradually adopt methods suited to intensive farming as soon as they see the advantages demonstrated.

Corn is usually planted by hand directly behind the plow, when the plow is not used the seed is placed in the ground with a stick or hoe. Farms that are located on the light soils such as sandy loam, loamy sand, or sand, blow very easily, and plowing this type of soil with a plow leaves the surface smooth which results in increasing the severity of wind erosion. On most of the farms of this type the present planting methods cannot be criticised unless we can change the factors responsible for the conditions we find at present.

The hoe and horse drawn blade are used for weeding and cultivation.

All the crops grown are harvested by hand. Corn is dried out in the sun, shelled, sacked and stored in under-ground bins or sold to the trader. The acreage planted to beans by each Indian is usually small so the harvesting of beans is no problem.

Fall plowing is not practiced. Livestock are usually allowed to graze on the farms as soon as the grain is removed. The range is usually poor in the vicinity of farm land and this results in the concentration of livestock on the farms from the time the grain is harvested until the fieldhas been

completely denuded of any signs of vegetation. The trampling of the soil by the livestock and the complete removal of the stalks leaves the soil unprotected and subject to severe wind erosion.

DISEASES AND PESTS

No diseases of agricultural crops were reported in this Unit.

Cut worms, grasshoppers, and army worms are not seriously damaging farm crops.

Rats, prairie dogs and squirrels are present in this Unit. Although they are apparently not seriously damaging crops, a close check should be made each year in the concentrated areas in order to avoid any serious outbreaks of rats and squirrels.

AGRICULTURAL LAND CLASSIFICATION

There are at present ~~688~~ 668 acres of farm land in this Unit, and by the diversion and economical use of flood water an additional 5450 acres can be put under cultivation, making a total of 6118 acres of agricultural land that has been found in this Unit.

There is no irrigated land in this Unit at the present time. The farm land found was classed as flood irrigated or rainfall (dry). (See Table III)

1. Irrigated land is land that has permanent water available.

2. Flood irrigated land is that land that is being irrigated from intermittent streams.

3. Rainfall farms are those farms that depend upon direct rainfall for moisture.

TABLE III CLASSIFICATION OF AGRICULTURAL LAND

Class	Present Farm Land	Potential Land	Total
Flood Irrigated	637	5450	6087
Rainfall (Dry)	31	___	31
Total	668	5450	6118

METHOD OF LOCATION

The farms in this Unit were given the same number on this survey they were given by the Agricultural Survey which was conducted during the summer of 1935. The Water Spreading projects were given the next consecutive numbers, and any new farms that were located were numbered consecutively from where the Water Spreading survey stopped. If there were 100 farms numbered on a mosaic and five water spreading projects, any new farms we found would be numbered consecutively starting with number 106. All members of the survey group helped locate farms which were not previously surveyed by the various parties who worked this Unit.

Present farm land is represented on the map by green color; potential land, yellow; water spreading, cross hatch; meadow land, orange.

Y I E L D S

No actual measurements of crop production were made in this Unit. All yields given are ocular estimates from conditions as we saw them in the field, and should not be used as definite material.

TABLE IV CROP YIELDS

Crop	Present Avg. Production	Expected Avg. Production
Corn	18 bu.	25 bu.
Beans	200 #	400 #
Melons & Squash	1500 #	2000 #
Alfalfa		6000 #
Potatoes		6000 #
Wheat		20-25 bu.

Increased yields can be accomplished by:

1. Subjugation of present farm land.

2. Efficient use of water.

3. Field selection of seed, and the planting of adaptable varieties.

4. The introducing and correct use of simple farm machinery.

5. Crop rotation.

6. Stop cropping where wind erosion is serious.

7. Fall plowing

a. Reduce damage being done by cutworms

b. Render soil permeable

8. Improvement in seed bed preparation, and cultivation practices.

SUGGESTED CROPS

Agricultural crops that can be grown in this Unit are corn, beans, melons, squash, pumpkins, oats, potatoes, sudan grass, grain sorghums, rye, barley, wheat, various fruits and vegetables.

Due to the long growing season and the availability of flood water during the fall and spring, a wide variation of crops can be grown.

For suggested crops that can be grown on each farm see Agronomy Survey notes.

AGRICULTURAL CONCENTRATIONS

It was the aim of this Land Management party to locate sufficient potential land within the range of livestock shifts to satisfy the demands of the people, however, we soon found that this was impossible, so we did the next best thing we could do, locate land wherever it is possible without considering the distribution of the people.

There are two agricultural concentrations in this Unit, one at Leupp and the other at Tolani Lakes. These two areas are vitally important as they are the only two places in the

Unit where there is a possibility of agricultural expansion sufficient to meet the needs of the people.

TOLANI LAKES

There has been several detailed surveys made of the Tolani Lakes area by the different departments of the SCS. Therefore, it was not necessary for us to make a survey of the area in order to obtain sufficient information to make our Land Management plans.

The following information was obtained from the different reports made on this area and it is in more detail than could have been presented by the Land Management Survey.

The Tolani Lakes project is located twelve miles north and five miles east of the Leupp Agency, comprising 194 acres of cultivated land and 4300 acres of land over which water can be spread from the Oraibi. The eastern portion of this area can be flooded from the Polacca if it is ever deemed necessary. There were about forty people who planted and harvested their crop in this area during the summer of 1936.

Topography:

Most of the area is a broad alluvial flat, which slopes gently toward the south and the southeast. The extreme southwast portion of the area slopes toward the west. In general the topography of the alluvial soil is level, although in the eastern portion of the area hummocks ranging in height from a few inches to about seven feet, have accumulated as a result

of wind action. The residual soils occurring in the west central and southern portion are characterized by a rolling topography. Most of the rock outcrop of Chin Lee formation is located in the west central portion.

The elevation of the area is about 4938 feet, taken at the long protective dike.

Soil:

The soils of this area fall into two main classes: Those derived directly from the local geological formation and those transported by water action and deposited at some distance from their source of origin.

Most of the alluvial soils mapped on this area are adapted to irrigation purposes and can be recommended for either good grass or farm land, depending upon position, texture and availability of water. The soils on the whole are light textured, sands or sandy loam, alternating with layers of light clay, with sand predominating in the profile. The surface soil is grayish-brown with a yellowish-brown or brown subsoil. In the southern portion of the area the soil profile is predominately clay or clay loam. These soils have been deposited mostly by water from the Oraibi.

The residual soils, derived from Chinlee formations, occur on approximately 20% of the area mapped. They occupy a rolling to steep topography with a shallow to moderately deep profile, varying from two to 40 inches in depth. The soil is

predominately a sand or sandy loam surface with a compact sandy clay loam subsoil. Over a large p rtion of the area gravel fragments are present in the entire profile. Most of the soils have a reddish-purple or reddish-yellow color. These soils are not recommended for irrigation.

Alkali:

Surface indications and laboratory determinations show that alkali is not serious, except in a few local places. The heavier textured soils have a higher alkali concentration than those of loose texture. White alkali occurs throughout the whole area, while black alkali is confined mostly to the residual and red sub-soil types.

Water:

Run-off figures have been obtained at Moencopi fo. he past eight years (1927 to 1934) and by the comparison of the two water sheds the figures were changed to equal the annual expectancy at Tolani Lakes.

October	350	Acre Feet
November	133	" "
December	106	" "
January	115	" "
February	237	" "
March	63	" "
April	29	" "
May	34	" "
June	67	" "
July	1153	" "
August	2561	" "
September	869	" "
Total	5717	" "

During the months of October to June, inclusive, an average of 800 acre feet can be expected during the dryer years.

The silt being carried down by the Oraibi wash and deposited in the Tolani Lakes area presents a difficult problem. The engineer estimates that 100,000 acre feet of ~~water~~ silt will be brought down by the Oraibi within the next twenty years. The study group feels that before complete subjugation of the land at Tolani Lakes takes place some means of reducing the silt deposition in the area should be carried out. The present plan is to spread the water several miles above the area, partially desilting it on its way down, so we will not have the heavy deposition of silt in the area that there is at the present time.

It is expected that by spreading the water above the Tolani Lakes area the flow of the semi-perennial stream will be increased. If the semi-perennial stream does increase it will show that there is a movement of water through the soil, and if this is true there may be an increase in the alkali content of the water. The increase will probably not be large enough to cause any alarm.

The analysis of the semi-perennial flow shows 3430 parts per million, which is rated as fair for irrigation purposes. (Sample taken summer of 1935.)

Calcium ppm	136
Mg.	44
Na. ppm	716
Co_3 ppm	0
HC_3 ppm	115
Cl ppm	105
SO_4 ppm	2000

A water table study was made of this area during October and November, 1935, by Wesley Kennedy. A few paragraphs are quoted in order to give the reader an idea of the water table as it was found in 1935.

According to this report there is no water table at twenty feet, where the present and potential farm land is now located. It is expected that the irrigation of the present and potential farm land and the spreading of the flood waters of the Oraibi will no doubt affect the present water table.

WATER TABLE STUDY
by
Wesley Kennedy
Sep. 15 - Dec. 5,1935

In this study the water table is defined as the upper surface of a zone of saturation.

The water table is not level due to variations of strata in the subsoil, variations in topography and relative elevation of the sources and outlets of the ground water. It was encountered within twenty feet of the surface of the flat at the base of the rocky slopes along the southwestern boundary. The moist area is east of this while the very dry holes occupy the east-central portion of the area.

The movement of water in heavy clays, heavy sandy clays, and heavy silty clays is very slow. A hole bored to the water table in soils of this nature will take a considerably longer time to fill to the ground level than will holes in more permeable soils. Therefore, the water table was determined most accurately in those areas containing strata of free draining material such as loams. Several holes in the moist area were checked two or three days after they were drilled but no water was found. In most cases these test holes had penetrated thick beds of plastic clay and muck.

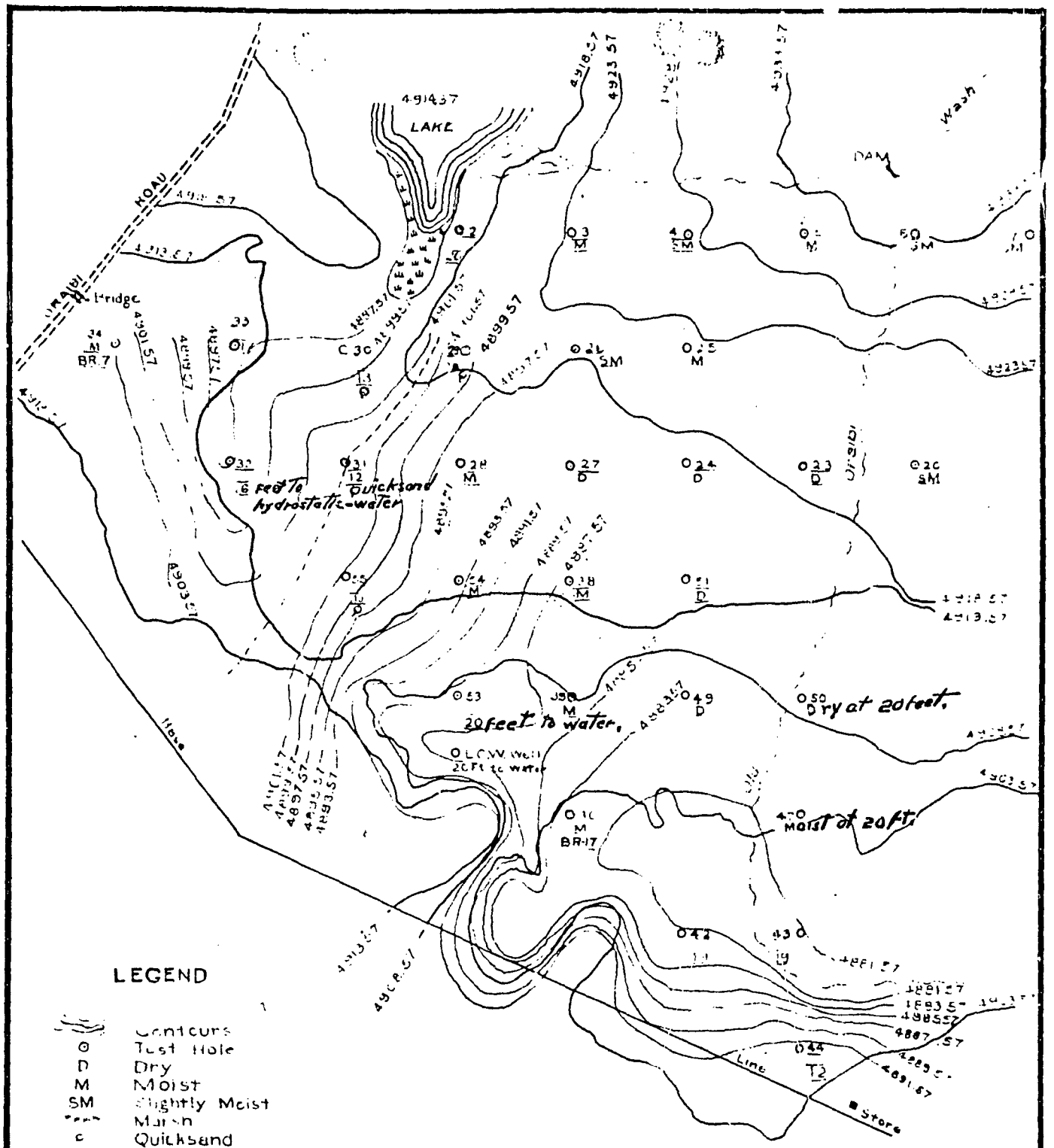
The soils of the area under consideration are heterogeneous. They range in texture from loamy sands to heavy clays. The flat, in which the water table was encountered within

twenty feet, is a shallow trough sloping gently to the southeast. To understand the ground water flow better, a contour map was made of the surface of the water table. Surface contours were also drawn so that a comparison of surface and water table contours at intersections could be made to determine the relative depth of the water table at that point.

The dotted line from test hole 29 through 31 and on to the base of the rocky slopes shows the probable high point in the water table at the time of the survey. It is probable that an underground saddle of Chin Lee material joins the opposing rocky slopes causing this high point. The underground flow from these slopes splits on the saddle, the majority of it flowing southeast toward the old Oraibi wash, while a small amount flows north. At test hole 34, the Chin Lee formation was found at a depth of seven feet, its damming action probably causing the water table found at numbers 30, 31, 32 and 33. The high concentration of salts found at 33 indicated lack of water movement in this area.

Another underground flow of water drains the northeastern areas towards the southwest, probably splitting on the saddle at the south end of the lake. There is also evidence of an underground flow from the rocky slopes along the southwest boundary as indicated by the sloping water table and low salt concentration of the water from the ECW well and test holes 44, 43 and 42.

The very dry area shown on the chart is covered with hummocks one to six feet in height of wind origin. The soil varies in texture but is predominantly a clay loam. Considerable trouble was experienced in boring the holes within this area because of the extreme dryness of the soil. Water penetration in the compact subsoil was observed to be less than one inch per hour.



LEGEND

	Contours
⊙	Test Hole
D	Dry
M	Moist
SM	Slightly Moist
	Marsh
C	Quicksand
BR	Bedrock
	Wash
	High Point in Water Table
044	No of Test Hole
D	Moisture Designation
12	Depth to Water Table

Difference Between Surface and Water Table Contours at Intersections = The Relative Water Table at that Point.

Scale: 1½" = 1 Mile

WATER TABLE STUDY
TOLANI LAKES AREA
NAVAJO DISTRICT

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

REFERENCE: FIELD SURVEY

SUBMITTED:		APPROVED:	
COMPILED: KENNEDY L.R. RICH	TRACED: Bright	CHECKED: W.L.E.	DATE: 4-20-36

L-338

WR 5911

Crops:

During the summer of 1936 there was 177 acres of corn, 15 acres of melons, 1 acre of beans, and 1 acre of squash grown at Tolani Lakes. These crops are no indication of the variety of plants that can be grown, if water is made available for irrigation.

Suggested crops are as follows:

Corn	Alfalfa	Beans
Wheat	Sudangrass	Melons
Oats	Field peas	Squash
Rye		Potatoes
Grain sorghums		Vegetables

The crop yields that can be expected are about the same as those listed on page 19 of this report.

Treatment of the land:

The following information was taken from Mr. David A. Rogers report on the AGRONOMIC PLAN FOR THE TOLANI LAKE AGRICULTURAL DEVELOPMENT.

The land to be used for irrigation purposes must be cleared and leveled with the slope, in preparation for the erection of contour borders at 32-feet intervals. (The lands 32 feet wide, the borders three feet wide).

Taken as a whole, the subjugation will be divided into 390 feet strips against the lay of the land. Seventy-five feet of which will be used for an efficient wind break composed of five rows of trees of varying sizes and characteristics of growth. The remaining 315 feet will be agricultural

land being bordered at 32-foot intervals for cropping. The over all width of one border and one land will be 35 feet.

Because of the probable tremendous amount of silt carried by the water in spite of desilting operations, the alfalfa fields should be located adjacent to the water distribution point in order to take advantage of the clear water. The silt laden water can be used on the row crops and tree plantations.

L E U P P

The agricultural concentration located north and east of Leupp, just outside of the protective dike, consists of 123 acres of farm land and about 800 acres of agricultural land.

This area is subject to floods from Corn Creek Wash, and complete subjugation of the land is not recommended.

The topography of the area is almost level, being on about the same grade as the Little Colorado. There are a few scattered hummocks in this area probably averaging about twelve inches in height.

The soil in this area is a sandy loam underlain at a depth of two to five feet by a lense of light clay underlain by lighter lenses. In addition to the 800 acres of "A" land there is about 600 acres of soil that ranges from a Gila sandy loam to light clay. There is some evidence of alkali concentration in spots.

Corn is the principal crop grown at the present time, with a small acreage planted to beans, squash, and melons.

The suggested crops are corn, beans, melons, squash, sudan-grass and grain sorghums. After it has been demonstrated that the wind erosion can be controlled in this area by wind-breaks and strip-cropping, winter wheat and alfalfa could possibly be grown if there is sufficient water.

Since any work we can do in this area will be temporary, as it is subject to floods, the complete subjugation of the land is not recommended.

Wind-breaks should be planted in this area, and farming methods should be practiced that will reduce the seriousness of wind erosion as much as possible. If trees are given a few years to grow before one of the major floods comes down, it is felt that they will be able to stand the flood without being damaged to any great extent.

There are one hundred acres of potential land four miles below Leupp on the north bank of the Little Colordao, which can be irrigated from the river. For details concerning this area see agronomy survey notes, It is also true that there are some extensive areas of agricultural land within a short distance of the Little Colorado that are not feasible to subjugate at the present time. However, as the need for more land is demonstrated and the Indians become better farmers, it may be possible to bring these areas under cultivation. (See Reconnissance Soils Map prepared by the Soils Department.)

There is also an area on the Jeddito (No. 10) where about one hundred acres of agricultural land may be subjugated if

after erosion control work has been completed, further surveys show there is sufficient water present, and there is no danger of further erosion.

The area west of the Dinnebito (No. 7) was rendered impossible to flood last fall when the spillway on the Dinnebito was completely washed out. The engineer claims that a diversion dam will cost several thousand dollars more than we could feasibly spend at this point where the agricultural land is limited. There is black alkali present in the area; however, it is believed that it would not have been a serious problem had the project continued.

COST OF FARM DEVELOPMENT

The total cost of agricultural development involving bordering, leveling, clearing, or a combination of all these is $40,615. All work recommended was on present and potential flood-irrigated land.

The cost of development on potential land, 2000 acres of which is at Tolani Lakes, is $36,250. The cost of developing the present farm land is $4,365.

TABLE V COST OF AGRICULTURAL DEVELOPMENT

Class	Acres	Avg. Cost Per Acre	Total
Present flood-irrigated land	317	$13.76	4,365
Potential flood-irrigated land	2950	12.30	36,250
Total	3,267		$40,615

TABLE VI CALCULATING COST OF SUBJUGATION

Slope	Leveling Only	Leveling and Bordering Flood
Less than 1%	0 to 6	8 to 12
1%	6 to 10	14 to 20
2%		20 to 30
3%		30 to 45
4%		40 to 60
5%		50 to 75

1. BASIS INFORMATION.

A. General Description:

1. Location:

a. Land Management Unit No. 5 is located in southwest corner of the Navajo Reservation.

2. Area:

a. There are 811,870 acres in the Unit

3. Vegetation:

a. Grassland

b. Browse

4. Soil:

a. Deep alluvial soils along the Little Colorado and the Valleys of the Jeddito, Polacca, and Oraibi Washes.

b. Residual:

1. Shallow porous soils

2. Shallow heavy soils

3. Permeable surface soil with heavy subsoil.

5. Drainages:

a. Dinnebito

b. Oraibi

c. Polacca

d. Jeddito

e. Little Colorado

6. Topography:

a. Smooth, gently sloping to rolling country

b. Little Colorado flood plain

c. Scattered mesa escarpments.

B. Present Farm Land:

1. Location:

a. Tolani Lakes, Leupp, and a few scattered farms

2. Acres:

a. Present

(1) 668 acres
(2) .56 acres per capita

b. Potential

(1) 5450 acres

3. Crops:

a. Present

(1) Corn, beans, melons, squash

4. Yields:

a. Corn yields are above the average for the Reservation, due to the good yields at Tolani Lakes.

II. Plans and Recommendations:

A. Crop improvement:

1. Seed selection

2. Increase adaptable varieties of crops grown

c. Topography:

a. Smooth, gently sloping to rolling country

b. Little Colorado flood plain

c. Scattered lava escarpments.

d. Present farm land:

1. Location:

a. Tolani Lake, Leupp, and a few scattered farms

2. Acres:

a. Present

(1) Dry farm

(2) Irrigated [illegible]

b. Possible

(1) Dry farm

3. Crops:

a. Present

(1) Corn, beans, melons, squash

4. Yields:

a. Corn yields are above the average for the Reservation, due to the good yields at Tolani Lake.

II. Plans and Recommendations:

a. Crop improvement:

1. Seed selection

2. Increase adaptable varieties of crops grown

C. Improved Farming Methods:

1. The use of simple farm machinery
2. Contour listing and strip cropping
3. Crop rotation
4. Fall plowing
   a. Reduce cut worms
   b. Moisture retention and percolation
   c. Erosion control
5. Improved seed or preparation and cultivation practice
6. The proper storage of seed.

APPROVED:

J. D. Woods
Chief Agronomist

SUBMITTED:

Ernest A. Nicholson
Jr. Agronomist

WR 5919

FACTORS FOR DETERMINING GRADE OF AGRICULTURAL LAND

In determining the grades of various types of land the following factors were considered.

1. Type of Soil
2. Alkali
3. Slope
4. Amount of water and expediency of handling

I. TYPE OF SOIL:

Types 2, 3, 4, and 5 will be considered as adapted to "flood", "irrigated" and "potential" lands when slopes do not exceed 5%; when slopes require little or no leveling; when erosion is not severe, and when the kind and amount of alkali is within limits given in the discussion of that subject. Type 6 and the lighter phases of type 7 will be considered tillable land for the above classes only when slopes do not exceed 3%. The heavier phases of type 7 will be considered as adapted only for the flooding of native grass and brush land and then only on slopes not exceeding 2%. Types 1, 8, and 9 are not tillable and must not be included in any tillable area or flooded grass land.

2. ALKALI:

No alkali will be allowed on any Class A & B flooded or irrigated land. This means that the maximum amount of alkali

in the soil within the reach of plant roots will not exceed .20 of 1% of white alkali.

Under Class C, a white alkali soil content, not exceeding .30 of 1%, would be permissable only when soil, water and slope conditions would indicate a possibility of flooding to maintain growths of grass-brush for grazing. Any amount of alkali exceeding .30 of 1% automatically excludes the land from Classes A, B, and C. Non-irrigated areas which, when brought under irrigation, might tend to develop alkaline conditions, will be excluded from all classes. The Soil Expert will pass on such areas. The presence of black alkali automatically excludes soil from any agricultural class, or any land to be flooded for producing grass for grazing.

3. SLOPE:

Slopes must be uniform, or require but little or no smoothing or leveling, for Classes A and B and must not exceed 5% for soil types 2, 3, 4, and 5. For types 6 and 7, surfaces must be smooth and not exceed 3%. In locating where it may be feasible to flood areas of brush or grass land, the slope on types 2, 3, 4 and 5 will not exceed 3%, and not more than 2% on types 6 and 7.

The above maximum slopes apply to Class C, with the exception that under this class considerable smoothing or land leveling will be necessary.

4. AMOUNT OF WATER AND EXPEDIENCY OF HANDLING:

1. Estimate drainage area from map

A. General slope of area (steep, moderate steep)

B. Density and type of cover or bare rock.

2. Observe gully and determine if it is eroding or non-eroding. Note width and depth of gully.

3. Soil type.

Refer all matters doubtful of water use and control to engineers.

FLOOD IRRIGATION:

A. Grade:

1. Will not be confined to soil type 2, 3, 4 and 5 (recon. leg.)

2. Will not contain any alkali at any time

3. Water must be available for satisfactory growing of tilled crops.

(Note all area where water shed area is large in proportion to cultivated area, for engineering survey).

4. Must not have over 5% slope for soil types 2, 3, 4 and 5

B. Grade:

1. Will be confined to soil type 2, 3, 4, 5, 6 and 7 (Recon. leg.)

2. No alkali will be tolerated in this class

3. Adequate water available under average conditions

4. Slope not over 5%.

C. Grade

Not recommended for agricultural purposes

1. Slope too steep or irregular considering type of soil and alkali conditions
2. Presence of over .3% alkali
3. Excessive erosion conditions
4. Lack of available water
5. Deficient drainage

IRRIGATED LAND:

Existing Projects:

A - Grade

1. Will be confined to soil type 2, 3, 4 and 5.
2. Must have adequate water supply for growing any crop.

B - Grade

1. Will be confined to soil types 2, 3, 4, 5, 6 and the lighter type soil in 7.
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 .3% alkali
3. Excessive erosion
4. Lack of available water
5. Deficient drainage

Note: The amount of white alkali will not exceed .20% of any irrigable land. Any amount of black alkali automatically excludes any land from project. Types 1, 8 and 9 will be considered as non-irrigable land.

DRY FARMING:

A - Grade

1. Will be confined to soil types 2, 3 and 4 when the slope does not exceed 5% and up to types 5 and 6 when the slope does not exceed 5%
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.

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

Proposed Areas: (Under consideration at present)

A - Grade

1. Will be confined to soil types 2, 3, 4, and 5 when slope does not exceed 5%, and up to types 6 and lighter phases of 7 when slope is not more than 3%

2. Must have adequate water supply

3. Must be easily put under ditch

4. No leveling allowed for this class.

B - Grade

1. Will be confined to types 6 and heavier phases of type 7

2. An uncertain water supply would justify placing types 2, 3, 4 and 5 in this grade.

3. A slight amount of leveling is permissable.

C - Grade

Not recommended for agricultural purpose

1. Slope too steep or irregular

2. Presence of over .3% alkali

3. Excessive erosion

4. Lack of available water

5. Deficient drainage

POTENTIAL LAND:

Grade A and B

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

Grade C

1. Will include any soil types 5, 6 and 7
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%.

LAND MANAGEMENT STUDY

AGRONOMY DIVISION ((DIST. 17 DIST. 5

Tract No.	1	2	3
Owner	Everet McCabe 16281 Gabrial Artnah		Tohaniah Haske
Topography	1%	1%	.5%
Soil	LS	LS	CL & SL
Alkali	NO		NO
Erosion	SEVERE WIND	SEVERE WIND	MOD. GULLY
Water	LOW	LOW	LOW
Expansion	NO	NO	NO
Present Crops	CORN - 2	IDLE - 8	CORN - 8
Suggested Crops	CORN		CORN
Yield	5 BU. - POOR		CORN - 10 BU.
Treatment	ABANDON	ABANDON	CONTOUR LIST WILL NOT JUSTIFY ANY WORK
Cost Per. Acre			
Class A			
Class B			8
Class C	2	8	
Class G			
Remarks	VERY LITTLE RUNOFF	VERY LITTLE RUNOFF	FLOOD IRRIGATED. HEADS ARE CUTTING BACK FROM THE MAI WASH, RENDERING THIS FARM WORTH-LESS.

WR 5927

LAND MANAGEMENT STUDY

AGRONOMY DIVISION QUAD. 16 DIST. 5

Tract No.	14	15	
Owner	ASHIHI TSOSJE	16396 BELER BODA SADI BEGER	
Topography	1% EVEN	1.5% EVEN	
Soil	SL	SAND	
Alkali	NO	NO	
Erosion	MOD. WIND	MOD. WIND	
Water	LOW	LOW	
Expansion	NO	NO	
Present Crops	CORN - 8	IDLE - 3	
Suggested Crops	CORN, BEANS AND SORGHUMS	CORN	
Yield	CORN - 12 BU.		
Treatment	CONTOUR LIST STRIP CROP	CONTOUR LIST	
Cost Per. Acre			
Class A	8	3	
Class B			
Class C			
Class G			
Remarks	FLOOD IRRIGATED WHEN TANK OVERFLOWS	FLOOD IRRIGATED. HAS BEEN ABANDONED FOR SEVERAL YEARS	

WR 5928

LAND MANAGEMENT STUDY

ACADEMY DIVISION QUAD. 17 DIST. 5

Tract No.	5	6	7
Owner		DINEH TSO 16268	SEE BACK OF PAGE
Topography	.5% EVEN	.5% EVEN	1%
Soil	SL	SL & LS	SL CLAY / CL CLAY
Alkali	NO	NO	NO
Erosion	MOD. WIND	MOD. WIND.	MOD. WIND
Water	SUFFICIENT	DOUBTFUL	LOW
Expansion	NO	NO	NO
Present Crops	IDLE - 15 CORN - 5	CORN - 15	MELONS - 2 BEANS - 1 CORN - 37
Suggested Crops	CORN, BEANS, MELONS WINTER WHEAT	CORN GRAIN SORGHUM	CORN, BEANS MELONS, SORGHUMS
Yield	CORN - 15 BU.	CORN - 8 BU.	CORN - 15 BU.
Treatment	STRIP CROP PLANT WIND*BREAKS	STRIP CROP CONTOUR LISTER PLANT	THIS AREA WILL PROBABLY BE ABANDONED
Cost Per. Acre			
Class A	20	15	40
Class B			
Class C			
Class G			
Remarks	FLOOD IRRIGATED. BY BUILDING A TEMPORARY DAM IN THE WASH THE FARM COULD BE FLOODED EASILY	RAINFALL FARM. LOW ON WATER	FLOOD IRRIGATED.. THE SPILLWAY WAS COMPLETELY WASHED OUT. IT WILL NOT BE POSSIBIE TO REBUILD THE DIVERSION

WR 5929

BAIE AH CO.Y	16609
RALPH PADDOCK	.....
NAL THOHEENE BITSU	.....
CHEE	16321
HOSTEEN NATANI	16329
NAVAJO JO	16295
HOSTEEN TSO	16309
CALVIN BEGAY	16346
BENET BITSIE AHCODI	16353
JOHN BEGAY	.....
DALE EDISON	.....

LAND MANAGEMENT STUDY

ANTHONY DIVISION QUAD. 17 DIST. 5

Tract No.	8		
Owner			
Topography	1.5%		
Soil	SL		
Alkali	No		
Erosion	MOD. WIND		
Water	LOW		
Expansion	NO		
Present Crops	CORN - 4		
Suggested Crops	CORN		
Yield	CORN - 10 BU.		
Treatment	CONTOUR LIST		
Cost Per. Acre			
Class A	4		
Class B			
Class C			
Class G			
Remarks	FLOOD IRRIGATED		

WR 5931

LAND MANAGEMENT STUDY

AGRICULTURAL DIVISION QUAD. 18 DIST. 5

Tract No.	1, 6, 7 & 8	2 & 3	4 & 5
Owner	SEE BACK OF PAGE	JOHN RIGGS DAN YAZZIE	ROSE GEORGE WALTER GEORGE BIG SUGAR
Topography	.5% EVEN	.3#	HOSTEEN GUNNI .5%
Soil	SL	CL	CLAY TO CL CLAY
Alkali	NO	NO	TRACE
Erosion	MOD. WIND	SEVERE WIND " SHEET	DEPOSITION BY FLOODS
Water	LOW EXCEPT WHEN RIVER OVERFLOWS	LOW EXCEPT DURING FLOODS	EXCESS DURING FLOODS
Expansion	800	NO	NO
Present Crops	CORN - 116 SQUASH - 5 BEANS - 1 MELONS - 3	IDLE - 35	CORN - 40
Suggested Crops	LISTER PLANT. WIND BREAKS SHOULD BE PLANTED	CORN	CORN
Yield	BEANS 100 # CORN - 15 BU.		CORN - 10 BU.
Treatment	THIS AREA IS SUBJECT TO FLOODS AND INTENSIVE SUBJUGATION WILL NOT PAY	CONTOUR LIST	NO RECOMMENDED TREATMENT
Cost Per. Acre	LISTER PLANT BETWEEN DIKES $5.00		
Class A	F - 123 E - 800		
Class B		35	40
Class C			
Class D			
Remarks	FLOOD IRRIGATED WHEN THE CORN WASH OVERFLOWS. THESE FARMS ARE IN VICINITY OF LEUPP	FLOOD IRRIGATED. THIS COUNTRY IS FLOODED DURING BIG FLOODS	FLOOD IRRIGATED COVERED WITH WATER AT TIME SURVEY WAS MADE

WR 5932

HERBERT KELLY	16771
JAMES TOMPSON	16726
ALBERT CODY	16611
AUGUST STORES	15847
BEN YAZZIE	.....
TSINI JINI ESTOY	.....
JOHN RIGGS	.....
OTIS DONA BEKIS	.....
DAN YAZZI	15914
HOSTEEN AH NA	16410
JIM SILVERSMITH	16042
TODACHEENE TSO	16684
MARTIN STORES	16745
NAJINI YAZZIE BODANI	16623
HOSTEEN TSO (BEN JOE)	15962
GHE JOHN	16603
JOHN SMITH	
ABDZAN BITSI ISCHILLI	15940
BAH	15418

4 % 5

CIA-SONIE	16146
JOE WILLIAMS	164338

WR 5933

LAND MANAGEMENT STUDY

ACTION DIVISION (( )) QUAD. 18 DIST. 5

		TOLANI LAKES (RED LAKE)	
Tract No.	IO	11 - 22	
Owner	16284 BALOME BEGAY	SEE BACK OF PAGE	
Topography	.5% EVEN	.5 EVEN	
Soil	CLAY CLAY	CLAY TO SL CLAY	
Alkali	NO	NO	
Erosion	S. SHEET S. WIND	S. WIND S. GULLY	
Water	LOW	SUFFICIENT	
Expansion	NO	4500	
Present Crops	IDLE - 5	CORN - 177 BEANS - 1 SQUASH - 1 MELONS - 15	
Suggested Crops	CORN SORGHUM	CORN, BEANS, MELONS, SORGHUMS, ALFALFA, OATS & WHEAT	
Yield		BEANS - 200# CORN - 20 BU.	
Treatment	CONTOUR LISTER PLANT	LEVELING & BORDERING	
Cost Per. Acre		15.00	
Class A		F - 194 P - 2000	
Class B	5	P - 2500	
Class C			
Class G			
Remarks	FLOOD IRRIGATED	FLOOD IRRIGATED 2000 acres at $75.00	

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WR 5934

INDIANS WHO ARE FARMING AT TOLANI LAKES

TODICHIENIE	15015
DO NA HE	.....
SEDA KISIE BEGAY	16398
ET DIL DONI BEGAY	16304
USHENE BEGAY #1	16475
SLIM SALT	.....
KAY YAZZIE	16436
HOSTEEN ELTSOASIGE BEGAY	15022
CLIZZIE THLANI	16201
BELONI BEGAY #2	16284
EDWIN CURLEY	15950
TAPACHA	16209
DENAH TSO BEGAY #1	16247
DENAH TSO BEGAY #2	16270
LUCIEN LONG NEZ	15974
DENAH TSO	16268
BALONE BEGAY #1	16376
GENE PRICE	16395
BELEN DODA JADI BEGAY	16396
HOSTEEN ELTSOASIGE	15019
YELLOW INDIAN	16299
BIG EYES	15001
TODACHIENIE YAZZIE	2992
HAROLD NEBITSI	.....
SEDA KIZIE BEGAY	16398
DENETHLY JINI	16256
ROSS YELLOW HAIR	.....
HOSKA DIEN	.....
HOSTEEN USHENE	16473
DENAH CHILE	16252
ATTAKA YAZZIE BIDONIE	16233
NAT YAZZIE	3031
DENA HADILTH CHAHLEY	16429
JERRY MONROE	16429
BEKAY BEGAY	16272
WALTER GEORGE	16007
DENAH TSO BEGAY #1	16247
WILBUR TOMPSON	16253
JACOB BALONE	16419
HOSTEEN BITSI LAKAI	16361
BELEN DODA JADI	16451
CLAH	16263
TSCHDESHGISH-NI YAZZI BEGAY	16398

INDIANS WHOSE FARMS WERE COMPLETELY WASHED OUT AT TONALI LAKES

YELLOW SINGER	.....
FRANK THOMPSON	16467
CHARLIE TOMPSON	16485
GUY TODACHEENE	15033
CHARLEY COFFEE	15012
YELLOW HAIR	.....
EVERETT McCABE	16281
BIG EYES	15001
CHARLEY ALCOTT	.....
HOSTEEN USHENE	16473
HOSTEEN USHENE BEGAY	.....
HOSTEEN USHENE BADONI	.....
ADELTONE BEGAY	
HUSKANDEEL	
KAY YAZZIE	16436
HOSTEEN NATONI	.....
YELLOW INDIAN	16299
JOE JUDGE	.....

WR 5935

LAND MANAGEMENT STUDY

AGRICULTURAL DIVISION QUAD. 18 DIST. 5

Tract No.	23	WATER SPREADING PROJECT NO.24	25
Owner	AUGUST STORES MARTIN STORES	THERE IS UNLIMITED SPREADING AREA HERE, HOWEVER THIS PROJECT WAS TURNED DOWN UNTIL THE VEGETATION ON THE WATER SHED HAS INCREASED IN DENSITY SUFFICIENT TO DECREASE THE SILT CONTENT & VOLUME OF WATER. THE ARROYA IS WIDE AND DEEP AT THIS POINT.	DICK SCOTT
Topography	.4%		2% HUMMOCKY
Soil	C & CL CLAY		SAND CLAY
Alkali	NO		NO
Erosion	S WIND		SEVERE WIND
Water	LOW		LOW
Expansion	NO		NO
Present Crops	IDLE - 5		IDLE -15
Suggested Crops	CORN		CORN
Yield			
Treatment	LISTER PLANT		ABANDON EXCEPT IN EXTREMELY WET YEARS
Cost Per. Acre			
Class A			
Class B	5		
Class C			15
Class G			
Remarks	FLOOD IRRIGATED ALONG THE BANK OF CANYON DIABLO, ADJACENT TO THE STEEL BRIDGE.		FLOOD IRRIGATED

WR 5936

LAND MANAGEMENT STUDY

ATLANTIC DIVISION QUAD. 64 DIST. 5

Tract No.	3	6	7 & 8
Owner	THE JEDDITO SPREADS OVER THE WHOLE VALLEY FLOOR, COVERING ABOUT	ATSITTY TSOH 15844 CHISCHILI TCOSIE 15818	15679 HOSTINELE PAH
Topography	1500 ACRES IN THIS VICINITY. THERE IS	.3% RIVER BOTTOM	1% IRREGULAR
Soil	A GOOD COVER OF GRASS AND IT WOULD BE POS- SIBLE TO CUT HAY HERE IF IT WERE PROTECTED.	SAND	SAND & CLAY
Alkali	HOWEVER, IT MAY HAVE MORE VALUE AS PASTURE	NO	NO
Erosion	IN THIS PARTICULAR CASE. THE EXACT USE THAT THIS AREA SHOULD	MOD. WIND	MOD. WIND
Water	BE PUT TO WILL NOT BE KNOWN UNTIL THE SURVEY IS COMPLETE	LOW EXCEPT DURING RAINY SEASONS	LOW
Expansion	ON L. M. U. 7 & 5. THIS FIGURE IS NOT INCLUDED IN THIS REPORT.	NO	NO
Present Crops		IDLE - 40	IDLE - 16
Suggested Crops		CORN	
Yield			
Treatment		NO RECOMMENDED TREATMENT	ABANDON
Cost Per. Acre			
Class A			
Class B		40	
Class C			16
Class G	1500		
Remarks	FLOOD IRRIGATED	FLOOD IRRIGATED. THIS IS A RISKY PROPO- SITION. YOU NEVER KNOW WHEN FLOODS WILL TAKE OUT THE WHOLE CROP	FLOOD IRRIGATED ONLY DURING MAX- IMUM FLOODS

WR 5937

LAND MANAGEMENT STUDY

AGRONOMY DIVISION QUAD. 64 DIST. 5

Tract No.	10		
Owner	HOSTEEN SONI 16101 THANASINI NEZ	MAN PULLER 16106	
Topography	5%		
Soil	SL CLAY		
Alkali	NO		
Erosion	SEVERE WIND		
Water	LOW		
Expansion	NO		
Present Crops	IDLE - 50		
Suggested Crops	CORN		
Yield			
Treatment	AFTER EROSION CONTROL HAS BEEN COMPLETED, POSSIBLE FARM SITES CAN THEN BE SELECTED AND SUBJUGATION WORK CARRIED OUT.	LEVELING AND LIST BETWEEN BORDERS	
Cost Per. Acre		$15.00	
Class A			
Class B	IDLE - 50 E-50		
Class C			
Class G			
Remarks	FLOOD IRRIGATED. THIS AREA COULD BE FARMED DURING FAVORABLE YEARS. HOWEVER, NO SUBJUGATION WORK SHOULD BE STARTED UNTIL EROSION CONTROL OF THIS WHOLE VALLEY IS COMPLETED -52-	$1500.00	

WR 5938

LAND MANAGEMENT STUDY

[illegible] DIVISION QUAD. 65 DIST. 5

Tract No.	4		
Owner			
Topography	.5%		
Soil	SL TO CL.		
Alkali	1.8 P.M - 1-12 inches heigh		
Erosion	MOD. WIND.		
Water	SUFFICIENT		
Expansion	242		
Present Crops			
Suggested Crops			
Yield			
Treatment			
Cost Per. Acre			
Class A	140		
Class B	102		
Class C			
Class G			
Remarks	This area was turned wo dpwn because of heigh alkali, and poor drainage.		

WR 5939

LAND MANAGEMENT STUDY

ATLANTIC DIVISION QUAD. 65 DIST. 5

Tract No.	2	3	1
Owner	Peet Sandoval		15962 HOSTEEN TSO (BEN JOE)
Topography	.5%	RIVER BOTTOM	.5% EVEN
Soil	CLAY / SAND	SAND / CLAY	SAND
Alkali	TRACE	NO	NO
Erosion	SLIGHT WIND	NO	MOD. WIND
Water	LOW	LOW	LOW
Expansion	NO	NO	NO
Present Crops	GARDEN PLOT 1/2 ACRE	CORN - 4 BEANS - 1	MELONS - 2 CORN - 5
Suggested Crops	VEGETABLES	CORN, PEAS, SUDAN BRASS	CORN, BEANS MELONS
Yield		CORN - 15 BU.	CORN - 12 BU.
Treatment	FALL PLOWING	NO RECOMMENDED TREATMENT	
Cost Per. Acre			
Class A		5	7
Class B	1/2		
Class C			
Class G			
Remarks	IRRIGATED FROM WELL. THIS AREA IS TOO SMALL TO INCLUDE IN COMPILATION	FLOOD IRRIGATED	OUTSIDE RESERVATION BOUNDARY.

WR 5940

LAND MANAGEMENT STUDY

ARROYO DIVISION QUAD. 68 DIST. 5

Tract No.	1	2	3
Owner	MARIE MARTIN	MARIE MARTIN	TO BE ASSIGNED
Topography	3#	.5% SAND BAR	.5% EVEN
Soil	CLAY	SAND LS	CL / SCL .05
Alkali	NO	NO	NO
Erosion	MOD. GULLY	WATER COVERS ENTIRE FARM DURING BIG FLOODS AND DROPS A LAYER OF SAND	S - WIND
Water	LOW		SUFFICIENT
Expansion	NO	NO	100
Present Crops	CORN - 2	IDLE - 6	
Suggested Crops	CORN	CORN	CORN - SORGHUM, MELONS, ALFALFA
Yield	CORN - 5 bu.		
Treatment	CONTOUR LIST	NO RECOMMENDED TREATMENT	LEVELING AND BORDERING
Cost Per. Acre			$15.00
Class A		6	
Class B	2		E 100
Class C			
Class G			
Remarks	FLOOD IRRIGATED	FLOOD IRRIGATED THIS IS A POOR PROPOSITION	FLOOD IRRIGATED. COVER IS MAINLY GREASEWOOD

WR 5941

LAND MANAGEMENT STUDY

ALLUVIAL DIVISION QUAD. 69 DIST. 5

Tract No.	1	2	
Owner		ALTA KAI 16628	
Topography	.5%	1.5%	
Soil	CLAY & SL / CLAY	CL TO CLAY	
Alkali	NO	NO	
Erosion	MOD. WIND	S. WIND	
Water	LOW	LOW	
Expansion	NO	NO	
Present Crops	CORN * 4	CORN - 1	
Suggested Crops	CORN, BEANS SORGHUM	CORN & BEANS	
Yield	CORN - 10 bu.	CORN - 15 BU.	
Treatment	LISTER PLANT	NO TREATMENT	
Cost Per. Acre			
Class A		1	
Class B	4		
Class C			
Class G			
Remarks	THIS WHOLE AREA IS FLOODED AFTER HEAVY RAINS	THIS FARM IS BELOW A TANK, AND IS BEING IRRIGATED AS LONG AS THE WATER LASTS	

WR 5942

LAND MANAGEMENT STUDY

ALLENY DIVISION QUAD. 96 DIST. 5

Tract No.	39	40	
Owner	DAN WOOLY		
Topography	HILLSIDE & RIVER BOTTOM .5% to 1.5%	1-2%	
Soil	SL	SL	
Alkali	NO	NO	
Erosion	MOD. GULLY	MOD. GULLY	
Water	LOW	LOW	
Expansion	NO	NO	
Present Crops	FEW YOUNG PEACH TREES CORN - 4 acres	CORN - 6	
Suggested Crops	CORN, MELONS	CORN, SORGHUMS, BEANS	
Yield	CORN - 10 BU.	CORN - 12 BU.	
Treatment	NO RECOMMENDED TREATMENT	STRIP CROP, AND CONTOUR LIST	
Cost Per. Acre			
Class A		6	
Class B	4		
Class C			
Class G			
Remarks	FLOOD IRRIGATED. 4 tracts. THREE FARMS ARE ON RIVER BOTTOM. ONE FARM IS ON THE HILLSIDE	RAINFALL FARM	

WR 5943

LAND MANAGEMENT STUDY

ACREAGE DIVISION QUAD. 96 DIST.

Tract No.	41		
Owner			
Topography	1%		
Soil	LS		
Alkali	NO		
Erosion	SLIGHT TO SEVERE WIND		
Water	LOW		
Expansion	NO		
Present Crops	IDLE - 2		
Suggested Crops	CORN		
Yield			
Treatment	CONTOUR LIST		
Cost Per Acre			
Class A			
Class B	2		
Class C			
Class G			
Remarks	FLOOD IRRIGATED 4 TRACTS		

WR 5944