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GANADO

This project in the Navajo country in Arizona, about 60 miles northwest of Gallup New Mexico, diverts the water from Rio Pueblo Colorado to a reservoir in a flat on the north side of the stream where a small wet weather lake existed, and to irrigate lands therefrom lying below in the valley. The stream has been dammed by a rock filled crib dam, the water diverted through a canal to the reservoir which was formed by building an earthen dyke high enough to hold 16 feet of water with a sufficient freeboard. The capacity of the reservoir is about 4,300 acre feet. The project lies on both sides of the stream and the total area is about 1700 acres of which 707 acres on the south side are under ditch and the balance lies on the north side, of which only a part is now ready for water until two flumes are constructed. The area has been subdivided into approximately 10 acre tracts and tentatively allotted to those Indians who will make use of it.

J. L. Hubbell who owns a homestead on the reservation to which he acquired title prior

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to making it a part of the reservation, had appropriated the water of this stream. In 1903 he constructed a ditch and actually diverted the water and made beneficial use of it. He later made a proposition that he would relinquish his rights to the flow of the stream if the Government would give him a reservoir right of 400 acre feet per annum, and that he would do his share of the operation and maintenance thereafter. This agreement was ratified by the Department in 1913.

The project was practically finished in 1918 and has been operated since. The Indians were slow in taking it up but at the present time all of the good land we can irrigate at present is now claimed and worked to a greater or less extent. During the years in operation we have had to contend with storms and floods which have damaged the project from time to time. No one but Indians are using the water other than Mr. Hubbell who is irrigating 108 acres and a Mission school which has 27 to 30 acres under cultivation. The Mission has done its share of operation and maintenance by donating labor.

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The Indians are taking hold of the work now in fine shape and have organized the Ganado Farm Association and hold monthly meetings to discuss ways and means and the betterment of their farming and home conditions. This Association has written asking that we complete the project that they may have more land for farming. The letter from the Association is as follows:

Ganado Arizona.
June 15, 1928

Mr. Robinson
Albuquerque, N.M.

Dear Sir:

There is no question that you are giving your uttermost interest to the great irrigation project in this part of the Navaho Indian territory.

The Ganado Farm Association is now urging upon you to request our honorable Government to enlarge the Ganado irrigation system. It is very difficult for the Indian on account of the situation and the condition of our ditches, due to the fact of the ditch being on the hillside which makes it very inconvenient for the Indian to make any progress.

We feel sure that your sympathetic consideration will be rendered regarding this matter.

The Government house where the Irrigation engineer is living needs to be repaired or else condemned, also the extension of the North ditch and South ditch.

We would like for you to send one of your engineers out to make an estimate on the work.

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As far as our present ditches go, the lands are all taken and now being all nicely cultivated by the Indians. There are four Indians already repairing their lands below the ditches and hoping for the extension of our Ganado ditches.

Very respectfully yours,

(SGD) John Curley
President

(SGD) David T. Hubbard
Secretary

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KIN LE CHEE

A small project some 9 miles north of Ganado, Arizona. Initiated by the Indians who live there, they agreed to give all of the common labor necessary in the construction if the Government would give the material, engineering and superintendence. Work was begun in 1921. The project consists of a diversion dam, two ditches and two high flumes to cross the main stream at one place and a large tributary in another.

During construction a heavy flood came down just before the gap in the dam was closed and partly took it out; it also did other damage and cut down the wash until the flumes had to be higher and longer than contemplated. Later during construction, another flood took out a flume before it was completed. The Indians have donated all of the labor possible - more than what was expected at the beginning of the job, and later, when it was necessary to do some heavy repairs because of flood damage, they gave two-thirds of the work, receiving pay for the other third. The project is in successful operation, and the Indians are doing fairly

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well.

Plans: Undoubtedly there will be some repair work needed during the next few years because the stream is subject to heavy and sudden floods, and any repairs to the large flumes and the dam will be beyond the capacity of the Indians. They do all of the ordinary O. & M.

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CHIN LEE

Superintendent Duclos of the Southern Jurisdiction requested our assistance in building a storage tank for domestic water supply at Chin Lee. We furnished one of our crews and this work was done under our supervision, but being paid for by the superintendent.

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LEUPP - Corn Creek

All of the drainage from the Hopi country is concentrated above Leupp where it enters Corn Creek and then flows into the Little Colorado.

Investigations were made to divert these flood waters to land opposite Leupp. A canal and diversion were constructed and for several years, under the Superintendent, an area was under cultivation. When a flood came carrying immense quantities of silt and much of the land was covered with from a few inches to six feet. The next season another flood came which eroded channels through this silt and down to the river level, and the cost of getting the water back on the land was so great that the project was abandoned.

Above Leupp some 20 miles, another investigation was made at what is known as the Tolani Lakes, where by the progressive building of an earthen dam water could be diverted, raising the dam as the land above filled up with silt. Several thousand acres of land could be irrigated if the water would be put on it. It was not considered entirely feasible largely because

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of the difficulty of providing a safe spillway, or at least not commensurate with the cost and nothing further was done. Some day it may be considered feasible and the construction commenced.

Plans: No plans for immediate further work here.

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LUKACHUKAI

In a small valley at the foot of the Lukachukai mountains, some 3½ by 4 miles, and about 60 miles north of Fort Defiance three creeks flow, joining and forming Cariso Creek which flows to the west into the Chin Lee Wash. These str ams bring a small but constant flow of water which is utilized by the Indians through six small ditches for their crops. The Indians make good use of the water, and desire some assistance in making small storage reservoirs to conserve the water for more extensive use. Plans: To build one or two small reservoirs to store the run of the streams when the Indians are not irrigating.

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MARSH PASS

A small project at Kayenta, Arizona, about 90 miles north of Tuba, and 170 miles from Flagstaff the nearest railroad point. The elevation is about 6000 feet and the rainfall is estimated at from 7 to 8 inches.

Water is diverted from Laguna Creek which has a normal flow of 6 to 10 second feet and flood flows of considerable magnitude. The diversion is by means of a rock filled dam. The water is conducted through a ditch for a couple of miles, into an old lake bed from which it is dropped into a natural channel and again diverted some distance below, where by the building of approximately three miles of distributing ditches approximately 1000 acres of land can be placed under irrigation. This area of land was subdivided into lots of approximately ten acres each.

In July, 1917, the dam was partly wrecked by a flood. It was repaired and on Nov. 9, by authority of the Office, the project was turned over to the Agency for operation.

In 1919 some repairs and maintenance work

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was done. In 1920 the head section was again put into shape by additional excavation to increase the grade and slight repairs to the dam made. In 1922 the stream threatened to leave its channel, going entirely around the dam. This was repaired and some protection work done.

In 1927 and 1928 the dam was vered with a cement jacket, by covering the structure with mesh wire and plastering with a thick layer of cement plaster to protect the logs and prevent seepage through the dam. This has proven entirely satisfactory to date.

Very little use has been made of this project for some reason I have not been able to determine. The Denehotso project only 25 miles away has been used to its full capacity. This project which has been built about 12 years and kept up more or less by this Service as shown above, has never been used to any extent. Last year 40 acres were cultivated, the year before 30 acres, and the year before that only 12 acres.

We have a pretty good project, water, good soil, and in a fairly populous neighborhood,

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still no farming. It would seem that the Agency employees should bring some pressure on the Indians to get them on the project.

We plan nothing for this project until or unless it is demonstrated that use will be made of it. At such time quite a bit of work will be needed to put it into shape for use and after 12 years of non-use the ditches are probably filled with sand and the structures in bad shape.

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MOENCOPI WASH

This wash is near Tuba City, and Moencopi village of the Hopi. The project, however, does not include the lands of the Hopi who get their water from Reservoir Canon where it comes from springs. The Wash project diverts water from the Wash by means of a concrete dam, through a canal and irrigates the school and agency farm and lands below which are for the Navajo Indians. It has been hard to maintain the diversion and the ditch because of the desert nature of the country and the fact that the entire rainfall of the year usually comes in one or two torrential storms and heavy runoff. In the past the old dams washed out, and the present structure, put in by the Irrigation Service is the 5th or 6th dam built. The ditch has been lined with concrete for about 2000 feet from the head because of losses by seepage and breaking ditch.

Plans: None, other than occasional repairs necessitated by floods in the stream or in the cross drainage.

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RED LAKE

Located about 15 miles north of Fort Defiance this project lies partly in Arizona and partly in New Mexico. It is an old project, initiated in about 1885, when the water was first diverted from Black Creek and a reservoir formed by building a dyke across a depression and running the water from the creek into it. From there it was proposed to irrigate some 700 acres of land. A short time after its construction and before the ditches had been built, it was washed out. In 1904 it was examined and a report made by H. F. Robinson. In 1909 the Superintendent in charge of the reservation announced that he would place a farmer at Red Lake and asked that it be rehabilitated. This was done at a cost of $925.69. The system of ditches was built about the same time. No use of the project was made and no farmer was stationed there. However, indirectly it was of benefit as the Indians living below on Black Creek used the reservoir to store flood waters which were turned down the creek when it was low and enabled them to divert it and do a little farming and to furnish stock water.

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The project was given no attention and allowed to deteriorate. Later it was again put into shape, but with the same result. At several times later it was requested that it be put into shape but this Service declined to do anything more without assurance that it would be used as a project.

In 1927, Superintendent Duclos, needing more farming land to raise forage for a dairy herd for the Fort Defiance Sanatarium, asked that it be put into shape, secured funds from Oil Royalty Funds, and assured us that it would be put to beneficial use. Forty acres of the land would be planted to alfalfa for the use of this herd. The project was again put into shape during the fiscal year 1928.

The project consists of a diversion dam across Black Creek, the Red Lake Reservoir with a capacity of 4,275 acre feet, a concrete gate at the head of the diversion canal which has a capacity of 65 second feet with a depth of one foot so that during flood times a large head can be diverted; a set of waste gates which discharge through a corrugated steel pipe, as the material is loose alluvium and sand and any other construction would be too expensive,

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at the head of which is a sand trap; the diversion canal, and three miles of main canal to deliver water to the lands under the project. It is estimated that the cost of all of this new work will be $10,300.

The combined drainage area of Black Creek above the dam and of Red Lake is about 250 square miles, and it is estimated that the annual runoff is from 30 to 45000 acre feet. There should be stored each year an ample amount for this project and still allow the peaks of the floods carrying large quantities of silt to pass on down the stream.

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WEPO WASH

This is a project to control the flood waters of Wepo Wash, which lies on the north side of the First Mesa, and is the site of the largest cultivated area of the Hopi Indians.

For generations the Indians had depended upon the waters to spread over the valley floor during flood periods which irrigated the crops. When the wash lower down the country commenced to cut deep into the ground, and continued to cut back up the valley it would be impossible to bring the water from the bottom of the wash to the land and much of their farming land was being lost. An effort was made to spread the water over the land by deflectors and to do some work to prevent further cutting. This was partly successful. Some work is indicated as being necessary in the future to further control this.

Plans: Some work should be done to stop the retrogression of grades in the stream or the entire area will be lost. Just what work should be done or can be done is rather problematical. Further studies should be made as the conditions have changed materially since the former work was done.

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WHEATFIELDS

Lies about 45 miles north of Fort Defiance, Arizona, with an elevation of about 7200 feet. About 1885 a small ditch was built taking water from Wheatfields Creek covering a small amount of land on the north side of this stream. In 1904 surveys showed that it was possible to build a diversion, a storage reservoir, and irrigate additional lands on the south side of the creek. Work was begun on this in 1905 or 1906 by Superintendent of Irrigation Butler who had built a diversion dam, and partly constructed the storage dam when he left the Service. In 1909 this office took over the work to complete it and had it practically completed when one of our engineering force was killed by a stroke of lightning on the dam. The Indians being superstitious, especially where one is killed by lightning, would have nothing to do with the project and it has remained unused to this day. In the meantime the diversion dam was washed out and the diversion ditch damaged.

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The reservoir has a capacity of 1300 acre feet and there are some 300 acres of fine land under it with another 400 that might be cultivated after some work.

Estimates have been made to rehabilitate this project at a cost of approximately $10,000. The matter is being held in abeyance until we can be assured that the Indians will take hold of the project and make use of it if rebuitl. The Superintendent is presumedly at work on this, and it should be in shape to have work done on it by 1930.

Plans: If the Indians will agree to make use of the project, to make amended plans and if money is available to commence the work.

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WATER SUPPLY, NAVAJO AND HOPI

The water development, so-called, to give domestic and stock water for the Navajo and Hopi Indians has been under way for a good many years. These Indians live in a most arid and inhospitable region, almost their entire livelihood comes from their stock raising, principally sheep.

For years the number of sheep and cattle was not increasing and it seemed had reached the limit under natural conditions. It was known that large areas of the reservation had sufficient grass and forage to care for considerable flocks and herds but the amount of water was very limited, there being large areas where there was none excepting in water holes after heavy rains or after the melting snows in the spring. This caused the Indian Office to decide to make an effort to develop water in these unwatered areas.

This work can be divided into several headings:

The development of underground water by drilling or digging wells. Several areas were found where by drilling deep holes artesian water was found, other areas in the valley

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water sufficient to water comparatively fair sized herds was found at reasonable depths, say under 150 feet, and wells were drilled and equipped with a pump, windmill, tank, and trough. In some few places it was found that shallow wells only a comparatively few feet in depth could be dug in the bottom of washes, some of these were equipped with windmills and others were simply left open for the Indians to get water.

At various points throughout the reservation springs are found. Not many of these springs are of any material size, most of them giving a few gallons an hour as a maximum after development. In some of them the water was not concentrated and simply seeped from a hard outcropping and none of the water was available for use. All of these various springs as far as possible were developed, the water concentrated, and piped out to concrete troughs where it was available for domestic purposes and for stock.

Another phase of water development is the building of reservoirs or tanks in which rain water and storm flow are conserved for a greater or less time.

During the past year no new wells were drilled, it being thought best to concentrate on the development of springs. In doing this work in the early years the work was done where the greatest results seemed to be obtainable, irrespective of the division of the six jurisdictions of the Navajo country. During the last several years, however, an effort has been made to apportion the available funds to the various jurisdictions with a bigger percentage to those jurisdictions who had had the least amount of work done in the past.

The following summary of the work done during the year as prepared by the General Foreman in charge of the work is submitted:

Hopi

On this reservation one spring development party which worked during the months of March, April, May, and part of June, developed eight springs and one well, a reinforced concrete stock watering trough constructed at each spring and three reinforced concrete troughs constructed at the one well, also a concrete trough constructed at well to replace old worn out metal trough.

In addition to the above, the necessary operation and maintenance of thirty seven wells, windmills, tanks, and troughs, also operation of headquarters shop, maintaining trucks, equipment, and other necessary work connected with the general operation.

Western Navajo

During the year on this reservation there were fourteen springs developed and reinforced concrete stock watering troughs constructed at each spring, also the necessary operation and maintenance of wells, windmills, tanks and troughs, and springs developed during past years; also a small warehouse was erected for supplies.

Leupp

On this reservation there was one spring and three dug wells developed and reinforced concrete stock watering troughs constructed at each, together with the necessary operation and maintenance of wells, windmills, troughs, and springs developed in past years.

Southern Navajo

In addition to the general operation and maintenance of thirty wells, windmills, tanks, and troughs, there were nine springs developed

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and reinforced concrete stock watering troughs constructed.

Northern Navajo

During the year in addition to the general operation and maintenance of thirteen wells, windmills, tanks and troughs, there were four reinforced concrete stock watering troughs constructed to replace old and worn out metal troughs constructed at wells, nineteen springs and eight dug wells developed, and a reinforced concrete stock watering trough constructed at each; also the maintenance of springs developed in past years, together with erecting a small storeroom or warehouse in which to store supplies.

Total dug wells developed -	12
Total springs developed -	51
Total reinforced concrete troughs constructed	53

It has been recognized by the Department and all other agencies and persons having knowledge of the work, that this water development is probably doing more material good for these Indians than any other work that could be done and it is encouraging to see that Congress has reached the same conclusion and is making more liberal appropriations for water development.

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At the end of the present fiscal year there had been developed 202 springs. A list of the first 104 has heretofore been submitted and a list of springs 105 to 202 inclusive is attached hereto. We have 131 wells that are equipped with pump, windmill, tanks and troughs.

When we began this work both tanks and troughs were built of metal but it is found that their life was comparatively short because of the nature of the water in many places and all new development and all replacements are now of concrete. There have also been developed 26 artesian wells and a number of other developments for water for these Indians has been made.

Plans for the next fiscal year are even more elaborate than in the past as the amount of money available is considerably greater. We will have during the fiscal year of 1929, twelve outfits in the field developing springs, doing betterment work with troughs and tanks, and operation and maintenance of the wells and springs already developed.

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