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Ground-water supplies and irrigation in San Pedro Valley, Arizona

By

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Source of pumped w. water -

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to Mammoth was washed out by a flood in ~~1927~~ Sept 1926 and had not been rebuilt, but a passable road extended for several miles, then forded the river and climbed northwest up the slope to Oracle. A graded road extended westward from Redington up the west side of the valley and across the Santa Catalina Mountains to Tucson. A graded road also extended from Redington southward along the east side of the valley, to Cascabel, and thence to the highway at Benson, a town of nearly 1,000 people. At Fort Huachuca on the southwest border of the valley, there was a garrison of about 1,000 cavalry.

There are several ranches along the lower part of Aravaipa Creek, and also in the upper valley of this creek, with settlements of ~~perhaps~~ 100 or 200 people at Aravaipa, Klondyke, and Bonita. The State Industrial School for Boys occupied the buildings at Fort Grant, at the head of the valley.

From Tucson, U.S. Highway 80 passes eastward to Benson and thence southeastward to Tombstone, Bisbee, and on eastward. State Highway 80 extends from Benson eastward through Dragoon Pass to Willcox and beyond. State Highway 82 connects Elgin and Fairbank with the main highways.

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GEOGRAPHIC AND GEOLOGIC FEATURES

Mountains

The northern part of the San Pedro basin is formed by Aravipa Valley which is bordered on the east by the Turnbull, Santa Teresa and Pinaleño Mountains. These rise to altitudes ~~above~~ of about 7,000 feet and culminate in Mount Graham at an altitude of 10,720 feet, the highest peak bordering the basin. Ranges of hills on the west separate the drainage of Aravipa Creek from the main San Pedro Valley. Other hills ~~form a~~ enclose a small upland valley in the vicinity of Hooker Hot Springs. Farther south the Little Dragoon and Dragoon Mountains form the divide between ~~the~~ San Pedro Valley and Sulphur Spring Valley to the east. The pass between these two groups of mountains has an altitude of about ~~4,515~~ 4,600 feet. The mountains themselves rise to 7,512 feet in Mount Glen. South of the Dragoon Mountains there is another wide pass at the head of Government Draw, beyond which are ~~which forms the drainage divide southward to~~ the Mule Mountains, ~~which form a small group near Bisbee.~~

On the west side of the valley the Tortilla Mountains in the north form a broad divide cut by numerous washes but having comparatively low relief. The Santa Catalina and Rincon Mountains border the western side of San Pedro Valley for about 15 miles their highest peaks rising to altitudes of 8,385 feet in Kellogg Mountain and 8,700 feet in Mica Mountain. At the south end of the Rincon Mountains there is a broad divide in the vicinity of Mescal which

Lemmon Mountain, the highest peak of the Santa Catalina Mountains, rises to 9,150 feet, but is somewhat west of the ridge.

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extends to the Whetstone Mountains, separating the San Pedro Valley from the drainage of ~~Pantano Wash~~ Cienaga Creek, a tributary to Santa Cruz ~~River~~ Valley on the west. The highest points in the Whetstone Mountains ~~culminate in~~ are Apache Peak at an altitude of 7,634 feet, and Granite peak at 7,387 feet. Another broad upland area then forms the drainage ~~di-~~ divide of the San Pedro river basin southward to the Canelo Hills and Huachuca Mountains. The former constitute a rugged area of ridges trending southeast-northwest on the western side of the Huachucas. The latter form a large mountain mass having a crest extending for several miles and ~~culminating in~~ rising to Miller and Carr Peaks at altitudes of 9,445 and 9,214 feet.

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Mountain pediments.

The mountains which border the San Pedro Valley do not extend down to the lowland. Their bases are rather sharply marked in most places by gently sloping plains which extend at nearly uniform slopes down towards the trough of the valley. The upper portions of these plains have bed-rock surfaces or only a very thin layer of gravel and rock waste. Such features were studied by Bryan in the Papago country farther west and were defindd by him as follows:

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During December to March snow occasionally falls on the mountains above altitudes of 6,000 feet and may remain for several weeks. The yearly records of precipitation at several stations that have been maintained in the river basin by the United States Weather Bureau are given in the following tables: Page 44 goes here. The figures show a great variation in the precipitation from year to year and also a considerable variation in the different portions of the valley. This is due to the fact that most of the summer rains come as local showers which are not uniformly distributed. The winter precipitation comes as more general storms.

The great yearly variation in the rainfall considerably affects the shallow ground water supplies and greatly affects grazing conditions. Springs and other shallow watering places may go dry during prolonged droughts and even domestic supplies from shallow wells may fail. The ample rainfall of 1905-1907 and 1914-1916 induced the settlement of considerable land where attempts were made at dry farming but in each period the succeeding dry years caused the abandonment of many homesteads.

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Valley ground water is found at 10 or 15 feet in the bottom land and somewhat deeper along the narrow valley sides. In the upper part of Sycamore Gulch ample water at the Diamond Q cattle and guest ranch is obtained from the gravelly stream wash. Farther down stream a small supply from fissured bedrock has been developed by Mr. R. L. Parsons into a flowing spring. Near the base of the Huachuca Mountains but high above Sycamore Gulch, with the pediment slope shown in Plate 15, there are several small perennial springs, of which those at the Pyatt Ranch are perhaps the largest. Their flow of about 10 gallons a minute is ponded and used for garden as well as domestic purposes. Near the central course of Lyle Canyon the water comes to the surface in a small meadow, and thence flows as a perennial stream for 2 or 3 miles.

Huachuca Mountains.--The northern and eastern portions of Huachuca Mountains are included in the Fort Huachuca military reservation, which was established ~~in the 70's~~ as one of the military posts to control the Apaches ~~near the Mexican border~~. The main water supply comes from 2 springs in the canyon above the fort. The supply is usually sufficient for the needs of the encampment of about 1,000 men and 200 horses ordinarily stationed there. The springs issue at elevations about 2,000 feet lower than the crest of the mountains. The upper spring is

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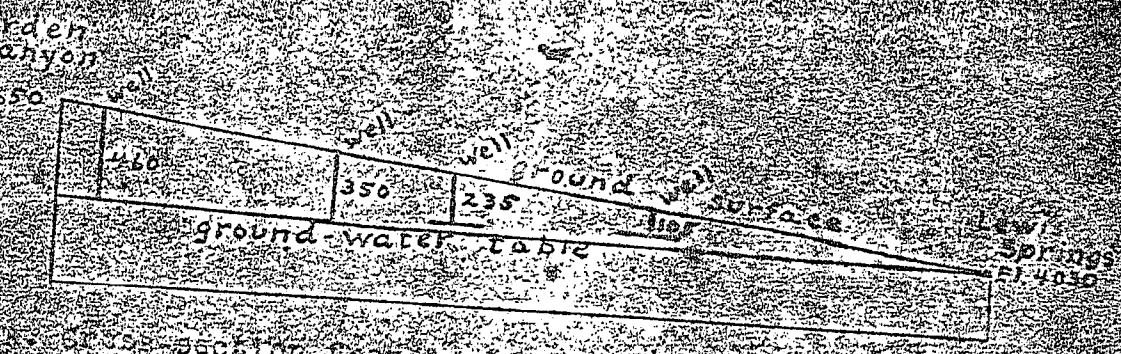
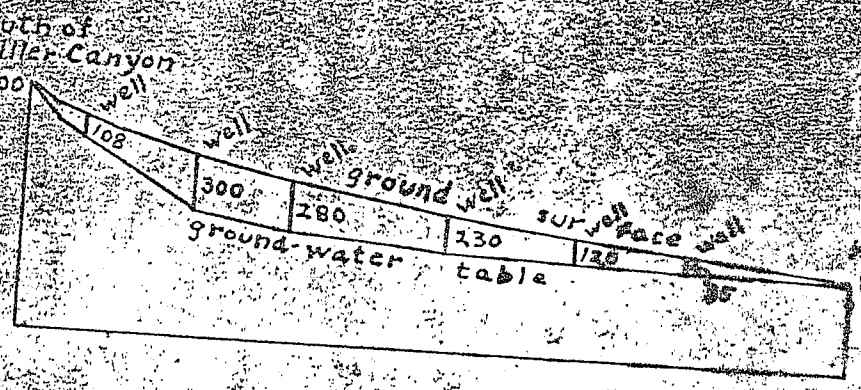
base quartzite
near the [illegible] of [illegible] rocks resting on granite. The lower spring, a
at the base of overlying the quartzite
mile farther down the canyon, issues from [illegible]; there a small
dike of porphyry forms a natural dam. Both springs are evidently fed by the
snow and rainfall of the higher slopes. During long dry periods the supply
notably diminishes, and in some years it has been necessary to transfer part
of the horses elsewhere until rain or snow has replenished the springs. Attempt
has been made to obtain additional supply by drilling wells. A well was drilled
to nearly [illegible] ft in bedrock on the east side of the canyon half a mile south of
of the Fort,
the office buildings, but only a small amount of water was encountered, in seams
in the upper rocks. In [illegible] a well was drilled 200 feet deep near where [illegible]
Canyon opens from the mountains. Water was found at a few feet in the gravel,
which was 75 feet thick at the well site. The remaining depth was drilled in
decomposed to fresh granite in which very little water was found. In
[illegible], after months of prolonged drought, water stood [illegible] in
this well, which was capped and not yet used as a supply. The lower part of
this canyon would offer a good place for the development of considerable
underflow water by wells dug or drilled in the gravel.

N. G. Supply was very small!
E. F. [illegible]



A. Cross-section from Garden Canyon



B. Cross-section from mouth of Miller Canyon to Hereford

Figure 5. Cross-sections [illegible]

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Infiltration galleries in the [illegible] part of the canyon, about 2 miles above the test well, significantly caused in furnishing a supply of water that can be piped by gravity to the village immediately at the foot. There is a cottonwood area of nearly 5 square miles in the higher part of the canyon, which is tributary to this area. It is not near the town of Santa Cruz, but most of the military reservation, around big wells which will have supplies in the wells of water. In 1921 there was a drilled well in Bell Park of 12-inch pipe that had a total depth of 210 feet. The water level was at about 40 feet. The well supplied a number of homes in the vicinity. Water subsoil, due the wide sloping plain, is not covered with a surface of alluvium. The depth to water is progressively shallower as the river is approached. The ground-water table was observed in several wells, and its relation to the river surface is shown in Figure 5. The slightly dome of the water table is due to the fact that it can not pass the [illegible] in the river.

Figure 5. Cross section through the west side of the Santa Cruz Valley showing relation of the ground-water table to the river surface.

[illegible] 10 feet per mile. [illegible] 10 feet per mile. [illegible] 10 feet per mile. Water levels [illegible] to the crest of the mountains. In the upper portion, adjacent to Patagonia and Elgin, which consist chiefly of summer cottages, owned by residents of Nogales and Tucson, are supplied with water from shallow wells.

A. Sonoita Canyon to Lewis Springs
B. Miller Canyon to Hereford

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sedimentary rocks.

In Rain Valley a few miles northeast of Elgin the drilled well of Mr. A. E. Barley probably obtains water from the basal part of Tertiary sandstone and conglomerate resting on ancient sedimentary rocks. Analysis 29 shows that the water has a comparatively low mineral content. By far the greater part of the dissolved material is calcium carbonate, presumably derived from the limestone of the neighboring hillsides. The low contents of sodium and sulphate and the absence of fluoride are noteworthy.

At the Babocomari home ranch east of Elgin the water from a well drilled to ground water level in the stream valley is of fair quality. Analysis 30 shows that calcium and bicarbonate are the chief mineral constituents as they are in most other waters of the district. Farther east down the valley of the Babocomari River the drilled well of Mr. Al Turner near Campstone railroad station supplies water of moderate concentration. Analysis 48 shows calcium and bicarbonate to be the principal substances in solution. No fluoride was found in this water, ~~whose temperature of _____ degrees indicates that it is not the uppermost~~ which ground water but comes from ~~a depth of perhaps _____ feet.~~ about 140 feet, to which depth the well was drilled and cased.

On the pediment slope north of Campstone a well that was drilled by the County Highway Department obtained water that is comparatively highly mineralized

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Analysis 47 shows that the principal dissolved mineral constituents are calcium, bicarbonate and sulphate. It probably obtains water from gypsum-bearing beds in the Tertiary sediments.

At Garden Canyon on the upper part of the pediment near Huachuca Mountains a deep drilled well of Mr. Oliver Frye reached water at a depth of 460 feet. Analysis 49 of this water shows that it has a low content of mineral matter in solution calcium carbonate being the principal dissolved mineral. It contains very minor amounts of sodium and sulphate and no fluoride.

A test well drilled a few miles east of Fort Huachuca in sutwash at the mouth of Tanner Canyon struck water of unusually low mineral content as shown by analysis 50. As the contents of calcium and magnesium are quite small, it is a soft water. In this respect it would be preferable to the water supply for Fort Huachuca which is obtained from springs. Analysis 51 shows that this spring water is comparatively hard with a rather high content of calcium and bicarbonate, which is very probably derived from limestone of the upper mountain slopes.

On the western side of the valley along the pediment slopes at the base of the Huachuca Mountains samples for analysis were collected from three wells and one spring. The dug well of Mr. L. B. Jordan reached water at 105 feet on the wide gravel covered plain. Analysis 63 shows that the water is of fairly low mineral

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content, calcium carbonate being the principal mineral in solution. The low contents of sodium and sulphate are of interest. About 10 miles farther south the well of Mr. John Dinwoodie drilled on the same pediment plain struck water at 300 feet. Analysis 64 shows that the water contains only 127 parts ~~to a~~ per million of total solids, calcium and bicarbonate being the chief mineral constituents with unusually low sodium and sulphate contents.

Boquillas Spring issues at the base of the mountains with a constant discharge of about ~~twenty-five~~ 25 gallons a minute. Analysis 65 shows that it is a calcium bicarbonate water as would be expected from the presence of much limestone in the nearby slopes.

The ~~A~~drilled well of Mr. Stanley Stoneis reached water in the gravels of the pediment at 315 feet. Analysis 66 of water from this well shows it to be less mineralized than that of Boquillas Spring although similar in composition with calcium and magnesium and bicarbonate as the principal substances in solution. The absence of fluoride from the four samples of groundwater collected along the east side of the Huachuca Mountains indicates that the rocks of this district do not contain appreciable amounts of fluoride-bearing minerals.

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