

Bulletin No. 10

Economic Series No. 5

***University of Arizona
Bulletin***

CHARLES F. WILLIS, *Director*

Gold Placers of Arizona

By FRANK G McCLURE

SECOND EDITION



Entered as second class matter November 23,
1915, at the postoffice at Tucson, Arizona,
under the Act of August 24, 1912. Issued
weekly, September to May.

PUBLISHED BY THE

**University of Arizona
Bureau of Mines**

TUCSON, ARIZONA

1915-16

BIBLIOGRAPHY

- United States Geological Survey Bulletin No. 507.
United States Geological Survey Mineral Resources 1905, 1906, 1907
1908 1909, 1910, 1911, 1912, 1913
Arivaca District—L. C. Friend, "Guigas Placer District."
Greaterville—Hillm, J. M. "Placer Deposits of Greaterville, Ariz."
U. S. G. S. Bulletin No. 430, 1910.
Quijotoa—U. S. G. S. Mineral Resources, Fred W. Fickett, "Quijotoa Placer."
Old Hat District—(Oracle) U. S. G. S. Mineral Resources 1912.
Big Bug District—U. S. G. S. Mineral Resources.
Rich Hill District—U. S. G. S. Mineral Resources.
Le Paz District—Bancroft, H., "Ore Deposits in Northern Yuma County." U. S. G. S. Bulletin No. 451, 1911.
Raymond, R. W. "Mining Statistics West of the Rocky Mountains."
Hassayampa District—U. S. G. S. Mineral Resources 1912.
Carter T. Lane, Mining & Scientific Press, Aug. 10, 1912.
Plomosa District—U. S. G. S. Mineral Resources 1912.
Church, John A., Professional Report on Plomosa District, Dos Cabezas," U. S. G. S. Mineral Resources, 1912.
Pacific Coast Miner, July, 1912.
Quijotoa Mining District Guide Book, by Bascom A. Stevens, 1884.
Greaterville—By Wm. P. Blake, American Geologist, Vol. 22, Oct., 1898.
Le Paz District—Ehrenberg, Herman, "Proc. Cal. Academy of Sciences," Page 163, 1884.
Arivaca District—"Las Guigas Placers," Willis, Charles F. Arizona Magazine, Nov., 1915.

GOLD PLACERS OF ARIZONA

By FRANK G McCLURE

The fame of Arizona as a copper producing state is so great and widespread that sometimes her deposits of other minerals do not receive their due share of attention. It is not very generally known that within the boundaries of Arizona are some of the largest and richest gold placers in the country. The early prospector discovered these placers and worked the richest spots with his pan and rocker. Considerable sums of money have been spent in attempts to develop certain of the deposits but either through mismanagement or unwise expenditure of the money because of insufficient investigation, few of these ventures have paid.

In the exploitation of placer ground the question of an easily available and abundant water supply is important. It is preeminently the great problem in the development of Arizona placers where there is so little rainfall and so few permanent streams. To the man who is able to solve this difficulty with a reasonable expenditure of capital, Arizona gold placers will give up millions of dollars worth of gold.

Experiments with dry washing machines have been carried on for a long time and have shown encouraging results. It may be that some such process will open the wealth of Arizona placers, but so far, dry methods of treating the gold bearing gravels are in the experimental stage. The most successful machines of this type are the Quenner disintegrating machine, which crushes the material to any desired fineness and the Stebbins concentrator. Both of these have been operated on a small scale with good results.

The placer deposits are not confined to one particular section, but are widely distributed, although all of those of importance lie south of the Mogollon plateau. They can best be treated by taking them up individually. The gold taken from the deposits was much greater in the few years immediately following their discovery, for the richest spots were the first to receive the attention of the prospector.

The table below shows the value of the placer gold produced in Arizona from 1903 to 1912:

Year	Yavapai Weaver Dis.	Maricopa, San Do- mingo Dis.	Yuma Plomosa Dis.	Yuma Other Dis.	Pima Quijotoa Dis.	Pima, Greater- ville Dis.	Pinal Old Hat Dis.
1903.....	.....	.....	.....	.....	\$5400	\$1920	\$ 416
1904.....	.....	.....	\$4000	.....	6400	2500	3229
1905.....	\$6273	\$700	829	.....	8992	5003	524
1906.....	9466	300	4754	9695	3000	2826	280
1907.....	11011	800	3532	8471	3800	5000	310
1908.....	6089	787	2732	7013	1504	3101	543
1909.....	6980	694	2136	6212	.....	2200	.....
1910.....	5983	1038	2368	6021	250	2138	.....
1911.....	4803	711	2491	4596	.....	2067	1017
1912.....	4812	543	9472	10967	922	3539	787

About 45 or 50 miles northward from Phoenix lies a placer area of considerable extent, on and near the Hassayampa River. This tract is called the Hassayampa placer, or sometimes the San Domingo placer. The fact that gold was to be found here has been known for a long time, but no serious attempt has been made to work the ground on a large scale. The gold-bearing gravel is found in numerous gulches which lead down from the surrounding heights and in time of heavy rainfall carry the run-off to the Hassayampa River. As might be expected, the values are higher in the lower parts of these gulches and the many test pits which have been sunk show that one must look for the gold near bed rock. As one proceeds up the gulches, the values rapidly pinch out, and the width of the "pay dirt" narrows until at the upper ends, there are relatively far apart and it will be seen that the available tonnage of gold bearing gravel is small, too small to justify the installation of an expensive hydraulic plant or a dredge. Such ground must be left to the lone prospector with his pan and cradle.

This conclusion, however, does not apply to all of the placer ground in that section. There is one piece of ground extensive enough and rich enough to permit a thorough investigation. The tract referred to is the group of claims known as the Lotowana mine. It consists of about 4000 acres situated in a rolling country, which is cut up by numerous washes down which the water runs in torrents after each rain. The water courses are so steep that the water soon runs off, and would interfere but little with mining operations.

The property was found a few years ago by John Sanger, who noticed a few Mexicans here and there drywashing the rich spots, but recovering but a small part of the gold. Sanger saw the possibilities, and instead of trying to work the ground himself, he devoted his time to acquiring title to this group, now known as the Lotowana mine. At the present time, it is only a question of interesting capital in the venture, and this should not be a difficult matter.

The deposit of gravel is in the midst of a highly mineralized section. The country around is traversed by a large number of quartz veins, many of which run high in gold. Undoubtedly the gold of the placers has been the result of weathering in these veins and the transportation of the weathered material down the slopes. Unlike the smaller gulches, the richest part of the gravel bed in the Lotowana group is not at bed rock, but in the test pits which have been sunk, good values have been found from the grass roots down. Apparently the gold has been deposited very gradually, and there has not been a concentration of it on bed rock, as is the usual case in placers that have been formed by swift flowing rivers. The particles of gold are very angular, showing that they have not been transported far, and there is practically no float gold; therefore the percentage of recovery in washing operations should be high. The fineness of the gold is "900" and over.

The material in which the gold occurs is remarkable for the almost total absence of clay. It is an easily disintegrated, more or less sandy material, and there are but few big boulders. Near the Hassayampa river, the thickness of the bed increases, and is partly solidified, owing to the infiltration of lime, but since there is a large tonnage of easily available material, this part of the deposit need not be touched for a long time.

The bed rock underlying the gravels and sand is relatively soft and would be easily workable to recover the gold which has probably penetrated the upper few inches of it.

Roger's Wash, which forms a part of the Lotowana group, is about 2 1-2 miles long, has an average width of 1000 feet and an average depth of nine feet, and is estimated to contain approximately 4,395,600 cubic yards. This part of the tract has been thoroughly tested, and the average value from many test pits has been 40 cents per cubic yard.

Various estimates of the cost of hydraulicking this material have been made. In the *Mining & Scientific Press* of August 10, 1912, Mr. T. Lane Carter estimated the cost of 10 cents per cubic yard. Even should the cost be more than this, capital invested in this proposition should realize a good return.

The great initial problem to be solved is that of securing an ample and constant water supply. Two solutions to this are obvious to those familiar with the country and conditions. A reservoir might be built and rain water stored for use during the dry seasons. A good drain site is available for this purpose, and it is in such a position that a supply of water could be impounded, sufficient to insure the working of the proposition for seven or eight months of each year. The water could be delivered to the ground by gravity. There are placers in Alaska no richer than the Hassayampa which work half as long each year and yet pay well. The second possible source of water is the Hassayampa river. Water could be obtained either by pumping or by building a dam across the river far enough up that the water could be brought down by gravity. While this scheme is more ambitious and expensive, it seems to be entirely feasible. The dam would supply water, not alone for the placer operations, but for irrigation purposes on the farming lands nearby.

The entire project is so promising that it at least deserves more than a cursory examination.

The Rich Hill district is also in Yavapai county not far from the Hassayampa district. Properties to the extent of 6700 acres of placer ground have been located under the name of the Rich Hill Placer Co. This ground extends down Antelope creek and over a mile back on either side. The district shows considerable promise and may prove to be valuable. A dam site was surveyed in 1914, and plans for hydraulicking perfected, but up to date little has been done toward beginning actual operations.

In the southeast corner of Pima county is located what is considered the largest and richest placer deposit in southern Arizona, if not in the state. The Greaterville district embraces an area of a little more than eight square miles, in the midst of which area is the little camp of Greaterville. It is about 35 miles from Tucson.

Placer gold was first discovered at Greaterville in 1874 by a prospector named Smith. A rush to the camp resulted, and the deposits were worked more or less thoroughly by two hundred or more men until 1878. The gravels were worked in those days by the rocker and long tom, the scarcity of water making more elaborate methods impracticable. Notwithstanding the fact that water had to be carried four miles on burros from Gardner Canyon, the output for each man was ten dollars or more a day. But by 1881 the richer gravels had been worked over, wages became lower and numbers of the men left

the camp, discouraged also by the hostility of the Indians. By 1886 the placers were considered worked out, and from that time to 1900 the camp was dead.

Interest in Greaterville was revived in 1900, due to the expenditure of the Stetson Company of a large sum for the installation of a hydraulic plant. However, after working a few months, operations were suspended.

By 1905 the Santa Rita Water & Mining Co. had acquired title to a large tract of the ground and had begun operations with extensive equipment, including eight or ten miles of ditch and pipe lines. The water for the operations was obtained by a system of dams constructed in the canyons roundabout for the purpose of impounding rain water. For a time hydraulic operations were conducted with profitable results, but the death of Mr. Stetson and of Mr. McAvery, the manager and backer, caused operations to be suspended, and work has never been resumed.

One company installed a steam shovel, screens, and a conical concentrating tank in Empire Canyon, but after working for a time it was found that the pay dirt was not rich enough to warrant the removal of the 16 feet or more of overburden, and the effort was abandoned.

Recently there has been a revival of activity in the district. Considerable areas are being prospected and developed and the installation of dredges and other machinery for working the deposits is contemplated. In October, 1914, it was reported that the Greaterville Dredge Gold Mining Co. had acquired 1100 acres of the placer ground, which they had thoroughly prospected, and were now planning to dredge. Much of the ground is said to average 90 cents per cubic yard and the dredge is expected to handle 2000 cubic yards daily. The water for floating the dredge and for washing the gravels is to be supplied from several wells to be sunk on the property.

Various estimates have been made on the amount of gold which the Greaterville placers have produced since their discovery. It is known to be large and Mr. P. J. Coyne estimates the total production up to date at \$7,000,000. He may have included in his estimate the production of certain nearby lode mines.

The Greaterville placer area lies at the east base of the Santa Rita mountains, sloping to the east. The area is deeply dissected by steep-sided arroyos, washes and gulches which render traveling difficult except along the main drainage channels. There is but little surface water and therefore sluicing must be restricted to the few

weeks of the rainy season. Dams for storing rain water would lengthen the period of operation.

The deposits consist of gold-bearing gravels, irregularly distributed, occurring chiefly in the bottoms of the present stream courses and gulches, and also upon the benches, slopes and tops of the ridges, where some of them seem to represent deposits in old stream channels. The deposits consist for the most part of a 2-foot bed of gravel which rests upon the bed rock, and is overlain by an overburden from one foot to 20 feet in thickness. In certain places the upturned, irregularly eroded edges of the underlying sedimentary beds have acted as natural riffles, behind which the gold has been concentrated.

The gravels of the gold bearing bed are generally small, although in some places cobbles up to eight inches in diameter occur. In a few parts of the deposit the material is slightly cemented with lime, but not strongly enough to interfere with hydraulic operations. The gravels rest in most places in a red-brown clayey matrix, which is handled without difficulty by hydraulic methods.

The gold is mostly coarse and easily recovered by ordinary methods of sluicing. In the early history of the camp the finding of nuggets running from one dollar up to fifty dollars was of common occurrence. The largest nugget reported from the district had a value of about \$630. Of course these nuggets were much sought after, and now there are very few reported.

The gold of the gravels in all probability came from the slope of the Santa Rita mountains as a direct result of the weathering and erosion of the many gold bearing quartz veins with which the east slope is intersected. By continued washing and transportation the gold was concentrated in the present gravel beds.

There is a considerable difference of opinion among mining men in regard to the amount of gold remaining in the Greaterville placers. While the richest portions have been worked over to a considerable extent, it is certain that there still remains great riches in the lower grade gravels. Some men have estimated the gold in the part which is well known at \$50,000,000. Mr. E. Ezekiel, a mining engineer of Tucson, who is familiar with the ground and who has made a very complete examination of the district, believes that there is \$100,000,000 still remaining to be sought for. It is probable that workable deposits occur in the deeper gravels of sections which are only just beginning to be exploited.

Dredging operations are feasible in the district, and also hydraulicking, if an ample supply of water can be obtained.

Pima county is fortunate in the matter of placer ground, for within its borders are three important districts. The second of these areas lies about 70 miles west of Tucson in and near the Quijotoa mountains. It extends south into Mexico and for hundreds of years has been worked by Indians and Mexicans.

The occurrence of the gold in this area is peculiar in one way. Not only is the gravel and sand in the surface layers gold bearing, but the hard strata of caliche underlying these gravels also carry gold values. In fact, the caliche is richer than the dirt above it.

Hydraulic mining of the Quijotoa placer is not so feasible as it is in some of the other placers, and the future of this district seems to be more or less intimately connected with the success or failure of dry washing methods. The Indians work the dirt and the softer part of the caliche by digging it out, pulverizing it by beating it in a rawhide bag, and then separating the gold with their hand machines or pans. While miners have made some attempts to work these grounds and have been unsuccessful, principally because they have been unable to pulverize the caliche in large quantities and do it cheaply. Even if this were possible, the scarcity of water would necessitate a machine for separating the gold from the pulverized material which did not require much water for its operation.

A great deal of experimentation has resulted from attempts to work placer ground without water, and it would seem that the efforts of the experimenters were meeting with some degree of success if one may judge by the reports which have been coming in. For pulverizing caliche and similar material a machine called a "Quenner" has been invented and tried out. It has been set up on the Quijotoa placer and is said to be able to pulverize thirty tons of caliche per hour, with a consumption of two gallons of gasoline.

The best form of dry separation so far tried is the Stebbins table, one of which has been working successfully for some time at the Arivaca placer. With a combination of the "Quenner" and the Stebbins table, the Quijotoa placer should develop into a profitable enterprise. Together, they require but a few men to operate, and the initial cost is not great.

The third placer of importance in Pima county is located about 60 miles southwest of Tucson in the Arivaca Valley. The tract includes 4200 acres of placer ground which lies between Guigas creek and the Guigas mountains. It is from these mountains that the placer receives its name, the Guigas placer. On the north side of the mountains the ground consists largely of mesa land, but also in-

cludes a number of gulches on the slope of the Guigas hills. On the southern slope there is no mesa land; here the gold-bearing material consists of heavy deposits of gravel lying in large basins and wide arroyos.

It is thought that this deposit is due to glacial action in some past period of geologic history, and this theory is borne out by the fact that the pebbles and particles of gold are rough and angular, showing but few signs of water action. The gold is of local origin, having come from the veins on the hills above, of which there are large numbers of all sizes, showing free gold in their outcroppings. The prominence of quartz in these veins is so marked that they give the name "Guigas," meaning quartz, to the mountains.

Over the mesa tract the average depth of the gold-bearing material is about one yard, while in the several large gulches the average depth is eight feet with a width of from 50 to 200 feet. On the southern slope the deposits are deeper, the gold-bearing material occurring more in patches, but the total gold content of the southern slope will probably equal that of the northern.

For the past fifty years these placers have been worked in a desultory manner by Mexicans and Indians during the rainy season. There are thousands of prospect holes on the tract, and while these mean that some gold has been removed, relatively the quantity is small. The holes are of much value in determining the value of the placer. Fifteen hundred tests made by L. C. Friend, who controls a large part of this tract, showed an average value of about one dollar per cubic yard. Very recently a clean-up was made, using the V. V. Clark "gold saver," a placer machine especially adapted to working ground where water is scarce, and an average value of \$1.19 per cubic yard was realized.

Investigation has proved that the Arivaca placer can be worked by hydraulic methods, although, owing to the difficulty of getting water to the ground, the first cost would be considerable, and the running expense would be higher than is usual in hydraulicking. The dry washer, if it proves to be successful, will probably be the most feasible way of working the placer. Recently the New Venture Gold Placer Co. has been organized for the purpose of exploiting the Guigas placer, and this company contemplates using the dry washing methods.

The Dos Cabezas placer field was discovered in 1901 by some Mexican prospectors. This placer covers a tract of several thousand acres, and at the time of discovery caused a great deal of interest throughout the country, but owing to the scarcity of water, only the richest portions have been worked. Certain parts of the deposit are

known to run from \$1 to \$6 per cubic yard, and the tract as a whole has been estimated to run 57 cents per cubic yard. Just how much dependence may be placed on this estimate cannot be stated, for the test pits sunk have been insufficient to give anything like an accurate idea of the value. The gravel is mixed with some clay, which would make the working more difficult, although if water were plentiful, this difficulty would be overcome—here, as in so many of Arizona's placers, dry washing seems to be the only solution.

The Plomosa mining district, lying east of the Colorado river in Yuma county, is situated in the Posas Valley, a great north and south depression, with the Plomosa mountains forming the eastern border and the north extension of the Castle Dome range, the western. Posas Valley trends northward 30 or 40 miles and is from 10 to 15 miles wide. It slopes to the north and forms a very extensive field. On the eastern side of the valley is the Plomosa placer and on the western side are the extended deposits of gold-bearing gravel known as La Cholla, Oro Fino, and Middle Camp. In some places pits have been sunk as deep as 50 feet or more to beds of cement, which are often richer than the gravels. Miles of the great deposit extending westward from the mountains, and from three to four miles in width, have been cut into by floods from the mountains, forming deep ravines, with miles of banks from ten to fifteen feet high, in which the upper layer of gravel is well exposed. From these banks, so far as investigations have been made, samples gave an average return of value of 64 cents per cubic yard, with gold at \$18 per ounce. The samples range from 42 cents to \$1.04 per cubic yard. John H. Church, in a professional report of tests he had made on the property, stated that a dry washer was used for the tests, and an area 2400 feet long, 1500 feet wide and 8 yards deep gave the values mentioned above.

Across the valley about 12 miles from the Plomosa placer is another bed of gravel of similar extent, and of high quality. There are three camps located in this area—Middle Camp, the most northerly, has granite gravel; Oro Fino, in the center, has much porphyritic slate, and La Cholla, at the south, is mostly composed of quartzite and schist pebbles. At La Cholla, which is much nearer the mountains, there is a siliceous cement, very rich, but also so very hard that it has to be broken by powder before going to the dry washer. At Oro Fino the shale bed rock is very near the surface. In Middle Camp there is a cement, but it is much softer than at La Cholla.

Middle Camp is the chosen locality for the individual dry washer, who can take his machine to some point where bedrock can be reached easily. It is here that the rich seams of gravel on the bedrock yield from four to ten times the value of the thicker gravels, and in crevices there have been found nuggets worth from ten to twenty-five dollars. La Cholla, south of Middle Camp, lies along the foot of the mountains like Plomosa, and is three or four miles in length. The depth of the gravel is irregular from Middle Camp through Oro Fino to La Cholla.

Forty years ago the Colorado River was the main gateway to Arizona on the west, and freight entered that way for many years. The value of the placers was known to the miners who, in that early day, passed over all the region adjoining the Colorado, but the almost total absence of water in the mountains compelled the miners to pack their rich dirt to the river to be washed. Oro Fino was the most celebrated camp of that day. There the soft shale bedrock rises to the surface, and after the art of dry washing was learned, this rich bedrock was the scene of active work. Much of it has been washed and reworked many times.

Surrounding the post office of Quartzite, in the Plomosa mining district, and extending in every direction covering an area of about 7500 acres, is found placer ground, with values to an average depth of 15 feet. The gold content per cubic yard is reported to average in coarse gold from ten cents to several dollars. Efforts are being made to get a combination of equipment which will successfully work the desert gravels and gold-carrying cement gravels at a minimum cost. At a point south of Quartzite and 17 miles north of Ehrenberg, on the Colorado river, a reduction plant capable of handling 2000 cubic yards of gravel every 24 hours was reported (1912) under construction. The machinery was to consist of a Barrett dredge, a Quenner disintegrating machine and a Stebbins concentrator.

The placer deposits near the Dome Rock mountains in Yuma county were among the earliest discoveries in central western Arizona. In the LePaz district the dry placers lie in Ferra, Garcia, Ravenna and Goodman gulches, about nine miles northeast of Ehrenberg. The gravel is more or less enriched throughout, but the greater values are found on bedrock. Beach gravels form the largese part of the deposits, which are reported 50 feet deep and are said to average \$1.50 per cubic yard in coarse gold. The largest nugget

found in this region was valued at \$1,150 and assayed about \$870 in fineness. One of the companies has a reservoir and preparations were under way in 1912 for a hydraulic plant which would be supplied with water from the Colorado river. A Newkirk was to be used to elevate the gravel to sluice boxes.

An area of 25,000 acres in the Old Hat district, Pinal county, situated from four to ten miles south from Oracle postoffice and about 20 miles north of Tucson, is found to contain valuable dry placer gravels, which have apparently been deposited at intervals by floods from the Santa Catalina mountains. These gravels are of nearly equal value from surface to bedrock, there being no pronounced accumulation of heavy gold except in the stream, Canado del Oro, which passes through the region. The bed of dry gravel is from six feet deep at the creek side to 250 feet at the summit, with an average thickness of about 150 feet. The deposit is in general a loose gravel, uncemented. There are, however, alternating strata of deep red, clayey material, which are of uniform thickness of three to four inches, and were probably deposited by floods, each being covered by a later flow of gravel, caused by rainfall eroding veins farther up the mountains. Shafts sunk on the hillsides to 50 feet in depth show values from 10 to 42 cents per cubic yard. The average is difficult to determine, as the gold is not evenly distributed. All the gold found is in well rounded nuggets, ranging from 50 cents to \$5 in value. There is a tradition of a lump weighing 16 pounds, with probably 40 per cent quartz, whose discoverers were found murdered in their camp 16 miles north of Tucson. The nugget had disappeared. In fineness, the gold averages about 0.905.

Generally the placer material is dry screened and hauled to the creek, there being washed by rockers, or sluiced when there is water enough. Many dry washers have been tried, but most of the gold lies in the red, clayey seams which apparently acted as bedrock for each period of deposition. Pulverizing this adherent material gives good results with the common bellows type of "dry wash." A boiler and pump were once used to throw water against the creek bank, but the water at that time proved insufficient for extensive operations.

While the placer districts described in this paper include those of greatest extent, and those which give the best promise for operation on a large scale, it must not be thought that there are no other placer deposits. Scattered all over the southern part of the state are many smaller areas which yield placer gold. Often the pay dirt lies in a

single small gulch and the gold in it can be traced to some one vein which outcrops farther up the mountain. Such placers as there are workable only by the individual miner with his pan or cradle. It very often happens that these small areas yield richly as long as they last.

The great possibilities of placer mining in Arizona, however, lie in the extensive deposits herein described in more or less detail. The one who can devise a way to work the great quantities of material in these areas and do it cheaply, will be rewarded with an abundance of the precious gold.