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DEPARTMENT OF  
HEALTH, EDUCATION, AND WELFARE  
Public Health Service  
Division of Indian Health

REPORT ON  
ENVIRONMENTAL SANITATION SURVEY  
AND  
PUBLIC HEALTH SERVICE SANITATION PROGRAM

FORT APACHE INDIAN RESERVATION

Whiteriver, Arizona

May 1958

Prepared by  
Sanitary Engineering Branch  
INDIAN HEALTH AREA OFFICE  
Phoenix, Arizona

## FOREWORD

The following report has been prepared to set forth the findings of a sanitary survey conducted by the U. S. Public Health Service on the Fort Apache Indian Reservation, and is intended to show sanitary conditions as existing on that reservation early in 1958. The house-to-house visits to secure the basic field data were made by the Public Health Service Sanitarian on the Reservation, Mr. Arnold Wehausen. This data, plus supplementary material secured from the Bureau of Indian Affairs, U. S. Census Reports, and other sources, was assembled and the report prepared by the Sanitary Engineering Branch of the Indian Health Area Office in Phoenix.

The assistance of the following officials is acknowledged with thanks: Dr. Daniel I. Yale, Medical Officer in Charge of the PHS Indian Hospital, Whiteriver; Mr. Albert Hawley, Superintendent of the Fort Apache Reservation; and Mr. Erich A. Schultz, Program Analyst at the Indian Health Area Office.

The first two sections of the report are intended to give the reader background material about the tribe and the reservation, and the results of the survey itself are presented in the succeeding sections, together with our conclusions and recommendations.

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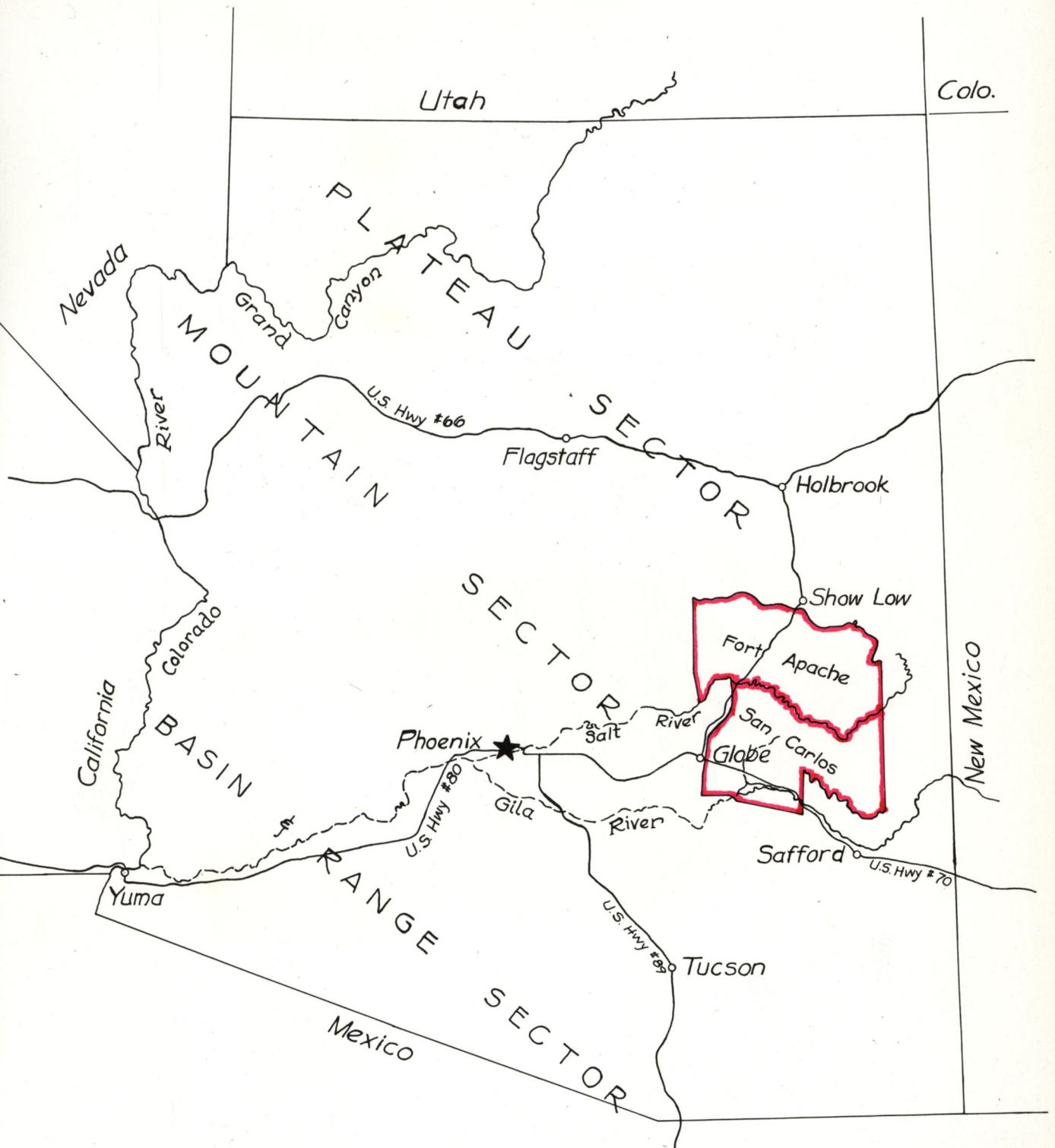
## THE RESERVATION AND ITS RESOURCES

The Fort Apache Indian Reservation, located in east central Arizona, has a total area of 1,664,800 acres (2,601 square miles), with a reach east and west of 75 miles, north and south of 45 miles. Almost the entire southern border is contiguous with the San Carlos Apache Reservation, the Black and Salt Rivers forming the boundary line. The reservation was established by Executive Order of President Ulysses S. Grant on November 9, 1871, and is legally denoted the "White Mountain Apache Reservation". By an Act of Congress, on June 7, 1897, the present San Carlos Reservation was separated from the former larger reserve, and an independent agency was established for the Fort Apache portion. Fort Apache itself was established as an army post in 1870, with two troops of cavalry, totaling 200 men. In 1922, the fort was abandoned and the Theodore Roosevelt School was organized on the site. The old parade ground is now a playground for the Indian pupils, and some of the former quarters are now used as housing for the faculty, including one dwelling used by General Crook in the 1870's.



Figure 1. Theodore Roosevelt Day School

Topographically, the region is one of rugged mountains in the northeast, broken country in the center, and semi-desert in the southwest. From a low elevation of 2,700 feet in the southwest, the land rises irregularly to a high of 11,460 at Old Baldy on the eastern edge of the reservation.



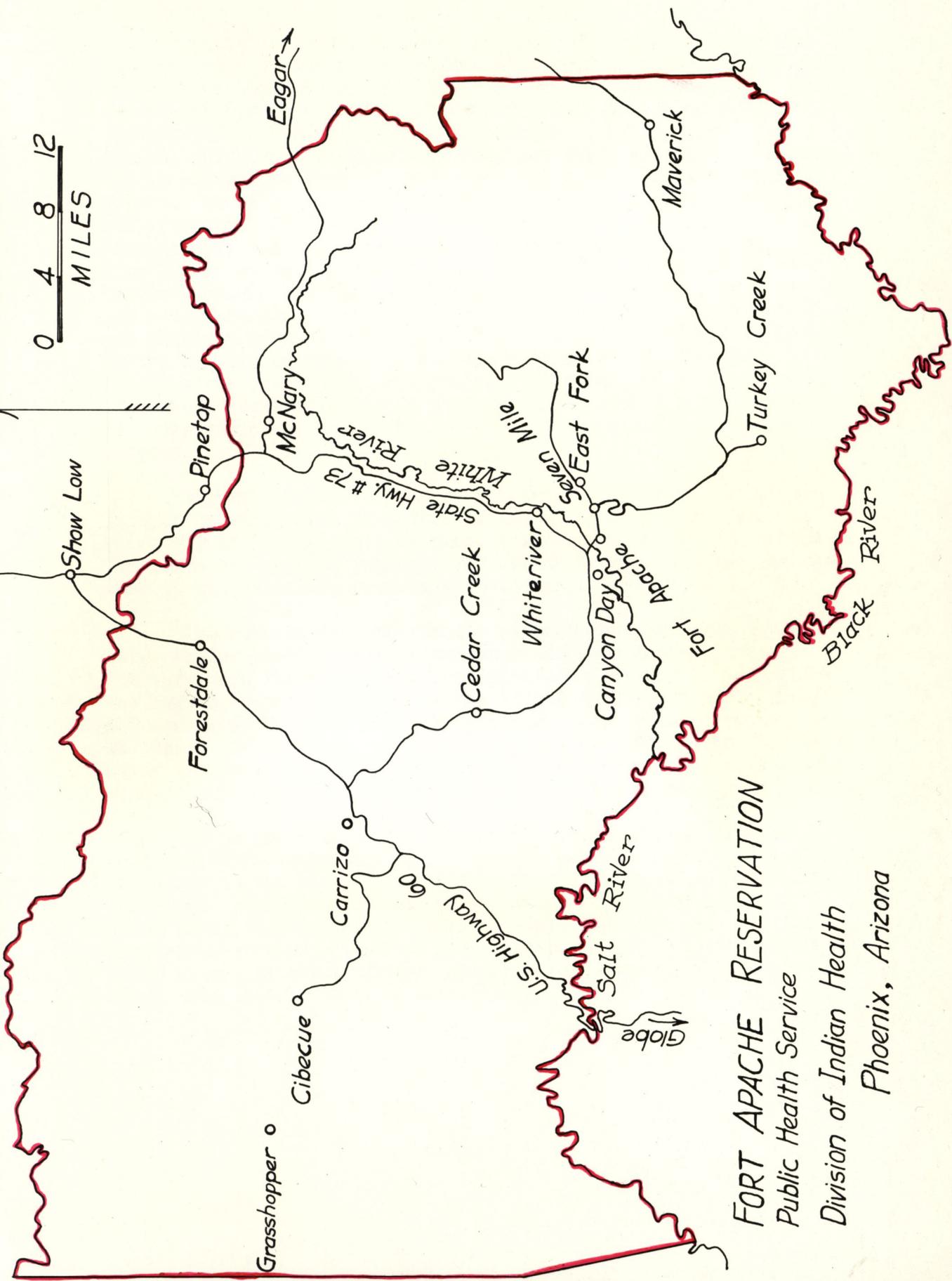
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Phoenix Area Office, Division of Indian Health, U.S. Public Health Service

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**FORT APACHE RESERVATION**

Public Health Service

Division of Indian Health

Phoenix, Arizona

On the reservation there are 453,000 acres of commercial forests (with 2 billion board feet of timber standing) and 338,000 acres of non-commercial forests. The bulk of the commercial trees are in the 6,000' - 10,000' elevation zone. Of the commercial timber, 70% is Ponderosa pine, the remainder being cork-bark, alpine, white, and Douglas firs, Mexican white and Chihuahua pines, and at elevations above 8,000' some pure stands of Colorado blue spruce. About 40 million board feet of lumber are cut annually and after the 10% deduction for administration required by Federal regulations, the tribe realizes an average of \$450,000 per year from lumber sales. A tribal venture, the Fort Apache Wholesale Lumber Company, operates a sawmill at Whiteriver, employing 55 men and processing Ponderosa pine, Inland Douglas fir, white fir, and Engelmann spruce. There are about 600,000 board feet of lumber drying at any one time. An average of 230 forest fires have to be fought every year on the reservation, some caused by man, most by lightning. Extinguishing is done by Apache fire-fighters under the supervision of 8 technical and 8 non-technical forestry employees.

Eighty per cent of the reservation is covered with pinon-juniper growth, which is a weed taking up space and moisture which should be available to grasses and other browse for cattle. The tribe has begun a juniper eradication program and has cleared over 98 square miles, returning it to range land.

The reservation experiences violent thunderstorms during July, August, and September, and snow and rain during January, February, and March. Annual precipitation averages 22 inches for the region, varying from 15 inches on the Salt River to 36 inches and more near Mount Baldy. The growing season varies from 131 to 157 days. Temperatures range from a high of 105° F along the Salt River in the southwest part of the reservation during the summer months to a low of -24°F in the mountains on some winter nights.

Crops grown (all by irrigation) include: corn, fruits, beans, alfalfa, oats, squash, and truck garden vegetables, and cane. There are in the vicinity of 18,000 head of cattle and horses on the range. When the Indians were settled on reservation land, about 1872, they were encouraged to claim small tracts of tillable land along streams. Most of these tracts have remained in Apache hands since, although through heirship they have often been divided down into  $1\frac{1}{2}$  to 30 acre portions.

Minerals represent a considerable potential in the development of the economic status of the tribe. There are significant deposits of asbestos, manganese, iron, gypsum, and coal, as well as some uranium toward the west end of the reservation. There are currently 8 leases operating for the mining of asbestos. An estimated ten million long tons of iron ore are awaiting development in the Chediski-Canyon Creek area.

While there are 575 miles of roads and trails on the reservation, only three routes are paved: the highway from Show Low south through Whiteriver to Canyon Day, the Indian Pine - McNary road, and U.S. 60 which traverses the reservation from Salt River Canyon to Forestdale and Show Low.

Currently under construction is a project to make an all-weather highway out of the present road from Canyon Day through Cedar Creek to U.S. Highway 60. The nearest railhead is at Holbrook, 88 miles north of Whiteriver.

The tribe, with the guidance of the Bureau of Indian Affairs, has made a strong effort in recent years to develop the recreation potential of the mountain area in the eastern portion of the reservation. Over 300 miles of excellent trout streams are available and the pleasant environment makes this area a haven for many non-Indians from Phoenix and Tucson during the summer months. More than 650 improved campgrounds have been established, using funds derived from the sale of hunting and fishing permits. Hunting draws many people to the reservation, adding considerably to the cash income of the Indians. Game animals on the reservation include elk, deer, bear, mountain lions, javelina, fox, coyote, badgers, squirrel, rabbit, as well as various birds.

## THE WHITE MOUNTAIN APACHE TRIBE

The Indians now living on the Fort Apache Reservation are a portion of the "Western Group" of the Apache Nation, being closely related to the San Carlos Apache to the south. They are descended from the same ancient Southern Athapaskan stock and their present way of life is similar to that of the San Carlos.

There are three bands represented on the Fort Apache Reservation: the White River, Cedar Creek, and the Cibecue, the latter in the far western side of the reservation. The bulk of the population lives in settled communities, all of which are on or near rivers. In the following analysis of the sanitary conditions found, we have grouped all of the homes into the following districts: Whiteriver, North Fork, East Fork, McNary, Cedar Creek, Canyon Day, Seven Mile, and Cibecue. As can be seen in Figure 2, the houses are scattered out and are not built up into the usual crowded pattern of a non-Indian community in Arizona.



Figure 2. A View of the Community of Canyon Day

The current Tribal Census Roll was analyzed by Mr. Erich A. Schultz and Mr. W. C. Gilbert, both of the Phoenix Area Office, and, taking into account births and deaths since the census, the analysis produced Table I, showing the age distribution of the members of the tribe. The number of Indians with whom our sanitation program is concerned (reservation Indians only) is 3,440.

TABLE I

Age Distribution of Fort Apache Enrolled Indians  
As of 31 December 1956

Age Group	Fort Apache Enrolled Indians, by Sex				Ratio: Males Per 100 Females
	Total		Male	Female	
	No.	%			
TOTAL	4,537	100.0	2,335	2,202	106.0
Under 5	602	13.3	312	290	107.6
5-9	675	14.9	334	341	98.0
10-14	516	11.4	252	264	95.5
15-19	448	9.9	211	237	89.0
20-24	470	10.3	232	238	97.5
25-29	356	7.8	176	180	97.8
30-34	285	6.3	156	129	120.9
35-39	261	5.7	130	131	99.2
40-44	179	3.9	105	74	141.9
45-49	185	4.1	105	80	131.3
50-54	146	3.2	82	64	128.1
55-59	130	2.9	80	50	160.0
60-64	81	1.8	50	31	161.3
65-69	77	1.7	44	33	133.3
70 & +	126	2.8	66	60	110.0

Table II is presented to afford a comparison between the median age of the Fort Apache Reservation Indians and that of the United States as a whole. (1) The fact that the Indian age distribution corresponds with that of the U.S. as of a time shortly before 1900 is one indication that the Apaches still have a high infant mortality rate.

The median age, from Table I, is 20 years, 3 months (20 years, 11 months for males; 19 years, 5 months for females). Roughly 13% of the population is under age 5; and additional 36% is in the age group 5 through 19. Less than 5% of the Indian population is age 65 and over. It is interesting to note that the median age of the San Carlos Apache tribe is 20 years and 5 months.....only two months difference.

(1) Current Population Reports, "Population Estimates", series P-25, No. 121, 27 September 1955, Bureau of the Census.

TABLE II

Median Age, U.S. Population, At Census Dates  
Since 1900 and for 1 July 1955

<u>Year</u>	<u>Median Age (Years)</u>
1900	22.9
1910	24.1
1920	25.3
1930	26.5
1940	29.0
1950	30.2
1955	30.1

Distribution of population on the reservation, according to districts, was found by Mr. Wehausen to be as follows:

TABLE III

Distribution of Indian Population, by Districts

District	Population		Distance from Whiteriver*
	<u>Number</u>	<u>Percent</u>	
Total	3,440	100.0	
Canyon Day	435	12.6	6
Cedar Creek	315	9.1	13
Cibecue	750	21.8	34
East Fork	373	10.9	3
McNary	234	6.8	18
North Fork	153	4.4	8
Seven Mile	377	11.0	4
Whiteriver	803	23.4	--

\*Airline: farther by road

Records for admissions into the hospital at Whiteriver were examined and gave the following number of cases of communicable disease of sanitary significance, from the year 1952 through August 1957. A change was made in the reporting procedure beginning with the calendar year 1957 and in the revised report, provision was made for enumerating cases of gastritis. This is the reason for the high number of cases reported where none were reported previously.

TABLE IV

Reported Cases of Selected Communicable Diseases  
Admitted to Whiteriver Hospital, Jan. 1952 - August 1957

<u>Disease</u>	<u>Calendar Year</u>					
	<u>1952</u>	<u>1953</u>	<u>1954</u>	<u>1955</u>	<u>1956</u>	<u>1957*</u>
Tuberculosis, All Forms	14	11	13	18	25	16
Syphilis	23	17	7	1	2	1
Gonorrhoea	10	25	48	37	28	12
Dysentery, bac. & amoeb.	353	119	0	2	6	2
Gastritis***	NR**	NR	NR	NR	NR	545
Poliomyelitis	1	0	0	0	0	0
Trachoma	22	0	10	13	141	2
Influenza	27	307	0	126	NR	NR
Pneumonia	34	140	57	38	71	287
Smallpox	3	0	0	0	0	0
Infectious Hepatitis	0	0	4	3	14	3

\*Through 31 August only

\*\*No Report

\*\*\*Excluding newborn

A break-down of the reported cases of dysentery by months shows the following cumulative monthly totals, 1952 to Aug. 1957:

TABLE V

Total Cases of Dysentery, by Months, 1952 - Aug. 1957

<u>Month</u>	<u>Number of Cases</u>	<u>Percent of Total</u>
TOTAL	482	100.0
January	13	2.7
February	15	3.1
March	19	4.0
April	31	6.4
May	51	10.6
June	74	15.4
July	125	25.9
August	41	8.5
September	52	10.8
October	32	6.6
November	22	4.6
December	7	1.4

The inordinately high annual morbidity rate for reported cases of gastritis at the PHS Indian Hospital (21,000 cases per 100,000 population) can, to a large degree, be attributed to the faulty environment in which the Indians live. The rise in case rates for dysentery shown in Table V indicate that this disease also is influenced by poor sanitation, as the rate increases with the coming of warm weather and subsides after September and October. The high rates appear to be caused in a large part by the prevalence of house flies and by the lack of refrigeration for milk, meats, and other perishables.

A Tribal Council was organized under the Indian Reorganization Act of 18 June 1934. There are, at present, 10 members - 9 from the districts, 1 from the reservation at large.

A Tribal Court was established in 1940, with one chief judge and two associate judges. All but ten major crime categories (which are tried in Federal court) are handled by the Tribal Court. A Special Officer, assisted by 10 Apache policemen, maintains order. Figure 3 shows the Tribal jail, operated by BIA for the tribe.



Figure 3. Jail at Whiteriver

In the field of welfare work, assistance to the Indians before 1946 was limited to the dispensing of food. In July of 1946, the tribe began making cash payments to indigent Indians. In August of 1956, the flat grant system was replaced by a more modern system, using budgetary control methods, the program being administered by a professional social worker operating under the supervision of the Reservation Superintendent, with salary paid from tribal funds. Beginning in 1951, public assistance funds became available to those Indians eligible through age, blindness, or their status as dependent children (orphans).

A very popular rodeo is held at Whiteriver every September (see Figure 4). Each year, exhibits are prepared by various groups, including a health exhibit set up by personnel of the Public Health Service on duty at Whiteriver.



Figure 4. Rodeo Grounds at Whiteriver

In the 1890's and early 1900's, prize cattle were brought up from Mexico and herds established on the reservation. One herd was set aside so that its income could be used to support aged Indians. In 1950, when their care was transferred to the Welfare Program, the "old folks' herd" reverted to the tribe. An annual income of approximately \$100,000 was realized from the herds during the years from 1942 to 1951, at which time a national drop in beef prices lowered the income for the Apaches.

Education on the reservation began in 1892 in a vacant barracks at Fort Apache. Thirty Indian pupils enrolled, and education was limited primarily to the teaching of English. At present, there are some 1,237 Apache children in school. Three BIA schools, two mission schools, and three public schools operate on the reservation: 42% of the children attend the public schools, 36% BIA, and 22% go to mission schools. The Tribal Court enforces the attendance of all children between the ages of 6 and 18. In 1956, the Tribal Council began a scholarship program through which those members of the tribe who want education beyond high school may secure it.

## HOUSING

There are two obvious types of houses on the reservation: the frame dwelling and the "wickiup", or brush shelter. The latter are shown in Figure 5, these being in the East Fork District.



Figure 5. Wickiups in the East Fork District

This dwelling is fashioned very quickly from inexpensive materials. A framework of saplings is first formed in a circle, with the tops subsequently drawn together, and a veneer of yucca fronds or other indigenous wild long-leaved plants fastened to the framework. The resulting enclosure is often covered on the outside with cowhides, corrugated iron sheathing, cardboard, or tarpaper. A rather recent improvement has been introduced, the adding of a conventional door with a small board entry-way.

Heating is done by a small campfire built in the center of the interior of the wickiup. Smoke escapes through the top of the dwelling, as may be seen in Figure 5. This fire is used for cooking as well as heating.

In a previous survey (October 1957) it was found that the wickiup type of dwelling comprised 2.5% of the housing on the San Carlos Reservation. A marked difference is found on the Fort Apache Reservation, where 25.4% of the homes are wickiups (Table VI). The remaining homes are frame buildings (71.4%) and tents (3.1%).

TABLE VI

District	Type of Housing, by Districts							
	Frame		Block		Wickiup		Tent	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Reservation	441	71.4	1	0.1	157	25.4	19	3.1
Canyon Day	64	73.0	0	---	24	27.0	0	---
Cedar Creek	33	60.0	0	---	21	38.0	1	2.0
Cibecue	59	44.0	0	---	57	43.0	18	13.0
East Fork	51	77.0	0	---	15	23.0	0	---
McNary	40	100.0	0	---	0	---	0	---
North Fork	25	89.0	0	---	3	11.0	0	---
Seven Mile	54	70.0	1	1.0	22	29.0	0	---
Whiteriver	115	88.0	0	---	15	12.0	0	---

A comparison of the number of rooms per dwelling on the reservation with that found in non-Indian homes in Arizona<sup>(1)</sup> indicates to a certain extent the degree of over-crowding to be found. Table VIII gives the information by districts on the Fort Apache Reservation.

TABLE VII

Comparison of Occupancy Rates,  
Fort Apache Indians Vs. State of Arizona

<u>No. Rooms</u>	<u>Fort Apache Indian Housing Units</u>		<u>State of Arizona</u>
	<u>No.</u>	<u>Percent</u>	<u>Percent</u>
Total	618	100.0	100.0
1	292	47.2	7.0
2	175	28.4	13.1
3	83	13.4	20.4
4	49	7.9	25.3
5	16	2.6	19.6
6	2	0.3	9.9
7	1	0.2	2.8
Over 7	0	---	1.9

(1) "Housing Conditions Among Reservation Indians, United States, 1950", Vital Statistics Section, Branch of Health, BIA, 9 May 1955.

TABLE VIII

## Number of Rooms Per Dwelling, By District

District	One-Room		Two-Room		Three-Room		Four-Room		Five-Room & +	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Reservation	292	47.2	175	28.4	83	13.4	49	7.9	19	3.1
Canyon Day	54	61.0	24	28.0	7	8.0	2	2.0	1	1.0
Cedar Creek	30	55.0	13	24.0	9	16.0	3	5.0	0	---
Cibecue	85	63.0	25	19.0	16	12.0	8	6.0	0	---
East Fork	30	45.0	22	33.0	7	11.0	6	9.0	1	2.0
McNary	3	8.0	27	68.0	5	12.0	3	7.0	2	5.0
North Fork	14	50.0	9	33.0	4	14.0	0	---	1	3.0
Seven Mile	39	51.0	12	16.0	12	15.0	10	13.0	4	5.0
Whiteriver	37	28.0	43	33.0	23	18.0	17	13.0	10	8.0

The same reference source presents the number of persons per room for housing in the State of Arizona, as of 1950. This data, with the comparative information developed from our sanitary survey, is presented as Table IX.

TABLE IX

## Dwelling Units By Persons Per Room

Persons Per Room	Reservation Indians		State of Arizona
	No.	Percent	Percent
0.75 or less	0	0	48.4
0.76 - 1.00	10	0.2	26.6
1.01 - 1.50	95	2.8	12.1
1.51 - 2.00	338	9.8	12.9*
2.01 - 2.50	543	15.8	
2.51 - 3.00	993	28.9	
3.01 or greater	1,461	42.5	

\*Includes 1.51 or more

A further study of the information obtained from our field survey shows that not only is there a serious problem in over-crowding in the rooms, but that the rooms themselves are small. Table X shows, by districts, the number of square feet of floor area available per person. Because the wickiups are not constructed with any element of permanence, they were not included in this table, although they were included in Tables VI, VII, and VIII, above.

TABLE X

Occupancy Rates, By Districts  
Square Feet Per Person

No. of Rms.	Reser- vation	Canyon Day	Cedar Creek	Cibecue	East Fork	McNary	North Fork	Seven Mile	Whiteriver
1*	32.6	39.2	33.9	31.9	30.7	24.7	41.5	24.1	30.4
2	49.4	57.4	48.5	50.5	51.4	55.8	45.3	52.3	46.4
3	57.5	75.0	42.0	70.7	60.7	41.3	54.3	74.0	52.0
4	82.1	160.0	42.0	72.5	89.7	73.9	-----	109.1	70.4
5	112.0	57.8	-----	-----	110.0	91.5	132.0	203.0	91.2
6	-----	-----	-----	-----	-----	-----	-----	240.0	107.2
7	-----	-----	-----	-----	-----	-----	-----	-----	56.7**

\*Excluding wickiups

\*\*One house only

A study of the number of homes with electricity produces a good idea of the physical standard of living obtainable in the districts involved. Without electric power the amenities of modern life, such as refrigerators, vacuum cleaners, lights, electric clocks, and washing machines are inaccessible. Table XI presents this information.

TABLE XI

Availability of Electricity

District	Homes With Electricity		Homes Without Electricity	
	No.	Percent	No.	Percent
Reservation	124	20	494	80
Canyon Day	7	8	81	92
Cedar Creek	0	0	55	100
Cibecue	0	0	134	100
East Fork	6	9	60	91
McNary	27	68	13	32
North Fork	5	18	23	82
Seven Mile	23	30	54	70
Whiteriver	56	43	74	57

Figure 6 shows two frame dwellings typical of many of this type of construction.



Figure 6. Frame Houses in East Fork District

## WATER SUPPLY

In the Canyon Day District, a community water system supplies domestic water to 79 of the 88 houses. Source for the system is a 27' well drilled in 1952 and located on the floodplain of the White River. A Westinghouse "Life-line" single-phase, 5 hp motor actuates a turbine pump, and there is a 2" line running some 8,000' to a 100,000-gallon steel storage tank (Figure 7). Along the line there are 15 hydrants and all but one house carry water from these hydrants.



Figure 7. Water Storage Tank, Canyon Day Community System

In March 1958, this office recommended continuous chlorination of the water at the pumphouse. There is obvious short-circuiting of the water from a nearby irrigation ditch: when water in the river is roily, it becomes equally roily in the distribution system.

Table XII indicates the distances water must be hauled by the householders in Canyon Day, as well as the remainder of the reservation. In Canyon Day, 74 homes are provided with covered milk cans or pails for the sanitary storage of water, and 14 have open cans.

TABLE XII

## Length of Haul of Water, Source to Home

Distance	Number of Homes, By District								Reservation	
	Canyon Day	Cedar Creek	Cibecue	East Fork	McNary	North Fork	Seven Mile	White-river	No. Surv.	Percent
Total	88	55	134	66	40	28	77	130	618	100.0
Inside Plumbing	1	0	0	0	4	0	7	18	30	4.8
1' to 50'	25	16	1	5	22	0	5	29	103	16.7
50' to 100'	9	5	2	2	5	0	5	4	32	5.2
100' to 200'	16	9	6	10	8	0	6	5	60	9.7
200' to 300'	3	3	3	9	1	0	2	16	37	6.0
300' to 400'	6	3	10	10	0	0	0	2	31	5.0
400' to 500'	5	0	11	0	0	0	3	8	27	4.0
500' - 200 yds.	1	2	14	2	0	0	2	9	30	4.9
200 yds.-500 yds.	8	6	80	28	0	5	39	29	195	31.7
500 yds.-1/2 mile	3	9	5	0	0	1	7	9	34	5.5
1 mile	5	0	1	0	0	6	1	1	14	2.4
2 miles	2	1	1	0	0	12	0	0	16	2.6
3 miles & over	4	1	0	0	0	4	0	0	9	1.5

There are 9 houses in the Canyon Day District which do not use the community system, generally because of distance away from the hydrants. Of these, 3 take untreated water directly from the White River, 2 haul water from the Whiteriver system, 3 haul from the water supply at the Theodore Roosevelt School (some 3.5 miles away), and 1 draws from an irrigation ditch.

In the Cedar Creek District there is, again, a community water supply. A perforated culvert pipe has been buried under the gravel and sand bottom of Cedar Creek, and the resulting infiltration gallery provides water which flows by gravity through a 2" pipeline to hydrants in the community. And, again, the lack of effective filtration before entry into the distribution system causes the water to be considered not safe for domestic use.

Thirty of the homes in this district use water from the hydrants on the system. Twenty homes take water directly from Cedar Creek, being beyond practical hauling distance of any hydrant; and five secure water from outlying sources (3 open dug wells, one stock well, and one well maintained by the Arizona Highway Department). In their present conditions, only the Highway Department well can be considered an approved source of water.

In the Cibecue area, 108 families take water directly from a river; 4 draw from irrigation ditches; 19 haul water from an approved source supplying water to the Government school; and 3 use a mission well, which is also satisfactory. Fifty-four families store water in milk cans, and 80 use pails. Of the 134 facilities for home storage examined, 72 were satisfactory, with covers, and 62 were suspect, as they did not have lids.

The water supply picture in the East Fork District is truly alarming, as it is in other districts. Of the 66 houses in the district, 57 take untreated water from the East Fork of the White River, and the remaining 9 bail the water from an irrigation ditch, which comes directly from the river farther upstream. There is considerable activity on the watershed above, including lumbering, hunting, and the running of cattle. There is no barrier of any sort between potential contamination above and the ultimate use of the water in the home.

Twenty-seven homes are equipped with milk cans for the storage of water: 39 use pails or buckets. Storage was considered satisfactory in 42% of the homes, and unsanitary in 58% (because of absence of any cover over the container).

Of the 40 homes in the McNary District only 4 had inside plumbing. The remaining 36 householders carried water by hand from public hydrants on the water system operated by the Southwest Lumber Company. This supply is derived from several springs and wells and is a very safe source of supply. It is intended primarily for Company operations, and is used by several hundred non-Indian residents, in addition to the 234 Indians in McNary.

In the North Fork District, 20 households take water directly from the White River. The other 8 generally haul water from a nearby sawmill, which in turn trucks it in from the Whiteriver system. Conditions here, at Whiteriver, and at Canyon Day are particularly tragic for those taking water from the river because the sewage from the community of McNary, after passage through a septic tank, is discharged into the White River, endangering the reaches of river downstream through the reservation. This office has endeavored to bring

about improvements through the lumber company, with some success. An oxidation pond is being planned by the company, which, when built, will improve the safety of the river. This would not, of course, make the raw river water safe for drinking, but it would improve the margin of safety where simple chlorination is practiced.

Storage of water in the homes was found to be satisfactory in all of the dwellings in this district.

In Seven Mile District, 24 of the families take their drinking water directly from the East Fork of the White River; 30 homes take water from an irrigation ditch (the same ditch used by Indians in the East Fork District); 13 families draw water from 4 unprotected wells; 4 families use one unprotected spring; and 7 are close enough to the Theodore Roosevelt School to have inside pressure lines from the system of that school. The source of supply for the school is a shallow well beside the White River, with channels constructed by BIA to bring the river water over close to the well to recharge the ground water. There is a chlorinator on this system, and a very definite need for its continuous operation.

At Whiteriver, 134 Indians (18 families) have the BIA supply piped into their houses. This supply is pumped from caissons (4 in use) located in or beside the White River (see arrows, Figure 8). These are recharged almost directly from the river, and the water is chlorinated before being pumped into the distribution system. A new 125,000-gallon steel storage tank is to be built under the supervision of BIA, to "ride" on the distribution system. There are also long-range plans to develop a better source of water, either from springs or via a treatment plant on the river.



Figure 8. Water Supply Plant at Whiteriver

Because of the especial hazard due to the sewage from McNary being present in the river at Whiteriver, a heavy dose of chlorine is maintained (4.0 ppm at the Nurses' Quarters, PHS Indian Hospital, on March 19, 1958, for example). This has the unfortunate side-effect of turning residents (both Indians and non-Indians) to other sources of water, which unless properly treated may not be safe for use.

409 Indians living in Whiteriver use water from the BIA system, but have to have it hauled to their homes. Sixty-eight homes are involved, being beyond the reach of the distribution system.

An additional 261 people (44 dwellings) in the district use untreated river water. These homes, in general, are located below the community of Whiteriver, on the floodplain of the stream itself.

Throughout the reservation, only 5% of the homes have water piped inside the premises under pressure. As will be seen from Table XIII, the majority of these are in Whiteriver, drawing from the BIA system there. The usual methods of hauling water for the remainder of the inhabitants are: by walking, 71%; by using donkeys or burros, 13%; and by use of automobile or truck, 11%. Needless to say, the use of water, when it must be carried a considerable distance to the home, is not lavish.

TABLE XIII

Methods In Use For Carrying Water

<u>District</u>	<u>Pressure</u>	<u>Hand</u>	<u>Animal</u>	<u>Truck/Car</u>
Reservation	30	438	84	66
Percent of Total	5%	71%	13%	11%
Canyon Day	1	70	3	14
Cedar Creek	0	47	5	3
Cibecue	0	84	22	28
East Fork	0	52	11	3
McNary	4	36	0	0
North Fork	0	5	17	6
Seven Mile	7	50	15	5
Whiteriver	18	94	11	7

We have summarized this section in Table XIV below, showing the number of Indians who routinely use safe water, and those having to use unsafe water.

TABLE XIV

Dwellings Having Safe or Unsafe Water Sources

<u>District</u>	<u>Using Safe Water</u>		<u>Using Unsafe Water</u>	
	<u>No.</u>	<u>Percent</u>	<u>No.</u>	<u>Percent</u>
Reservation	73	11.8	545	88.2
Canyon Day	3	3.4	85	96.6
Cedar Creek	1	1.8	54	98.2
Cibecue	22	16.4	112	83.6
East Fork	0	0.0	66	100.0
McNary	40	100.0	0	0.0
North Fork	0	0.0	28	100.0
Seven Mile	7	9.1	70	90.9
Whiteriver	0	0.0	130	100.0

SEWAGE AND EXCRETA DISPOSAL

Table XV below, if examined with care, should impress the reader with the deplorable nature of the status of sewage disposal more than any text. Some 1,548 Indians on the Fort Apache Reservation do not have any means for the disposal of excreta, other than the ground about their premises. About 960 other Indians have to use existing privies which are of faulty construction and are not fly-tight. Only 932 Indians on the reservation have approvable excreta disposal facilities.

TABLE XV

Excreta Disposal

District	Satis. Privy		Unsat. Privy		Inside		None	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Reservation	139	23	173	28	26	4	280	45
Canyon Day	23	27	32	36	1	1	32	36
Cedar Creek	16	29	13	24	0	0	26	47
Cibecue	23	17	24	18	0	0	87	65
East Fork	7	11	16	24	1	2	42	63
McNary	14	35	20	50	4	10	2	5
North Fork	6	21	8	29	0	0	14	50
Seven Mile	12	16	10	13	8	10	47	61
Whiteriver	38	29	50	39	12	9	30	23

At Whiteriver, the 12 houses with inside plumbing are either connected to the Agency sewage disposal system or have individual disposal systems on the premises:

Agency system	3
Septic tank	3
Cesspool	3
Unknown	3

The Fort Apache Tribal Council has embarked on a program for the construction of proper privies for indigent Indian families on the reservation. Lumber is secured at a nominal rate from the tribe's own mill and then worked up into privies by prisoners under the supervision of the PHS Sanitarian Aide, Mr. Wehausen. This, of course, fills a desperate need and the program should be encouraged in any way possible.

## PREMISE SANITATION

Under this heading we will consider the extent of screening, the extent of refrigeration facilities, a program for the control of insects, and other factors in the immediate environment of the home.

It is virtually impossible to screen out insects from the wicki-up. There is no chimney for the escape of smoke: it simply diffuses out through the brush at the peak of the dwelling. And this allows ready access for mosquitoes and flies. Another factor in a campaign to exclude insects by screening is that much of a family's activities take place under brush shelters, particularly during the warmer months (see Figure 9). Of special sanitation interest is that food is prepared and served under these shelters and flies cannot be excluded effectively.

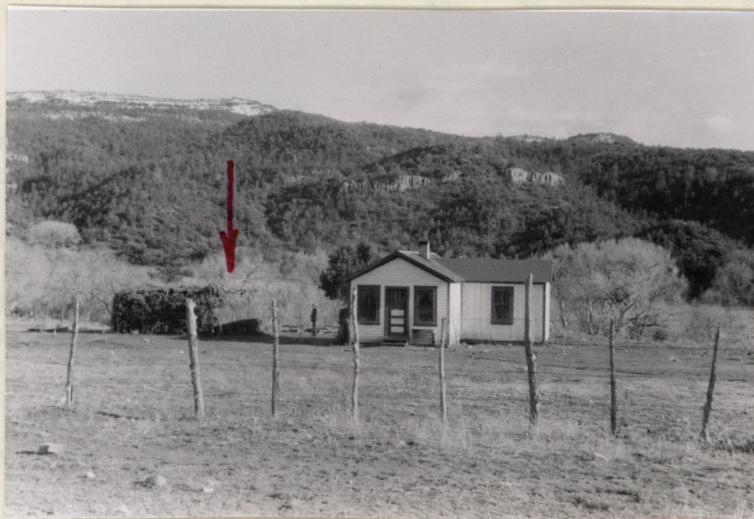


Figure 9. Typical "Squaw Cooler" or Shelter To Left of House

In most instances in Table XVI, where a home was found to have "partial" screening, the home had screens on windows but no screen door. In addition, much of the screening found was defective through tears, deterioration, or misuse.

TABLE XVI

## Extent of Screening of Homes

<u>District</u>	<u>Full</u>		<u>Partial</u>		<u>None</u>	
	<u>No.</u>	<u>Percent</u>	<u>No.</u>	<u>Percent</u>	<u>No.</u>	<u>Percent</u>
Reservation	73	12	163	26	382	62
Canyon Day	9	10	31	35	48	55
Cedar Creek	6	11	16	29	33	60
Cibecue	5	3	33	25	96	72
East Fork	1	2	22	33	43	65
McNary	5	13	14	35	21	52
North Fork	1	4	4	14	23	82
Seven Mile	12	16	11	14	54	70
Whiteriver	34	26	32	25	64	49

Of particular interest to sanitarians is the provision of facilities for the preparation and preservation of food, especially perishables, which if not properly handled may become a vector for the passing of disease from one person to another. An inquiry was made at each of the homes on the reservation about the use of a refrigerator or ice-box. The latter is not used anywhere because there are no sources of ice available to the Indians. Two districts were completely devoid of refrigeration for food, Cedar Creek and Cibecue. And throughout the reservation, only 7% of the homes have refrigerators. (Table XVII).

TABLE XVII  
Prevalence of Refrigeration Facilities

<u>District</u>	<u>With Refrigeration</u>		<u>Without Refrigeration</u>	
	<u>No.</u>	<u>Percent</u>	<u>No.</u>	<u>Percent</u>
Reservation	46	7	571	93
Canyon Day	2	2	86	98
Cedar Creek	0	0	55	100
Cibecue	0	0	134	100
East Fork	2	3	64	97
McNary	6	15	34	85
North Fork	1	4	26	96
Seven Mile	11	14	67	86
Whiteriver	24	18	106	82

Wood-burning stoves are in use in 68% of the homes for the cooking of food. The next most common type of stove is the ordinary camp fire, usually associated on the reservation with wickiups. At the time of our survey, there were only 3 electric stoves and 22 gas stoves in use. (Table XVIII).

TABLE XVIII

Type of Cooking Facility in Use

<u>District</u>	<u>Wood Stove</u>	<u>Campfire</u>	<u>Gas</u>	<u>Electric</u>	<u>Nothing</u>
Reservation	420	144	22	3	29
Percent of Total	68%	24%	3.5%	0.5%	4%
Canyon Day	62	20	---	---	6
Cedar Creek	35	20	---	---	---
Cibecue	83	51	---	---	---
East Fork	38	16	---	---	12
McNary	36	---	3	1	---
North Fork	23	3	---	---	2
Seven Mile	50	20	7	---	---
Whiteriver	93	14	12	2	9

Each spring an effort is made to conduct a "clean-up" campaign on the reservation, in preparation for extensive spraying to control flies. Only moderate success has been achieved in the past: with the assignment of additional personnel, there will be a more concerted and effective campaign in the future.

During the spring and summer of 1958, the reservation homes will be treated on the outside with a spray made up of Malathion and sugar (as an attractant) in water. As the usefulness of this measure becomes apparent to the Indians, it is planned that the program will gradually be turned over to some interested Indian groups, or to the householders themselves.

## PUBLIC HEALTH SERVICE PROGRAM

Headquarters for the field health and curative medicine activities of the Public Health Service on the Fort Apache Reservation is the PHS Indian Hospital at Whiteriver, location also of the BIA Agency offices and of the Tribal offices. This 38-bed hospital has an office for our Sanitarian Aide, a PHS field nurse, and a medical officer who works in the field (as well as an operating staff of 2 doctors and a dentist for the hospital itself).

Sanitary improvements on a large reservation such as Fort Apache, embracing some 3,440 Indians, must of necessity involve more than sanitation personnel working alone. The sanitation program must relate itself to the total field health program on the reservation, to officials and programs of the Bureau of Indian Affairs, the tribe, and other groups present in the area, such as religious missions. Figure 10, for example, shows an oxidation pond designed by our staff and built by the East Fork Lutheran Mission.



Figure 10. Sewage Facility at East Fork Lutheran Mission

Beginning in the fall of 1957, more adequate supervision and guidance has been made available to the sanitation program on the reservation with the assignment of a professional sanitarian, Mr. James E. Cowan. With headquarters at Show Low, Arizona, Mr. Cowan is responsible for sanitation activities on the Fort Apache, San Carlos, and Hopi Indian Reservations.

The sanitation program has, to date, had little to do with the provision of more adequate housing. This, of course, is a desperate need, but there are no authorizations or funds available to the Indian Health Program for this type of improvement.

The program of the sanitarians on the Fort Apache Reservation embraces the following: improvement of water supplies through the offering of advice and instruction; the testing of existing sources for contamination; the encouragement of better excreta disposal facilities; the control of the spread of disease through fly control; cooperation with health educators in programs for the teaching of sanitary practices in schools, civic groups, clubs, community associations, and similar organizations; the encouragement of better premise sanitation through improved refuse and garbage disposal, more adequate screening, safer handling of food and milk; and general sanitary activities such as the inspecting of trading posts, restaurants and schools, and the control of nuisances.

The medical officer in charge of the PHS Indian Hospital has general and administrative responsibility for the entire health program on the reservation. The technical content of the sanitarian aide's program is under the purview of his supervising field sanitarian. During the past two years, the Medical Officer in Charge, Dr. Yale, has been particularly interested in the sanitation program and has been of assistance to Mr. Wehausen far beyond the requirements of his office. This has been of great help to the sanitation program, particularly in its relationships with the Bureau of Indian Affairs and the tribe.

## CONCLUSIONS AND RECOMMENDATIONS

In the preceding sections, we have presented information setting forth the current sanitation picture on the Fort Apache Reservation. This has NOT been a reassuring picture: tremendously high disease morbidity rates have been recorded, traceable, in part, to a faulty environment. There can be no inexpensive, easy solution to the problem. Safe drinking water will have to be provided; proper excreta disposal facilities will have to be built; the inordinately high prevalence of flies will have to be controlled. In an area where only 7 out of every 100 homes has a refrigerator for milk, meat, and other perishable foods, control of food-borne disease must inevitably be substandard until the economic level of the people climbs to the point where these facilities can be afforded. Ultimately, improved housing will have to be provided, if for no other reason than to control the high incidence of pneumonia and other respiratory infections (estimated at 8350 cases per 100,000 for pneumonia last year alone). In this section, we will develop an idea of the cost involved in definitive, long range sanitary improvements.

Water Supply. There is need for a hypochlorinator on the Canyon Day water supply. A suitable unit would cost an estimated \$625 complete. To complete the provision of suitable water in this district, 9 wells with sanitary hand pumps are needed. Water could presumably be encountered at a depth of about 40 feet. Each well would then cost on the order of \$300, for a total cost of \$2700.

At Cedar Creek, a meter-actuated hypochlorinator should be installed on the line from the infiltration gallery to the hydrants. \$1300 would be needed for the machine, housing over the device, and incidental plumbing. Extension of the existing line to serve an estimated 15 additional homes downstream from the end of the line would require 4000 more feet of 2" pipe, at \$3840 for the supplying and installation of heavy-duty rigid plastic pipe, more for metal pipe.

For the 10 homes beyond the economical reach of a distribution line, small wells would again suffice. At \$300 each, the cost would be \$3000.

Cibecue presents something of a dilemma: the homes are too scattered to make a community-type system practical, although they are still rather close together. In the final analysis, a careful study would be necessary to determine the most reasonable solution. For the

purposes of this report, we are assuming that individual supplies would be necessary. There are 112 homes now taking water from a river or open ditch. The cost for properly constructed wells would be on the order of \$33,000. An alternate possibility would be one larger-capacity well, elevated storage tank, and distribution line with hydrants.

In the East Fork District, 66 private wells are needed. These would probably have to go deeper than the wells mentioned for Cedar Creek and Cibecue, because more of the homes are on a side hill above the floodplain. Each well is presumed to go to a depth of 60 feet, for a per-well cost of \$400, or district cost of \$26,000.

McNary Indians would benefit significantly from a project whereby existing water were piped into the homes. Four have such convenience now, and the other 36 are within easy reach of a water main. A sink, piping, and necessary service lines and corporation cocks for the 36 homes would cost about \$7800.

North Fork homes are located on a shelf above the White River, along the highway from Whiteriver to Show Low. The shelf exists because it is made of "malapai", a dense form of lava. A religious mission in the vicinity recently completed a successful well, and because there are no shallow sources on or above the shelf, we have to recommend the building of a similar system, with a deep well and suitable gasoline or electric-powered pump and motor, storage tank, and hydrant. The installation is estimated to cost \$11,000 and provision could be made for the future installation of a distribution system (by suitable location of the well with respect to the community).

At Seven Mile, the protection of the Theodore Roosevelt School well against contamination by short-circuiting of river water into the well is the responsibility of BIA. The spring currently supplying 4 houses is capable of no additional load. It should be protected against contamination by a proper cover with outlet arranged so that milk cans, buckets, and the like may be conveniently filled (\$300). Sixty-seven individual wells are needed to service the remaining dwellings in the district. The prognosis for water in this vicinity is fairly good. We are assuming water will be encountered at an average of 50 feet. With each well costing some \$400, the district cost would then be \$26,800.

Whiteriver represents the most complex administrative problem for the development of adequate water. Extensions to the existing system would make water available in or near an additional 68 Indian homes, at a reasonable cost. However, the system is operated by BIA and under current policies, that agency cannot sell water to private

Indian families. A possible solution would be effected by the tribe's taking over of the system and in turn selling water to BIA, PHS, and the Indian families. Considerable negotiation is anticipated before a final solution could be developed. Extending some existing mains and strengthening the distribution system to handle the increased load is estimated to cost (very roughly) as follows:

6000' of 4" line.....	\$ 5,600.00
Trenching, backfilling @40¢ per foot.....	2,400.00
Hydrants, miscellaneous.....	500.00
Replacing smaller existing lines.....	4,500.00
	<u>\$13,000.00</u>

Some 44 individual water supplies would be needed for those Indians living away from the distribution system. These can be assured along the banks of the White River. At a depth of 40 feet, each well would cost about \$300, for a total cost of \$13,200.

Recapitulating the above, we have the following:

Canyon Day.....	\$ 3,325.00
Cedar Creek.....	8,140.00
Cibecus.....	33,000.00
East Fork.....	26,000.00
McNary.....	7,800.00
North Fork.....	11,000.00
Seven Mile.....	27,100.00
Whiteriver.....	26,200.00
Total for Materials & labor.....	<u>\$142,565.00</u>
Administrative expenses @ 10%.....	14,250.00
Contingencies, profit, @ 10%.....	15,680.00
TOTAL COST WATER IMPROVEMENTS.....	<u>\$172,495.00</u>

Significant improvements in the health of the Fort Apache Indians can be anticipated through a long-term project involving the construction of ordinary sanitary pit privies and education of the beneficiaries in their use. There is an existing need for 453 privies. As time goes by, those families able to afford improvements could then "graduate" to a water-carriage system. In the total health picture at the present time, such additional facilities are not warranted on this reservation.