

Preliminary Hydrographic Survey Report
For
The San Pedro River Watershed

Volume I: General Assessment

IN RE: The General Adjudication of The
Gila River System and Source

CASE NUMBER: W1, W2, W3, W4 Consolidated

In The Superior Court In and For The
County of Maricopa

Arizona Department of Water Resources
January, 1987



FORT HUACHUCA
111-23-F1

Introduction

Fort Huachuca, currently the United States Army Communications Command Post, is located approximately sixty miles southeast of Tucson, Arizona, and about fifteen miles north of the Mexican Border. The fort is situated along the northern range of the Huachuca Mountains in Cochise County, just west of the City of Sierra Vista, and due south of Huachuca City along state highway 92 (Figure 39).

The fort was established on October 29, 1881, by Presidential Executive Order, although the United States Army installed an outpost at this location on March 3, 1877 (Camp Huachuca). The primary purpose of the post was to aid in the repression of Apache Indian attacks against the influx of settlements into the southern areas of the Arizona Territory. Following the surrender of the Apache Chief Geronimo in September of 1886, the primary purpose of the fort shifted to the Villista Campaign ("Pancho" Villa), although a few renegade bands of Apache Indians continued to raid settlers and settlements.

The Villista Campaign, which was designed to stop raids by Pancho Villa in the United States, eventually led to political friction between the United States and the Republic of Mexico, since the United States dispatched troops deep into Mexico. Although the U.S. Government claimed to pursue Villistas into Mexican territory only for the purpose of halting raids within U.S. boundaries, U.S. officials were concerned that the Mexican Government would view this "expedition" as unfriendly aggression. In 1917, the Villista expedition returned to the United States.

Following the punitive expedition against the Villistas in 1917, the United States declared war in Europe (World War I). At this time, the fort was primarily used to train troops, and during World War II, the fort was utilized to train full divisions. After the end of World War II (1945-1951), the fort was closed, and designated as surplus property by the U.S. Army. At the start of the Korean War, the fort was reactivated. However, at the close of the Korean Conflict (1953), the fort was once again deactivated, and reclassified as surplus. Fort Huachuca was reactivated on February 1, 1954, as the U.S. Army Electronic Proving Ground. In July of 1967, Fort Huachuca became the U.S. Army Strategic Communications Command, subsequently renamed the U.S. Army Communications Command. Fort Huachuca has remained in this status up to the present.

Hydrogeology

The primary water resources of Fort Huachuca are groundwater and surface water systems fed by precipitation on the land surface. The average annual precipitation for the fort (at 5,000 feet) is approximately 15.4 inches, where summer thunderstorms in July and August account for nearly fifty percent of the total annual rainfall (Figures 40 and 41).

Fig.39

Location of Ft. Huachuca, Arizona

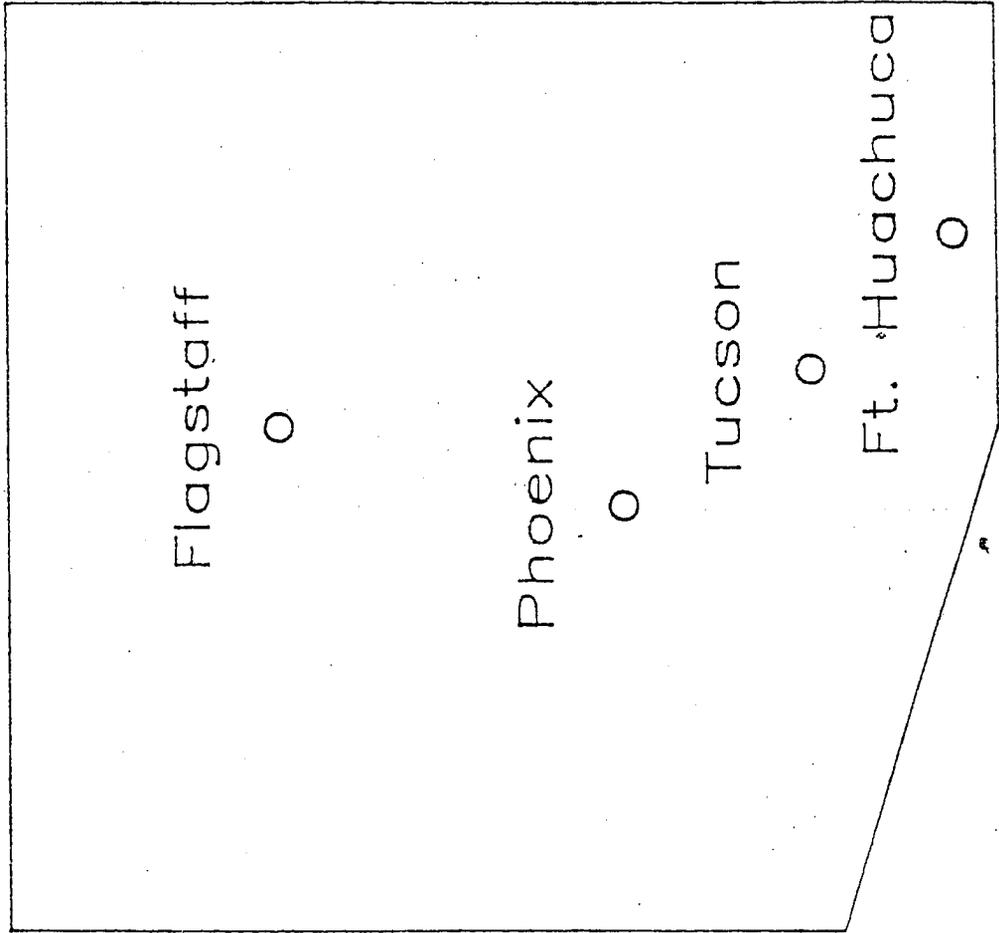


Fig.40

**AVERAGE MONTHLY PRECIPITATION
FORT HUACHUCA, ARIZONA
1951 TO 1980**

Source: Ariz. St. Univ. Climatology Laboratory

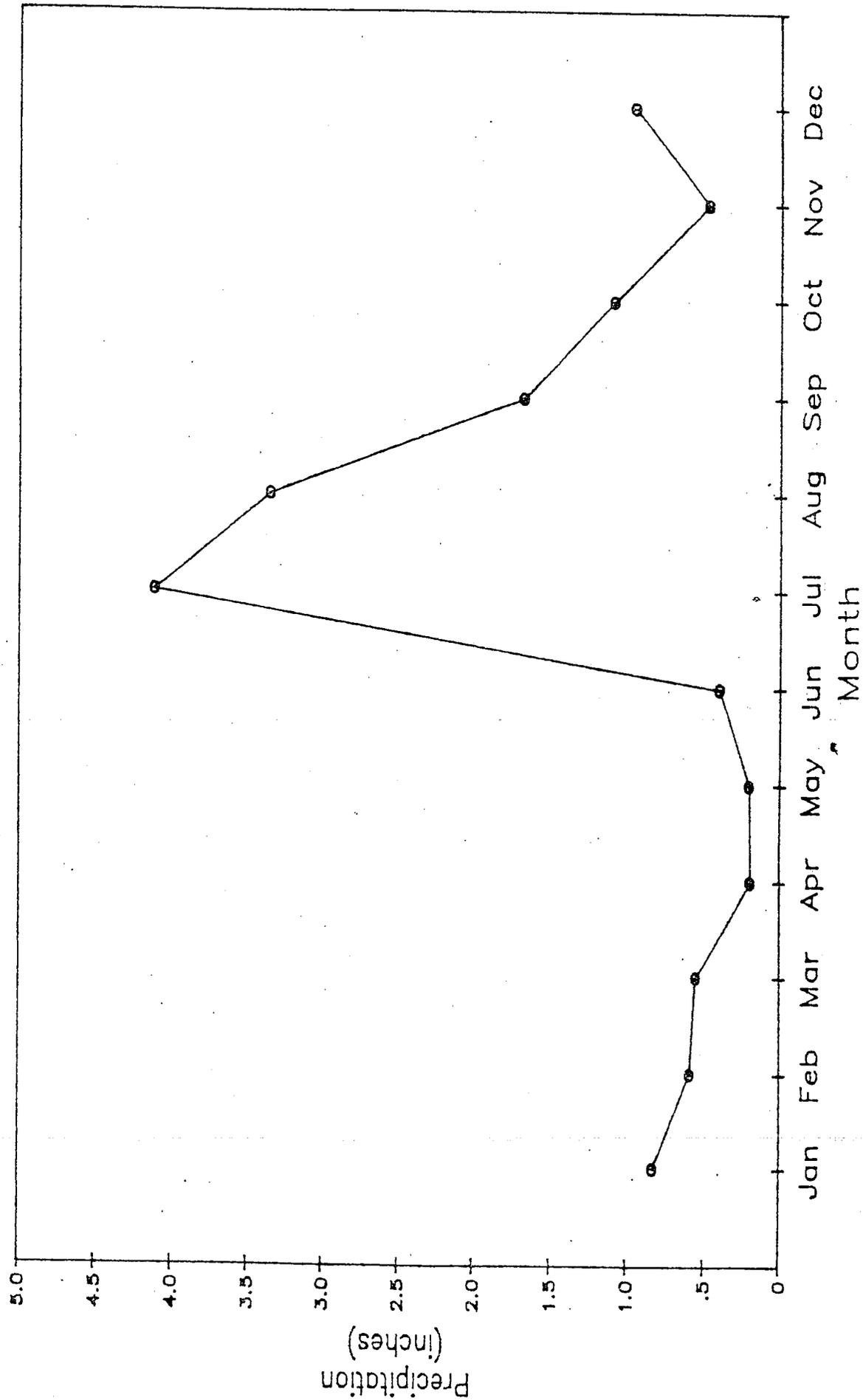
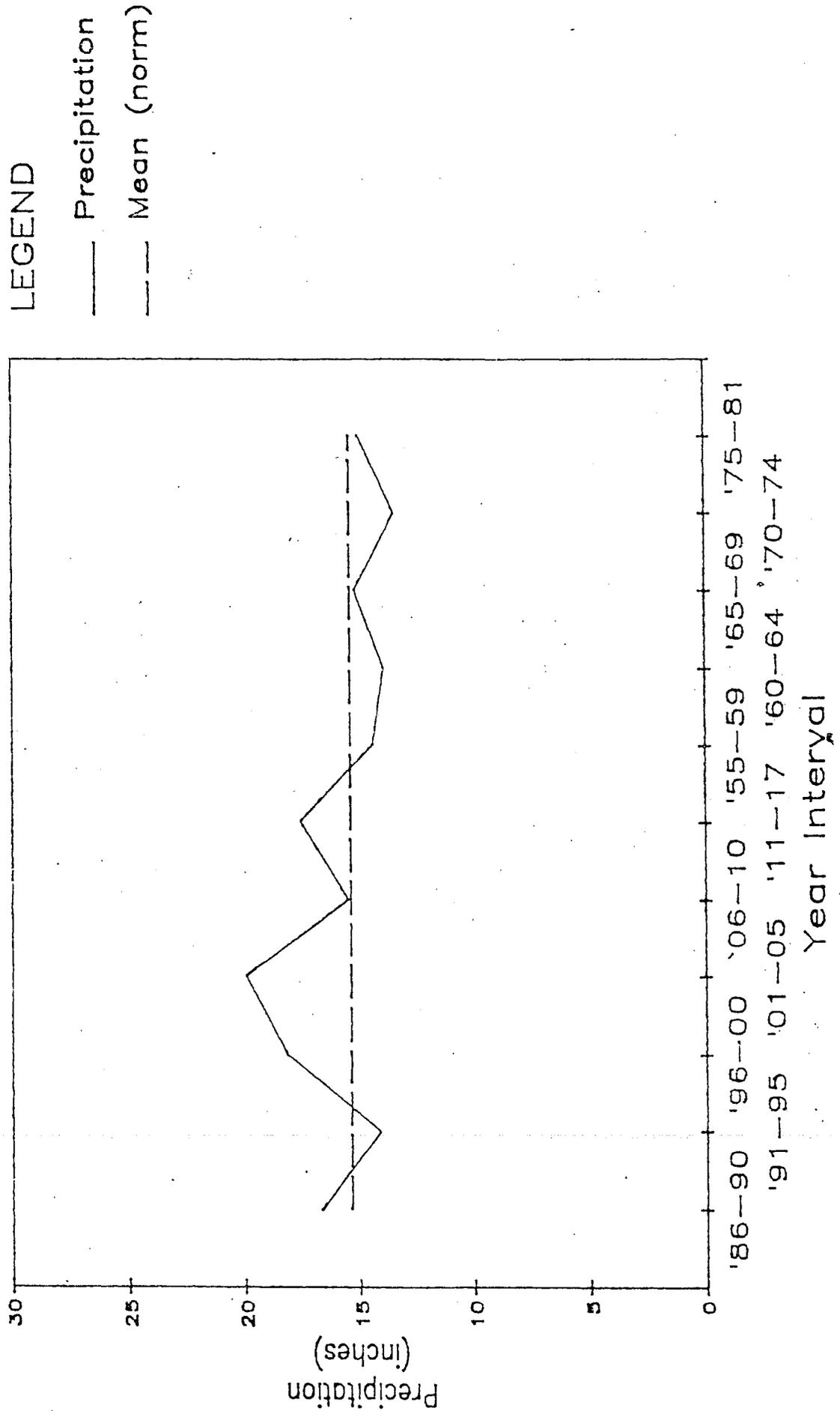


Fig. 41

**AVERAGE ANNUAL PRECIPITATION
FORT HUACHUCA, ARIZONA
1886 TO 1981***

Source: Ariz. St. Univ. Climatology Laboratory



*No data available for 1918-1954

The major water supplies for Fort Huachuca are from two primary sources located on the east side of the Huachuca Mountains. These are (1) groundwater from a regional aquifer, and (2) water from fracture and fault-controlled springs. The regional aquifer is recharged along the mountain fronts, and from flow from mountain washes. Flows from mountain washes rarely reach the San Pedro River, except during severe thunderstorms prevalent during the summer months. There is little or no groundwater recharge from soil percolation. Springs are recharged by surface runoff from rainfall and snowmelt. These waters are trapped by fractures in the mountain rock formations, where the water is rapidly discharged through the springs. The only springs capable of yielding sufficient quantity and quality of water usable by the fort for domestic purposes are located in either Garden Canyon or Huachuca Canyon (Figure 42).

Size and Growth

Fort Huachuca has claimed a post population of 9,304 (residents), with an additional 6,465 employees who work on the post (non-residents). The claim indicates no known future population increases. Mr. Tom Cochran, Chief Utilities Engineer for the fort, indicated a present full-time post population of about 9,000, with about 7,500 day-time residents. When calculating municipal needs for the installation (water requirements, refuge, etc.), an "effective population" of 11,400 is used. Effective Population (EP) is calculated by the following formula:

$$EP = \frac{DT}{3} + FT, \text{ where}$$

EP = Effective Population

DT = Daytime (non-resident) population

FT = Full-time (resident) population

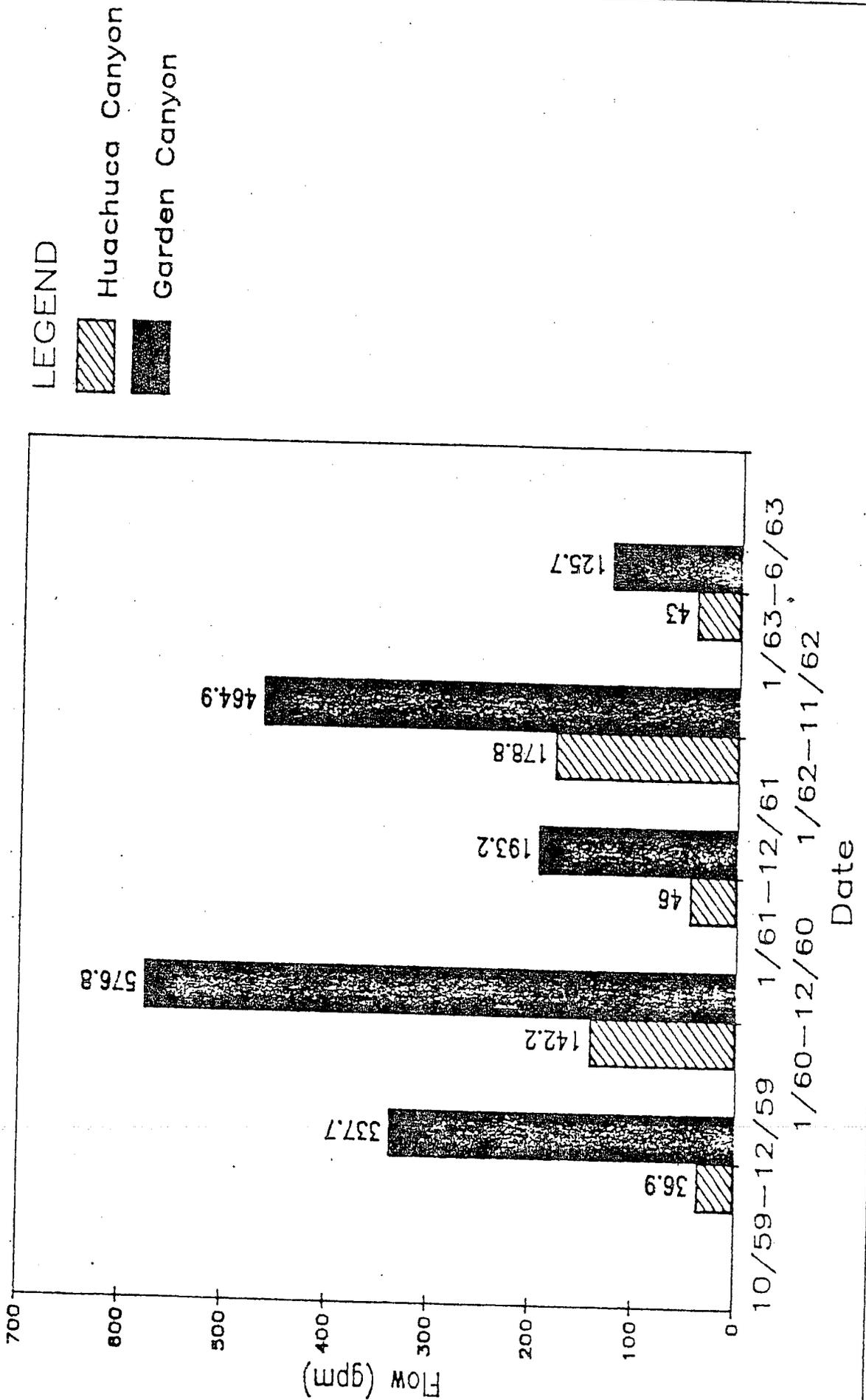
The Arizona Department of Commerce listed a 1985 post population of 9,022, including 6,231 military employees and 6,223 civilian workers.

Fort Huachuca was incorporated into the city limits of Sierra Vista on February 17, 1971. In 1970, the post population was 6,659, and in 1980, the population was 9,475. Sierra Vista currently has a population of 30,520. Projections by the Arizona Department of Economic Security indicates a population of 54,625 by the year 2000. This amounts to an annual growth rate of approximately 5.5 to 6.0%. The growth rate of the State of Arizona has been estimated at about 3.0% per year. Although Sierra Vista's economy is closely related to the installation, the post population has changed little within the past five years ($\pm 3\%$), despite the area's population boom (Figure 43). It should be pointed out that although the population of Fort Huachuca has not changed, the fort's well field is directly affected by well pumping from surrounding areas, since the aquifers tapped by Fort Huachuca, Sierra Vista, and developments just outside of Sierra Vista are hydraulically continuous. Therefore, any pumping of wells by Sierra Vista will, in time, cause drawdown in Fort Huachuca.

Fig.42

Average spring flow for Garden and Huachuca Canyons
Fort Huachuca, Arizona
1959 through 1963

Data based on U.S.G.S. Report #1819-D



The fort has claimed an on-post land area of 73,344 acres. When the post was first established in 1881, the size of the fort was 41,760 acres. On May 14, 1883, the fort boundaries were expanded by Presidential Executive Order to 44,800 acres. In the 1940's, Fort Huachuca was expanded again to include lands due east of the original boundaries. This area is now known as the East Range, and encompasses approximately 13,545 acres. This brought the total area of Fort Huachuca to about 58,345 acres. In August of 1957, 13,463 acres of Bureau of Land Management (BLM) land was removed from the public domain, and transferred to Fort Huachuca, bringing the fort's total acreage to 71,808 acres. The remaining acreage claimed by the fort (1,536 acres) is currently state trust land that is utilized by the fort pending exchange between the State of Arizona and the United States Government (Figure 44).

Fort Huachuca and the City of Sierra Vista share an airfield located within the west range of Fort Huachuca. Pursuant to the Airport and Airway Development Act of 1970, the Federal Aviation Administration (FAA) required Fort Huachuca to convey 29.0 acres to the City of Sierra Vista. This conveyance, deeded to Sierra Vista on December 12, 1982, reduced the fort's acreage to 73,315, the present size of Fort Huachuca. Sierra Vista began construction for a new air terminal on this newly acquired acreage on September 6, 1983, and it was completed on February 15, 1984.

Claimed Data

Fort Huachuca has claimed a total of twenty-four wells, thirty-eight springs, and sixty-five ponds. These diversions are summarized below (Table 39). Total amount of potable water claimed is 3,287 million gallons (10,087 af) per annum (see projected water use). The fort based these claims on (1) Federal Reserve Water Rights and (2) legitimate and authorized federal activities.

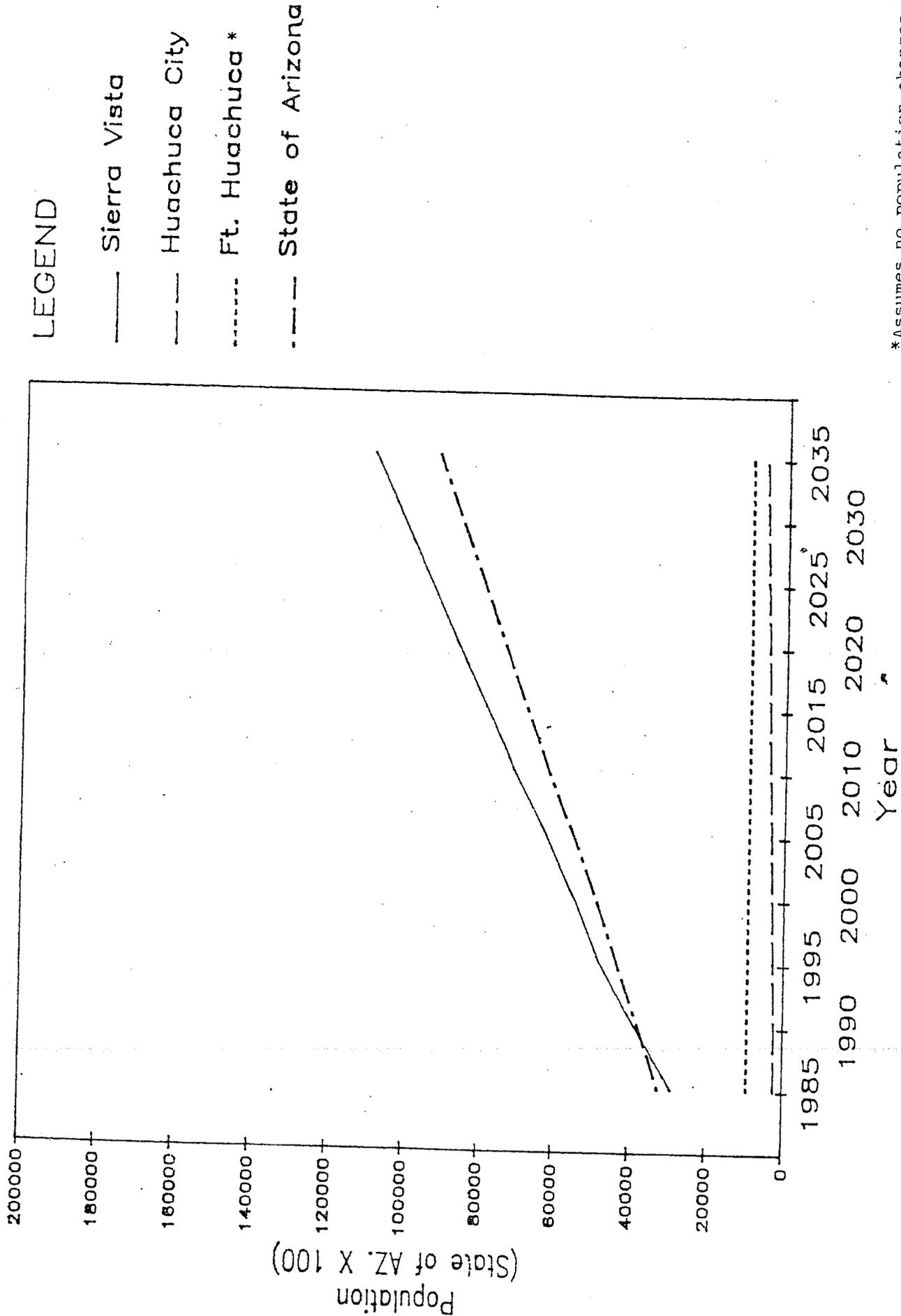
For the above diversions, the fort claimed approximate dates of first use. These dates (years) are shown below (Table 40).

TABLE 39. SUMMARY OF DIVERSIONS CLAIMED BY FORT HUACHUCA

<u>Wells</u>	<u># Claimed</u>	<u>Quantity (annual)</u>
Potable (Domestic)	6	966,972,000 gal. (2967.6 AC-FT)
Non-potable	9	58,161,900 gal. (178.5 AC-FT)
Test	9	
<u>Total</u>	<u>24</u>	<u>1,025,133,900 gal. (3146.1 AC-FT)</u>
<u>Springs</u>		
Potable	14	125.2 AC-FT
Non-potable	24	51.6 AC-FT
<u>Total</u>	<u>38</u>	<u>176.8 AC-FT</u>
<u>Ponds</u>		
Effluent evaporation	5	25.7 AC-FT
Game management	5	2.6 AC-FT
Wildlife, Recreation	17	72.1 AC-FT
Erosion control	38	65.4 AC-FT
<u>Total</u>	<u>65</u>	<u>165.8 AC-FT</u>

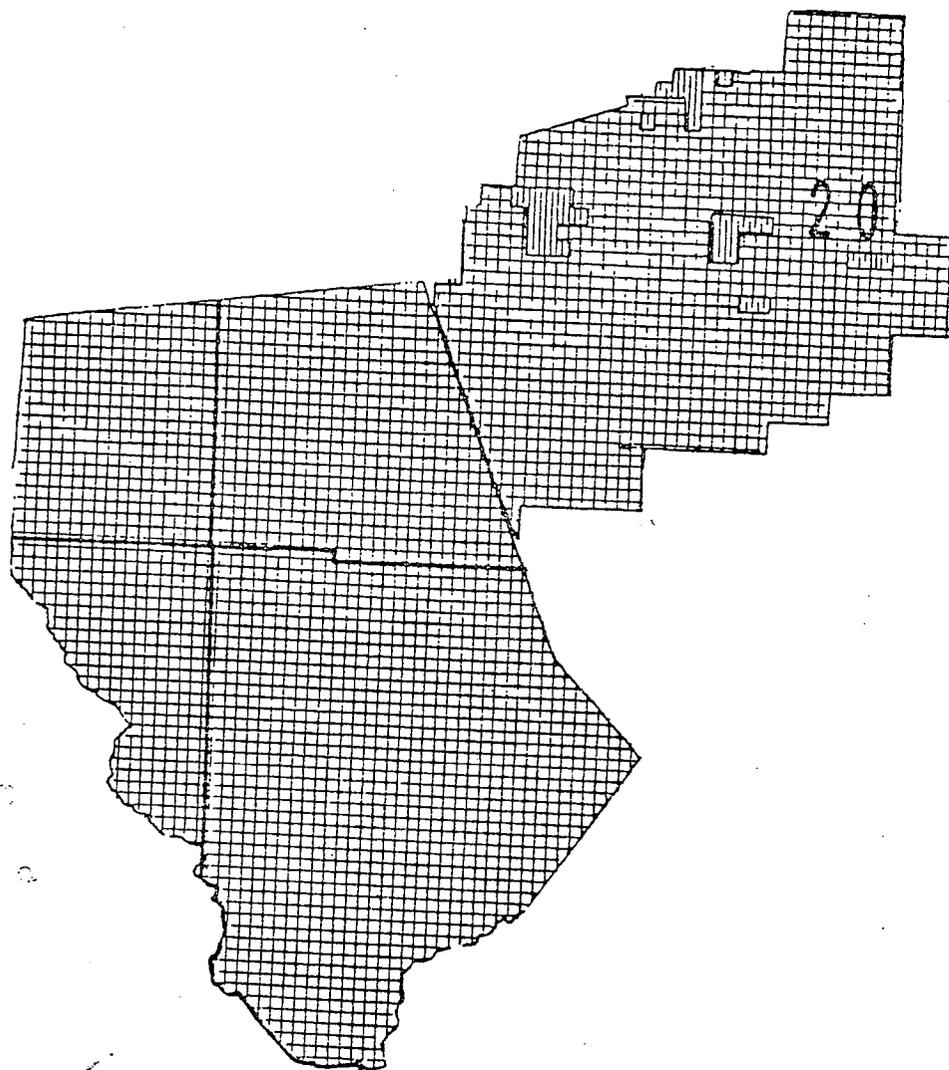
Fig. 43

PROJECTED POPULATION GROWTH FOR THE SIERRA VISTA AREA
Source: Arizona Dept. of Economic Security, 3/86



*Assumes no population changes

STATE TRUST LANDS LOCATED WITHIN FORT HUACHUCA BOUNDARIES



 Fort Huachuca

 State Trust Land

SCALE

1 : 200,000
(1 in. equals approx. 3.2 mi.)

TABLE 40. DATES (YEARS) OF FIRST USE FOR CLAIMED DIVERSIONS

<u>Wells</u>	<u>First Use</u>
#1	1940
#2	1941
#3	1943
#4	1943
#5	1943
#6	1959
#7	1982
#8	1982
East Rg. Bunker	1958
Garden Canyon	1930(est).
Rembass #1	1978
Rembass #2	1978
Spatial Resolution	1964
<u>Springs</u>	
Potable	1877
Non-potable	1954
<u>Ponds</u>	
All, except as shown below	1954
Dam (SENW2120S21E)	1976
Dam (SWSE1821S21E)	1976
Dam (NESW1721S21E)	1977
Dam (SWNW2021S21E)	1977
Dam (NWNW2021S21E)	1977
Dam (SENE1921S21E)	1977
Dam (SESE1821S21E)	1977
Dam (NESW1021S20E)	1977
Dam (SENW1021S20E)	1977
Dam (SENE1021S20E)	1977
Dam (SESE0321S20E)	1977
Dam (NENE0921S20E)	1977
Sediment (NESE2121S20E)	1978
Sediment (SENE2121S20E)	1978
Sediment (NENE2121S20E)	1978
Sediment (NWNW1521S20E)	1978
Dam (NWE3621S19E)	1979
Dam (NENE2822S20E)	1979

Analysis of Claim

DWR staff visited Fort Huachuca on several occasions. The purpose of these field trips was to (1) investigate claimed water uses by the fort, and (2) gather other pertinent data as necessary (documentation, mapping, etc.).

DWR staff verified the use of well #1 through #8, spatial resolution well, east range bunker well, and the Garden Canyon well (non-potable). The Garden Canyon well (no number given in claim) can be connected into the potable system. These wells are discussed in the summary spreadsheet (Table 45), and Table 41 below.

TABLE 41. DEPTH AND DISCHARGE OF SIX WELLS (POTABLE)
LOCATED IN FORT HUACHUCA, ARIZONA

Well #	Depth(ft.) ¹	Discharge(gpm) ²
1	701	
2	710	500/500
3	802	700/900
4	912	700/700
5	800	700/700
6	1,230	700/700
		700/310

(1) Figures from U.S.G.S. Report #1819-D.

(2) Figures shown are claimed data by fort/data reported by U.S.G.S.

All potable springs were visited, except for Cabin Spring, which could not be found (Table 42). DWR staff did not visit any non-potable springs.

As stated previously, Fort Huachuca claimed sixty-five ponds. DWR staff was able to verify forty-two of these impoundments using aerial photography or field check. Of these forty-two impoundments, eleven were surveyed (Table 43); twenty-eight were too small to be surveyed (less than one surface acre in size, or a capacity less than 15 acre feet); two had pipes in the dam (flood control); and one was destroyed (Pan Am) due to airport expansion.

In addition to claimed ponds, DWR staff verified thirteen impoundments not claimed by Fort Huachuca (aerial photography). Of these thirteen impoundments, five were surveyed (Table 43); the remaining eight impoundments were less than one surface acre in size.

Storage and Distribution (Potable Water)

Fort Huachuca has claimed a total storage capacity of 5,630,000 gallons, and a distribution system totaling 1,256,148 lineal feet (see stock maps). There is also 104,560 lineal feet of non-potable water line which is used to irrigate the golf course and Chaffee Parade Field (see irrigation maps, vol. 5).

TABLE 42. SPRING FLOW MEASUREMENTS FOR GARDEN CANYON AND HUACHUCA CANYON, FORT HUACHUCA, ARIZONA

System	Spring #	Period	Number of Measurements	Discharge (gpm)
Garden Canyon	1	Jan. 1962-June 1963	46	194
Garden Canyon	1a	Winter, 1960-1961	Not Listed	400 *
Garden Canyon	2	Jan. 1960-Aug. 1961	47	176
Garden Canyon	3	Mar. 1960-Nov. 1962	43	32.9
Garden Canyon	4	Mar. 1960-Nov. 1962	43	32.9
Garden Canyon	Cabin	Not Listed	Not Listed	15-25
Garden Canyon	Chain	Not Listed	Not Listed	150-250 **
Garden Canyon	Picnic	Not Listed	Not Listed	540 *
Huachuca Canyon	2	Feb. 1960-Sep. 1962	47	16.5
Huachuca Canyon	3	Apr. 1961-Jan. 1962	47	28.3

* Maximum flow measured (data not listed).

** Based on flow during wet weather; does not flow during the remainder of the year.

Source: USGS Report #1819-D.

TABLE 43. SUMMARY OF SURVEYED IMPOUNDMENTS (SEE STOCK MAPS FOR EXACT LOCATION.)

Map #	Name	Location	Capacity (AC-FT)	Area (acres)
PS1	Antelope	S.16 T.21S R.19E	26.4	2.6
PS2	Sycamore	S.20 T.21S R.19E	38.8	3.9
PS3	Hidden	S.28 T.21S R.19E	22.5	2.1
PS4	Golf Course	S.9 T.22S R.20E	59.7	7.6
PS5	Gravel Pit	S.17 T.22S R.20E	57.4	7.0
WL4	Unclaimed	S.16 T.21S R.19E	14.9	2.2
WL5	Unclaimed	S.29 T.21S R.19E	10.5	1.5
WL12	Sediment	S.15 T.21S R.20E	29.6	9.5
WL15	East #1	S.16 T.21S R.20E	6.0	2.5
WL16	Sediment	S.21 T.21S R.20E	11.0	3.5
WL18	Unclaimed	S.21 T.21S R.20E	12.0	2.8
WL19	Unclaimed	S.21 T.21S R.20E	5.5	3.3
WL29	Lower Woodcutter	S.9 T.22S R.20E	20.7	2.5
WL31	Woodcutter	S.16 T.22S R.20E	8.4	1.8
WL40	Dam	S.28 T.22S R.20E	16.9	2.4
WL41	Unclaimed	S.28 T.22S R.20E	27.1	4.1
TOTAL			367.4 AC-FT	59.3 acres

Irrigation (outside municipal system)

The fort currently irrigates four areas that utilize non-potable water. Two areas are located in the east range; the other two in the west range. Together, total irrigation areas are 142.92 acres. These areas are summarized in Table 44.

TABLE 44. IRRIGATION SUMMARIZATION - FT. HUACHUCA

	<u>Location</u>	<u>Source</u>	<u>Acres</u>
IR 1	S.32 T.21S R.20E	Water Trt. Plt.#2	10.25
IR 2	S.26 T.21S R.20E	Rembass #1	5.67
IR 2	S.23 T.21S R.20E	Rembass #2	42.20
RC 1	S.4 T.22S R.20E	Water Trt. Plt's 1 & 2	84.80

Both IR1 and IR3 are irrigated using a sprinkler system. IR1 (Chaffer Parade Field) receives it's water supply from water treatment plant #2 (effluent). RC1 (golf course) receives water from water treatment plant #1 and #2 (see map). IR2 (Rembass well #1 and #2) is flood irrigated using groundwater.

Projected Water Use

Fort Huachuca has projected a future potable water use of 3,287 million gallons for fiscal year 2001. This was based on an average of 6% increase per year for twenty years. The fort recommends this usage figure since (1) it is less than the present capacities of all potable wells currently developed, (2) allows for a reasonable margin for future expansion of the fort, and (3) ability to meet unusual water demands, such as 275,000 gallons per day for dust control during construction of the new runway at Libby Army Airfield (Sierra Vista Airport), which was completed in December of 1985 (Figure 45).

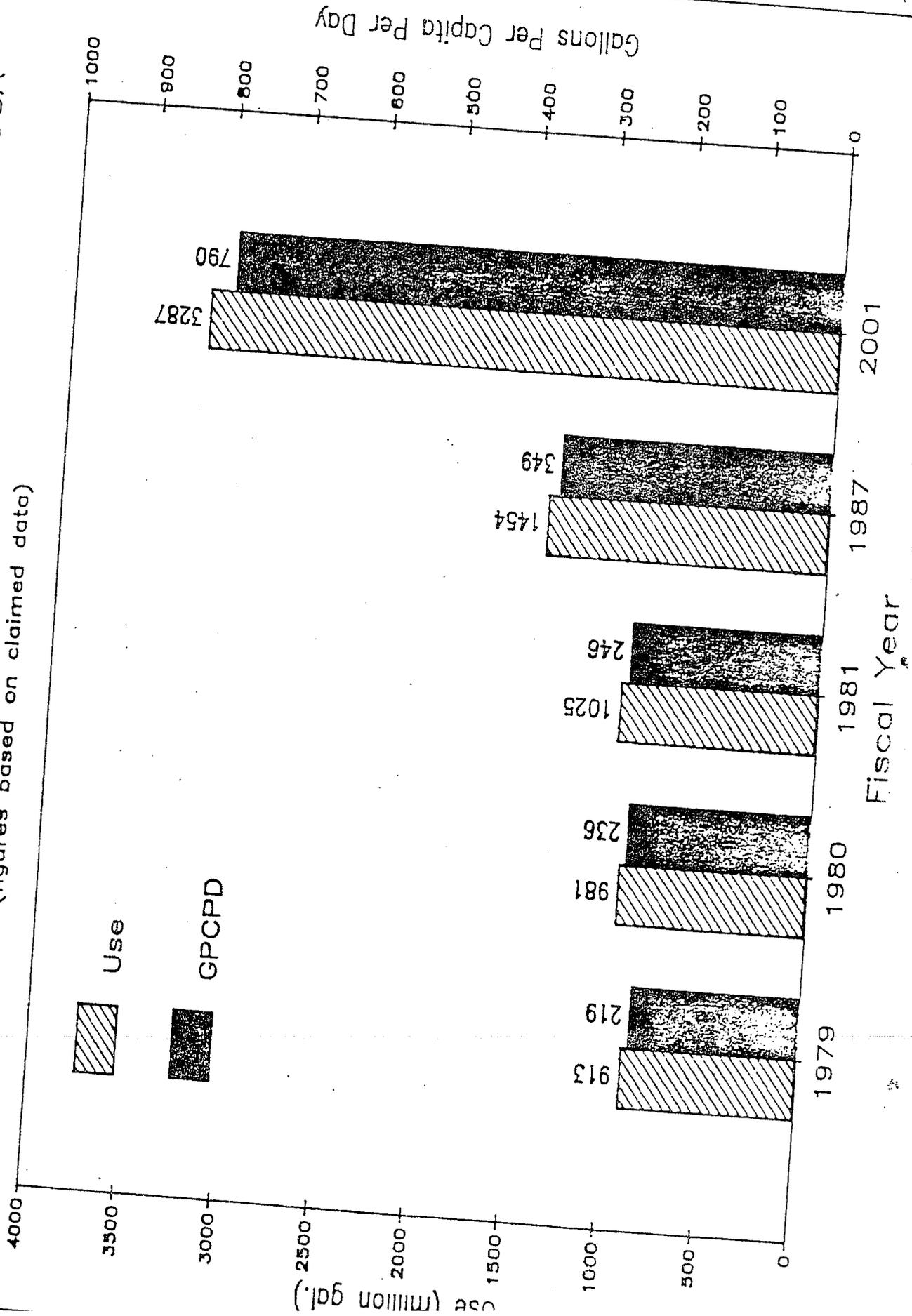
Non-Federal Claims Within Fort Boundaries

A claimant in the Sierra Vista subwatershed has claimed a well that is located within Fort Huachuca boundaries. The fort did not claim this well, nor did the fort claim a well within the same section:

Claimant: Hotter, Nancy
Statement of Claimant #39-005884
Watershed File #: 111-23-BBA-001
Dom. Well File #: 35-082899
Claimed Location: T.22S R.20E
SW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ Sect. 8
[D(22-20)8CAB]

Filed: 6/25/80

Fig. 45
HISTORIC AND PROJECTED WATER USE BY FT. HUACHUCA
POTABLE WATER
 (figures based on claimed data)



Summary

Fort Huachuca is currently the United States Army Communications Command Post. It is comprised of 73,315 acres, with an estimated population of 9,000 full-time residents, and about 7,500 day-time residents. For the past five years, the population of the fort has changed only $\pm 3\%$. The fort does not know of any future population increases.

Fort Huachuca has claimed twenty-four wells, thirty-eight springs, and sixty-five ponds. For their domestic supply, the fort claimed 3,287 million gallons (3.287×10^6) per year, which is the projected water use by the installation in the year 2001. The fort also claimed a potable water storage capacity of 5,630,000 gallons, with a pipe distribution system totaling 1,256,148 lineal feet.

The Department of Water Resources (DWR) staff has verified thirteen wells (on-site inspection), thirteen domestic springs (on-site inspection), and forty-two ponds (personal inspection and aerial photography). DWR staff also verified thirteen unclaimed ponds. A total of sixteen ponds were surveyed. The total capacity of these ponds are 367.4 acre-feet. Twenty-three claimed ponds could not be located by aerial photography.

TABLE 45. FEDERAL RESERVED WATER RIGHTS SUMMARY SPREADSHEET

	KEY
DOM	Domestic
ER	Erosion Control
IRR	Irrigation
MIL	Military Purposes
RC	Recreation
WL	Wildlife/Game Mgt.