

**DRAFT**

**Arivaca Resources**

**Pima County**

**Sonoran Desert Conservation Plan**

**March 2000**

Presented by the Arivaca Watershed Education Taskforce (AWET)

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## Overview

Arivaca, located on the Southern border of Pima County, is one of the few remaining riparian areas in Southern Arizona. The Arivaca Watershed Education Taskforce (AWET) has been gathering and dispersing information on the Arivaca watershed since 1997. This report will present collected data, show how the Arivaca area relates to the Sonoran Desert Conservation Plan, and make recommendations on how the plan could address pressing groundwater issues in the Arivaca Valley.

## The Problem

There is not enough groundwater in the Arivaca watershed to support the maximum potential build-out allowable under current zoning. The watershed is an isolated microbasin without the possibility of water being imported to alleviate groundwater shortages. With full build-out, many domestic wells, the cienega, and surrounding riparian habitat could go dry. This would threaten endangered species in the Arivaca Valley and negatively affect Pima County's Sonoran Desert Conservation Plan goals of compliance with the Federal Endangered Species Act.

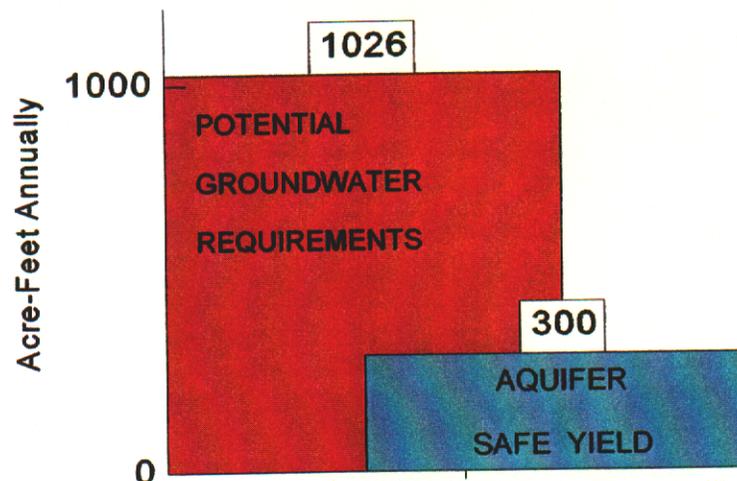
## The Numbers

Under current zoning an additional 2,177 residences could be built in the Arivaca Valley. This would result in an estimated usage of 1026 acre-feet of groundwater annually (AFA). The estimated safe yield for the Arivaca aquifer is 300 AFA, resulting in a groundwater shortfall of 726 AFA.

## Conclusion

If action is taken in the near future, the potential personal hardship, financial disaster and environmental degradation can be averted, and Pima County can protect its valuable resources through the Sonoran Desert Conservation Plan. We support financial incentives so goals can be met voluntarily.

## ARIVACA GROUNDWATER



## Who We Are

Arivaca is located on the southern boundary of Pima County, 23 miles southwest of I-19, on a tributary to Altar Wash. The town is adjacent to the Arivaca Cienega and most of the population of 1237 live to the east in the foothills surrounding the riparian corridor formed by Arivaca Creek. The cienega and some of the riparian areas are now part of the Buenos Aires National Wildlife Refuge. See Figure 1 for location map.

In 1997 a group of volunteers formed The Arivaca Watershed Education Taskforce (AWET) in response to widespread community concern about the future of Arivaca water resources and the lack of information about our aquifer. The volunteers are a diverse group of Arivacans including fourth-generation ranchers, professionals, business owners and retirees. AWET organized a network of forty people throughout the Arivaca Valley to measure rainfall and monitor well levels and has been collecting data for two years. The goal is to create a groundwater budget specifying maximum safe yield. There is a parallel effort to educate the community about the watershed, methods to promote recharge and the importance of land stewardship. Workshops on watershed preservation and restoration involve Arivaca residents in building water retention structures on their land to slow runoff and enhance recharge. Dozens of land owners in the valley have constructed gabions as a result of this project and have become aware of the importance of erosion control and land revegetation.

## How Does Arivaca Fit Into The Sonoran Desert Conservation Plan?

Arivaca is rich in the resources sought by the Sonoran Desert Conservation Plan and its attempt to address the Federal Endangered Species Act.:

1. The Arivaca Cienega and creek is one of the few remaining riparian areas in Southern Arizona and is home to several threatened plant and animal species.
2. The watershed includes wetlands, sensitive uplands habitat, and functions as a wildlife corridor.
3. Ranching has been the dominant land use, and due to the isolation of Arivaca, the rural culture has been retained.
4. The Arivaca Valley has been intermittently inhabited for centuries and archaeological remains can be found across the valley floor.
5. Because Arivaca has low density development (approximately 1250 people on 10,000 acres), preservation of these resources would be compatible with current land use, and will not require vast expenditures to maintain.

One of the goals of the Sonoran Desert Conservation Plan is to reach safe yield in Pima County. In Arivaca, as well as the rest of the Southwest, groundwater is the crux of the issue.

## Water

All life in the desert, including Arivaca residents, the riparian habitat, and the threatened species, depend upon water for their survival. The first step in establishing a groundwater budget for safe yield in the Arivaca watershed is to acquire an estimate of how many acre-feet of aquifer recharge there is on an average yearly basis. In this section we will present information AWET has accumulated on this issue.

Water has always been a concern in the Arivaca Valley and as the following quotes illustrate, sometimes it's plentiful and sometimes it's not. **"This [Arivaca] valley is large, but swampy and unhealthy.... The horse herds will enjoy good pastures, but the soldiers no health... .... The valley is large with considerable pasture, but without any water except in the marshes which in time of drouth hardly provides the necessary amount to satisfy thirst..."** (Thomas)

May 13, 1780

**When I reconnoitered Aribac ...we found the houses in ruins. The surrounding area was entirely without water. The Tubac residents assured me that to their knowledge, this was the first time that such had ever been the case."** (Williams)

Dr. Paul Sheppard from the tree-ring laboratory at the University of Arizona states: **"Tree-ring chronologies behave essentially as "integrating rain gauges" . Tree growth typically responds to moisture availability during the growing season... Prolonged droughts and wet periods are noted in the instrumental record of the Southwest. For example, no less than thirteen episodes of drought and ten episodes with above average precipitation are reported for southeastern Arizona for the years from 1866 to 1961 ...Long periods of generally below average moisture availability occurred from 1850 to 1905 as well as from 1770 to 1825. ....Several tree-ring chronologies from the Southwest show an unprecedented ramp of tree growth beginning in the mid-1970s....(Southwest Climate Assessment, 1999)**

The Arivaca area has long been susceptible to drought---in 1780 houses were abandoned and the cienega dried up. The tree-ring data shows prolonged periods of low rainfall have occurred in the past. The low moisture period including the 1780 drought lasted 45 years. The tree-ring data also indicates the period from 1980 to the present has been unusually moist. Population influx leading to increased groundwater pumping in the Arivaca Valley began in the mid-1970's.

In 1971 Arivaca Ranch sold 10,000 acres to Nationwide Land and Development Company which were in turn sold as forty acre parcels, creating an area in the Arivaca Valley known as 'The Forties'. When this development was under review, both the Arizona Water Commission hydrologist, Briggs, and Nationwide's Hydrologist, Manera, put forward estimates of safe yield: **"The developer's consultant estimates that the basin's safe yield, as evidenced by its outflow, is 645 acre-feet/year. ...The [AZ Water Commission] Committee felt that the safe yield, also as measured by the basin's outflow, was 300-400 acre-feet/year..."** (1973 Letter to Pima County Planning & Zoning Department)

Manera, the hydrologist hired by Nationwide Development Company, originally produced a report estimating recharge to be 2000-2500 AFA based on a standard percentage of the average 15" rain/year. (Manera 1972) The report was challenged and Manera issued a revised report in 1973, saying safe yield was 645 AFA. (Manera Two, 1973) The Arizona Water Commission hydrologist lowered the estimated safe yield even further to 300-400 AFA in the Arivaca Valley.

AWET has been monitoring wells across the Valley since 1998 when there was 20" of rainfall, much of it concentrated in the winter season. In 1998 well levels rose Valley-wide, suggesting aquifer recharge. However, during 1999 with only 14" of rainfall, well levels dropped up to 6' three miles upstream from the cienega, while remaining roughly the same on the Valley floor. This suggests there was little or no recharge during 1999. One upstream well on Arivaca Creek has been monitored for twenty-five years and has shown a water level variation of as much as twenty-six feet, reaching its highest points only when Arivaca Dam overflows. The water level in this well rose 8' in 1998 and dropped 6' in 1999. (Regan) This suggests a shallow aquifer which rapidly reflects variations in annual rainfall.

The Arivaca microbasin covers 87 square miles. Arivaca Dam, built in 1970, is managed by Arizona Fish and Game as a recreational resource. The dam retains 17% of the runoff from the basin. Only five times in the past twenty five years has the dam overflowed into Arivaca Creek and contributed to significant aquifer recharge; the last time was in 1993. (Regan)

There has been no scientific study of aquifer recharge in the Arivaca area which considers all the relevant factors, including the amount of rainfall needed per rainfall event for recharge to occur, the percentage which leaves the Valley in runoff during floods, the amount captured by Arivaca Lake and stocktanks, and the affect of prolonged drought on the aquifer. We do know, however, that in 1780 before there was groundwater pumping, and before Arivaca Dam and stocktanks captured any runoff, the cienega went dry. We further know extended periods of low moisture have occurred with some frequency in Southern Arizona.

Arivaca is an isolated microbasin and cannot rely upon CAP water being piped in to relieve the community in times of drought. The safe yield range the experts have settled upon is wide: from the Arizona Water Commission's hydrologist's estimate of 300 AFA, to Nationwide's hydrologist's estimate of 645 AFA. In order to avoid the personal hardship, financial disaster, and environmental degradation accompanying an extended drought, it seems prudent to use conservative safe yield estimates when planning our groundwater future.

**MAXIMUM SAFE YIELD FOR THE ARIVACA VALLEY:**

NATIONWIDE HYDROLOGIST

645 AFA

AZ WATER COMMISSION HYDROLOGIST

300-400 AFA

## How Much Groundwater Is Already Allocated?

Groundwater allocation and groundwater use are, fortunately, two different things. If and when the groundwater runs out, claims will be settled in court on a "first in time, first in line" basis.

ADWR records show there is currently **924 AFA** of grandfathered groundwater rights allocated in the Arivaca basin.

According to state law, each domestic 'exempt' well is allowed 10 AFA of groundwater use. There are 245 registered domestic wells in the Arivaca watershed. Domestic well allotment is **2450 AFA**.

<b><u>GROUNDWATER ALLOCATIONS</u></b>		
GRANDFATHERED RIGHTS	<b>924</b>	<b>AFA</b>
DOMESTIC WELLS	<b><u>2450</u></b>	<b>AFA</b>
<b>TOTAL ALLOCATED.....</b>	<b>3374</b>	<b>AFA</b>

There are about 10 times more 'rights to groundwater' than there is groundwater to have rights to, on an annual basis.

## How Much Water Do We Currently Use?

According to Pima County Assessor 1999 land use records, there were 266 residences in the Arivaca watershed outside of the townsite. Household use is estimated at .42 AFA. (ADWR estimates per capita water consumption @ 150 gallons/day, and the Census Bureau uses 2.5 persons/residence as average.) This accounts for **111 AFA**.

The Arivaca Townsite Cooperative Water Company reported using **24.5 AFA** (a fifteen year average).

Irrigation use reported in 1998 was **68.6 AFA**.

Four commercial wells and 23 ranch wells are estimated to use **11 AFA**.

The total acre feet of groundwater used in the Arivaca watershed is currently estimated to be **215 AFA**.

<b><u>ESTIMATED CURRENT GROUNDWATER USAGE:</u></b>		
266 RESIDENTIAL UNITS OUTSIDE TOWNSITE	<b>111</b>	<b>AFA</b>
TOWNSITE (15 YR. AVERAGE)	<b>24.5</b>	<b>AFA</b>
4 COMMERCIAL AND 23 RANCH WELLS	<b>11</b>	<b>AFA</b>
IRRIGATION USE REPORTED IN 1998	<b>68.6</b>	<b>AFA</b>
<b>TOTAL</b> .....	<b>215</b>	<b>AFA</b>

## Under Current Zoning, What Is The Potential Groundwater Usage?

Current RH zoning permits one residence/4.13 acres. This zoning covers all of The Forties, much of which has already been split into 10 and 20 acre parcels: there are currently 477 parcels. If all owners were to sell down to their last split there would be 1248 parcels in The Forties. This would amount to **524 AFA**, (1248 x 2.5 persons x 150 gallons/day). The 150 gallons/day figure is used by ADWR for estimating urban water use. Rural water use may be higher when stock watering and gardens are taken into account, but we have no figures to quantify this.

There are several working ranches in the Arivaca watershed. If all the privately owned land zoned RH, excluding The Forties, were to be split into parcels of 4.13 acres that would result in an additional 865 residences and amount to **363 AFA** groundwater use.

Some of that land is zoned GR-1 which allows one residence /36,000 sq.ft. There are 330 potential parcels with GR-1 zoning which would amount to **139 AFA**.

If all the land in private ownership in March 2000 were split into its legally smallest units there could be a total of 2,443 residences in the Arivaca Watershed, using 1026 AFA.

<b><u>POTENTIAL WATER USAGE UNDER CURRENT ZONING:</u></b>	
FORTIES: 1248 POSSIBLE RESIDENCES	<b>524 AFA</b>
865 OUTSIDE FORTIES ( INCL. RANCLAND)	<b>363 AFA</b>
330 ON GR-1 LAND	<b>139 AFA</b>
<b>POTENTIAL TOTAL.....</b>	<b>1026 AFA</b>

See Figure 2 for map of existing private parcels and potential build-out display.

**Conclusion**

<b><u>MAXIMUM SAFE YIELD FOR THE ARIVACA VALLEY:</u></b>	
NATIONWIDE HYDROLOGIST	<b>645 AFA</b>
AZ WATER COMMISSION HYDROLOGIST	<b>300-400 AFA</b>
<b><u>GROUNDWATER ALLOCATIONS: .....</u></b>	<b>3374 AFA</b>
<b><u>POTENTIAL GROUNDWATER USAGE .....</u></b>	<b>1026 AFA</b>

Arivaca groundwater is already over-allocated. Further, if all the privately owned land in the Arivaca watershed were to be split down to the **currently legally allowable** smallest units, estimated groundwater usage would be 1026 AFA. That is nearly triple the safe yield estimate of 300-400 AFA by the Arizona Water Commission; it is 381 AFA over Nationwide's estimated safe yield. Both those safe yield estimates were made on the basis of data collected in 1972, a year with average rainfall of 16.30", following a year of above average rainfall in 1971 with 20".

<b>AQUIFER SAFE YIELD.....</b>	<b>300 AFA</b>
<b>POTENTIAL GROUNDWATER USAGE.....</b>	<b>1026 AFA</b>
<b>GROUNDWATER OVERDRAFT.....</b>	<b>726 AFA</b>

If the Arivaca Valley is to have adequate water for residents and habitat in the future, groundwater issues must be addressed.

## Riparian Habitat and Threatened Species

The cienega lies in the lap of the Arivaca Valley adjacent to the townsite where the geology creates a shale dike that holds back the water of Arivaca Creek, before it drains down to Brawley Wash and the Altar river. Eighty-seven square miles of upland watershed support and contribute to this wetland.

Established in 1985, the Buenos Aires National Wildlife Refuge includes parts of Arivaca Creek and the Arivaca Cienega. **"The species living on BANWR both directly and indirectly depend on Arivaca Creek as a source of water: mammals and birds use the creek as a source of drinking water; Arivaca cienega is directly connected to the creek; the creek supports a riparian corridor of cottonwoods and willows, among other trees and shrubs. This vegetation creates a forest of forage material, food and protection for the wildlife living on the refuge."** (FWS, 1999) BANWR owns 1,619 acres of the Arivaca watershed.

Because of the rarity of wetlands in Southern Arizona and Northern Sonora, this area is home to a wide assortment of species. The endangered and threatened species located in the Arivaca Watershed include:

<b>Chiracahua leopard frog</b>	<b>Buff-collared nightjar</b>
<b>Large flowered blue star</b>	<b>Black-bellied whistling-duck</b>
<b>Lowland leopard frog</b>	<b>Cactus Ferruginous pygmy-owl</b>
<b>Mexican long tongued bat</b>	<b>California leaf-nosed bat</b>
<b>Greater Western mastiff bat</b>	<b>Gila topminnow</b>
<b>Cave myotis</b>	<b>Mexican garter snake</b>
<b>Northern beardless tyrannulet</b>	<b>Northern gray hawk</b>
<b>Pale Townsend's big-eared bat</b>	<b>Rose-throated Becard</b>
<b>Santa Cruz striped Agave</b>	<b>Thick-billed kingbird</b>
<b>Tropical kingbird</b>	<b>Western Yellow-billed cuckoo</b>
<b>Yellow-nosed cotton rat</b>	(AZGFD Heritage Data Management System, 1999)

The privately owned riparian areas and the open space in the uplands surrounding the Buenos Aires Refuge provide habitat and corridors for wildlife. The condition of the uplands is crucial to the life and health of the Arivaca Cienega. Hence, it is important to maintain good vegetative growth which slows runoff and promotes recharge; avoid depleting groundwater; repair and control erosion by installing gabions, revegetate damaged areas; and continue land stewardship education programs.

## Historical and Cultural Resources

The first written notice of the Arivaca Valley was by Father Kino who marked the location of Arivaca (then called Aribac), on a 1695 map. Arivaca became the center for miners and ranchers of the surrounding area. (See Appendix A) The ranching culture continues to this day: fourth generation descendants of early ranchers and homesteaders still live and ranch in the Arivaca Valley. However, other Arivaca ranches have changed hands within the past few years.

Archaeological exploration of the Arivaca Valley has been limited. Due to road construction in 1992, a site was excavated and found to be a Trincheras-Hohokam Farmstead dated at A.D. 850 to A.D. 950. It is believed Arivaca was a contact area between the Hohokam of the Tucson Basin and the Trincheras of Sonora. The study concludes: **"Although extremely limited in scope, [these] archaeological investigations...provide the first detailed information about a previously unknown archaeological region. ..This upland area is characterized by mild climate, diverse natural resources, an expanse of arable land, and a perennial stream. These characteristics have made the area attractive to sedentary agriculturalists from early prehistoric times and imbued it with a rich cultural history."** (1992, Dept. of Transportation) Pottery shards, arrowheads, and spearheads are routinely seen. Residents have found burial sites, metates, and fire pits in areas previously inhabited prehistoric people.

## Recommendations

The resources of the Arivaca Valley are at risk if groundwater use and further development proceeds as allowed under current law. It is still possible to meet the goals of the Tucson AMA for safe yield without major disruption of residents if actions are taken in the near future to conserve groundwater resources. U.S. Fish and Wildlife goals for the preservation of the Arivaca Cienega will be met only if the growth of groundwater use in the adjacent privately owned land is ameliorated.

We support voluntary inducements to meet these challenges. We believe it is just as important to reduce the number of potential 'splits' by small landowners as it is to preserve ranch land. Small and large landowners should receive financial incentives to meet these community goals voluntarily.

1. Take steps to ensure State Land remains undeveloped and available for agricultural and recreational use.
2. County, State, or Federal governments, or Conservation groups could purchase and retire groundwater rights from willing sellers.
3. Conservation easements could be purchased from willing ranchers to protect the ranching culture, open space and wildlife corridors in perpetuity.
4. Small land owners would need substantial incentives to forego potential profits from splitting their land.

(a.) A substantially reduced 'Land Stewardship tax-rate' could be established to encourage small parcel owners to sign over 'split rights' and take those potential splits off the table in perpetuity.

(b.) Established dwellings could be 'grandfathered' in the Pima County Building Code for those who enter the land stewardship program.

These incentives would make it possible for the current residents to remain in the area even if decreased land supply led to increased land values and hence higher land taxes. Tax increases could be indexed to specific improvements rather than estimated land value increases. Without this tax relief the culture of the area would be distorted because only those with high incomes could afford to live in the Arivaca Valley.

5. We recommend the Arivaca Road remain two-lane, with its curves, washes and grades intact. Not only does it preserve the arduous old wagon route, but it contributes to the sense of remote isolation which is an integral part of the historical culture.

6. Funding for continued watershed improvement would contribute to the preservation of the riparian habitat. Money for further educational workshops, gabion building materials and revegetation projects would enable land owners to participate in sound land stewardship.

These proposed Pima County expenditures and tax incentives would be offset by the reduced growth in infrastructure costs which result from expanded wildcat development through lot splitting. For instance, it would reduce increased road maintenance costs, flood control improvements, refuse and sewage management, etc. which are often expected County services when urbanites move to rural, developing areas. Protecting the Arivaca watershed will contribute to meeting the goals of the Sonoran Desert Conservation Plan.

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Williams, Jack F, transl., *The Land Laid Waste by War: Diary of an Expedition to Northern Sonora Undertaken in 1780*. Page 35.

Wittlesey, Stephanie M. and Ciolek-Torrello, Richard S., *On the Frontier: A Trincheras-Hohokam Farmstead, Arivaca, Arizona*. Pima County Department of Transportation and Flood Control District, 1992.

## APPENDIX A

### A History of Arivaca Valley Water Resources and Land Use

by Mary Noon Kasulaitis

The Arivaca valley and its surrounding hills had been home to Native Americans for centuries. The terrain supports numerous nutritious plants and trees, providing a year-round food supply, available for just a short trip from the cienaga in the valley to oak trees in the hills. An irrigation canal some two miles long snakes down the valley. It may date from Spanish times or even earlier, when the Hohokam resided there.

Father Kino was the first Christian missionary to Southern Arizona, marking the location of Arivaca, then called Aribac, on a 1695 map. In those days, if people lived here, there must have been water. There is no indication that Kino carried out much activity at Arivaca, and after his death in 1711, there was even less. Father Campos was assigned to this area, but his visits were few. After 1730, however, more Jesuits arrived to take over the mission field, bringing with them Spanish settlers. Arivaca became a visita of Guevavi Mission, and priests came here from time to time to baptise children and marry couples. There is no indication that there was any more than just a simple adobe building or ramada to serve as a church.

The 1740s were busy years in Arivaca, according to mission records. Don Antonio de Rivera employed a number of people on his ranch near Arivaca, both Pimas and gente de razón (Spanish settlers). The Jesuits at Guevavi also ran cattle in the Arivaca area. Then came the Pima Revolt which lasted from November 1751 through Jan 1752. Several ranch employees were killed by natives in an unexpected uprising known as the Pima Revolt. The Spanish retaliated and were able to subdue the revolutionaries in another battle near Arivaca.

After January 1752, Arivaca was abandoned and remained so for several decades. In 1764, Fr. Nentvig wrote that it had been destroyed and was not populated at that time. On the expedition to California in 1774, Capt. Juan Bautista de Anza noted in his diary that a stop was made at "La Aribac, a place which was occupied by some cattle ranches and Spaniards until the end of the year 1751, when it was abandoned because of the general uprising of the Pima tribe, which killed most of its inhabitants. The battle with the rebels themselves, which took place right here the year after the uprising, is memorable. For having come more than two thousand strong, led by their captain-general, to attack the Spanish forces composed of eighty soldiers and commanded by Don Bernardo de Urrea, now captain of the presidio of El Altar, the army of the enemy was completely put to rout, with many deaths on their side, from which resulted the pacification of this tribe.

"This place has the advantage of good gold and silver mines which were worked until the year 'sixty-seven, when they were abandoned because of greater persecution by the Apaches. . . It also has most beautiful and abundant pastures, and a number of permanent springs in the interior of the mountains. The chief one where the settlement was, is now running, although not with great abundance." (Anza Diary, Sun., Jan. 9, 1774)

Kessell, John. *Mission of Sorrows*.

Bolton, Herbert Eugene. *Anza's California Expeditions*, Vol. II New York :

Russell and Russell, 1966.

Mission Guevavi, Libro de Bautismos, Diocese of Tucson

In 1766 the Marqués de Rubí was sent to the frontier of New Spain on an extremely lengthy trip, to reconnoiter the situation and make recommendations. These included setting presidios at carefully spaced sites across the northern frontier. Rubí would have changed the location of the presidio at Tubac to the Arivaca valley, because he felt it was a better location. But again it was not to be. Lt. Col. Hugo O'Connor was assigned to complete the realignment of the presidios. In 1774 he sent out his deputy, Don Antonio de Bonilla, to look at the situation again. Bonilla looked at the possible presidio sites and made his recommendation:

"The settlers of Tubac and the mission of Tumacacori are in the most unprotected condition and will, without support, emigrate as soon as the presidio is moved to Arivac.

"This valley is large, but swampy and unhealthy. . . The horse herds will enjoy good pastures, but the soldiers no health, and the only good which this transmigration will produce will be that the rich mines of silver called Longoreña, La Duri and others will be worked. But in Sonora where

minerals are plentiful, people and the spirit to work the mines are lacking."

O'Connor had to see for himself. He arrived here in 1775 and soon decided that Arivaca was too far south and "its only water was a ciénaga that all but evaporated during the dry season." O'Connor recommended Tucson instead, and so the Tubac garrison moved north in 1776.

Kessell, John L. *Friars, Soldiers and Reformers*  
Thomas, Alfred Barnaby, ed. and transl. *Teodoro de Croix and  
the Northern Frontier of New Spain, 1776-1783*

The Ortiz family received a land grant in the Arivaca valley in 1812, but their family homes were in Tucson and Tubac. They attempted to maintain the ranch until the 1850s, but were constantly plagued with Apache attacks. According to testimony taken in 1880, Santos Aguirre stated that the Ortiz brothers were on the ranch and in possession of it until they were driven off by the Apaches. At that time, three persons and a child were killed in the house. After this, the Ortiz brothers abandoned the place and went to Tubac. Aguirre did not know when this happened, but Nasario Ortiz (no relation) testified that he thought it was in 1824. He added that they did not return to take possession of the ranch in person but held possession by agents and returned from time to time.

Jose Herreras stated that, besides having cattle and horses on the ranch, they or their employees cultivated the land and irrigated it. He claimed that the irrigation ditch was five or six miles long. José María Elias added that between 1846 and 1847 persons occupied the ranch with the consent and under the direction of the Ortiz brothers although they themselves did not go there. There were cattle and untamed horses on the ranch and, Elias explained, the consent of the Ortiz's was always asked to make a rodeo. It has been said that there were many wild bulls on the ranch in the mid 1850s, due to the fact that roundups could not often be held. It appears that anyone looking for a rodeo would have gone to the right place!

Arizona (Terr.) Surveyor General, *Journal of Private Land  
Grants*, 1881, in U. of A Library microfilm collection.

After the Gadsden Purchase, Charles Poston and mining engineer Herman Ehrenberg found Arivaca while out scouting for likely mining country. Along with Major Samuel P. Heintzelman, who had established a U.S. Army post at what is now Yuma, they formed the Sonora Exploring and Mining Company. In 1856, they began development. The 1856 report to the stockholders of the Company stated that the purchase of the Arivaca land grant was their first aim. According to Ehrenberg, "It is one of the finest places in the Purchase with splendid grass and abundance of water. I am told that on it and the adjoining hills there is room and food for 50 or 60,000 head of cattle at least..."

The Company used the Arivaca valley for its mill sites, utilizing the existing oak and mesquite for fuel. The pasture land served for raising cattle and horses. After a few years of this, the Civil War ended mining activity. Apaches and Mexican bandits were a constant problem. Ownership of the land grant was in limbo until after the turn of the 20th century. However, settlers had moved in and begun farming. Pedro Aguirre, owner of the stage line, began the Buenos Aires ranch and lived in Arivaca, where he built a school. In the 1870s many settlers moved into the area, most with mining interests, but a few were farmers.

North, Diane M.T. *Samuel Peter Heintzelman and the Sonora Exploring and  
Mining Company.*  
*Report of the Sonora Exploring and Mining Co. to the Stockholders*, Cincinnati:  
Railroad Record Print, December, 1856 and September, 1857.

The conditions in Arivaca in 1881 were described by Owen P. White, whose father ran the Customs House there:

"I can remember the house we lived in...it had two doors and no window, and was located, for the convenience of malaria mosquitoes, which strange to say, operated ravenously down in that country, at the edge of a small swamp...my brother and I...ran away from home whenever we could, and I am really inclined to believe that my mother looked upon the fact that we had both yielded to the influences of the nearby swamp and acquired malaria as something that had come to her as a real blessing. Because for an hour or two every day, during the time when we

were having our regular chills, she always knew exactly where my brother and I were to be found. However, nobody stole or scalped either of us. Just why they didn't is hard to say, but at any rate they didn't; and so for almost a year we hungered and suffered and shook with ague down at Arivaca."

White, Owen P. *A Frontier Mother*, New York : Minton, Balch & Co, 1929.

In the late 1870s Noah W. Bernard and John Bogan formed a partnership and became cattle barons. Noah W. Bernard was the first postmaster and owned the store in Arivaca. A number of miners and other settlers moved into the area. Reportedly the 70s were wet years, leading people to think that things would always be like that. The coming of the railroad in 1880 guaranteed a market for beef. Soon there were cattle everywhere, but thousands of head of sheep also grazed on the hills. The grass disappeared. By the time the golden years of the 80s were over, times were very different. The cattle industry faced setbacks in the 1890s. First there was an extended drought: Between 1893 and 1900 the number of cattle in Arizona declined by 50%. Many starved because they could not be sold, due to depressed economic conditions resulting from the Panic of 1893, equivalent in some ways to the Depression of the 1930s.

Wagoner, Jay. *A History of the Cattle Industry in Southern Arizona.*

In the early 1900s the settlers in the valley went through several years of battling over ownership of the valuable springs in this area. The Arivaca Land and Cattle Company had attempted to claim the old Mexican land grant and had been in court for more than twenty years. When the Supreme Court of the United States decided in 1902 that the Arivaca land grant was not valid, thus opening up the valley to settlement, the fight was on to file homestead claims. All this time some people had been living on the land grant, farming and ranching with no actual claim to their land. It was open range, so ranchers could run cattle just about anywhere and usually only fenced the springs or pastures that they owned.

There were two kinds of homestead entries. The regular kind of 160 acres had been established in the eastern part of the country where it rains oftener and farming is common. 160 acres is not enough land for ranching in the desert, so a different type of homestead was established, the Desert land entry, with 320 acres. Now even that is not much for cattle ranching in dry country, but it was the most the government would do.

At the end of the court battle there was a land rush. John Bogan, Nonie C. Bernard (son of Noah, who had died in 1907) and partner George Pusch set out to file legal claims on as much of Arivaca valley as they could. Naturally they wanted the springs. Nonie Bernard's homestead took in a good section of what is now the USFWS Buenos Aires Refuge's part of the cienaga. His house was near the entrance trail. George Pusch, by some questionable but apparently legal method, filed on several 40 acre parcels, mostly springs, wetlands or just where there was good soil. On February 11, 1907, John Bogan filed a Desert land entry for 320 acres of the valley just east of Nonie's homestead.

Arthur Noon had been ranching his father's homestead at Oro Blanco. He was looking to file for his own homestead and saw the opening up of the Arivaca valley as a good opportunity. Other settlers like Phil Ward and Rita Sanchez Mora had been living on their claims in the Arivaca valley for years, but now had to find a legal way to obtain ownership. When Bogan filed for the Desert entry on land that everyone knew was not desert, Arthur Noon decided to file a protest. His brother, S. F. Noon, an attorney in Nogales, represented him.

Is the cienaga a desert? That was the question. Bogan had to prove it was, and the Noons that it wasn't. Valley residents took up sides and were called on to testify at the hearing, which began December 7, 1908.

One issue was whether or not you could farm without irrigation. Corn from Rita Sanchez' land and beans from Francisco Tapia's were presented as evidence that there was enough subsurface water that you need not irrigate to produce a crop. Billy Marteny, who homesteaded 3 miles upstream, said he had never seen the cienaga dry, even during relatively dry years. From the Bogans he had purchased native grass hay which had been cut from the cienaga. For eighteen years on his own land he had grown corn, beans and pumpkins, all without the aid of irrigation.

John Bartlett testified that the whole cienaga was subject to flooding from Cedar Creek and that if you wanted to farm some portions of the cienaga you would have to drain it first. He defined cienaga land as swamp that you would have to drain in order to farm.

Arivaca pioneer sheep rancher John Conti said he had never seen the creek dry, in fact, he

had caught and sold as many as a thousand dozen bullfrogs to buyers in Tucson. He proclaimed, "In general, what is flat is wet."

At the conclusion of the hearing, it was found that the part of the Arivaca valley claimed by Mr Bogan to be desert was indeed not desert. He was eligible to file on 160 acres and Arthur Noon filed on the other 160 acres.

Three years later John Bogan (4/20/1911) filed for all the water in Arivaca Creek from a point 300 feet south of the old Arivaca hotel to the junction of Cedar Creek and Montana Canyon (where Arivaca Lake now is) to the full amount and extent of 500 cubic feet per second. Arivaca valley residents retaliated eight days later. They filed with the county Recorder a document showing that the nine original owners of the Arivaca fields had regulated their own use of Arivaca Creek by allotting irrigation water to users on a regular basis. An individual would have the use of water from the ditch for six hours a week. This agreement had been in force since 1886. Furthermore, town residents used the creek for household water, taking it directly from the creek or irrigation ditches. That was common until at least the 1920s.

Pima County Records, Land ClaimBook 2, Page 311-12.  
Transcript of Noon v. Bogan, 1908

The government was getting involved in other ways. In the summer of 1906 the newly created Forest Reserve sent a man named Lieberg to examine the region west of Nogales and the Baboquivari. The first Tumacacori Reserve was proclaimed on November 7, 1906.

Government Surveyor George Roskrue had done an extensive survey in the Arivaca area in the 1880s, followed by Contzen in 1907, and the plats and notes were available to the Forest Reserve surveyors. These maps clearly showed topography. Chosen boundaries ran along section lines and whole townships were included if possible. The intent was to include mountains and foothills: the whole watershed. Homesteaded lands that had already been proved up were excluded, and a 1906 law protected those who were in the process of filing. Land that appeared flat enough to farm, including rolling hills, was not included.

It was the value of the Tumacacoris, Pajaritos and the Cobre Range as watershed that led them to be included in the Forest Reserve, not their ability to produce lumber. The first Tumacacori Forest Reserve map clearly shows all the major washes and their tributaries. Grazing permits were allowed to those ranchers who had already been running cattle on what became the National Forests. In the early years Rangers attended the big area roundups to count cattle in order to calculate grazing fees.

In those early years, woodcutting restrictions probably affected the most people. The Nogales District paid expenses by selling fuel wood to mining operations.

"The Forest Reserve," by Mary N. Kasulaitis.  
The Connection, November 1997

In 1916, the Mexican Revolution was in full swing and troops were needed to guard the border. The Connecticut National Guard arrived in Arivaca and kept a diary:

"We spent almost nine weeks at Arivaca encamped within the confines of a barbed wire enclosure, flanked by adobe walled store--adobe church and adobe residences occupied by both men and chickens and cattle. We guarded the old smugglers' trail leading southward from Tucson to Saric. We patrolled the mining and cattle country to the southward along the Border. Montana, California Gulch, the Stone House (Casa Piedra), La Osa, Tres Bellotas, Sasabi, Buenos Ayres and Oro Blanca became familiar names and still recall familiar scenes.

"It would take too long to tell every episode of interest which transpired during our tour of duty on the Border. But for the benefit of those of you who weren't there let me sketch for you a few of the incidents of our life at Arivaca together with now and then a portrait of some of the men who worked with us.

"Bugles blown by Haynes and Taylor cut the chill morning air, as one finds it before sunrise. . .

"After breakfast watering is in order. . . in a jiffy the whole troop is mounted bareback in column of twos and on the way to Arivaca Crick, which with full stream flows past the town and within two miles thereafter runs dry..."

Howard, James L., ed. *The Origin and Fortunes of Troop B, Cavalry,*  
Connecticut National Guard, 1917. Hartford, CT: The Case, Lockwood  
and Brainard Co, 1921.

1920-21 are the years Arivaca cattlemen remember best for a prolonged drought. It hurt everyone, but especially the Arivaca Land and Cattle Company. Ranchers had to go to great lengths to keep themselves solvent and their herd together. Every effort had to be taken. Katherine Grantham remembers her brother bringing calves in on his saddle, their mothers having succumbed to the drought. Many cattle became stuck in the mud of the cienaga, where a little water remained, and a breath of dampness attracted thirsty cows. In those days there weren't many windmills or manmade reservoirs, and animals depended upon natural water holes. The Arivaca Ranch lost a lot of cows, and little calves were wandering all over the creek bottoms.

Katherine Noon Grantham, interview

"We survived on water cress during the Depression. There was beautiful big water cress and there were no fences. You could go any where. We used to haul that stuff in by the bucket load. . . My mom always raised beans and those big Mexican pumpkins. . . There was an apple orchard down by the river going west toward the Piñeda house which was about a mile from the town itself. . . There were several old orchards. There were several old Spanish ranches especially down towards Las Jarillas and every one of them had their own orchard. If you came upon a tree that had fruit on it you picked the fruit. It was just there. Nobody ever said anything about it, as long as you didn't do any damage you were welcome to eat. . . We always had bellotas (acorns) and black walnuts. You would go up in the hills to get them. There was yerba del manzo, we used to dig it up in the meadow. Its an herb. I believe the leaf is a wide green leaf and it just grew above the ground, with little white flowers. They used the root for some kind of medicine. Yerba del Indio grew out there too. That was a real bitter root. We dug it up down below the Hubbell house: there was a meadow there.'

Armando Membrila, interview

When the Chiracahua Cattle Company, owned by the Boice Brothers, purchased the Arivaca Ranch in 1930, they brought their Herefords with them. Charlie Boice, the youngest brother, was in charge. He set out to improve the range and began a development program which made significant changes in the utilization of Arivaca Creek. Between 1930 and 36 Charlie built dikes across the creek, in the parcels now owned by the U.S. Fish and Wildlife Service. He diverted the water toward the south side of the valley and built the reservoir. Arivaca residents were used to having an irrigation ditch on the north side, near town. Upstream, near the ranch house, there were more diversion projects. Charlie built Stokes tank and Sapo tank, besides others further away from town. He had a cement mixer on wheels that was pulled by four mules to out-of-the-way dam sites. Wells were dug and windmills went up everywhere, including a gigantic one that rose high up out of Tres Bellotas canyon. The disaster of the drought of the early twenties would not be repeated if permanent water could be developed in strategic locations around the range. Other ranchers were also building stock tanks and reservoirs and cleaning out springs, learning to work with the Soil Conservation Service.

Arivaca Ranch history, part 5, by Mary N. Kasulaitis, the Connection, May 1999

Malaria had always been common, but there were two cases of malaria in Arivaca in the 1930s which prompted some action. The State Health Department investigated, and in 1938 they decided to try introducing a mosquitofish, *Gambusia affinis*, into the ponds in Arivaca cienaga. These fish eat mosquito larvae. Within two years they had taken care of almost all the mosquitos, and do so to this day.

"Before *Gambusia*," by Mary N. Kasulaitis, the Connection, August 1995.

In 1947, the Clarke Ranch built a dam across the Arivaca Creek, just downstream from the confluence of Cedar and Chimney Canyons and about five and a half miles southeast of Arivaca town. It was sometimes known as Bartolo Dam because Bartolo Caviglia had had his homestead in what was now the lake bottom. This location had been deemed desirable for a dam since the days of Bernard and Bogan. The Clarke dam was about 30 feet high and the capacity of the reservoir was about 990 acre feet. The Clarkes used it for recreation as well as for a ranch water supply. According to Fred Noon, as official Weather Observer for the area from 1931 to 1994,

and longtime valley resident and rancher, the dam only spilled over some six or seven times during its 18 year life. Some years it only reached half capacity. This dam was not sealed to bedrock and seeped water continuously to the great benefit of the underground water supply. The winter of 1965-66, however, was very wet, softening the dam and leading to the collapse of the dam in December, 1965 after some 8 inches of rain had fallen. The resultant flood, four to six feet deep and six miles long, caused the evacuation of and some damage to the Brouse/Casey home in Arivaca and much damage to fences in its path.

The Arizona Game and Fish Commission determined to rebuild the Clarke Dam and purchased acreage from Maynard Gaylor, who had purchased the Clarke Ranch. The Dept entertained the idea that it might buy the cienaga also. Before the dam was even built, Fred Noon apprised them of the fact that the cienaga downstream might suffer from lack of water because rainfall in the area is erratic. (letter dated 4/9/69 and a hearing in 1969) and reminded them of it later when the dam did not fill (letter dated 7/14/75). The dam was constructed and dedicated in 1970. It was firmly sealed on bedrock and holds at capacity some 1100 acre feet of water.

Subsequently, Fred Noon reminded them, "At the hearing in 1969 I asked Bob Curtis if a discharge pipe would be installed in the dam and if water could be released if the valley water supply became critically short and he replied affirmatively to both questions. Your Department Biological Report on the Arivaca Valley, compiled in April, 1969, had this recommendation: 'Should the land in question be acquired it may prove desirable and necessary to periodically release water from Arivaca Lake to maintain desirable conditions for wildlife downstream.'" In the 30 years since Arivaca Lake was constructed, Game and Fish has never done this.

Arivaca Slough Acquisition Proposal Biological Report submitted by David E. Brown and Richard L Todd to the Ariz. Game and Fish Dept., 4/28/69.  
Fred Noon's files

In 1970 there were reportedly less than ten wells in the valley. There were a hundred or so folks living in the townsite and a few ranches scattered around the hills. Then Nationwide Land Development Co. purchased some 10,000 acres from the Boice family which had been ranching here since the 1930s and decided to sell out. The company set out to obtain rezoning which, if allowed, would radically change Arivaca valley. In September of 1971, Nationwide asked to rezone most of the property from General Rural to Suburban Ranch with some at higher density. 11,500 acres were involved, including some not in the Boice property. There would be four-acre homesites on 10,000 acres and one-acre homesites on 780 acres. Other land would be set aside for commercial use. Fifteen Arivaca residents appeared at the County Planning and Zoning Commission meeting to object to the rezoning. Part of their objection was to the inclusion of their land in the rezoning without their knowledge or consent. The County objected because the proposal had insufficient information regarding water, soil, and other technical aspects of development. The Company withdrew its request, pending the development of a comprehensive land use plan.

Fred Noon had begun to do his own research regarding the water resources in the valley, as he feared that the proposed dense development would negatively impact the water level in the cienaga. He began a letter writing campaign and enlisted the support of Robert Jantzen of the Arizona Game and Fish Department and the Department of Hydrology and Water Resources at the University of Arizona. Other residents joined him in the protest effort.

Nationwide employed Manera and Associates, Inc, Consulting Hydrologists, to do a study of the area, which they entitled Geophysical and Hydrological Reconnaissance of the Arivaca Area, Pima and Santa Cruz Counties, Arizona, dated March 14, 1972. They did a geologic reconnaissance of the area and measured depth to water. They gathered water samples and well data. They did an electrical resistivity survey of one quarter section to determine the electrical characteristics of the subsurface materials. Some of their conclusions were: 58,431 acre feet of water per year fall as precipitation on the Arivaca drainage area using the average of 15 inches of annual precipitation; between 2000 and 2500 acre-feet of water per annum would be recharged into the ground water reservoir; the minimum safe yield of the basin would be 1,200 gallons per minute; that the Arivaca basin is capable of yielding 1,200 gpm annually, and therefore the project area could be subdivided into 1,000 units.

Fred Noon provided a statement for the Planning and Zoning commission which refuted several of Manera's conclusions because he believed that there was less water available than their study showed. He said (referring to the records that he had kept as an official Observer for the U.S. Weather Bureau): Manera's report did not take into account the drought years, that there

have been more below-average precipitation years than above-average; that there have been several years when all the sloughs dried up and the stream ceased to flow; that Arivaca Lake (rebuilt 1970) has removed a significant number of acre feet of water from the Valley and due to its solid construction was not leaking water into the water table.

A Hydrological Study Committee was convened by the Planning and Zoning Dept. to study and review the water supply and surface water conditions as given in the Arivaca Ranch Area Plan. Members of this committee included representatives from the U.S.G.S., the University of Arizona, Tucson Audubon Society, the City of Tucson Water Dept and consulting hydrologists John Harshbarger and Leonard Halpenny. Halpenny did not do an independent hydrologic investigation, he noted, but served in a volunteer capacity. The committee was to find that more study was needed before they could make a decision. This study would take the better part of a year.

In January, 1973, the revised Manera report became available. It provided somewhat more information on the geology and topography of the area. Two test wells were monitored for about a week-long period late in 1972, with favorable results. (Fred Noon noted that these were drilled near wells that were known to be good) Runoff was monitored by the U.S.G.S. Recharge data was calculated as 765 acre-foot per annum. When all was said and done, the volume of water available was calculated to be enough to serve 1200 units.

In the meantime, Nationwide was going ahead with its other project: a new 120 acre lake to be built in Papalote Wash in the vicinity of Twin Peaks. (Hence the term, Arivaca Lakes Estates) Actually, the AZ Game and Fish Dept was going to buy the land and build the reservoir, but it was obvious Nationwide would directly benefit from its construction. Again, Arivaca and Sopori Valley residents protested, the two main reasons being the effect of the dam on water users downstream and the impact of increased numbers of people on the wildlife habitat. These in fact were the reasons given for the ultimate denial of the application by the State Water Department, in particular, the impact of a dam on the "already overburdened" water supply in the Santa Cruz Valley.

An Arivaca Area Plan was developed by Blanton and Co. for Nationwide to fulfill the other P & Z requirements, namely, percolation tests, a drainage study, available fire protection (none), and a cursory environmental impact study done by Ted Knipe. Recreational facilities were noted: the Coronado National Forest is the only thing listed. Knipe suggested making Yellow Jacket Canyon into a community park. Sahuarita School District was contacted for its input (not available).

The Hydrological Study Committee reactivated the Arivaca Area Plan Study in early 1973 when the revised Manera study was available. This time, however, instead of 765 acre feet as claimed by Manera, the minimum safe yield was determined by the Committee to be 300-400 acre feet per year and that amount would be used to plan land use within the Arivaca watershed basin.

The Pima County Planning and Zoning Dept held a hearing on September 25, 1973. Again, a number of Arivaca residents spoke. P & Z did not make a decision, but referred the matter to the Arizona Water Commission which was given (legislatively) the responsibility for evaluating the adequacy of water supply for new subdivisions. (It could not forbid development, but the developer would have to adequately advertise the lack of water.)

On November 14, 1973 the Commission made its decision. The opinion was: since the safe yield was 300-400 acre feet per year, there was not enough water for 1200 lots. The development should be limited to 300-500 units, but runoff alone (without mining groundwater) would only support 140 units. This put a damper on the efforts made by Nationwide.

Mort Freedman, the president of Nationwide, said that since they had put a lot of time and effort into the rezoning process and been thwarted, they decided not to proceed further with the development plans which they had made. Nationwide decided that they would just sell off 40-acre parcels. They did not subdivide these themselves, but purchasers were able to, under the law, divide them into smaller parcels.

"How we got the Forties," by Mary N. Kasulaitis, the Connection, October 1997. Manera Reports, Interviews of Fred Noon, Mort Freedman, Mary Jane Broadhurst, Don Honnas, Mary Nusbaum

Water is so important to life that it's not surprising that it is fought over. As old John Conti said in 1908, "Before I am in Arivaca anybody living there could cut hay, then they build the fence and everybody was kept off, now the government has surveyed it and everybody wants it."

GEORGE E. LEONARD  
CHAIRMAN

JOHN S. HOOPES  
VICE-CHAIRMAN

WESLEY E. STEINER  
EXECUTIVE DIRECTOR  
AND  
STATE WATER ENGINEER



## Arizona Water Commission

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### MEMBERS

PETER BIANCO  
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DAVID R. GIPE  
DOUGLAS J. WALL  
WILLIAM H. WHEELER

### EXOFFICIO MEMBERS

ANDREW L. BETTWEY  
MARSHALL HUMPHREY

November 14, 1973

Mr. Lance R. MacVittie  
Principal Planner  
Pima County Planning & Zoning Dept.  
Pima County Governmental Center  
131 West Congress Street  
Tucson, Arizona 85701

Dear Lance:

As requested we have reviewed the reports, and minutes of the Hydrological Study Committee meetings, on Nationwide Land and Development Company's development at Arivaca. It is our opinion that proposed source of supply is inadequate for 1200 lots.

The developer's consultant estimates that the basin's safe yield, as evidenced by its outflow, is 645 acre-feet/year. The consultant recommends that the development be limited to this amount of water and finds that it will supply 1200 units. The Committee felt that the safe yield, also as measured by the basin's outflow, was 300-400 acre-feet/year, and noted that as the already recorded lots would yield about 300 units that the development be limited to 300-500 units. We too have estimated that the basin outflow is about 300-400 acre-feet/year, but have additionally estimated that the proposed development could recover only about 70 acre-feet/year of that amount without mining the underlying groundwater. This would supply about 140 units in the proposed development. We did not evaluate the adequacy of supply using groundwater in storage as there was no indication the developer desired to do so and thus found the intended supply inadequate.

Within limits, mining of groundwater is considered to be an adequate source of supply. If the developer wishes to revise his plans we will reevaluate the supply. At the moment, the available groundwater information is insufficient from which to make a reasonable evaluation. Should the developer wish to revise his water supply plans we would be happy

Mr. Lance R. MacVittie  
Page 2  
November 14, 1973

to provide guidelines for the requisite investigation and water supply adequacy demonstration.

I've attached a staff report detailing our review for your further reference. Please call me if you have any questions.

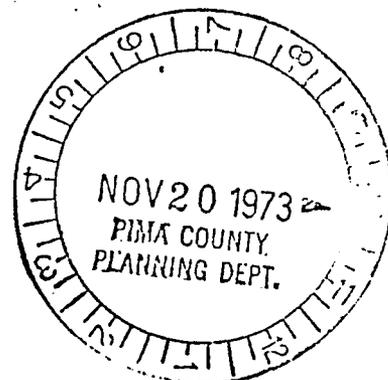
Sincerely,

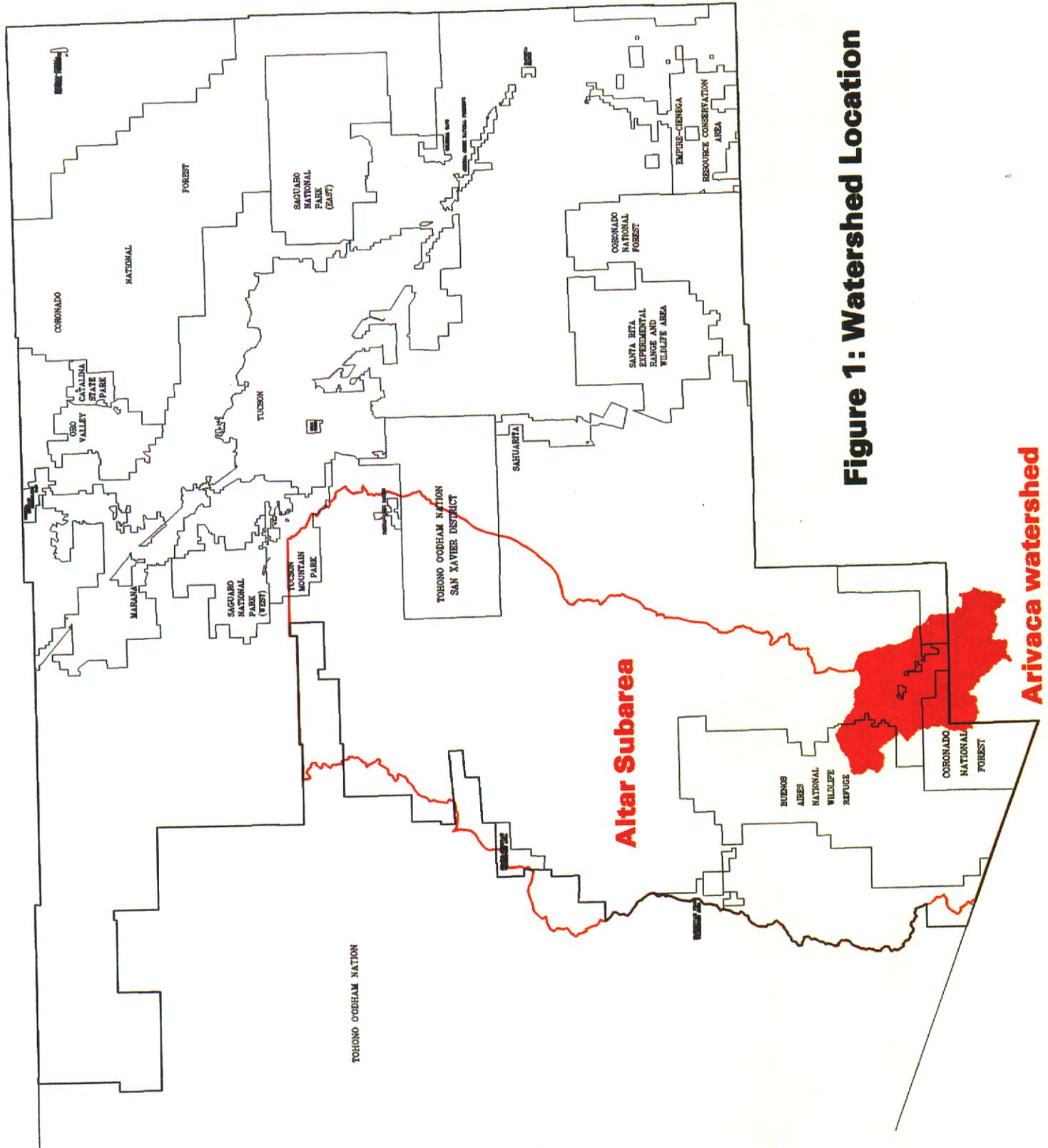
*Phil*

Philip C. Briggs  
Chief Hydrologist

Enclosures

cc: Mr. L. Linwood Schorr

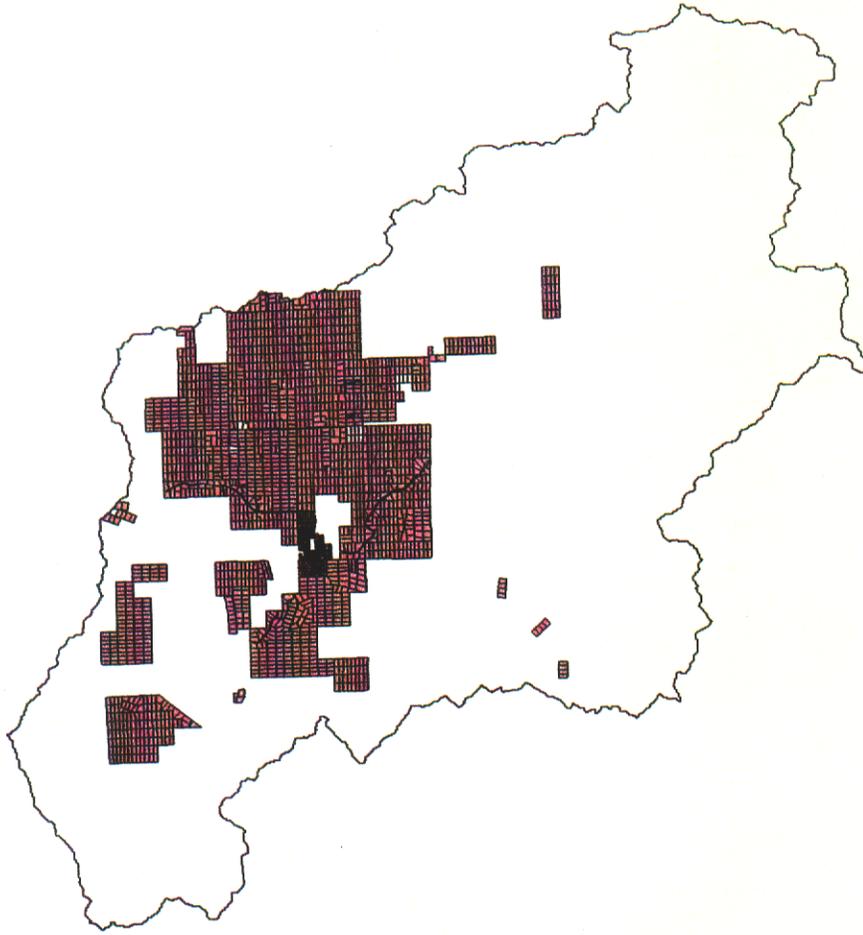




**Figure 1: Watershed Location**

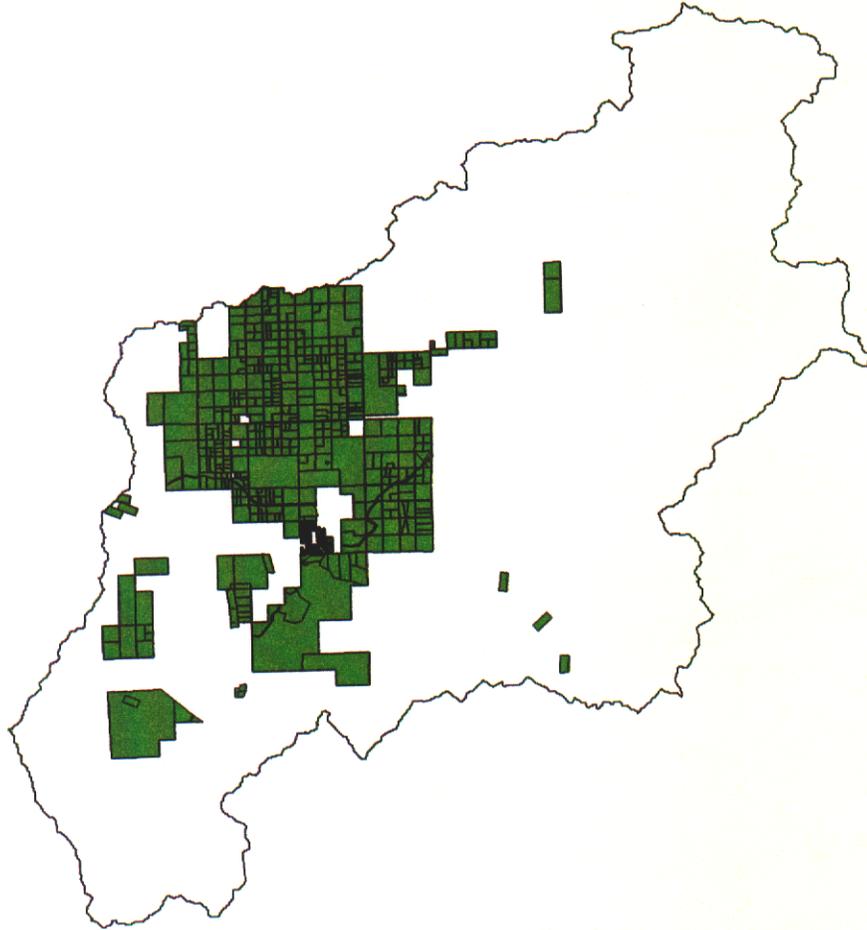
**Figure 2**

**Full Build-out**



 **Private parcels  
incl. ranches &  
mining claims at  
full build-out  
(2,443)**

**Existing**



 **Private Parcels incl.  
ranches & mining claims  
(739)**