

Water Resources Division

National Park Service
U.S. Department of the Interior



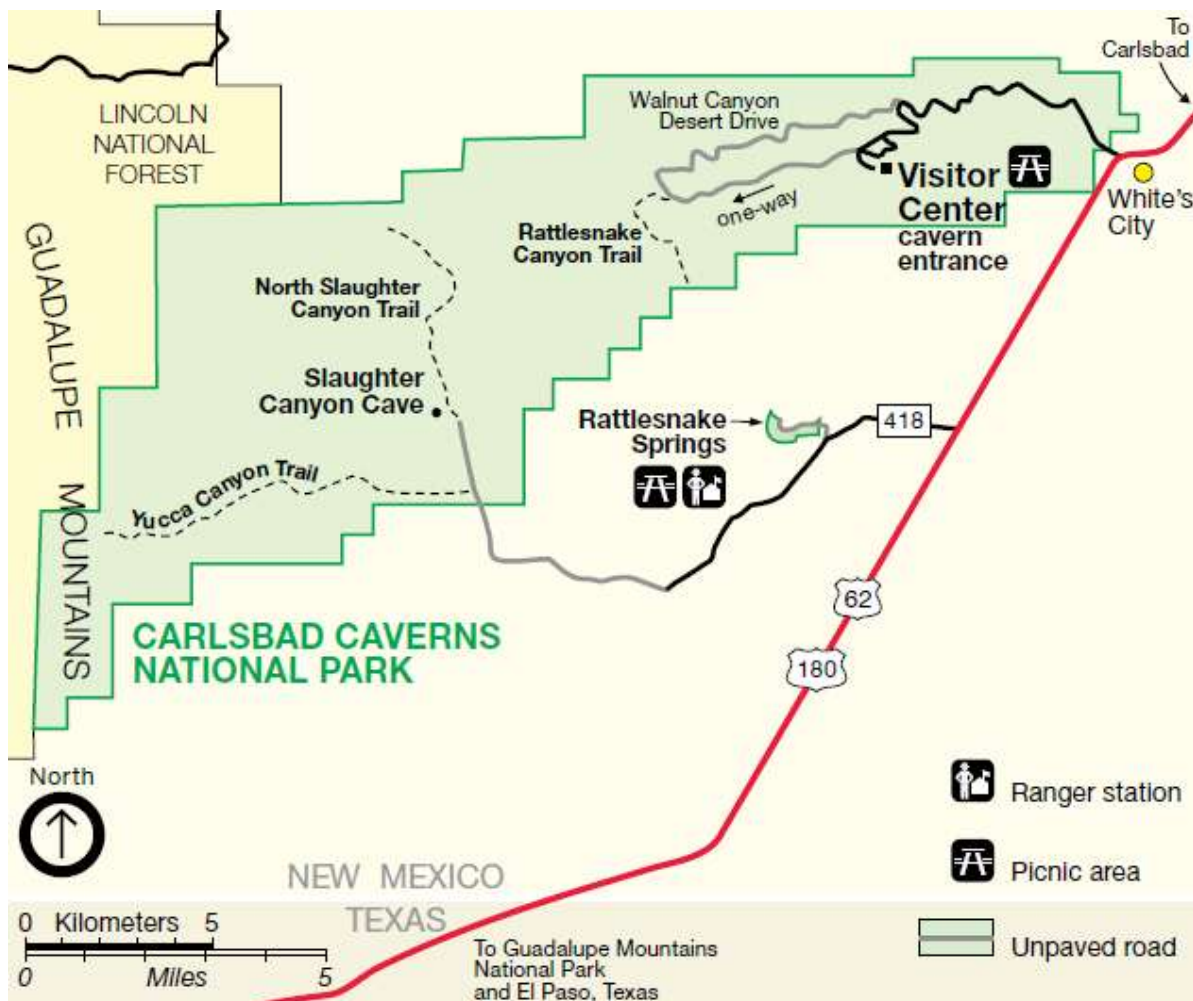
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Summary of Hydrogeologic Investigations in the Vicinity of Rattlesnake Springs, Carlsbad Caverns National Park, New Mexico

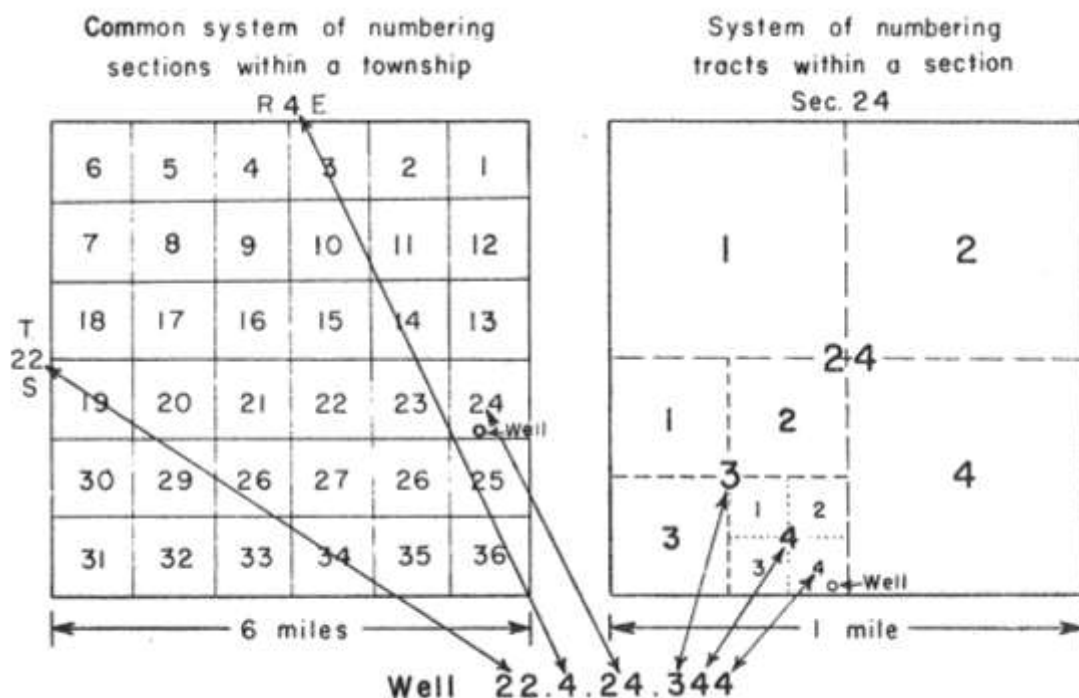
The Rattlesnake Springs unit was acquired as a detached unit of Carlsbad Caverns National Park in 1934 primarily to ensure a reliable domestic water supply for NPS facilities at the caverns. Originally, water was pumped from the spring pool. In the early 1960s, a well was drilled nearby to provide a more reliable source of water. The stream and wetland system are sustained by the remaining undiverted spring flow and are an extraordinary natural resource. More than 350 species of birds, at least 40 species of amphibians and reptiles, at least 30 species of mammals, and a very high diversity of invertebrate species occur at Rattlesnake Springs. In addition, this area was used by prehistoric and historic peoples.



Several hydrogeologic studies have been conducted at Rattlesnake Springs and the surrounding area. In addition to the NPS use of water from the spring; Washington Ranch also diverts water from the spring for irrigation and fish ponds at the ranch. There is some irrigated agriculture, mostly west and southwest (upgradient) of Rattlesnake Springs. El Paso Natural Gas operates an underground natural gas storage and recovery facility southwest (upgradient) of Rattlesnake Springs. The goal of this report is to summarize the previous investigations and reports to contribute to the overall understanding of the hydrogeology of the springs.

Well Numbering

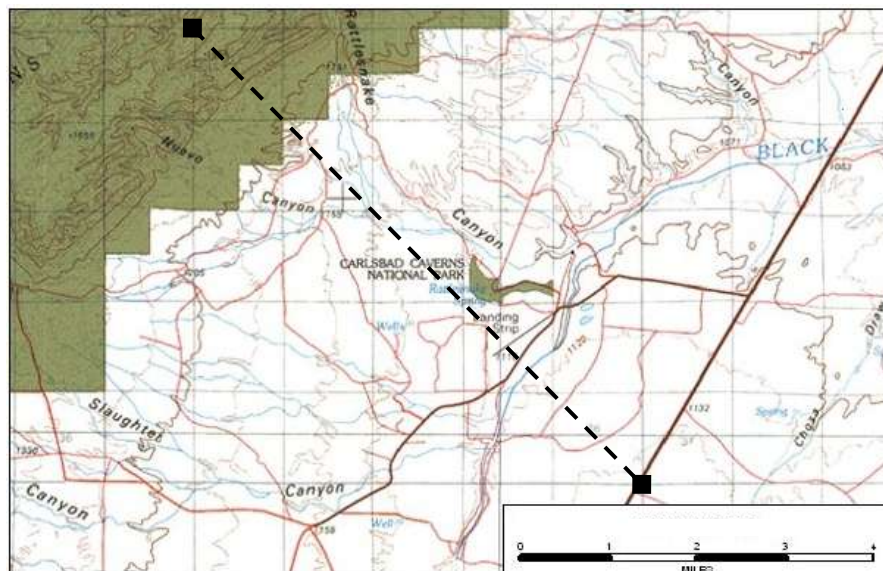
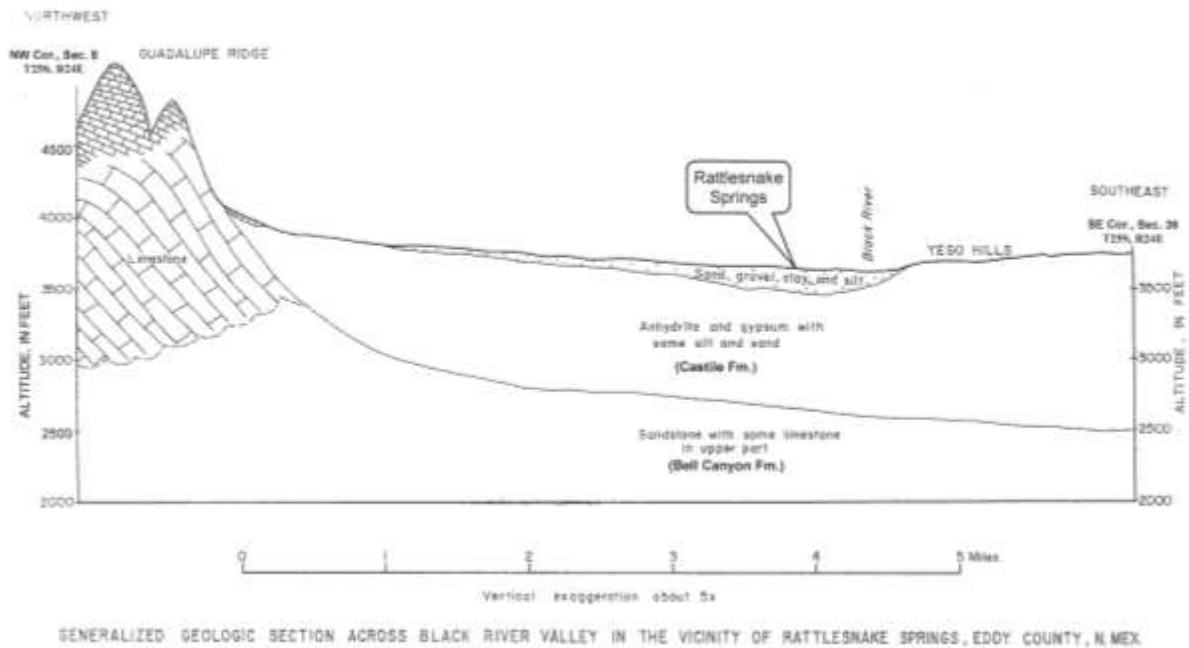
The well numbering system in New Mexico is slightly different from that used in most other states. The numbering system is still based on the public lands survey system. The number is divided into four segments by periods. The first segment denotes the township, the second segment denotes the range, and the third segment denotes the section. The fourth segment is up to three digits and denotes the 10-acre tract in which the well is located. For this purpose, the section is divided into four quarters, numbered 1-4, in a clockwise direction starting with the northwest quarter. The first digit of the fourth segment gives the quarter section, usually a 160-acre tract. Each quarter section is similarly divided into 40-acre tracts, numbered in the same manner. Each 40-acre tract is further divided into four 10-acre tracts, numbered from 1-4 in the same clockwise manner starting in the northwest quarter. A well numbered 25.24.27.124 is located in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ of Section 27, T25S, R24E. Letters (a, b, c, ...) are added to the fourth segment if more than one well is located in the same 1-acre tract. All wells in Eddy County are south of the New Mexico Base Line and east of the New Mexico Principal Meridian. The following figure shows the method of numbering wells in New Mexico.



Well numbering system in New Mexico

General Hydrogeology

The oldest rocks exposed in the area belong to the Capitan Limestone which is at the surface of the Guadalupe Escarpment, forming the northwest boundary of the Black River Valley. Beds in the Capitan Limestone dip steeply to the southeast and terminate in the subsurface beneath the valley where they interfinger with sandstone beds of the Bell Canyon Formation. The age-equivalent limestone and sandstone beds southeast of the escarpment are overlain by anhydrite and gypsum beds of the Castile and Rustler Formations. Above the gypsum beds, alluvial sediments cover most of the Black River Valley.



Dashed line shows the location of the generalized geologic section.

The alluvium in the Black River Valley consists of unconsolidated to consolidated beds of boulders, cobbles, gravel, sand, and silt eroded from the Guadalupe Mountains. Near Guadalupe Ridge, the uplift forming the northwest boundary of the Black River Valley, the alluvium is largely unconsolidated sediments formed by the coalescing alluvial fans extending from the mouths of Slaughter and Rattlesnake Canyons. Near the Black River, the alluvium is mostly composed of consolidated limestone conglomerate. Underlying the alluvium are the gypsum beds of the Castile Formation. The alluvium is 100-350 feet deep.

Groundwater in the alluvium occurs under both water-table and artesian conditions. Artesian conditions occur locally where the alluvium is completely saturated and overlain by lower permeability sediments. The Castile Formation has low permeability and thus prevents downward percolation of alluvial groundwater and upward flow from deeper bedrock formations. It is thought that intermittent runoff after heavy precipitation, primarily from Guadalupe Ridge along the northern margin of the valley, is the primary source of recharge to the alluvium.

The principal water-producing formation in the upper Black River Valley is the alluvium. Most of the irrigation wells are completed in the alluvium. Wells that penetrate into the underlying bedrock obtain most of their water from the alluvium. Large spring in the valley (Rattlesnake and Blue Springs) issue from conglomerate and gravel beds in the alluvium. Yields greater than 1000 gpm have been reported for irrigation wells completed in conglomerate beds in the alluvium.

Chemistry of water in the alluvium depends largely on the source and flow path of the water. Groundwater moving into the alluvium from adjacent gypsum beds will have high concentration of sulfate. Water that originated as surface runoff in the canyons and infiltrated into the alluvium at the mouth of the canyons will probably have a low sulfate concentration. The water that issues from Rattlesnake Springs has a lower mineral content than any other groundwater in the area. The bicarbonate content is 290 ppm, sulfate is 120 ppm, and chloride is 6 ppm.

Regional Investigations

The regional geology has been extensively studied by oil companies because of the similarity of the geologic formations exposed in this area to those from which oil and gas are obtained farther east in southeastern New Mexico and west Texas. King (1948) summarizes the regional geology. P.T. Hayes conducted geologic mapping of the 15-minute quads that include Carlsbad Caverns (Hayes, 1957; Hayes and Koogler, 1958). Hendrickson and Jones (1952) conducted an investigation of geology and groundwater resources for Eddy County, New Mexico.

New Mexico State Engineers Office, 1955

W.E. Hale (1955) of the USGS conducted an investigation of groundwater conditions in the vicinity of Rattlesnake Springs. The investigation was prompted by concerns about the possible effects of pumping then recently constructed irrigation wells in the area on the flow at Rattlesnake Springs. Hale's report was published as a technical report by the New Mexico State Engineers Office.

Irrigation using groundwater sources began in 1946 with the irrigation of 18 acres in T26S-R24E-Sec3, about 3½ miles south of Rattlesnake Springs. More acreage was irrigated in 1951 and in 1952, approximately 670 acres in the upper Black River valley was being irrigated, most of it within 2 miles of Rattlesnake Springs. Irrigation wells with yields of 1300 gpm were developed in conglomerate beds in the alluvium. Hale identified additional, relatively flat land that could be developed as irrigated cropland. He estimated that 2,000-3,000 acres could be irrigated in the area upstream from the Hwy 62 crossing over the Black River.

Hale opined that the four irrigation wells in the immediate vicinity of Rattlesnake Springs were completed in the same aquifer that is the source of the springs. The seasonal discharge of groundwater from the four irrigation wells was approximately the same as the observed decrease of flow from the springs.

Table 1. Acreage irrigated by groundwater and estimated pumpage in the upper Black Valley. Assumes 2½ acre-feet/acre for cropland and ½ acre-foot/acre for pasture.

Year	Irrigated cropland (Acres)	Irrigated Pasture (Acres)	Estimated pumpage (Acre-feet)
1946	18	0	45
1947	18	0	45
1948	23	0	55
1949	23	0	55
1950	50	10	130
1951	230	20	600
1952	395	275	1,100
1953	460	260	1,250

Hale (1955) described the source of Rattlesnake Springs as being from a conglomerate bed within the alluvium, with upward flow through overlying sand and gravel into the spring pool. The conglomerate either terminates to the east of Rattlesnake Springs or abuts against clays; restricting the flow of the water underground and forcing it to the surface. Well 25.24.26.121, about 550 feet south of Rattlesnake Springs, is completed in the same conglomerate aquifer that is the source of the springs. The water level fluctuation in the well correlates with the water level and flow changes at the spring pool.

The source of water discharging at Rattlesnake Springs was inferred from three types of data; water chemistry, the altitude of water levels in nearby wells and the spring pool, and fluctuations of spring discharge in response to pumping of nearby wells.

It appeared that pumping of nearby irrigation wells caused the natural discharge of Rattlesnake Springs to decline by a comparable amount. Further, it appeared that groundwater levels and spring discharge recovered after groundwater pumping stopped at the end of the irrigation season. There was no evidence of a long-term, year-to-year decline of spring flow. It was also suggested that if groundwater pumping caused Rattlesnake Spring to cease flowing, that a well

could be drilled nearby into the conglomerate to provide potable water to NPS facilities at Carlsbad Caverns. (At that time, NPS pumped water from the pond for use at the caverns.)

Cox, 1963

In July 1959, the National Park Service filed suit in the U.S. District Court against the owners of three irrigation wells near Rattlesnake Springs. The suit alleged that pumping from the irrigation wells caused the flow from Rattlesnake Springs to decrease. The federal judge hearing the case directed that the flow from Rattlesnake Springs and pumping from the three irrigation wells be measured for one year. E.R. Cox of the U.S. Geological Survey conducted an investigation from February 1961-62 to evaluate the effects of three irrigation wells on the flow of Rattlesnake Springs.

Cox (1963) showed a strong correlation between water levels in well 25.24.26.121 and discharge at Rattlesnake Springs. The well is 550 feet south of the springs. The water level in the well can be used as a more sensitive indicator of the flow from the springs.

Wells 25.24.27.124, 25.24.27.421 and 25.24.34.112a are the irrigation wells nearest Rattlesnake Springs. Pumping from these wells was monitored from February 1, 1961 to February 1, 1962. Each of these wells is pumped at about 1200 gpm for irrigation supply. Locations of wells monitored during Cox's study are shown on Figure 1.

The data indicate that pumping from wells 25.24.27.124 and 25.24.27.421 has a direct effect on the discharge of Rattlesnake Springs. Well 25.24.27.124 is 1.0 mile from Rattlesnake Springs. Well 25.24.27.421 is 0.9 mile from Rattlesnake Springs.

Pumping from well 25.24.34.112a has only a slight effect on flow of the springs. Well 25.24.34.112a is 1.7 miles from the springs.

U.S vs. Ballard et al.

In the late 1950s, park officials began to raise concern about what they felt was unauthorized groundwater pumping from the Black River aquifer. This led to a series of charges and counter-charges which ultimately led to the NPS filing suit in US District Court in an attempt to obtain a permanent injunction against several local ranchers/farmers; the principle defendant being the Ballard family. NPS sought to enjoin upstream irrigators (groundwater sources) because pumping of wells had reduced the flow from the springs to less than the entitlement of the US rights. As a result of the lawsuit, the NPS began daily monitoring of springflow in June 1959.

The court sustained the NPS senior priority of 1880 and confirmed the junior priorities of Washington Ranch and the New Mexico Game and Fish Department. However, the court failed to discover any harm to the government as a result of pumping from irrigation wells upgradient of Rattlesnake Springs and refused to grant the requested relief.

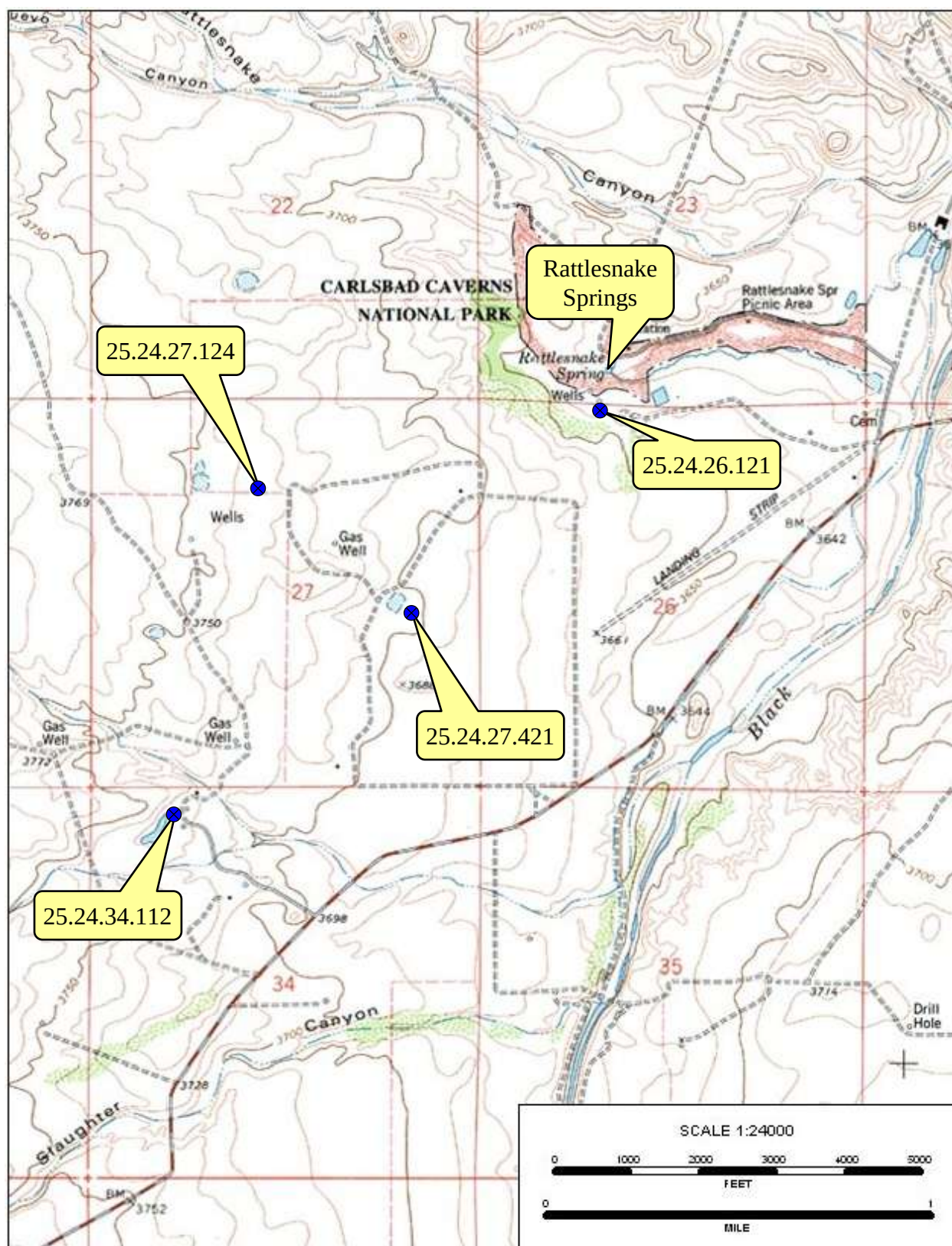


Figure 1. Locations of wells monitored for Cox's 1963 report.

Although the court refused to enjoin the irrigators because no irreparable harm had been shown, it affirmed the water rights of the park to be 0.5 cfs, not to exceed 105 afy, with a priority of 1880. The water right is further divided to provide 42 afy for municipal purposes at the park and 63 afy for the irrigation at Rattlesnake Springs.

The court further directed that the NPS should drill a well in the immediate vicinity of Rattlesnake Springs to provide a supplemental source of water during times when the flow from the springs was insufficient to meet the needs of the park.

The citation for the court case is; U.S. vs. H.F. Ballard, et al., Civil No 4194, in the U.S. District Court for the District of New Mexico, Relating to Waters of Rattlesnake Springs for Carlsbad Caverns National Park

Mourant and Havens (1964)

In 1963, the USGS supervised construction and testing of four test wells near Rattlesnake Springs. The wells were constructed to locate a supplemental supply of water for times when the flow from the springs was not sufficient to meet the demands of the park.

Groundwater in the vicinity of Rattlesnake Springs occurs in alluvium of Tertiary or Quaternary age that overlies the Castile Formations of Permian age. Large yields are obtained from wells that penetrate solution channels in conglomerate beds in the alluvium. The conglomerate beds and solution channels are erratically distributed. Back in 1963, surface geophysical methods had not yet been developed to identify optimal locations for drilling test wells.

The Mourant and Havens (1964) report contains geological and construction details for the 4 test wells that were drilled near Rattlesnake Springs. Two wells produced 10 gpm and one well produced 170 gpm. These wells were plugged and abandoned because they did not produce the minimum desired amount of 225 gpm.

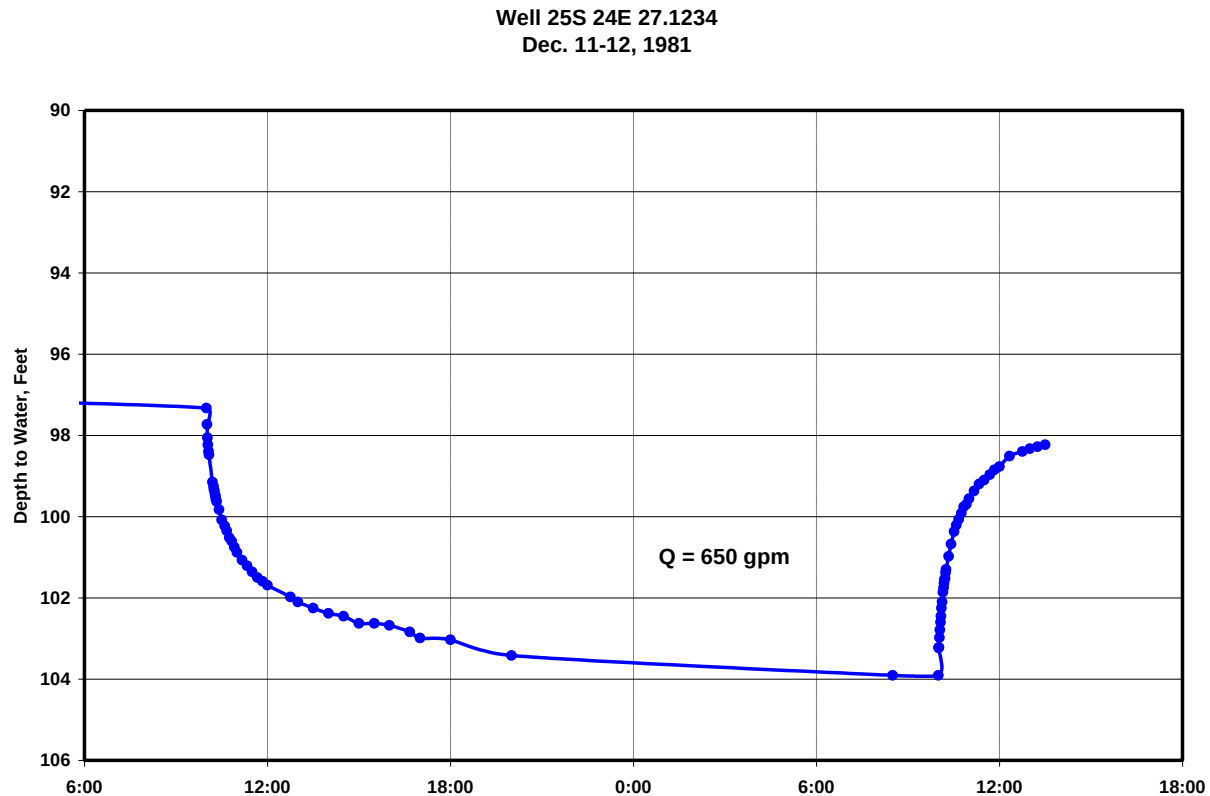
The remaining test well (25.24.23.343d) was estimated to yield 1000 gpm. The well was test pumped for two periods at 270 and 290 gpm with less than 1 foot of drawdown after 6-7 hours of pumping. This well was completed as a water supply well for the park and remains in use today. The well is located about 200 feet southwest of the spring pool. The well was originally drilled to 128 feet and was plugged back to 118 feet. The well obtains water from conglomerate and cavernous voids from 92-119 feet. The well is located 230 feet south and 220 feet west of the Rattlesnake Springs pool.

Washington Ranch Natural Gas Storage Facility

El Paso Natural Gas operates an underground natural gas storage facility about one mile SSW (upgradient) from Rattlesnake Springs. Natural gas is pumped into a geologic trap during certain times of the year and removed during other times of the year.

Sprester and Uribe (1982) prepared a report for El Paso Natural Gas (EPNG) in which they evaluated the potential groundwater supply for the then proposed facility. Their evaluation

included a pumping test of an irrigation well known as the “Miller Farm Sprinkler Field Well”, NMSE No. 25S .24E.27.1234. The well was pumped at 650 gpm for 24 hours, resulting in 7 feet of drawdown. The estimated transmissivity of the aquifer at this well site is 60,000 gpd/ft (8,000 ft²/day).



Sprester and Uribe (1982) sampled several wells in the area and determined that the area of good quality groundwater is limited to areas adjacent to large tributary canyons and a narrow strip down the center of the valley. It appears that there is abundant recharge of fresh groundwater as inflow from tributary canyons and that the fresh groundwater flows toward Rattlesnake Springs (Figure 2). Wells constructed at the margins of the valley will likely encounter groundwater with a high sulfate concentration.

Richard and Boehm, 1987-89

The area south and west (upgradient) of Rattlesnake Springs was developed as a natural gas field in the late 1970s, with the installation of at least 10 gas extraction wells by the El Paso Natural Gas Co. After this resource was exhausted in 1981, the area was developed as a natural gas reinjection and storage facility; the Washington Ranch Gas Storage Project. By 1984, a total of 23 gas injection/withdrawal wells had been placed in service within two miles of Rattlesnake Springs. Groundwater contamination was detected in several water wells southwest of Rattlesnake Springs starting in 1982 due to leakage of natural gas from several of the gas injection/withdrawal wells. Repairs to the gas wells were completed in 1984.

Richard and Boehm (1989) concluded that;

1. Natural gas contamination from leaking injection/withdrawal wells occurred at the Ballard wells (25.24.34.112) in 1982.
2. The contamination extended northward to the Smart House well (25.24.27.141), but not to any wells farther north or to Rattlesnake Springs.
3. No contamination was observed in the waters of Rattlesnake Springs. Either the contamination did not extend that far, or the plume bypassed the springs.

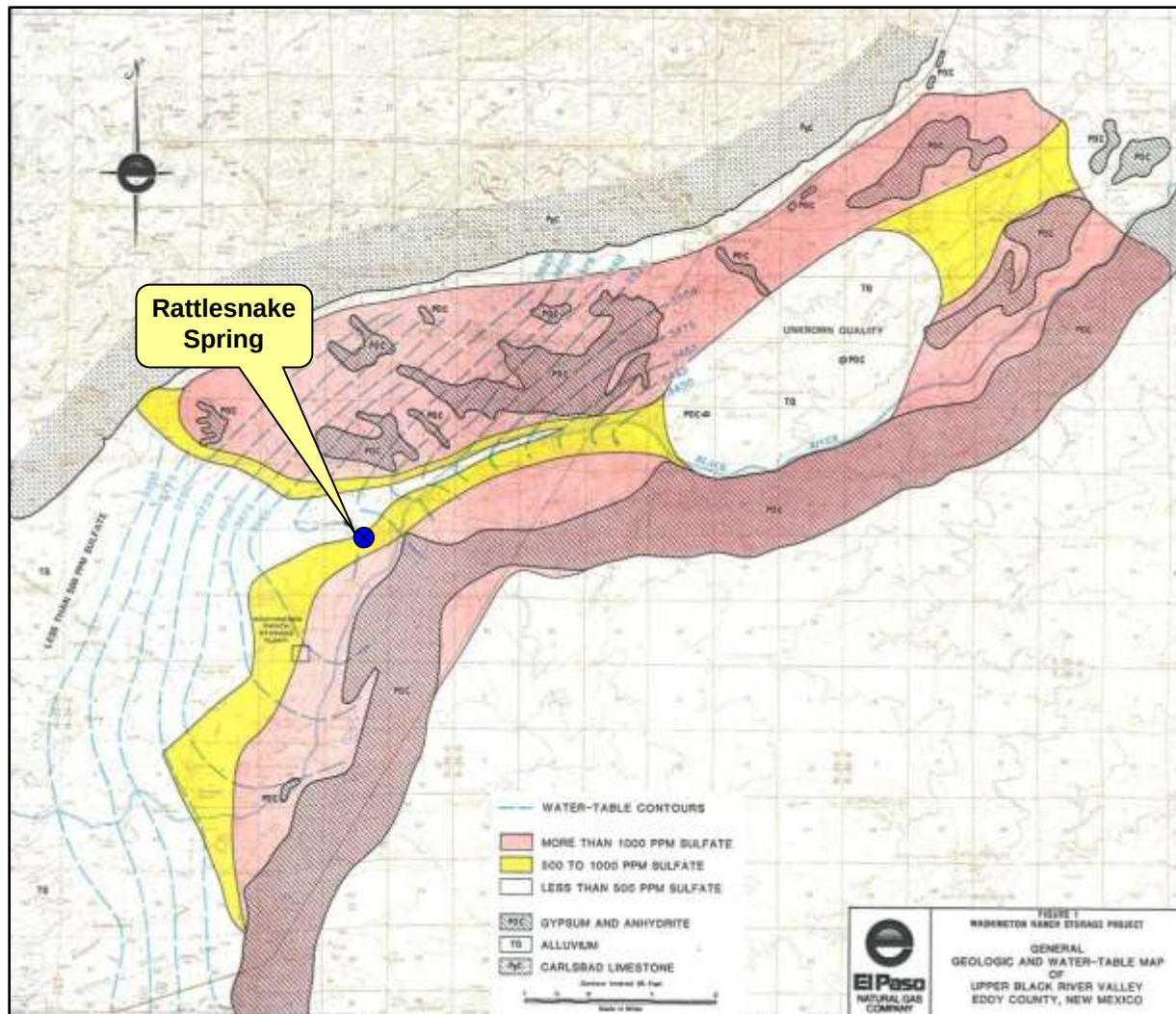


Figure 2. General geologic and water-table map of the Upper Black River Valley, from Sprester and Uribe (1982).

Erika Bowen, 1998

In 1998, Erika Bowen completed a masters' thesis on the "Hydrogeology of Rattlesnake Springs" at the New Mexico Institute of Mining and Technology. Her thesis contains an excellent summary of the hydrogeology of the area, including presentation of a conceptual model

for the formation of the alluvial fan extending out from the mouth of Slaughter Canyon into the Black River valley. This fan forms the aquifer that is the source of water for Rattlesnake Springs. A conceptual model for the formation of the alluvial fan is shown in Figure 3.

The alluvial fan was formed over a long period of time and is comprised of sediments deposited by many different floods emanating from Slaughter Canyon. The alluvial sediments interfinger both vertically and horizontally with limestone and other sediments in the Black River valley. In many places the limestone has been dissolved to form karst openings which store and transmit large quantities of water. The alluvial sediments and karstic limestone are bordered by low-permeability evaporite deposits farther out in the valley. Thus, we get tremendous variability in permeability and production from wells within close proximity. The yield of test wells drilled at Rattlesnake Springs by NPS in 1963 ranged from less than 10 gpm to more than 300 gpm. (The maximum pumping rate was limited by the size of the test pump. The well could probably produce more than 1000 gpm.) There are irrigation wells within a mile of Rattlesnake Springs that produce more than 1000 gpm. Pumping from some of the nearby irrigation wells near Rattlesnake Springs has an immediate and direct effect on springflow, some don't. It depends on whether a particular well is completed in a geologic unit that has a direct connection to the springs.

Bowen states, "The shifting nature of alluvial fans could produce a barrier of finer sediment or soil between lobes of the fan complex resulting in the hydrologic barriers shown by the water chemistry data." Bowen goes on to summarize the groundwater chemistry data for wells and springs in the area as falling into three groups. Group I is groundwater with low concentrations of sulfate (0-200 ppm), high in alkalinity (>250 ppm), indicating an origin from a primarily carbonate aquifer. Group II consists of groundwater that is intermediate in sulfate (600-800 ppm) and alkalinity (>225 ppm). Group III is groundwater with high concentrations of sulfate (>800 ppm) and alkalinity (>250 ppm).

Group I groundwater is found at Rattlesnake Springs, a few irrigation and domestic wells in close proximity to Rattlesnake Springs, and a few wells on the distal areas of the Slaughter Canyon alluvial fan. Group II includes the Ballard and Smart wells in the area of the reported natural gas contamination and the discharge from Castle Springs and Blue Springs. Group III includes the "headward springs", a few springs that discharge from the Castile Formation (gypsum) and the majority of flow in the Black River.

The grouping of the water chemistry, and the areal distribution (clustering) of water sources with similar chemistry, supports the conceptual model of discrete groundwater flow paths through different hydrogeologic strata. Group I is groundwater that flows mostly through carbonate rocks, as evidenced by low sulfate concentrations. Group III is groundwater that has flowed through sulfate rocks (gypsum). Group II groundwater has intermediate chemistry, resulting from flow through both carbonate and sulfate rocks.

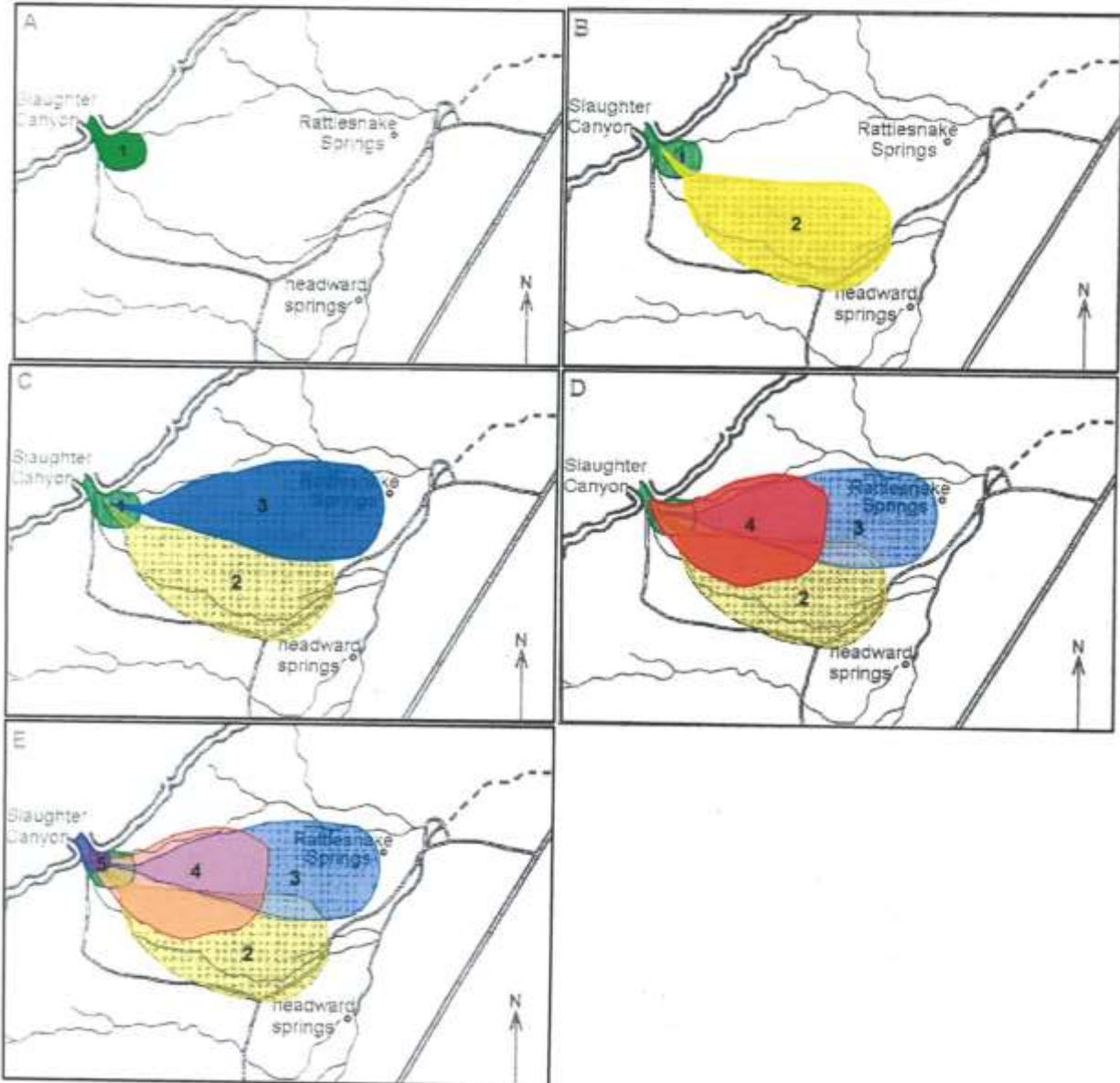


Figure 3. A proposed conceptual model of development of the Slaughter Canyon alluvial fan (from Bowen, 1989). A) Initial development of a small alluvial fan with initial formation of the Slaughter Canyon drainage system. B-D) Show shifting areas of deposition as the fan migrates across the Black River valley. Shifting may be in response to changing hydrologic regimes associated with glacial/interglacial cycles. E) Current small area of active deposition.

Additional analyses by Bowen, including computer modeling and particle tracking of the groundwater flow system shows that water discharging at Rattlesnake Springs is controlled by the geology of the Slaughter Canyon alluvial fan. Paleo-stream channels within the fan have coarser carbonate material and act as a conduit to transmit groundwater from the recharge areas near the mouth of the canyon to the distal end of the fan. Where the coarse-grained sediments of the alluvial fan pinch out at the distal end of the fan, groundwater is forced to the surface at Rattlesnake Springs.

The deeper groundwater flow paths in the Slaughter Canyon alluvial fan comes in closer contact with the underlying evaporite rocks in the Castile Fm., resulting in higher sulfate concentrations as observed in the Group II groundwater. Groundwater flow through the El Paso Natural Gas facility has the Group II signature and is therefore assumed to flow through an older, deeper lobe of the alluvial fan. This groundwater discharges directly to the Black River upstream of Rattlesnake Springs. Groundwater discharging at Rattlesnake Springs has Group I type chemistry and is assumed to have flowed through a younger, shallower lobe in the alluvial fan and did not come in contact with the sulfate rocks in the underlying Castile Fm.

Computer modeling of the groundwater flow system showed that the groundwater flow paths through the Washington Ranch natural gas injection and storage facility did not intersect or commingle with groundwater flow paths to Rattlesnake Springs. Bowen concluded that, “groundwater flow is sufficiently separated by geological barriers and karst channels and by orientation of the hydraulic gradient, to prevent contamination from the facility from reaching Rattlesnake Springs.” Further, “the numerical model showed no set of conditions that would allow [groundwater] flow from the facility to the Rattlesnake Springs area.”

NPS Briefing Statement, 2006

Park staff prepared a briefing statement in June 2006 to address concerns about the continued availability of water at Rattlesnake Springs. The area was in the midst of a drought and the flow from the springs was the lowest ever recorded. A copy of the briefing statement is attached to this report. It includes a map showing locations of irrigation wells and irrigated farmland upgradient of Rattlesnake Springs.

UTEP 2009

Researchers from the University of Texas at El Paso were contracted to conduct geophysical studies in the vicinity of Rattlesnake Springs to identify geological features associated with the springs and to better delineate the source of water for the springs. A zone of high conductivity was mapped near the springs. Other zones of high conductivity were mapped in a generally east-west orientation. These zones are believed to be associated with dissolution features or karst in the underlying bedrock. Additional geophysical work may be conducted by UTEP at the springs, if it can be coordinated with the park (Doser et al., 2009).

More information about the UTEP studies is provided in the following sections which summarize the theses of two MS students who were involved in the UTEP investigations.

Nikolay Boykov, 2009

Boykov made an initial conductivity survey as an initial screening of the area. He then conducted a series of microgravity surveys to map the depth to the gypsum bedrock and locate the trend of faults and fractures that could control groundwater flow to the springs. The free-air anomaly map reflects the known locations of bedrock highs and lows. The map contours suggest an underlying network of fractures that is mimicked by surficial drainage patterns and features that are believed

to be the remnants of dissolution structures (karst) within the gypsum bedrock. These results suggest groundwater flow from the west-northwest toward the springs, in agreement with other geophysical investigations that were conducted near the springs. The gravity data also suggest the presence of an east-northeast trending fault/fracture located just to the east of the springs that could be a barrier to groundwater flow, causing upflow at the springs.

Claudia Santiago, 2009

Santiago conducted conductivity and resistivity surveys to identify possible locations of fractures in the subsurface at Rattlesnake Springs. She focused on a north-south trending structure located just east of the springs that appears to form a barrier to groundwater flow. In particular, Santiago identified a large anomaly north-northeast of the spring that she hypothesized might be caused by a deep deposit of fine-grained material, i.e., low permeability sediments that would impede the continued flow of groundwater down the valley, forcing groundwater to the surface at the springs.

Recommendations for Future Studies

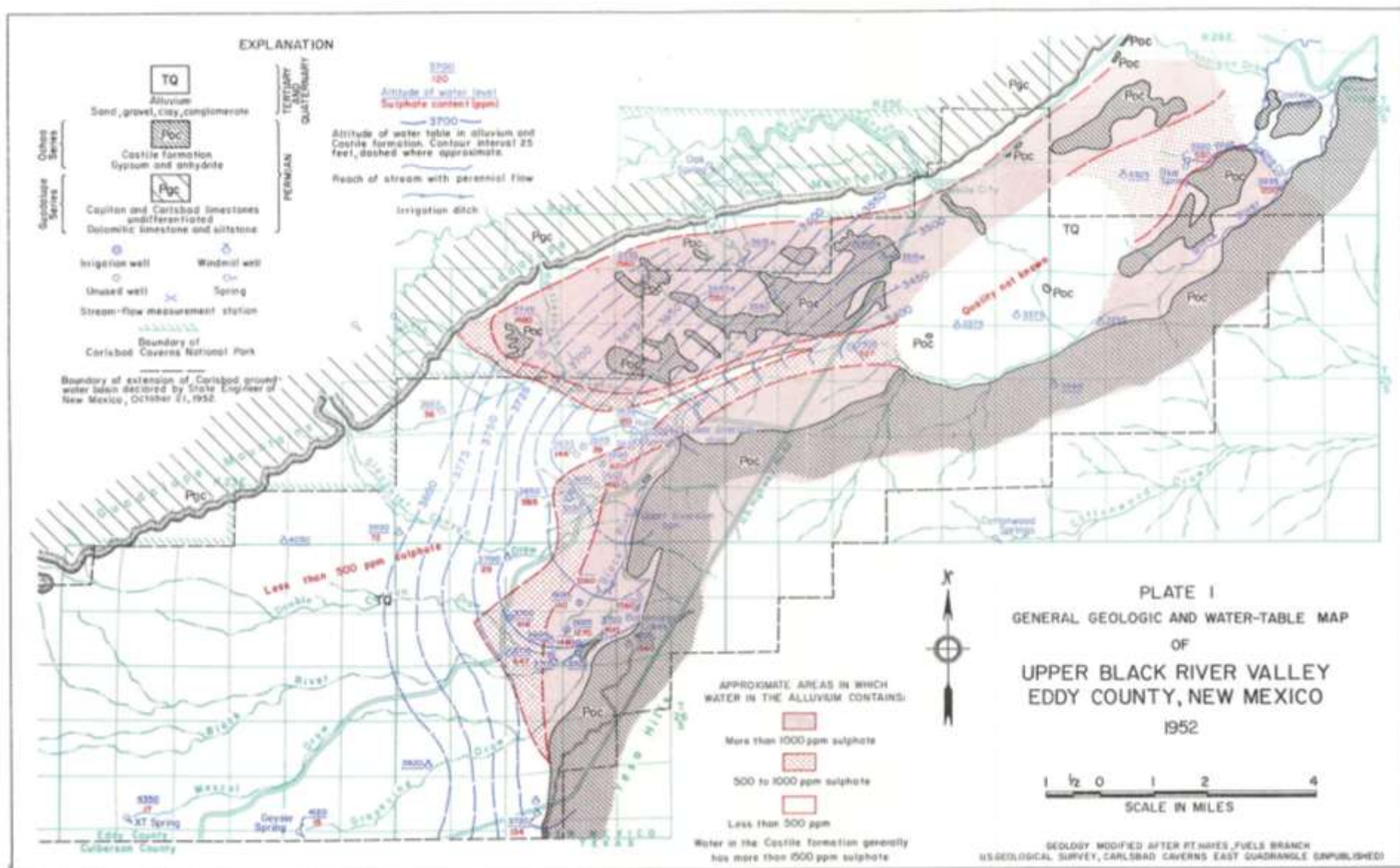
The groundwater flow system for Rattlesnake Springs has been described about as well as possible. The additional geophysical investigations proposed by Santiago and Doser (UTEP) will further aid in confirmation of the conceptual model described by Bowen.

The data files for the computer model prepared by Bowen seem to have been lost. There may be enough information in Bowen's thesis (1998) to recreate the computer model, or to allow construction of a new computer model that would be very similar to the previous model. Modern computer models incorporate an impressive array of visual output and animation features that would allow the lay reader to better visualize groundwater flow patterns in the area.

The Carlsbad basin (including the Black River valley) is fully appropriated; consequently, no new groundwater depletions are allowed (except small volume domestic/stock wells). In order to use groundwater at a new location or for a new purpose, one must purchase valid water rights from a willing seller in the basin and transfer those water rights to the new location. Transfer of a water right requires approval from the State Engineers Office and is subject to public review and comment (i.e., protests). The State Engineers Office would perform an analysis of the proposed transfer to determine the portion of the water rights eligible for transfer and whether any existing water rights might be impaired as a consequence. It's unlikely that anyone would purchase water rights from elsewhere in the basin to use for groundwater development near Rattlesnake Springs. If it did happen, there would be ample opportunity for NPS to protest the action to protect their senior water rights.

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From Hale (1955)

Briefing Statement

Bureau: National Park Service
Issue: CAVE – Potential Park Water Supply Disruption at Rattlesnake Springs
Park Site: Carlsbad Caverns National Park
Date: June 23, 2006

Background:

- Over the past month, regular flow measurements at Rattlesnake Springs (RS), the park's water source, have shown a significant drop in flow. Park records indicate that recent measurements taken are the lowest ever recorded in the park.
- The park's main water supply is currently unaffected. However, as a result of this drop in flow, the park is not able to meet its water-sharing obligations with neighboring Washington Ranch or to use its irrigation rights to water the picnic grounds at RS. In addition, the sensitive desert riparian area at RS is being impacted, because no water is available for the natural drainage that runs through the site.
- Although the park's water right has precedent (1880) over others in the area, a court case in 1960 (Ballard) essentially determined that up-gradient wells had "little appreciable effect on the flow" of RS. This ruling was 46 years ago.
- In response to this ruling, a second study was conducted by the USGS and NPS (Cox 1963). This study found that two wells around the agricultural fields to the south and southwest of the park had a **definite** impact on flow from RS.
- Field observations, in conjunction with data obtained from the State Engineer Office well data and aerial photographs (see map), indicate that these fields are currently in production and have been pulling water for an extended period.
- By New Mexico law, the farms are allowed their total annual groundwater allotment and are not required to spread this allotment evenly throughout the year. As long as they have not exceeded their annual allotment, the State Engineer cannot force them to cease pumping (according to the Roswell Basin Supervisor).
- DOJ has indicated that if the park can show upstream wells are causing our flows to diminish, we should be able to get some judicial recourse.
- We are in the midst of a significant short- and long-term drought, so the water level drops cannot be strictly attributed to over-pumping. The drop may be the result of long-term declines in water levels and lack of natural recharge.

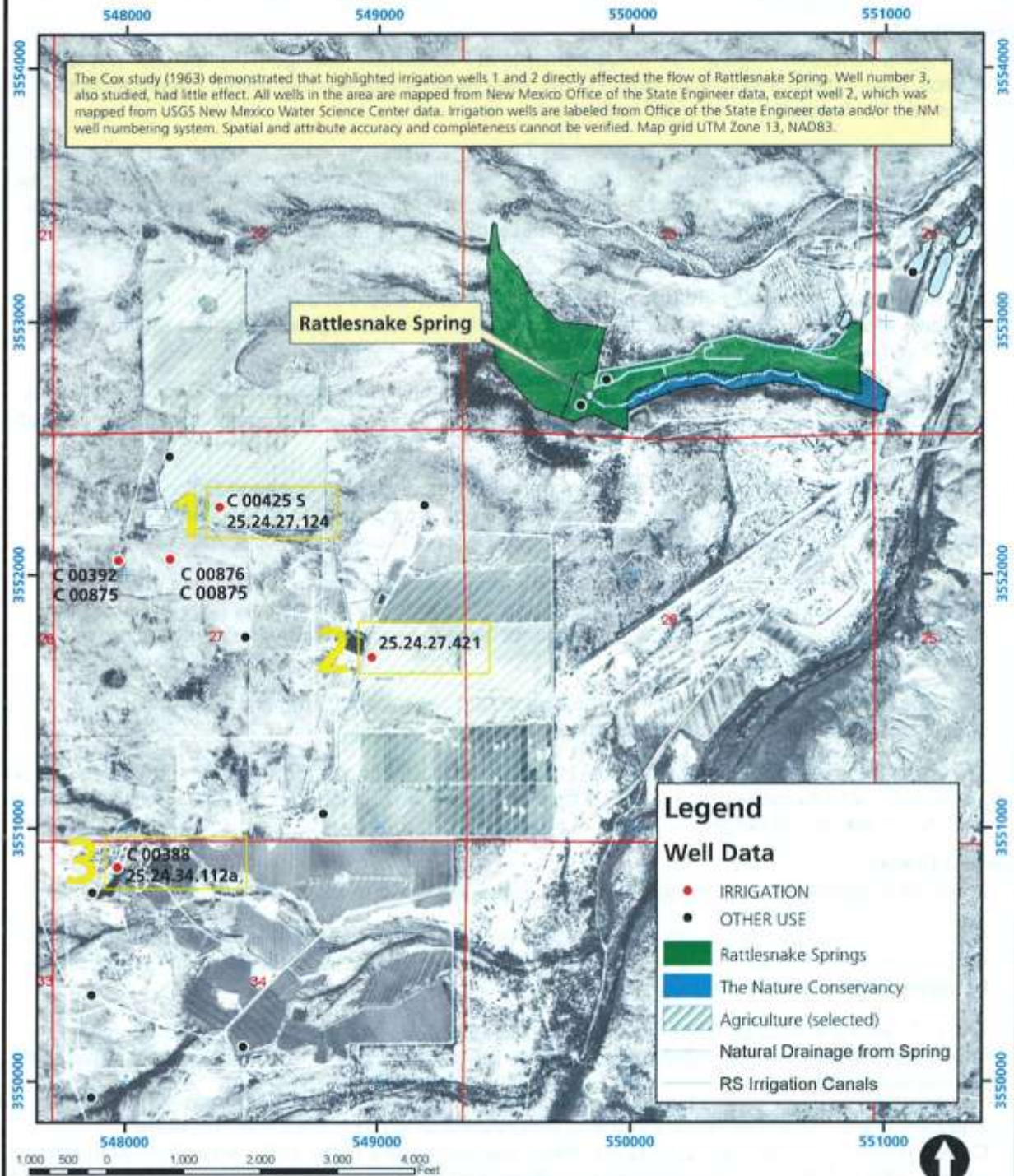
Current Status:

- The park is developing a contingency plan for supplying water to the park.
- This summer, the park will begin a geophysical study to determine the extent and catchment area for the water that feeds RS and will be soliciting assistance to further understand the connections between water usage, the aquifer and RS.
- The park wants to request more detailed pumping schedule records from the upstream users. Quarterly records currently collected by the state are not sufficient to quantify the direct impacts of the upstream water use.
- The park plans to consult with a solicitor to determine if funds from the Land and Water Conservation Fund could be used to purchase additional water rights in the watershed from willing sellers. Although there is a moratorium on federal land purchases, it may still be possible to acquire water rights.

Contact: John Benjamin, Superintendent, 505.785.3020, john_benjamin@nps.gov



Rattlesnake Springs Up- Basin Agricultural Use



Produced by D. Roemer, Resources Stewardship and Science, 1:20,000-scale

FILE: C:\GIS-CAVE\Documents\rs_wells.mxd

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