

KEEPING OUR STREAMS FLOWING

TONTO NATIONAL FOREST GROUND WATER POLICY

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Current Situation:

Demand for development of Forest ground water resources is increasing. Much of this demand is coming from entities that propose to develop water for transport and use off-Forest.

Why is demand growing?

- **Rapid Population Growth.** The population of Central Arizona and much of the West is growing very rapidly. This rapid increase in population growth translates into a growing demand for water resources.
- **Fully Appropriated Surface Water Resources.** Most surface waters are fully appropriated by existing users. As a result, ground water is often the only source of water available for future needs.
- **Arizona Water Law.** Arizona water law is somewhat unique in that there are few regulations governing ground water resources (outside of several specially designated areas such as Phoenix and Tucson). Ground water is not subject to water rights under the prior appropriation system that is common to much of the West. Thus, all that is required to obtain National Forest ground water resources is a Special-Use Authorization for well drilling and water conveyance.
- **Cost.** The Forest Service charges nothing for the water it provides, only for the land use authorization.

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Concerns:

Affect On National Forest Resources. Ground water and surface water form an interconnected hydrologic system. Recharge to ground water supplies originates from precipitation and surface waters. Conversely, ground water discharge is the reason that perennial streams, springs and seeps flow throughout the year. Ground water pumping from wells can result in lower water tables and reduced stream flows. As surface water and shallow ground water sustain riparian and aquatic ecosystems, ground water removal can negatively impact these resources.

Riparian areas can be characterized by their diverse and productive nature, and their limited size (riparian areas constitute less than one percent of the entire Tonto National Forest). Riparian areas in arid environments are particularly valuable, and can be viewed as unique "reservoirs" of plant and animal diversity. These areas also perform important hydrologic functions and are the focal point for many recreational activities.

Affect On Adjacent Water Supplies. Many public and private entities within and adjacent to the Forest currently rely on ground water for a variety of purposes. Authorization of additional wells and removal of ground water from the Forest can lower water levels and impact these existing ground water users.

Limited NEPA Analysis. Historically, NEPA analyses of proposals to develop Forest ground water resources have focused on the impacts of drilling and the construction of infrastructure such as wells, pumping facilities, roads and power lines. Little attention has been paid to the potential impact to Forest water resources, associated riparian areas, and adjacent water supplies. Continuation of our historic approach to evaluating impacts could result in the authorization of new water developments that adversely affect important Forest resources and activities. It also implies that the Forest should evaluate any new requests for ground water very carefully.

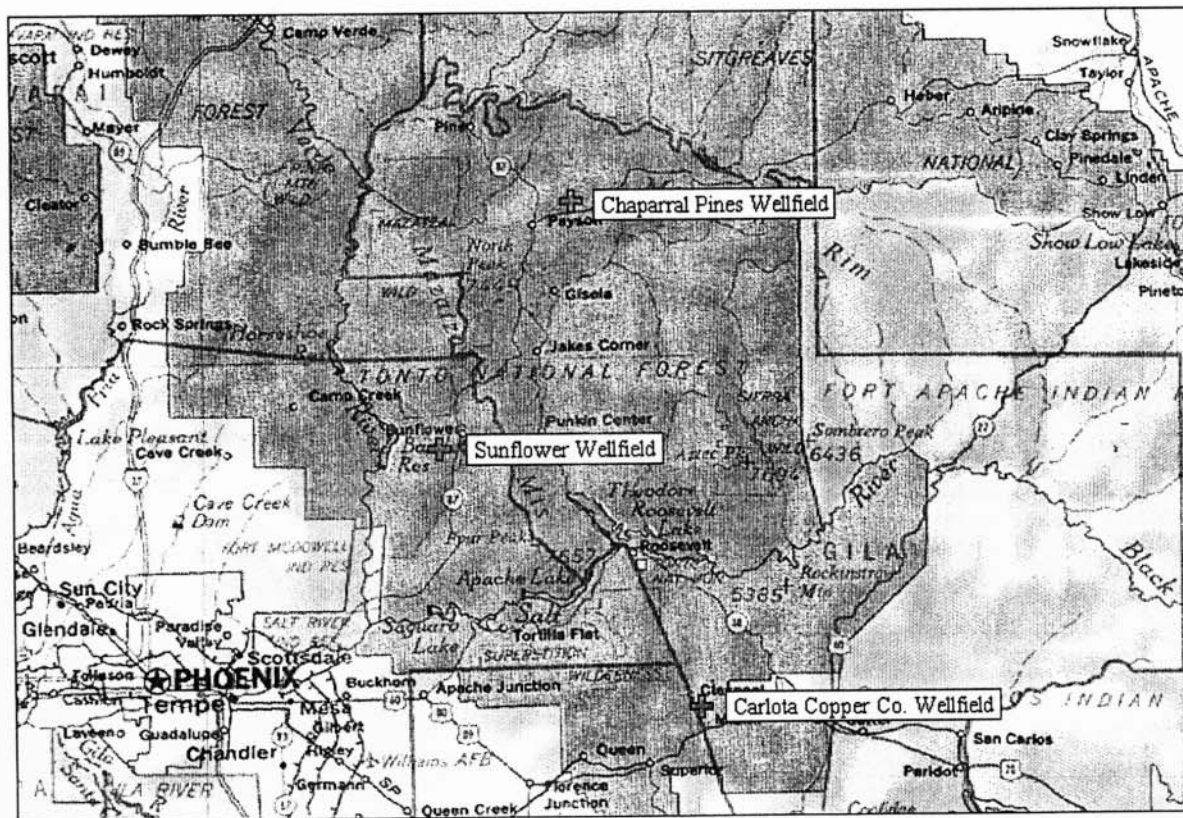
Special-Use Permits Are Long-Term Commitments. Special Use Permits for the conveyance of water across the Forest are issued for a specific number of years. Although the Forest Service has the legal right to deny reissuance of such permits, it is often very difficult to do so. In essence, most Special-Use Permits for water are permanent commitments. This makes it very difficult to correct existing resource problems that can be attributed to such developments.

Lack Of Consistency. Historically, the Forest responded with a variety of approaches to requests for the development and use of ground water. In some instances we immediately denied such requests, while in others we encouraged such development and use. Such inconsistency without a sound rationale usually leads to problems.

Case Studies:

The Forest's ground water policy evolved from our experiences with three ground water development projects on or adjacent to the Forest. These include: the proposed Carlota Copper Mine, a medium sized copper mine partially located on the Forest near the Globe/Miami mining area, The Sunflower Well, a well on private land that was proposed to provide water for widening and relocating a highway between the Phoenix metropolitan area and summer recreation areas along the Mogollon Rim in Central Arizona, and the Chaparral Pines pipeline, a water supply pipeline that conveys water from a wellfield on private land across the forest to a subdivision near Payson, Arizona, also on private land. The discussion that follows provides brief descriptions of each of these projects.

Ground Water Development Project Locations



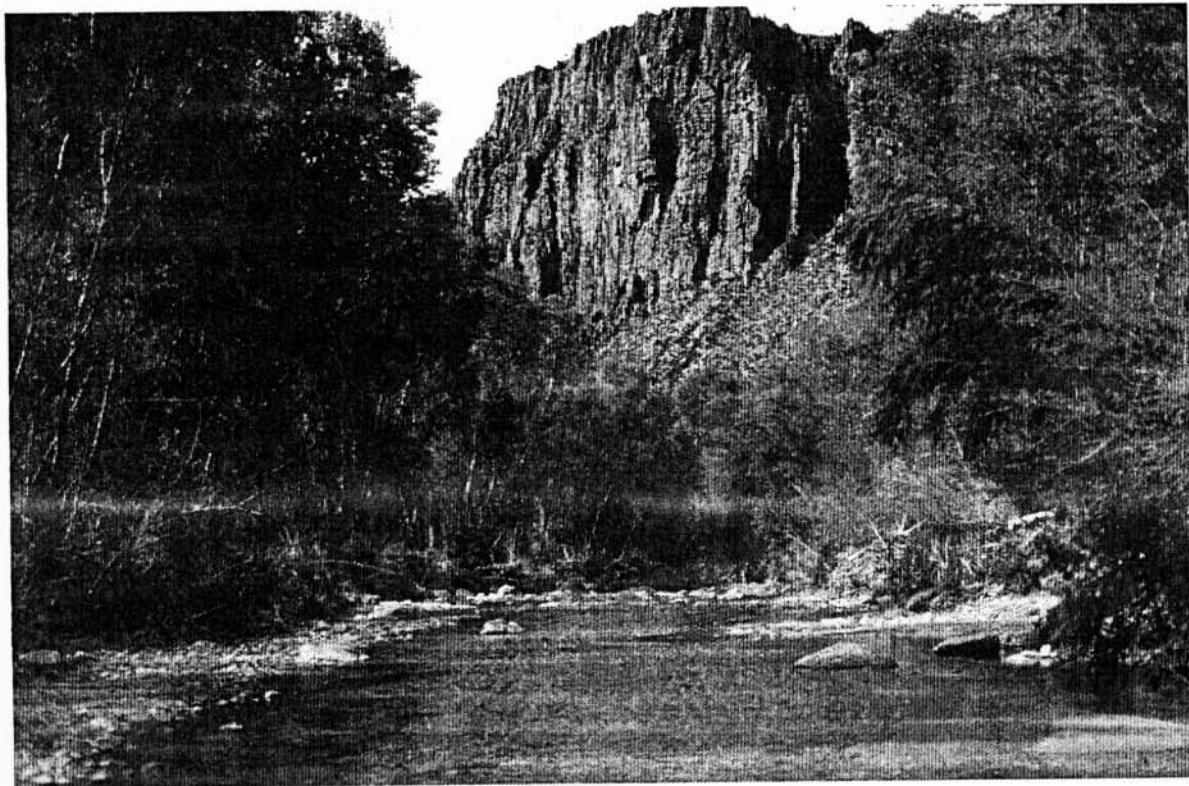
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Carlota Copper Co. Wellfield

The Carlota Copper Mine is located 6 miles west of Miami, Arizona, at an elevation of approximately 3700 feet in a rugged mountainous semiarid region composed predominately of chaparral, desert brush and juniper grassland. The Carlota Copper Company proposes to mine 100 million tons of ore from open pits over a twenty-year period to produce 900 million pounds of copper. The ore would be leached with a sulfuric acid solution in a heap leach process. Water requirements for the mine average 590 gallons per minute (gpm) with peak water requirements of 850 gpm during dry months.

The mine is located in the Pinto Creek watershed, which drains into Roosevelt Lake, a major water supply reservoir for the Phoenix metropolitan area. Pinto Creek, which becomes perennial below the project area, is a valuable resource on the forest. It is a rare perennial stream in the Sonoran desert, it has been designated as an Aquatic Resource of National Importance (ARNI) by the EPA, it has been studied for eligibility for inclusion in the nations Wild and Scenic River System, it has been nominated for unique waters status, it has been named as one of the ten most endangered rivers in the nation by the American Rivers environmental group and has been called a "jewel in the desert" by Barry Goldwater. To protect the stream the Forest applied for and received an instream flow water right from the state that seeks to maintain median monthly flows along a nine mile reach of the stream located approximately four miles below the Carlota project area. These flows range from 1 to 2.7 cfs.

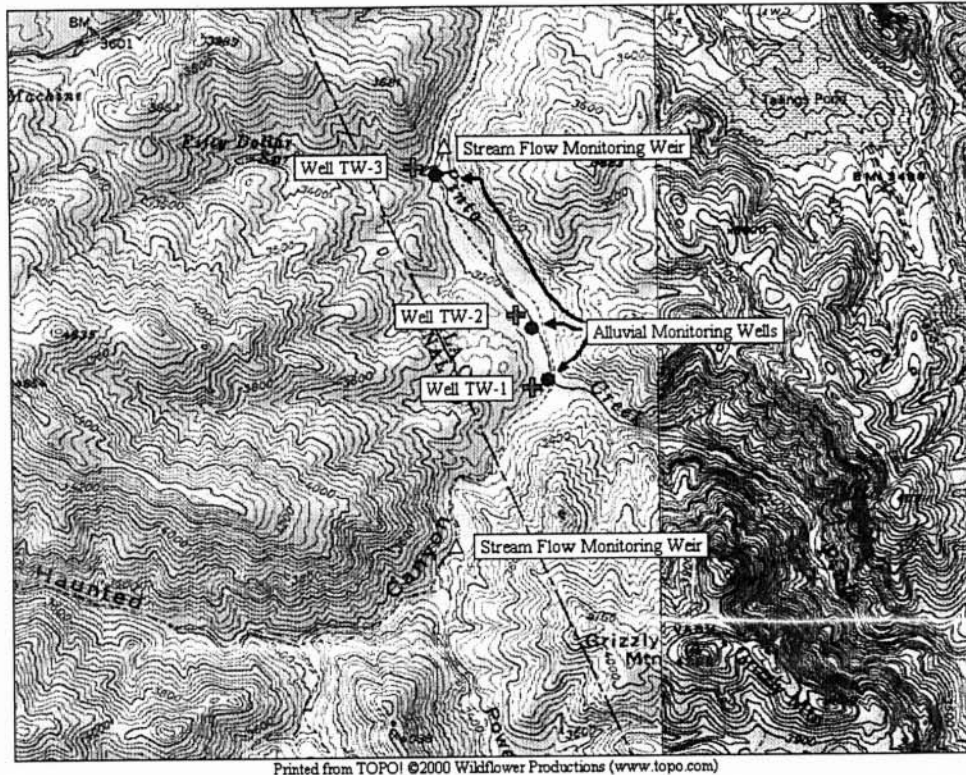
Pinto Creek



The mine conducted an extensive search for water that included: acquisition of Central Arizona Project water from Roosevelt Lake, five surface water reservoir sites on Pinto Creek and Powers Gulch, water purchased from nearby municipalities or other commercial sources, low quality water from adjacent mining operations, and ground water from a variety of locations. For various reasons many of these water supply sources could not meet the mines requirements and the source ultimately selected included ground water from a wellfield located approximately two miles downstream of the main

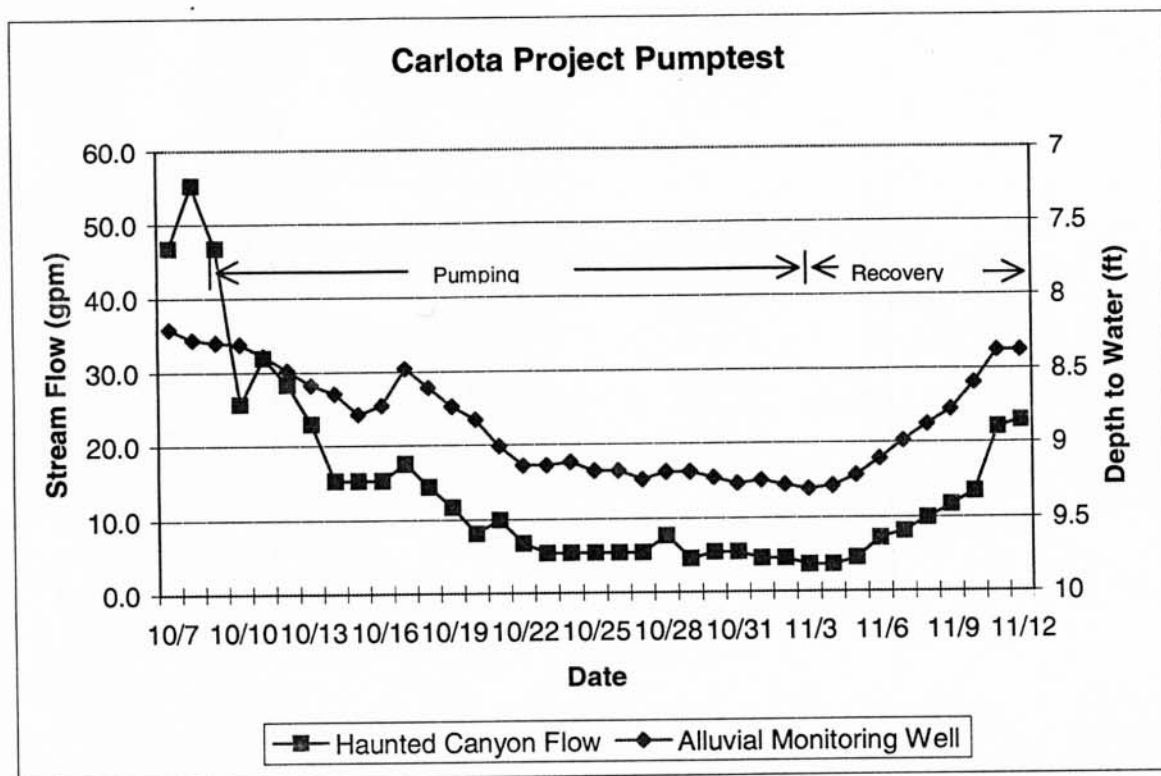
project area in an area adjacent to the confluence of Pinto Creek and Haunted Canyon (a perennial tributary to Pinto Creek).

Carlota Wellfield



Three test wells were drilled at this site from June to September 1993, ranging in depth from 755 feet to 1220 feet below ground surface. All three wells experienced artesian flows with artesian discharge from the middle well (TW-2) flowing at 250 gpm. Test pumping of these wells was conducted to evaluate the long-term yield potential of the aquifer, and the impact of pumping on surface water resources and on alluvial ground water elevations. Well TW-2 was pumped for 25 days at a rate of 600 gpm. A monitoring network consisting of 3 shallow alluvial monitoring wells, 4 bedrock complex monitoring wells, weirs at two springs, and a weir or parshall flume at two locations in Haunted Canyon and Pinto Creek was installed to detect potential impacts.

During the 25-day pump test of TW-2 stream flow at a weir in Haunted Canyon approximately 2,300 feet south of the TW-2 well declined from approximately 45 gpm at the start of the test to 5 gpm at the end of the test. Flow increased progressively to approximately 27 gpm within a few days of shutting off the pump. The water level in an alluvial monitoring well in Haunted Canyon located approximately 1550 south of TW-2, declined approximately one foot during the 25-day test and recovered slowly following the test.



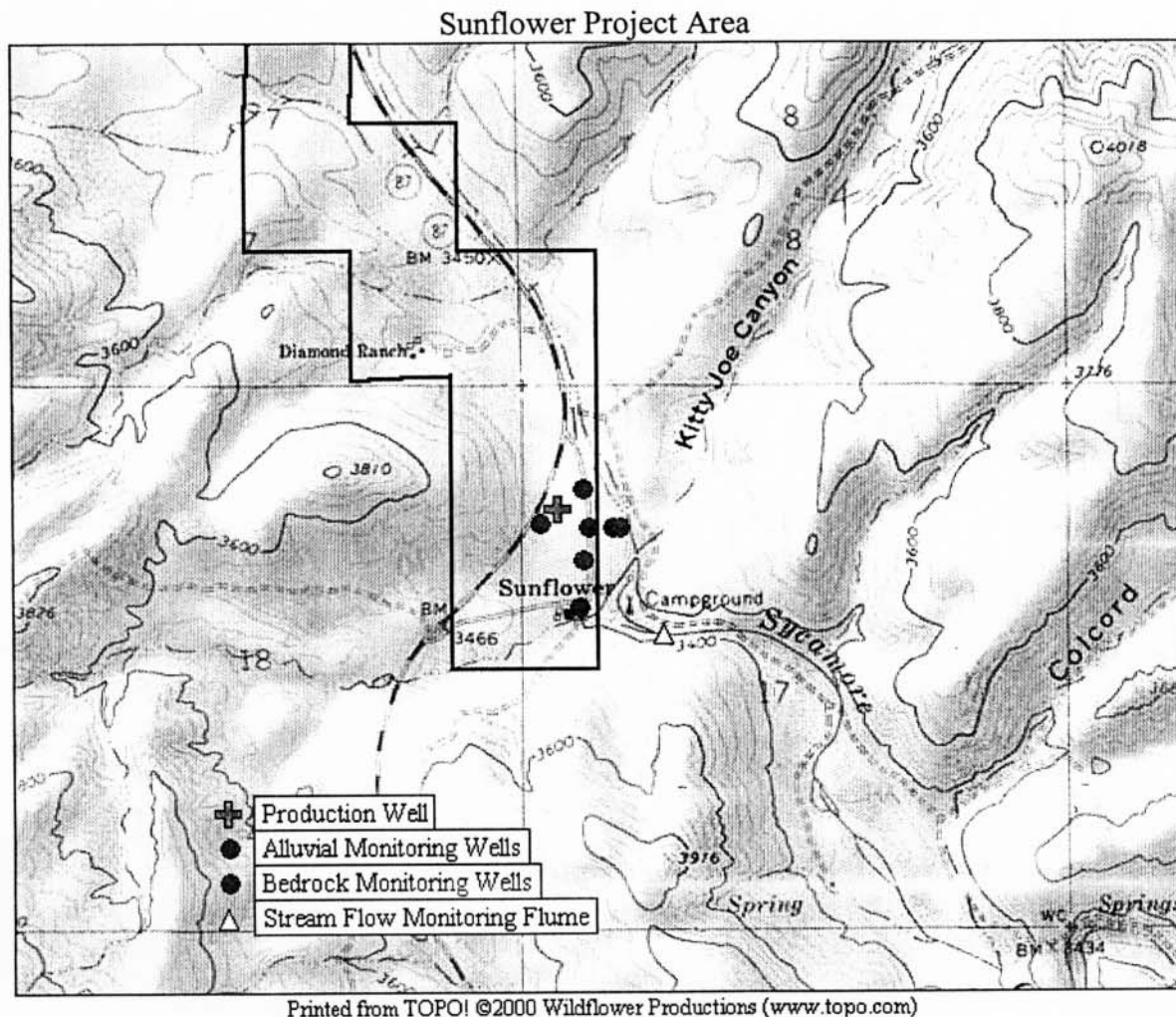
Based on these test results the Forest sent a letter to the Arizona Department of Water Resources (ADWR) requesting an appropriability determination. In Arizona water pumped from a well is considered to be appropriable if withdrawing that water tends to directly and appreciably reduce flow in a surface water source. ADWR reviewed the aquifer test results and concluded that the well was withdrawing appropriable water and would need a water right if it was to be used. The Carlota Copper Company subsequently submitted a water right application. The Forest protested the application based on its instream flow water right downstream on Pinto Creek. The Forest negotiated a wellfield mitigation program with the mine that seeks to maintain median monthly flows in Haunted Canyon and Pinto Creek in exchange for the Forest's withdrawal of its protest.

Sunflower Well

The second ground water development project influencing the development of the Forest's ground water policy was the Sunflower Well. This well was proposed as a water supply source for upgrading a portion of State Highway 87 that carries heavy traffic from the Phoenix metropolitan area to summer recreation areas in the high country along the Mogollon Rim in North Central Arizona. Water requirements for highway construction were estimated to be about 200 gpm for compaction of fills and for dust control.

The Sunflower well is located on private land near Sycamore Creek, which has reaches of both intermittent and perennial flow near the well. Sycamore Creek, like Pinto Creek, is a stream with reaches of perennial flow in the Sonoran Desert. It supports valuable riparian vegetation, provides habitat for native fish, and is a popular recreation area.

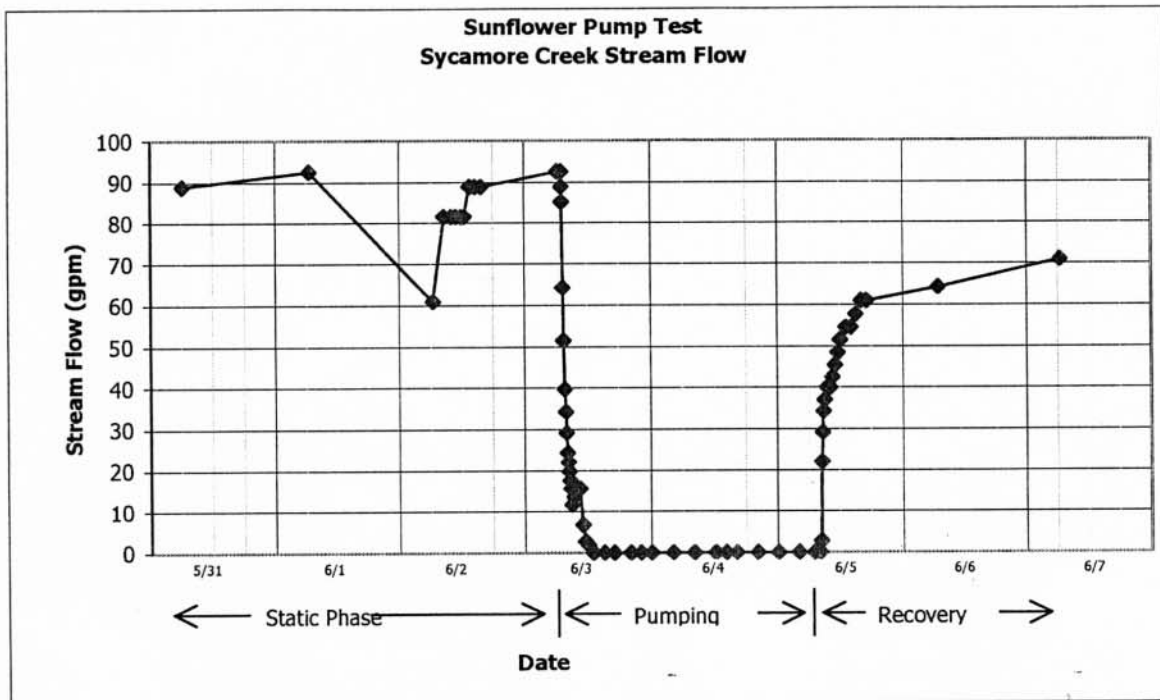
The Record of Decision (ROD) for the Environmental Impact Statement (EIS) prepared for the highway upgrading project stated that construction water would not be withdrawn from Sycamore Creek. To evaluate the effects of the well on Sycamore Creek an aquifer test with observation wells and a streamflow monitoring flume was conducted.



The proposed production well was completed to a depth of 240 feet in fractured basalt. Water rose under artesian pressure to a depth of about 20 feet below ground surface. The monitoring network consisted of four shallow observation wells in the alluvium bordering the creek, two deep observation wells in the bedrock basalt aquifer and a parshall flume in a perennial reach of Sycamore Creek just downstream of the well. The aquifer test was originally scheduled for 3 days with the production well pumping at an average rate of 250 gpm.

Water levels in the shallow monitoring wells declined before, during and after the test. Water levels declined at a slightly greater rate during the test. The majority of the decline is believed to be attributable to natural conditions. The impact of pumping on stream flow through the flume was dramatically different than the impact to the shallow observation wells. Prior to beginning the test the flow rate through the flume was about 90 gpm.

About 6 minutes after the pump in the production well was turned on, flow through the flume started to decline. Approximately six hours into the test, flow in Sycamore Creek declined to the point where it was no longer flowing through the flume. One hour and 20 minutes after the pump was turned off, Sycamore Creek started flowing through the flume again. Two hours after the pump was turned off flow through the flume was 37 gpm, and 10 hours after turning the pump off, flow through the flume was 61 gpm.



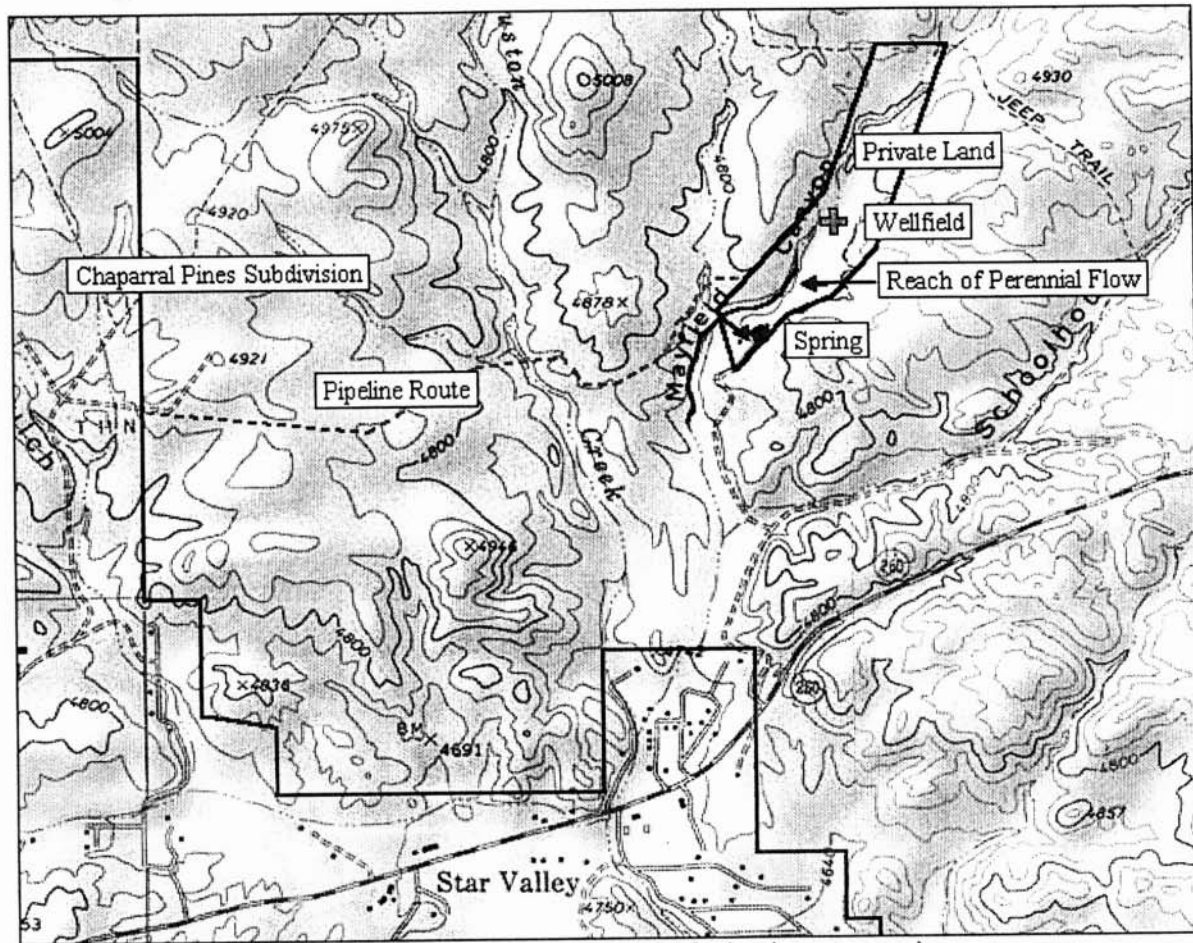
Based on the results of this test the contractor was not allowed to use the well for the highway upgrade project.

Mayfield Canyon Wellfield

The purpose of this project was to provide water for a subdivision and golf course near the community of Payson, Arizona. The wellfield was located on a parcel of private land, known as Calhoun Ranch, that is entirely surrounded by National Forest System lands. The proponents intended to construct a pipeline that would transport water from the wellfield across the Forest and back onto private lands where the subdivision and golf course were located. Mayfield Canyon flows through the private lands where the wellfield is located, enters the forest for approximately one half mile and then flows back onto private lands in the community of Star Valley. The stream becomes perennial on the Calhoun Ranch private lands due to ground water discharge that seeps into the bed and banks of the channel and from discharge from a significant spring (estimated to discharge at approximately 30-40 gpm). Perennial flow continues downstream of the private land onto the Forest for approximately 200 yards until it seeps into the sands and gravels of the stream bottom alluvium. The reach of perennial flow on the Forest supports a lush riparian zone of cottonwood and willow. Peak water requirements for the golf course and

subdivision were estimated at approximately 360 gpm. The residents of Star Valley who are dependent on wells for the majority of their water needs were concerned that development of the wellfield on Mayfield Canyon (which is upgradient of Star Valley) would reduce ground water availability to their wells.

Chaparral Pines Wellfield and Pipeline



The subdivision developer needed a Special Use Permit from the Forest for the pipeline from Calhoun Ranch to the subdivision at Chaparral Pines. The Forest, as part of its compliance with the National Environmental Policy Act evaluated the connected actions associated with the project proposal. In this instance it meant looking at the impacts of pumping the ground water as well as the impacts of the pipeline itself.

Eight wells were drilled at the Calhoun Ranch site ranging in depth from 200 to 500 feet and completed in fractured granite. Prior to submitting an application for a special use permit the developer completed a number of aquifer tests including a 33 day test on the most productive well which was pumped at a constant rate of 300 gpm during the test. Drawdown in 5 observation wells ranged from 20 to 30 feet during the test. Streamflow in Mayfield Canyon was not monitored during this test. The developers consultant concluded that impacts to surface water flows from operation of the wellfield would be

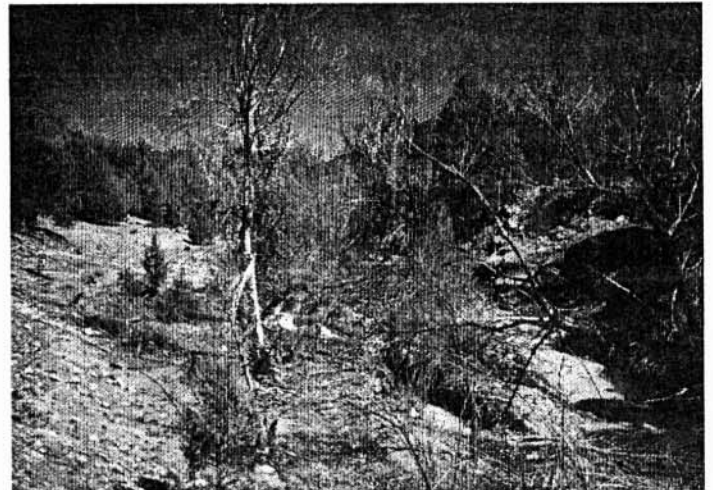
negligible because flow in Mayfield Canyon is intermittent and the result of precipitation events.

Once the developer submitted a Special Use Permit application the Forest asked the developer to conduct a second 30 day aquifer test with flow measurements in Mayfield Canyon to directly assess impacts to stream flows. The developer refused stating that a long-term aquifer test had already been completed and that the consultants who conducted the test had reached their conclusions about ground water-surface water impacts. As an alternative the Forest asked the developer to conduct a water budget analysis that would assess the impacts of ground water withdrawals on inputs and outputs of water resources in the watershed. The Developer agreed to this request and subsequently concluded that ground water pumping would not reduce the surface runoff component of the water budget, but can affect baseflow in the reach of Mayfield Canyon above the cone of influence of the ground water wells. A Special Use Permit was subsequently issued and the photos below display the impacts of wellfield operation on the reach of Mayfield Canyon within the National Forest.

Before



After



GROUND WATER POLICY

Policy. Ground water shall be managed for the long-term protection and enhancement of the Forest's streams, springs and seeps, and associated riparian and aquatic ecosystems. Development and use of ground water for consumptive purposes shall be permitted only if it can be demonstrated that such proposals will adequately protect Forest resources.

Consistency With Existing Policies And Management Direction.

The Forest policy for the development and use of ground water is consistent with National and Regional policy and direction.

- **Watershed & Riparian Area Policy.** Forest Service Manual (FSM) 2503(2) requires that management activities “maintain and enhance long term productivity, water quantity and water quality.” FSM 2526.03(2) requires that preferential consideration be given to riparian dependent resources when conflicts among land use activities occur. FSM 2541.35 requires the Forest Service to “Include stipulations in the authorizing documents to ensure the quantities of water needed to fulfill purposes of the National Forest and for environmental needs will be maintained instream.” FSM 2541.34 indicates that if projected water requirements of uses not directly related to Forest Service programs “will adversely affect National Forest resources, the potential permittee must seek alternative water sources or develop mitigation plans acceptable to the Forest Service.”
- **Special Use Authorizations.** Objectives of the Special Uses program include managing National Forest System (NFS) lands in a manner which protects natural resource values, and is consistent with Forest land and resource management plans (FSM 2702). Special-use authorizations should be denied if they are in conflict with other Forest management objectives, or can reasonably be accommodated on non-NFS lands (FSM 2703.2 (2) and (3)). FSM 2703.2 also indicates that the use of NFS lands should not be authorized just because it affords a lower cost and less restrictive location than non-NFS lands.

Criteria For Development And Use Of Ground Water. Proposals to develop and use ground water derived from National Forest System lands must meet the following conditions:

- A. The proposal to use water must be consistent with applicable laws, regulations, polices, rules, and Forest land and resource management plans (FSM 2702 & 2703).
- B. The proposal to use water must adequately protect National Forest resources (FSM 2702.1 & 2541.34).

- C. If the proposed place of use of water will be located on non-National Forest System lands, the proponent must demonstrate that alternative water sources do not exist off-Forest (FSM 2703.2).

PROCEDURES – Methods to Implement Policy

Phases Of Water Development

1. **Preliminary Analysis.** Initial screening process.
2. **Exploration and Testing.** Drilling for a suitable water supply, and testing for impacts to Forest resources and adjacent water supplies.
3. **Construction and Production.** Construction of all infrastructure, conveyance of water, and long-term monitoring and mitigation.

Detailed Procedures.

1. **Preliminary Analysis.**

If water is to be used off-Forest, the proponent must demonstrate that alternative water sources do not exist off-Forest.

For All Proposals Need:

- 1) **Description of proposal.**
 - Quantity of water needed
 - Infrastructure requirements
- 2) **Inventory of key resources.**
 - The location of potentially affected surface water resources.
 - The location and description of riparian vegetation.
 - Any known Threatened and Endangered species.
 - Pertinent geologic information.
 - Pertinent hydrologic information.
- 3) **Inventory of Existing Water Developments.**

2. Exploration And Testing.

This phase would only occur if the proposal satisfies the requirements of the screening process in the preliminary analysis phase.

Temporary Permit Issued. If the Preliminary Analysis indicates a reasonable likelihood of developing water without impacts to Forest resources or adjacent water developments, a Temporary Permit may be issued for the Exploration and Testing phase of the proposal. This Temporary Permit shall contain the conditions necessary to minimize impacts to Forest resources.

If sufficient water is found in the exploration phase to meet the needs of the proponent:

Testing Conducted.

- Monitoring Plan submitted
- Long-term pump test and/or modeling is conducted
- Observe or predict affects

3. Construction And Production.

This phase occurs only if testing indicates that Forest resources will not be adversely affected or can be mitigated, and nearby water developments can be adequately protected.

Permit Issued. Infrastructure needed to produce and convey water is constructed.

Monitoring And Mitigation. Any monitoring or mitigation measures necessary to ensure protection of Forest resources during the construction of water storage and conveyance facilities, and during the long-term removal of ground water will be included as a plan of operations attached to and made part of the Special-Use Permit. If long-term monitoring detects additional or unforeseen adverse impacts to Forest resources that were not discovered during the exploration and testing phase, or if mitigation measures do not adequately protect Forest resources, the Permit shall not be reissued.

OTHER CONSIDERATIONS

NEPA Analysis and Documentation. The scope of any analysis needed to comply with NEPA will depend largely on potential resource impacts, and on the level of public concern.

For NEPA purposes, ground water exploration and development can often most logically be addressed in two distinct phases. The first NEPA analysis can address the impacts associated with the exploration and testing phase. This phase can be separated from the development and production phase because the availability of ground water, and the impacts from pumping are often unknown during the exploration phase. A second NEPA analysis can be conducted if a suitable supply of ground water is found and if test pumping does not result in impacts that would constitute a reason for denial of a Special-Use Permit for the production phase. The second NEPA analysis would address impacts identified during the exploration and testing phase, from the construction of infrastructure, and from the operation of the proposed facilities.

Water Rights. Applicable laws and regulations governing wells and water rights will be adhered to for all proposals.

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