

Shared Water Resources Overview Paper No. NPS-01

NPS SHARED WATER RESOURCE ISSUES IN THE MEXICAN HIGHLANDS SUBAREA

Study Area: Mexican Highlands Subarea

Bureau: National Park Service (NPS)

The NPS administers five units of the National Park system located within the Mexican Highlands subarea, **Coronado National Memorial, Tumacacori National Historical Park, Chiricahua National Monument, Fort Bowie National Historic Site and Saguaro National Park**. In addition, The Rivers, Trails, and Conservation Assistance Program of the National Park Service has cooperated with Arizona State Parks in completing a **Santa Cruz River Corridor Study**.

Coronado National Memorial

Coronado National Memorial (CORO) is located in the San Pedro River drainage on the US - Mexico border approximately 40 mi (64 km) east of Nogales. CORO consists of 4750 acres located at the southern end of the Huachuca Mountains. The US - Mexico boundary forms the 3.5 mile long southern boundary of the memorial.

Sources of surface water within the memorial are few; however, there are over 11 known springs (several of which will trickle much of the year during wet years) and more than 500 acres of riparian habitat. Three wells are used to support park operations and cattle grazing. The memorial draws its water supply for park operations from a 150 foot well. In 1979, the memorial acquired two other wells from a private inholding that may also provide backup water for park operations.

Water resource concerns of the memorial include: 1) a lack of information concerning surface and groundwater resources, 2) concern about the effects of increasing groundwater withdrawals on springs and seeps within the memorial due to withdrawal of water in the San Pedro River Valley, and 3) water rights determinations.

The entire San Pedro Valley is experiencing an increase in urban development with the growth of the city of Sierra Vista and Fort Huachuca. A cone of depression in the water table currently exists under the cities of Sierra Vista and Palominas. As urbanization continues, impact to water resources in the memorial may be expected. There is also concern that land use issues in Mexico may affect the memorial, though this has not yet been documented.

Present groundwater withdrawal supports industry in Cananea, Sonora (approximately 25 miles south). In addition, a new Port of Entry (POE) has been proposed approximately one mile east of the memorial. The potential development associated with this proposed POE would be dependent on additional groundwater withdrawals. Other industrial development along the US - Mexico border due to NAFTA could also impact the memorial.

The Coronado National Memorial Resources Management Plan (NPS, 1993) discusses the need to monitor surface and groundwater resources as well as providing a more complete mapping and monitoring process of riparian resources, and assess water resource related attributes.

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Tumacacori National Historical Park

Tumacacori National Historical Park (TUMA) consists of three geographically-separate units (Guevavi, Calabazas and Tumacacori) totalling 47 acres located in Santa Cruz County, Arizona. The Spanish colonial mission sites are located approximately 5 miles (8 km) to 18 miles (29 km) north of the U.S. - Mexico border, Guevavi being the southernmost, Tumacacori the northernmost, and Calabazas

about equi-distant between the two. Both the Guevavi and Calabazas sites are situated on the east side of the Santa Cruz River; the Tumacacori site is on the west side. This latter site is the most developed of the three and is located on an upper river terrace approximately 900 meters from the river channel. The Calabazas ruins site lies just south of the confluence with Sonoita Creek, on an area of high ground about 500 meters from the river channel.

The ruins of the southernmost mission at Guevavi are located on a bluff above the river channel. A small portion of the Guevavi site includes the riparian zone associated with the river floodplain, which zone is suspected to be wetland based on vegetation characteristics.

A trail linked the three (and associated) sites during the Spanish colonial period, which essentially followed the Santa Cruz River corridor, and is known to have been a traditional travel and trade route through the area. This is also the general route traveled by Juan Bautista de Anza, captain of the Spanish presidio at Tubac (just north of the Tumacacori mission), who led an expedition of settlers from Culiacan in the winter of 1775-76 that resulted in the founding of the city of San Francisco in California. Although final alignments of the Anza National Historic Trail, designated in 1990, have not been determined in respect to proximity to the park's 3 units, one 4.5 mile improved section already extends from the north end of the Tumacacori site to the historic presidio at Tubac. This section lies in the river floodplain.

Although the headwaters of the Santa Cruz River lie in Arizona, the river flows south into Mexico and then turns northward again, re-entering the U.S. east of the border city of Nogales, AZ. Classified as "intermittent," the Santa Cruz flows naturally year-round past Guevavi, continuing up to the vicinity of Calabazas. There it's flow is directed into the Nogales International Waste Water Treatment Plant (IWWTP), where effluent is discharged into the river. The surface flow of the river northward from this area typically extends up past the Tumacacori unit.

At the primary Tumacacori site, the park draws its water supply for residential and visitor use from a 152 foot well drilled into the alluvium of the Santa Cruz River. Recharge is presumed to be constant from surface water infiltration. However, the quantity, quality, and geographic extent of the groundwater resources in this immediate area are currently unknown but of widespread interest.

As an example of the latter, the park is already cooperating in two separate studies as part of a larger effort--outlined in Tumacacori's Resources Management Plan to inventory and monitor subsurface water sources and water-related resource attributes throughout the park. One of these studies, directed by researchers in the Department of Hydrology & Water Resources, University of Arizona involves monitoring and sampling the Tumacacori well as part of a effort to assess the impacts of effluent discharge from the Nogales IWWTP upon groundwater from Nogales north to approximately the Tumacacori mission site. The other study,

directed by the State of Arizona Department of Environmental Quality, Water Resources Division, involves mapping the location of wells in the Santa Cruz River Valley using GPS technology, and includes a sampling program specific to determining the existence of nitrates in the water.

The river is unquestionably the dominant surface water feature for the park. Further, an array of transboundary issues associated with water flow, water quality, and the protection of water-dependent habitats for the Santa Cruz River are of concern to both the park and the National Park Service.

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Santa Cruz River Corridor Process Study

The National Park Service's Rivers, Trails, and Conservation Assistance Program has recently cooperated with Arizona State Park's in the completion of a river corridor planning study for the Santa Cruz River Valley, Arizona (Arizona State Parks Board, 1994). Water-related issues identified during this study include: 1) local water quantity and water quality, 2) liability for providing public access to the river across private lands, 3) trespass and private property rights, 4) impacts from NAFTA, and 5) how the community could go about developing a river protection strategy which respects private property rights.

Specific transboundary water resource issues identified as part of

this study include:

- the need to address and manage ground water and surface water as part of the same hydrologic unit;
- the impact of the International Waste Water Treatment Plant, located 9 miles (14.4 km) north of Nogales on surface and ground water hydrology of the Santa Cruz River;
- the impact of changing land use patterns and increased groundwater pumpage and withdrawals upon the Santa Cruz River water resources and water-dependent environments;
- impacts of recent flooding on public and private lands
- inadequate sewage disposal and/or inappropriate use of septic tanks in many locales throughout the region due to potential seepage into groundwater and/or wash out from steep slopes during periods of heavy rain;
- the need for protection of riparian areas.

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Chiricahua National Monument

Chiricahua National Monument (CHIR) is located approximately 45 miles (72 km) north of the US - Mexico border, northeast of Douglas, AZ. CHIR consists of nearly 12,000 acres and protects a unique rock formation located in steep, wooded drainages in the Chiricahua Mountains.

Water resources within the Monument consist of two intermittent drainages (Rhyolite Canyon and Bonita Canyon), 5 springs, and approximately 180 acres of riparian habitat. Water resource issues are local in nature, and consist primarily of: 1) a lack of basic inventory and monitoring information pertaining to the unit's water resources and water-dependent environments, 2) potential flash flooding in the two primary drainages within the Monument (Rhyolite Canyon and Bonita Canyon), and 3) potential water quality degradation from mining and recreational activities. The Monument's Resource Management Plan also lists the need to develop a comprehensive water resources management program as a management priority.

There are no transboundary water issues presently identified at Chiricahua NM, though atmospheric deposition resulting from air pollution in Mexico could potentially affect surface water quality within the National Monument.

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Fort Bowie National Historic Site

Fort Bowie National Historic Site (FOBO) is located in the Apache Pass area between the Chiricahua Mountains and the Dos Cabezas Mountains in Cochise County, Arizona approximately 50 miles (80 km) north of the US - Mexico border. The National Historic Site consists of approximately 1000 acres of Chihuahuan desert environment set aside to preserve the site of decades of struggle between the Apache people, who were protecting their lands and water sources, and the westward-expanding white culture in Apache Pass.

Water resources consist of 2 springs which support approximately 30 acres of riparian habitat. FOBO has had a history of water allocation issues concerning water from Apache and Mine Tunnel springs. Presently, the NPS receives half the flow from Apache Springs and all the flow from Mine Tunnel springs minus an amount necessary to provide stock water on a nearby Bureau of Land Management grazing allotment. A third spring, Quillian Well, is located about one-half mile from south of FOBO and flows intermittently though the site.

Water resource issues at FOBO are local in nature, and consist primarily of a lack of basic inventory and monitoring information, as well as the impact of grazing on water resources. The FOBO Resource Management Plan identifies the needs to develop a water resource management program. The first step in developing this program would be to provide an issues assessment which would identify and assess information on historic spring flows, evaluate the need for spring flow monitoring, assess flood hazards, evaluate water rights and water supply issues.

There are no transboundary water issues presently identified at Fort Bowie National Historic Site.

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Saguaro National Park

Saguaro National Park (SAGU) is located on the northeastern edge of the Sonoran Desert in the Santa Cruz River valley near Tucson, approximately 60 miles (96 km). The 85,000 acre park consists of two distinct districts, the Rincon Mountain District to the east and the Tucson Mountain District to the west. Both units are dissected by steep mountain canyons at higher elevations and meandering washes at lower elevations. The Rincon Mountain District contains a number of perennial springs/seeps and a few small perennial streams. However, with the exception of a few springs/seeps, very little surface water is available in the Tucson Mountain District because of its lower elevation and smaller watershed. Both areas however, are subject to intermittent stream flows, typically for a few hours following summer thunderstorms and for up to a few weeks following longer periods of winter rains.

Water resource issues within the SAGU are local in nature and include flash floods and water rights. There are no transboundary water issues presently identified at Saguaro NP, though atmospheric deposition resulting from air pollution in the southwestern United States and Mexico could potentially affect surface water quality within the National Park.

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