

MEMORANDUM FOR THE RECORD

SUBJECT: Determination of Two Reaches of the Santa Cruz River as Traditional Navigable Waters (TNW)

Summary

The Corps' Los Angeles District has determined that two reaches of the Santa Cruz River, Study Reach A from Tubac gage station (USGS # 09481740) to the Continental gage station (USGS #09482000) and Study Reach B from Roger Road wastewater treatment plant (WWTP) downstream to the Pima/Pinal County line, Arizona, as shown in Exhibit A, are TNWs (collectively, referred to as the "Study Reaches"). This determination is consistent with the Clean Water Act (CWA), the agencies' regulations (including 33 C.F.R. § 328.3), relevant case law, and existing guidance, including the June 5, 2007 joint U.S. Environmental Protection Agency and Department of the Army legal memorandum entitled *Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States* (Rapanos Guidance) and *Appendix D of the U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook* issued June 5, 2007 (Appendix D).

Background

The Santa Cruz River originates in Arizona, flows south into Mexico, and then flows north again into Arizona. It is the primary river which flows from Nogales, Mexico through Tucson, Arizona, and a number of Indian reservations, including Tohono O'odham Nation (TON), to the Gila River near Phoenix. The watershed of the Santa Cruz River is approximately 8,600 square miles. Until the late nineteenth century, the Santa Cruz River was primarily a perennial watercourse that served the region's agricultural needs until a quickly developing industrial society began to tap the river's subsurface flow (Exhibit B).

The Upper Santa Cruz River Valley, located between Nogales, Arizona on the US-Mexico border, and extending 65 miles north to the major urban area of Tucson, has a long history of European settlement spanning three centuries. Prior to the discovery of the area by European explorers, the area was inhabited for thousands of years by aboriginal native peoples. The Santa Cruz River has long been an important corridor for trade and exploration. The river and its well-established riparian habitat have served as a vital commodity for people and wildlife in the region.¹

In addition to the use of the Study Reaches by recreational watercraft described in case-specific analysis below, in the mid 1850s, William Rowlett and his brother, Alfred, constructed an earthen dam on the Santa Cruz River south of the present-day Silverlake Road. They also installed a water-powered flour mill at this location in 1857/58. In 1860, William Grant purchased the flour mill and the dam/lake and improved the dam and mill in order to supply military posts in the southwestern region. He built a second, larger mill on the river and purchased the machinery in California. However, the mill was burned in 1861 to keep it from falling into Confederate hands. The mill was purchased by James Lee and returned to operations in 1864. In 1884, the mill, dam,

¹ *The Santa Cruz River: A Resource Shared by Two Cities* by Hugh Holub, paper presented to the Border XXI EPA Regional Water Sub Work Group Meeting on March 6, 2001, Nogales, Sonora.

and lake were sold to Frederick Maish and Thomas Driscoll who developed the Silver Lake Resort. In 1883, Solomon Warner built a second dam and mill on the river. The lake was approximately 60 acres, 8 feet deep, and the *Arizona Citizen* reported the use of a flat-bottom boat on the lake. Waterfowl populated the lake and hunting organizations claimed exclusive rights to shooting the waterfowl. The dams at both Silver Lake and Warner's Lake were breached by floods in 1886 and 1887; the *Arizona Star* reported on July 13, 1887 that the river was wide and deep enough to float a "mammoth steamboat." In 1888, Frank and Warren Allison purchased Warner Lake, repaired the dam, and stocked the lake with carp for commercial fish production selling over 500 pounds of fish per day. Both dams were washed out by 1890.²

Further, in the summer of 1951, Glenton G. Syke, Tucson city engineer, navigated the Santa Cruz River in a 14-foot-long boat from the San Xavier del Bac Mission to Congress Street in Tucson.³

The Study Reaches were selected based on personal knowledge of the river by Regulatory staff, evidence of perennial flows based on stream gage data, and more readily available evidence of navigability.

Basis for TNW Determination

The Rapanos Guidance indicates that in its context, the term TNW refers to those waters that are under the jurisdiction of the Corps, pursuant to 33 C.F.R. § 328.3(a)(1), (i.e., "[a]ll waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide."

As stated in Appendix D: "when determining whether a water body qualifies as a "traditional navigable water" (i.e., an (a)(1) water), relevant considerations include whether a Corps District has determined that the water body is a navigable water of the United States pursuant to 33 C.F.R. § 320.14, or the water body qualifies as a navigable water of the United States under any of the tests set forth in 33 C.F.R. Part 329, or a federal court has determined that the water body is navigable-in-fact under federal law for any purpose, or the water body is "navigable-in-fact" under the standards that have been used by the federal courts."

To determine whether the Study Reaches are a TNW, in accordance to 33 C.F.R. § 328.3(a)(1), a case-specific analysis to evaluate whether the Study Reaches are navigable-in-fact, including consideration of its potential susceptibility to interstate and foreign commerce, was undertaken. The Corps has determined that the Study Reaches are a TNW based on the following factors:

1. The physical characteristics of the Santa Cruz River within the Study Reaches indicate that they have the capacity and susceptibility to be navigated by recreational watercraft.

- A. Study Reach A is approximately 22 miles in length. The river near Tubac is typically more confined in ordinary flows to a channel approximately 15-20 feet wide with an approximate 1.5 mile wide, densely vegetated floodplain. Downstream of Amado, the floodplain increases in width to approximately 2.5 miles; the river channel is less confined, less vegetated, and more braided. Exhibit C shows monthly and daily flows for the Tubac, Amado, and Continental gage stations, as well as peak flows for the Amado and Continental gage stations (Tubac information unavailable). The monthly gage data indicate perennial flow at Tubac since

² History of Navigation of the Santa Cruz River by Don Bufkin, citation unknown.

³ Admiral of the Santa Cruz by Glenton G. Sykes, *The Journal of Arizona History*, Vol. 20, Number 4, Winter, 1979.

1996, flow most months at the Amado gage station since 2003 (prior years unavailable), and intermittent flows at the Continental gage station.⁴ Average daily flows are typically lower in May and June but increase during the summer monsoon season which typically begins in July. Average daily flow rates again typically increase during December and January. The gage data indicate the highest daily mean value at the Tubac gage station over the last 11-12 years was 637 cubic feet per second (cfs) during October and the lowest daily mean value at the same station during the same period was 4.5 cfs during June. The highest daily mean values typically occur from July-October.⁵ The range of mean monthly flows (6.9 to 78 cfs) and the average daily flow in a representative year of 35 cfs indicate perennial flow at the Tubac gage station. The mean monthly discharge information at the Amado gage station is only available since October, 2003; the mean monthly discharge at this station in the last four years varied from .97 cfs to 67 cfs while the daily mean flow chart at the Amado gage station indicates perennial flow. The mean monthly discharge at the Continental gage station since 1940 varies from .43 cfs to 76 cfs while the mean daily values since 1939 shows flow daily with the exception of mid to late May through mid-June. This is expected since the river begins subsurface flow at this point, which defines the downstream end of this Study Reach.

B. Study Reach B is approximately 32 miles in length. The width of the riverbed varies from approximately 280 feet at the Roger Road WWTP to approximately 670 feet at Cortaro and approximately 575 feet at Trico Road while the active (ordinary flow) river channel at all three locations varies from 40-60 feet; at one location within this Study Reach, the river diverges into two similarly-sized channels. The river in Study Reach B is often confined at its maximum width by steep banks with soil cement or other bank stabilization in several locations. In other locations, for example at Ina Road, the river has lower, easily accessible, vegetated banks. Some areas are more densely vegetated than others. Exhibit C shows monthly, daily, and peak flows for gage stations at Cortaro and Trico Road (just upstream of the Pima/Pinal County line). Average daily flows are typically lower in May and June but increase during the summer monsoon season which typically begins in July. Average daily flows again typically increase during December and January. The highest average daily mean value at the Cortaro gage station over the last 57-60 years was 703 cfs, also in October, and the lowest average daily mean value at the same station over the same period was 22 cfs during June. The average monthly discharge ranges from 23 to 124 cfs and the average daily flow in a representative year of 75 cfs indicate perennial flow at the Cortaro gage station. At the Trico Road gage station, since 1997, the average monthly discharge ranged from 3.5 cfs to 710 cfs and daily mean values since 1989 ranged from 11 cfs to 863 cfs. The gage data document perennial flow at the Cortaro and Trico Road gages every month since 1996 with the exception of October, 1996.⁶

C. The peak flow charts demonstrate the frequency of flows which exceed 1,000 cfs.⁷ Peak flow data is unavailable at the Tubac gage station; however, the maximum peak flow at the Amado gage station since 2004 was approximately 7,800 cfs and peak flow has approached or exceeded 2,000 cfs annually. The maximum peak flow at the Continental gage station was approximately 45,000 cfs in the early 1980s and the minimum peak flow has exceeded 1,000 cfs 63 times since 1940. The maximum peak flow at the Cortaro gage station exceeded 60,000 cfs in the early 1980s and has exceeded 1,000 cfs on an annual basis from 1940-1988 with the exception of once in the 1940s and once in the 1950s; the peak flow at the Cortaro gage station

⁴ <http://nwis.waterdata.usgs.gov/az/nwis/monthly>

⁵ <http://nwis.waterdata.usgs.gov/az/nwis/dvstat>

⁶ Ibid

⁷ <http://nwis.waterdata.usgs.gov/az/nwis/peak>

has also exceeded 1,000 cfs on an annual basis since approximately 1995. The maximum peak flow at the Trico gage station exceeded 25,000 cfs in 2007 and the minimum peak flow has been at or exceeded 1,000 cfs most years since 1989. The figures at the end of Exhibit C indicate the "real time" stages for late March-early April, 2008, at the Tubac, Cortaro, and Trico Road gage stations indicating flows in the river on a daily basis.⁸ All three stations indicated flows with depths varying from 1-2 feet and no precipitation had occurred for approximately 6 weeks.⁹ Additional real-time stage data obtained for late May is also provided for Tubac, Green Valley (near Continental), Cortaro, and Trico Road and indicates 1-2 feet of water currently in the channel at all the above locations. Extremely light precipitation occurred one day during this timeframe; however, the amount of precipitation received would not have been sufficient to cause surface flows¹⁰. A list of the large magnitude peak flow events of the Santa Cruz River over the last 100 years is provided at Exhibit D.¹¹

D. While there is a variation in minimum flow required for canoeing, studies indicate the 95% confidence interval on the predicted minimum canoeing flow of 86 cfs for flatwater is 63 to 118 cfs.¹² Approximately two-three feet of water depth is sufficient to float a canoe, kayak, or small boat. Based on the above information, during most days from July-October and again for approximately half the months of December and January, there is sufficient flow in the Santa Cruz River within the Study Reaches to float a canoe (based on the average daily mean value). Typically a kayak would be able to navigate in lower flows and less water than canoes.

E. Based on aerial photographs attached at Exhibit E, the Santa Cruz River from Tubac gage station to just upstream of Continental gage station and Roger Road WWTP to the Pima/Pinal County line has uninterrupted flow.

F. The Arizona Department of Environmental Quality has adopted water quality standards for the Santa Cruz River for partial body contact.¹³ Partial body contact allows for use of the surface water where the body comes into contact with the water but does not become fully submerged. Allowable uses under partial body contact would include but are not limited to boating and wading.

2. The Study Reaches within the Santa Cruz River have public accessibility.

A. The river has low banks in the vicinity of Tubac which allows for easy public access; these areas are currently frequented by riders on horseback. Resorts along the river provide access for out-of-state visitors for birding and hiking along the river.

B. Two Corps of Engineers feasibility studies for river restoration, El Rio Medio and Tres Rios del Norte, are in process. El Rio Medio will begin at Congress Street and progress downstream to Prince Road; Tres Rios del Norte will begin at Prince Road and progress

⁸ National Weather Service Advanced Hydrologic Prediction Service: <http://www/nws.noaa.gov/oh/ahps/>

⁹ Personal observation, Marjorie Blaine, Senior Project Manager, Regulatory Division, Tucson Project Office

¹⁰ Ibid

¹¹ <http://www.wrh.noaa.gov/twc/hydro/floodhis.php>

¹² Riparian Areas of the Southwestern United States: Hydrology, Ecology, and Management by Malchus B. Baker and Peter F. Ffolliott, CRC Press, 2004

¹³ Personal communication with Steve Pawlowski, Arizona Department of Environmental Quality, Unit Manager, Water Quality Standards and Assessments, April 24, 2008.

downstream to Sanders Road in Marana. These projects will provide public trails along the river. Although the final design for these two projects has not been completed, it is likely river access will be provided. The two projects are shown in Exhibit F.

C. There is currently public access to the river at several bridges, including but not limited to the Ina Road bridge where there are pull-out areas, the Cortaro Road bridge (including a parking lot), and at the Sanders Road bridge in Marana. All of these bridges have easy access to Interstate 10.

D. The historic 1200-mile Juan Bautista de Anza National Historic Trail runs from Nogales, Arizona to San Francisco, California. This trail parallels and overlaps the Santa Cruz River in the Study Reaches. The river can be accessed at several points along this trail in the Study Reaches by auto or also on foot (Exhibit F).

3. The Study Reaches of the Santa Cruz River have been used for interstate commerce and have the potential to be used for commercial activities involving navigation and interstate commerce in the future.

A. Navigation has occurred historically and recent times within the Study Reaches of the Santa Cruz River.

(1) On August 23, 2005, as part of a promotion, a local radio show host navigated the Santa Cruz River in a raft for an unspecified distance starting at El Camino del Cerro (within Study Reach B) (Exhibit G).

(2) In October, 1994, two members of the Friends of the Santa Cruz navigated a 17-foot-long canoe from a point south of Tubac three miles to a point north of Tubac (Exhibit G).

B. The Santa Cruz River is an international and interstate water. Several areas along the river provide access for birding by out-of-state visitors and resorts bordering the river, such as the Tubac Golf Resort, host out-of-state visitors who partake in local recreation including hiking, horseback riding, and birding along the river. The Tucson Audubon Society's North Simpson Farm is an area where prolific riparian habitat restoration projects have been focused and it is well-known for its opportunities for birding. This type of "ecotourism" provides a significant water resource-oriented opportunity in the desert. The Study Reaches and other areas within the region receive many interstate and foreign tourists seeking to expand their "bird list"; the Sonoran Desert, particularly in riparian areas such as the Santa Cruz River, provides a significant opportunity to see species endemic to this area.

C. Use of the river within the Study Reaches by recreational watercraft provides evidence of the susceptibility for commercial use.

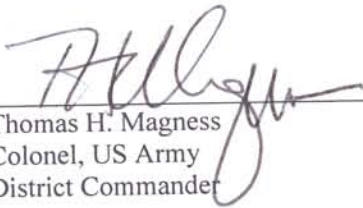
Determination

Public access points within of the Study Reaches such as low river banks, bridges, and trail systems, together with their physical characteristics, such as frequency, duration, and permanency of flow, indicate that the Study Reaches have the potential to be used for commercial recreational navigation activities, such as canoeing, kayaking, birding, nature and wildlife viewing. Such attractions and activities demonstrate that the Study Reaches may be susceptible to use in interstate commerce. Collectively, the above discussed factors demonstrate that the Study

Reaches are navigable-in-fact, and thus a TNW, susceptible to use in interstate commerce associated with recreational navigation activities. Therefore, I hereby determine that the Study Reaches are subject to the jurisdiction of Section 404 of the CWA, pursuant to 33 C.F.R. § 328.3(a)(1).

This determination does not 1) consider any other potentially applicable bases for determining CWA jurisdiction within the Study Reaches or 2) foreclose analysis of other areas of the Santa Cruz River outside the Study Reaches for purposes of determining CWA jurisdiction.

5/23/08
Date



Thomas H. Magness
Colonel, US Army
District Commander

EXHIBIT A

Study Reaches A and B

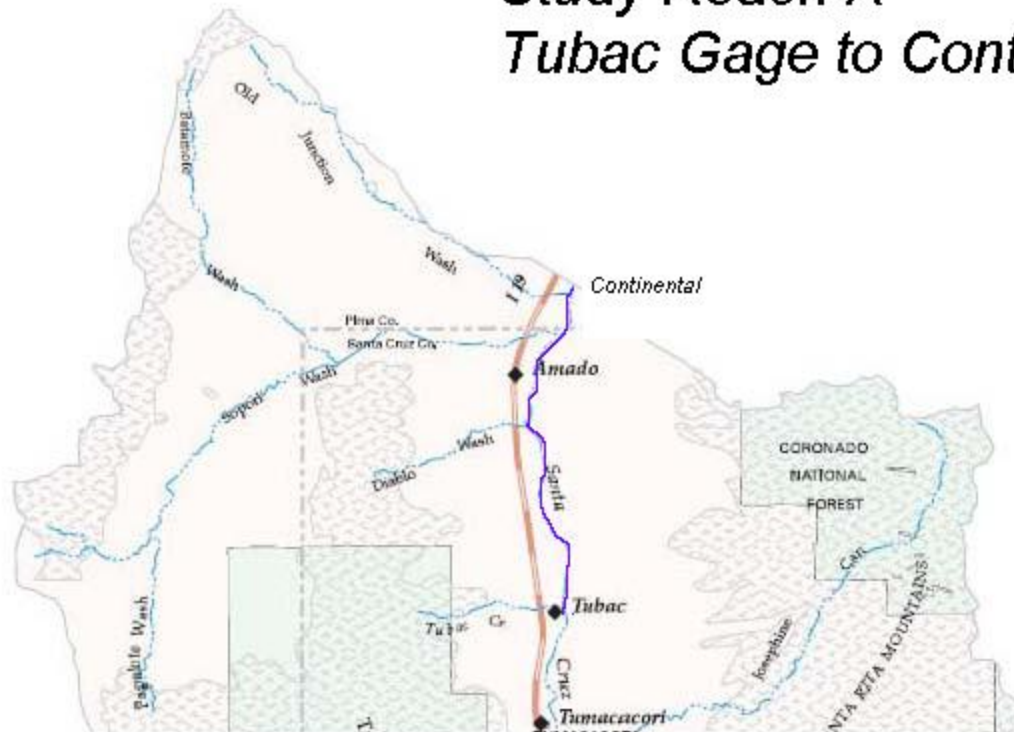
**Maps Source: Arizona Department of Water Resources
Santa Cruz Active Management Area, Third Management Plan
Tucson Active Management Area, Third Management Plan**

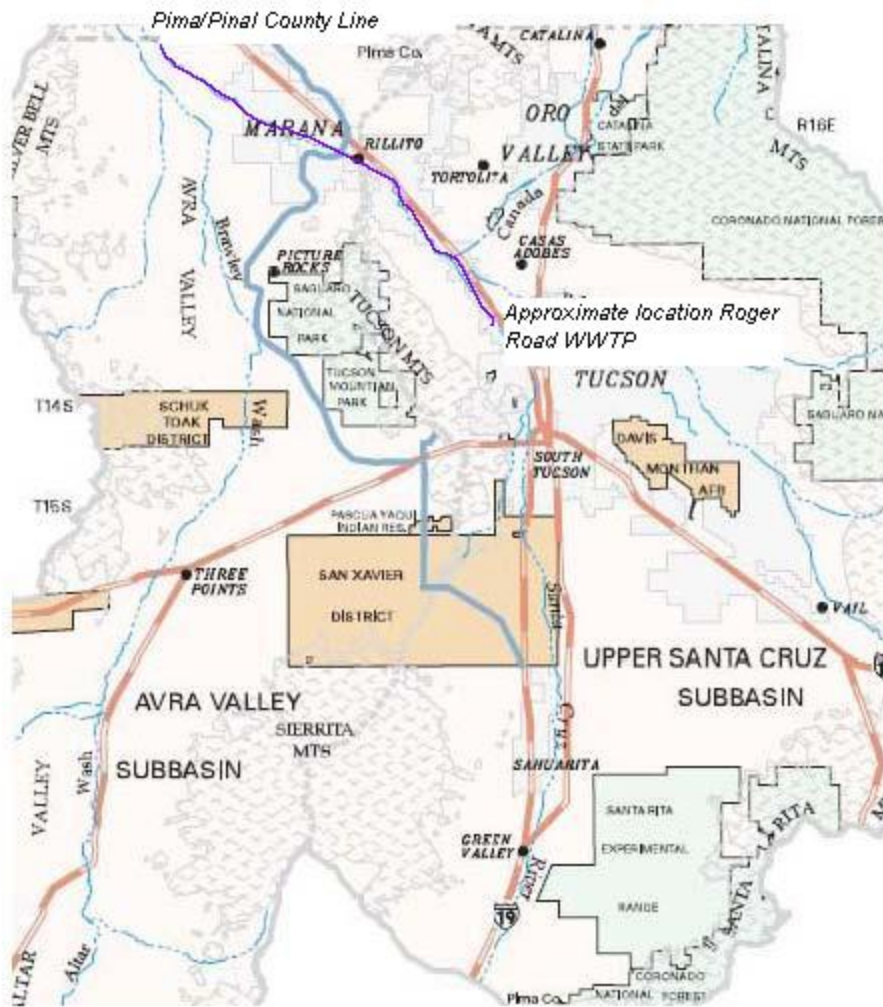
Purple denotes TNW segments

**Study Reach A: Tubac Gage Station downstream to
Continental Gage Station**

**Study Reach B: Roger Road WWTP downstream to
Pima/Pinal County line**

Santa Cruz River Study Reach A Tubac Gage to Continental Gage





***Santa Cruz River -- Study Reach B
Roger Road WWTP to Pima/Pinal
County Line***

EXHIBIT B
HISTORICAL PHOTO



Santa Cruz River in 1904

EXHIBIT C FLOW DATA

Monthly, Daily, and Peak flow data retrieved April 1, 2008 from:

<http://nwis.waterdata.usgs.gov/az/nwis/monthly>

<http://nwis.waterdata.usgs.gov/az/nwis/dvstat>

<http://nwis.waterdata.usgs.gov/az/nwis/peak>

Hydrographs retrieved March 28, 2008 and May 23, 2008 from:

<http://www.nws.noaa.gov/oh/ahps/>



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USGS 09481740 SANTA CRUZ RIVER AT TUBAC, AZ.

Available data for this site

Santa Cruz County, Arizona
 Hydrologic Unit Code 15050301
 Latitude 31°36'46", Longitude 111°02'27" NAD27
 Gage datum 3,180 feet above sea level NGVD29

Output formats

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00060, Discharge, cubic feet per second,

YEAR	Monthly mean in cfs (Calculation Period: 1995-10-01 -> 2007-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995										11.6	25.5	24.3
1996	24.2	25.3	22.6	12.5	4.72	3.62	17.1	22.1	15.1	8.99	14.7	17.1
1997	24.3	27.9	16.9	8.73	3.17	0.947	2.24	32.8	30.5	15.1	8.57	23.8
1998	28.3	67.7	45.4	46.3	20.7	12.6	62.8	46.7	27.1	18.0	19.1	21.3
1999	23.8	23.5	19.7	14.2	7.55	3.78	48.2	58.9	69.1	28.0	28.0	18.9
2000	23.6	25.0	24.8	20.1	10.0	22.4	23.4	29.0	19.2	798.4	277.9	91.1
2001	77.5	51.6	42.6	68.7	29.2	6.55	17.5	32.6	13.3	18.3	17.6	

2002	25.9	27.6	22.9	15.4	3.15			39.3	14.3	2.89	14.6	16.1
2003	14.6	19.0	16.0	9.73	3.23	0.117	31.0	60.9	13.3	9.40	18.6	18.1
2004	23.2	19.9	14.6	25.5	6.82	7.68	37.2	30.0	9.93	9.61	13.0	17.7
2005	14.7	14.3	14.6	11.4	8.55	8.36	102.8	211.5	3.62	5.50	10.8	12.5
2006	11.8	11.0	12.1	8.19	5.33	3.26	124.1	35.2	52.8	9.55	14.4	16.7
2007	14.8	16.9	15.5	11.6	8.07	6.26	110.9	116.1	23.8			
Mean of monthly Discharge	26	27	22	21	9.2	6.9	52	60	24	78	39	25

** No Incomplete data have been used for statistical calculation

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USGS 09481770 SANTA CRUZ NR AMADO, AZ

Available data for this site

Pima County, Arizona
 Hydrologic Unit Code 15050301
 Latitude 31°44'41", Longitude 111°02'11" NAD83
 Gage datum 3,040 feet above sea level NAVD88

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00060, Discharge, cubic feet per second,

YEAR	Monthly mean in cfs (Calculation Period: 2003-10-01 -> 2007-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003										0.000	0.078	2.64
2004	5.25	7.97	6.64	4.21	0.532	0.000	16.2	19.1	8.77	3.87	6.58	13.1
2005	19.2	17.5	12.0	4.42	4.73	3.90	32.0	112.0	0.000	0.000	0.000	0.000
2006	0.000	0.000	0.000	0.071	0.001	0.024	70.6	46.4	31.7	0.000	0.028	1.74
2007	4.37	8.39	8.75	7.54	1.31	0.098	96.4	89.9	16.0			
Mean of monthly Discharge	7.2	8.5	6.8	4.1	1.6	1.0	54	67	14	0.97	1.7	4.4

** No Incomplete data have been used for statistical calculation

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USGS 09482000 SANTA CRUZ RIVER AT CONTINENTAL, AZ

Available data for this site

Pima County, Arizona
 Hydrologic Unit Code 15050301
 Latitude 31°52'17", Longitude 110°58'46" NAD27
 Drainage area 1,682.00 square miles
 Gage datum 2,819.82 feet above sea level NGVD29

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00060, Discharge, cubic feet per second,

YEAR	Monthly mean in cfs (Calculation Period: 1940-05-01 -> 2007-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1940					0.000	3.43	9.84	164.0	29.3	0.003	0.000	0.452
1941	2.67	0.393	0.000	0.000	0.000	0.000	16.0	11.0	2.17	0.065	0.000	0.000
1942	0.000	0.000	0.000	0.000	0.000	0.000	18.6	29.8	9.73	0.000	0.000	0.000
1943	0.000	0.000	0.000	0.000	0.000	4.17	31.0	126.1	3.93	0.000	0.000	0.000
1944	0.000	0.000	0.000	0.000	0.000	0.000	0.129	62.4	3.87	8.13	0.067	0.000
1945	0.000	0.000	0.000	0.000	0.000	0.000	67.8	179.5	15.3	14.0	0.000	0.000
1946	0.000	0.000	0.000	0.000	0.000	0.000	79.0	70.4	39.8			

1951										7.32	0.000	0.000	
1952	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9.02	26.7	10.4	0.000	0.000	0.000
1953	0.010	0.018	0.000	0.000	0.000	0.000	0.000	112.7	0.697	0.000	0.000	0.000	0.000
1954	0.000	0.000	7.20	0.000	0.000	0.000	2.43	226.6	341.6	37.7	0.129	0.000	0.000
1955	0.000	0.000	0.000	0.000	0.000	0.000	0.000	47.4	753.0	0.017	0.023	0.000	0.000
1956	0.000	0.000	0.000	0.000	0.000	0.000	0.000	16.4	0.000	0.000	0.000	0.000	0.000
1957	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.66	15.2	0.000	0.023	0.000	0.000
1958	0.000	0.000	0.000	0.000	0.000	0.000	0.000	48.0	164.0	20.1	0.000	0.000	0.000
1959	0.000	0.000	0.000	0.000	0.000	0.000	1.93	10.1	78.5	0.013	0.000	0.000	2.34
1960	190.7	0.000	0.000	0.000	0.000	0.000	0.000	6.87	22.9	10.4	19.5	0.000	0.000
1961	0.000	0.000	0.000	0.000	0.000	0.000	0.000	15.6	53.6	23.5	0.000	0.000	42.8
1962	52.4	0.000	0.000	0.000	0.000	0.000	0.000	0.810	0.616	4.84	0.000	0.000	0.000
1963	0.000	0.000	0.000	0.000	0.000	0.000	0.000	71.4	122.4	29.9	0.000	4.37	0.000
1964	0.000	0.000	0.003	0.003	0.000	0.000	0.000	17.0	188.3	284.9	0.000	0.000	0.000
1965	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.203	0.639	2.30	0.000	0.000	421.5
1966	18.2	206.5	0.000	0.000	0.000	0.000	0.000	43.5	362.7	14.9	1.00	0.000	0.000
1967	0.000	0.000	0.000	0.000	0.000	0.000	0.450	44.3	6.47	4.70	0.874	0.000	658.1
1968	0.732	2.61	18.0	0.000	0.000	0.000	0.000	3.22	0.645	0.000	0.000	0.000	0.000
1969	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.87	36.4	4.95	0.174	0.000	0.100
1970	0.042	0.304	0.000	0.000	0.000	0.000	0.000	10.0	22.5	27.8	0.126	0.000	0.000
1971	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.76	175.6	21.7	2.27	0.000	0.010
1972	0.000	0.000	0.000	0.000	0.000	0.000	0.040	24.5	3.03	1.99	5.74	0.000	0.000
1973	0.000	56.7	123.8	0.000	0.000	0.000	0.000	0.642	0.000	0.000	0.000	0.000	0.000
1974	0.000	0.000	0.000	0.000	0.000	0.000	0.000	26.9	34.2	12.7	0.000	0.000	0.000
1975	0.000	0.000	0.000	0.000	0.000	0.000	0.000	42.7	8.32	30.6	0.000	0.000	0.000
1976	0.806	0.000	0.000	0.123	0.000	0.037	166.7	5.45	9.02	0.448	0.000	0.000	0.039
1977	0.006	0.000	0.000	0.000	0.000	0.000	0.000	21.5	39.0	42.8	755.2	0.000	0.000
1978	6.23	70.9	131.7	0.000	0.000	6.18	27.4	77.6	0.030	21.3	133.1	529.4	
1979	565.2	55.5	14.4	0.000	0.000	0.000	0.000	20.7	37.1	0.000	0.000	0.000	0.000
1980	0.000	0.655	0.000	0.000	0.000	0.000	0.000	11.1	28.9	1.01	0.000	0.000	0.000
1981	0.000	0.000	1.73	0.000	0.000	0.027	52.9	20.8	26.8	4.49	0.009	0.000	
1982	0.000	0.000	0.000	0.000	0.045	0.000	2.80	19.8	11.2	0.000	0.160	14.9	
1983	0.913	137.9	181.0	0.683	0.000	0.000	3.97	5.74	63.9	1,525	4.20	4.84	
1984	27.6	1.00	0.002	0.028	0.013	0.000	96.6	668.2	107.7				
1991											5.32	0.000	0.000
1992	0.000	0.000	37.1	31.5	1.32	0.000	1.13	74.7	0.073	0.000	0.000	0.000	2.78

1993	1,386	52.4	0.168	0.000	0.000	0.000	0.000	7.02	0.000	0.000	0.000	0.000
1994	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.94	6.83	0.000	5.00	77.0
1995	37.1	11.2	0.000	0.000	0.000	0.000	0.014	0.781	0.153	0.000	0.000	0.000
1996	0.000	0.000	0.000	0.000	0.000	0.000	5.52	1.55	13.8	0.710	0.000	0.000
1997	0.000	0.000	0.000	0.000	0.000	0.000	0.189	6.02	3.00	2.27	0.000	2.47
1998	0.000	18.8	1.88	3.13	0.000	0.000	20.3	3.49	7.48	0.094	0.000	0.000
1999	0.000	0.000	0.000	0.000	0.000	0.000	17.0	17.3	10.7	0.000	0.000	0.000
2000	0.000	0.013	0.903	0.000	0.000	5.27	3.66	16.8	0.000	266.8	129.2	0.000
2001	0.000	0.000	0.000	0.840	0.000	0.020	1.36	0.174	0.050	0.000	0.000	0.000
2002	0.000	0.000	0.000	0.000	0.000	0.000	0.427	2.14	3.81	0.000	0.000	0.000
2003	0.000	0.000	0.000	0.000	0.000	0.000	16.8	5.78	0.119	0.000	0.003	0.000
2004	0.000	0.000	0.000	0.016	0.000	0.000	7.89	8.46	1.67	0.000	0.000	0.000
2005	0.115	1.40	3.22	0.903	0.153	0.000	14.0	100.8	0.000	0.000	0.000	0.000
2006	0.000	0.000	0.000	0.000	0.000	0.000	39.0	24.3	27.5	0.000	0.000	0.000
2007	0.000	0.000	0.000	0.000	0.000	0.000	49.8	38.0	4.47			
Mean of monthly Discharge	42	11	9.5	0.68	0.03	0.43	29	76	18	48	5.0	32

** No Incomplete data have been used for statistical calculation

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Title: Surface Water data for Arizona: USGS Monthly Statistics

URL: <http://waterdata.usgs.gov/az/nwis/monthly?>



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4.78 4.51 nadww01



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USGS 09481740 SANTA CRUZ RIVER AT TUBAC, AZ.

Available data for this site

Santa Cruz County, Arizona
 Hydrologic Unit Code 15050301
 Latitude 31°36'46", Longitude 111°02'27" NAD27
 Gage datum 3,180 feet above sea level NGVD29

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00060, Discharge, cubic feet per second,

Day of month	Mean of daily mean values for each day for 11 - 12 years of record in, cfs (Calculation Period 1995-10-01 -> 2007-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	35	25	26	26	13	5.5	5.7	136	60	13	40	28
2	22	25	24	27	13	5.1	16	171	16	28	37	27
3	23	24	23	54	13	5.3	20	113	15	11	27	27
4	25	37	23	21	12	5.3	23	37	13	11	42	26
5	24	28	24	19	12	5.2	21	24	20	11	106	27
6	26	23	23	40	11	5.2	25	45	52	12	60	28
7	28	23	31	50	11	5.0	29	41	37	13	123	28

8	24	23	27	28	11	4.8	48	28	39	12	70	24
9	24	23	23	22	10	4.5	8.7	35	33	26	47	24
10	24	24	23	19	10	4.7	7.7	46	25	15	31	24
11	24	24	23	19	9.7	4.8	7.0	21	32	28	47	24
12	25	27	24	18	9.6	4.8	7.6	40	38	167	60	23
13	27	25	22	18	9.3	4.9	6.6	50	34	52	43	23
14	26	24	21	18	9.0	4.7	11	211	33	11	32	23
15	25	25	23	18	8.5	4.7	15	129	18	9.8	26	23
16	25	26	21	17	8.4	4.7	18	35	24	10	24	25
17	26	25	21	17	9.0	4.6	10	26	34	9.9	23	25
18	26	34	22	17	8.7	10	26	34	13	11	22	24
19	26	35	21	17	8.5	12	42	58	20	11	22	24
20	25	28	23	17	7.9	5.2	44	23	35	125	23	25
21	27	40	20	16	7.8	7.0	31	15	15	73	22	24
22	26	38	20	16	7.6	7.7	117	21	14	245	22	32
23	24	29	20	16	7.6	9.6	91	121	14	637	24	27
24	24	27	19	16	7.2	8.4	42	52	17	156	23	25
25	24	27	19	15	6.6	7.8	136	31	14	86	24	27
26	24	29	20	15	6.8	4.8	57	31	14	65	24	25
27	27	26	19	15	6.6	4.9	77	50	13	60	27	25
28	29	27	18	14	6.4	4.9	112	50	15	144	28	26
29	26	24	18	14	12	8.6	172	75	13	140	30	25
30	26		22	14	6.1	15	70	77	11	112	29	24
31	25		28		5.5		227	19		110		24

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USGS 09481770 SANTA CRUZ NR AMADO, AZ

Available data for this site

Pima County, Arizona
 Hydrologic Unit Code 15050301
 Latitude 31°44'41", Longitude 111°02'11" NAD83
 Gage datum 3,040 feet above sea level NAVD88

Output formats

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00060, Discharge, cubic feet per second,

Day of month	Mean of daily mean values for each day for 4 - 4 years of record in, cfs (Calculation Period 2003-10-01 -> 2007-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	6.4	6.6	8.5	4.6	3.0	1.1	0.97	151	1.8	1.2	1.4	4.0
2	4.7	6.6	8.9	5.9	3.0	0.99	1.1	492	1.8	1.3	1.6	3.6
3	6.0	6.9	9.3	15	2.6	0.56	0.95	135	2.6	1.1	1.4	2.4
4	9.8	6.9	9.7	5.8	2.7	0.94	5.2	47	3.9	0.85	1.2	2.5
5	11	7.4	9.0	5.2	2.2	1.0	2.4	21	13	0.80	1.2	4.4
6	6.9	7.8	9.3	4.2	2.1	0.93	1.3	35	48	0.90	1.3	6.4
7	6.5	7.9	9.8	3.6	2.3	0.96	0.79	25	53	0.97	1.2	7.9

8	6.9	8.4	8.1	3.2	2.3	0.93	1.5	104	47	0.95	1.2	3.8
9	6.4	8.4	7.6	3.2	2.1	0.82	4.3	159	17	0.85	1.3	3.3
10	6.5	9.2	7.5	3.3	2.0	0.83	5.3	13	17	0.70	1.2	3.1
11	6.9	9.3	7.1	3.4	1.9	0.88	0.71	16	3.6	0.60	1.1	3.1
12	7.3	14	6.8	3.3	1.9	0.93	0.70	31	3.5	0.65	1.2	3.1
13	7.4	13	7.2	3.4	1.9	0.81	0.88	64	64	0.65	1.2	2.7
14	6.8	8.0	7.6	3.5	1.5	0.97	0.99	117	5.9	0.75	1.3	2.8
15	6.6	8.1	7.2	3.1	1.4	0.85	11	95	2.6	0.72	1.2	2.8
16	6.9	8.1	6.7	2.7	1.2	0.80	38	34	34	0.75	1.4	3.1
17	6.6	8.3	6.6	2.9	1.2	0.75	2.3	12	68	0.72	1.6	3.6
18	6.4	8.4	6.6	2.8	1.2	0.90	1.0	1.7	24	0.78	1.8	3.8
19	7.3	8.1	6.3	2.9	1.2	0.90	175	3.9	0.28	0.90	1.9	3.9
20	8.1	9.3	6.7	3.3	0.95	0.80	77	5.9	0.60	1.0	2.0	4.1
21	7.9	8.7	6.1	3.6	1.1	0.95	19	1.3	1.5	1.0	1.8	4.5
22	13	9.3	6.2	3.3	0.80	0.95	16	5.2	0.80	1.2	1.6	4.9
23	7.4	8.4	6.0	3.5	0.60	0.90	22	356	0.90	1.1	1.9	5.4
24	6.3	8.6	5.7	3.8	0.70	1.7	50	24	1.1	1.1	2.0	5.5
25	6.5	8.2	5.1	4.7	0.80	2.2	272	70	1.0	0.95	2.3	5.7
26	6.2	7.8	4.8	4.0	0.90	1.5	48	31	1.0	1.1	2.5	4.8
27	8.6	7.8	4.3	3.6	1.0	1.3	69	5.5	1.1	1.1	2.4	5.3
28	6.7	8.0	4.2	3.4	1.3	1.1	131	3.1	1.2	1.2	2.2	5.7
29	6.4	7.1	4.3	3.4	2.1	1.0	350	9.2	1.4	1.3	2.1	6.4
30	6.2		4.7	3.2	1.8	0.95	117	3.0	2.9	1.4	3.7	7.4
31	6.0		4.7		1.2		243	2.0		1.3		5.6

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Title: Surface Water data for Arizona: USGS Surface-Water Daily Statistics
URL: <http://waterdata.usgs.gov/az/nwis/dvstat?>



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USGS 09482000 SANTA CRUZ RIVER AT CONTINENTAL, AZ

Available data for this site

Pima County, Arizona
 Hydrologic Unit Code 15050301
 Latitude 31°52'17", Longitude 110°58'46" NAD27
 Drainage area 1,682.00 square miles
 Gage datum 2,819.82 feet above sea level NGVD29

Output formats

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00060, Discharge, cubic feet per second,

Day of month	Mean of daily mean values for each day for 55 - 56 years of record in, cfs (Calculation Period 1939-10-01 -> 2007-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	26	2.6	6.3	1.3	0.01	0.00	4.2	104	25	124	1.3	0.21
2	13	2.1	20	1.1	0.01	0.02	2.6	81	38	326	0.23	0.05
3	4.4	2.0	14	5.6	0.01	0.00	2.1	52	20	136	0.07	0.24
4	2.4	44	51	4.5	0.01	0.00	6.1	57	22	71	0.07	0.09
5	2.4	21	38	3.3	0.03	0.00	5.1	140	23	58	2.8	0.29
6	11	16	13	2.6	0.01	0.00	6.1	67	12	54	4.3	22
7	15	9.0	9.6	1.2	0.01	0.00	6.3	103	7.6	44	21	15

8	41	27	6.9	0.22	0.01	0.00	9.0	44	10	100	13	1.1
9	49	27	4.8	0.05	0.01	0.00	3.7	63	22	267	6.3	0.33
10	28	18	4.1	0.04	0.00	0.00	5.1	78	131	95	4.5	7.1
11	90	16	8.4	0.04	0.00	0.00	13	85	34	14	4.3	15
12	88	20	0.71	0.04	0.00	0.00	20	42	41	15	5.4	1.7
13	37	15	7.7	0.04	0.00	0.00	18	129	20	11	6.1	0.23
14	31	11	33	0.03	0.01	0.00	19	199	9.6	1.9	2.5	0.04
15	21	15	26	0.02	0.00	0.00	21	99	3.2	1.4	1.6	21
16	16	12	10	0.02	0.00	0.00	41	84	6.3	0.91	0.87	34
17	15	6.4	5.8	0.01	0.00	0.00	20	62	2.6	0.79	0.42	43
18	229	3.7	2.5	0.01	0.00	0.00	28	62	2.6	0.91	0.17	100
19	298	3.7	1.0	0.02	0.00	0.00	22	120	3.2	4.0	0.05	247
20	21	2.2	0.87	0.01	0.18	0.46	53	104	3.2	2.7	0.05	200
21	11	4.1	4.5	0.01	0.55	0.45	32	129	2.8	19	2.8	34
22	8.7	24	2.1	0.01	0.00	0.47	49	40	9.1	7.0	0.24	52
23	5.0	9.4	1.1	0.01	0.00	2.0	87	101	4.3	65	0.09	103
24	4.3	1.3	4.0	0.01	0.00	0.23	29	81	17	21	9.2	36
25	102	0.52	0.89	0.01	0.00	0.49	43	42	6.4	10	55	11
26	63	0.23	0.30	0.01	0.00	1.3	16	54	18	5.9	8.1	3.7
27	34	0.09	0.28	0.01	0.00	0.00	55	43	2.8	3.8	1.0	3.0
28	11	0.07	2.0	0.01	0.00	3.2	70	48	0.96	7.8	0.05	2.6
29	4.7	0.00	8.4	0.01	0.00	2.5	74	36	3.6	10	0.06	1.3
30	3.8		4.3	0.01	0.00	1.7	64	10	27	7.4	0.14	1.6
31	3.0		2.2		0.00		61	6.8		2.7		36

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Peak Streamflow for Arizona

USGS 09481770 SANTA CRUZ NR AMADO, AZ

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Pima County, Arizona
Hydrologic Unit Code 15050301
Latitude 31°44'41", Longitude 111°02'11" NAD83
Gage datum 3,040 feet above sea level NAVD88

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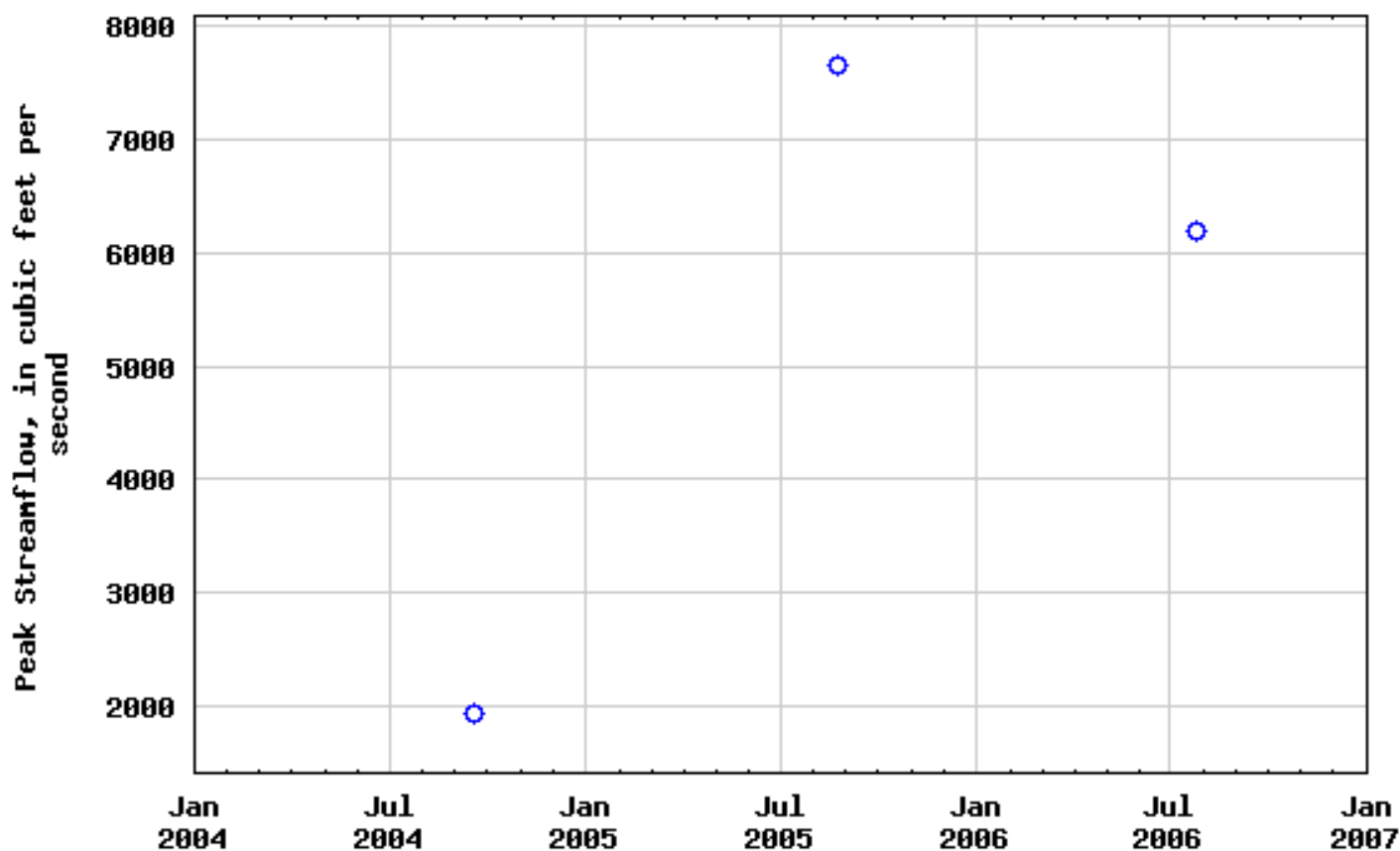
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Title: Surface Water for Arizona: Peak Streamflow

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Peak Streamflow for Arizona

USGS 09482000 SANTA CRUZ RIVER AT CONTINENTAL, AZ

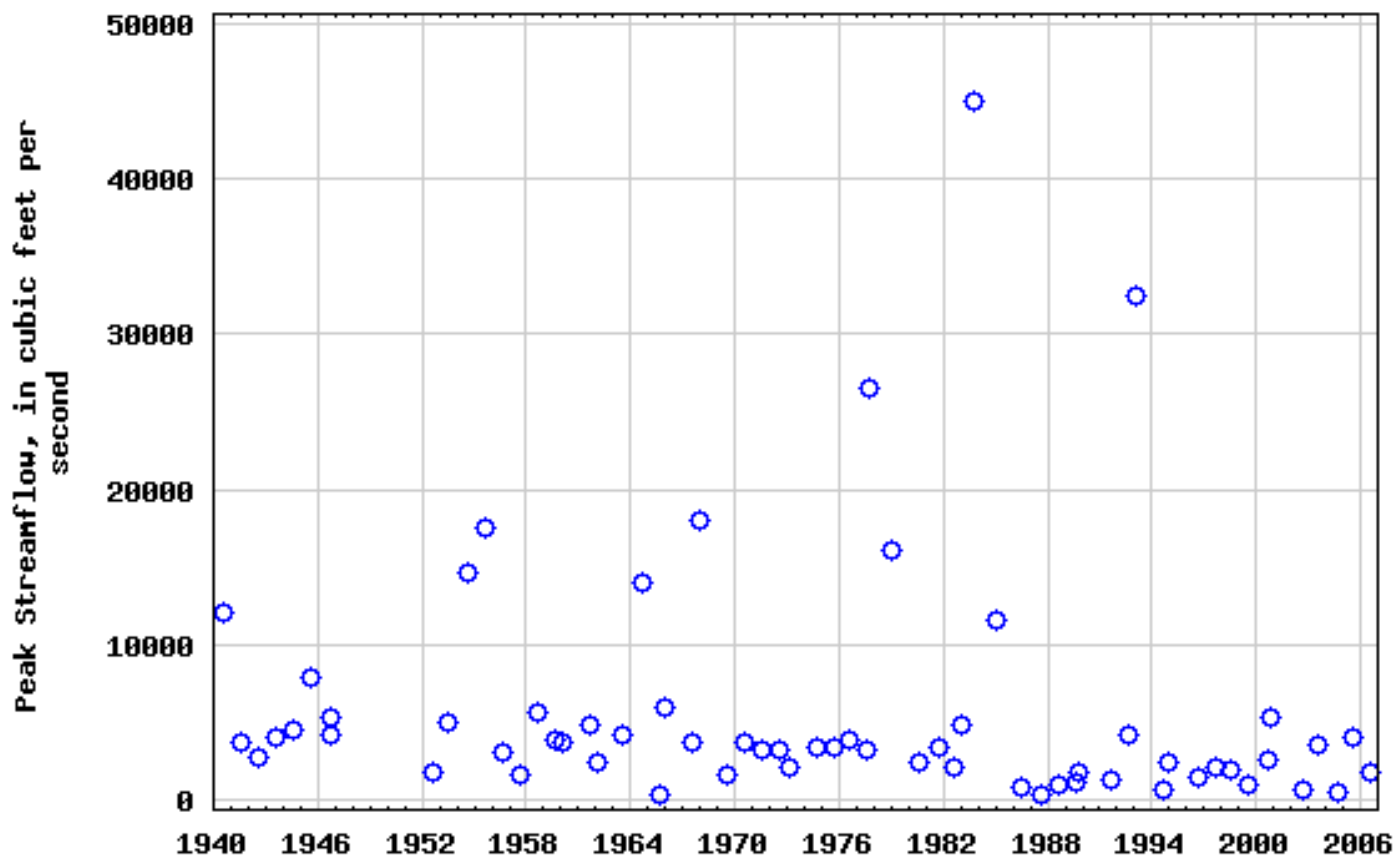
Available data for this site

Pima County, Arizona
 Hydrologic Unit Code 15050301
 Latitude 31°52'17", Longitude 110°58'46" NAD27
 Drainage area 1,682.00 square miles
 Gage datum 2,819.82 feet above sea level NGVD29

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Title: Surface Water for Arizona: Peak Streamflow

URL: <http://waterdata.usgs.gov/az/nwis/peak?>



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2.23 1.86 nadww01



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USGS 09486500 SANTA CRUZ RIVER AT CORTARO, AZ

Available data for this site

Pima County, Arizona
 Hydrologic Unit Code 15050302
 Latitude 32°21'04", Longitude 111°05'38" NAD27
 Drainage area 3,503.00 square miles
 Gage datum 2,100.00 feet above sea level NGVD29

Output formats

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00060, Discharge, cubic feet per second,

YEAR	Monthly mean in cfs (Calculation Period: 1939-10-01 -> 2007-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1939										0.000	0.767	0.032
1940	0.677	11.9	0.000	0.000	0.000	10.2	24.2	264.5	18.9	0.000	11.7	169.3
1941	37.6	40.0	43.2	0.000	0.226	0.000	9.74	55.5	36.1	0.097	0.033	4.45
1942	1.13	4.64	2.45	0.867	0.000	0.000	8.25	24.6	15.8	0.000	0.000	0.000
1943	0.000	0.000	6.71	0.000	0.032	1.77	26.1	165.1	89.0	0.023	0.063	0.000
1944	0.003	0.000	0.000	0.000	0.000	0.000	14.8	179.4	39.8	6.32	6.20	0.032
1945	0.000	0.000	0.194	0.000	0.000	0.000	97.6	279.8	2.43	7.48	0.000	0.000

1946	4.90	0.000	0.000	0.000	0.000	0.000	62.5	158.7	41.1	39.7	1.23	0.000
1947	0.000	0.000	0.000	0.000	0.000	0.000						
1950								31.0	7.27	0.000	0.000	0.000
1951	0.000	0.000	0.171	1.23	0.471	1.31	70.7	111.6	1.83	28.0	15.9	12.7
1952	26.7	0.000	26.7	5.10	0.000	0.030	17.6	72.4	18.8	0.000	8.85	0.000
1953	0.000	0.054	0.106	0.000	0.000	0.007	230.9	2.76	0.000	0.000	0.000	0.000
1954	0.000	0.000	101.6	0.000	0.000	28.8	393.3	273.7	72.1	3.91	0.000	0.000
1955	0.894	0.000	0.000	0.000	0.000	0.067	222.4	867.6	1.11	2.23	0.000	0.000
1956	1.77	0.000	0.000	0.000	0.000	0.000	23.4	3.14	0.000	0.000	0.000	0.000
1957	27.1	0.575	0.000	0.000	0.000	0.043	5.39	30.5	15.3	8.15	3.23	0.032
1958	0.000	5.92	62.4	0.130	0.000	0.000	109.0	132.9	13.4	2.13	0.140	0.000
1959	0.000	0.000	0.000	0.000	0.000	0.000	62.3	157.4	1.37	12.2	0.400	32.4
1960	245.2	0.162	0.000	0.000	0.000	0.000	1.69	72.3	6.33	24.1	0.000	1.65
1961	3.97	0.000	0.000	0.000	0.000	0.000	35.1	216.1	8.63	0.000	0.000	45.0
1962	45.7	0.000	0.000	0.000	0.000	0.833	2.17	1.97	115.3	0.161	0.000	0.174
1963	0.548	33.4	0.000	0.133	0.000	0.000	66.4	195.0	38.3	0.765	6.73	0.000
1964	0.000	0.000	0.000	0.433	0.000	2.60	108.2	164.8	358.3	0.845	0.167	6.06
1965	4.13	4.83	0.000	0.000	0.000	0.000	16.2	2.25	3.10	0.000	0.000	850.1
1966	0.594	191.5	0.000	0.000	0.000	0.000	35.8	210.9	87.4	1.44	0.053	0.000
1967	0.000	0.000	0.100	0.000	2.06	0.000	124.4	5.45	1.43	14.3	0.000	688.2
1968	0.000	83.0	38.4	0.000	0.000	0.000	1.94	43.3	0.000	0.000	2.77	0.000
1969	0.000	0.000	0.000	0.000	0.000	0.000	7.11	70.2	15.4	25.9	33.1	23.6
1970	6.82	6.45	8.28	7.30	5.11	31.9	116.1	39.0	135.2	16.9	13.1	31.2
1971	41.4	25.1	40.2	51.5	27.1	34.4	67.5	325.5	75.8	29.0	18.9	34.5
1972	27.2	25.8	20.2	13.6	21.3	28.3	72.9	62.4	31.2	236.0	12.9	9.83
1973	17.9	169.8	175.6	7.88	16.2	3.16	30.5	35.5	48.4	41.7	35.0	35.5
1974	41.2	40.2	41.8	40.3	48.0	44.4	181.9	84.7	76.5	53.0	61.1	56.9
1975	64.4	51.6	42.4	39.4	39.6	42.1	126.1	55.6	91.7	44.2	45.0	41.2
1976	38.8	40.1	35.5	45.2	45.1	42.8	152.2	70.2	130.7	42.4	39.7	33.2
1977	42.8	40.8	32.3	37.1	32.7	34.0	36.2	65.9	73.0	743.9	31.1	50.6
1978	114.2	114.4	496.3	20.0	18.5	15.8	34.9	117.7	16.3	34.0	168.2	1,044
1979	756.4	104.2	35.2	31.2	31.1	30.1	32.8	47.8	31.0	40.2	54.7	59.9
1980	64.1	137.9	26.4	19.4	11.9	17.3	45.7	87.4	71.9	38.7	38.4	51.3
1981	63.3	58.0	52.1	35.9	41.4	43.0	241.8	104.6	104.1	50.4	59.6	48.9
1982	70.0	65.1	56.4	52.5	42.7	39.2	91.3	248.6	237.4			
1984										32.4	67.4	

1990			59.5	56.9	54.0	52.7				47.0	42.2	60.1
1991	50.9	47.8	67.7	22.7	24.3	29.0	33.4	54.0	60.1	52.7	53.7	65.5
1992	66.3	103.3	108.8	60.4	35.1	38.6	58.9	131.7	60.3	65.8	70.2	82.7
1993	2,485	135.2	40.9	39.5	38.2	26.0	27.0	41.2	55.2	38.5	39.9	55.6
1994	51.7	68.0	61.9	43.0	53.2	61.4	61.5	47.1	75.1	56.6	79.3	195.4
1995	273.1	252.3	42.5	44.2	41.0	31.7	29.0	58.9	64.3	40.7	49.7	63.7
1996	68.8	67.8	57.0	50.1	50.2	43.3	40.7	67.0	216.2	55.7	57.6	81.5
1997	108.5	66.4	37.0	25.8	53.3	47.0	44.0	53.6	61.0	60.5	71.5	88.8
1998	73.3	251.6	75.9	104.0	48.4	51.6	109.1	57.2	59.3	61.6	66.2	67.5
1999	78.6	81.1	64.9	55.8	65.8	58.6	228.6	92.2	96.3	57.4	52.2	48.4
2000	47.8	49.2	50.0	48.4	50.6	84.9	66.3	102.6	73.3	523.0	227.8	47.8
2001	59.2	58.8	60.0	64.2	59.9	56.4	69.0	69.7	58.2	58.7	64.7	70.3
2002	74.5	69.6	72.8	65.0	63.9	63.6	79.4	99.9	143.9	64.1	73.3	78.0
2003	76.7	79.0	73.7	71.8	67.7	72.2	119.2	264.5	87.0	69.0	85.5	66.3
2004	82.6	79.9	95.3	81.6	71.3	64.5	89.4	104.5	114.2	67.7	73.4	87.9
2005	115.6	190.5	67.1	61.4	57.7	51.1	68.0	363.0	80.8	69.5	67.0	73.9
2006	74.8	68.7	67.5	65.0	56.3	55.8	725.0	211.8	114.1	57.9	56.8	64.9
2007	62.5	60.1	59.1	52.9	49.9	48.0	256.8	135.7	51.0			
Mean of monthly Discharge	98	52	43	25	23	24	91	124	63	52	34	81

** No Incomplete data have been used for statistical calculation

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Title: Surface Water data for Arizona: USGS Monthly Statistics

URL: <http://waterdata.usgs.gov/az/nwis/monthly?>



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4.65 4.65 nadww01



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USGS 09486520 SANTA CRUZ RIVER AT TRICO ROAD, NR MARANA, AZ.

Available data for this site

Pima County, Arizona
 Hydrologic Unit Code 15050303
 Latitude 32°28'17", Longitude 111°18'25" NAD27
 Drainage area 3,641 square miles
 Gage datum 1,910 feet above sea level NGVD29

Output formats

- [HTML table of all data](#)
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00060, Discharge, cubic feet per second,

YEAR	Monthly mean in cfs (Calculation Period: 1989-10-01 -> 2007-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1989										40.0	40.5	34.5
1990	37.1	46.2	35.9	27.3	17.0	10.8	317.7	39.3	21.1	5.78	14.3	36.6
1991	25.5	2.56	82.1	0.000	0.000	0.000	0.000	2.00	0.074	6.27	10.0	8.72
1992	9.60	43.9	42.1	3.13	2.48	4.35	2.37	29.7	2.50	13.1	16.5	39.8
1993	1,509	0.000	0.000	0.000	0.000	0.000	0.000	6.13	0.693	7.11	6.49	10.2
1994	33.8	21.4	29.0	14.2	9.66	12.0	6.35	3.11	6.72	8.79	11.3	156.7
1995	221.3	261.0	8.71	0.000	0.000	0.000	0.000	18.9	0.000	0.000	1.76	12.2

1996	18.3	17.8	17.0	14.2	9.36	4.48	7.96	30.3	206.7	0.000	4.78	18.8
1997	19.9	22.8	14.2	9.63	6.57	8.94	4.36	3.52	3.99	25.3	39.3	43.9
1998	52.0	294.3	6.24	41.1	3.93	6.17	39.7	34.7	28.7	23.4	36.7	29.9
1999	34.1	28.5	24.2	16.3	12.4	6.31	144.8	27.9	45.1	21.4	25.9	33.1
2000	36.5	35.2	29.2	24.2	18.3	22.8	18.5	49.1	26.3	336.6	73.0	3.83
2001	13.5	18.5	14.4	17.6	11.4	6.92	15.5	28.5	21.0	20.4	30.0	39.4
2002	42.9	41.9	39.2	25.5	19.4	15.5	23.5	31.6	66.0	21.0	34.7	41.4
2003	36.0	35.7	28.4	19.9	18.8	20.9	51.1	140.5	39.7	35.0	55.3	39.6
2004	56.2	49.8	56.4	50.8	32.5	27.1	54.5	68.7	66.1	40.6	53.8	61.1
2005	83.5	94.2	32.0	23.8	19.5	16.1	23.7	362.2	56.0	45.2	46.3	56.4
2006	53.2	44.6	43.1	37.3	26.5	27.3	704.1	147.2	68.2	31.5	33.1	42.0
2007	43.9	41.7	35.5	24.1	17.7	15.8	210.9	90.0	24.1			
Mean of monthly Discharge	129	61	30	19	13	11	90	62	38	38	30	39

** No Incomplete data have been used for statistical calculation

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Title: Surface Water data for Arizona: USGS Monthly Statistics

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USGS 09486500 SANTA CRUZ RIVER AT CORTARO, AZ

Available data for this site

Pima County, Arizona Hydrologic Unit Code 15050302 Latitude 32°21'04", Longitude 111°05'38" NAD27 Drainage area 3,503.00 square miles Gage datum 2,100.00 feet above sea level NGVD29	Output formats HTML table of all data Tab-separated data Reselect output format
---	---

00060, Discharge, cubic feet per second,

Day of month	Mean of daily mean values for each day for 57 - 60 years of record in, cfs (Calculation Period 1939-10-01 -> 2007-09-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	73	40	105	29	24	22	25	131	65	352	26	31
2	45	37	118	38	23	22	32	190	50	703	26	27
3	38	39	108	30	23	22	32	137	101	320	25	31
4	51	102	93	29	23	22	23	144	56	95	26	34
5	97	82	104	26	23	22	31	116	60	53	27	61
6	75	55	55	27	23	23	36	148	101	56	30	66
7	72	51	41	23	22	22	73	153	83	43	79	37

8	116	55	37	23	22	22	79	110	49	35	42	28
9	95	70	34	23	22	22	38	140	37	151	30	30
10	44	52	36	23	22	22	33	205	224	243	29	53
11	198	51	37	23	21	22	58	134	93	50	34	70
12	170	120	28	23	22	23	58	129	81	49	48	36
13	122	75	34	23	22	22	60	177	73	33	37	36
14	74	63	57	23	22	22	55	305	50	25	29	35
15	58	112	66	23	23	22	156	137	60	23	28	65
16	55	73	46	24	23	22	104	148	61	24	33	66
17	71	54	34	24	23	23	154	118	31	25	31	69
18	266	66	36	23	23	22	75	92	50	25	30	208
19	505	47	37	24	23	22	75	121	36	82	34	323
20	196	60	32	26	24	22	155	147	33	60	27	241
21	81	43	26	23	24	27	136	140	34	36	31	173
22	58	71	52	23	23	25	195	69	42	54	29	156
23	36	53	69	24	23	27	172	303	55	144	27	187
24	34	33	30	23	24	26	218	131	76	72	41	93
25	88	31	31	23	24	29	115	79	76	29	85	63
26	110	30	27	23	23	28	65	103	131	27	30	39
27	65	27	24	22	23	22	83	70	43	34	27	44
28	51	32	27	22	23	29	138	62	37	30	27	170
29	41	24	34	22	24	29	220	41	45	34	27	45
30	74		32	22	22	34	243	45	88	39	27	54
31	54		28		22		406	50		36		139

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1.55 1.49 nadww01



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USGS 09486520 SANTA CRUZ RIVER AT TRICO ROAD, NR MARANA, AZ.

Available data for this site

Pima County, Arizona Hydrologic Unit Code 15050303 Latitude 32°28'17", Longitude 111°18'25" NAD27 Drainage area 3,641 square miles Gage datum 1,910 feet above sea level NGVD29	Output formats HTML table of all data Tab-separated data Reselect output format
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00060, Discharge, cubic feet per second,

Mean of daily mean values for each day for 18 - 18 years of record in, cfs (Calculation Period 1989-10-01 -> 2007-09-30)

Day of month	Calculation period restricted by USGS staff due to special conditions at/near site											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	32	27	26	17	12	12	15	160	59	16	21	26
2	30	29	116	76	14	12	11	80	20	19	23	25
3	35	30	60	32	14	12	8.9	38	295	17	23	25
4	54	29	52	26	13	13	8.0	31	64	17	24	28
5	55	29	28	23	12	12	9.5	30	41	30	24	119
6	239	29	31	22	12	11	14	63	33	28	27	168

7	166	33	30	20	12	12	22	62	103	22	120	59
8	160	42	33	18	12	13	108	62	34	18	40	29
9	147	53	39	16	12	12	29	114	24	18	28	27
10	80	47	34	17	13	12	15	54	24	22	26	27
11	421	30	27	17	12	12	21	28	66	20	25	26
12	198	63	24	18	12	11	24	33	18	68	30	26
13	227	79	23	16	13	11	12	17	16	37	41	26
14	58	56	23	14	12	12	13	74	18	27	27	27
15	40	239	23	15	12	11	212	130	24	18	24	27
16	35	132	21	15	13	11	37	55	31	17	24	30
17	58	107	19	16	13	11	15	26	16	19	24	29
18	253	259	20	17	13	12	19	21	18	18	24	30
19	863	51	19	17	13	11	17	20	37	18	25	31
20	419	62	21	16	13	11	103	19	18	26	26	29
21	87	87	21	16	12	11	27	17	16	24	27	33
22	56	39	20	16	12	10	45	18	16	53	26	29
23	44	26	20	16	13	10	79	256	16	261	27	28
24	36	26	18	16	13	11	285	182	24	188	26	29
25	32	27	18	17	12	10	108	49	29	42	26	29
26	30	30	22	16	11	10	40	41	16	22	25	24
27	32	27	19	15	12	10	28	84	15	21	26	28
28	33	26	18	14	12	9.9	137	59	15	22	26	33
29	28	27	47	14	14	9.1	478	40	16	21	27	69
30	28		35	13	14	17	206	31	16	21	26	62
31	29		19		13		652	23		22		40

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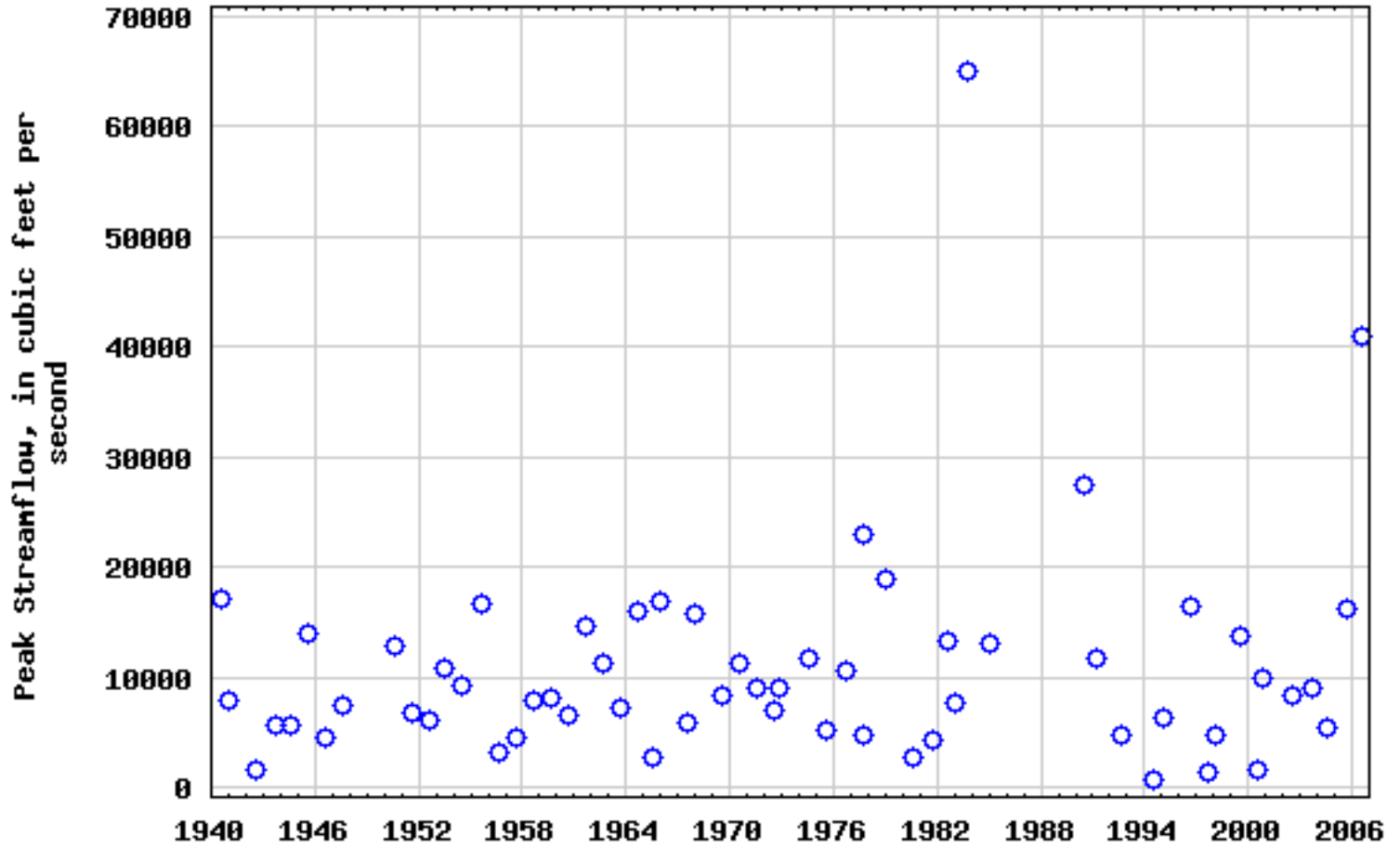
URL: <http://waterdata.usgs.gov/az/nwis/dvstat?>

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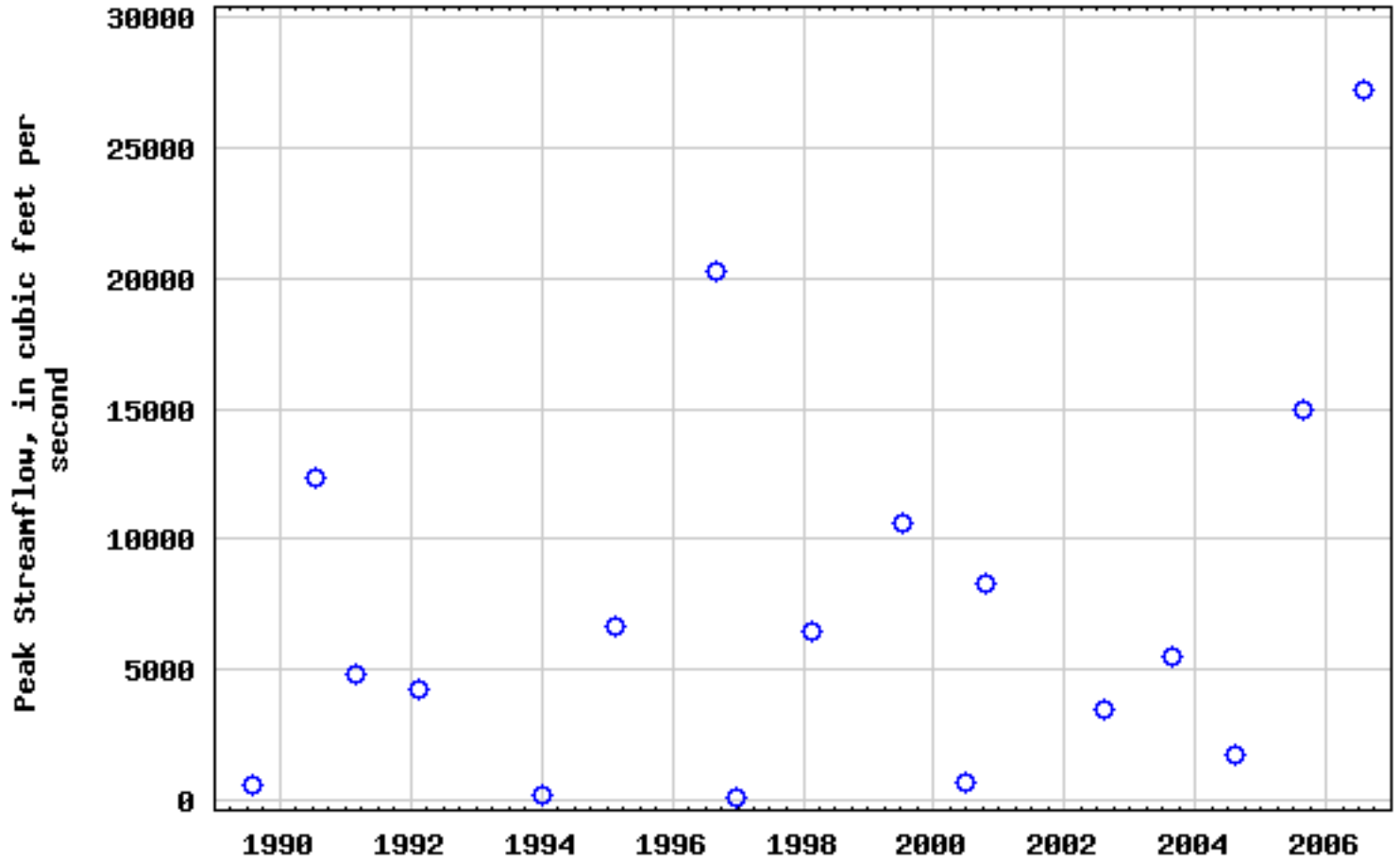


USGS 09486500 SANTA CRUZ RIVER AT CORTARO, AZ





USGS 09486520 SANTA CRUZ RIVER AT TRICO ROAD, NR MARANA, AZ.





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Latest Stage: 21.82 ft at 19:15 UTC
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Current Warnings/Statements/
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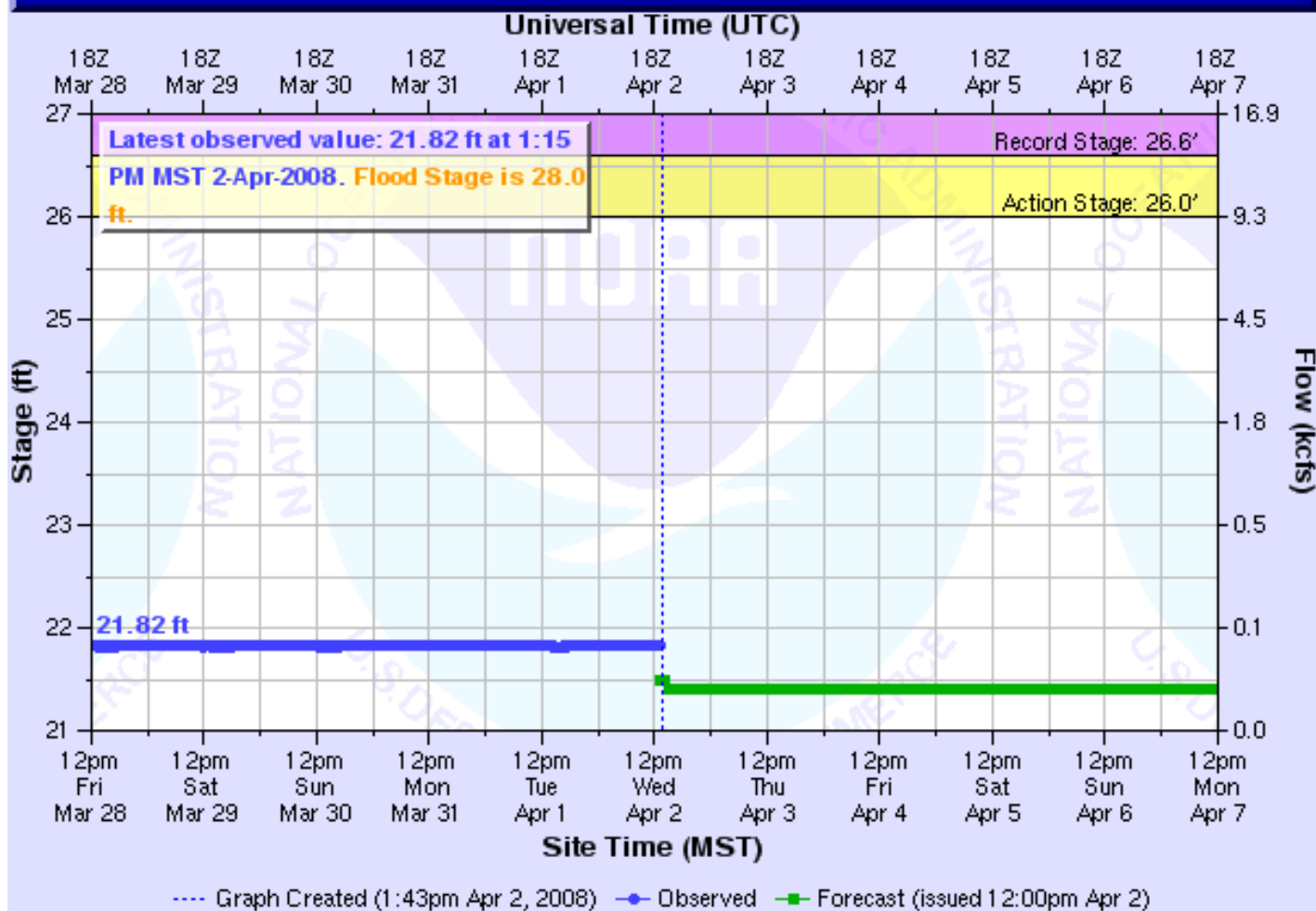
None currently.

[Complete information about the Santa Cruz River near Tubac](#)

available from

NWS Tucson, AZ.

Santa Cruz River 1 SE Tubac



STBA3 (plotting HGIRG) "Gage 0" Datum: 3180.00'

Observations courtesy of the US Geological Survey

NOTE: Forecasts for the Santa Cruz River near Tubac are issued as needed during times of high water, but are not routinely available.



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at Cortaro

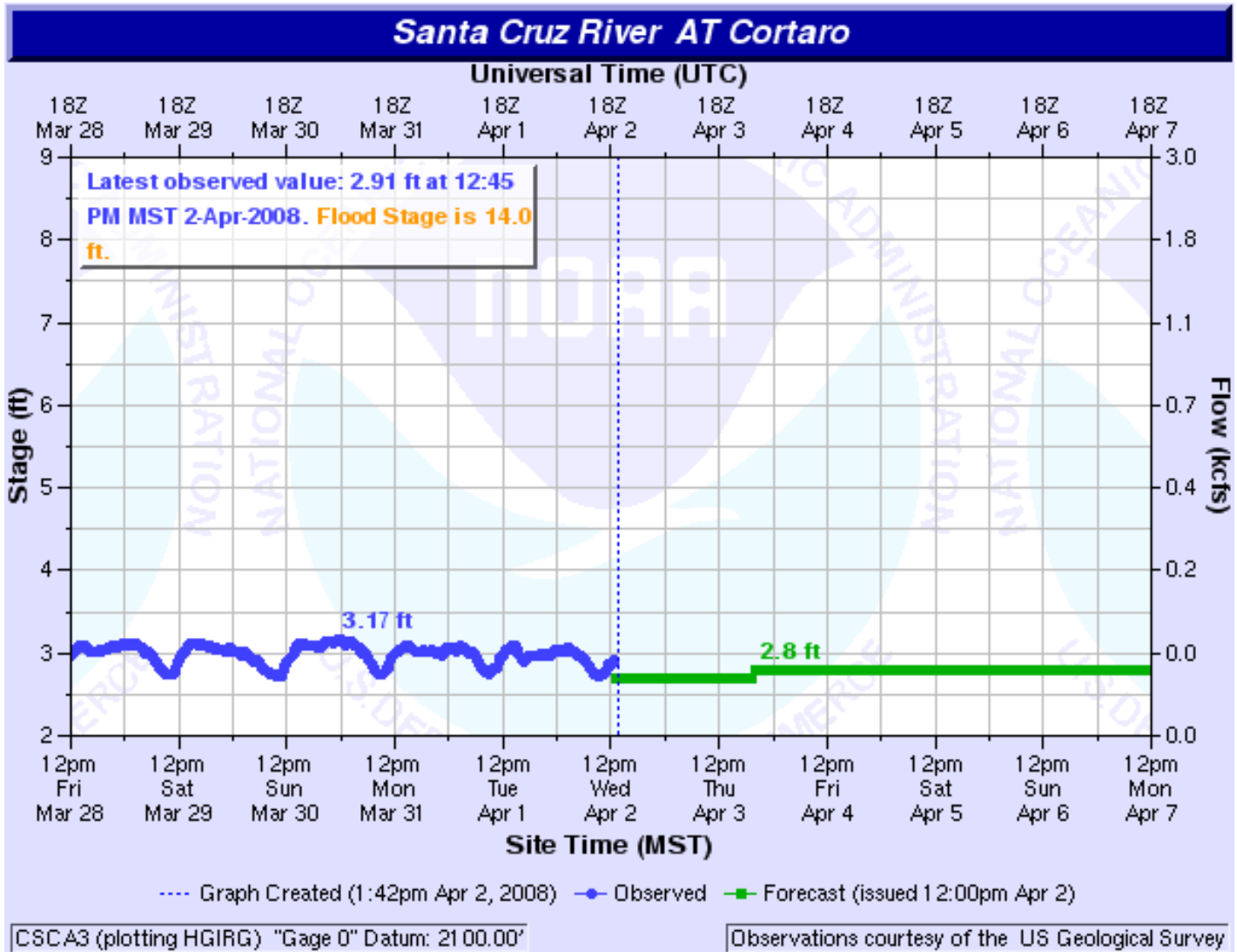
Flood Stage: 14Feet

Latest Stage: 3.09 ft at 20:45 UTC
04/01

**Current Warnings/Statements/
Advisories:**

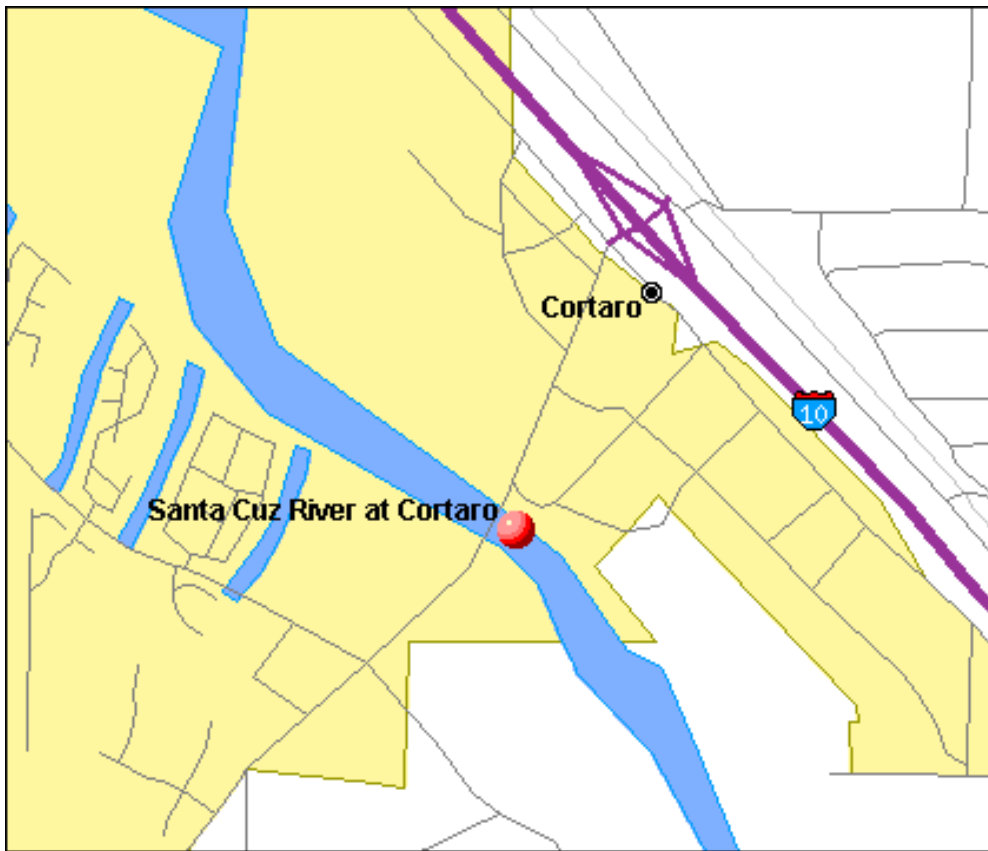
None currently.

[Complete information about
the Santa Cruz River at Cortaro](#)
available from
[NWS Tucson, AZ.](#)



NOTE: Flood stage level has recently changed.

NOTE: Graphical forecasts are not available for the Santa Cruz River at Cortaro. During times of high water, forecast crest information can be found in the [text products](#).



Flood Categories (in feet)

Major Flood Stage:	16
Moderate Flood Stage:	15
Flood Stage:	14
Action Stage:	13

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at Trico Road

Flood Stage: 16Feet

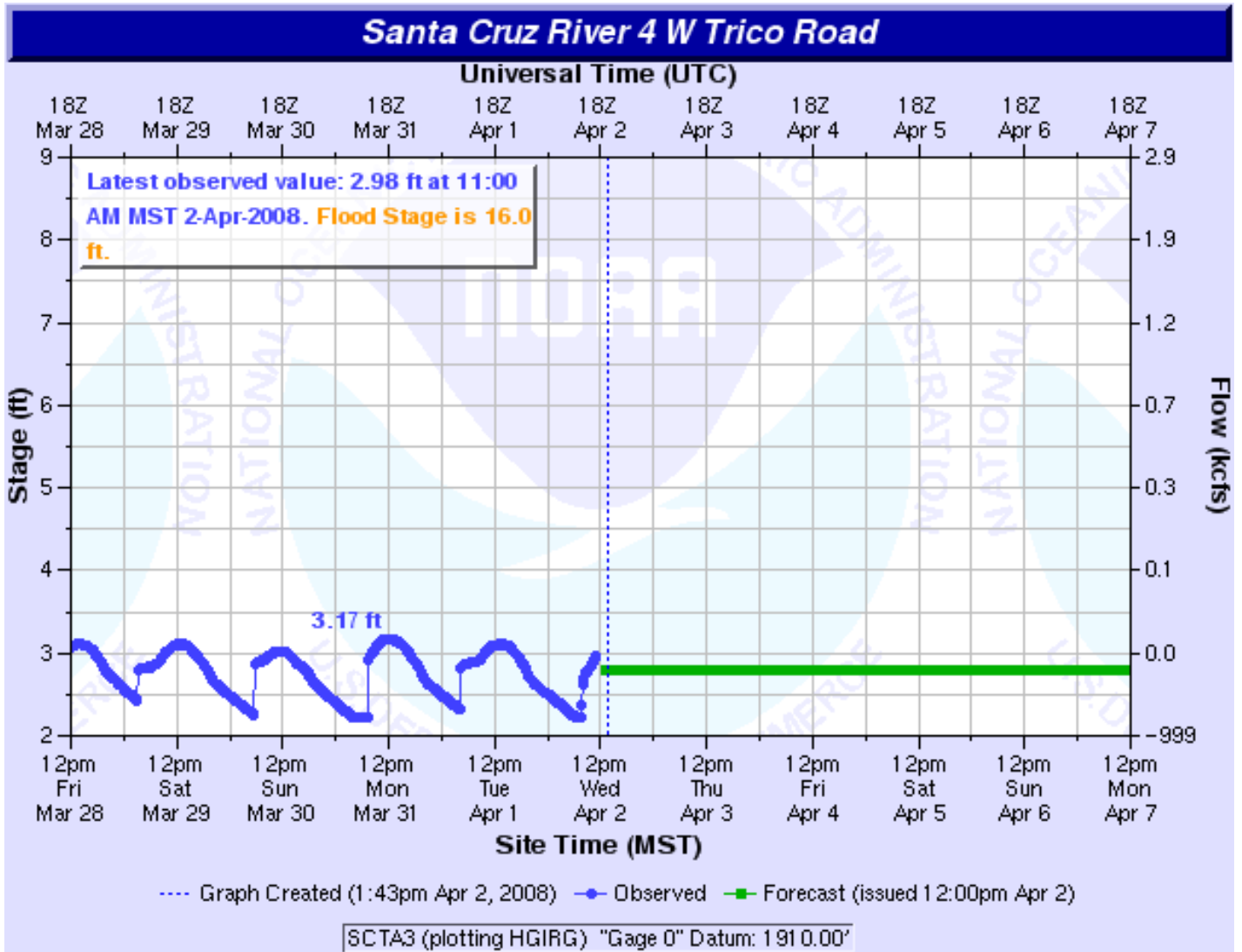
Latest Stage: 3.09 ft at 21:00 UTC
04/01

Current Warnings/Statements/

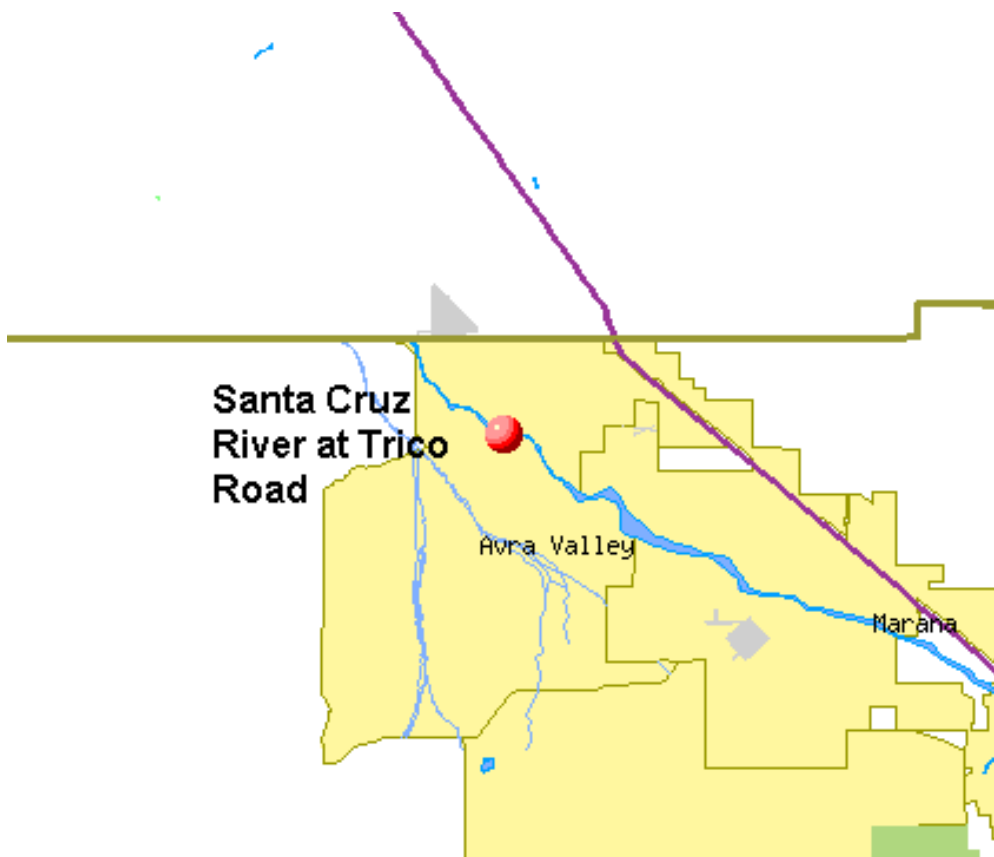
Advisories:

None currently.

[Complete information about the Santa Cruz River at Trico Road](#)
available from
[NWS Tucson, AZ.](#)



NOTE: Graphical forecasts are not available for the Santa Cruz River at Trico Road. During times of high water, forecast crest information can be found in the [text products](#).



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Collaborative Agencies

 Collapse

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National Weather Service
Tucson Weather Forecast Office
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Tucson, AZ 85719
(520) 670-6526

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Santa Cruz River

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[Santa Cruz River Point Selection Page](#)

Important Note:

Book-marking page saves current search criteria

near Tubac

Flood Stage: 28Feet

Latest Stage: 21.82 ft at 15:15 UTC
05/28

Current Warnings/Statements/
Advisories:

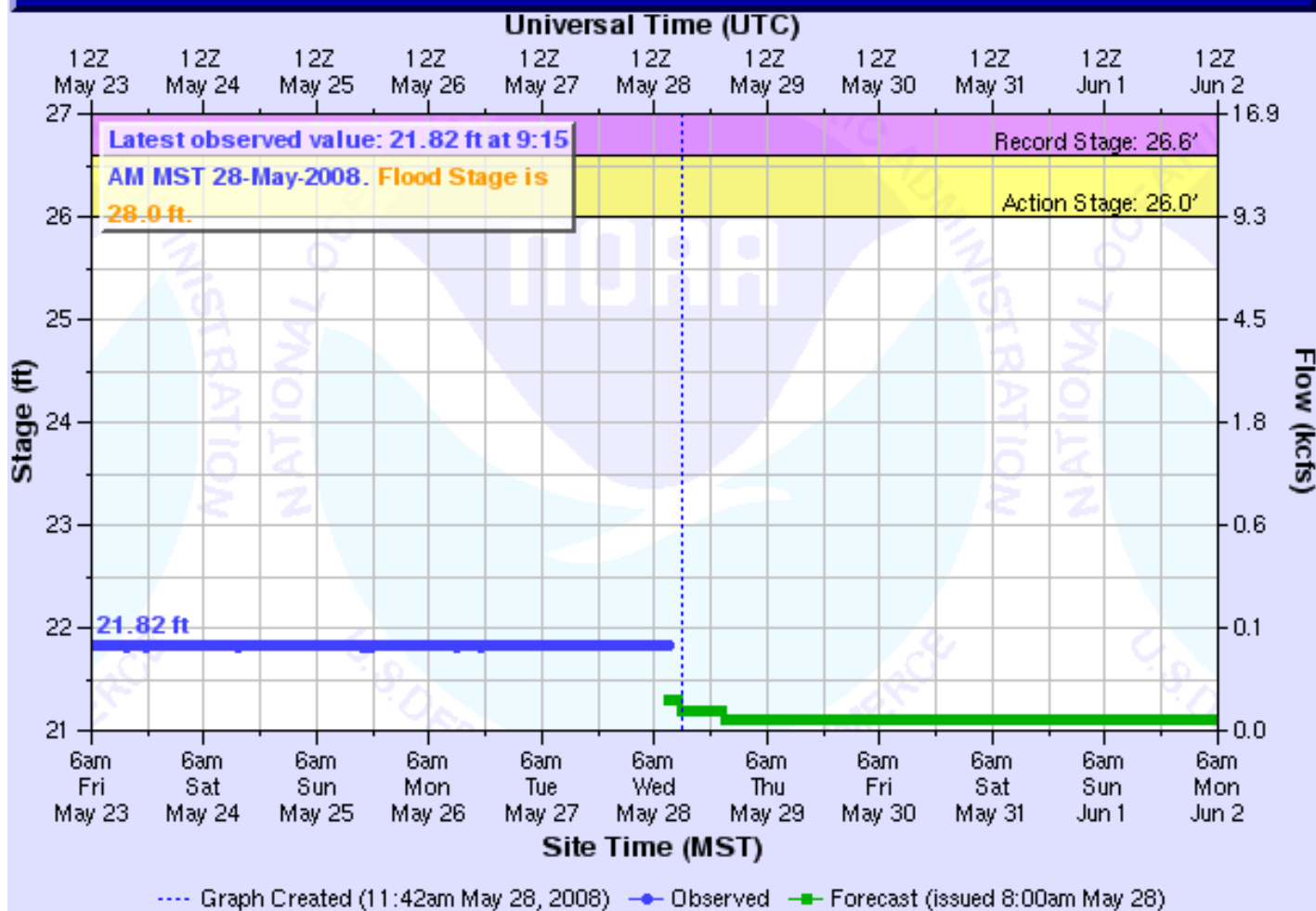
None currently.

[Complete information about the Santa Cruz River near Tubac](#)

available from

NWS Tucson, AZ.

Santa Cruz River 1 SE Tubac



STBA3 (plotting HGIRG) "Gage 0" Datum: 3180.00'

Observations courtesy of the US Geological Survey

NOTE: Forecasts for the Santa Cruz River near Tubac are issued as needed during times of high water, but are not routinely available.

[Return to the Top](#)

at Green Valley

Flood Stage: 14Feet

Latest Stage: 2.08 ft at 17:00 UTC 05/28

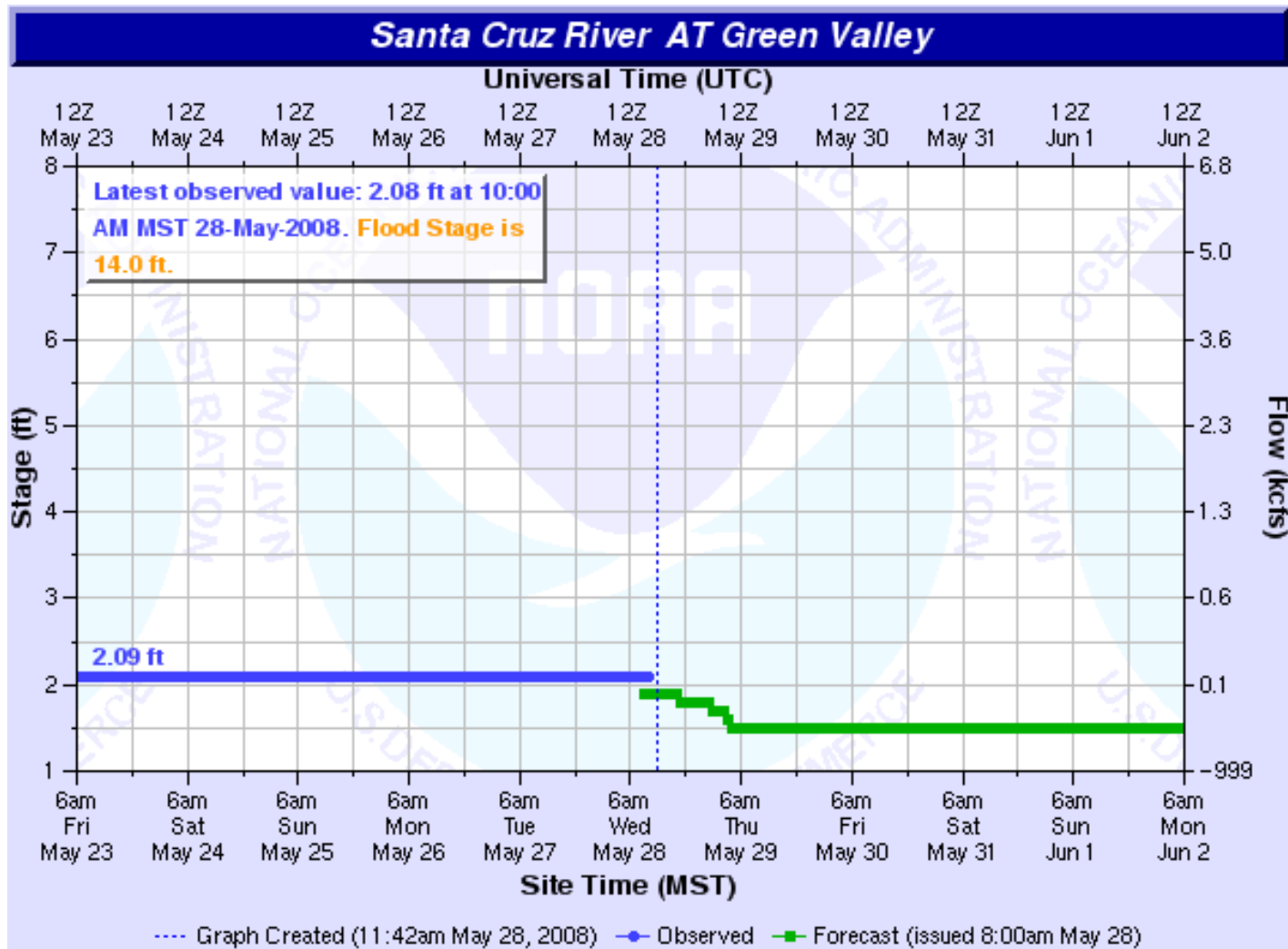
Current Warnings/Statements/

Advisories:

None currently.

[Complete information about the Santa Cruz River at Green Valley](#)

available from NWS Tucson, AZ.



SCCA3 (plotting HGIRG) "Gage 0" Datum: 2806.61' Observations courtesy of the US Geological Survey

NOTE: Graphical forecasts are not available for the Santa Cruz River at Green Valley. During times of high water, forecast crest information can be found in the [text products](#).

Flood Categories (in feet)

Major Flood Stage:	16
Moderate Flood Stage:	15
Flood Stage:	14
Action Stage:	11

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at Cortaro

Flood Stage: 14Feet

Latest Stage: 3 ft at 17:45 UTC 05/28

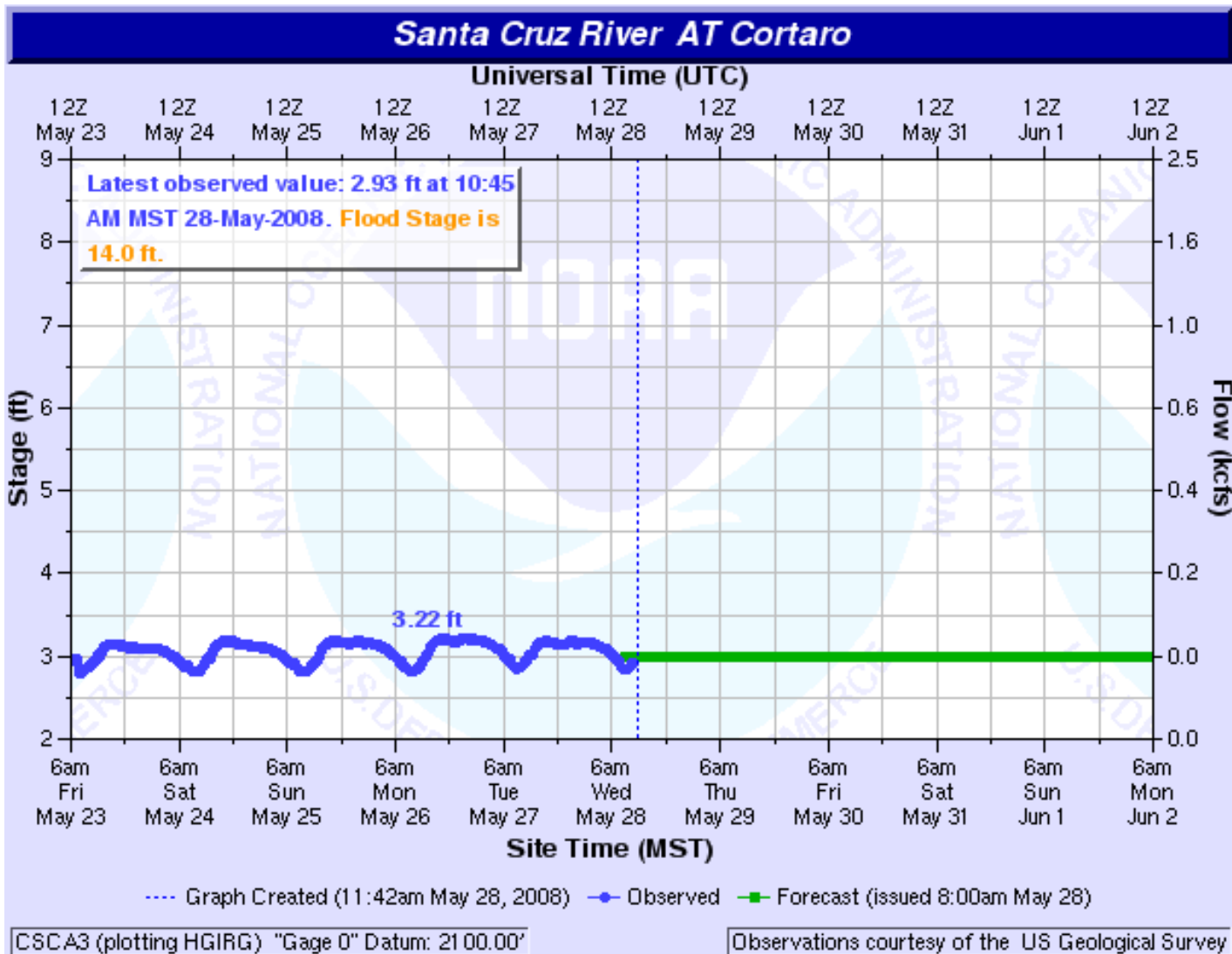
Current Warnings/Statements/

Advisories:

None currently.

[Complete information about the Santa Cruz River at Cortaro](#)

available from NWS Tucson, AZ.



NOTE: Flood stage level has recently changed.

NOTE: Graphical forecasts are not available for the Santa Cruz River at Cortaro. During times of high water, forecast crest information can be found in the [text products](#).

Flood Categories (in feet)	
Major Flood Stage:	16
Moderate Flood Stage:	15
Flood Stage:	14
Action Stage:	13

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at Trico Road

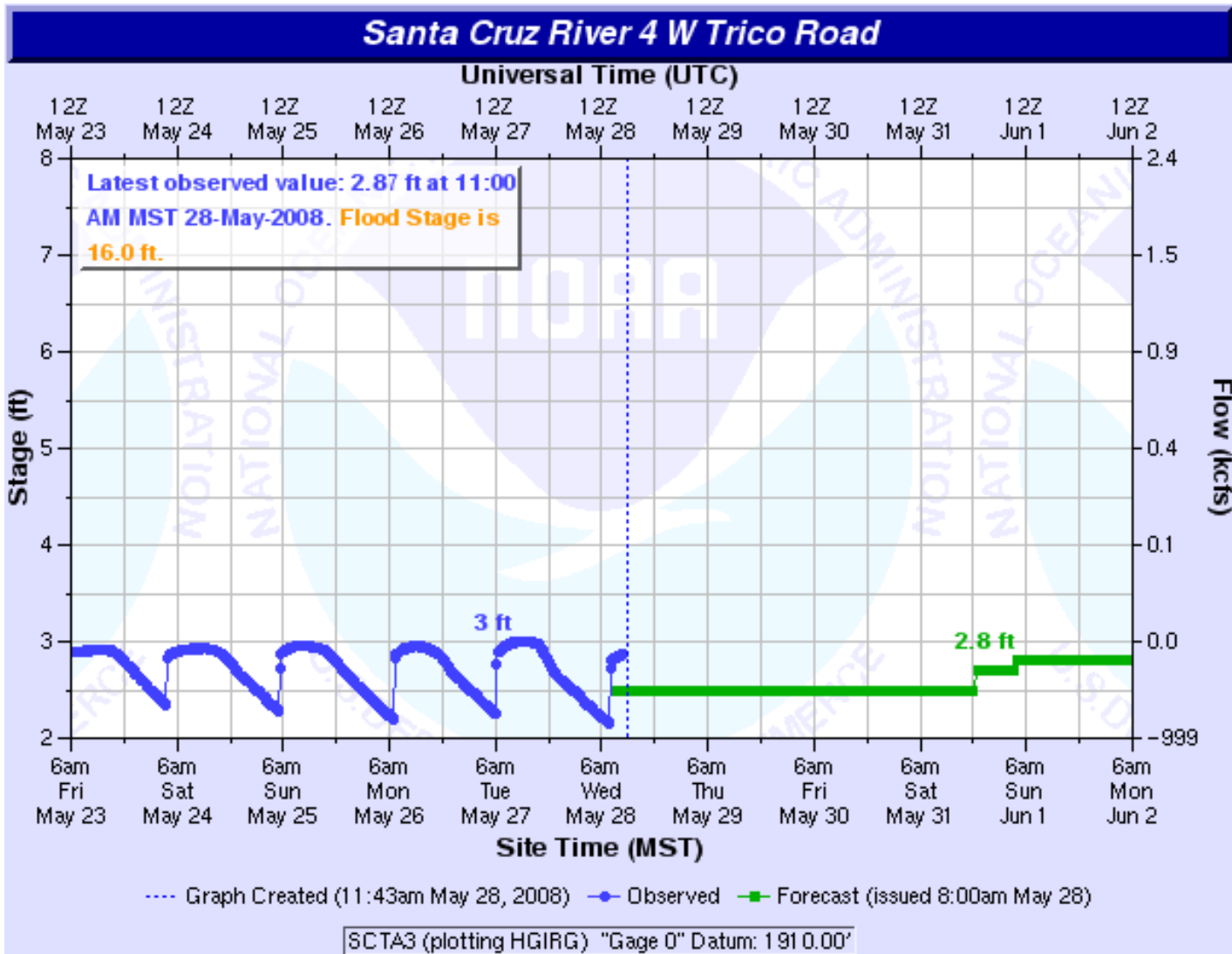
Flood Stage: 16Feet

Latest Stage: 2.87 ft at 17:00 UTC
05/28

**Current Warnings/Statements/
Advisories:**

None currently.

[Complete information about
the Santa Cruz River at Trico Road](#)
available from
NWS Tucson, AZ.



NOTE: Graphical forecasts are not available for the Santa Cruz River at Trico Road. During times of high water, forecast crest information can be found in the [text products](#).

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Collaborative Agencies

Collapse

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EXHIBIT D
SIGNIFICANT FLOW EVENTS

SIGNIFICANT FLOW EVENTS, SANTA CRUZ RIVER

Date	Event
Feb 19-22, 1890	Overbank flooding of Santa Cruz River documented
Sep 18, 1925	Peak flow of 3,400 cfs, Tucson
Sep 28, 1926	Peak flow of 11,400 cfs, Tucson
Sep 24, 1929	Peak flow of 10,400 cfs, Tucson
Aug 18, 1931	Peak flow of 9,200 cfs
Aug 10, 1945	Peak flow of 14,000 cfs, Cortaro
Jul 14, 1953	Peak flow of 10,800 cfs, Cortaro
Aug 20, 1959	Peak flow of 8,000 cfs, Cortaro
Aug, 23, 1961	Peak flow of 16,600 cfs, Tucson
Dec 20, 1967	Peak flow of 16,100 cfs, Tucson
Oct 9, 1977	Peak flow of 26,500 cfs, Continental (Green Valley)
Dec 19, 1978	Peak flow of 13,500 Tucson
Aug 23, 1982	Peak flow of 13,300 cfs, Cortaro
Oct 2, 1983	Peak flow of 52,700 cfs, Tucson and 65,000 cfs, Cortaro
Jul 24, 1990	Peak flow of 21,000 cfs, Tucson
Aug 6, 1992	Peak flow of 5,970 cfs, Tucson
Jan 19, 1993	Peak flow of 37,400 cfs, Tucson

Flow data derived from <http://www.wrh.noaa.gov/twc/hydro/floodhis.php>; no gaging data provided at this website for peak flows after 1994

EXHIBIT E

AERIAL PHOTOS--SANTA CRUZ RIVER IN STUDY REACHES A AND B

First Photo: Tubac (Study Reach A)

Second Photo: Continental (Study Reach A)

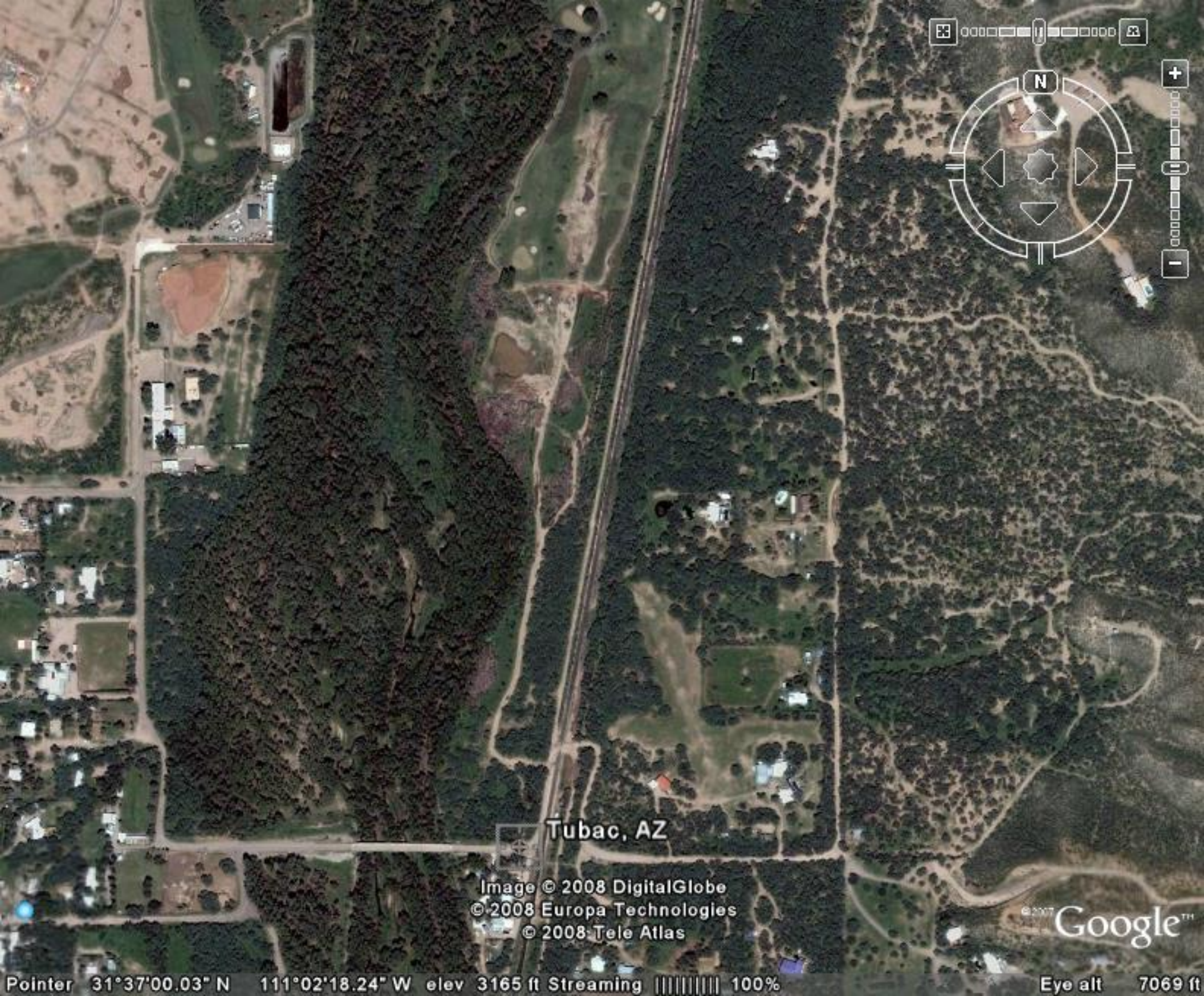
Third Photo: Roger Road (Study Reach B)

Fourth Photo: Just downstream of Roger Road (Study Reach B)

Fifth Photo: Confluence w/Rillito River and Canada del Oro Wash (Study Reach B)

Sixth Photo: Cortaro Road (Study Reach B)

Seventh Photo: Pima/Pinal County Lines just downstream of Trico Road (Study Reach B)



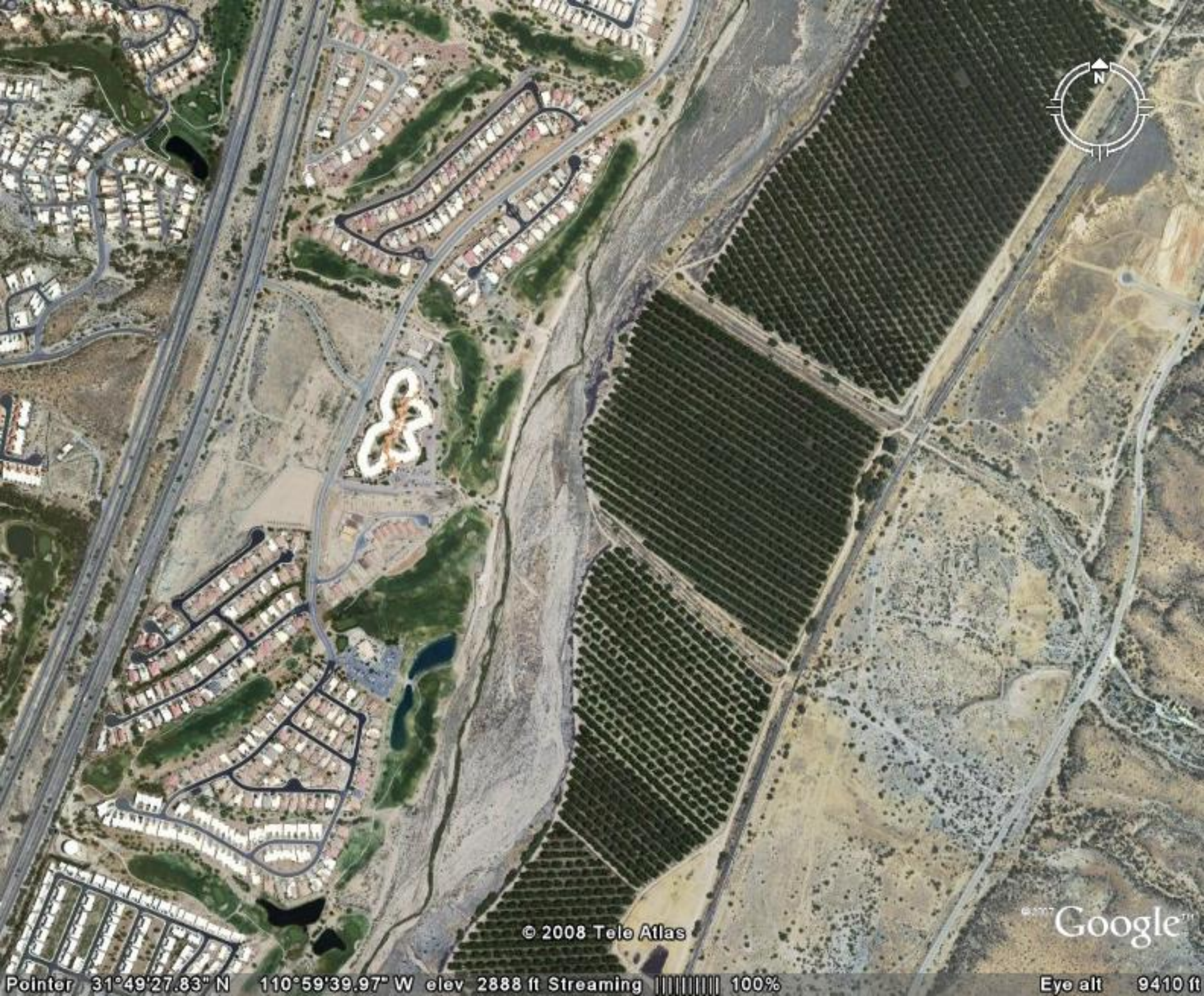
Tubac, AZ

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Pointer 31°37'00.03" N 111°02'18.24" W elev 3165 ft Streaming ||||| 100%

Eye alt 7069 ft



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Pointer 31°49'27.83" N 110°59'39.97" W elev 2888 ft Streaming ||||| 100%

Eye alt 9410 ft



Flowing Water



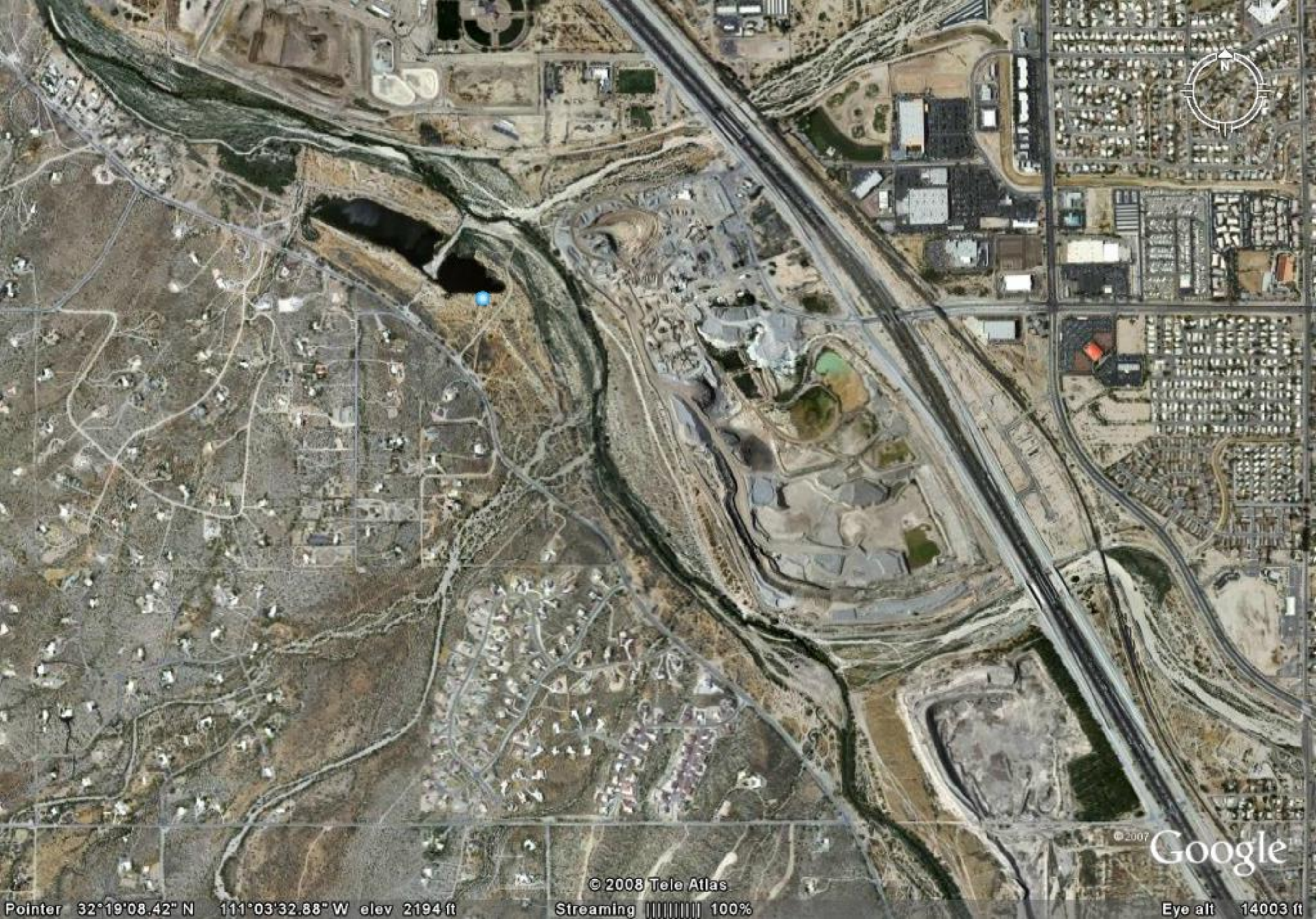
Google

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Streaming 100%

Pointer 32°17'08.79" N 111°01'37.66" W elev 2251 ft

Eye alt 14003 ft



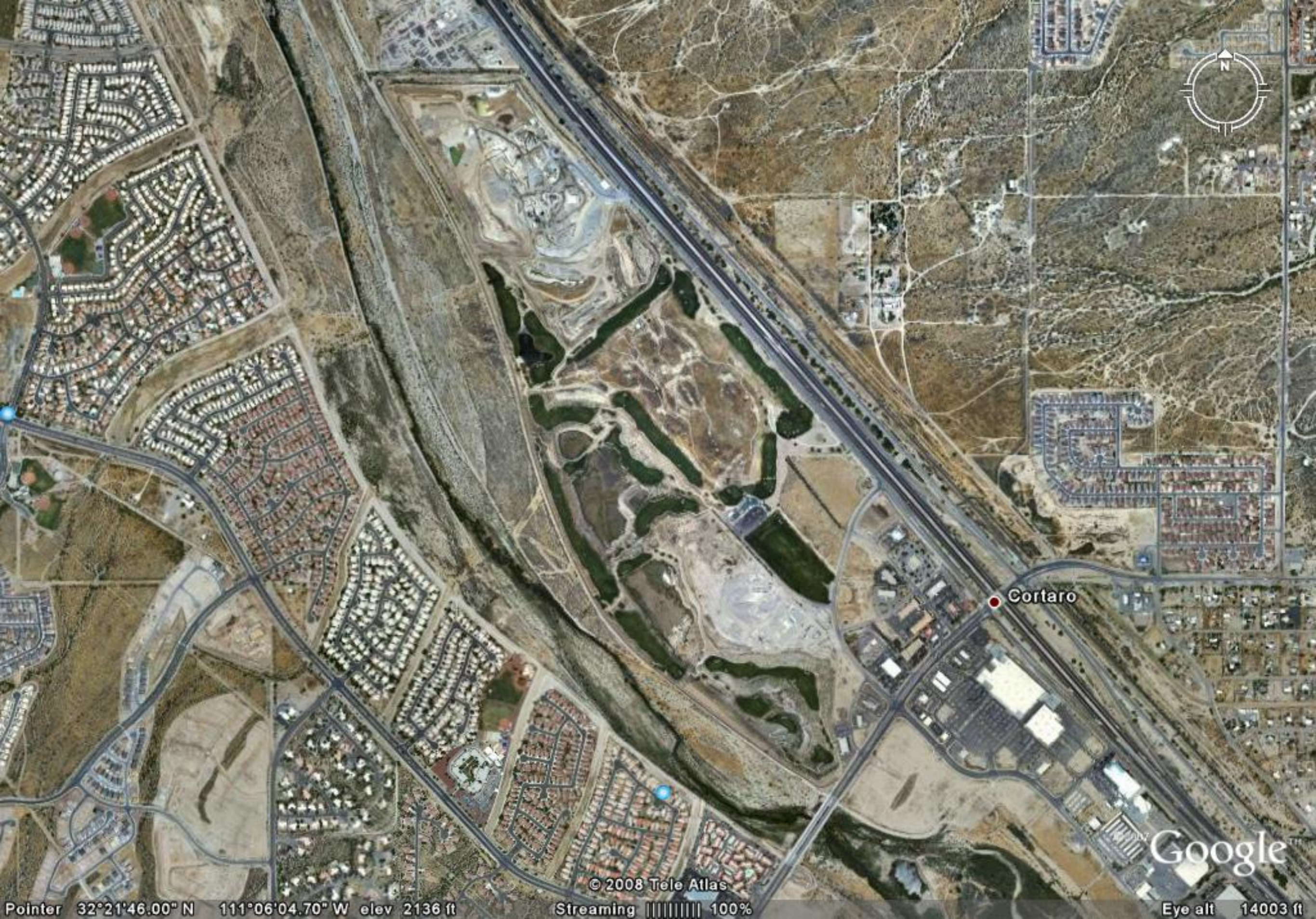
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Pointer 32°19'08.42" N 111°03'32.88" W elev 2194 ft

Streaming ||||| 100%

Eye alt 14003 ft



Cortaro

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Pointer 32°21'46.00" N 111°06'04.70" W elev 2136 ft

Streaming ||||| 100%

Eye alt 14003 ft



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Pointer 32°29'37.45" N 111°19'43.15" W elev 1884 ft

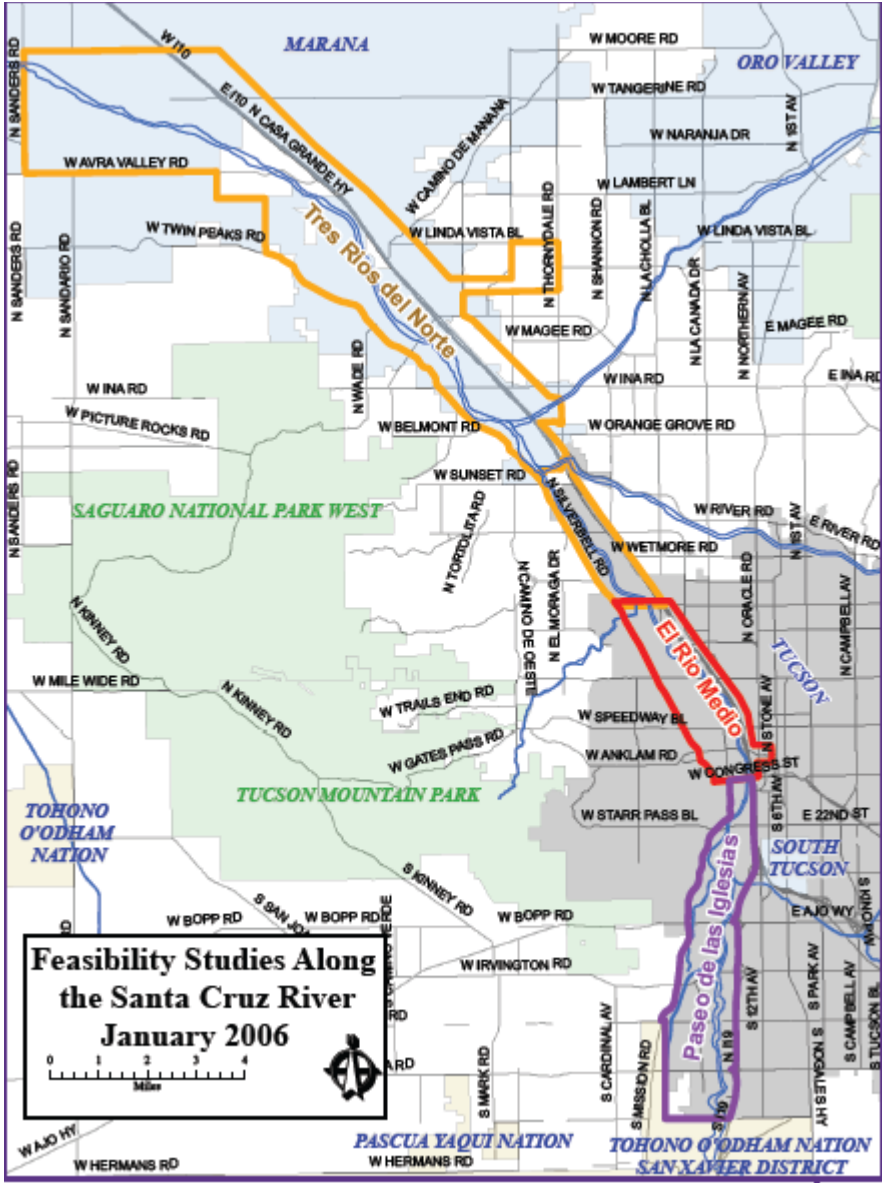
Streaming ||||| 100%

Eye alt 14003 ft

EXHIBIT F
Existing and Proposed Santa Cruz River Parks

**Proposed El Rio Medio, Congress Street to Prince Road and
Tres Rios del Norte (Prince Road to Sanders Road)**

**-Historic Juan Bautista de Anza Trail Map within area of
determination**



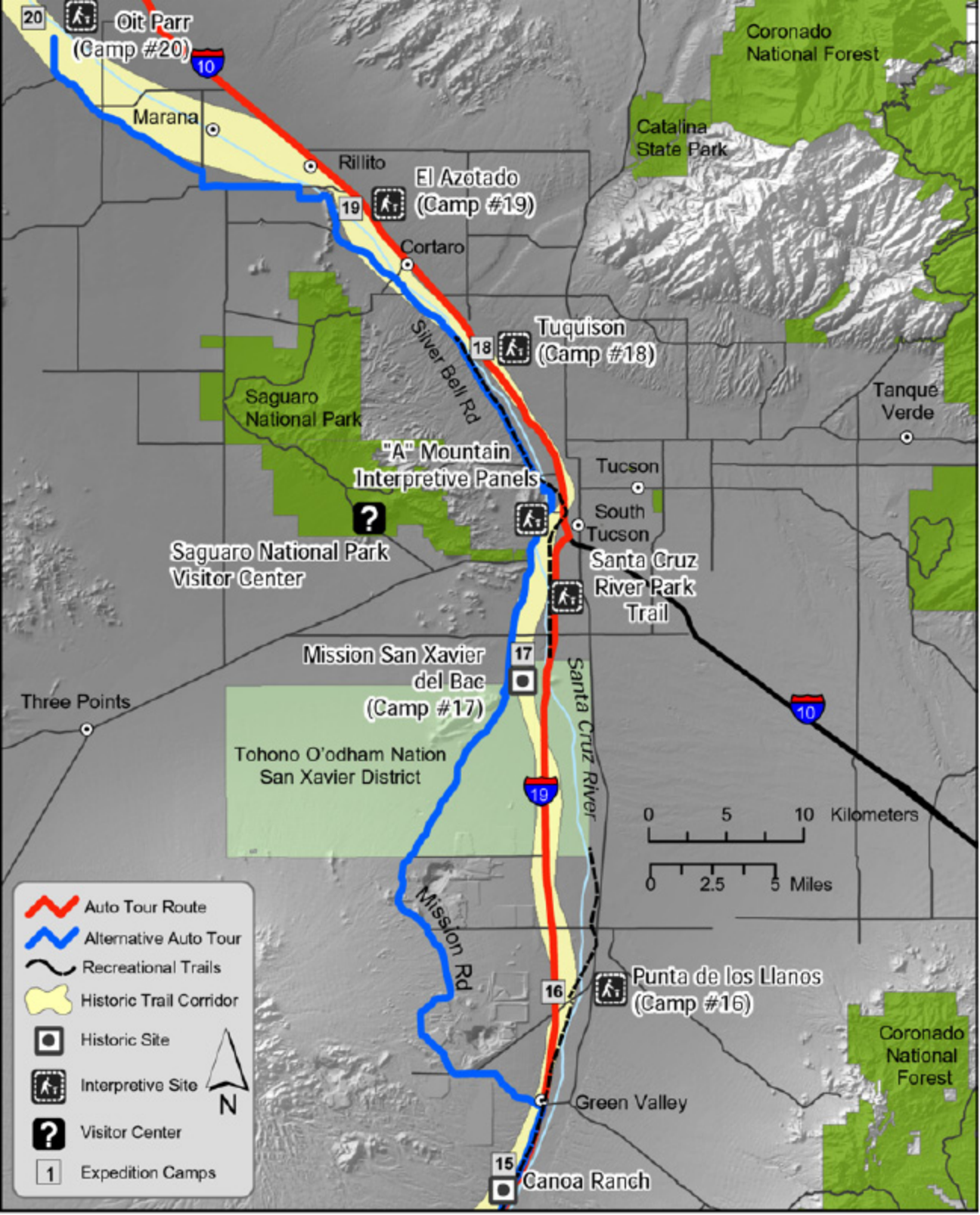


EXHIBIT G
ADDITIONAL NAVIGATION
DOCUMENTATION

1994 Article
2005 Article



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October 4, 1994

Section: NEWS

Page: 7A

Santa Cruz on the River; River takes pair for joyous ride

Laura Brooks

NOTE: **SANTA CRUZ ON THE RIVER**; Third in a four-day series

TUBAC - They got slammed, bumped, tossed and dumped. But in the end, the canoe ride down the **Santa Cruz** was ``a hoot," says Sherry Sass, head of Friends of the **Santa Cruz River**, and Mark Larkin, also a group member.

An avid **river** watcher, Sass says she often wondered about cruising the waterway.

``It's not like a major thoroughfare for **boats**, God knows," Sass admits. But, ``I think it's navigable some of the time."

Last year, after the January floods, Sass and Larkin decided it was time to float - not tote - Larkin's **boat**.

The duo searched for water ``deep enough that you can float for a distance, but not dangerous," Sass says.

A mile south of Tubac, they found a spot where the water was waist deep and running hard.

``We basically just jumped in and slammed against a cottonwood and got dumped," Sass says.

``It wasn't a real good start," says Larkin, deadpanning.

Then, as Sass helped pull the 17-foot canoe off the tree against the stream, she slipped and skinned her leg.

``I was stunned at the power of the **river**," Sass says. ``Somehow we got back in and shot down the **river**. And it was just a hoot after that."

The pair rode about three miles of **river** before pulling the plastic canoe ashore beyond Tubac.

Like Sass and Larkin, there have been others who ``sailed" the **river**.

One trip occurred during 1914 floods, apparently in the spirit of friendly rivalry between Nogales and Tucson, wrote the late historian Don Bufkin.

On Dec. 26 that year, Nogales officials launched the ``good **boat** Nogales" with a New Year's greeting for Tucson. It was set to arrive at Tucson's Congress Street the next day, The Arizona Daily Star reported. It didn't make it.

``The (ship) Nogales ran into the branches of a fallen tree and is now moored this side of Tubac," the paper reported.

Finally, the stranded **boat** hulk ``was dragged out of the **river** bed and saw service as a watering trough for cattle for many years," Bufkin wrote, quoting the late Judy England, of Tumacacori.



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August 25, 2005

Section: TUCSON/REGION

Page: B2

Fire Dept. criticizes KRQQ's river stunt

Becky Pallack, ARIZONA DAILY STAR

A radio-show stunt that sent an intern **rafting** in **the** flooded **Santa Cruz River** on Wednesday morning was irresponsible and mocks **the** safety message firefighters have been spreading this summer, a Tucson Fire Department official said.

While **on the** air with Johnjay and Rich **on** KRQQ (93.7-FM), intern Randy Stein launched near West El Camino del Cerro, but he managed to get out of **the river** before a police officer asked him to leave, DJ Rich Berra said.

Stein likely will not face criminal charges for **the** stunt, but Fire Capt. Paul McDonough said "it sends **the** wrong message."

"We've had several drownings in wash-related accidents this year and this kind of behavior is counterproductive to **the** importance of our message: Don't go in **the** wash, don't play in **the** wash," McDonough said.

Berra said he agrees with McDonough, but added: "If we just did responsible things **on the** radio, we would not be entertaining."

He said Stein has performed other stunts and was not in danger.

Two years ago, **the** station was under federal investigation after a man claiming to be a KRQQ intern sneaked onto Davis-Monthan Air Force Base during a presidential visit.

"We don't want kids to do as we do, just listen and enjoy," Berra said. "People who think it's irresponsible don't have an intern trying to earn college credit."

The important message, McDonough said, is that washes and **rivers** can be deadly.

"Boulders become wrecking balls, trees and branches become projectiles, and you don't realize **the** force of **the** water," he said. "It can be deceptive."

* Contact reporter Becky Pallack at 629-9412 or bpallack@azstarnet.com.

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