

# **DRAFT**

## **APRIL 21-APRIL 25, 2003 FAMILIARIZATION TRIP AND WFO OUTREACH: Tucson, El Paso, Albuquerque, and Phoenix Hydrologic Service Areas**

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### **INTRODUCTION**

**A**s requested by Hydro Intern Mike Schaffner, the primary purposes of this trip were to 1) familiarize ourselves with the upper Gila basin in New Mexico, and Arizona; 2) meet in the field jointly with Ed Polasko, Senior Service Hydrologist, Albuquerque, and Tim Price, Hydrologic Focal Point, El Paso; 3) meet in the field with Tom Zickus, Senior Hydrologist, Phoenix; and 4) visit the San Carlos Reservoir including a tour of Coolidge Dam. Mike did an outstanding job coordinating this trip: bringing two Regions and four WFOs together. Many ideas and concepts were shared by all participating. Discussions included the modern concept of determining bankfull, minor flood, moderate flood, and major flood stages at all gages, even in wilderness areas. It should be noted that determining these reference criteria does not imply an official flood stage has been established. However, if an official flood stage does exist, it is usually used as the minor flood criterion. The author has calculated these criteria for 756 sites in the Colorado Basin River Forecast Center's area of concern. He appreciates the opportunity to ground truth these values in the field with local experts. This trip is one of several he has made.

**E**stablishing minor, moderate, and major stages at all gages for reference; is not policy, but just a common sense approach to dealing with the ever-growing data stream flowing into our office. As centers for excellence in water forecasting, the River Forecast Centers and WFOs need to be able to answer questions about "high" stages and flows whenever and wherever they occur.

### **LOGISTICS**

**M**ONDAY: Arrived at CBRFC at 8:30 am. Departed Salt Lake City for Tucson at 11:25 am. Arrived Tucson at 12:09 pm. Mike Schaffner picked me up at the airport in the government owned 4x4 we would be using for the week. We drove to Lordsburg, New Mexico where we were met by Ed Polasko and Tim Price. After checking into the hotel, we all took one vehicle to visit Gila near Virden (GVRN5), and Gila near Redrock (RGRN5). RGRN5 was located near nightfall; therefore, we decided to return to RGRN5 the next day. These sites are in EPZ HSA. Night spent in Lordsburg.

**T**UESDAY: We left Lordsburg in three vehicles because later in the day 1) Tim Price would be returning to El Paso and 2) Ed Polasko would be returning to Albuquerque. We drove to Redrock Post Office where we parked two vehicles and then took the third (the TWC 4x4) to RGRN5. To reach the site one has to drive by the Red Rock Wildlife Management Area, an area set aside to protect desert bighorn sheep within 9-foot high game fences. We then returned to the Post Office, picked up the other two vehicles, and drove to Gila, New Mexico by way of the Big Burro Mountains. From Gila we drove to State Route 293, parked two vehicles at the end of the paved road, and then took the third (this time the ABQ 4x4) to Gila near Gila (GILN5). This site is an official forecast point in EPZ HSA. To reach the site we had to ford Mogollon Creek. On the way out we picked up the other two vehicles and drove to the San Francisco Hot Springs trailhead. The 1.5-mile hike to river provided a good view of this isolated canyon used for recreation and much needed exercise. Ed Polasko left for Albuquerque upon returning to the trailhead at 5:20 pm because he had the longest drive ahead of him. Although the San Francisco near

Glenwood gage (GSFN5) is just a short distance upstream of the springs, we did not visit the gage from this location. To visit the gage we return to the trailhead and then drove the remaining two vehicles towards Greenwood on US Route 180, turning at the next San Francisco River viewing area. After visiting GSFN5, Tim Price left for El Paso. This site is an official forecast point in ABQ HSA. Since there was still some daylight left, Mike and I headed towards San Francisco near Reserve (RSFN5). At 7:55 pm (MDT), just 12 miles shy of Reserve, NM; we decided to turn around when we realized we would not get to the gage before darkness fell. We then drove to Safford, AZ arriving around 9:00 pm (MST).

**W**EDNESDAY: We drove to Gila near Solomon, Head of Safford Valley (GLHA3); Gila near Clifton (GCFA3); San Francisco at Clifton (SFCA3); and Gila at Duncan (DUNA3). Realizing that we had accidentally left it unlocked, we drove back to GLHA3 to lock the gage house. This provided yet another opportunity to practice our 4x4 skills. We then returned to Safford, arriving after dark.

**T**HURSDAY: We drove to Bonita Creek near Morenci (BNMA3) within the Gila Box Riparian National Conservation Area. We then drove to San Carlos Reservoir where we met Tom Zickus. As Mike had arranged, we met the dam tender, who provided us a tour of Coolidge Dam (CLDA3) including the downstream flume and Gila below Coolidge Dam (GCDA3). From here, Tom, Mike and I visited San Carlos near Peridot (SNCA3) and viewed Tufa Stone Dam above the Town of San Carlos. Night spent at hotel on San Carlos Indian Reservation.

**F**RIDAY: Continuing to use two vehicles, Tom, Mike and I visited the Gila at Winkleman (discontinued GLWA3), the Gila near Hayden (location of the confluence of San Pedro and Gila), and Gila at Kelvin (GLKA3). From Kelvin, Mike and I returned to Tucson, where he dropped me off at the airport. I departed Tucson at 4:55 pm and arrived at Salt Lake City at 7:33 pm.

## **OBSERVATIONS**

**A**PRIL 21<sup>ST</sup>, GVRN5: The Gila River Below Blue Creek, near Virden, NM is located approximately 10 miles upstream of Virden, and approximately 15 miles downstream of Redrock, NM (see next site). The estimated flow was 160 cfs. USGS reports that stage was 3.11 feet and flow was 147 cfs (note: unless otherwise stated, all USGS values in this report are from either the New Mexico or Arizona USGS Water Resources websites, and are for the approximated date and time of visit). We noted a recent high water mark of approximately 10 feet, which likely was made by the 10/7/2002 flow of 7,920 cfs, reported as 9.34 feet. We decided upon a bankfull stage of 12 feet, a minor flood stage of 15 feet, a moderate flood stage of 20 feet, and a major flood stage of 28 feet. These values are higher than those previously determined by Reed, reflecting the remoteness of this site. (It should be noted that the most recent E-19A dated 10/23/1996 states that the bankfull stage is 9 feet.)

**A**PRIL 22<sup>ND</sup>, RGRN5: The Gila River near Redrock, NM is located approximately 15 miles upstream of GVRN5, and approximately 35 miles downstream of GILN5 (see site after next). The estimated flow was 150 cfs. USGS reports that stage was 5.3 feet and flow was 156 cfs. We noted a high water mark of 8 to 9 feet, which likely occurred in September or October 2002. We decided upon a bankfull stage of 15 feet (in agreement with E-19A), a minor flood stage of 20 feet, a moderate flood stage of 25 feet, and a major flood stage of 29 feet. These flood values are lower than those previously determined by Reed, reflecting local encroachment of the floodplain.

**A**PRIL 22<sup>ND</sup>, MOGOLLON CREEK AT MOUTH: The flow was estimated at 10 cfs. This creek is gauged 12 miles upstream (MCCN5). The USGS reports that the upstream gage stage was 1.88 feet and the upstream flow was 21 cfs. Perhaps at these low flows, the stream reach is a losing reach, or perhaps water is being diverted for irrigation purposes.

**A**PRIL 22<sup>ND</sup>, GILN5: A large portion of the watershed above Gila River near Gila, NM is wilderness area. The drainage area is 1,864 square miles. The flow was estimated at 125 cfs. USGS reports that stage was

1.34 feet and flow was 126 cfs. We decided upon a bankfull stage of 9 feet (in agreement with E-19A), a minor flood stage of 11 feet, a moderate flood stage of 13 feet, and a major flood stage of 15 feet. These values are lower than those previously determined by Reed, and are consistent with those now determined for RGRN5, and GVRN5.

**APRIL 22<sup>ND</sup>, SAN FRANCISCO HOT SPRINGS:** Local recreational use of the San Francisco River includes hot springs downstream of GSFN5 (see next site). The flow here was estimated at 108 cfs.

**APRIL 22<sup>ND</sup>, GSFN5:** The San Francisco River near Glenwood, NM is approximately 50 miles downstream of Reserve, and 5 miles downstream of Glenwood. The gage is located on private land. USGS reports that stage was 2.58 feet and flow was 54 cfs. The flow value seems low and perhaps the current rating is off at low flows. We decided upon a bankfull stage of 12 feet (in agreement with E-19A), a minor flood stage of 15 feet, a moderate flood stage of 17 feet, and a major flood stage of 19 feet. These numbers are in excellent agreement with those prepared by Reed (differences being 1 foot or less) and therefore, these stages are consistent with wilderness values. (It should be noted that GNWN5 is also reported as the San Francisco River near Glenwood, NM, and has its own rating table, resulting in slightly different values for bankfull, minor, moderate, and major. However, since there is no recent data for this site, it is likely discontinued.)

**APRIL 22<sup>ND</sup>, NEAR RESERVE:** The San Francisco Mountains, Gila National Forest, have burned during recent history in the local drainage between GSFN5 and RSN5.

**APRIL 23<sup>RD</sup>, GLHA3:** The Gila River at Head of Safford Valley, near Solomon, AZ is reported by the USGS as 17 miles downstream of the confluence of the Gila and San Francisco. The flow here should roughly be equivalent to the flow at GCFA3 plus SFCA3. The flow was estimated at 300 cfs. This is roughly equivalent to 175 cfs + 137 cfs (see next two sites). USGS reports that stage was 6.0 feet and flow was 283 cfs. We decided to leave the stages as reported in E-19A dated 3/10/2001: bankfull stage of 12 feet, a minor flood stage of 17 feet, a moderate flood stage of 18 feet, and a major flood stage of 19 feet.

**APRIL 23<sup>RD</sup>, GCFA3:** The Gila River near Clifton, AZ is reported by the USGS as 6 miles upstream of the confluence of the Gila and San Francisco. Therefore it is 23 miles upstream of GLHA3. The flow was estimated at 140 to 210 cfs (will use 175 cfs). USGS reports that stage was 1.6 feet and flow was 67 cfs. The flow value seems exceptionally low, and perhaps the rating is off. We decided to use the “flows” downstream at GLHA3 to determine the stages here; therefore, bankfull stage equals 10.5 feet, minor flood stage equals 24.5 feet, moderate flood stage equals 29 feet, and major flood stage equals 31 feet.

**APRIL 23<sup>RD</sup>, SFCA3:** The San Francisco River at Clifton, AZ is reported by the USGS as 9.9 miles upstream of the confluence of the Gila and San Francisco. Therefore it is 26.9 miles upstream of GLHA3. USGS reports that stage was 10.56 feet and flow was 137 cfs. The area has received extensive flood proofing including floodgates for the road and railway. At this site for SFCA3, 0 flow = 9.1 feet. This datum offset perhaps causes some confusion locally. We decided upon a bankfull stage of 17 feet, a minor flood stage of 21 feet, a moderate flood stage of 23 feet, and a major flood stage of 25 feet. These values are 2 to 3 feet lower than those reported in the E-19A dated 2/22/2001. (It should be noted that CFNA3 is also reported as the San Francisco River at Clifton, AZ. This gage has a different rating with 0 flow = 0 feet; and the above values are 6.25 for bankfull, 8.25 for minor, 9.25 for moderate, and 10.5 for major using this rating. It should also be noted that there is recent data for both SFCA3 and CFNA3 and it does not agree.)

**APRIL 23<sup>RD</sup>, DUNA3:** The Gila River at Duncan, AZ is a new gage that does not have a rating table yet. This gage is located approximately halfway between GVRN5 (upstream) and GCFA3 (downstream). Flow was estimated at 90 cfs. Given the wide sandy channel at this site, there could be considerable underflow at low flows. USGS reports that stage was 3.31 feet. We decided upon a bankfull stage of 9 feet, a minor flood stage of 12 feet, a moderate flood stage of 15 feet, and a major flood stage of 18 feet. These values should be reevaluated when a rating

table for the site is provided and zero flow determined. It should be noted that these numbers do not agree with the E-19A dated 2/19/2001. For example the E-19A has a bankfull stage of 3.0 feet which is lower than the observed stage at the time of our visit.

**APRIL 24<sup>TH</sup>, BNMA3:** Bonita Creek near Morenci, AZ is a tributary to the Gila River upstream of GLHA3. USGS reports that the City of Safford water supply intake is downstream of gage. The flow was estimated at 6 cfs, this measurement was made downstream of the gage where the stream was no longer braided. USGS reports that stage was 4.57 feet and flow was 2.1 cfs. However, it was observed that a portion of the stream's flow was bypassing the gage and thus not measured at the gage. We decided that the previously calculated wilderness values would be appropriate for this remote site. Therefore, bankfull stage equals 10 feet (in agreement with E-19A), minor flood stage equals 13 feet, moderate flood stage equals 18 feet, and major flood stage equals 23 feet. At these higher stages, the gage should work just fine.

**APRIL 24<sup>TH</sup>, CLDA3:** Coolidge Dam creates San Carlos Reservoir. At the time of our visit the water level behind the dam was 2418.74 feet, which is 91.66 feet below the spillway crest of 2,510.40 feet and is 116.46 feet below the dam crest elevation of 2535.3 feet. It should be noted that this is 36.11 feet above the sill of the lowest outlet gate elevation of 2,382.63 feet. This dam is no longer used for power generation. The outlet works capacity is 5000 cfs.

**APRIL 24<sup>TH</sup>, GCDA3:** The Gila River below Coolidge Dam can be used to forecast flows at Winkleman, AZ. At this site there is a parshall flume that controls flows below 2000 cfs. At time of visit the stage associated with the parshall flume was 1.24 feet corresponding to a flow of 160 cfs. USGS reports that stage was 1.1 feet and flow was 132 cfs. The USGS gage house sits high above the floodplain. We decided upon a bankfull stage of 9 feet (4000 cfs), a minor flood stage of 16.5 feet (10,000 cfs), a moderate flood stage of 37 feet (35,000 cfs), and a major flood stage of 41 feet (42000 cfs). It should be noted that for flows between 4,000 cfs and 10,000 cfs the gage might report incorrectly as water bypasses the gage until some reuniting stage, likely below flood stage, is reached.

**APRIL 24<sup>TH</sup>, SNCA3:** The flow at San Carlos River near Peridot, AZ was estimated at 4 cfs. USGS reports that stage was 5.35 feet and flow was 11 cfs. It was observed that the ponded water at the gage was not hydraulically connected to the flow. We decided upon a bankfull stage of 10 feet, a minor flood stage of 11 feet, a moderate flood stage of 12 feet, and a major flood stage of 13 feet.

**APRIL 24<sup>TH</sup>, TUFA STONE DAM:** We observed this site at a distance. It was dry and resembled a large detention basin. There are several residential areas being constructed below the dam.

**APRIL 25<sup>TH</sup>, GILA AT WINKLEMAN:** The Gila at Winkleman, AZ was once GLWA3. There are no gages at this location at this time. The flow was estimated at 150 cfs. We observed the community still abandoned since the last flood, the footbridge, and the town's waterfront park.

**APRIL 25<sup>TH</sup>, CONFLUENCE OF SAN PEDRO AND GILA:** The confluence of the San Pedro and Gila Rivers is downstream of Hayden, AZ in the vicinity of a railroad bridge. The rivers are braided in this location so the exact confluence was not observed. However, it was noted that the channel capacity appeared no greater here than it did at Winkleman.

**APRIL 25<sup>TH</sup>, GILA AT KELVIN:** The Gila at Kelvin, AZ is reported by the USGS as 18 miles downstream of the confluence of San Pedro and Gila. USGS reports that stage was 2.93 feet and flow was 171 cfs. Although we did not have time to discuss stages at the site, the values of 19 feet for bankfull, 21 feet for minor flood, 26 for moderate flood, and 30 for major flood provided in the E-19A dated 5/1/2001 seem reasonable.

**A**PRIL 25<sup>TH</sup>, DUDLEYVILLE: This area of potential floods was discussed during our return trip to Tucson. The possibility of using an RFC forecast for San Pedro at Redington (SPRA3) as well as forecast for San Pedro at Charleston (SAPA3). One gives more lead-time; the other provides an estimate of increases due to local.

## **RECOMMENDATIONS**

The gage below San Carlos Reservoir can be used for the reach of Gila to confluence with San Pedro including Winkleman and Hayden.

The Gila at Duncan should be revisited after a rating table is established.

The San Francisco River at Reserve should be visited.

## **ACTION ITEMS**

Enter agreed upon stages into the RFC's database.

Place photos taken during the trip upon website.