

# SEPTEMBER 9-13, 2002 FAMILIARIZATION TRIP

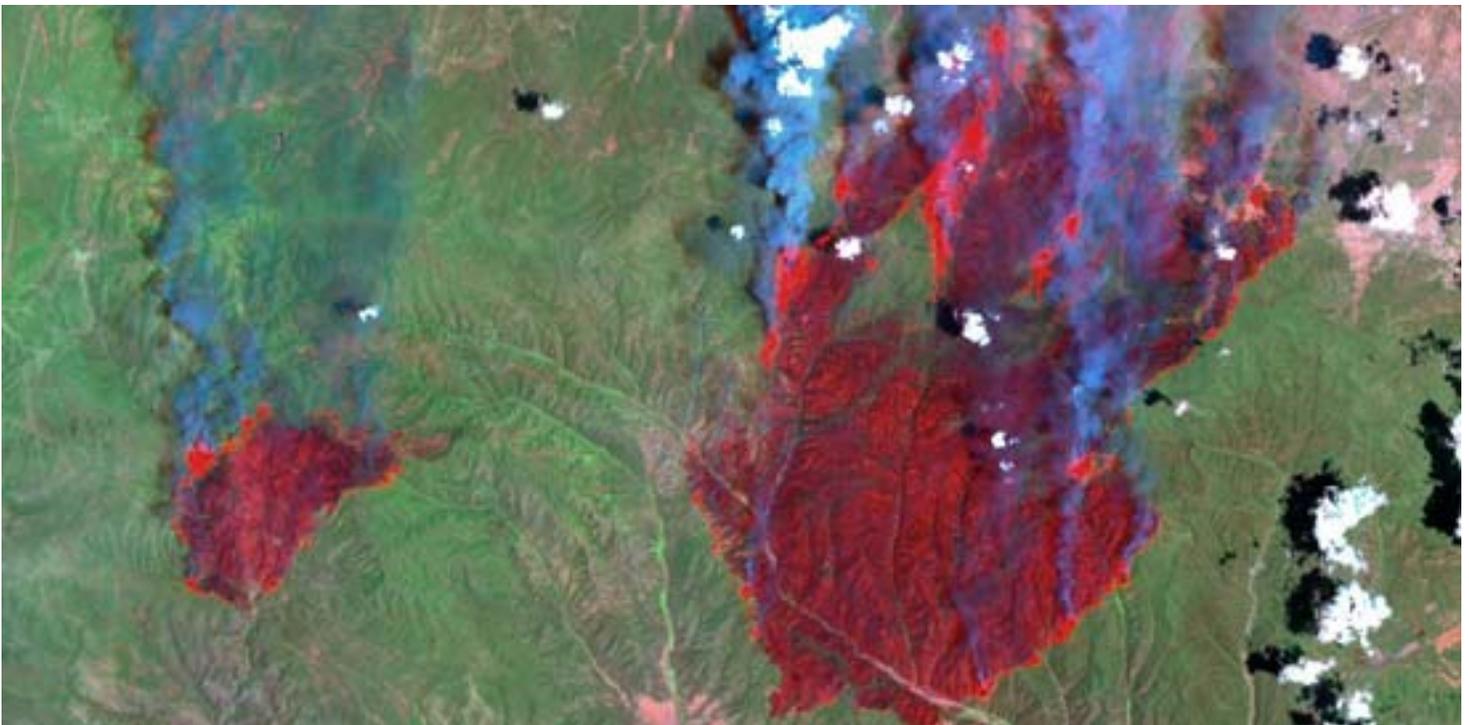
## Tucson and Flagstaff Hydrologic Service Areas Including the Drainages of the Chediski & Rodeo Fire

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### INTRODUCTION

Funding permitting, a familiarization trip is made to our focal point area at least once per year. As the Lower Colorado River focal point, my area includes Arizona. This year, I took this opportunity to visit:

- 1) **the Tucson Hydrologic Service Area (HSA)** -- meeting with and providing training to Tucson NWSFO's Hydrologist Intern Mike Schaffner; and
- 2) **the drainages of the Chediski & Rodeo Fire in Flagstaff's HSA.** On the Fort Apache Indian Reservation, the drainages south of the Mogollon Rim (specifically: Cibeqe Creek, Carrizo Creek, and Corduroy Creek) were visited. These sites were visited with Tribal Member Loren Lupe, Flagstaff's Hydrologic Focal Point Tom Clemmons, and Phoenix's Senior Service Hydrologist Tom Zickus. North of the rim, Tom Zickus and I visited several drainages with Navajo County's Deputy Director for Flood Control Tom Hieb **including Black Canyon Dam**. The Rodeo & Chediski Fire started on 06/18/02 and was contained on 07/07/02, total acres burned was 468,638. The soils throughout this area have become hydrophobic (water repellent).



The Rodeo and Chediski fires in Arizona on June 21<sup>st</sup>, 2002 as seen by the Landsat 7 satellite. The Rodeo Fire (red area on the right) is over the upper Carrizo Creek drainage area. The drainage area at bottom center of image is upper Cibeqe Creek. The two fires merged on June 24<sup>th</sup>. Image obtained from <http://www.fs.fed.us/eng/rsac/>.

## LOGISTICS

**Monday:** Departed Salt Lake City for Phoenix at 6:15 am. Arrived Phoenix at 7:00 am. Tom Zickus, who provided transportation to NWSFO Phoenix, picked me up at the airport. I checked out a government car at NWSFO Phoenix and drove to NWSFO Tucson. Arrived Tucson at 11:00 am.

Drove with Mike Schaffner to near the gaging sites: RINCON CK - TUCSON, NR (RINA3) and PANTANO WASH - VAIL, NR (PNTA3). We also visited the gaging sites: RILLITO CK - LA CHOLLA BLVD (RICA3) and RILLITO CK - TUCSON, DODGE BLVD, AT (RILA3).

**Tuesday:** Mike Schaffner and I visited, in a government owned 4x4, the gaging sites: SANTA CRUZ – TUBAC (STBA3) and SANTA CRUZ – CONTINENTAL (SCCA3). I also revisited RILLITO CK - TUCSON, DODGE BLVD, AT (RILA3) to observe flow due to local afternoon downpour with hail.

**Wednesday:** Mike Schaffner and I visited, in a government owned 4x4, the gaging site, PANTANO WASH - VAIL, NR (PNTA3). Departed Tucson after lunch and drove to NWSFO Phoenix. Dropped off government car and picked up a government 4x4. Drove to Flagstaff with Tom Zickus.

**Thursday:** Met Tom Clemmons at hotel and in two vehicles drove to Show Low. On the way to Show Low, we visited the LITTLE COLORADO RIVER NEAR WINSLOW (LCWA3) gaging station. At Show Low we met with Loren Lupe, our guide for the day. Since Loren also had a truck, we left one 4x4 in Show Low.

**On the Fort Apache Indian Reservation,** we visited the following gaging and non-gaging sites: low water crossing upstream of SOWA3, CORDUROY CREEK NEAR SHOW LOW (SOWA3), Corduroy above confluence at Carrizo, Carrizo above confluence at Carrizo, CIBECUE CREEK NEAR CIBECUE (CBCA3), Cibecue at "crossing" downstream of OVGA3, CIBECUE CREEK NEAR ELK CAMP, aka. NEAR OVERGAARD, (OVGA3), and Chedeski Peak. We also drove by CARRIZO CK NEAR SHOW LOW, actually located downstream of Carrizo, (CRZA3). Tom Zickus and I spent the night in Show Low. Tom Clemmons returned to Flagstaff in order to work an operational shift the following morning.

**Friday:** Met Tom Hieb at hotel. With Tom Hieb, Tom Zickus and I visited the following gaging and non-gaging sites: Hog Wash in Linden area, Timberland Acres, BUCKSKIN WASH AT HEBER (LBWA3), BLACK CANYON WASH AT HEBER (LBKA3), and BLACK CANYON DAM (LBDA3). While returning to Highway 260, Tom Zickus and I visited HEBER SNOTEL (HBEA3) adjacent to Mogollon Rim Road.

## OBSERVATIONS TUCSON HSA

**RINA3.** We crossed Rincon Creek at the Old Spanish Trail low water crossing that is approximately 3 miles downstream of gage. The headwaters of this creek lie within Saguaro National Monument and thereby are protected from development. Outside the park, the ranch land of Rincon Valley is slowly giving way to several residential developments.

**PNTA3.** This gage is the site of a small dam/weir on Pantano Wash within the Cienega Creek Natural Preserve. The natural preserve protects the riparian corridor; however, the watershed outside the corridor continues to be developed. We crossed Pantano Wash on Colossal Cave Road Bridge that is approximately 1 mile downstream of the gage. As directed by the USGS, we approached the site by traveling a 4x4 road between the two lines of the Southern Pacific. Upon reaching the first major tributary, we parked our vehicle in the wash and crossed under the northern track through an underpass. The gage was a short distance east (upstream) of the confluence. The drop at the dam wall is approximately 4.5 feet. There are pools both above and below the dam. The flow was approximately 3 cfs.

**RICA3.** This site had no flow at the time of our visit on September 9<sup>th</sup>. The next day it peaked at 1,600 cfs at 17:15. Assuming that RILA3 contributed 500 cfs to this peak, then 1,100 cfs (68% of the peak) was contributed by the local urban drainage.

**RILA3.** This site had no flow at the time of our visit on September 9<sup>th</sup>. The next day it peaked at 116 cfs at 21:15 (USGS preliminary records). However, I estimated a flow of 500 cfs at 16:20. For a live view of the site (if operating) see [http://az.water.usgs.gov/webcam/9485700\\_cam/cam\\_09485700.html](http://az.water.usgs.gov/webcam/9485700_cam/cam_09485700.html). This USGS webpage also includes a few good photos of the site.

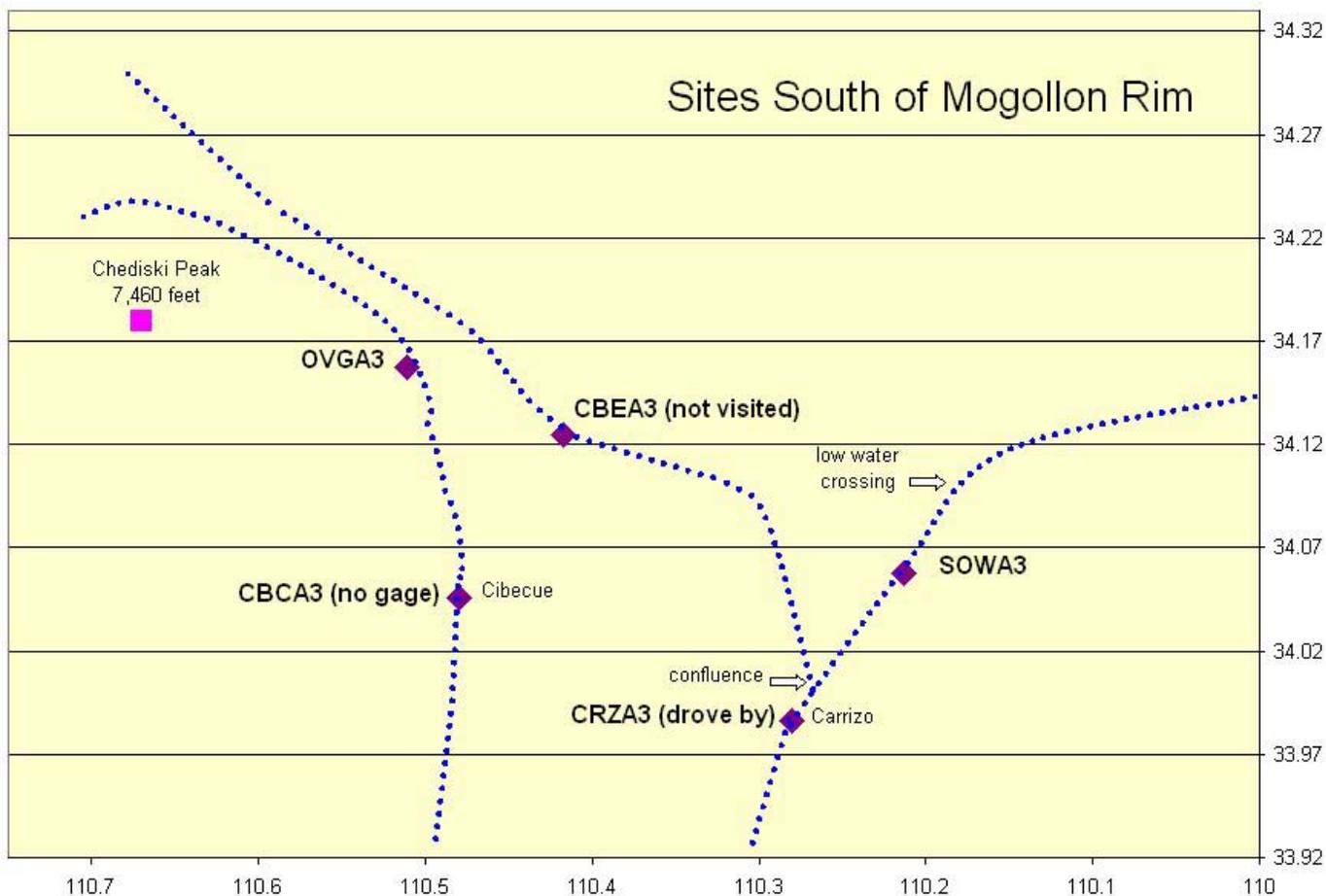
**STBA3.** There is an artist community and State Park at this historic town located approximately 40 miles south of Tucson. The Santa Cruz River flows from Mexico to Tucson and it is a tributary to the Gila River (confluence near Tempe). At Tubac, the drainage area is 1,209 square miles with 395 square miles in Mexico (USGS data). The gage was not reporting a flow at the time of our visit. However, we estimated the flow to be 10 cfs.

**SCCA3.** This gage is located approximately 20 miles south of Tucson. The area adjacent to the gage is a pecan grove. The natural banks have been raised on both sides of the river. However, these banks are not hardened like the ones adjacent to the residential community upstream of the grove.

## OBSERVATIONS FLAGSTAFF HSA

**LCWA3.** See Photo 1 in Appendix I; the river was flowing bank to bank. As mention in my trip report for travel the week of November 26, 2001, NWSFO Flagstaff is considering requesting a forecast at this new gage, established within the last year. A quick stop was made at this site between Highway 40 lanes.

### --- 7 SITES SOUTH OF MOGOLLON RIM ---



**LOW WATER CROSSING UPSTREAM OF SOWA3.** Recent flow at this site was estimated at 2,000 cfs from a high water mark of 4 feet, width at bottom of 50 feet, width at top of 150 feet, and assuming a velocity of 5 ft/sec. Flow at time of visit was estimated at 2.25 cfs.

**SOWA3.** See Photo 2 in Appendix I; the gage house is located high above the channel. The hike to this site is strenuous requiring a scramble down a steep canyon wall. Once down we had to crisscross the flowing channel several times. Recent flow at this site was estimated at 3,600 cfs from a high water mark of 6 feet, an average width of 100 feet, and assuming a velocity of 6 ft/sec. Flow at time of visit was estimated at 6.2 cfs. Gage was reporting a higher flow due to silting in of lower orifice. To resolve this recurring problem, the sensor could be removed from the lower orifice and placed in the upper orifice.

**CONFLUENCE OF CORDUROY AND CARRIZO.** See Photo 3 in Appendix I; the author is pointing to upper high water mark for Carrizo Creek. Distance from rim to confluence along Carrizo Creek's main channel is approximately 30 miles. Distance from rim to confluence along Corduroy Creek's main channel is approximately 25 miles. Recent flows of Carrizo Creek were estimated at 9,000 cfs (most recent) and 11,000 cfs from corresponding high water marks of 4.5 feet (most recent) and 7 feet. Recent flow of Corduroy Creek was estimated at 4,500 feet under backwater conditions.

**CBCA3.** See Photo 4 in Appendix I; proposed site for staff gage. There is no gage at this site where a forecast for the town of Cibecue is desired. The bridge at this site has a capacity of approximately 20,000 cfs (approximately the 100-year event). Flow at time of visit was estimated at 21 cfs.

**CIBECUE AT THE CROSSING DOWNSTREAM OF OVGA3.** See Photos 5 and 6 in Appendix I. Here it was noted that two or three culverts are now needed instead of one. Presently, due to overflow, the road upstream of culvert has to be re-graded about every other week instead of annually.

**OVGA3.** See Photo 7 in Appendix I. At this site the sensor is placed in the upper orifice. Recent flow at this site was estimated at 4,000 cfs from a high water mark of 9 feet. Flow at time of visit was estimated at 1.2 cfs. If gage is working properly, then the upper orifice must be higher than 9 feet + 15.8 feet (zero flow elevation) = 24.8 feet.

**CHEDISKI PEAK.** See Photo 8 in Appendix I; notice the fern undergrowth coming back near Chediski Peak. This peak is located near the hydrologic divide between Canyon Creek to the southwest and Cibecue Creek to the northeast. The view from this peak provided a glimpse of slopes covered in ash and completely void of trees within the upper Canyon Creek, Cibecue Creek and Carrizo Creek drainages.

### --- 6 SITES NORTH OF MOGOLLON RIM ---

**HOG WASH IN LINDEN AREA.** See Photo 9 in Appendix I. This site north of the rim was experiencing the same kind of problem as the road crossing downstream of OVGA3, i.e., increased runoff from hydrophobic soils is causing the road to be washed out more frequently. Here construction was taking place to deal with the problem.

**TIMBERLAND ACRES.** Houses on forested lots are now empty lots of blackened trees. Yet a few houses still stand, and many that were destroyed are now being rebuilt.

**LBWA3.** See Photo 10 in Appendix I. The headwaters of Buckskin Wash are directly north, across the rim, from the headwaters of Carrizo Creek. Distance from the rim to Heber along the main channel is approximately 10 miles. Buckskin Wash is a tributary of the Black Canyon Wash, and lies to the east. The confluence of Buckskin Wash and Black Canyon Wash is just downstream of the Highway 260 bridges. There is an ALERT gage at the bridge (on the downstream side), however, we (CBRFC) seem to receive data only sporadically. Perhaps it is set to report only twice per day and a few reports are missed.

**LBCA3.** See Photo 11 in Appendix I. Distance from the rim to Heber along Black Canyon Wash is approximately 15 miles. There are several homes within the floodplain. A dam failure would likely cause damage upstream of Highway 260. There is another ALERT gage on the downstream side of this bridge, however, we at CBRFC seem to receive data only sporadically from this gage as well. Perhaps it is also set to report only twice per day and also a few reports are missed.

**LBDA3.** See Photo 12 in Appendix I; the author is standing in the spillway. At Black Canyon Dam, the upper portion of the lake has receded approximately 120 yards (the length of a football field) leaving boat

ramps high and dry. The water level at time of visit was approximately 21 feet below spillway crest (water level was approximately 26 feet below top of dam). The spillway capacity = approximately 1,850 cfs. Additionally, at the base of the dam there is a 1.5 foot diameter controlled release pipe. According to Arizona Game & Fish Department, no trout survived in this lake after the fire.

**HBEA3.** See **Photo 13 in Appendix I.** Only a small circle around the site was not burned. An interesting story must exist about how this site was saved from the flames.

## ACTION ITEMS

- Correct plotting of BNGA3 on our webpage (done).
- Follow through with Tom Hieb to obtain cross sections downstream of Black Canyon Dam used by COE to simulate a dam break (email sent). Tom Zickus may make a visit to Tom Hieb's office.
- Request from Tom Hieb rating tables for LBWA3 and LBCA3 (email sent).
- In interim, develop synthetic ratings and estimate stages and flows for Bankfull, Flood, Moderate, and Major at CBCA3, LBWA3, and LBCA3 (done).
- Look into why data is sporadic from LBWA3 and LBCA3, i.e., determine reporting schedule and cause of missing data (email sent to Tom Clemmons).
- Provide stages and flows for Bankfull, Flood, Moderate, and Major at 303 Flow Sites in AZ (Excel file sent via email to Mike Schaffner, Tom Clemmons, and Tom Zickus).
- Provide Mike Schaffner a brief description of the differences between issued forecasts and our webpage during high flows (email sent).
- Look into how CBRFC forecasts are plotted on NWSFO AWIPS. It is my understanding that during times when a SLCRVFUG is issued (or other specific forecast), the SLCRVFUG should be plotted on local office AWIPS for use by forecasters. At other times I assume SLCRVFMCT is plotted. However, the WHFS display may not be able to handle the two products overwriting each other (Tom Zickus is the lead).
- Correspond with the USGS to ascertain the present configuration of gaging stations on Reservation. The placement of sensor in upper or lower orifice affects the way the gages operate. (I have contacted both Tucson and Tempe USGS offices and have obtained current configuration for two of the gages. However, USGS will be in the field the week of September 30<sup>th</sup> and will provide more details upon return.)
- Visit the upper Gila watershed with Mike Schaffner in April 2003.
- Visit CBEA3 if it becomes accessible.

## CONCLUSIONS

- Continuing urbanization of the Tucson metropolitan area will present major problems during what were previously minor flood conditions. This will be especially true at low-water crossing and where bridges in the urban area are not designed for the 100-year flood.
- Due to watershed differences between Corduroy Creek and Carrizo Creek--in percent burn and burn intensity--the flows of Carrizo Creek will likely be impacted more than the flows of Corduroy Creek.
- Until dual instrumentation is established; perhaps, SOWA3, CBEA3, and OVGA3 should all have sensor placed in upper orifice. This will eliminate poor data at low flows.
- If dual instrumentation is established; perhaps, it would be best for each sensor to transmit on a different frequency.
- The health of the watersheds visited in the burn area may take three to five years to recover. However, not all watersheds were visited: others may take longer.
- Based upon recent channel changes, it is my initial impression, that runoff from the burn area is currently two to three times normal. In other words, a precipitation event that would have normally caused bankfull flow may now cause a significant out-of-bank flow. This is true for both sides of the rim.
- At CBCA3 it would be beneficial to establish a staff gage on the upstream face of the bridge for high flows and downstream at the natural control for low flows.
- There are several drainages in Navajo County where extensive upper watershed fire damage may cause increased runoff downstream (e.g., Hog Wash, Linden Draw, Mortensen Wash, Cottonwood Wash, Day Wash, Buckskin Wash and Black Canyon Wash).
- The channels of Buckskin Wash and Black Canyon Wash in the vicinity of Heber are actively adjusting to increased runoff from the burn area. The potential for flooding has greatly increased in both drainages.

- Presently the water level below Black Canyon Dam is approximately 21 feet below the spillway crest. Therefore, at this time, there appears to be plenty of storage for increased runoff from the small watershed above the dam.

**Appendix I: Photos by Tom Zickus, NWSFO Phoenix.**

**Appendix II: Field Data (spreadsheet provided by email).**

**Copies of report sent to: Tom Zickus (2), Tom Clemmons (2), and Mike Schaffner (2).**