



***E. coli* Reduction on the San Francisco and Blue Rivers: How We Did It and What Lies Ahead**

By Deborah Mendelsohn, Project Coordinator

In 2008, the Arizona Department of Environmental Quality (ADEQ) made it official that there was a problem with fecal contamination on portions of the San Francisco and Blue Rivers. This was based on tests that they and other agencies had done on water samples from the two rivers, looking for the “indicator pathogen” *Escherichia coli* (*E. coli*). Greenlee County Engineer Phil Ronnerud approached the Gila Watershed Partnership’s Executive Director Jan Holder about the possibility of obtaining grant funding to address the contamination. In 2009, the GWP was awarded funding from ADEQ to research the source of the *E. coli* issue.

It’s worth reflecting for a moment here on what the San Francisco-Blue watershed is. It is the largest tributary to the Gila River. It’s vast: 2,700 square miles, roughly half in Arizona and half in New Mexico. It’s very thinly populated:

the 4,000 residents in the Arizona part of the watershed are mostly in Clifton and Morenci. On average, the population density is about two persons per square mile. The wildlife population is, of course, outstanding. Big-horn sheep wander through Clifton regularly. So, a little less regularly, do mountain lions.

Most of the riparian area is difficult to impossible to access, especially when rains or snowmelt swell the rivers. To the extent that the Frisco and Blue are reachable, they support moderately diverse land uses, mainly ranching and farming, hunting and camping, fishing, swimming and boating, urban parks and RV sites. Both rivers have high-value potential for outdoor-oriented tourism.

And both are populated largely by folks who would prefer to be left alone with the rigors of their daily work, which includes dealing with the aftermaths of occasional high waters.

Starting out, we knew we had two related jobs to do. The first one was the field research itself. We organized that upon the following principles: testing in places where *E. coli* exceedances had been recorded in the past; testing in just about every other place we could get to and still get samples into the incubator within the required six hours; testing repeatedly in places where we saw conditions that could contribute to exceedances: cattle, beaver dams, recreation. None of this was easy, given the distances and the terrain.

The second job was to organize people from the area that would be interested in the *E. coli* contamination, and where it was coming from. We brought in our U of A scientific advisors to present background information. Our project quickly engaged a committed group of intelligent local people with broadly divergent opinions. Over time they became our "Watershed Improvement Council." They reviewed the field research as it came in, and eventually developed the recommendations that have been incorporated into the project's Watershed Improvement Plan.

Greenlee County epidemiologist Dr. Matt Bolinger was a pivotal figure in these early stages. He had concerns that there really was a public health hazard when there was little evidence that anyone in Greenlee County had become ill from contact with the San Francisco River. He was speaking for a lot of people in the area when he asked that question.

Dr. Suzanne Menges, an educator and Greenlee County rancher, was concerned about the intent of the project, and the sources of some of the *E. coli* exceedances. She asked hard questions, and ensured that the project's findings were based on hard facts and real science.

Dr. Channah Rock, Professor with the U of A presented to the Watershed Improvement Council information on what the *E. coli* exceedances really mean, that they point to the presence of any number of bacteria, viruses and parasites that have caused very serious health problems in other public

recreational waters. She and her team at the U of A Maricopa Agricultural Center Water Quality lab put our water samples through tests to determine whether the *E. coli* in the Frisco and the Blue originated from humans, cattle or "other," which includes wildlife and domesticated animals such as cats or dogs. We weren't as concerned about wildlife fecal contributions because those are a given in any watershed.

Dr. Rock rejected an initial group of test results that were overwhelmingly positive for cattle. Suspecting a flaw in the test itself, she began a long process involving other microbiologists and an EPA lab in vetting several bovine *E. coli* tests until they landed on one they believed was reliable. This took many months of work that no one had foreseen. In the end, there were results that associated some of the *E. coli* problems in the Frisco and Blue with cattle. By then, though, we had a clear, comprehensive picture of what was happening in the watershed. Cows were just one part of it.

Here are the most significant trends findings of our research:

- One hundred percent of *E. coli* exceedances recorded by GWP occurred in the summer monsoon months between July and September, in both 2010 and 2011.
- A total of 120 samples taken in the months of October through June in 2010 through 2012 consistently produced low *E. coli* numbers regardless of location.
- *E. coli* exceedances occurred in 29.4% of all samples taken in 2010 through 2012 (214 total samples successfully processed).
- *E. coli* exceedances occurred in 67.0% of samples taken during the months of July through September in 2010 and 2011 (94 total samples successfully processed).
- *E. coli* numbers remained low in early summer until the onset of summer monsoon rains.
- *E. coli* numbers remained high after monsoon rains tapered off, until cooler temperatures occurred in mid to late September.
- Contamination from recreation is clearly established as a cause of seasonal *E. coli* exceedances on the San Francisco River from

State Lands to Morenci Gulch, based on combined Microbial Source Tracking results and field observations.

- Contamination from livestock watering in the stream is clearly established as a cause of seasonal *E. coli* exceedances on the lower Blue River in the area of Juan Miller Crossing and on the San Francisco River from just upstream of Hole in the Rock on State Lands through the Town of Clifton, based on combined Microbial Source Tracking results and field observations.
- Contamination from livestock watering in the stream is less clearly established as a cause of seasonal *E. coli* exceedances on State Lands above the upper Hole in the Rock sampling site.

The cattle-related *E. coli* in the lower Blue was a troubling fact for the team and watershed council since cattle had been removed from the National Forest there many years before. But eventually the mystery was solved. Forest Service personnel and private citizens began documenting the presence of wild cattle in the region, possibly as many as 100. Once this was clearly established, the Forest Service put a round-up plan into effect, which is underway this fall.

Another dramatic aspect of this project was the impacts of the Wallow Fire of 2011, and then the Whitewater-Baldy Fire of 2012. The Wallow fire's extraordinarily high intensity created sterile zones in the upper watershed that threatened to leave the area highly unstable, affecting both sedimentation and water chemistry for months and possibly years to come. Post-fire runoff increases nutrients in streams, especially nitrate and phosphorus, which is transported with sediments; higher nutrient levels in the stream are well known to promote the growth of *E. coli*. The ashy sediments filling the rivers killed nearly all the fish, both native and non-native, and virtually shut down recreation on the rivers.

Just one year later, as riparian vegetation was rebounding thanks to highly successful seeding work by the Forest Service and the good fortune of a gentle summer monsoon, the Whitewater-Baldy fire burned mountainous tracts of the San Francisco watershed in New Mexico. The dense, ashy water returned, rolling through Clifton and on down through the Gila Box into

Graham County. Once again aquatic life was devastated, and camping areas along the river were eerily quiet. *E. coli* levels consistently went off the top of our charts during the post-fire rains.

Before we conclude with the recommendations made to ADEQ by our watershed improvement council, we should mention three excellent outcomes of this project. One is the founding of Friends of the Frisco, a community volunteer group that organizes regular river bank clean-ups with the support of Freeport McMoRan, Gila Health Resources and other local businesses and individuals. Another is the first Master Watershed Steward course in Greenlee County, conducted with the support of Bill Brandau, Phil Ronnerud, Channah Rock, Suzanne Menges, Matt Bolinger and others, which graduated 22 highly motivated people from the community. Finally, Graham County Cooperative Extension teacher Cindy Pearson presented four surface water quality units to Clifton and Morenci schoolchildren, even taking them out on the San Francisco to collect and test water samples.

Our Watershed Improvement Plan for the region, presented to ADEQ and EPA in June of this year, noted that while test results show bovine and human contributions to *E. coli* in the watershed in roughly comparable measures, the scientific advisors to this project, Drs. Channah Rock and Phil Guertin, both state that human contributions constitute a more serious threat to human health than bovine contributions. The recommended "best management practices" address both sources. These include the following: 1) toilet facilities in key recreation areas, augmented by prominent visitor information and public outreach; 2) off-riparian solar wells that will remove a ranchers livestock from the riparian area, augmented by public outreach; 3) targeted signage that includes general keep-it-clean and specific pit toilet-related signage in recreation areas, augmented by public outreach. The full San Francisco-Blue Rivers Watershed Improvement Plan is available on the Gila Watershed Partnership's web site at: www.gilawatershedpartnership.com, on the Downloads page.

Project and Program Status Report

AWPF Eagle Creek Riparian Restoration at Filleman Crossing Project – Souder, Miller & Associates (SMA) has completed the Archeological Survey and the Biological Survey. SMA is working on the 404 permit for submittal to the Army Corps of Engineers. SMA met with Phil Ronnerud, Darcy, and Gary Ely in September to discuss the project and construction. Additional funding has been supplied for this project by the USFW Partners grant program.

ADEQ Education Master Watershed Steward Program, Phase II - We have eight people registered and we have completed five classes and one field trip. This week's class features Dr. Phil Guertin, lecture, titled An Introduction to Hydrology. Last week's class's subject was on the climate. It was opened to the general public by special request. Approximately 20 people heard Dr. Mike Crimmins's discussion of weather and climate. Anyone interested in volunteering to help in the field research on sediment detention structures is welcome – it will be fun and challenging outdoor work. Call Deborah Mendelsohn at 928-200-0790.

The AWPF Gila River Water Conservation Education Program – The water analysis team continues their work. Anyone, whether you are a business, residence, or municipality (even those on a well or partial well system) can request an analysis – and save water and money - by calling 928-228-8730.



Bill Brandau and his Watershed Steward class.

AWPF Eagle Creek Riparian Protection Project - Implementation plans are being prepared.

The BOR Graham County Fairgrounds Project – Installation is continuing for a reverse osmosis system to improve the water quality at the fairgrounds .

The USFW Partners Syfert Wildlife Watering Facility – The project is being implemented as this newsletter is being completed. We will have a full report and a presentation next month.

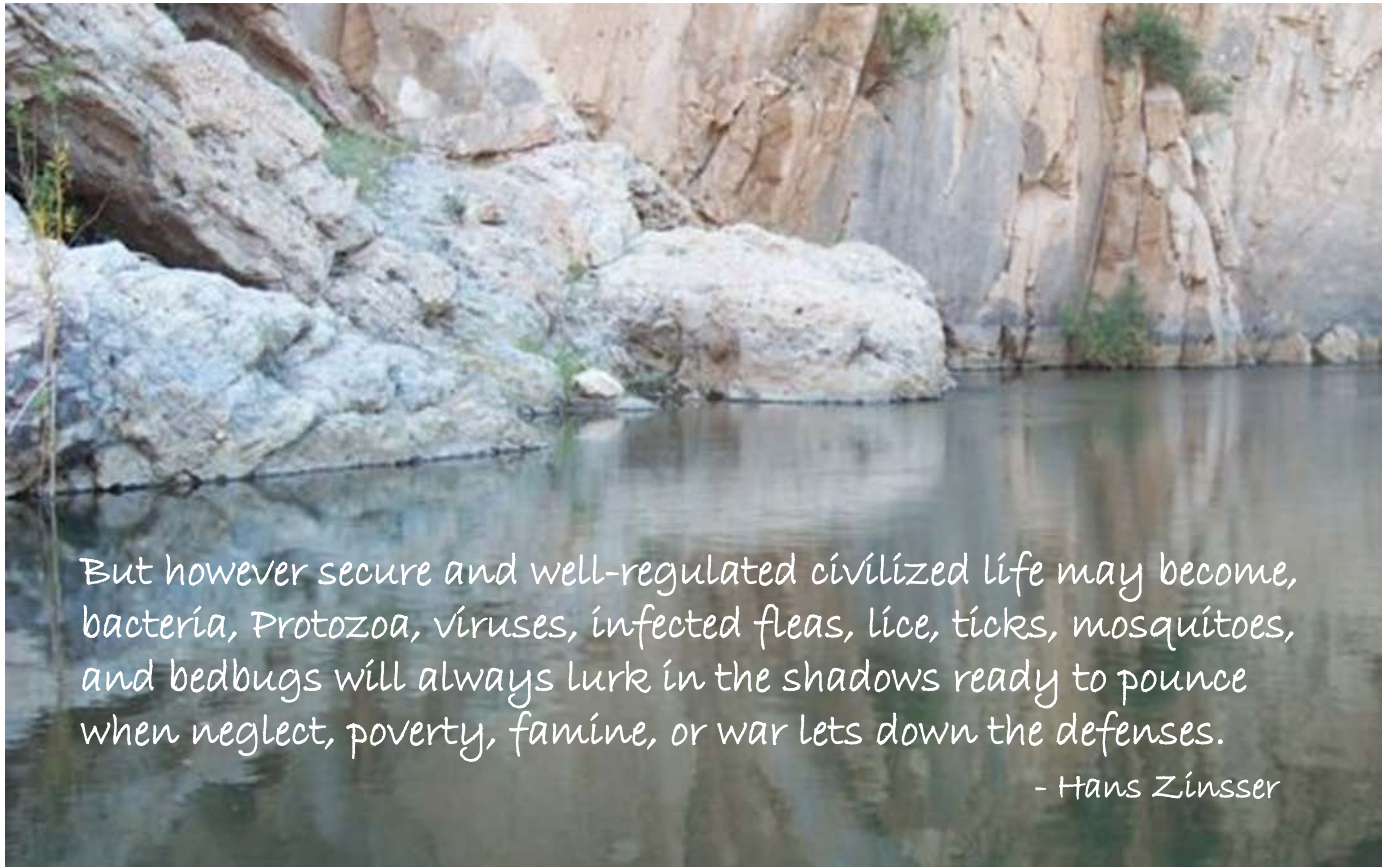
The Walton Family Foundation Upper Gila Watershed Riparian Restoration Project – We have applied for a grant from the Walton Family Foundation to develop a science-based restoration framework for the Upper Gila Watershed, and a restoration implementation plan. The project will include education and outreach and the development of a native plant nursery for future restoration work. We have a tentative approval for our application, and we hope for a November 1 start date.



Robert Porter, GWP newsletter editor, is an Engineer with Souder Miller and Associates, and is a past board chair.

EDITOR'S

NOTE: This photo is from the GWP archives. It is at Hole in the Rock on the Blue River. I have been to the confluence of the Blue and Gila Rivers during the construction of the fish barrier on the Blue River. It is surprising that such a beautiful River can be so potentially hazardous to public health. We all owe a great big thank you to Deborah Mendelsohn and the "Watershed Improvement Council" for these rivers to have trekked throughout the Frisco and Blue River Watersheds to collect samples and begin to address a critical public health issue.



But however secure and well-regulated civilized life may become, bacteria, Protozoa, viruses, infected fleas, lice, ticks, mosquitoes, and bedbugs will always lurk in the shadows ready to pounce when neglect, poverty, famine, or war lets down the defenses.

- Hans Zinsser

Calendar of Events

Wednesday, October 10, 2012 @ 7 p.m. - Deborah Mendelsohn will give us a report on the *E.coli* Reduction on the San Francisco and Blue Rivers project. It was a highly successful project that identified the sources of a serious *E.coli* impairment on the Lower Blue and San Francisco Rivers in Greenlee County.

Wednesday, November 14, 2012 @ 7 p.m. – Susan Syfert gives us a report on the wildlife watering facility she installed on her property using funding supplied by the USFW Partners program.

Our partners include:

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| Arizona Department of Agriculture | Eastern Arizona College |
| Arizona Department of Environmental Quality | Farm Bureau |
| Arizona Department of Transportation | Freeport McMoRan Copper and Gold Inc. |
| Arizona Department of Water Resources | Graham County |
| Arizona Game and Fish Department | Greenlee County |
| Arizona Geological Survey | Gila Valley Irrigation District |
| Arizona State Land Department | Natural Resource Conservation Service |
| Bureau of Land Management | University of Arizona Cooperative Extension |
| City of Safford | University of Arizona NEMO Project |
| Town of Thatcher | U.S. Fish and Wildlife Service |
| Town of Pima | U.S. Forest Service – Apache |
| Town of Clifton | Sitgreaves and Coronado Forests |
| Town of Duncan | U.S. Bureau of Reclamation |
| Gila Valley NRCD | And many community members |

Get involved in your watershed

For more information, contact Jan Holder at the Gila Watershed Partnership, 711 S. 14th Avenue, 85546, 520-419-0374, email-watershedholder@gmail.com