



KALER RANCH EROSION CONTROL PROJECT PHASE II
FINAL REPORT
ARIZONA WATER PROTECTION FUND
CONTRACT NUMBER 07-145WPF

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
INTRODUCTION	4
SITE BACKGROUND AND HISTORY	5
STATEMENT OF THE PROBLEM	7
PROJECT GOALS AND OBJECTIVES	10
SUMMARY OF RESULTS	11
PROJECT CONCLUSIONS	16
RECOMMENDATIONS FOR FUTURE PROJECTS	17
MONITORING REPORT	19

The project is located adjacent to the San Francisco River six miles from the historic town of Clifton, in Greenlee County, Arizona. The owner, who is a livestock producer, was not informed at the time of sale that a highway project abandoned years before would have significant impacts on his property, under certain rainfall conditions.

Huge culverts installed to drain water off of the new road were never completed, and ended on flat benches within the Kaler ranch, some distance from the river's edge. During low to normal rainfall periods, the culverts drained sediments from the unpaved roadway above to those benches. Under heavy rain conditions, the drainage had disastrous consequences to that reach of the river and to the Kalers' personal property.

According to the Greenlee County Engineer, removing the culverts was far too costly to undertake. GWP was able to devise a different solution to the incomplete culvert structures. This grant was written to match an ADEQ grant to extend four of the culverts to the river's edge, add a vegetation buffer and a bulwark to reduce erosion, and install fencing to exclude livestock from the riparian area.

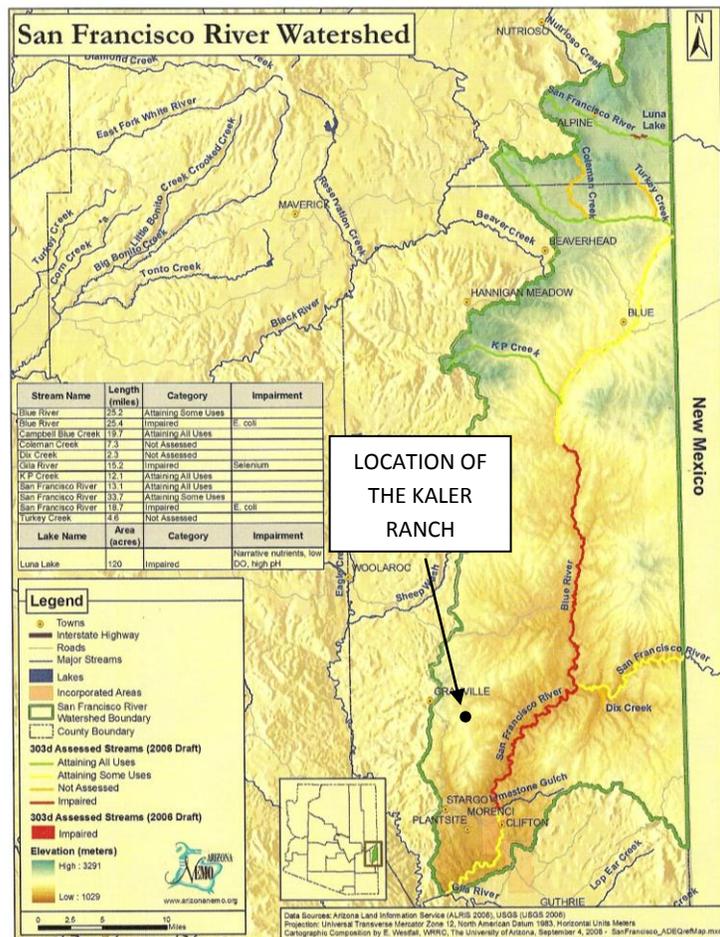
The results of these activities were supported by an expert assessment of vegetative cover and other basic indicators of riparian health.

The project has succeeded in all of its stated objectives. It has also made a significant contribution to a wider strategy of solving sedimentation and pathogen problems in the San Francisco River, a major tributary to the Gila River.

In 2006, the Gila Watershed Partnership (GWP) wrote a grant to the Arizona Water Protection Fund on behalf of Richard and Lois Kaler to address a serious problem on the San Francisco River in Greenlee County, Arizona. It was intended to match a grant from the Arizona Department of Environmental Quality (ADEQ). In addition, more funds were needed as costs had risen since the original grant was written, the cost for labor was underestimated, and enhancements had been recommended by the

Natural Resources Conservation Service (NRCS) and other advisors to the project.

Those enhancements included: 1. new fencing to replace the decades old, damaged and inadequate fence on the west side of the river, and additional fencing to control the landowner's livestock, 2. a vegetation buffer to increase the stability of the banks of the San Francisco River and the field benches, to slow down sheet flow descending from upland areas during rainfall events, and to decrease erosion and reduce the sediment load in the San Francisco River, 3. installation of a bulwark to protect a vulnerable area on the river bank, 4. dust control to reduce sediment reaching the river during construction, and 5. road repair to fix the roads due to the damage from construction vehicles. In addition, the condition of the riparian area and the water quality of the San Francisco River suggested that additional monitoring was warranted. This was also recommended by ADEQ after the award of their 319 grant. Their TMDL (Total Maximum Daily Load) department suggested that the San Francisco River may be impaired by E.coli. The grant was awarded in winter of 2006.



SITE BACKGROUND AND HISTORY

The project is located adjacent to the San Francisco River six miles from the historic town of Clifton, in Greenlee County, Arizona. The area has historically been utilized for cattle ranching. The owner, who operates a traditional cow-calf operation, also has a grazing allotment with the Bureau of Land Management (BLM). He is in good standing with the BLM. He also has a grazing lease with the Arizona State Land Department, and a private lease with the Freeport McMoRan mining company.

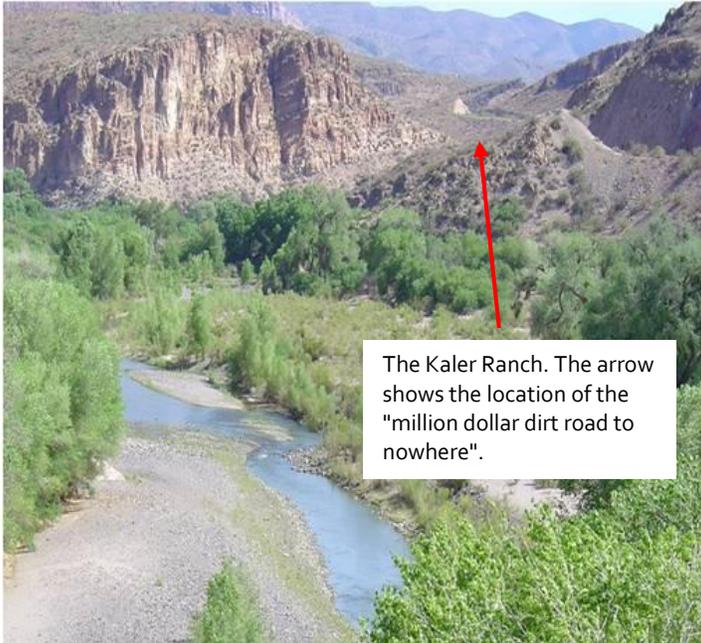
The river is accessed by a well maintained road that traverses along and through the river. Recreational use occurs year round. The area supports camping, backpacking, hiking, picnicking, recreational driving, fishing, hunting, horseback riding, water play, tubing, kayaking, bird watching, photography, nature study and mountain biking.

The area around the Kaler Ranch has been and still is used for mineral extraction. The Freeport McMoRan Morenci operation is approximately one and a half miles west of the allotment. Numerous old abandoned mine shafts, and current mining claims occur throughout the allotment. Metals, primarily copper, are mined, but mining operations for limestone and agate also occur in the area.



Vegetation in the area includes scrub grassland, cottonwood and mesquite. Soils consist of weathered granite and fine silty loam.

Special status species in the area include the Apache Trout, Gila Chubb, Gila trout, Speckled Dace, Razorback sucker, Common Black Hawk, Yellow-billed Cuckoo, the Southwest Willow Flycatcher, Mexican Spotted Owl, Lesser Long-nosed Bat, Chiricahua Leopard Frog and the Mexican Grey Wolf. In addition, the San Francisco is suitable habitat and designated critical habitat for the endangered Loach Minnow, and according to the BLM, a population in very low number may still exist in the river south of the forest boundary.



The Kaler Ranch. The arrow shows the location of the "million dollar dirt road to nowhere".

In 1972 the State of Arizona and the Phelps Dodge Mining Corporation put in the road bed for a highway intended to replace the section of Highway 191 that runs through the Morenci Mine.

Now known in the community as "the million dollar dirt road to nowhere," the project was abandoned due to the difficulty of construction and the disproportionate costs involved. It is maintained by the county

as an unpaved river access road, and on weekends and holidays is heavily traveled.

Huge culverts installed to drain water off of the road were never completed, and ended on flat benches within the ranch some distance from the river's edge. During low to normal rainfall periods, they drained rocky sediments from the unpaved roadway above that blocked private access roads. According to the Greenlee County Engineer, removing the culverts was not practical due to the prohibitive cost.

In addition, Mr. Ronnerud determined that their removal would de-stabilize the road during rainfall events, and would create new, unknown erosion



The arrows point to two of the culverts prior to the project implementation, ending at the eastern edge of the ranch fields

issues that may be a larger problem than extending the culverts. The "million dollar road to nowhere" is the road to the Kaler Ranch, as well as other private, county, state, BLM, and Forest Service properties. It was Mr. Ronnerud's opinion that the culverts should be extended to the river's edge. Mr. Kaler spent over a year attempting to determine who would take responsibility for the culverts, but the state, the county and the mining company all turned him down.

Richard Kaler purchased his ranch on the San Francisco River in the winter of 2001, and he has done considerable work to improve it. He removed hundreds of loads of trash that had accumulated over decades. His ranch is almost free of the wildcat dumping that covered the riparian area. He used a Natural Resources Conservation Service (NRCS) Environmental Quality Improvement Project (EQIP) grant to level the fields and thereby reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff. Mr. Kaler joined the Gila Watershed Partnership in 2002 to learn how to restore the riparian area, and find a solution to a problem that was threatening to destroy the occupied part of his ranch and devastate the river and riparian area. Mr. Kaler explained that when he and his wife first visited the ranch prior to purchase, the area had been in a prolonged period of low rainfall. During the first significant rain event, as they were settling in, massive amounts of water flooded out of the culverts, carrying topsoil, livestock waste from the surrounding area and a great deal of the Kalers' possessions, across the inundated benches and into the river. The GWP agreed to work with the Kalers to develop and implement a multi-faceted plan to address the issues on the Kaler Ranch, and restore this reach of the San Francisco River and the riparian area.



Richard Kaler and his horse Licorice



Richard Kaler standing in one of the culverts

The landowners, Lois and Richard Kaler, implemented an EQIP contract to level the fields and reduce the runoff. Even though the sediment and nutrient transport to the San Francisco River was reduced during minimal rainfall, the area was still heavily damaged whenever there was much water running off the road into and then out of the culverts.

In addition, the water draining from the culverts was destabilizing the banks of the river in two places. One of these was the main access to the ranch. The only other access is very steep and completely unpassable during any rainfall event. The banks needed to be stabilized from the point of view of

riparian health as well, since they were crumbling into the river and adding significantly to the sediment loads.

According to the University of Arizona NEMO Program's draft Upper Gila Watershed Characterization and Assessment, the Chase Creek-San Francisco subwatershed's water quality assessment results for organics is classified as high risk as it drains into Yuma Wash that is classified as extreme risk. The Chase Creek San Francisco subwatershed's water quality assessment results for sediment is classified as high risk - 0.8, because it drains into Yuma Wash, which ranks high because it is an important corridor and is in risk of channel degradation.

The GWP and the Kalers worked with the NRCS and their engineer, Magdalena Moreno, to plan and design the improvements. Since the culverts were impossible to remove, the NRCS recommended attaching them to sediment collection boxes and then new culvert sections that would cross the pastures to rock aprons at the river's edge. They recommended protecting the two unstable river bank sections with stream barbs.

THE ADEQ KALER RANCH EROSION CONTROL PROJECT, PHASE I

In 2004, the Gila Watershed Partnership wrote and was subsequently awarded an ADEQ Water Quality Improvement grant to restore the area. Within one month of the award, a storm event completely removed the ranch entrance road. It was impossible even to bring in equipment to start the work. The project was revised with the assistance of the Greenlee County Engineer, Phil Ronnerud, who designed gabion structures to restore and stabilize the two river bank areas.



Both archeological clearance from the Arizona State Historical Preservation Office and a permit from the Army Corps of Engineers were required. Both were obtained. The Archeologist's report and the Biological Evaluation are attached. A grant from the Arizona Department of Agriculture, Livestock and Crop Conservation Program was obtained to match the ADEQ grant. The grant was completed and the improvements were installed as planned.

THE KALER RANCH EROSION CONTROL PROJECT, PHASE II

In 2005, the Gila Watershed Partnership wrote another grant to the ADEQ Water Quality Improvement department to address four more of the culverts, as well as erosion along a ranch road. The grant was awarded and a contract signed in May of 2006.

Unfortunately, before the grant project proceeded, we realized that we had some problems. Costs for construction materials had risen considerably since the original grant was written, and the cost for labor was underestimated by the original engineer we used to plan the project. Additionally the Gila Watershed Partnership discovered that the impacts on the San Francisco River itself were more complex than excess sedimentation. E.coli issues had been recently published by the TMDL department of ADEQ. Even though we were unable to quantify and address all of the possible sources of E.coli, we knew that the Kaler Ranch was a probable source, and we wanted to add improvements to begin reducing the impact of the Kaler Ranch's livestock on the San Francisco River. We were going to need funding to supplement the ADEQ grant.

The goal of the project was to reduce erosion and excess sedimentation in the San Francisco River, and to work with the landowner to reduce his livestock's impact on the riparian area and the river.

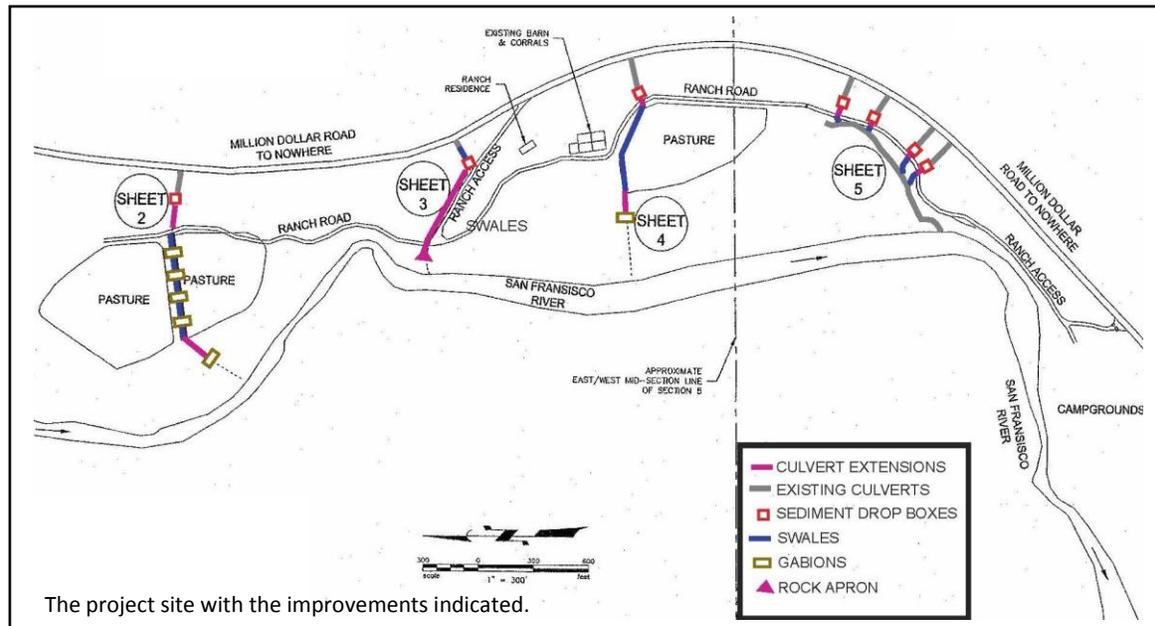
The objectives of the project were:

- 1:** To control the water draining from the "million dollar dirt road to nowhere" and transport it directly to the San Francisco River through improvements on a poorly designed culvert system that cannot be removed due to high costs. The improvements were to add sediment collection boxes connecting the old culvert terminuses to new culvert sections or to ditches, as the situation dictated.. See complete description of each extension under Task 4, below, and on attached engineering drawings.
- 2:** To build a drainage bulwark to slow and direct the water that drains off the upland areas away from a vulnerable area and to the river's edge.
- 3:** To replace old, inadequate fences to ensure that the cattle are kept out of the riparian area, thereby reducing erosion , excess sedimentation and livestock waste in the stream .
- 4:** To establish a vegetation buffer to stabilize the banks of the river, and the benches surrounding the fields.
- 5:** To minimize excess sediment during the construction process, and restore the roads post construction to the pre-construction condition.

To design this project, we planned to hire an engineering firm and consult with the Greenlee County Engineer, the Safford NRCS office, and then hire a contractor experienced in municipal flood control, pipeline and ditch projects.

SUMMARY OF RESULTS

The project is finished. The improvements are in place, and the monitoring is complete. The problems that we had were mainly related to the remote location. All equipment and supplies had to be specified to be able to maneuver down steep, narrow, rocky



The project site with the improvements indicated.

inclines. The larger items, such as the culverts, had to be ordered from the closest supplier in New Mexico, then unloaded at the main road in Clifton onto a smaller flat bed truck, then offloaded onto an even smaller vehicle at the entrance to the ranch road. This was complicated by a major problem with the engineering firm in Safford. The downturn in the local economy resulted in the engineer's becoming laid off, and he moved out of state. Thankfully, the Greenlee County Engineer was willing to step in and check the as-builts to ensure that the work had been done to the specifications.

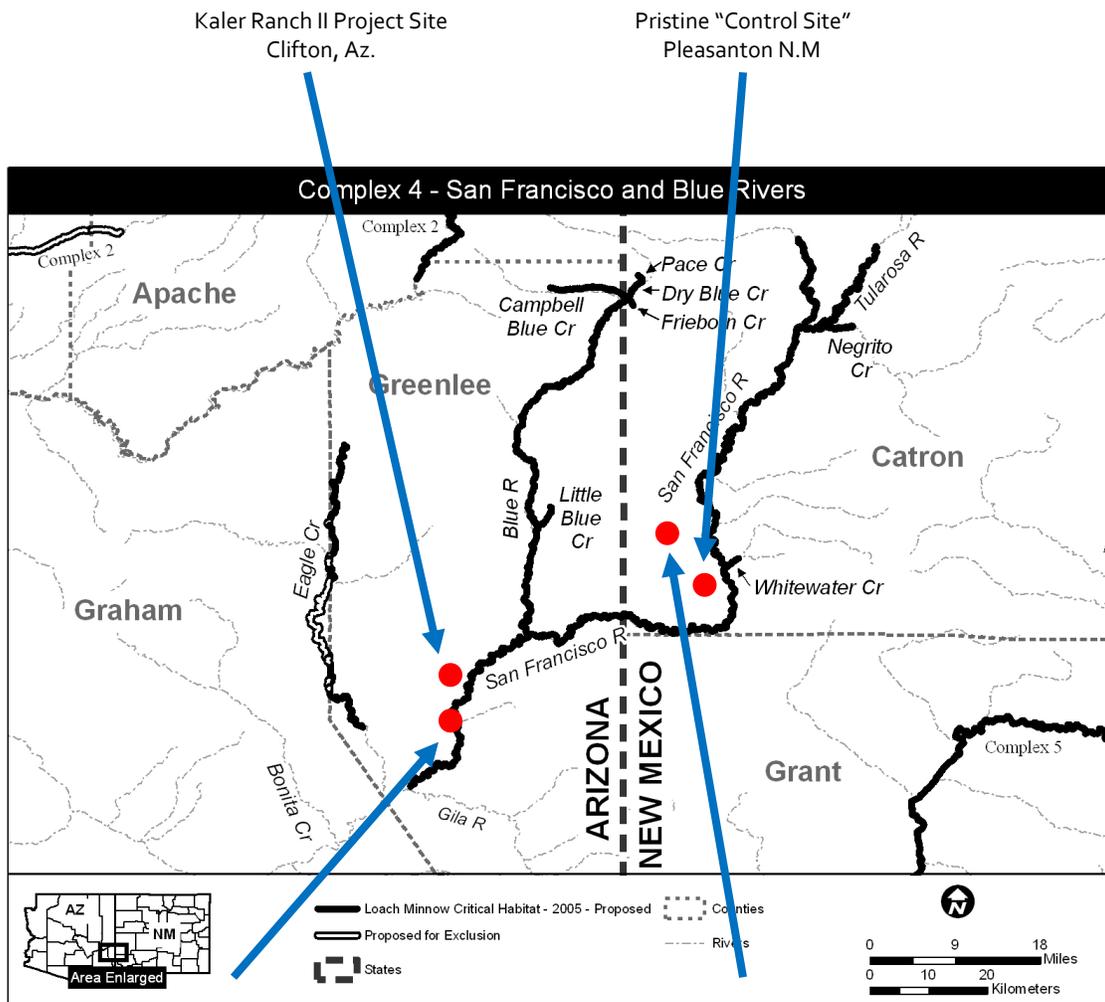
We have visited the site with the Greenlee County Engineer after two large storm events to see how the improvements are functioning. All of the culvert extensions, the sediment collection boxes, the rock aprons at the river's edge and the bulwark



Old culvert connected to a sediment collection box and a new culvert section

are functioning perfectly. The vegetation buffer is growing and functioning well, although a few of the plants have died and will need to be replaced in the fall, which is the best planting time. The fences are some of the best in the county, and are the envy of the cattle growers association.

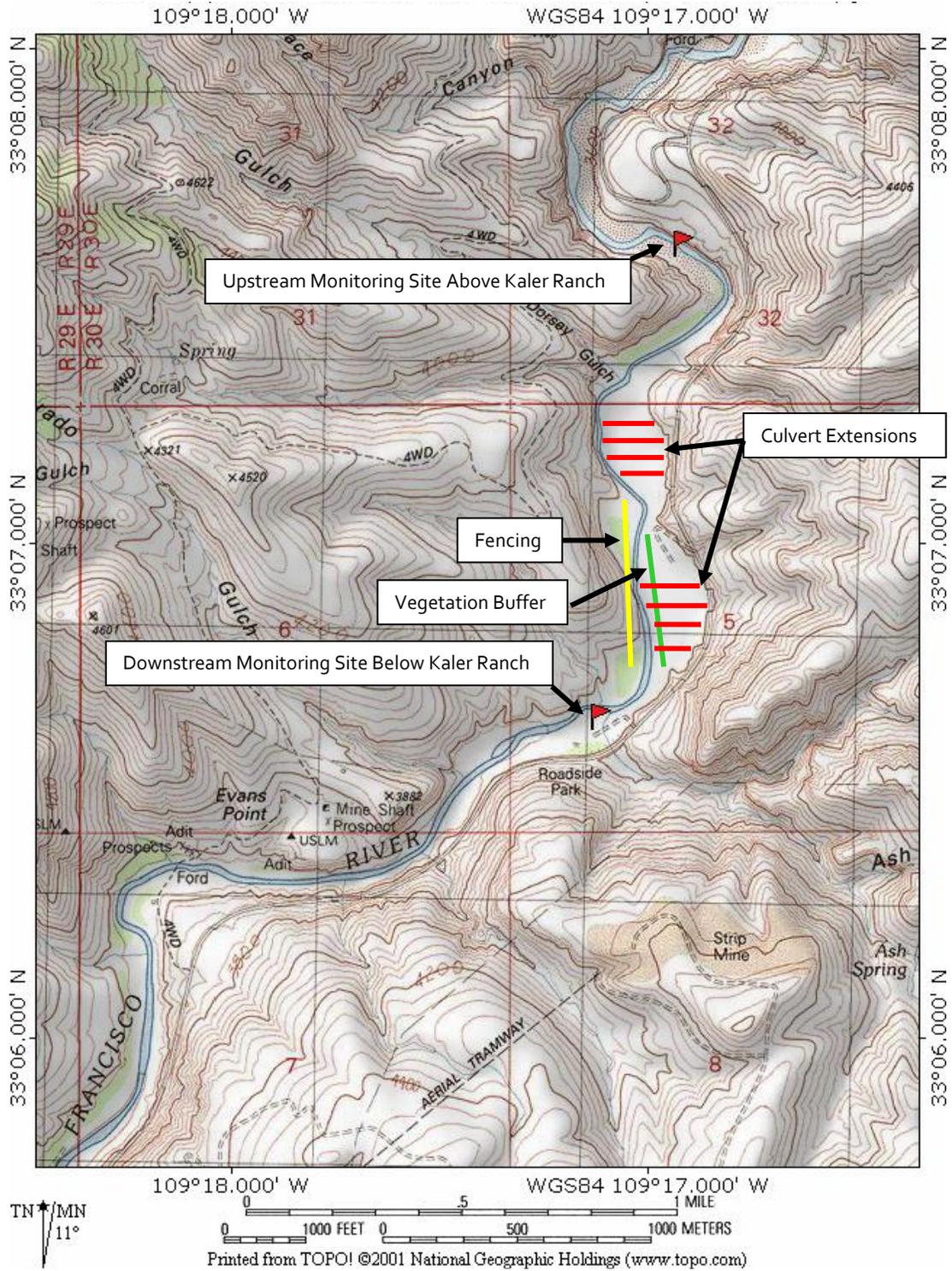
Within the Kaler Ranch boundaries, water quality monitoring points were established above and below the project action sites. The downstream monitoring site corresponded with the same location as the Kaler Ranch Phase I Project. A "control site" was also added to this project, located in Pleasanton, New Mexico.



Historical Data Collected at USGS Gauging Station, Clifton Az., downstream from Kaler Ranch

Historical Data Collected at USGS Gauging Station, Glenwood NM., upstream from Kaler Ranch

Two USGS gauging stations were used as monitoring sites.



The illustration above indicates the location of water quality monitoring sites in relation to project improvements.

A 200 foot Daubenmire transect was randomly determined near the flow channel for the purpose of collecting before and after data associated with the construction of the fencing enclosures. A control site was established in Pleasanton, New Mexico. In order to monitor the vegetation, all plantings were individually surveyed for condition and height.

Monitoring was conducted and reported before the improvements were installed, in August of 2007, and after the improvements were installed in September of 2008. The final monitoring session was conducted at the end of March in 2010. It was due to be conducted earlier, but weather conditions made it impossible to monitor until one month later. The data to be evaluated included: 1. the vegetative buffer zone, 2. nitrogen, nitrate, 3. nitrogen, nitrite, 4. the enclosure fencing, 5. turbidity, 6. total coliforms/E.coli, 7. pebble count data, 8. dissolved oxygen, and 9. phosphorus.

The attached monitoring report contains complete information regarding the results. The following is a conclusion regarding the monitoring results by Dave Henson, our monitoring specialist:

"The ADEQ Narrative Bottom Deposits Standard Implementation Procedures for Wadeable, Perennial Streams suggests, "The proposed 50% fines criterion is reasonable for warm water streams of Arizona for several reasons. This value is a composite of multiple macroinvertebrate species sediment tolerance values developed by Relyea et al. (2000). Many of these species reside in Arizona's warm water streams. This criterion represents a loss of habitation by aquatic life, namely the aquatic insects. In addition, ADEQ has supporting macroinvertebrate data indicating that sediment effects to macroinvertebrates occur at levels of 40-50% fines in San Pedro River streams (Spindler, 2004)." Fines were less than 32% on this Project.

Although turbidity was higher than one would want due to large run-off from snowpack melt in the high country, the downstream value was actually less than the upstream value. This would suggest that management practices should decrease sediment washing into the San Francisco from the Kaler Ranch pastures.

All data gathered on this project is a one-day shot for that moment when a monitoring visit was made. The project budget did not allow for continuous computer data monitoring equipment which is what would be needed when trying to make conclusive statements. But you have to start somewhere to get a general idea of what possible chemistry and physical parameters exist on this stretch of the river. One can observe the results of the management actions designed to reduce the erosion of Kaler Ranch sediments into the San Francisco and I suggest that this project should be of great benefit to the water quality of the river. The inclusion of a vegetation buffer will stabilize the terrace banks, provide habitat for local animal

populations, and reduce sediment loss during flood events. The 93% survival success of these plantings is due in part by the added drip irrigation system.

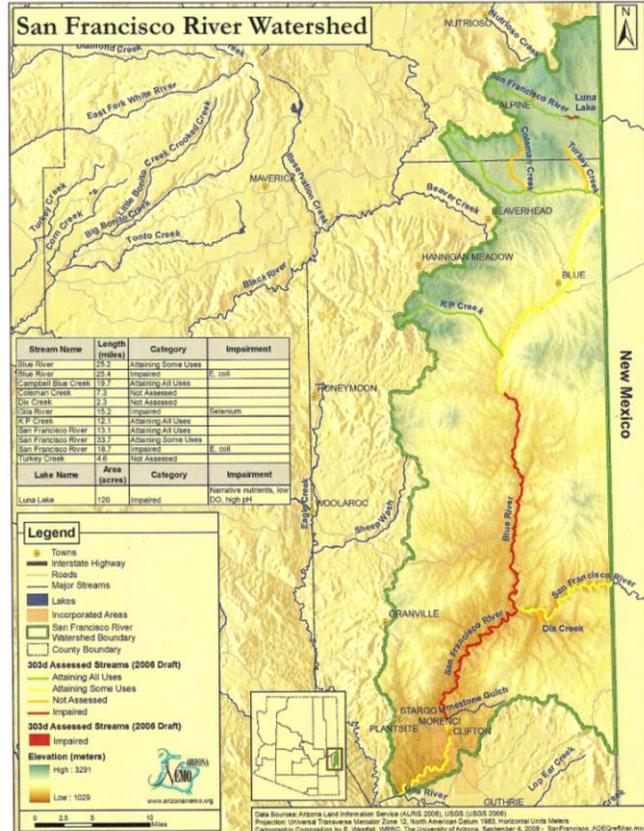
All and all this is a project in which I believe money has been well spent in decreasing sediment deposition from an upland source into the San Francisco River during precipitation run-off events.

With every project we undertake, we draw a little closer to our goal of a healthy watershed. But we also learn more each time about how far we have to go. Ours is a wilderness watershed with sparse population and very little of the industrial or typically urban contaminants affecting urban watersheds. But we have our own issues that affect the land, our water, and the health of our people. In our 18 years of work, we have come to see that real progress is not made through single events or silver bullets. Rather, it is made through a series of small efforts built slowly one upon the other.

This project was entirely successful in achieving its stated goals. However, it is just one step toward reducing erosion and sedimentation on the San Francisco River to levels commensurate with riparian health. There are many related issues that we need to address, most of them pertaining to the damaging effects of various land uses. It will take us many years, a great deal of public education, and a few more material interventions to reduce pathogen contamination of the stream and remove the San Francisco River from the EPA's 303(d) list. That is our objective, within a wider goal of slowly resolving all of the controllable conditions that harm our Upper Gila River watershed and the human and animal communities living within it.

RECOMMENDATIONS FOR FUTURE PROJECTS

The Gila Watershed Partnership highly recommends that we continue to address the environmental issues on the San Francisco River. Since this project was funded, the Environmental Protection Agency has added the San Francisco and Lower Blue Rivers to their 303(d) list of impaired waters for E.coli. The Gila River is soon to be listed as impaired for E. coli as well. The Arizona Department of Environmental Quality funded a Targeted Watershed Grant we submitted in 2009 titled "E.coli Reduction on the San Francisco and Lower Blue Rivers," to address this impairment. The grant activities include forming a "watershed improvement council" of volunteers to work on the project, sampling the San Francisco and Blue Rivers, testing the samples for elevated E.coli levels, and doing DNA testing to determine the sources of the E.coli. We will be writing a "watershed improvement plan" that will include recommended projects to eliminate the impairment, prioritized. A small amount of funding was set aside in the grant to apply to one or more of the recommended projects.



The areas of the San Francisco and Lower Blue River shown in red are listed on the EPA's 303(d) as impaired for E.coli.

Though we are still awaiting results of the DNA testing, anecdotal evidence collected by the project coordinator suggests that sources of the E.coli exceedences will probably prove to be a combination of human recreation, livestock and wildlife. The DNA data will help us identify the next tier of projects to reduce the E.coli on the San Francisco River, which of course is a major tributary to the Gila River, also impaired and about to be listed. The final goal of this phase of our work to reduce the E.coli levels on the San Francisco and Lower Blue Rivers sufficiently to have them removed from the 303(d) list.

We are working with individuals and organizations, the county and municipalities , and local, state and federal agencies to make the San Francisco River clean and healthy. Our efforts have spawned new local organization called" The Friends of the Frisco," closely aligned with GWP and dedicated to cleaning up trash accumulating regularly along the river. "Friends" already has over 100 members, and is supported by previously anti-environmental organizations including the Greenlee County Cattle Growers Association and the Freeport McMoRan Mining Company. This is a very significant accomplishment for our region.

We have applied for and have been awarded a number of grants to install solar-operated wells for the Kaler Ranch, to remove their livestock from the riparian area. We only need to drill one more well to be able to completely exclude the Kaler Ranch livestock from the San Francisco River. We have recently applied to the Arizona Water Protection Fund for that project.