Final Report

La Cienega de San Vicente Wetland Project

October 2014

Assistance Agreement No. CD # 966857-01-0A)

(This project is Part A of a larger 2008 grant award to NMED Wetlands Program entitled "2008 New Mexico Wetlands Awards Project.")

Wetlands Program
New Mexico Environment Department
Surface Water Quality Bureau

La Cienega De San Vicente Final Report

Executive Summary

The Silver City Watershed is a small sub-watershed (~38 square miles) located within the larger geographically isolated Mimbres Watershed. La Cienega de San Vicente Wetlands Project is located within and adjacent to the Historic District of the Town of Silver City, a small city with a population of nearly 17,000.

San Vicente Creek in downtown Silver City in the late 1800s

Water quality issues are often encountered in surface waters and wetlands in small watersheds undergoing urbanization. Properly functioning wetlands can help mitigate water quality impacts caused by urbanization. Significant impacts to water quality arising from urbanization in and around Silver City have been documented and include:

1) Bottom deposits and suspended or settleable solids. As impermeable surfaces in the watershed increase the storm runoff yield (the system becomes "flashy") causing flooding and erosion problems. High turbidity generated during storm runoff leads to deposition of fine sediment. These bottom deposits negatively affect habitat for fish and other aquatic life.

2) Floating solids, oil, and grease. This is mostly trash, leaking automotive fluids, and other wastes that run off streets, empty lots, and residential and commercial properties during storm water runoff events. Many businesses including laundromats, restaurants, and automotive repair back directly onto the San Vicente drainage and are known sources of both solid and liquid waste.

3) Pathogens are another issue of concern in the watershed. A significant source of bacteria and other pathogens in urban settings is pet waste and antiquated wastewater infrastructure common in historic districts. Suburban and exurban areas also contribute to pet waste and include larger domesticated

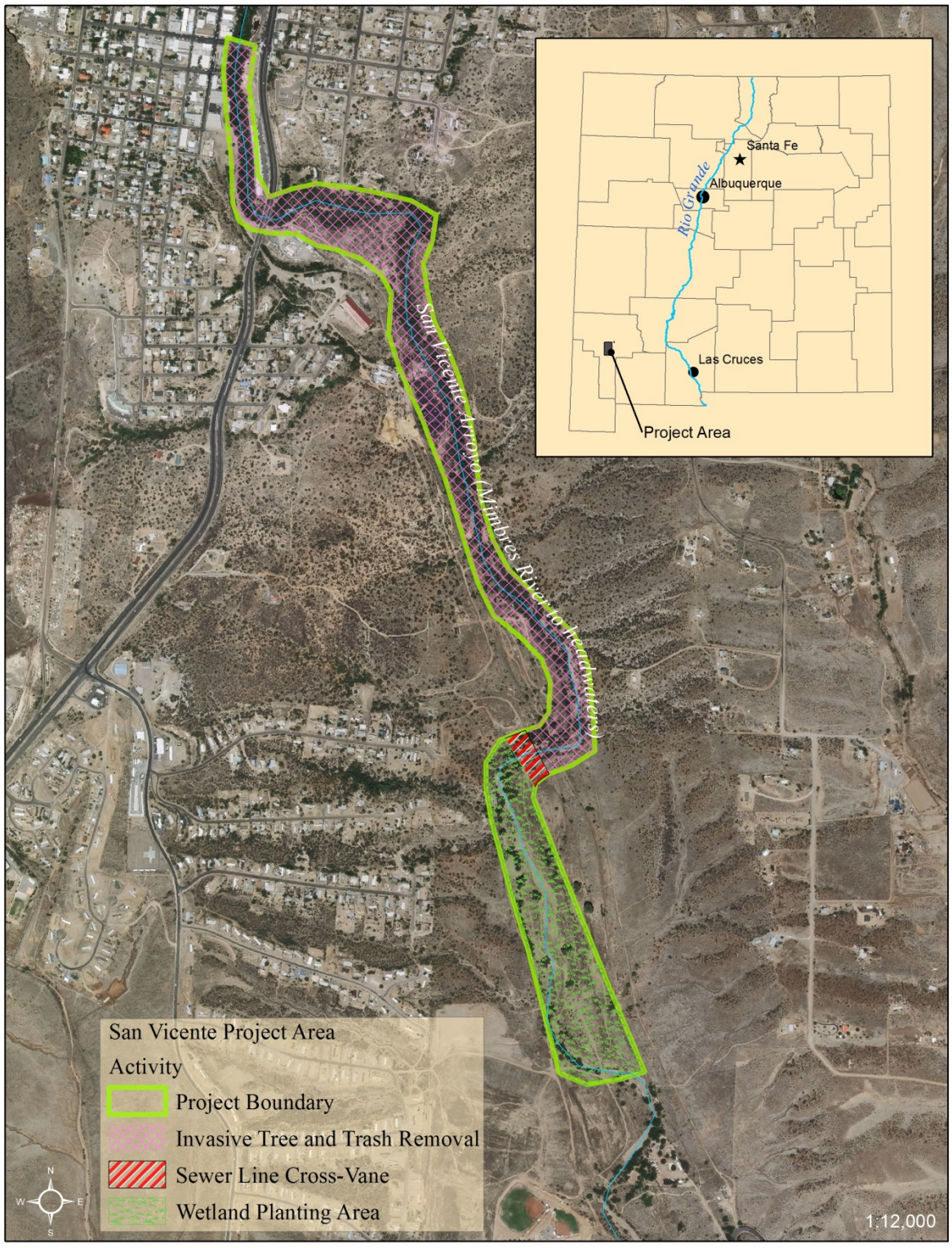
animals like horses. The disposal of manure in suburban and rural areas around Silver City is not regulated and often ends up in ephemeral tributaries that drain to San Vicente Creek.

The most important wetland and riparian issues for many citizens of Silver City are loss of wetland/riparian habitat and invasion of non-native species replacing populations of native species. Siberian elm (*Ulmus pumila*) and Tree of Heaven (*Alianthus altissima*) are the most common non-native invasive woody species within the drainages of the Silver City Watershed. Appropriate native woody species for vegetative restoration could include Goodding's willow (*Salix gooddingii*,), Fremont cottonwood (*Populus fremontii*), boxelder (*Acer negundo*), velvet ash (*Fraxinus velutina*), and Arizona walnut (*Juglans major*). Loss of habitat in the Silver City Watershed has been caused by urban encroachment into the floodplain for residential development and infrastructure.

Declining floodplain and wetland habitat exacerbates the water quality impacts that small urban watersheds contend with; restoring and protecting wetlands can remove pollutant sources and improve water quality while providing for a richer urban experience.

La Cienega de San Vicente project area just below Silver City

Project Area Map



Wetlands Project Goals and Objectives:

This project sought to protect, sustain, and restore more than 35 acres of riverine wetlands. The Surface Water Quality Bureau worked to establish new partnerships to achieve a net increase in wetland acres. The project goals also included the development of criteria for assessing the condition of degraded wetlands in the arid southwest, improving the knowledge and decision-making ability of local government for the protection of wetlands, and demonstrating methods for restoration of similar wetlands in other geographically isolated watersheds.

Project Outcomes and Results:

This project characterized a floodplain riparian wetland system within the town of Silver City. Extensive soils, hydrologic and vegetation data were gathered at a fine scale previously unavailable. Additionally, active and passive restoration techniques were utilized to protect and enhance thirty acres of floodplain wetland habitat. None of these would have been possible without the massive amount of volunteer and in-kind work contributed by the project partners including: the Town of Silver City, the Youth Conservation Corps, Aldo Leopold High School, Western New Mexico University, the Gila Conservation Education Center and many, many more partners. This project created new partnerships, strengthened existing relationships between agencies and the public and galvanized local support and awareness for the small, but vital riparian corridor that flows through the center of Silver City.

Timeline:

The original project timeline ran from February 2009 to March 2012. The timeline was extended in order to complete several grade-control structures within San Vicente Creek. During the course of this project, the original Project Officer retired and a replacement was not in-place for several months after the retirement. The table below demonstrates the original milestones, project vs. actual timeline for meeting the milestones.

Task	*Milestone*	Project completion	Actual completion
1—Baseline survey and monitoring	QAPP and Monitoring Plan	By June 1 2009	Approved July 2009
	Baseline inventory	By Sept 1 2009	Submitted August 2010
	1st monitoring report	By March 1 2010	Botany report submitted July 2012
	2nd monitoring report	By March 1, 2011	Hydrology report June 2014
2—Education and outreach	Outreach plan	By Jun 1 2009	Submitted October 2009
	Outreach completed	By March 1, 2012	November 2011
3—Wetland Restoration	Restoration plan	By Sept 30, 2009	January 2011
	Regulatory clearance	By Dec 31, 2009	Obtained May 2012
	30 ac restored and protected	By March 1, 2012	Completed June 2014
4—Training	Training completed	By March 2012	Completed July 2012

5—Project Administration	Agreements in place	By May 30, 2009	May 2009
	Semi-annual reporting	April and October annually	Completed on schedule
	Final Report	March 2012	September 2014

Cooperators.

This project was fortunate to have the assistance and commitment of many outstanding organizations. These include:

- AmeriCorps
- New Mexico Youth Conservation Corps
- Aldo Leopold High School
- Gila Resource Information Project
- Gila Conservation Education Coalition
- Western New Mexico University
- Silver City Watershed Keepers
- The Town of Silver City
- Stream Dynamics Incorporated
- The Silver City Office of Sustainability
- …. And countless individual volunteers and members of the community who showed support and enthusiasm for the project.

Funding

This project remained within the original federal budget allocation and exceeded the required match by $26,451.

La Cienega de San Vicente Budget Details	
Federal funds allocated	$231,439
Federal funds expended	$183,973
Non-federal match expected	$114,320
Non-federal match actual	$140,771

Project Highlights and Chronology

Project Tasks and Deliverables.

This project included 5 tasks that included survey and monitoring, education and outreach, wetland restoration, training and project administration. Each task is described below with major deliverables listed.

Task 1. Baseline Survey and Monitoring. This task included a soil, hydrologic and vegetation survey and characterization of the project area. The vegetation survey was repeated following major restoration activities like non-native plant control and native species planting. Prior to this project, a fine scale survey of the area had not been completed and this project added significantly to the local knowledge of the area and serves as a reference point for future investigators or students.

Deliverables

- Baseline Botany Report
- Interim Botany Report
- Final Botany Report
- Baseline Soil Survey
- Baseline Hydrologic Report
- Post restoration Hydrologic Report

Project area soil survey (above) and stream cross-section (below).

Task2. Education and Outreach. The project contracted a local not-for-profit environmental education group, the Gila Education Conservation Center to provide both education and outreach about the project specifically and wetland ecology and water quality in general. This task was extremely successful in engaging members of the community and bringing them out for volunteer work days, educational tours for diverse age groups and the "Big Ditch" community celebration of the project. Numerous newspaper articles featured the project and the New Mexico's senior senator Jeff Bingaman toured the project in 2009.

Project officer Dave Menzie with local high school students

Deliverables

- Outreach and Education Plan
- Outreach and Education

US Senator Jeff Bingaman touring the project

Task 3. Wetland Restoration. Wetland restoration activities included a broad range of techniques including: non-native species removal, dormant willow and cottonwood stake and pole planting, transplant of live plants, seed collection and seeding, fencing to protect wetland and riparian areas, trail closure and signage to prevent trespass and damage to restored areas, and construction of in-stream grade control structures. Work was completed by Surface Water Quality Bureau staff, volunteers, Americorps and Youth Conservation Corps team members and via one contract to Stream Dynamics Inc. for the construction of a cross-vane and Zuni bowl in San Vicente Creek. All of these activities were guided by, and included in, the restoration plan drafted by the Project Officer. Prior to implementing any treatments or activities, the necessary environmental compliance was secured. This amounted to a thorough archeological survey of the area and a consultation with the US Army Corps of Engineers to determine whether a dredge-and-fill permit was needed. Due to the small 'footprint' of the in-stream structures, it was determined that a dredge-and-fill permit was not necessary.

In general, the wetland restoration was successful. Staff and volunteers worked throughout the riparian corridor and adjacent floodplain planting 35 acres with willow and cottonwood stakes, and transplanting or direct seeding facultative wetland species like Giant Sacaton (*Sporobolus wrightii*). The survivorship of willow and cottonwood poles was approximately 90% in their first growing season. After two or three seasons, there has been some die-off, but planted areas are averaging about 70% survivorship.

Non-native species removal had mixed results. Siberian elm removal was generally more effective than Tree of Heaven removal. This reflects both the characteristics of the plant and the treatment strategy. Invasive trees were removed using both chemical and physical strategies. Most trees were cut and sprayed with an aquatic-safe formulation of Triclopyr (Garlon 3A). However, given the many volunteers that were typically on site, often the trees would be sprayed after the volunteers had left, resulting in a small lag time between exposure of the cut-stump and herbicide application. As lag times increased, no doubt the effectiveness of the herbicide was reduced. Reviewing the treated areas 2 and 3 years later, variability in effectiveness is easy to see. But, in general, elm was more easily treated and killed than Tree of Heaven. The below-ground rhizomes and growth points of Tree of Heaven made treatment difficult. In response to cutting, underground growing points would activate, pushing new stems to the surface. Without follow-up treatment for several seasons, the Tree of Heaven is very difficult to eradicate. Garlon 3A did appear effective on some plants, but the quick and energetic growth of new shoots more than offset the removal and treatment of the "parent" plant.

Finally, late in the project term, a grade-control structure was built in San Vicente Creek to slow flood waters, allow for ground water recharge, protect a municipal sewer line and arrest the gradual incising of San Vicente Creek. The grade control structure was a rock cross-vane and Zuni Bowl, built by Stream Dynamics, Inc. The structure spreads water out onto the surrounding floodplain while slowing the velocity within the main channel. Planting of wetland and riparian species native to the area accompanied the construction of the cross-vane. Over 25 different species were planted, including some transplanted material that had been salvaged during construction of the cross-vane. The cross-vane was completed just prior to the summer rainy season. With several major storms and associated

flooding events, the cross vane has remained undamaged and fully functional. It has protected the city's sewer line while simultaneously slowing and spreading the floodwaters across the floodplain.

Deliverables

- Restoration Plan
- Regulator clearance
- 30 acres of willow and cottonwood planting
- 60 acres of trash removal and non-native species treatment
- Installation of grade control structures

Local high school students auguring holes for willow planting

Watering in willow stakes (above) and construction of cross-vane (below)

Task 4. Training. Training, both formally and informally was a large part of this project. SWQB staff attending professional classes in stream hydrology and wetland ecology. Volunteers and Youth Corps members received on-the-ground training in plant identification, water quality sampling, invasive species removal, seed collection, and wetland restoration techniques .

Deliverables:

- Professional seminars and classes.
- On-site training for students and volunteers

Task 5. Project Administration. This task consisted of completing semi -annual reports and tracking budget spend down and non-federal match attainment. The project officer completed all the required deliverables in this task, on-time.

Deliverables

- Semi-annual and this final report.

Major Project Highlights.

One of the major highlights of this project was a thorough characterization of a wetland community that exists in an urbanized area but was relatively unknown, disregarded and poorly understood. Lying within the town of Silver City, the large wetland is a short walk from the historic downtown, yet is relatively unknown. This project brought new interest, new biological and physical data and a sense of community "ownership" of an area that had been long overlooked.

Early on in the project the area was characterized for indicators of wetland hydrology, soils and vegetation. Several ground-water monitoring wells were installed, channel cross-sections and profiles were established and a soil survey of the area was completed. The baseline condition derived from hydrological, vegetation, and soils investigations showed that the San Vicente Site did not have hydric soils, has a very limited community of wetland plants, and did not currently have the requisite hydroperiod to be classed as a wetland. The site did have the potential to be a wetland if the hydrology of San Vicente Creek can be restored to allow for more frequent overbanking events to occur. However, San Vicente Creek is incised throughout much of the project area. Without some floodplain or channel modification the wetland condition was not likely to improve. The proximity of the San Vicente Creek and wetland to the town of Silver City both complicated and provided areas of opportunity. One of these complications was utility lines that criss-crossed the project area. Several phone lines, water mains and sewer lines cross the San Vicente Creek channel. These lines have always been subject to damage during high flow events in the creek. In 2008 the city's main sewer line was broken in San Vicente Creek causing raw effluent to be discharged into the creek. One of the highlights of this project was the construction of an in-stream cross vane just below the sewer line. The cross vane not only protected the sewer line from future damage, but has caused some aggradation of

Main sewer line for Silver City crossing San Vicente Creek. Deep scour on the downstream side has compromised the concrete protection.

the streambed, and allowed for some overbank flow in portions of the wetland that had previously been disconnected from the floodplain. In terms of direct wetland creation, the cross vane resulted in approximately an additional quarter-acre. In terms of indirect impact of ground water recharge and potential to raise the water table and support wetland vegetation elsewhere, it is still too early to know. We will continue to track the site periodically with site visits and repeat photographs to try and document long term changes in the project area.

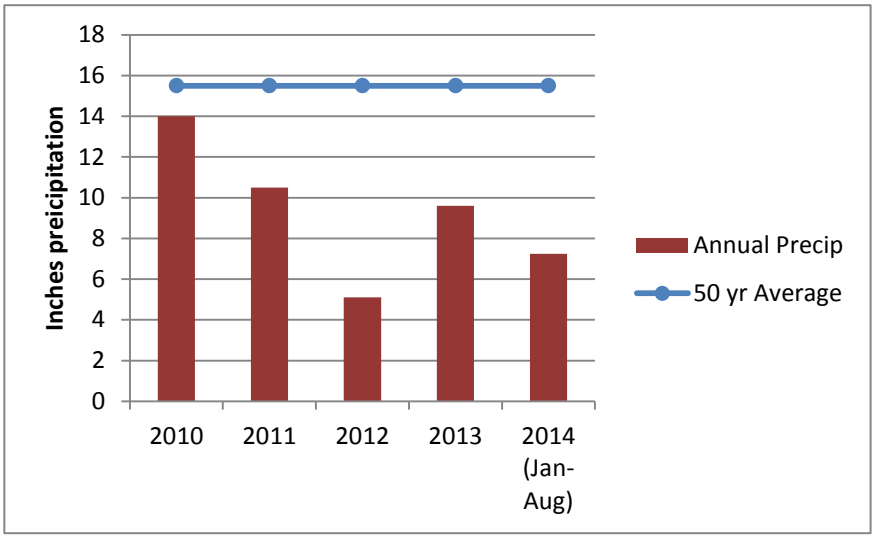
This project also mobilized a large number of volunteers to assist with willow planting, hydrologic monitoring and characterization, removal of weedy plant species and trash and other debris, contributing over 3800 hours of service. Hundreds of willow and cottonwood poles were planted, thousands of pounds of trash were hauled out of the area, while participants learned about wetland ecology, stream function and the natural history of the area. The area is significantly more pleasing in an aesthetic sense and consequently more people have begun to recreate in the area.

The type of recreation is slowly shifting from what has been a destructive form of mechanized travel through the area, to non-motorized forms of travel like bicycles and hiking. The Town of Silver City has developed a trail network through the wetland which, prior to this project, would not have been a

priority. This has been in a sense, the best kind of outreach because the wetland project has brought new interest in the area, which has spurred some action at the city level, which has created a greater awareness and appreciation for the area.

Installation of trail signage in newly restored areas

Obstacles



The principle obstacle in this project was the persistent drought which has been on-going in the Southwest for 3 years. Scanty annual precipitation reduced ground water inputs and lowered the water table within the project area. This made it difficult to auger holes deep enough to reach permanent water while installing willow and cottonwood poles. We worked around this as best we could by choosing planting areas that were in depressions or closer to the creek. In general, this was

a successful strategy. Most willow and cottonwood stakes and poles had an initial survivorship rate of 90% after the first growing season. After two or three years, the success rate has dropped, but still remains at between 65 and 70%. For a semi-arid climate, during a moderate to severe drought, the success is beyond our expectations.

Willow stakes still alive and growing 3 years after installation in a very dry location.

Lessons Learned

What made this project successful.

The success of this project is owed, in large part, to the amount of community support it received. For a relatively small town, a tremendous amount of volunteer effort was put forth to make this project a success. As previously mentioned, over 3800 volunteer hours were logged and this does not count the time spent by city and county employees working on permitting or developing trails and open space management plans that included the project area. The interest shown by the town government and residents made the project much bigger than an "EPA project" or "NMED project". Volunteers took real ownership in the outcomes of the wetland restoration and continue to assist in the maintenance of the area by hosting annual clean-up days, monitoring vehicle trespass into the area and performing informal monitoring of planted species and stream structures.

If the project suffered from unsuccessful aspects, it was largely a function of the necessary, but laborious process of permitting and contracting. Small delays in getting contracts secured would affect the sequencing of the project activities. For example, it would have been better if some of the plantings

could have occurred after the in-stream structures had been built. This would have improved their survival somewhat, but as it was, they had to be planted in advance of a finalized contract to build grade control structures in the river.

Another significant challenge in this project was managing the motorized recreation. Historically, the area had been largely un-managed with roads and trails leading to every corner of the project area. Working with the city and volunteers, the project was able to close some roads, install fencing and signage to begin to change the recreation use patterns, however, vehicle trespass remains an issue at the site.

Looking ahead and trying to anticipate the long-lead times for contracts and permits to be secured would help prevent some of difficulties encountered on this project. Unfortunately, it may not always work and building in some flexibility in terms of long planting windows or multiple planting efforts helps to offset some of the impact of other parts of the work being delayed.

Technical Transfer

While much of this project dealt with community involvement and outreach, some of the technical aspects of restoration do have wider applicability. For example, that San Vicente Creek has numerous utility line crossings is not novel throughout the semi-arid west. Often the utility lines were placed long before horizontal boring or other techniques were invented to place the line underground without disturbing the streambank and floodplain. The lines are often shallow and in intermittent to ephemeral drainages that are prone to flash flooding, sedimentation and scour. These geomorphic disturbances, while completely natural and predictable can uncover utility lines and make them vulnerable to damage. Emergency repairs to utility lines are typically expensive, poorly designed and often have unintended consequences to stream dynamics, channel morphology and associated wetlands.

The cross-vane that was built on San Vicente Creek is dual purpose. It both protects a vulnerable sewer line while slowing and spreading flood flows across the floodplain. Positioning the vane just below the sewer line slows incoming flood water allowing sediment to drop out of suspension around the sewer line creating maintenance free protection for foreseeable future. Similar types of in-stream structures could be built as part of the permitting process for new construction. The costs would be relatively minor compared to emergency repairs or replacement of damaged lines. Adding some sort of engineered in-stream protection to utility lines would also reduce the life-cycle costs of proposed developments and serve as a form of water protection by preventing damage and discharge to surface waters. They should be viewed as not just stream improvements, but also as components to anti-degradation policies.

Beginning construction of cross-vane to protect the sewer line and also raise spread flood waters out onto the adjacent floodplain. The sewer line had been broken several times in the past and was repaired by surrounding the pipe in concrete. However, the concrete accelerated flood flows and scour holes formed on the downstream side of the concrete, exposing the pipe.

Completed cross vane during a moderate flood event with flood waters spreading onto floodplain.

Post flooding sediment deposition. Sewer line now protected from scour by cross-vane.

In August 2014, just two months after construction was completed, Van Clothier, who designed and built the cross-vane was able to catch a flood event as it approached the structure. The video is a fascinating "proof of concept" as it clearly demonstrates the effectiveness of the cross-vane both slowing and spreading the flood water. The video can be accessed at this website:

http://www.streamdynamics.us/blog-entry/san-vicente-creek-project-action

EPA Feedback Loop

The feedback between the EPA and NMED regarding this project was without reproach. However, this project was hamstringed several times by personnel changes and difficulties in getting contracts in place to complete the necessary deliverables. In the end, the contracts were secured and the project was completed on schedule, and on budget. The New Mexico Environment Department appreciates the continued support and collaboration with the Environmental Protection Agency and looks forward to additional wetland projects in the future.