RECLAMATION

*Managing Water in the West*

# 2008 Post-Runoff Field Review

Middle Rio Grande Project, New Mexico

December 2008

Technical Services Division, Albuquerque Area Office

U.S. DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

# 2008 Post-Runoff Field Review

Middle Rio Grande Project, New Mexico
December 2008

## Contents


1 Introduction

1 Site Classification Summary

3 Velarde Reach

5 Española Reach

6 Cochiti Reach

11 Albuquerque Reach

13 Belen Reach

14 Rio Puerco Reach

15 Socorro Reach

17 San Marcial Reach

19 Acknowledgments


*Cover: Gravel bars in newly constructed secondary channel, Cochiti River Mile 228.9 (July 2008).*

# Introduction

The 2008 spring runoff in the Rio Grande was the highest since 2005. After the spring runoff seasons of 2006 and 2007, no field reviews were conducted. In 2006, an unusually active summer monsoon thunderstorm season occurred with above normal rainfall from July through September. During the 2008 runoff, Reclamation conducted periodic aerial and ground monitoring of levees and other sites potentially subject to erosion or flood damage. In addition, a comprehensive post-runoff review was performed on July 21–25, 2008; this included aerial and ground inspections at various locations, as well as extensive discussions. The staff involved in the comprehensive review included Jonathan AuBuchon (AAO—TSD), Drew Baird (Denver—TSC), Carolyn Donnelly (AAO—TSD), Paula Makar (Denver—TSC), Mark Nemeth (AAO—TSD), Robert Padilla (AAO—TSD), Tim Randle (Denver—TSC), Cheryl Rolland (AAO—TSD), and Dwight Slaugh (Provo—UC Regional Office). Some additional visits were made to selected sites after the July field review.

The purpose of this report is to document the following:

- river conditions during and after runoff
- work that occurred during runoff
- new river maintenance sites
- reassessment of existing river maintenance sites
- recommendations for future action

This report is organized by Middle Rio Grande Project geomorphic reaches and provides general observations and site specific information. Gaged peak discharge information is included at the beginning of each reach section.

## Priority Site Definition

A river maintenance priority site is defined as a site at which one or more of the following exist and could be addressed by river maintenance activities:

- The continuation of current trends of channel migration or morphology will likely result in damage to riverside infrastructure within the foreseeable future
- Similar conditions have historically resulted in failures or near failures at flows less than the 2-year flood
- Existing conditions cause significant economic loss, danger to public health and safety, or loss of water

There are many sites where Reclamation is concerned about development of future river maintenance problems, though current conditions do not warrant designation as priority sites. Such sites are designated as monitored sites.

# Site Classification Summary

The summary lists below contain the recommendations for river maintenance site classification developed at the conclusion of the post-runoff review. Sites denoted with an asterisk were added to the priority site listing between the 2005 and 2008 runoffs.

## Priority Sites Remaining as Priority Sites

Santo Domingo RM 225.1
Galisteo Creek
Santo Domingo RM 224.1
San Felipe RM 215.5
San Felipe RM 214.4
San Felipe RM 213.7
San Felipe RM 213.4*
San Felipe RM 212.8
San Felipe RM 212.0
San Felipe RM 210.3
San Felipe RM 210.1
San Felipe RM 210.0
Corrales Siphon*
Drain Unit 7*
San Acacia RM 111
Bosque del Apache Levee
Tiffany/San Marcial Levee
Tiffany Sediment Plug*
Fort Craig Bend*
River Mile 60*
Temporary Channel 2000/2002/2004
Truth or Consequences (not reviewed)

## Monitored Sites and Previously Unlisted Sites Upgraded to Priority Sites

Tamaya
Bosque del Apache Sediment Plug

## Former Priority Sites where Work Has Been Completed Since 2004

La Canova (2005)
Salazar Pit (2005, 2007)
San Ildefonso Pond (2007)
Cochiti RM 231.3 (2008)
Santa Fe River Confluence (2004)
Cochiti RM 228.9 (2008)
Bernalillo (2006)
Sandia (2008)
San Acacia RM 114 (2007)
San Acacia RM 113 (2007)
Arroyo de la Parida (2005)

## Former Priority Site Downgraded to Monitored Site

Arroyo de las Cañas*

(Between 2005 and 2008, the following additional sites were downgraded to from priority to monitored: San Juan Ponds, Santa Cruz Pump Station, San Acacia RM 110.)

## Site Needing Further Evaluation before Classification

San Felipe RM 211.3 (currently monitored, may be upgraded to priority)

# Velarde Reach

The Velarde reach encompasses approximately 13 river miles between Velarde, New Mexico, and the Rio Chama confluence. The Embudo gage is located at the upstream end of the Velarde reach; the highest recorded daily mean discharge during 2008 spring runoff was 3,870 cfs on May 24. Based on aerial and field monitoring during runoff, the Velarde reach performed well. There was minimal bankline erosion and flooding, with all flooding in close proximity to the river channel.

**Recommendations**

- For this reach and the Española reach, obtain cross-section and modeling data from the Corps of Engineers.
- Consider monitoring the condition of diversion dams.
- Be diligent in performing aerial and field inspections of the monitored sites in this reach.
- Consider periodically collecting data on a reach-wide basis.

*Revegetation at La Canova (July 2008).*

## La Canova

The La Canova site is located along the outside of a bend and was of concern because of the close proximity (about 15 feet) to the concrete-lined La Canova Acequia. Bankline protection was installed prior to the 2005 runoff and consisted of a riprap toe designed for 5,000 cfs, with an upper slope stabilization of coir blocks. Willows were planted in the riprap; various other native species were planted among the coir blocks.

There was no evidence of erosion on either the rock toe or the coir block area since the project was constructed. Some of the coyote willows planted in the rock toe did not survive, but there were many that appeared to be in good health. Pole plantings in the coir blocks were generally successful, though there were some instances of plant mortality. On the top level of the project, adjacent to the acequia, plant survival was poor. In this area, the only plant species that consistently appeared to be in good health was fourwing saltbush (*Atriplex canescens*). The coir fabric was still present throughout the site, but it had degraded to the point that it did not appear to have much structural integrity. Many herbaceous plants associated with early succession stages (particularly American licorice) were present, but no noxious weeds were observed.

*Degraded coir fabric, La Canova (April 2008).*

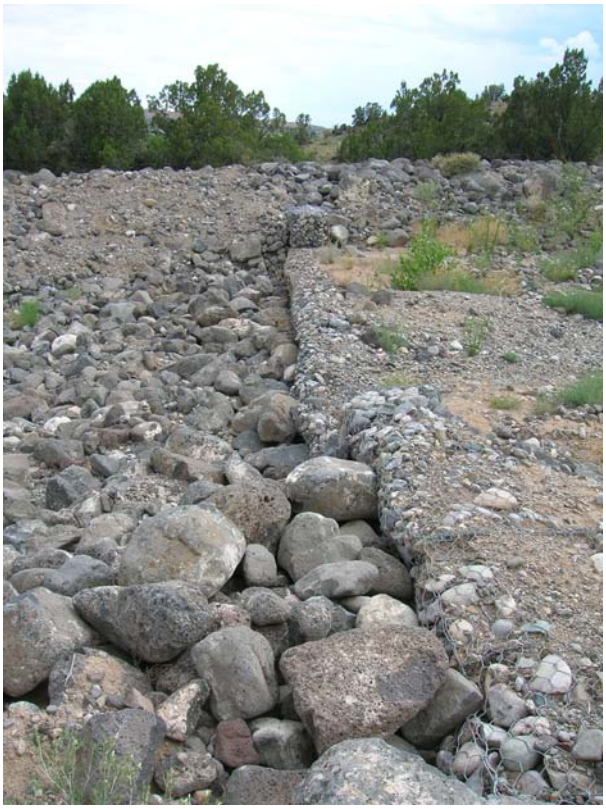
**Recommendations**

Continue to monitor degradation of the coir blocks.

- Monitor survival of plant species; consider establishing photopoints.
- Discuss plant succession dynamics with Reclamation's environmental staff. Is it better to continually remove plants like cockleburr, Russian thistle, and American licorice? Or is it better to leave them in place so that later successional stages will develop?
- Involve BLM in decisions about vegetation at the site.
- Use fourwing saltbush in future projects where it is necessary to establish shrub species in sunlit areas above the water table.

## Salazar Pit

Salazar Pit was a riprap mine for Reclamation projects in the Velarde area. After the conclusion of mining operations, there was an increase in the size and quantity of sediment material being deposited on the county road below the pit. In 2005, Reclamation constructed a project intended to reduce the material deposition. It included four energy dissipation weirs and two areas of channel widening. As part of an agreement with the landowner, Reclamation will maintain the project for 25 years from the conclusion of construction. During the heavy monsoons of summer 2006, the arroyo experienced a very high flow which probably exceeded the design discharge. A large volume of sediment, including numerous very large boulders, was transported down the arroyo, causing structural damage to some of the gabions comprising the weir structures. Repairs were completed in 2007. In July 2008, the weirs were functioning as intended and were in generally good condition, although there was minor damage at the junction of two gabions on the downstream-most weir.



*Downstream weir at Salazar Pit (July 2008).*

**Recommendations**

- Monitor and inspect the site at least once a year, preferably after local thunderstorm events.
- Consider submitting a paper about this project to the sedimentation conference.
- Perform minor repairs on the damaged gabions.

*Damage to gabion baskets of downstream weir at Salazar Pit (July 2008).*

## Lyden Wasteway

In January 2007, riprap was placed at the outlet of the Lyden Wasteway to protect the bank from erosion caused by discharge from the wasteway. The riprap and gabions at the site were in good condition and

appeared to be functioning as designed. At the time of the inspection, there was a lot of debris stuck in the gates of the wasteway. The previous erosion problems may have been partially attributable to irregular flow patterns caused by debris blocking the gates.

**Recommendations**

- Should the opportunity arise, explain to the acequia association that proper operation and maintenance (i.e., clearing debris) of the gates will probably reduce their problems with erosion.


*Riprap and gabions on south bank of Lyden wasteway (July 2008).*

# Española Reach

The Española reach starts at the confluence with the Rio Chama and extends downstream approximately 14 river miles to Otowi Bridge. The Otowi gage is located near Otowi Bridge (U.S. Highway 502). The highest daily mean flow the gage recorded during 2008 spring runoff was 5,970 cfs on May 27. Overall, the reach handled the spring runoff flows well, with minimal bankline migration and erosion.

**Recommendations**

- For this reach and the Velarde reach, obtain cross-section and modeling data from the Corps of Engineers.
- Be diligent in performing aerial and field inspections of the monitored sites in this reach.
- Consider periodically collecting data on a reach-wide basis.

## Santa Clara

In the early 1990s, a series of groins were installed as bankline protection measures. The riverbed appears to have degraded, causing the rootwads that were installed to be above the water surface during base flow conditions, according to field observations in December 2003. In 2006, measurements of flow velocity in the vicinity of the groins occurred.

**Recommendations**

- Produce a short summary report documenting results of the 2006 fieldwork.
- Schedule a field inspection to evaluate current conditions.

## San Ildefonso Pond

This pond, located on the Pueblo of San Ildefonso, is used for fishing and other recreation. The concern

at this site was that the bankline adjacent to the pond would erode to the east, damaging the berm surrounding the pond. To address this issue, designs were developed for a project to place buried rock vanes between the berm and the bankline. These structures were essentially buried bendway weirs, but the term "rock vanes" was used with the Pueblo to emphasize that they wouldn't be placed in the active channel. Earthwork on the San Ildefonso Pond site concluded in May 2007. Pole planting was completed in March 2008; survival rates thus far appear to be high. During the spring runoff of 2005, the planform changed upstream of the project area, and the bend immediately upstream of the pond moved 60–80 feet eastward, necessitating rerouting of an access road in the vicinity. This bend has continued to erode during periods of high and moderate flow. During the 2008 spring runoff, the bankline eroded approximately 5 feet, as determined through periodic measurements using wood stakes adjacent to the channel. This erosion extends to the upstream end of the project site, where a few feet of the upstream-most rock vane has become exposed. In the area of the channel adjacent to the pond, the thalweg has shifted to the west side of the river.

*Installation of buried rock vanes near the San Ildefonso Pond (May 2007).*


*Tip of previously buried rock vane exposed by erosion, San Ildefonso Pond (July 2008)).*

**Recommendations**

- Determine whether grass seeding of the project area is necessary.
- Review post-project monitoring data when it is available.
- Develop a written plan to enlarge the diagonal rock vane at the upstream end of the project so that it will function as a revetment, as opposed to a bendway weir. If the upstream bend continues to erode toward the vane, the enlargement plan would then be implemented.

## Cochiti Reach

The Cochiti reach extends approximately 23 river miles from Cochiti Dam to Angostura Diversion Dam The highest daily mean in 2008 at the Cochiti gage was 6,210 cfs on May 24. At the San Felipe gage, the highest daily mean in 2008 was 6,170 cfs on May 24. The effects of the high flows varied along the reach. Throughout Cochiti and Santo Domingo Pueblos, the river channel appeared to handle the high discharges without significant changes, whereas substantial bank erosion occurred on portions of San Felipe Pueblo.

**Recommendations**

- Continue aerial monitoring, paying particular attention to possible rapid migration during high

flows at sites where the river was previously stable.

## Cochiti RM 231.3

This site is located on the Pueblo of Cochiti, approximately 1 mile downstream of Cochiti Dam. At the site, the bankline migrated westward into a jetty field during the 1970s. A bankline protection project was completed in April 2008. This project included removal of the jetty field and installation of a riprap toe, three layers of coir blocks, and a French drain between the adjacent agricultural fields and the river. On the basis of previous field observations, the French drain appears to be successful at intercepting subsurface flows from the agricultural fields; this flow had previously been causing sinkhole formation in the road between the fields and the bankline. Thus far, the project is successful at preventing bank erosion. However, the water surface is much lower at both base flows and spring runoff peaks than the HEC-RAS model predicted, so more of the riprap toe is exposed than had been expected. This may have negative effects on the survival rates of planted willow poles and, furthermore, is somewhat aesthetically displeasing. The lower water surface may be due to enlargement of the eastern secondary channel that occurred when the entire river flow was diverted into it during construction.

*Bank stabilization project at Cochiti River Mile 231.3 (July 2008).*

**Recommendations**

- Collect post-project cross-section data and update the hydraulic model.
- Consider a field trip to determine if enlargement or sedimentation of the east channel occurred.
- Evaluate adaptive management alternatives in HEC-RAS.
- Plant tree poles between the bankline and the new road location.

## Santa Fe River Confluence

River maintenance work at the Santa Fe River Confluence site, which is located on the Pueblo of Cochiti, was completed in December 2004. The work included relocating a portion of the levee away from the river, armoring the riverward toe and slope of the levee, placing earth fill in a short portion of the riverside drain, creating a new floodplain area, and planting native vegetation for erosion resistance. The toe of the levee is now approximately at the estimated water surface elevation of a 10,000-cfs flow. Growth of tree poles planted between the levee and the bankline

*Aerial view of Santa Fe River confluence (June 2008).*

has been slow, with moderate survival rates.

**Recommendations**

- Continue to monitor the bio-engineered portion of the project.
- Consider additional pole plantings in conjunction with upcoming revegetation work at River Miles 228.9 and 231.3.

## Cochiti RM 228.9

This site is located on the Pueblo of Cochiti, near the upstream end of a large island that is about 3 miles downstream of Cochiti Dam. The main channel is on the west side of the island, and the secondary channel is on the east side. The secondary channel carries water year-round. The concern at this site was that the secondary channel was slowly, but steadily, migrating eastward toward the levee and riverside drain. To address concerns at this site, a new secondary channel was excavated through the island; it connects to the previous secondary channel downstream of the priority site. The entrance to the previous secondary channel was blocked with a dike composed of a rock toe, three layers of coir blocks, and earth fill. The area of the old channel between the dike and the confluence with the new channel was left as a backwater wetland. The new secondary channel has widened considerably and has increased in sinuosity since its construction in spring 2008.

**Recommendations**

- Consider this project as a paper for the sedimentation conference, focusing on the morphological development of the new secondary channel. Try to show time lapse photos of the new channel.
- It's probably not necessary to reshape the bank at the former priority site location, as had been specified in the original design.
- Take a field trip to inspect the downstream end of the island to determine if there has been any change in the secondary channel; if so, evaluate whether any action is necessary to maintain fish habitat.
- Collect river cross-section data on throughout the project area.
- Proceed with tree pole revegetation in winter 2008–2009.


*Dike blocking entrance to previous secondary channel, Cochiti River Mile 228.9 (July 2008).*

*Development of gravel bars in the new secondary channel, Cochiti River Mile 228.9 (July 2008).*

*Growth of grass and seedlings in the constructed oxbowl, Cochiti River Mile 228.9 (July 2008).*

## Galisteo Creek

This site is located on the west bank of the Rio Grande, opposite and slightly downstream of the Galisteo Creek confluence. The river has previously eroded beyond the jetty jack line. The bankline did not appear to have moved since previous inspections. A small island, probably composed of sediment from Calisteo Creek, has formed on the western side of the channel. The contractor who provided geomorphic analysis for this project believed that the island would continually reform if it was removed and that removing it may be counterproductive to the goal of stabilizing the bankline.

**Recommendations**

- Consider using the island as a feature in the river maintenance project.

*Jetty jacks near the west bankline of the Rio Grande, opposite the Galisteo Creek confluence (July 2008).*

## Santo Domingo RM 224.1 (Riprap Stockpile)

This site is located on the west bank of the Rio Grande, adjacent to Reclamation's riprap stockpile. The concern at this site is that the river may erode into the riprap stockpile, resulting in loss of rock material and limitation in access to the stockpile. Damage to a levee and drain could also occur. The bankline did not appear to have migrated significantly during the 2005 runoff. The secondary channel upstream of the site carried much less flow than had been the case in the late 1990s.

**Recommendations**

- Consider adjusting flow in the multiple river channels near the site; however, the Pueblo doesn't want any erosion to occur on the east side.
- Consider reactivating the old channel between the bridge and the stockpile site.


*Riprap stockpile and bankline, Santo Domingo River Mile 224.1 (July 2008).*

## San Felipe RM 213.4

The priority site at River Mile 213.4 experienced extensive erosion during the 2008 runoff. A short section of a dirt road adjacent to the west bank was destroyed; the road had been passable at the beginning of runoff. The island at this site appears to be continually enlarging to the west. Alternative analysis is currently underway for a river maintenance project at this site.

*Recent erosion at San Felipe River Mile 213.4 (June 2008).*

**Recommendations**

- Continue monitoring the site during periods of high flow.
- Review aerial photography that would show the temporal development of the island.
- Proceed with alternative analysis and designs.

## San Felipe RM 212.0

The priority site at River Mile 212.0 experienced minimal erosion during the 2008 runoff. Erosion has proceeded to the berm on the west side of the channel, adjacent to a riverside drain. Alternative analysis is currently underway for a river maintenance project at this site. There is a long, irregularly shaped island in the channel near the location of the priority site. Erosion is active in the upstream portion of the site, adjacent to the island. In the downstream portion of the site, which is downstream of the island, the bankline is currently stable, though it was actively eroding several years ago.

**Recommendations**

- Evaluate changes in the morphology of the island; the current location of erosion is probably attributable to changes in island morphology, coupled with reduced capacity in the east branch of the channel.
- Before implementing a project to increase flow in the east channel, make sure that it won't cause erosion at the downstream portion of the site.
- Proposed alternatives that involve straightening the channel could have undesirable effects.

*Bankline at upstream portion of San Felipe River Mile 212.0 (April 2008).*

## San Felipe RM 211.3

At River Mile 211.3, there was evidence of active erosion on the west bankline, but the bankline did not appear to have moved more than a few feet during the 2008 runoff. River Mile 211.3 is currently a monitored site, but it is under consideration for upgrade to priority site status, owing to the active erosion and close proximity to the drain on the west side of the channel.

**Recommendations**

- Determine the rate of erosion of the bankline.
- Apply the typical evaluation methodology to assist in determining whether this should be a priority site.
- Consider performing work at this site simultaneously with work at nearby sites to reduce costs of mobilization, environmental compliance, and design.

*Top of bank (at left) and berm adjacent to riverside drain (at right) at San Felipe River Mile 211.3 (June 2008).*

# Albuquerque Reach

The Albuquerque Reach extends approximately 40 river miles from Angostura Diversion Dam to Isleta Diversion Dam. The highest daily mean flow at the Albuquerque gage at the Central Avenue bridge during 2008 spring runoff was 5,170 cfs on May 25.

## Santa Ana

Overall, the project appears to be functioning well. The bio-engineered banklines, constructed wetlands, and vegetated floodplain also appear to be developing successfully. The spoil piles on the east side of the channel remain in place. Designs for their removal and relocation are complete, as are environmental compliance permits and documentation. Construction has been postponed because other current projects were determined to have higher priority. Construction will occur when the Socorro Field Division crews become available. Environmental compliance documentation remains valid as long as the baseline condition of the site does not change significantly.

*Dense vegetation growth in constructed wetland area, Santa Ana (July 2008).*

**Recommendations**

- Try to begin construction before environmental compliance documents become outdated.

## Tamaya

This site is located within the Pueblo of Santa Ana, on the east bank of the Rio Grande, across from the Tamaya Resort special events tent. For many years, the bankline had been stable and had followed the jetty jack line. Prior to the 2008 runoff, the bankline had migrated beyond the jetty jack line. Further erosion occurred during the 2008 runoff. The Pueblo of Santa Ana has repeatedly stated concern about conditions at the site. The Corps of Engineers is planning an island and bar lowering project that will encompass this area.

*Recent bank erosion at the Tamaya site, Pueblo of Santa Ana (July 2008).*

**Recommendations**

- Contact the Corps of Engineers to ensure that their plans for the bank lowering project are compatible with river maintenance requirements.
- Evaluate the rate of bank erosion.
- Continue monitoring; this site seems to be similar to previous priority sites on the Pueblo of Santa Ana where emergency conditions developed quickly.
- Determine whether this site is geomorphically

similar to the Bernalillo and Santa Ana priority sites, where the river also made sharp curves to the east.
- Upgrade to a priority site.

## Bernalillo

Reclamation completed a river maintenance project at this site in late 2006. The project involved placement of 15 bendway weirs, spaced 75 feet apart, along the east bankline and construction of a secondary channel on the west side of the floodway. Immediately following construction, the west channel had enlarged (because all flow had been diverted into it during construction) to the extent that it carried the majority of flow. The 2007 runoff reworked the channel, resulting in deposition in the west channel and deepening of the east channel; the configuration at the end of the 2007 runoff was similar to the design intent. The 2008 runoff caused extensive further reworking of the channel, including additional deposition in the west channel and a change in location of the island between the east and west channels. Erosion occurred between a few of the bendway weirs, resulting in scalloping of the bankline a few feet beyond its original location.

*Scalloping between bendway weirs, Bernalillo (September 2008).*

**Recommendations**

- Closely monitor scalloping between bendway weirs and changes to the secondary channel.
- Determine whether any of the riprap of the bendway weirs has become dislodged from its original position.

## Sandia

Earthwork and bendway weir installation for a river maintenance project at this site was completed in early 2008. There were 48 weirs installed at 75-foot intervals. The project also included a realignment of the channel to increase sinuosity. Backwater and floodplain shelf areas were constructed to provide habitat improvements and allow for placement of earth material excavated from other areas of the project. Revegetation is planned for winter 2008–2009. The 2008 runoff appears to have caused few changes from the constructed configuration.

*Aerial view of Sandia site during spring runoff (June 2008).*

**Recommendations**

- Monitor longevity of the newly constructed secondary channels.
- Complete revegetation.

## Corrales Siphon

The Corrales Siphon site was identified in early 2005 as a monitored site and upgraded to a priority site at the end of that year. The Corrales Siphon is located about 600 feet downstream of the Arroyo de la Barranca confluence (which is also the site of the Rio Rancho wastewater treatment outfall). It is an inverted siphon that conveys irrigation water to the Corrales Main Canal by passing under the Rio Grande channel. During the high flows of the 2005 spring runoff, the bank experienced erosion primarily associated with undercutting. The site is located in an area frequented by the public. No erosion has occurred since the 2005 runoff; significant deposition has even occurred at the upstream portion of the site.

*Gravel bar upstream of the Corrales Siphon site (July 2008).*

Designs for a river maintenance project were completed at the end of 2006. Environmental compliance was nearly complete when it was brought to Reclamation's attention that the pipeline of the inverted siphon is constructed of wood stave pipe that was installed about 75 years ago. This raised concern that the pipeline could be damaged by vibrations from construction equipment. Reclamation contracted with a consultant specializing in vibration issues to evaluate the potential for the pipeline to be damaged by vibrations; the consultant recommended that heavy construction should be operated no closer to the pipeline than 35 feet and should only be operated in first gear.


*Bankline at Corrales Siphon (July 2008).*

The bar on the west side of the channel upstream of the site appears to be providing protection from erosion. It is unclear whether this bar has increased in size or has remained a constant size since late 2005. In summer 2008, it had some vegetation but was not heavily vegetated.

**Recommendations**

- Consider stabilizing the bar upstream of the site by adding a riprap-filled trench at its upper end or by extensively planting vegetation, or both.
- If vegetation is planted, consider including a foot trail for public use.
- If possible, have construction equipment approach from Arroyo de la Barranca to minimize vibrations near the wood pipeline.

# Belen Reach

The Belen Reach extends approximately 42 river miles from Isleta Diversion Dam to the Rio Puerco confluence. The Isleta and Bosque Farms USGS gages

were not functioning properly throughout much of the 2008 spring runoff. The USGS estimate of maximum daily mean at the Isleta gage during the 2008 spring runoff was 5,090 cfs on an unspecified day in May. During the post-runoff review, a significant narrowing trend was observed south of the Highway 60 bridge near Bernardo, most notably along the west bank near La Joya. River planform changes involving the establishment of permanent woody vegetation, bar and island attachment to the banklines, and channel narrowing continue to be a concern in this reach. These planform changes may create problems along the levee system in the near future.

*Attached, vegetated bar causing channel narrowing in the Belen Reach (April 2008).*

## Isleta Diversion Dam

Presently, there are no river maintenance sites near Isleta Diversion Dam. However, the Pueblo of Isleta has repeatedly expressed concern about sedimentation issues in the vicinity of the dam.

# Rio Puerco Reach

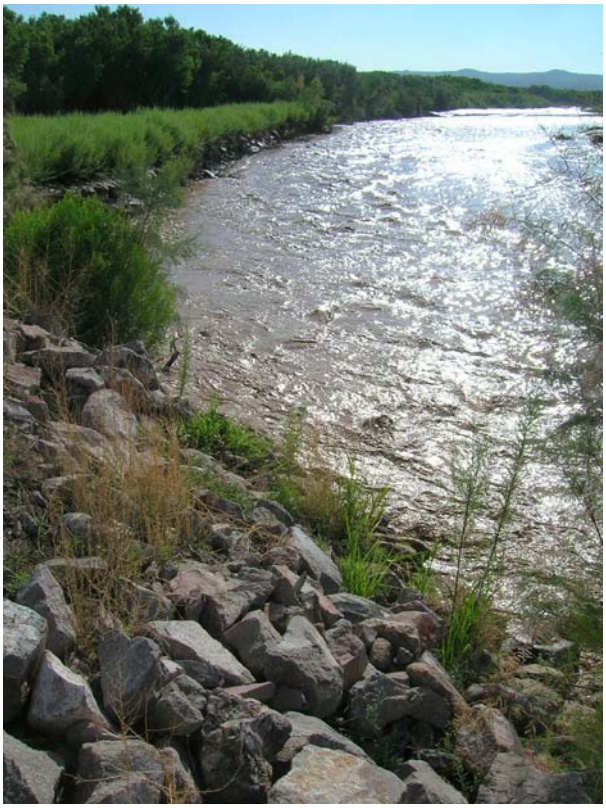
The Rio Puerco Reach is a relatively short reach that starts at the Rio Puerco confluence and extends approximately 10 river miles downstream to San Acacia Diversion Dam. The Bernardo gage, located just upstream of the Rio Puerco Reach, is no longer being maintained by the USGS. The closest gage to this reach is now the San Acacia gage, where the highest daily mean during the 2008 spring runoff was 5,200 cfs on May 27.

## Drain Unit 7

The Drain Unit 7 site is located immediately upstream of San Acacia Diversion Dam, on the northwest bank of the river. Designs for riprap placement are complete, and construction is planned for early 2009. The bar on the opposite side of the channel has become sufficiently established that changes to gate operations at the dam are unlikely to significantly affect channel morphology. The two-dimensional modeling that occurred in preparation for the design was useful but did not provide entirely definitive results.

**Recommendation**

- Proceed with current plans for riprap placement.



*Bankline at Drain Unit 7 site (July 2008).*

# Socorro Reach

The Socorro Reach extends about 38 river miles, from San Acacia Diversion Dam downstream to river mile 78, near the middle of Bosque del Apache National Wildlife Refuge. This reach was extremely active during the 2005 spring runoff, especially near river miles 110 and 111. However, erosion during the 2008 runoff was minimal at these sites. The maximum daily mean discharge at the San Acacia gage during 2008 spring runoff was 5,200 cfs on May 27.

## San Acacia RM 114 & 113

The levee setback project at River Miles 114 and 113 is complete. During previous periods of high flow, the bankline at River Mile 114 had eroded beyond the former location of the levee toe. However, some deposition occurred in this area since the 2006 monsoon season.

*Erosion at former levee toe, San Acacia River Mile 114 (May 2008).*

## San Acacia RM 111

River Mile 111 had extensive bank erosion during the 2005 spring runoff. Consequently, a self-launching riprap windrow was placed between the levee and the bankline as a short term erosion control measure. Construction of a levee setback project began in early 2008 and will be complete in 2009. During the 2008 runoff, some erosion occurred at River Mile 111, but the bankline did not erode to the location of the riprap windrow. As the downstream portion of the bankline eroded, a former secondary channel downstream of the bend became the main channel. The riprap windrow will be removed if it has not self-launched by the time the levee setback project is complete.

*Bankline and temporary riprap windrow, San Acacia River Mile 111 (July 2008).*

## San Acacia RM 110

The rapid erosion of the bend at River Mile 110 during the 2005 runoff created much concern about damage to the levee. In response, Reclamation instituted an intensive monitoring program to evaluate planform changes and erosion rates. Near the end of the 2008 runoff, the meander bends on both the east and west sides of the river were cut off, returning the channel to a straighter planform. The previous meander bends became areas of deposition.

**Recommendation**

- Continue monitoring the site; there is no need for action at this time.

*Recently abandoned bend at San Acacia River Mile 110 (July 2008).*

## Arroyo de las Cañas

This site is located on the west bank of the Rio Grande, near the confluence of an unnamed arroyo upstream of Arroyo de las Cañas. During the 2005 runoff, erosion proceeded to within 100 feet of the levee. Accordingly, designs were developed for a river maintenance project. However, by 2008 the channel had migrated eastward (away from the levee) throughout most of the area of concern. A sandbar has been deposited in the former location of the channel adjacent to the levee. The current designs do not address the conditions that now exist at the site.

**Recommendations**

- When 2008 aerial photographs become available, observe changes in channel planform and attempt to predict trends.
- Vegetation planting to stabilize the sandbar may be advisable; consider planting coyote willows in a configuration similar to what was used for jetty jacks.
- Consider downgrading from a priority site to a monitored site.

*Sandbar at former location of main river channel, Arroyo de las Cañas site (January 2008).*

## Bosquecito

This is a 4,300-foot-long monitored site where the west bank of the Rio Grande is near the LFCC levee. The downstream end of the site is next to the Neil Cupp pump site. The distance between the levee and the bankline is relatively low throughout the entire site, but the closest points are at the upstream and downstream ends of the site. There is no evidence of significant recent erosion.

**Recommendation**

- Should remain on the list of monitored sites.

*Bankline at downstream end of Bosquecito site (July 2008).*

## Bosque del Apache Sediment Plug

A sediment plug formed in Bosque del Apache National Wildlife Refuge during the 2008 spring runoff. Until this year, there had been no history of sediment plug formation in this area. During the 2008 spring runoff, Reclamation undertook emergency raising and widening of the levee adjacent to the sediment plug to avoid overtopping and seepage failure. Excavation of the plug began in October 2008. The Refuge management does not want construction to take place during the height of migratory bird presence. Additionally, the Refuge has strongly stated a preference against the presence of spoil berms

adjacent to the pilot channel during the 2009 runoff, so spoil piles will be removed in early 2009. There is uncertainty about how fast the plug will erode after the pilot channel is complete.

**Recommendations**

- Try to make the slope of the pilot channel relatively constant.
- Place spoil berms close to the pilot channel to increase the rate of erosion.

# San Marcial Reach

The San Marcial geomorphic reach extends from river mile 78, at the upstream end of the Bosque del Apache channel widening project, to the pool of Elephant Butte Reservoir. The nearest gage for this reach is located downstream of the San Marcial railroad bridge. During the 2008 spring runoff, the maximum daily mean discharge was 4,260 cfs on May 28.

## Tiffany Sediment Plug

Sediment transport modeling before runoff predicted the formation of a sediment plug in the Tiffany area, as had occurred in 2005 and some other previous years. However, a sediment plug did not form in this area in 2008, probably owing to the formation of a sediment plug upstream in Bosque del Apache and continued bed lowering in the Tiffany reach caused by the lower reservoir pool elevation.

**Recommendations**

- Reevaluate current plans for a long term solution in light of this year's formation of a plug in Bosque del Apache.
- Through analysis of 2008 hydrologic and hydrographic data as well as pre-runoff sediment modeling, determine the cause of inaccurate sediment plug formation prediction in the Tiffany Reach.

## Fort Craig Bend

Extensive erosion occurred at this site during the 2005 spring runoff, resulting in its designation as a priority site. Additional erosion at the upstream end of the site occurred during the 2008 runoff, whereas deposition occurred in the downstream portion.

**Recommendations**

- Conduct a GPS survey of the bankline to

*Former main Rio Grande channel, Bosque del Apache sediment plug (August 2008).*

*High water levels in overbank area, Tiffany (May 2008).*

*Fort Craig Bend with new sandbar downstream (July 2008).*

determine the extent of recent erosion.

- Consider allowing the levee to breach and the river to move to the west side of the valley; now would be a good time for this to occur because the elevation of the LFCC invert and the river are currently similar.

## River Mile 60

There is a series of bends just upstream of EB-24 where the levee road is next to the river. The river channel flows directly into a riprap revetment along the levee at this location. Riprap has been placed in the past to prevent erosion of the levee. However, the bends are migrating laterally and causing problems along the levee. The river in this area has degraded during the last few years. In unprotected areas, the bankline has actively eroded. Seepage through the levee to the Rio Grande from the LFCC was observed during the field review. The Socorro Field Division, along with some other agencies, has indicated a preference to maintain the road to allow access to the Temporary Channel between this point and the LFCC outfall. The AAO's current policy decision is probably to allow failure at this site if anything more than an inexpensive, temporary repair would be required.

**Recommendations**

- Clarify policy on maintenance at this site.
- Evaluate alternative means of access to the portion of the Temporary Channel served by the existing road.
- Determine whether bed elevation changes have occurred since 2007.

*Looking downstream from edge of levee, River Mile 60 (July 2008).*

*Seepage through the levee to the river at River Mile 60 (July 2008).*

## Elephant Butte Temporary Channel

Extensive sediment deposition occurred in the area upstream of the Narrows, near Red Rock Canyon. This portion of the Temporary Channel is very flat and historically had high maintenance requirements because of sediment deposition. The elevation of this portion of the reservoir pool is relatively constant across cross-sections; there is no definitive low spot. Prior to construction, the area along the west side of the reservoir pool was wetter, leading to the widespread belief that elevation was lower there. However, this was probably attributable to small groundwater springs, rather than elevation differences. The rate of sediment deposition in this reach is closely linked to reservoir stage. If the reservoir drops, any channel alignment will probably be successful in preventing the channel from becoming plugged with sediment; if the

*Upstream end of sediment deposition in the Elephant Butte Temporary Channel upstream of the Narrows (July 2008).*

reservoir rises, any channel alignment will probably be unsuccessful. Willow flycatcher nests are currently present on the west side of the Temporary Channel, but not on the east side.

**Recommendations**

- Avoid locating the channel along the west edge of the reservoir pool because of the likely presence of springs there.
- Determine whether it's possible to quantify the effect of current conditions on depletions.
- Investigate the presence and seasonal variation of groundwater springs in this area, as well as the source of groundwater (e.g., alluvial, artesian, etc.). Consider contacting New Mexico Tech or the New Mexico Bureau of Geology.

# Acknowledgments

The information contained within this report was provided by Jonathan AuBuchon, Drew Baird, Carolyn Donnelly, Paula Makar, Mark Nemeth, Robert Padilla, Tim Randle, Cheryl Rolland, and Dwight Slaugh. Assistance in plant identification was provided by Jeanne Dye. As always, the monitoring and maintenance efforts of the Socorro Field Division during the 2008 runoff were greatly appreciated.