8 9 4 1 4	ERID#: 89414	LOS ALAMOS NATIONAL LABORATORY ENVIRONMENTAL RESTORATION (RRES-R) Records Processing Facility ER Records Index Form

Date Received: 8/17/2005 ***Processor:*** JR ***Page Count:*** 41

Privileged: (Y/N) N ***Record Category:*** P ***Administrative Record: (Y/N)*** Y

FileFolder: N/A

Miscellaneous Comments: SUBMITTED BY JARED LYMAN

Record Documents:

Start Pg	Doc Type	Doc Date	Title	Box	Package
1	REPORT	6/1/2005	CHARACTERIZATION OF EROSION AND DEPOSITION OF SEDIMENT IN PUEBLO CANYON, LOS ALAMOS, NEW MEXICO, FOLLOWING THE CERRO GRANDE FIRE (ER2005-0136) LA-14231 ER2005-0136 N/A		
40	SIGNATURE FORM	5/17/2005	RRES-RS DOCUMENT SIGNATURE FORM FOR ER2005-0136 -CHARACTERIZATION OF EROSION AND DEPOSITION OF SEDIMENT IN PUEBLO CANYON, LOS ALAMOS, NEW MEXICO, FOLLOWING THE CERRO GRANDE FIRE N/A ER2005-0136 N/A		

30982

894141

41

LA-14231
Approved for public release;
distribution is unlimited.

Characterization of Erosion and Deposition of Sediment in Pueblo Canyon, Los Alamos, New Mexico, Following the Cerro Grande Fire

Los Alamos
NATIONAL LABORATORY
EST. 1943

The World's Greatest Science Protecting America

RECEIVED
AUG 17 2005
By

Edited by Meena Sachdeva, Group IM-1

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by the University of California for the United States Department of Energy under contract W-7405-ENG-36.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the Regents of the University of California, the United States Government nor any agency thereof, nor any of their employees make any warranty, express or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represent that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the Regents of the University of California, the United States Government, or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the Regents of the University of California, the United States Government, or any agency thereof. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.

LA-14231
Issued: June 2005

Characterization of Erosion and Deposition of Sediment in Pueblo Canyon, Los Alamos, New Mexico, Following the Cerro Grande Fire

Jared Lyman
Steven L. Reneau
Danny Katzman
Alexis Levine
Daniel V. Malmon*

*Western Earth Surface Processes Team, U.S. Geological Survey, MS 973, 345 Middlefield Road, Menlo Park, CA 94025

Los Alamos
NATIONAL LABORATORY
EST. 1943

The World's Greatest Science Protecting America

Characterization of Erosion and Deposition of Sediment in Pueblo Canyon, Los Alamos, New Mexico, Following the Cerro Grande Fire

by
Jared Lyman[1], Steven L. Reneau[1], Daniel V. Malmon[2], Danny Katzman[1], Alexis Lavine[1]

[1] Environmental Geology and Spatial Analysis Group, EES-9, MS M992, Los Alamos National Laboratory, Los Alamos, NM, 87545

[2] Western Earth Surface Processes Team, U.S. Geological Survey, MS 973, 345 Middlefield Road, Menlo Park, CA 94025

ABSTRACT

The Cerro Grande fire (May 2000) burned approximately 174 km^2 in and around Los Alamos, New Mexico. Post-fire runoff was greatly enhanced by the loss of forest litter and the development of hydrophobic soils. The upper 4.9 km^2 of the 21.7 km^2 drainage basin of Pueblo Canyon experienced high-severity burn with 100% tree mortality. Pueblo Canyon has subsequently experienced multiple post-fire floods, the largest of which occurred on 2 July 2001 with an estimated peak discharge of 1440 cubic feet per second. Resurveying of 42 channel cross sections originally surveyed in November 1996 along 10 km of Pueblo Canyon downstream of the burn area allows quantification of the channel's geomorphic response during the first two seasons of post-fire floods.

Channel change at the surveyed locations in 2000 and 2001 varied greatly, ranging from a net incision of 0.75 m to a net aggradation of 1.1 m and channel widening of up to 5.3 m. Extrapolation between sections yields an estimated net deposition of approximately 2,400 m^3 of sediment within the channel along the 10 km length of Pueblo Canyon. The predominant result of overbank flooding was net deposition on the floodplains, although some localized scour also occurred. More than 0.5 m of floodplain deposition was measured at some cross sections, with an estimated total floodplain deposition in the study area of approximately 6000 m^3. Available data indicate that the average net sediment deposition following the Cerro Grande fire is similar in magnitude to the historical average yearly pre-fire sediment deposition. However, fine-grained sediment deposition rates were apparently higher after the fire, while coarse-grained sediment deposition rates were higher before the fire. These differences are probably related to differing sources of sediment before and after the fire, combined with the increased flood magnitude after the fire.

INTRODUCTION

The Cerro Grande fire of May 2000 burned approximately 174 km^2 within and to the north and west of Los Alamos, causing major hydrologic changes in the burn area (BAER 2000) and increasing the magnitude and frequency of flooding along downstream channels (Gallaher and Koch, 2004; Shaull et al., 2004). Pueblo Canyon was one of the more severely impacted watersheds. Transport of sediment in the canyon is of concern because of the presence of legacy contaminants, particularly plutonium-239, 240, within post-1942 sediment deposits (Stoker et al., 1981; Graf, 1996; Reneau et al., 1998, 2004; LANL 2004). An understanding of the geomorphic response to flooding after the Cerro Grande fire is needed to help identify sources and redeposition of contaminated sediment. This report documents an investigation conducted in Pueblo Canyon (Figure 1) related to sediment erosion and deposition by floods in the first two rainfall seasons following this wildfire, revising preliminary summaries previously presented in Lyman et al. (2002).

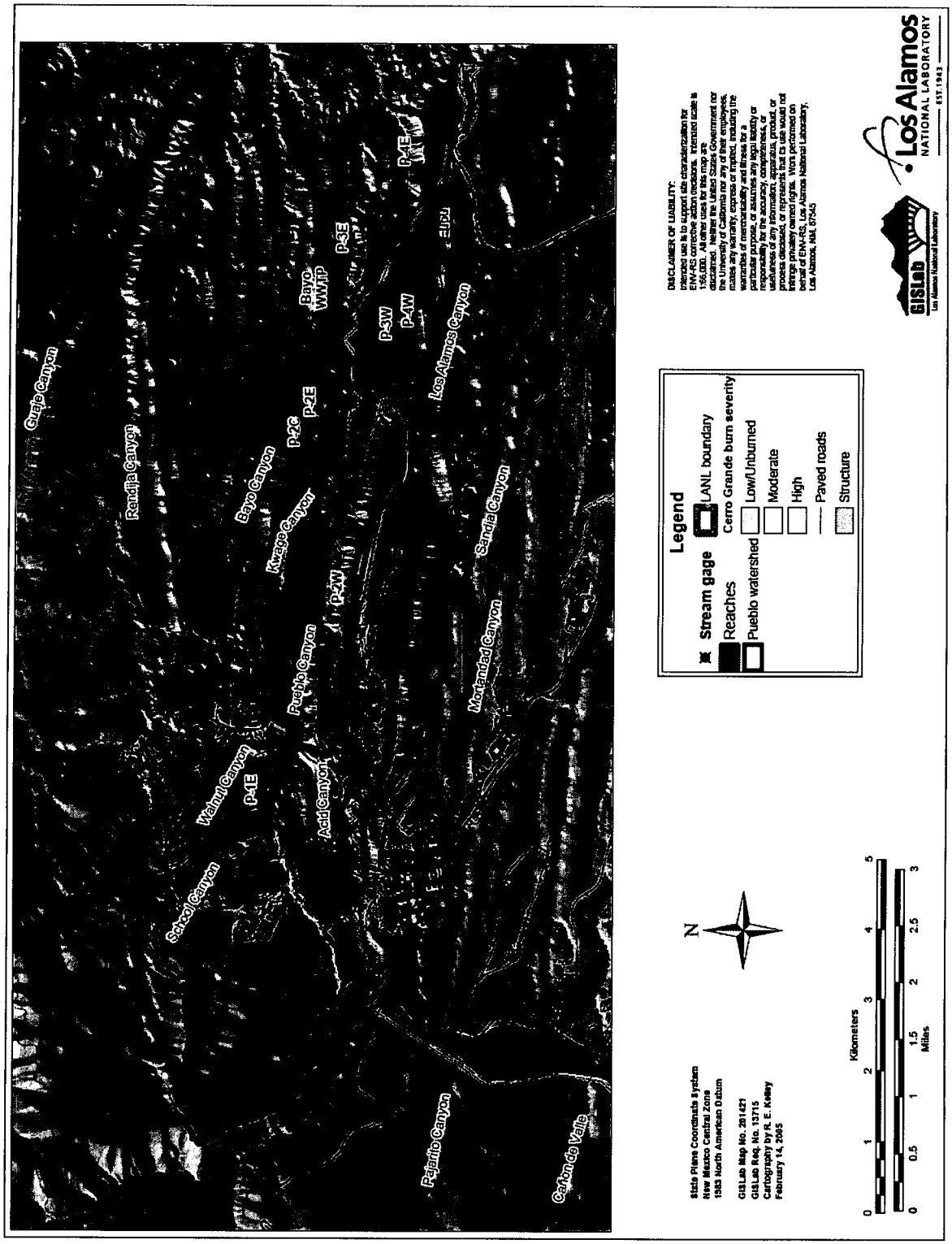


Figure 1: Locations of reaches discussed in this report.

Pueblo Canyon runs west to east from the east side of the Jemez Mountains across the Pajarito Plateau (Figure 1). It begins in the Santa Fe National Forest, runs through Los Alamos County, and San Ildefonso Pueblo lands before its confluence with Los Alamos Canyon, which

eventually drains into the Rio Grande. Pueblo Canyon is approximately 16 km long with a drainage basin area of 21.7 km^2. The Tschicoma Formation, Puye Formation, Cerro Toledo interval, and Otowi and Tshirege Members of the Bandelier Tuff underlie the canyon bottom alluvium in different areas.

Post-fire conditions in the drainage area of Pueblo Canyon included the development of hydrophobic soils, the destruction of forest litter, and 100% tree mortality in 4.9 km^2 of the upper drainage basin, an area which experienced high-severity burn (BAER, 2000). As a result of these conditions, runoff increased after the fire, and multiple post-fire floods have occurred in Pueblo Canyon. The largest post-fire flood previous to this report occurred on 2 July 2001 with an estimated peak discharge of 1440 cubic feet per second (cfs) (Shaull et al., 2004, p. 98).

METHODS

The ENV-RS project canyons team at investigated geomorphic changes in channel sediment after the Cerro Grande fire by conducting repeat surveys of a series of 42 cross sections perpendicular to the channel along 10 km of Pueblo Canyon. These sections extend from just below the confluence with Acid Canyon, downstream to near the confluence with Los Alamos Canyon. Original surveys were conducted in 1996, 1998, and 2000, and surveys were repeated in 2001. The 2001 surveys were conducted after the 2 July 2001 flood (the largest post-fire flood to date) and document the net effect of this flood and smaller post-fire floods. The "before" and "after" cross sections and associated survey data are presented in Appendix A. Table 1 summarizes the locations of cross sections discussed in this report. Locations of surveyed reaches are shown in Figure 1.

Table 1. Summary of Cross Section Locations and General Geomorphic Changes in Pueblo Canyon Reaches

Reach	Distance from Acid Canyon (km) *	Number of cross sections measured	Average channel gradient	General geomorphic changes
P-1 East	0.16	3	3.0%	Discontinuous channel widening and overbank deposition
P-2 West	3.26	4	1.5%	Some floodplain deposition; variable channel aggradation
P-2 Central	4.22	7	1.5%	Some channel widening; floodplain deposition
P-2 East	4.48	8	1.5%	Channel widening and scour; broad floodplain deposition
P-3 West	6.35	11	1.0%	Up to 1 m of net channel aggradation; bank erosion
P-3 East	7.71	1	1.6%	Significant floodplain deposition; localized channel scour
P-4 West	8.35	4	1.8%	Some channel and floodplain deposition with variable scour
P-4 East	9.35	4	1.9%	Broad areas of up to 0.7 m of net aggradation

*Distances are from the confluence of Acid Canyon to the midpoint of each reach. Acid Canyon is referenced as the zero point, as the source of contamination entering Pueblo Canyon.

Subsequent geomorphic changes in 2002 through 2004 have not been systematically evaluated. Because no large floods occurred in Pueblo Canyon between the original surveys and July 2000, the changes identified in the post-fire surveys largely or entirely represent the effects of post-fire floods.

The majority of the cross sections presented in this report were measured using a surveying rod, hand level, and 100 m surveying tape. These cross sections have an internal accuracy of less than 5 cm. Some cross sections in reach P-3 West with "P-U-X" prefixes, were measured using a Geodimeter 600 total station surveying instrument. The data from the total station in this area may be considered internally accurate within 2 cm. The cross sections presented in Appendix A are shown with zero on the northern side of the canyon in order from upstream to downstream. From this orientation, all the cross sections depict a view looking downstream along the channel.

Coordinates of most of the cross section endpoints were determined using a Trimble RTK 5700 Global Positioning System referenced from monumented Los Alamos National Laboratory(LANL) survey control points in the vicinity and are presented in Appendix B. These measurements have an accuracy in reference to external control points of less than 10 cm. The endpoints are physically monumented with rebar and aluminum tags, most of which were emplaced at the time of the original surveys. Some of the cross section endpoints were not monumented in the original surveys and were relocated using surveyed sample locations as reference points. For each cross section, estimates of net change in cross sectional area between the original and repeat surveys were made, distinguishing between the part of the section occupied by channel or floodplain. These estimates document either net erosion or net deposition between the surveys.

The net change in cross sectional area (units of m^2) is equal to a volumetric change per unit of channel length (units of m^3/m). The average value for all cross sections per reach was also calculated to indicate general differences among reaches and to allow extrapolation of net sediment volume changes between reaches. For the purposes of these calculations, areas previously mapped as "c1" or "c1b" units (Reneau et al., 1998) were considered channels and areas previously mapped as other units (e.g., c2, f1) were considered floodplains. When channel widening occurred by bank erosion into floodplains, the change in the volume of floodplain sediments was deemed negative.

It should be noted that the profiles in Appendix A show only a total net change in sediment deposition or erosion, and additional changes may occur during individual floods. For example, it is possible that channels that experienced net deposition in a flood may have experienced erosion during the rising stage of the flood, with sediment accumulating only during the waning stage. In addition, net erosion may occur at a location during one flood and net deposition in another flood.

RESULTS

Net erosion and deposition of sediment after the Cerro Grande fire varied along the length of the Pueblo Canyon study area. The geomorphic changes in each reach identified by the resurveyed cross sections and other field observations are discussed in the following sections and summarized in Table 1. Estimates of net channel and floodplain erosion or deposition for each cross section are presented in Table 2. Channel widening is presented in Table 3.

Table 2. Estimate Net Sediment Erosion or Deposition in Floodplains and Channels by Cross Section.

Cross sections	Net floodplain area change estimates (m^3/m). Possitive is fill.	Net channel area change estimates (m^3/m). Positive is fill.
P-1 East		
P1E XS-5	0	0.19
P1E XS-6	0.45	0
P1E XS-7	0	0
P-2 West		
P2W XS-1	0.17	0.39
P2W XS-2	*1*	0
P2W XS-3	1.3	-0.16
P2W CSG-1	1.9	-0.15
P-2 Central		
P2C XS-1	3.2	0.66
P2C XS-2	0.81	0
P2C XS-3	0.31	0
P2C CSG-1	3.5	-0.1
P2C CSG-2	1.9	0.25
P2C XS-5	0	-0.17
P2C XS-6	0.31	-0.85
P-2 East		
P2E XS-7	1.48	-2.2
P2E XS-8	0.918	-1.5
P2E XS-9	0.43	-4.8
P2E CSG-4	0.35	-2.4
P2E XS-14	2.3	-1.3
P2E CSG-1	3.35	-0.5
P2E CSG-2	3.53	-0.43
P2E CSG-3	2.5	-0.74
P-3 West		
P3W PUX7	-0.45	-0.1
P3W PUX8	0.92	0.05
P3W XS-0	0	0.43
P3W PUX3	2.63	0.45
P3W PUX1	0	2.21
P3W XS-1	0.31	4.2
P3W PUX2	0	4.29
P3W PUX4	0	2.34
P3W PUX5	0	12.49
P3W PUX6	0	8.826
P3W CSG-4	5.2	10.6
P-3 East		
P3E XS-1	6.99	-0.22
P-4 West		
P4W XS-5	0.2	1.57
P4W XS-6	0	-0.38

P4W XS-7	0.53	0.2
P4W XS-8	0.29	-0.36
P-4 East		
P4E XS-4	0	1.6
P4E XS-3	0	0.15
P4E XS-1	0.42	1.4
P4E XS-2	0.45	0.2

Reach P-1 East

Reach P-1 East is a relatively steep and narrow portion of Pueblo Canyon with an average channel slope of 3%, the steepest of any reach in the study area. Parts of the channel in this reach were disturbed by construction activities associated with work on a County sewer line and access road after the 2 July 2001 flood, in addition to changes caused by the post-fire floods themselves (Figure 2). Boulders are common in the channel in this portion of this canyon. Tschicoma Formation dacite bedrock is also locally exposed along the channel contributing to channel stability.

Figure 2. Reach P-1 East looking downstream near the section in Figure A-1. This photograph shows a disturbed portion of the right-hand side of channel near the western end of the study area. The boulder-lined channel can be seen in the background.

The most significant geomorphic change in reach P-1 East was a widening of the channel up to 2.7 m in some areas. Table 2 shows channel widening as a decrease in floodplain sedimentation. No appreciable net scour was observed at the cross sections, probably from resistance provided by bouldery alluvium and exposed bedrock, and a small amount of net

deposition was measured (Table 2). However, local scour occured during the flood of 2 July 2001, damaging a County sewer line. On the southern side of the channel, some portion of the widening may be attributable to construction activities (Figure A-1). A more significant portion of the erosion, however, resulted from floods as seen in Figures A-2 and A-3.

Some floodplain deposition also occurred within this reach, although the estimated average floodplain deposition in P-1 East was the lowest in any reach in this study (Table 4). Floodplains in this portion of the canyon are narrow and generally bordering on colluvial slopes, so significant aggradation over a wide area was not possible. Most of the increase of floodplain sediment on the southern side of Figure A-1 is the result of road construction. The added sediment on the southern edge of Figure A-3 is primarily colluvial.

Table 3. Estimated Net Channel Widening or Incision by Cross Sections

Cross Section	Change in Channel Width (m)
	(positive is widening)
P1W XS-5	2.9
P1W XS-6	0.7
P1W XS-7	2.5
P2W XS-1	0
P2W XS-2	0.15
P2W XS-3	-0.05
P2W CSG-1	0.1
P2E XS-1	0.9
P2E XS-2	0.4
P2E XS-3	0.05
P2E CSG-1	-0.05
P2E CSG-2	0.1
P2E XS-5	0.6
P2E XS-6	-0.55
P2E XS-7	-1.47
P2E XS-8	-1.79
P2E XS-9	-2.88
P2E CSG-4	0.6
P2E XS-14	-0.95
P2E CSG-1	0.7
P2E CSG-2	1.55
P2E CSG-3	1.85
P3W PUX7	3.31
P3W PUX8	1.59
P3W XS-0	1.19
P3W PUX3	5.31
P3W PUX1	0.7
P3W XS-1	6.6
P3W PUX2	-0.99
P3W PUX4	-0.13
P3W PUX5	-0.82
P3W PUX6	0.41
P3W CSG-4	0.5
P3E XS-1	-0.3

P4W XS-5	-3.2
P4W XS-6	-5
P4W XS-7	-2.75
P4W XS-8	-3.95
P4E XS-4	-18.8
P4E XS-3	-1.25
P4E XS-1	0.25
P4E XS-2	0

Reach P-2 West

Between reach P-1 East and P-2 West is a relatively long, unmapped, narrow and steep stretch of canyon. This area is geomorphically similar to reach P-1 East and probably experienced similar amounts of net channel and floodplain deposition. Local scour also occurred during the flood of 2 July 2001, damaging the Los Alamos County sewer line in the canyon bottom. A few small tributaries enter Pueblo Canyon in this area.

At the upstream border of reach P-2 West, the canyon and channel become wider and the gradient decreases (Table 1). Minor meanders and broad floodplains occur throughout much of this reach. The significant gradient decrease and relative meander increase of this portion of the channel both contributed to increased sediment deposition on floodplains in this area (Figure A-4).

Point-bar deposition of more than 1.0 m can be seen on the southern end of Figure A-5. Other floodplain deposition occurred through the upstream portion of this reach seen in Figures A-5 through A-7. Up to 0.5 m of net channel aggradation also occurred locally in this reach. However, the downstream sections (Figures A-6 and A-7) showed little net geomorphic change, probably because of their location on linear, boulder-lined portions of the channel.

Reach P-2 Central

Reach P-2 Central is an unmapped segment of Pueblo Canyon just above the confluence with Kwage Canyon. The canyon and channel both continue to broaden in this region of Pueblo Canyon, although the gradient is similar to upstream in P-2 West.

This reach exhibited increased amounts of floodplain aggradation in the upstream portion (Figures A-9 through A-11). The average floodplain deposition here was the highest in any of the study reaches (Table 4). Less net deposition occurred in the downstream part of the reach, and the sections farthest downstream (Figures A-12 through A-14) experienced almost no net change other than some localized channel scour. This portion of the Pueblo Canyon channel above the Kwage Canyon confluence experienced minor channel scour (see Figures A-13 and A-14) related to a significant erosion-induced drop in base level downstream from the confluence in reach P-2 East (see Figures A-16 through A-22). However, on average, relatively little change in the channel occurred in P-2 Central, with a very small amount of net channel scour estimated from the cross sections (Table 2).

Reach P-2 East

Kwage Canyon enters Pueblo Canyon from the north at the upper end of reach P-2 East. In this reach, the channel had significantly aggraded before the Cerro Grande fire, probably the result of a high sediment influx from Kwage Canyon (Reneau et al., 1998). Up to a meter of scour occurred in the channel below Kwage Canyon after the fire (Figures A-15 through A-22), perhaps largely excavating this recently deposited sediment. This reach was the only reach that

experienced significant net channel erosion (Table 4). This reach also experienced significant floodplain aggradation, with the second highest volumetric sediment deposition in the surveyed reaches (Table 4). An example of an aggrading floodplain in P-2 East is shown in Figure 3.

Most of the Figures from A-17 through A-22 show significant amounts of lateral bank erosion that increased the channel width by up to 1.6 m in some areas. Figure A-17 also shows a portion of the channel where the southern bank was undercut, causing the collapse of a large section of an adjacent stream terrace. Most of these sections where lateral erosion took place resulted in nearly vertical banks (Figure 4).

Table 4. Estimated Net Sediment Deposition or Erosion in Post-fire Floods in 2000 and 2001 in Pueblo Canyon Reaches

Reach	Average channel gradient	Estimated floodplain deposition (m^3)	Estimated channel deposition or erosion (m^3)
P-1 East	3.0%	76.5	32
P-2 West	1.5%	561	10
P-2 Central	1.5%	980	-21
P-2 East	1.5%	819	-430
P-3 West	1.0%	398	2100
P-3 East	1.6%	Insufficient data	Insufficient data
P-4 West	1.8%	130	130
P-4 East	1.9%	132	504

Reach P-3 West

Reach P-3 West includes several large meanders in the channel, collectively referred to as Hamilton Bend (Figure 5). The channel in this area is broad and sinuous, with an average gradient of 1%, the lowest channel gradient in the canyon.

All of the cross sections in this reach are in the area of Hamilton Bend. Figures A-23 through A-27 show bank erosion occurring on the outside of a large meander (southern channel). A hundred meters downstream, this reach showed the thickest accumulation of channel sediments within the study area of more than 1.0 m (see Figures A-29 through A-33). This reach also had the highest total volumetric sediment accumulation in the channel (Table 4). Some floodplain deposition also occurred in this area, although net floodplain deposition in P-3 West was less than in upstream reaches.

The sediment added to the northern bank of Figure A-31 is primarily colluvial fill. Little geomorphic change is seen on their southern banks because of their proximity to a resistant outcrop of the Puye Formation (Figures A-27 through A-29).

Figure 3. Reach P-2 East looking downstream in the area of Figures A-20 through A-22. Note the broad vegetated floodplain. On either side of the channel, flattened vegetation can be seen as a result of the 2 July 2001 flood.

Figure 4. Collapsed bank in reach P-2 East. This is a view looking upstream, past the section shown in Figure A-17. Note the vertical aspect of the bank.

Reach P-3 East

Figure A-34, the only cross section within reach P-3 East, lies a few hundred meters downstream from the Los Alamos County Bayo Wastewater Treatment Plant (WWTP) outfall. The outfall from the WWTP enters the canyon between reach P-3 West and reach P-3 East. The outfall results in an essentially perennial surface flow through lower Pueblo Canyon of between 0.5 and 3.0 cfs (E060 gauging station; Shaull et al., 2004). This continuous flow has created a wetland environment from above reach P-3 East through reach P-4 East. Above the WWTP the channel is ephemeral.

The wetland throughout this lower portion of Pueblo Canyon consists primarily of tall reed canary grass in a series of shallow anastomosing channels (Figure 6). This vegetation occupies much of the wide canyon bottom, trapping sediment from passing stormwater.

In addition to the cross section measured here, other field observations showed significant amounts of deposition in this area, including along a northern branch of the post-fire channel where it traverses a former floodplain. At least 0.41 m of net aggradation occurred in this area along the currently active channel (Figure A-34). The influx of sediment also altered the channel location. In the area shown in Figure A-34, the main channel moved 35 m to the north after the 2 July 2001 flood. The lowest point in the channel in this area, which was the active channel before the fire, is now abandoned during low-flow conditions. In contrast to the northern channel through the floodplain, it has incised about 0.6 m during post-fire floods.

Reach P-4 West

Reach P-4 West is slightly steeper than reach P-3 East, with an average channel gradient of 1.8%. The canyon floor continues to broaden in this area. The channel is incised between banks into historic fill terraces and is locally broad and anastomosing. Dense wetland grasses occupy most of the low surfaces adjacent to the channel here, probably contributing to sediment deposition. As high as 0.5 m of sediment was deposited in some portions of this reach, as seen in Figures A-35 through A-38. Similar amounts of net deposition occurred in the channel and on adjacent floodplains, with volumetrically lower amounts of floodplain deposition measured here than in most upstream reaches (Table 4).

Localized scour occurred in portions of this reach, although deposition dominated. The influx of sediment also altered channel configuration. The apparent erosion of the first three points on the northern bank of the section shown in Figure A-36 is from the slight movement of the northern endpoint rebar. The high water mark from the 2 July 2001 flood was well below the rebar, thus eliminating the possibility of significant erosion.

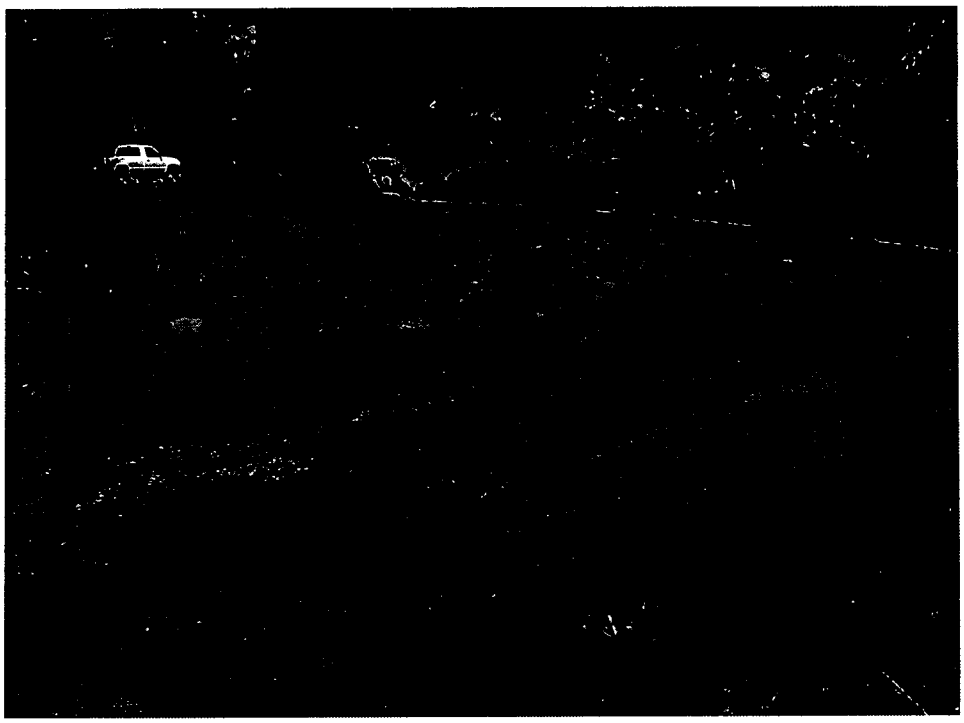


Figure 5. Reach P-3 West looking downstream in the area of Hamilton Bend near the sections in Figures A-23 through A-28. A high-water mud line from the 2 July 2001 flood can be seen on the wall in the upper right portion of this photograph. The height of this mud line may be related to super-elevation of the floodwaters around a bend in the channel.

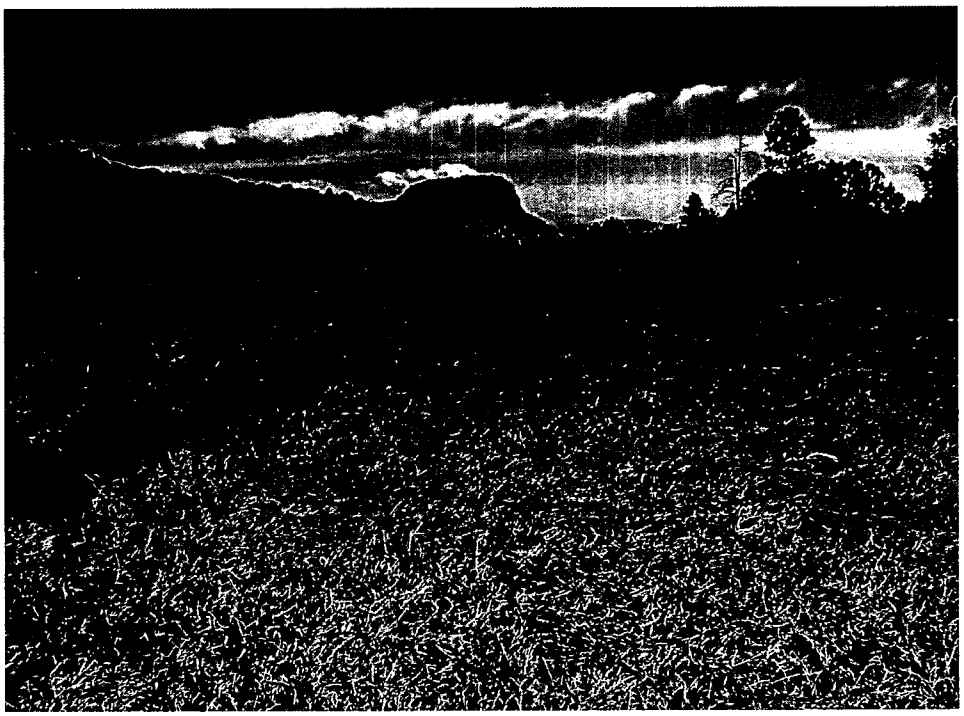


Figure 6: Photograph taken looking East from the western edge of Reach P-4 West during an effluent release.

Reach P-4 East

This reach experienced net aggradation of at least 0.7 m over wide areas of the channel and floodplain. Estimated net volumetric sediment deposition was greater in the channel in P-4 East than upstream in P-4 West, and similar in the floodplains (Table 4). However, the area of flooding on 2 July 2001 was wider than the area of the cross sections, with floodwaters extending over broad areas of floodplain. The value in Table 4 probably underestimates total floodplain sediment deposition in this reach. The minor net scour that occurred in parts of this reach (Figure A-39) resulted from the anastomosing channel scouring into historic fill after significant aggradation occurred in adjacent channels. Inferred Puye Formation bedrock outcrops in the channel in the lower part of this reach. The lowest three sections within this reach (Figures A-40 through A-42) exhibited no channel scour, possibly from this bedrock-defined base level.

Reach P-4 East is geomorphically similar to reach P-4 West. Dense wetland vegetation occupies the low surfaces and may enhance sediment deposition within this part of the canyon. A few hundred meters downstream from the section shown in Figure A-42, Pueblo Canyon drains into Los Alamos Canyon. Most of the wetland vegetation ends at this point.

DISCUSSION AND CONCLUSION

The estimated average net deposition or erosion in the surveyed reaches, presented in Table 4, was used to calculate approximate volumes of post-fire sediment deposited in Pueblo Canyon between Acid Canyon and Los Alamos Canyon during 2000 and 2001. The estimated volumes for both surveyed and nonsurveyed reaches are shown in Table 4 and summarized in Table 5 for the length of the study area. These estimates assume that the cross sections are representative of the study reaches. The volumes of deposition for reaches not surveyed in this study area were extrapolated from the study reaches. Because of these assumptions, the estimated sediment volumes are first approximations, although the general magnitude of deposition or erosion and the relative differences between reaches and between channels and floodplains are considered reasonable.

Table 5. Estimated Sediment Deposition from Post-fire Floods in 2000 and 2001 Compared to Estimated Annual Pre-fire Average

Net sediment deposition in 2000 and 2001	Net average annual pre-fire sediment deposition (1942-1997)
2400 m^3 net channel deposition (coarse)	5000 m^3 net coarse sediment deposition per year
6000 m^3 net floodplain deposition (fine)	1600 m^3 net fine sediment deposition per year
8400 m^3 total deposition	6600 m^3 total yearly average deposition

As summarized in Table 5, calculations of an estimated 8400 m^3 of net sediment deposition was estimated in Pueblo Canyon in 2000 and 2001, assumed to result from the 2 July 2001 flood. Of the estimated total post-fire sediment deposition, about 70% was overbank sedimentation dominated by fine-grained sediment, and about 30% was channel sedimentation dominated by coarse-grained sediment. Table 5 also shows the estimated post-fire sediment distribution compared to the historical pre-fire average. Estimates of pre-fire sediment deposition volumes in each reach are presented in Table 5 and are derived from mapping and thickness measurements conducted before the fire (Reneau et al., 1998, with volume estimates modified in LANL, 2004, and Reneau et al , 2004).

The total annual pre- and post-fire deposition rates are of the same magnitude. Flooding after the Cerro Grande fire caused no significant net change in yearly Pueblo Canyon sedimentation rates. However, these estimates indicate the that average annual coarse-sediment deposition was higher before the fire, while the average fine sediment deposition was higher after the fire. Higher fine-sediment deposition rates after the fire may have been caused by a greater influx of headwater sediment that occurred concurrently with increased overbank flooding after the fire. Similarly, higher coarse-sediment deposition rates before the fire may be related to lower-magnitude floods with relatively high transmission losses causing deposition of bedload sediment supplied from tributary drainages (e.g., Kwage Canyon).

Post-fire deposition and erosion rates varied significantly among the reaches (Table 4). The highest net floodplain deposition averages occurred in the P-2 reaches despite significant lateral bank erosion of floodplains (Figures A-16, A-17, and A-20 to A-22). Channel gradients are lower and the floodplains are broader here than upstream, and both factors probably contributed to the relatively high floodplain deposition rates in P-2 West through P-2 East. Reaches P-2 Central and P-2 East exhibited net channel scour, whereas the other reaches showed net channel aggradation. This channel scour occurs in an area that had experienced aggradation prior to the fire, associated with sediment supplied from Kwage Canyon. The post-fire scour is apparently from the excavation of this post-fire sediment. Channel deposition rates were much higher in P-3 West than in the other reaches, probably because this reach has the lowest channel gradient in Pueblo Canyon.

Depositional averages for reach P-3 East were not included in Table 4 since only one cross section (A-34) was measured within the reach. This cross section and other field measurements indicate that a considerable amount of net channel and floodplain deposition occurred in this reach, comparable to the deposition average from reach P-4 East, probably related to broad surfaces and dense vegetation.

The channel gradient was a significant factor contributing to the spatial patterns of channel deposition in Pueblo Canyon during the 2000 and 2001 post-fire flooding, in part shown by the correspondence of the highest channel deposition with the lowest channel gradient in reach P-3 West. Downstream decreases in channel gradient, combined with increasing floodplain widths, also contributed to the relatively high floodplain deposition rates in P-2 West and downstream. Vegetation may also have contributed to sediment deposition on floodplains, particularly in the wetlands downstream from the Bayo WWTP. Figure 6 shows an area of vegetation that increased roughness in the flood area, which may have contributed significantly to net aggradation in these areas.

The channels and floodplains in Pueblo Canyon have continued to change since the time these cross section surveys were completed. For example, field observations indicate that the area of extensive channel aggradation in reach P-3 West has subsequently been partly incised, and test holes dug in the wetlands east of the Bayo WWTP indicate additional sediment deposition in floods in 2002 and 2003. It is expected that in future floods net floodplain aggradation will continue in areas experiencing overbank flooding; variable scour or aggradation along the channel may also continue depending on local channel gradient, sediment supply, flood characteristics, and other factors.

ACKNOWLEDGEMENTS

This work was supported by the Department of Energy through the LANL Environmental Stewardship Remediation Services project and its predecessor organizations and through the LANL Cerro Grande Recovery Project. Surveying assistance was provided by Shannon Allen, Robert Budd, Evan Canfield, Ryan Channel, Kelly Crowell, Rose Gallaway, Jamie Gardener, Jeanette Lyman, Simon Mudd, Valisa Nez, Celina Salazar, and Mark Vaneeckhout.

REFERENCES

BAER, 2000, Cerro Grande Fire, Burned Area Emergency Rehabilitation (BAER) Plan: Interagency Burned Area Emergency Rehabilitation Team.

Gallaher, B. M., and Koch, R. J., 2004, Cerro Grande fire impacts to water quality and stream flow near Los Alamos National Laboratory: Results of four years of monitoring: Los Alamos National Laboratory report LA-14177, Los Alamos, New Mexico, 195 pp.

Graf, W. L., 1996, Transport and deposition of plutonium-contaminated sediments by fluvial processes, Los Alamos Canyon, New Mexico: Geological Society of America Bulletin, v. 108, pp. 1342–1355.

LANL (Los Alamos National Laboratory), 2004, Los Alamos and Pueblo Canyons investigation report: Los Alamos National Laboratory report LA-UR-04-2714, Los Alamos, New Mexico.

Lyman, J., Reneau, S., Malmon, D., Lavine, A., Canfield, H. E., and Katzman, D., 2002, Geomorphic response of Pueblo Canyon, Los Alamos, New Mexico, to flooding after the Cerro Grande fire: New Mexico Geology, v. 24, no. 2, pp. 57–58.

Reneau, S., Ryti, R., Tardiff, M., Linn, J., 1998, Evaluation of sediment contamination in Pueblo Canyon: Reaches P-1, P-2, P-3, and P-4: Los Alamos National Laboratory report LA-UR-98-3324, Los Alamos, New Mexico.

Reneau, S. L., Drakos, P. G., Katzman, D., Malmon, D. V., McDonald, E. V., and Ryti, R. T., 2004, Geomorphic controls on contaminant distribution along an ephemeral stream: Earth Surface Processes and Landforms, v. 29, pp. 1209–1223.

Shaull, D. A., Ortiz, D., Alexander, M. R., and Romero, R. P., 2004, Surface water data at Los Alamos National Laboratory: 2003 Water Year: Los Alamos National Laboratory report LA-14131-PR, Los Alamos, New Mexico, 104 pp.

Stoker, A. K., Ahlquist, A. J., Mayfield, D. L., Hansen, W. R., Talley, A. D., and Purtymun, W. D., 1981, Radiological survey of the site of a former radioactive liquid waste treatment plant (TA-45) and the effluent receiving areas of Acid, Pueblo, and Los Alamos Canyons, Los Alamos, New Mexico: Los Alamos National Laboratory report LA-8890-ENV, Los Alamos, New Mexico, 252 pp.

Appendix A

Cross sections of geomorphic channel change in Pueblo Canyon. Corresponding notes are found below each section. Graphs display cross section width (meters) with cross section height (meters) measured from a fixed reference point.

List of Figures

A-1: Cross sections and notes for P-1 East XS-5

A-2: Cross sections and notes for P-1East XS-6

A-3: Cross sections and notes for P-1 East XS-7

A-4: Cross sections and notes for P-2 West X-1

A-5: Cross sections and notes for P-2 West X-2

A-6: Cross sections and notes for P-2 West X-3

A-7: Cross sections and notes for P-2 West CSG-1

A-8: Cross sections and notes for P-2 Central XS-1

A-9: Cross sections and notes for P-2 Central XS-2

A-10: Cross sections and notes for P-2 Central XS-3

A-11: Cross sections and notes for P-2 Central CSG-1

A-12: Cross sections and notes for P-2 Central CSG-2

A-13: Cross sections and notes for P-2 Central X-5

A-14: Cross sections and notes for P-2 Central X-6

A-15: Cross sections and notes for P-2 East X-7

A-16: Cross sections and notes for P-2 East X-8

A-17: Cross sections and notes for P-2 East XS-9

A-18: Cross sections and notes for P-2 East CSG-4

A-19: Cross sections and notes for P-2 East X-14

A-20: Cross sections and notes for P-2 East CSG-1

A-21: Cross sections and notes for P-2 East CSG-2

A-22: Cross sections and notes for P-2 East CSG-3

A-23: Cross sections PUX-7

A-24: Cross sections PUX-8

A-25: Cross sections XS-0

A-26: Cross sections PUX-3

A-27: Cross sections PUX-1

A-28: Cross sections and notes for P-3 West XS-1

A-29: Cross sections P-3 West PUX-2

A-30: Cross sections P-3 West PUX-4

A-31: Cross sections PUX-5

A-32: Cross sections P-3 West PUX-6

A-33: Cross sections and notes for P-3 West CSG-4

A-34: Cross sections and notes for P-3 East XS-1

A-35: Cross sections and notes for P-4 West X-5

A-36: Cross sections and notes for P-4 West X-6

A-37: Cross sections and notes for P-4 West X-7

A-38: Cross sections and notes for P-4 West X-8

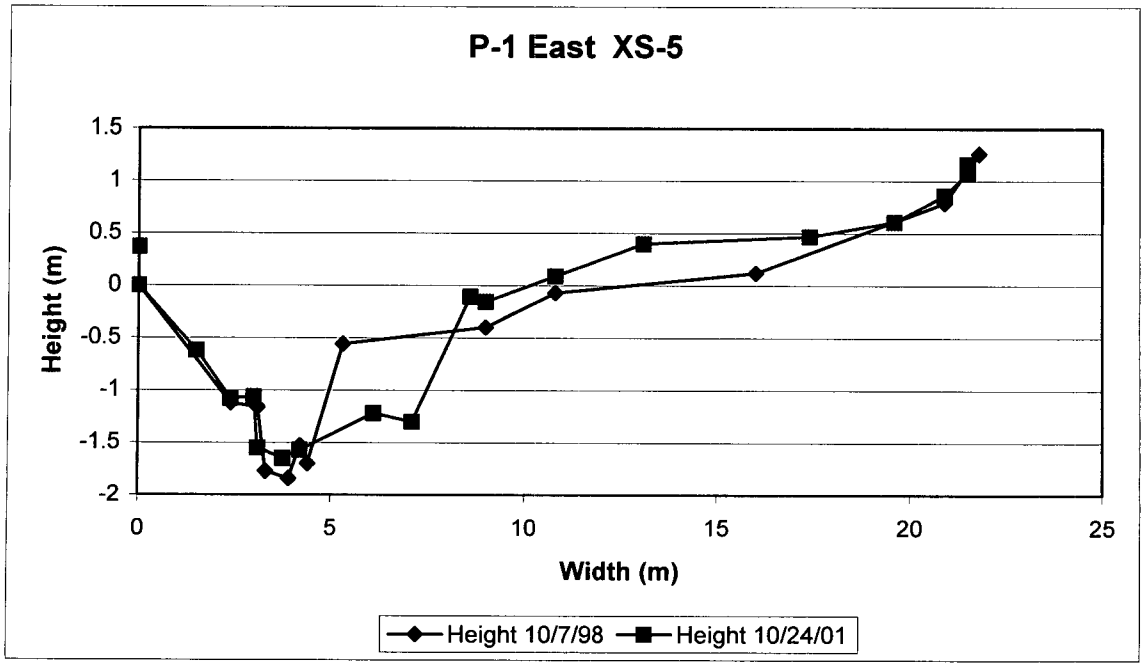
A-39: Cross sections and notes for P-4 East X-4

A-40: Cross sections and notes for P-4 East X-3

A-41: Cross sections and notes for P-4 East X-1

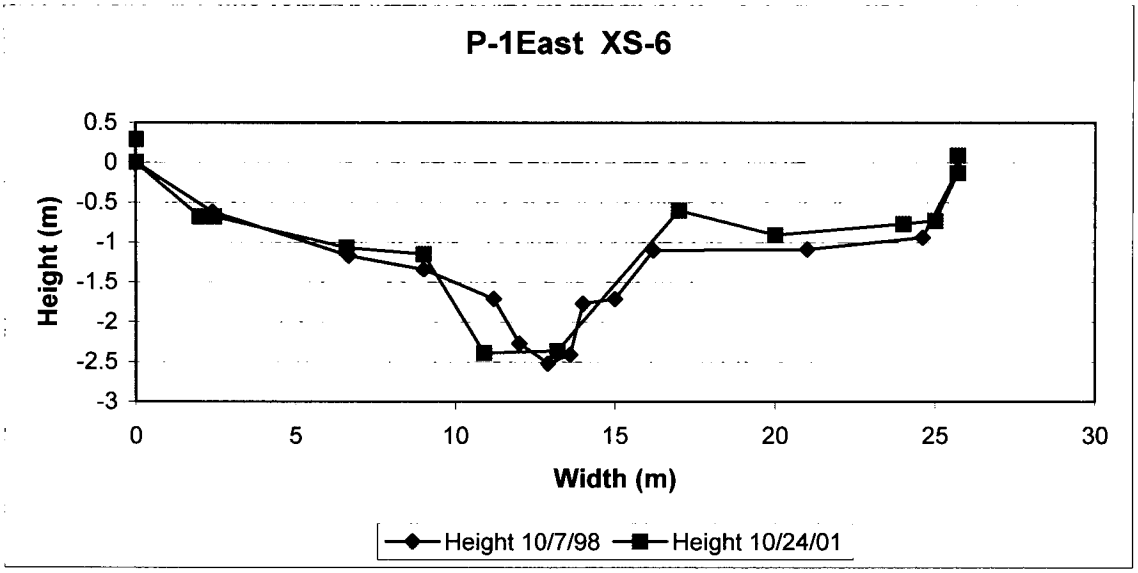
A-42: Cross sections and notes for P-4 East X-2

A-1 Cross sections and notes for P-1 East XS-5



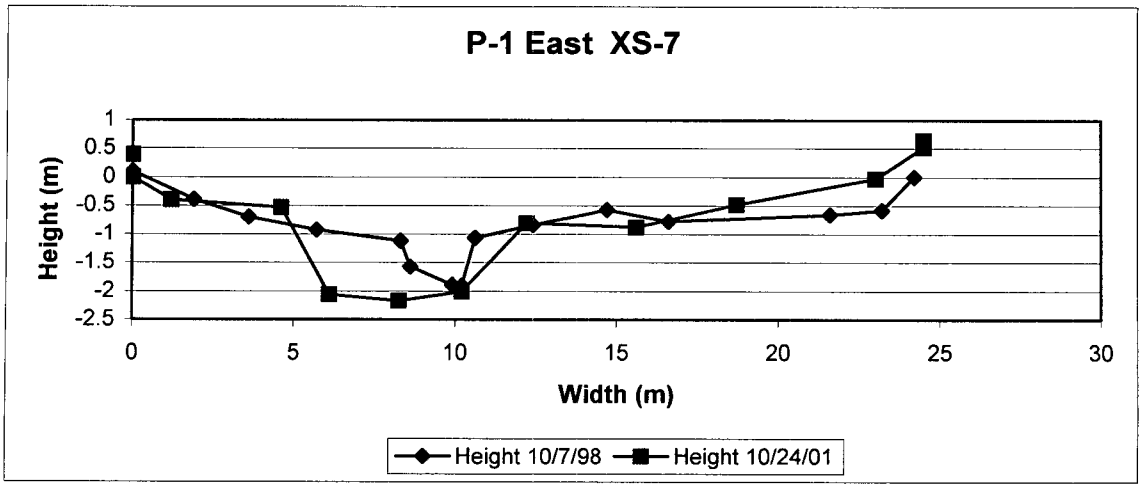
Distance (m)	Height 10/7/98 (m)	Height 10/24/01 (m)	Notes (2001 unless noted)
0		0.37	Top of rebar
0	0	0	Base of rebar
1.5		-0.62	Top of slope
2.4	-1.12	-1.08	Trough
3		-1.06	Top of bank
3.1	-1.16	-1.55	North edge of channel
3.3	-1.77		North bank (1998)
3.75		-1.65	Thalweg
3.9	-1.84		Thalweg (1998)
4.2	-1.53	-1.57	Crest stage guage
4.4	-1.7		Edge of channel (1998)
5.3	-0.56		Tree / sample PUB-023 (1998)
6.1		-1.22	Near tree
7.1		-1.3	Southern edge of channel
8.6		-0.105	Top of bank
9	-0.4	-0.155	On overbank
10.8	-0.07	0.09	Grass
13.1		0.4	North side of road
16	0.12		Break in slope
17.4		0.47	South side of road
19.6		0.61	Change in slope (1998)
20.9	0.79	0.86	South edge of valley
21.5		1.08	Base of rebar
21.5		1.16	Top of rebar
21.8	1.26		Valley wall (1998)

A-2 Cross sections and notes for P-1East XS-6



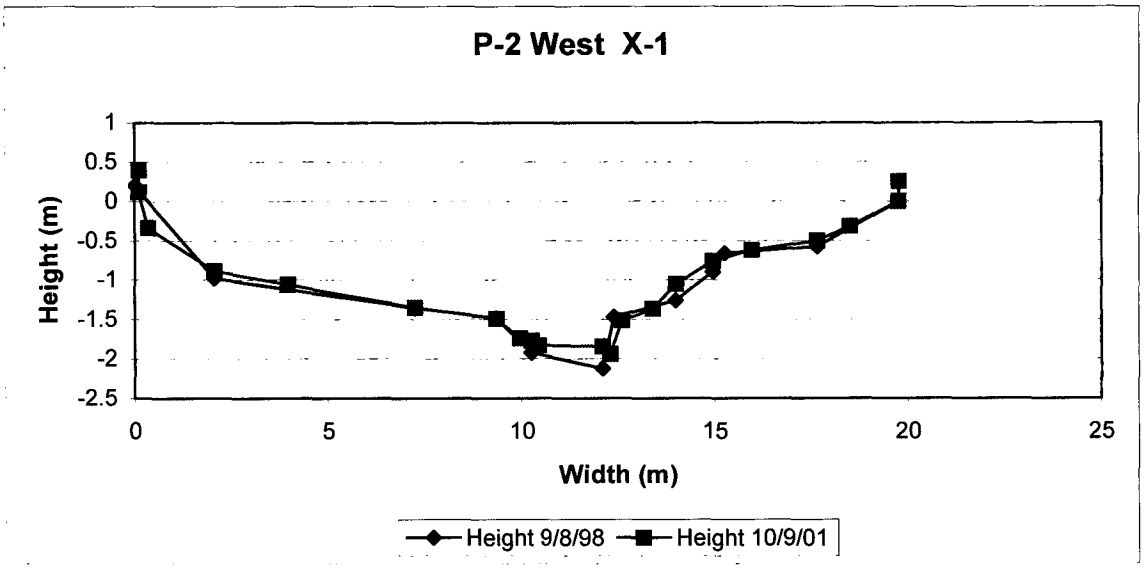
Distance (m)	Height 10/7/98 (m)	Height 10/24/01 (m)	Notes (2001 unless noted)
0		0.29	Top of rebar
0	0	0	Base of rebar
2		-0.68	Break in slope
2.4	-0.62		Edge of valley deposit (1998)
2.45		-0.68	High water mark 7/2/01
6.6		-1.07	Slight trough
6.66	-1.17		On slope (1998)
9	-1.34	-1.15	Tree / top of bank / sample PUB-024
10.9		-2.39	Base of slope
11.2	-1.71		Edge of bank (1998)
12	-2.27		North edge channel (1998)
12.9	-2.52		Thalweg (1998)
13.2		-2.36	Low point in channel
13.6	-2.41		South edge channel (1998)
14	-1.77		South bank C2 / fill? (1998)
15	-1.71		C2? (1998)
16.2	-1.1		Fill (1998)
17		-0.6	Top of bank in some fill
20		-0.91	North side of road
21	-1.09		On trail (1998)
24		-0.77	South side of road
24.6	-0.94		Edge of valley floor (1998)
25		-0.73	South valley wall break
25.7	-0.09	-0.13	Rebar base / approximate high water 7/2/01
25.7		0.09	Top of rebar

A-3. Cross sections and notes for P-1 East XS-7



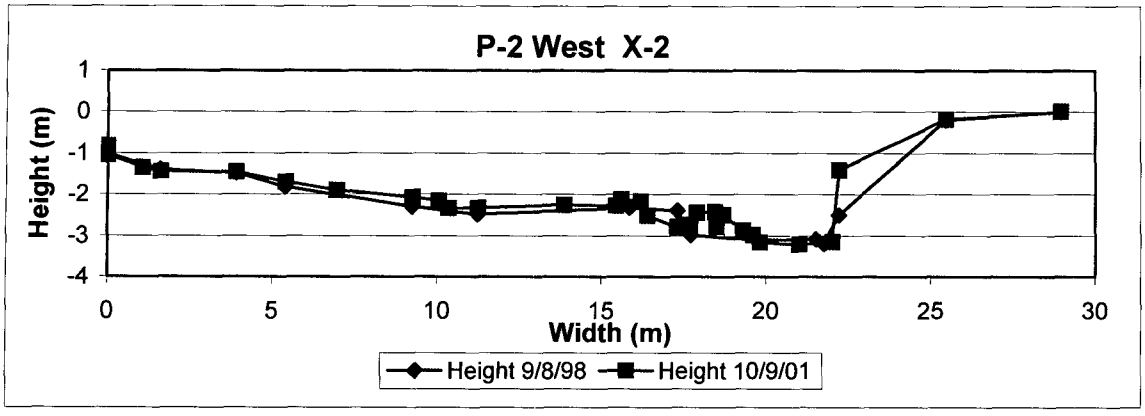
Distance (m)	Height 10/7/98 (m)	Height 10/24/01 (m)	Notes (2001 unless noted)
0		0.39	Top of rebar
0	0.1	0	Base of rebar / high water 7/2/01
1.2		-0.4	Overbank
1.9	-0.39		North edge C2 / valley floor (1998)
3.6	-0.7		C2 (1998)
4.6		-0.53	Top of disturbed bank
5.7	-0.93		C2 (1998)
6.1		-2.06	North side channel
8.25		-2.17	Thalweg
8.3	-1.12		C2 bank (1998)
8.6	-1.57		North edge C1 / sand bar (1998)
9.9	-1.89		Middle channel (1998)
10.2	-1.91	-2.01	South side of channel
10.6	-1.07		South edge of bank (1998)
12.2		-0.805	Top of disturbed bank
12.4	-0.84		C2 (1998)
14.7	-0.57		C2 fill (1998)
15.6		-0.88	Disturbed ground
16.6	-0.78		C2 fill (1998)
18.7		-0.48	North side of road
21.6	-0.66		Foot trail (1998)
23		-0.03	South side of road
23.2	-0.58		South valley floor edge (1998)
24.2	0		South valley wall (1998)
24.5		0.52	Base of rebar
24.5		0.64	Top of rebar

A-4. Cross sections and notes for P-2 West X-1



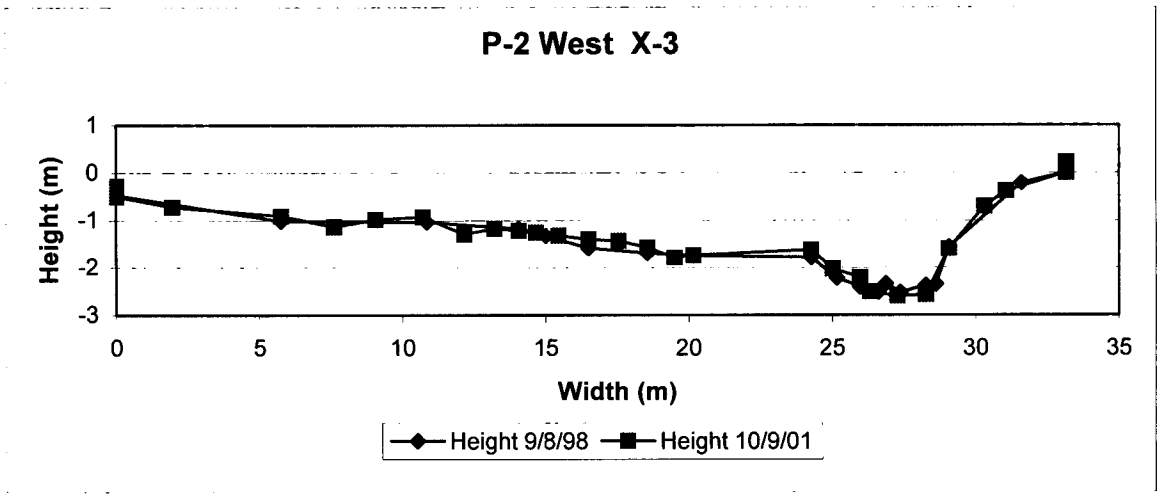
Distance (m)	Height 9/8/98 (m)	Height 10/9/01 (m)	Notes (2001 unless noted)
0	0.195		South valley wall (1998)
0.1		0.39	Top of rebar
0.1		0.11	Base of rebar
0.35		-0.34	High water 7/2/01
2.05	-0.981	-0.89	Edge of fine sand
3.95		-1.06	Sand bar 7/2/01
7.25	-1.354	-1.35	Sand bar 7/2/01
9.35	-1.484	-1.49	Mid-bank slope
9.95		-1.74	South edge low surface
10.25	-1.921	-1.77	Top of bank
10.45		-1.83	Channel edge
12.1	-2.12	-1.84	Channel coarse sand / thalweg
12.3		-1.94	Channel / north edge coarse sand
12.4	-1.468		South edge channel (1998)
12.6		-1.51	Channel fines
13.4		-1.36	Base of low bank
14	-1.255	-1.05	Top of low bank / sample PU-0124
14.95	-0.899	-0.76	C2 surface
15.25	-0.661		Break in slope (1998)
15.95		-0.62	C2 surface
17.65	-0.576	-0.5	North edge floodplain
18.5		-0.32	Approximate high water 7/2/01
19.75		0	Gravel
19.75	0	0.25	Top of rebar

A-5. Cross sections and notes for P-2 West X-2



Distance (m)	Height 9/8/98 (m)	Height 10/9/01 (m)	Notes (2001 unless noted)
0		-0.84	Top of rebar
0	-1.019	-1.05	Base of rebar
1.05		-1.35	High water 7/2/01
1.6	-1.404	-1.44	Floodplain
3.9	-1.479	-1.46	Floodplain
5.4	-1.823	-1.7	South edge channel
6.95		-1.9	Crest stage gauge #1 (1998)
9.25	-2.3	-2.07	Floodplain
10.05		-2.16	Channel
10.35		-2.34	Channel (1998)
11.25	-2.488	-2.33	Sand from 7/2/01 flood
13.85		-2.25	Top of low step
15.45		-2.28	Base of low step
15.6		-2.12	C2 sand from 7/2/01 flood
15.85	-2.32		C2? (1998)
16.2		-2.17	North base of boulder
16.4		-2.52	Top of boulder's north side
17.3	-2.394	-2.79	South edge top of boulder
17.7	-2.979	-2.74	South base of boulder
17.9		-2.44	Trough
18.45		-2.42	Boulder (1998)
18.5		-2.78	Base of boulder
18.7		-2.49	Edge boulder
19.3		-2.87	Edge boulder
19.6		-2.98	Base of boulder
19.7	-3.105		C1b unit (1998)
19.8		-3.16	North edge channel
21		-3.21	Middle channel, rocks and sand
21.5	-3.079		Crest stage gauge (1998)
21.75	-3.198		South edge channel (1998)
22		-3.14	South edge channel
22.2	-2.497	-1.4	Lower slope inner bank
25.45	-0.195	-0.18	Near N. edge terrace
28.95		0	Base of rebar
28.95	0	0.01	Top of rebar

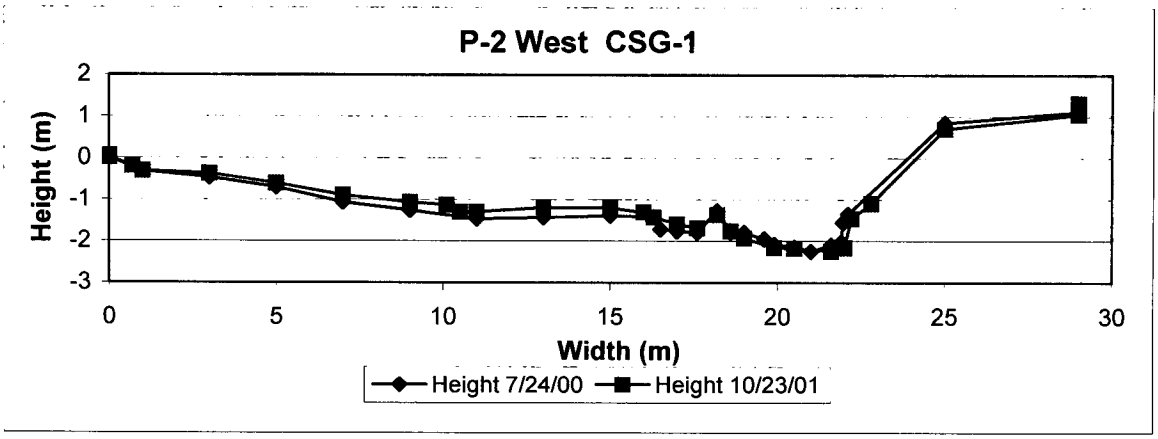
A-6. Cross sections and notes for P-2 West X-3



Distance (m)	Height 9/8/98 (m)	Height 10/9/01 (m)	Notes (2001 unless noted)
0		-0.28	Top of rebar
0	-0.474	-0.5	Base of rebar
1.95		-0.72	High water 7/2/01
5.75	-1.017	-0.91	Near sample PU-10204/floodplain
7.6		-1.14	Trough in floodplain
9.05		-0.98	Sand and gravel from 7/2/01 flood
10.7		-0.93	Sand and gravel from 7/2/01 flood
10.85	-1.037		F1 unit?
12.15		-1.29	Head of scour feature
13.2		-1.17	F1
14.05	-1.178	-1.22	Near sample PU-0126
14.65		-1.25	F1 / C3?
15	-1.325		F1 / C3 (1998)
15.45		-1.32	C3?
16.5	-1.583	-1.4	C3?
17.55		-1.43	C3?
18.55	-1.695	-1.57	C3? Slope
19.5		-1.79	Trough
20.15	-1.75	-1.74	Slope
24.25	-1.784	-1.62	C2 / sample PU-0158/flood deposit 7/2/01
25		-2.03	Back edge C1b, grass
25.15	-2.226		North edge channel (1998)
25.95	-2.407	-2.21	Edge of low bank/ grass
26.3		-2.51	North edge of channel
26.6	-2.516		Channel (1998)
26.85	-2.343		Channel (1998)
27.25		-2.6	Thalweg
27.35	-2.524		Crest stage gauge #2 (1998)
28.25	-2.376	-2.57	South edge channel

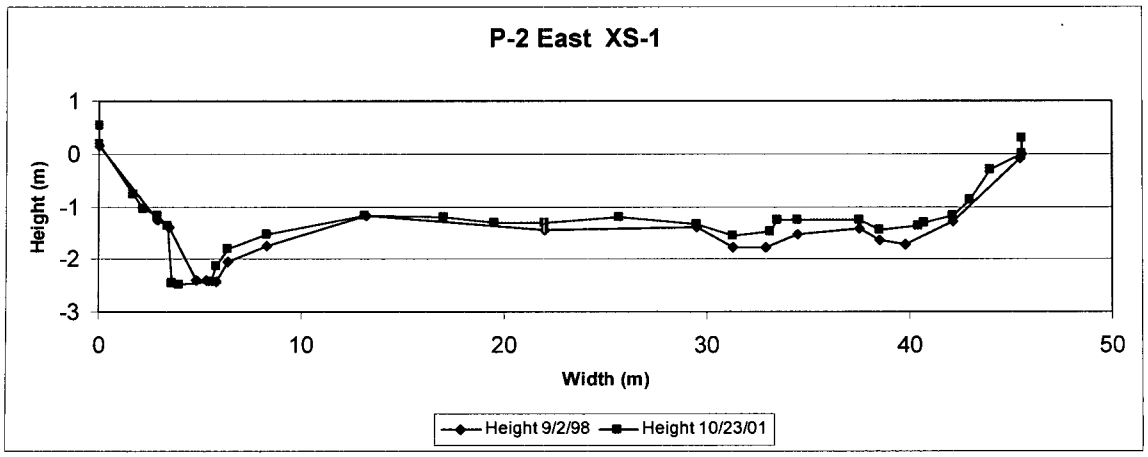
Distance (m) (continued)	Height 9/8/98 (m) (continued)	Height 10/9/01 (m) (continued)	Notes (2001 unless noted) (continued)
28.6	-2.351		Edge of channel (1998)
30.3		-0.7	Apprx. high water 7/2/01 near top of bank
31.05		-0.38	Edge of terrace
31.59	-0.211		Edge of Qt (1998)
33.15	0	0	Base of rebar
33.15		0.22	Top of rebar

A-7. Cross sections and notes for P-2 West CSG-1



Distance (m)	Height 7/24/00 (m)	Height 10/23/01 (m)	Notes (2001 unless noted)
0	0	0.04	Top of rebar
0		0	Base of rebar
0.7		-0.2	High water mark 7/2/01
1	-0.32	-0.32	Rebar
3	-0.47	-0.38	Rebar
5	-0.71	-0.62	Debris
7	-1.07	-0.9	Rebar
9	-1.26	-1.07	Rebar on F1?
10.1		-1.13	Top of a bank
10.5		-1.31	Base of a bank
11	-1.47	-1.3	Rebar in C2?
13	-1.44	-1.19	Rebar in C2?
15	-1.39	-1.2	C2 surface
16		-1.31	Top of bank slope
16.3	-1.42	-1.43	On slope
16.5	-1.72		High water mark (2000)
17	-1.77	-1.59	Rebar
17.6	-1.8	-1.69	Low rocks
18.2	-1.28	-1.37	Top of rocks
18.6	-1.8	-1.76	Base of rocks
19	-1.8	-1.93	Rebar
19.6	-1.95		C1b?
19.9	-2.08	-2.16	Base of bank
20.5	-2.15	-2.17	Channel
21	-2.25		Thalweg / hole (2000)
21.6	-2.1	-2.24	Thalweg / crest stage guage
21.9	-2.02		South edge of channel (2000)
21.95	-1.56		On bank (2000)
22		-2.16	South bank
22.1	-1.35		C1b
22.2		-1.46	Top of bank
22.8		-1.09	High water mark 7/2/01
25	0.84	0.7	Top of slope / bank
29	1.11	1.05	Base of rebar
29		1.32	Top of rebar

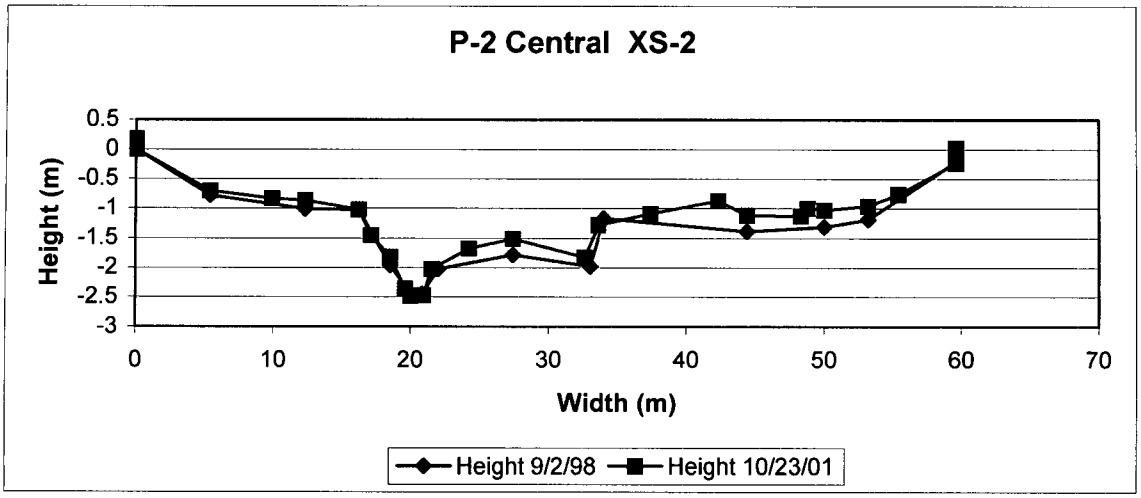
A-8. Cross sections and notes for P-2 Central XS-1



Distance (m)	Height 9/2/98 (m)	Height 10/23/01 (m)	Notes (2001 unless noted)
0		0.55	Top of stake
0	0.154	0.18	Base of stake
1.7		-0.78	High water mark 7/2/01
2.2		-1.035	Slope break
2.9	-1.261	-1.18	C3?
3.4		-1.36	Top of bank
3.5	-1.385		North edge of bank (1998)
3.6		-2.455	North side channel
4		-2.49	Thalweg
4.8	-2.41		Base of colluvial slope (1998)
5.3	-2.411		Edge of bank (1998)
5.5		-2.42	Base of bank
5.8	-2.421	-2.12	Top of cutbank
6.4	-2.045	-1.81	C2? Surface
8.3	-1.757	-1.54	Trough in C2?
13.1		-1.18	Top of overbank
13.2	-1.189		Top of slope (1998)
17		-1.2	Overbank
19.5		-1.3	Overbank
22	-1.436	-1.31	Overbank
25.7		-1.21	Top of overbank
29.5	-1.387	-1.33	Top of trough
31.3	-1.774	-1.56	Trough
32.9	-1.767		Old channel (1998)
33.1		-1.47	In trough
33.5		-1.27	Top of trough
34.5	-1.533	-1.26	Overbank
37.5	-1.425	-1.26	Top of trough
38.5	-1.634	-1.46	North side trough
39.8	-1.719		Base of terrace (1998)
40.4		-1.37	South side trough

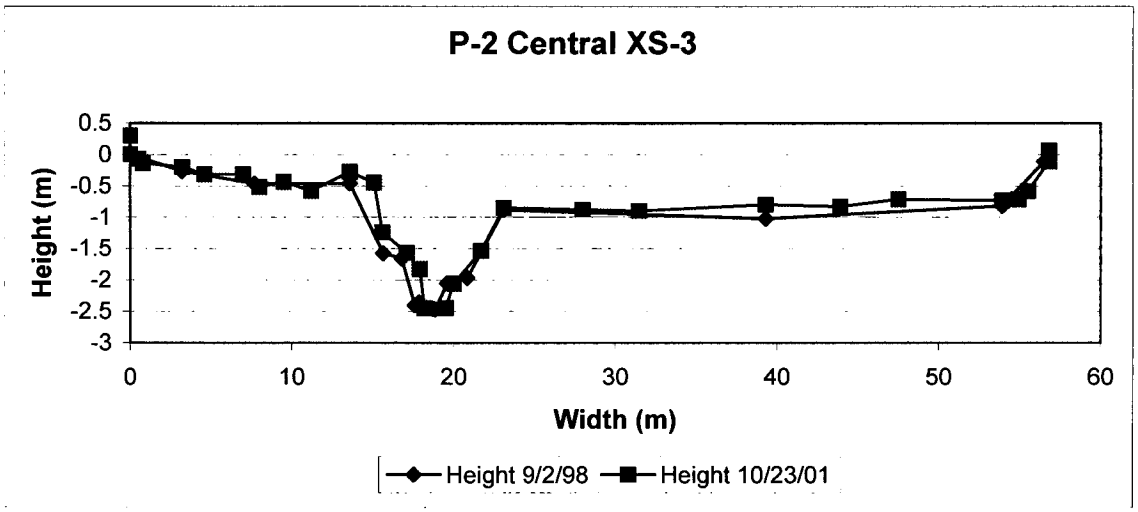
Distance (m) (continued)	Height 9/2/98 (m) (continued)	Height 10/23/01 (m) (continued)	Notes (2001 unless noted) (continued)
42.1	-1.281	-1.19	South side overbank channel
42.95		-0.89	Base of terrace slope
44		-0.31	Top of terrace
45.43	-0.08		Base of terrace slope (1998)
45.5		0	Base of rebar
45.5	0	0.3	Top of rebar

A-9. Cross sections and notes for P-2 Central XS-2



Distance (m)	Height 9/2/98 (m)	Height 10/23/01 (m)	Notes (2001 unless noted)
0	0	0.17	Top of rebar
0		0	Base of rebar
5.4	-0.78	-0.7	Slight slope
9.9		-0.83	High water 7/2/01
12.3	-1.01	-0.865	Overbank
16.2	-1.024	-1.02	Top of bank / slope
17.1		-1.45	Break in slope
18.5	-1.962	-1.82	Bank
19.6		-2.36	North side channel
20	-2.438	-2.48	Thalweg
20.8	-2.45		Channel (1998)
20.9		-2.47	South side channel
21.5		-2.03	Bank
22	-2.024		Top of bank (1998)
24.2		-1.68	Edge of grass
27.4	-1.789	-1.51	Overbank
32.6		-1.83	Base of C3? / edge of C2
33	-1.982		Edge of C2? (1998)
33.6		-1.28	Top of slope on terrace
34	-1.168		Edge of C3? (1998)
37.4		-1.09	C3? Overbank
42.3		-0.87	High point on overbank
44.4	-1.387	-1.12	Grassy overbank trough
48.3		-1.13	Trough
48.8		-1	High point
50	-1.312	-1.03	Point in slope
53.2	-1.189	-0.96	Break in slope
55.4		-0.76	High water 7/2/01
59.6	-0.214	-0.24	Base of rebar
59.6		0.02	Top of rebar

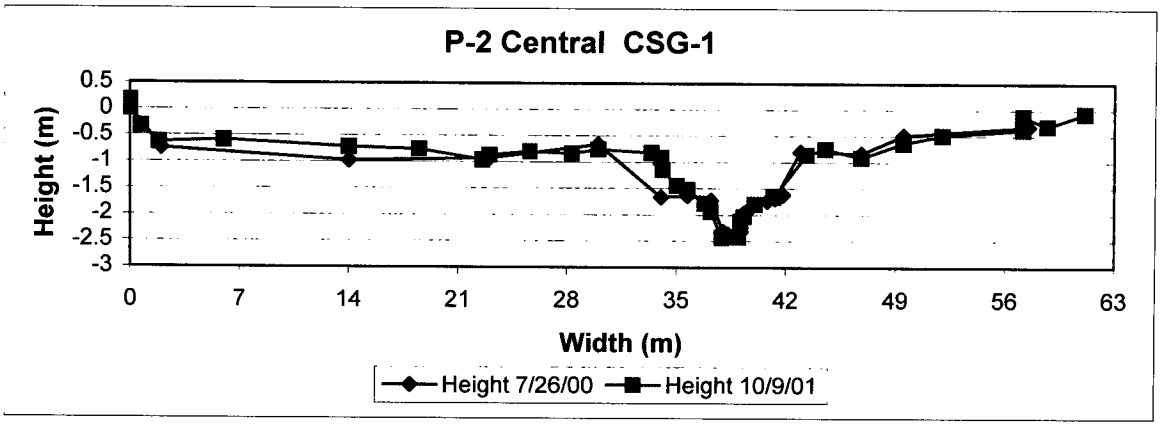
A-10. Cross sections and notes for P-2 Central XS-3



Distance (m)	Height 9/2/98 (m)	Height 10/23/01 (m)	Notes (2001 unless noted)
0	0	0.3	Top of stake
0		0	Base of stake
0.5		-0.07	High water mark 7/2/01
0.8		-0.14	Base of slope
3.23	-0.27	-0.2	Overbank
4.6		-0.32	Overbank
7		-0.32	Trough
7.7	-0.467		North edge C3? (1998)
8		-0.52	Overbank
9.5		-0.44	Overbank
11.2		-0.58	Overbank
13.59	-0.459		South edge of C2? (1998)
13.6		-0.28	Top of slope
15.1		-0.45	Base of slope
15.6		-1.24	Top of channel
15.64	-1.574		North side bank (1998)
16.8	-1.656		North side channel (1998)
17.1		-1.57	North edge channel
17.6	-2.403		Top of slope (1998)
17.85	-2.359		Base of crest stage guage (1998)
17.9		-1.83	Channel (1998)
18.2		-2.45	Channel
18.71	-2.459		Channel (1998)
18.85	-2.47		Channel (1998)
19.5		-2.45	Channel
19.6	-2.054		Channel (1998)
20		-2.06	South edge channel
20.85	-1.97		Edge of C2? (1998)
21.7		-1.54	Bank
23.09	-0.882		Edge of C3? (1998)

Distance (m) (continued)	Height 9/2/98 (m) (continued)	Height 10/23/01 (m) (continued)	Notes (2001 unless noted) (continued)
23.1		-0.85	Top of bank
28		-0.88	Top of trough
28		-0.88	Trough
31.5		-0.9	Top of trough
39.3	-1.025	-0.8	Trough
43.9		-0.83	Top of trough
47.5		-0.71	Wide trough
53.9	-0.82	-0.73	Overbank
54.9		-0.71	Trough
55.5		-0.58	High water mark 7/2/01
56.5	-0.11		South side of valley (1998)
56.8		-0.11	Base of rebar
56.8		0.06	Top of rebar

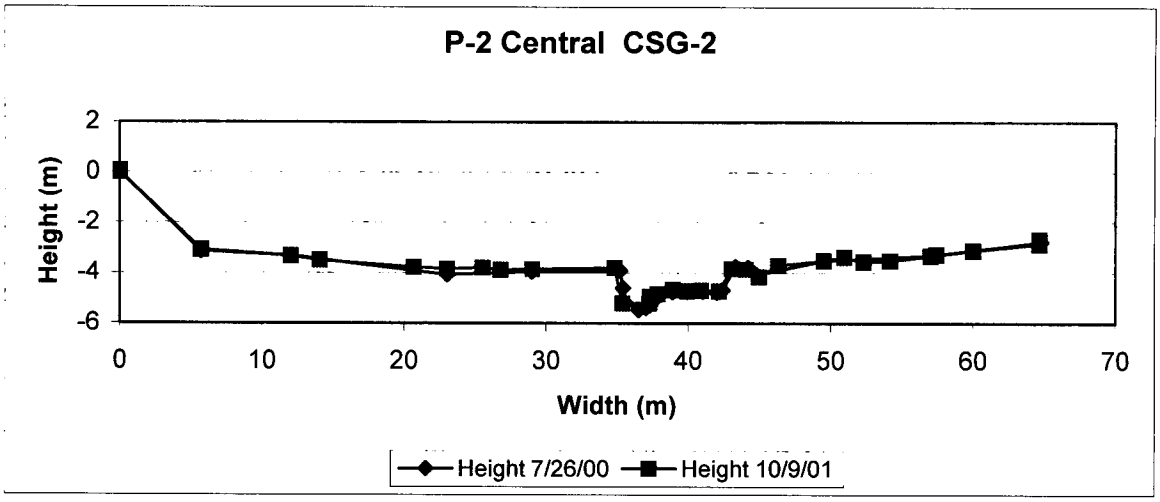
A-11. Cross sections and notes for P-2 Central CSG-1



Distance (m)	Height 7/26/00 (m)	Height 10/9/01 (m)	Notes (2001 unless noted)
0		0.16	Top of stake
0	0	0	Base of stake
0.7		-0.33	High water mark 7/2/01
1.85		-0.63	Base of slope
2	-0.74		North edge valley(2000)
6		-0.59	Floodplain
14	-0.98	-0.72	Floodplain
18.5		-0.76	Floodplain
22.55		-0.96	Shallow trough
23	-0.93	-0.87	Edge of mound / floodplain
25.6		-0.8	High point / bushes
28.3		-0.84	Floodplain / trough
30	-0.66	-0.76	Floodplain
33.4		-0.82	Near top of bank
34	-1.67	-0.91	Point on bank
34.1		-1.15	Base of step on bank
35		-1.45	Break in slope
35.7	-1.64	-1.52	Low inset
36.8		-1.78	Rounded bank
37.2	-1.73	-1.94	Rounded bank
37.9		-2.43	North edge channel
38	-2.32		Channel (2000)
38.3	-2.37		Thalweg (2000)
38.6	-2.42		Base of crest stage guage (2000)
38.95		-2.42	South edge channel
39.1	-2.32	-2.12	Rounded grassy bank
39.3	-1.97	-2.03	Rounded bank
39.8	-1.85		C2? (2000)
40		-1.8	Near edge of inset
40.8	-1.74		Break in slope (2000)
41.2		-1.67	Back edge of inset
41.8	-1.62		Break in slope (2000)
41.3	-1.69		Point of slope (2000)

Distance (m) (continued)	Height 7/26/00 (m) (continued)	Height 10/9/01 (m) (continued)	Notes (2001 unless noted) (continued)
42.9	-0.8		Top of F1 unit (2000)
43.3		-0.86	Top of bank / N. edge F1?
44.5		-0.75	Local high
46.8	-0.83	-0.91	Trough
49.5	-0.49	-0.63	Floodplain
52		-0.49	Floodplain
57.15		-0.38	Base of rebar
57.15		-0.12	Top of rebar
57.5	-0.32		Base of rebar (2000)
58.7		-0.31	High water mark 7/2/01
61.1		-0.07	Qc?

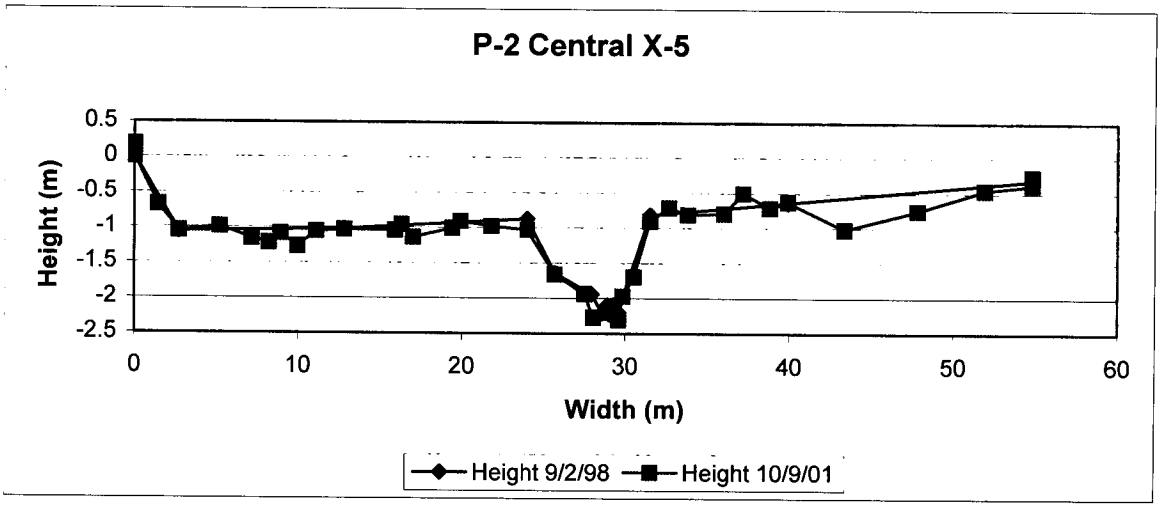
A-12. Cross sections and notes for P-2 Central CSG-2



Distance (m)	Height 7/26/00 (m)	Height 10/9/01 (m)	Notes (2001 unless noted)
0		0.05	Top of rebar
0	0	0	Base of rebar
5.7	-3.14	-3.09	North edge valley
12	-3.32	-3.33	Qc floodplain
14.05		-3.49	High water mark 7/2/01
20.65		-3.77	Base of slope
23	-4.07	-3.83	Floodplain / scour troughs
25.5		-3.79	Local high
26.75		-3.88	Narrow floodplain trough
29	-3.95	-3.84	Shallow trough
34.8		-3.8	Top of bank
35.2	-3.91		Top of bank (2000)
35.35		-5.21	North edge of channel
35.4	-4.6		Point on slope (2000)
35.5	-5.14		North edge channel (2000)
36.5	-5.47		Center of channel (2000)
37	-5.38		Base of crest stage guage (2000)
37.25		-5.21	South edge channel
37.3		-4.93	Top of low bank
37.3	-5.28		South edge channel (2000)
37.5	-4.95		Point on slope (2000)
37.85		-4.84	Sediment pin
37.9	-4.9		Sediment pin (2000)
38.9	-4.75	-4.68	Sediment pin
39.9	-4.73	-4.71	Sediment pin
40.9		-4.7	Sediment pin
41	-4.73		Sediment pin (2000)
42	-4.77		Sediment pin (2000)
42.15		-4.72	Sediment pin
42.2	-4.73		Break in slope (2000)
42.4	-4.68		2000 high water mark (2000)

Distance (m) (continued)	Height 9/2/98 (m) (continued)	Height 10/9/01 (m) (continued)	Notes (2001 unless noted) (continued)
43.05		-3.82	Top of bank
43.3	-3.74		North edge F1 unit (2000)
44		-3.84	Bank / secondary trough
44.2	-3.77		Break in slope (2000)
44.8	-4.07		Top of F1 unit (2000)
44.95		-4.15	Trough
46.3		-3.7	Bank above trough
49.5	-3.51	-3.5	Floodplain
50.95		-3.37	Floodplain
52.3		-3.55	North edge trough
54.15		-3.51	South edge trough
57	-3.31	-3.32	Floodplain / scour troughs
57.4		-3.27	High water mark 7/2/01
60		-3.11	Qc? Slope
64.65		-2.85	Base of rebar
64.65		-2.68	Top of rebar
64.8	-2.78		Rebar (2000)

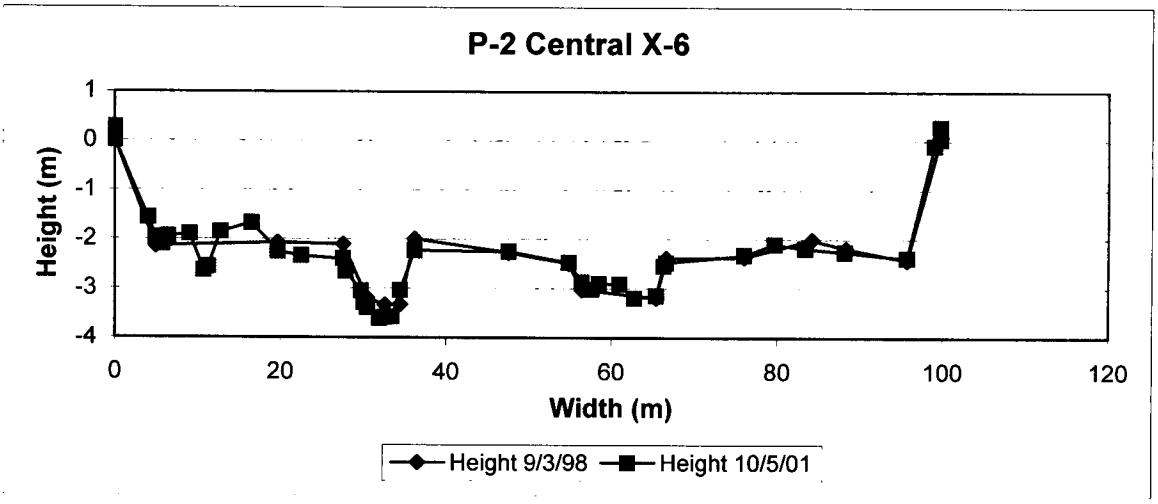
A-13. Cross sections and notes for P-2 Central X-5



Distance (m)	Height 9/2/98 (m)	Height 10/9/01 (m)	Notes (2001 unless noted)
0		0.18	Top of stake
0	0	0	Base of stake
1.45		-0.68	High water line 7/2/01
2.7	-1.057	-1.05	Base of colluvial slope
5.2		-0.99	Local high
7.15		-1.16	Trough on floodplain
8.2		-1.22	Trough
8.9		-1.09	Local high
9.95		-1.27	Trough
11.1		-1.06	Floodplain C2?
12.8	-1.024	-1.03	Floodplain C2?
15.9		-1.04	Floodplain
16.3		-0.96	Depositional feature
17		-1.14	Trough
19.4		-1.01	Local scour feature
19.9		-0.91	Local mound
21.8		-0.98	Mud cracks in low area
24	-0.874	-1.03	Top of rounded bank
25.7	-1.641	-1.66	C2 surface
27.5		-1.94	Top of bank / C2
27.95	-1.942		North edge C2 unit (1998)
28.05		-2.28	North edge channel
28.6	-2.216		South edge C2 unit (1998)
28.9	-2.103		North edge channel (1998)
29.05	-2.226		Channel (1998)
29.3	-2.091		Crest stage guage (1998)
29.55	-2.194		South edge of channel (1998)
29.6		-2.31	South edge of channel
29.85		-1.97	Top of C2 bank
30.5		-1.7	Mud bank / edge C2
31.5	-0.816	-0.9	Top of bank / F1

Distance (m) (continued)	Height 9/2/98 (m) (continued)	Height 10/9/01 (m) (continued)	Notes (2001 unless noted) (continued)
32.65		-0.71	Deposition of F1
33.8		-0.81	Scour behind tree
36		-0.79	Scour feature
37.15		-0.5	Bushed on local high
38.8		-0.71	Trough on floodplain
39.9	-0.639	-0.63	Floodplain
43.35		-1.02	North edge trough
47.8		-0.75	High water line 7/2/01
51.9		-0.45	Qc? Surface
54.8	-0.311	-0.38	Base of rebar
54.8		-0.26	Top of rebar

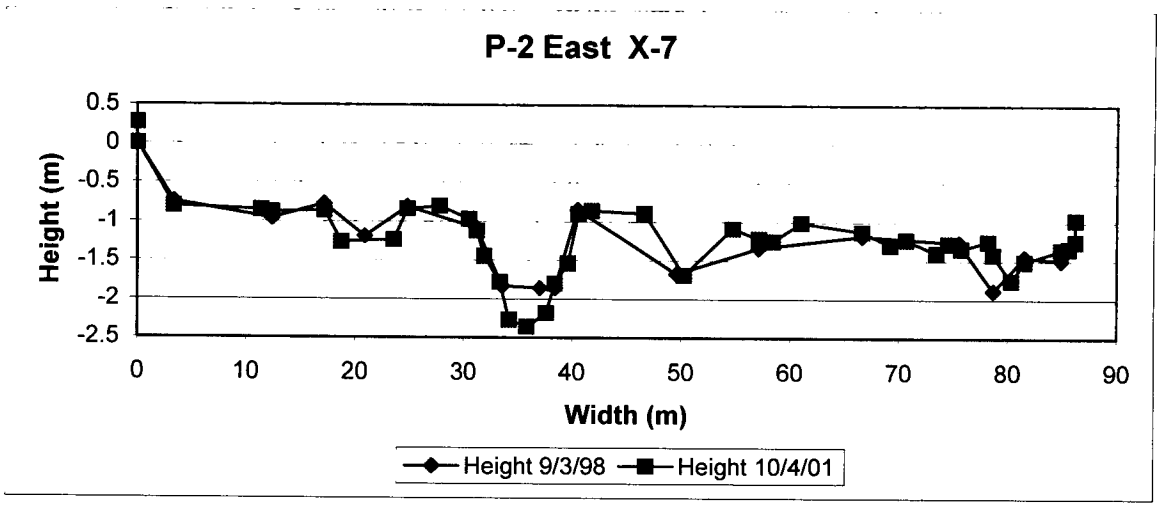
A-14. Cross sections and notes for P-2 Central X-6



Distance (m)	Height 9/3/98 (m)	Height 10/5/01 (m)	Notes (2001 unless noted)
0		0.28	Top of stake
0	0	0	Base of stake
4		-1.57	High water line 7/2/01
4.95	-2.139	-1.97	Base of slope
5.7		-2.1	Local trough
6.45		-1.95	Low floodplain C2?
9		-1.9	Top of bank / northern channel
10.7		-2.63	Northern channel thalweg
11.25		-2.56	Northern channel
12.75		-1.86	Top of northern bank
16.5		-1.68	Depositional mound behind shrub
19.65	-2.08	-2.25	Floodplain
22.5		-2.34	Local trough
27.55	-2.112	-2.4	Top of bank
27.9		-2.65	Base of bank / step
29.7		-3.05	Edge of step
30.05		-3.3	North edge main channel
30.5	-3.2	-3.4	Undisturbed channel
31.95		-3.61	Center of disturbed channel
32.6	-3.333	-3.59	Channel disturbed
33.45		-3.58	Edge of disturbed channel
34.45	-3.328	-3.04	Mid-bank slope
36.2	-1.999	-2.23	Top of bank
47.5	-2.269	-2.25	Floodplain C2?
54.85	-2.492	-2.47	Slightly disturbed
56.4	-3.024	-2.87	Disturbed area
57.6		-3.02	Local trough
58.45		-2.9	Depositional bar
60.95		-2.91	Depositional bar
62.75		-3.2	Southern channel thalweg
65.4	-3.191	-3.15	Base of bank

Distance (m) (continued)	Height 9/2/98 (m) (continued)	Height 10/9/01 (m) (continued)	Notes (2001 unless noted) (continued)
66.3		-2.54	Top of bank
66.6	-2.39	-2.48	Floodplain C2?
76	-2.364	-2.32	Floodplain
79.65		-2.1	North edge road
83.35		-2.19	South edge road
84.15	-2.014		Edge road (1998)
88.15		-2.26	High water line 7/2/01
88.3	-2.184		Near road (1998)
95.7	-2.418	-2.38	Base of slope
98.95		-0.1	Top of bank
99.7		0.03	Base of stake
99.7		0.29	Top of stake
99.75	0.078		Base of rebar (1998)

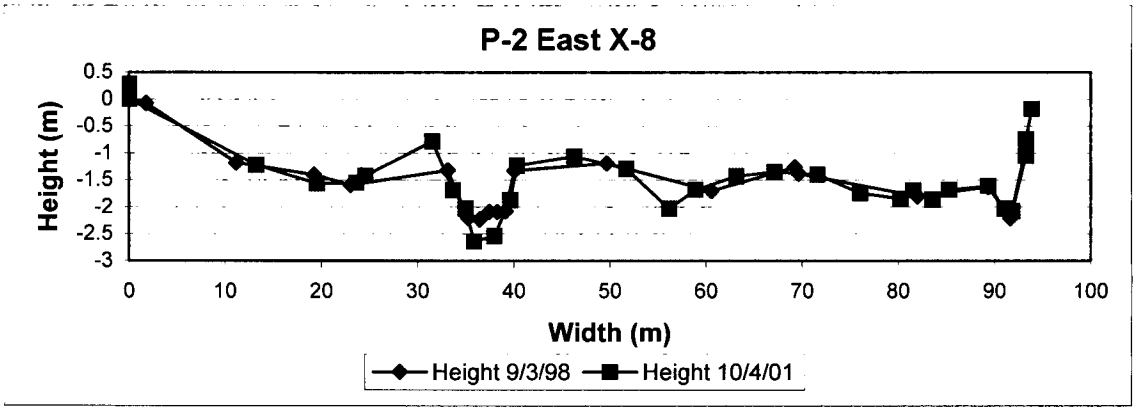
A-15. Cross sections and notes for P-2 East X-7



Distance (m)	Height 9/3/98 (m)	Height 10/4/01 (m)	Notes (2001 unless noted)
0	0	0.27	Top of rebar
0		0	Base of rebar
3.35		-0.8	Break in slope
3.36	-0.744		Break in slope (1998)
11.35		-0.85	High mud line 7/2/01
12.35	-0.961	-0.88	Floodplain
17.15		-0.86	Fill next to road
17.17	-0.772		Fill next to road (1998)
18.75		-1.27	North edge of road
20.89	-1.195		Road (1998)
23.55		-1.24	South edge of road
24.8	-0.808	-0.84	Floodplain
27.75		-0.8	Floodplain / ponderosa
30.45		-0.97	Floodplain near bank
31.13	-1.085		Top of bank (1998)
31.15		-1.12	Slope
31.85		-1.45	Point on slope
33.3		-1.78	Inner bank
33.5	-1.829		North edge of channel (1998)
34.15		-2.27	North edge of channel
35.75		-2.36	Thalweg
36.99	-1.858		Channel (1998)
37.6		-2.18	South edge of channel
38.4		-1.8	Top of low point
38.42	-1.858		Channel (1998)
39.6		-1.54	Base of bank
40.48	-0.845		Top of bank (1998)
40.55		-0.9	Top of bank
41.75		-0.86	Nail in ponderosa
46.6		-0.89	Floodplain
49.56	-1.672		Break in slope (1998)
50.25		-1.69	Center of trough
54.7		-1.09	Floodplain

Distance (m) (continued)	Height 9/3/98 (m) (continued)	Height 10/4/01 (m) (continued)	Notes (2001 unless noted) (continued)
57.1	-1.343	-1.22	Trough
58.4		-1.25	Edge of trough
61		-1.01	Floodplain
66.6	-1.187	-1.13	Floodplain
69.2		-1.3	Floodplain
70.65		-1.23	Scoured high behind tree
73.45		-1.4	Scoured area in channel
74.55		-1.28	Local high
75.5	-1.27		Top of old C2 bank (1998)
75.7		-1.34	Narrow trough
78.2		-1.25	Depositional lobe
78.65		-1.42	Floodplain
78.66	-1.884		North edge C2 (1998)
80.3		-1.75	Trough
81.55	-1.452	-1.51	Slope on floodplain
84.89	-1.493		Edge of valley (1998)
84.9		-1.36	Floodplain
85.6		-1.34	High water mark 7/2/01
86.2		-1.25	Base of rebar
86.2		-0.97	Top of rebar
86.07	-1.275		Base of rebar (1998)

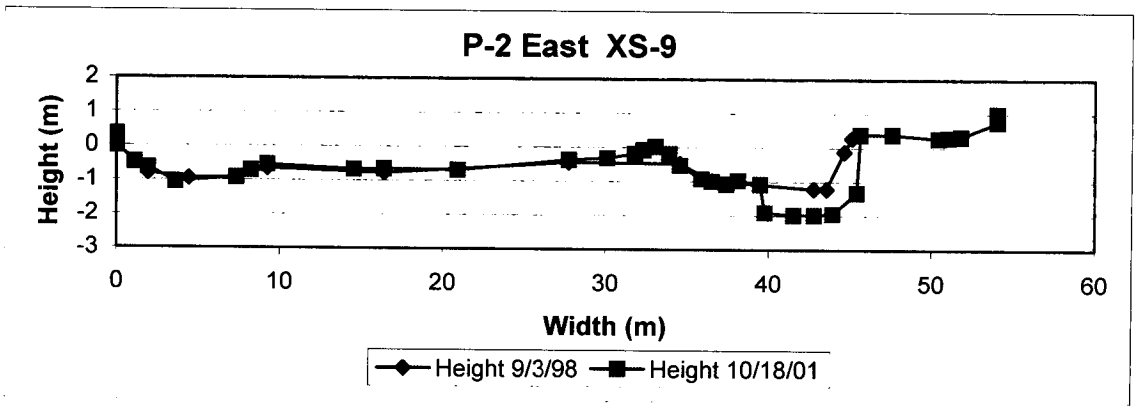
A-16. Cross sections and notes for P-2 East X-8



Distance (m)	Height 9/3/98 (m)	Height 10/4/01 (m)	Notes (2001 unless noted)
0	0	0.28	Top of rebar
0		0	Base of rebar
1.75	-0.075		Qc (1998)
11.14	-1.182		Break in slope (1998)
13.2		-1.22	High water mark 7/2/01
19.2	-1.401		Floodplain (1998)
19.5		-1.57	North edge of road
22.99	-1.593		Road (1998)
23.6		-1.55	South edge of road
24.55		-1.42	Floodplain
31.5		-0.78	Fill mound
33.08	-1.323		Top of bank (1998)
33.65		-1.69	Floodplain
34.95		-2.03	Top of bank
35.21	-2.2		North edge of channel (1998)
35.85		-2.64	North base of bank / channel
36.42	-2.229		Center of channel (1998)
37.41	-2.091		Channel (1998)
37.95		-2.54	South base of bank / channel
38.22	-2.087		Channel (1998)
39.1	-2.077		South edge channel (1998)
39.6		-1.87	Eroded channel margin
40.3		-1.23	Top of bank / floodplain
40.04	-1.329		On south bank (1998)
46.3		-1.06	Floodplain
49.65	-1.192		Local high (1998)
51.7		-1.29	Floodplain above trough
56.15		-2.03	Center of trough
58.9		-1.68	Floodplain slope
60.53	-1.701		Floodplain (1998)
63.15		-1.43	Floodplain
67.1		-1.35	Base of ponderosa
69.21	-1.259		Base of marker PU-0163 (1998)

Distance (m) (continued)	Height 9/3/98 (m) (continued)	Height 10/4/01 (m) (continued)	Notes (2001 unless noted) (continued)
69.6	-1.38		Floodplain (1998)
71.6		-1.4	Floodplain
76		-1.74	Trough
80.2		-1.85	Scour trough
81.5		-1.69	Local high in abandonded channel
81.99	-1.797		Low point (1998)
83.55		-1.86	Abandonded channel
85.25		-1.68	Local high
89.35	-1.629	-1.61	Top of bank of abandonded channel
91.05		-2.03	Thalweg of abandoned channel
91.62	-2.207		South edge valley floor (1998)
91.85		-2.08	Base of bank
93.23	-0.939		Valley wall (1998)
93.25		-1.05	Base of rebar / high water mark 7/2/01
93.25		-0.74	Top of rebar
93.85		-0.18	Slope

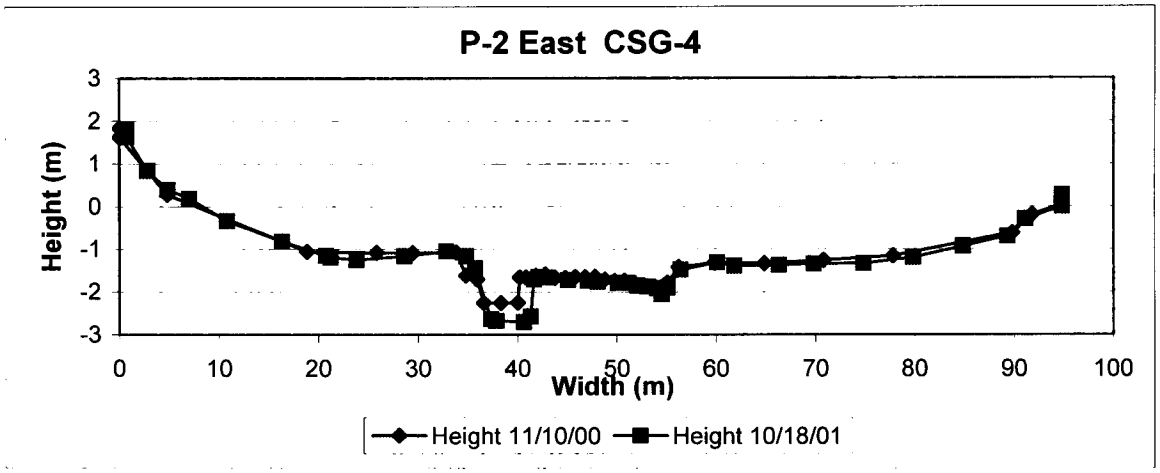
A-17. Cross sections and notes for P-2 East XS-9



Distance (m)	Height 9/3/98 (m)	Height 10/18/01 (m)	Notes (2001 unless noted)
0	0	0.34	Top of rebar
0		0	Base of rebar
1.1		-0.48	High water mark 7/2/01
1.92	-0.799	-0.64	Floodplain
3.6		-1.06	North side of road
4.42	-0.959		North side of road (1998)
7.24	-0.927		South side of road (1998)
7.35		-0.93	South side of road
8.22		-0.71	Bank of road
9.24		-0.55	Floodplain
9.246	-0.651		Fill next to road (1998)
14.55		-0.68	Trough
16.4	-0.776	-0.66	Floodplain
20.9		-0.69	Floodplain / base of gentle slope
27.75	-0.446	-0.37	Floodplain
30.1		-0.31	Floodplain
31.8		-0.18	Base of levy
32.32		-0.07	Levy
33.05		0.03	High water mark 7/2/01?
33.9		-0.18	Top of bank
34.57	-0.472	-0.53	Near base of bank
35.88		-0.92	Base of slope
36.5	-0.978	-0.99	Top of trough
37.4		-1.07	Center of trough
38.1		-0.97	Top of trough
39.45		-1.07	Top of bank
39.75		-1.91	Base of bank
41.52		-1.97	Thalweg
42.75	-1.212		Channel (1998)
42.76		-1.97	Channel
43.53	-1.209		Base of slope (1998)
43.9		-1.95	Base of slope failure
44.6	-0.122		On bank (1998)
45.4		-1.32	Top of slope failure

Distance (m) (continued)	Height 9/3/98 (m) (continued)	Height 10/4/01 (m) (continued)	Notes (2001 unless noted) (continued)
45.08	0.285		Top of bank (1998)
45.6		0.4	Top of bank / base of mound
47.57		0.4	Mound
50.4		0.28	Base of mound
51		0.3	Older trough
51.78		0.34	Base of trough
54		0.76	Base of stake
54		1.01	Top of stake

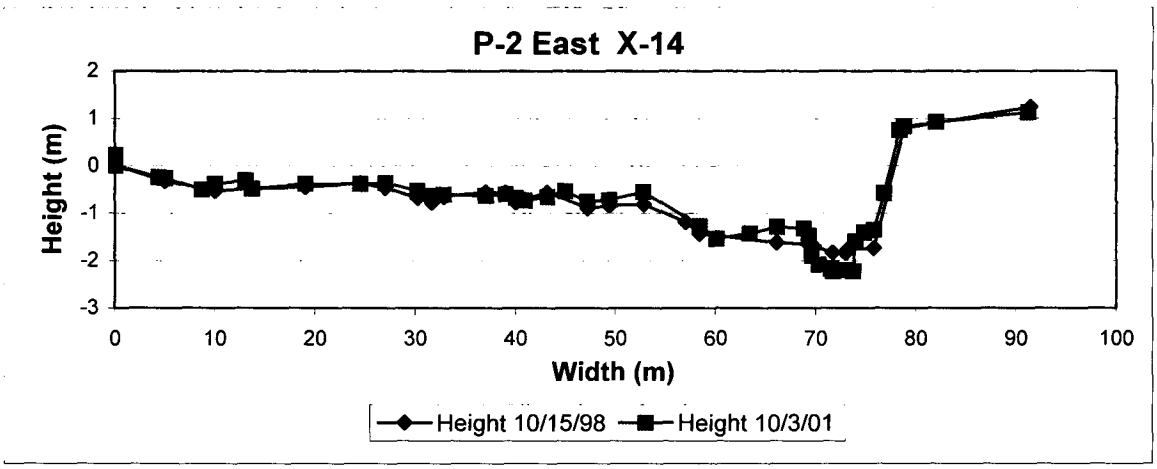
A-18. Cross sections and notes for P-2 East CSG-4



Distance (m)	Height 11/10/00 (m)	Height 10/18/01 (m)	Notes (2001 unless noted)
0	1.83		Top of stake (2000)
0	1.62		Base of stake (2000)
0.7		1.8	Top of rebar
0.7		1.63	Base of rebar
2.8		0.84	Slope
4.8	0.28	0.4	Slope / bushes
7		0.19	Slope
10.8		-0.34	Slope
16.3		-0.82	Base of slope
18.8	-1.06		Floodplain (2000)
20.7		-1.15	High water 7/2/01
21.2		-1.19	Floodplain
23.8		-1.25	Floodplain
25.8	-1.08		Floodplain (2000)
28.6		-1.16	Low point on slope
29.4	-1.09		Floodplain (2000)
32.8		-1.05	Top of slope
33.8	-1.07		Top of slope (2000)
34.8	-1.61	-1.16	Debris on bank
35.7		-1.44	Top of bank in a bush
37.3		-2.64	Base of bank
35.9	-1.7		North edge of channel (2000)
36.6	-2.26		Channel (2000)
37.85		-2.67	Edge of sand and gravel
38.3	-2.26		Channel (2000)
40	-2.25		Channel (2000)
40.2	-1.66		South edge channel (2000)
40.6		-2.7	Thalweg
40.8	-1.66		Break in slope (2000)
41.3		-2.57	Base of bank
41.6		-1.7	Top of bank
41.8	-1.62		Alluvial flag (2000)

Distance (m) (continued)	Height 9/3/98 (m) (continued)	Height 10/4/01 (m) (continued)	Notes (2001 unless noted) (continued)
42.1		-1.64	Alluvial flag
42.8	-1.59		Alluvial flag (2000)
43.1		-1.66	Alluvial flag
43.8	-1.67		Alluvial flag (2000)
44.8	-1.67		Alluvial flag (2000)
45.1		-1.72	Alluvial flag
45.8	-1.65		Alluvial flag (2000)
46.8	-1.65		Alluvial flag (2000)
47.1		-1.74	Alluvial flag
47.8	-1.64		Alluvial flag (2000)
48.1		-1.76	Alluvial flag
48.8	-1.71		Alluvial flag (2000)
49.8	-1.75		Alluvial flag (2000)
50.1		-1.79	Alluvial flag
50.8	-1.74		Alluvial flag (2000)
51.05		-1.79	Alluvial flag
51.8	-1.8		Alluvial flag (2000)
52.05		-1.85	Alluvial flag
52.8	-1.86		Alluvial flag (2000)
53.05		-1.87	Alluvial flag
53.8	-1.88		North edge terrace (2000)
54.05		-1.92	Top of trough
54.2	-2.01		2000 high water mark (2000)
54.5		-2.06	Trough
54.8	-1.84		North edge F1 (2000)
55.1	-1.78	-1.9	Top of trough
56.2	-1.42		Sample PU-0165 (2000)
56.4		-1.48	Top of bank
59.8	-1.32		South edge F1 (2000)
60.1		-1.31	Sample PU-0165
61.8		-1.39	Floodplain
64.8	-1.33		Floodplain (2000)
66.3		-1.37	High water 7/2/01
69.8		-1.34	Floodplain
70.8	-1.26		Floodplain (2000)
74.8		-1.33	Floodplain
77.8	-1.15		Floodplain (2000)
79.8		-1.19	Floodplain
84.8		-0.93	Bushes
89.3		-0.69	Base of slope
89.8	-0.62		Break in slope (2000)
91.1		-0.29	Top of slope
91.8	-0.19		Point on slope (2000)
94.8	0.04	0	Base of rebar
94.8	0.28	0.27	Top of rebar

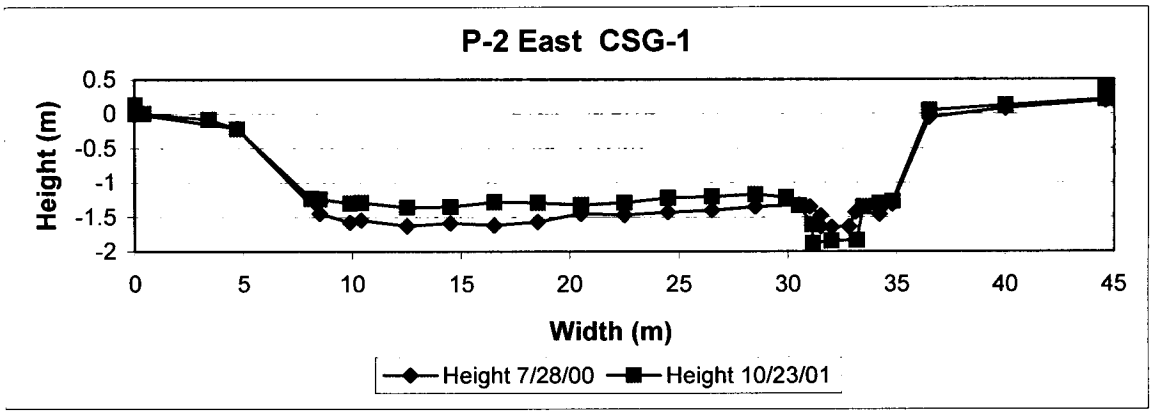
A-19. Cross sections and notes for P-2 East X-14



Distance (m)	Height 10/15/98 (m)	Height 10/3/01 (m)	Notes (2001 unless noted)
0		0.23	Top of rebar
0	0	0	Base of rebar
4.35		-0.24	High water line 7/2/01
5	-0.32	-0.26	On slpoe
8.7		-0.5	Shallow trough
10	-0.53	-0.38	Edge of mound
13.05		-0.31	Floodplain depositional feature
13.7	-0.48	-0.48	Deeper flow on floodplain
19	-0.45	-0.38	Floodplain
24.5	-0.37	-0.38	Floodplain
27	-0.46	-0.36	Floodplain
30.2	-0.68	-0.53	Floodplain mud cracks
31.6	-0.77	-0.63	Floodplain mud cracks
32.8	-0.65	-0.61	Mud cracks
37	-0.56	-0.63	Old channel? / mud cracks
39	-0.57	-0.6	Floodplain
40	-0.77	-0.68	Floodplain
40.9	-0.71	-0.73	Floodplain channel
43.2	-0.56	-0.66	Floodplain channel
45		-0.54	High on floodplain
47.2	-0.89	-0.75	Floodplain channel
49.4	-0.84	-0.72	Floodplain channel
52.8	-0.81	-0.55	Next to debris pile
57	-1.19		C2 / C3 slope (1998)
58.4	-1.43	-1.27	Edge of C2 / boulder
60.1		-1.54	C2 channel
63.4		-1.42	Edge of 2001 sandbar
66.1	-1.62	-1.29	C2 / sandbar
68.8		-1.32	C2
69.3		-1.47	Top of bank
69.6		-1.89	Base of bank
69.3	-1.66		Edge of C2 (1998)
69.8	-1.7		C1 (1998)
70.3		-2.08	C1 / break in slope

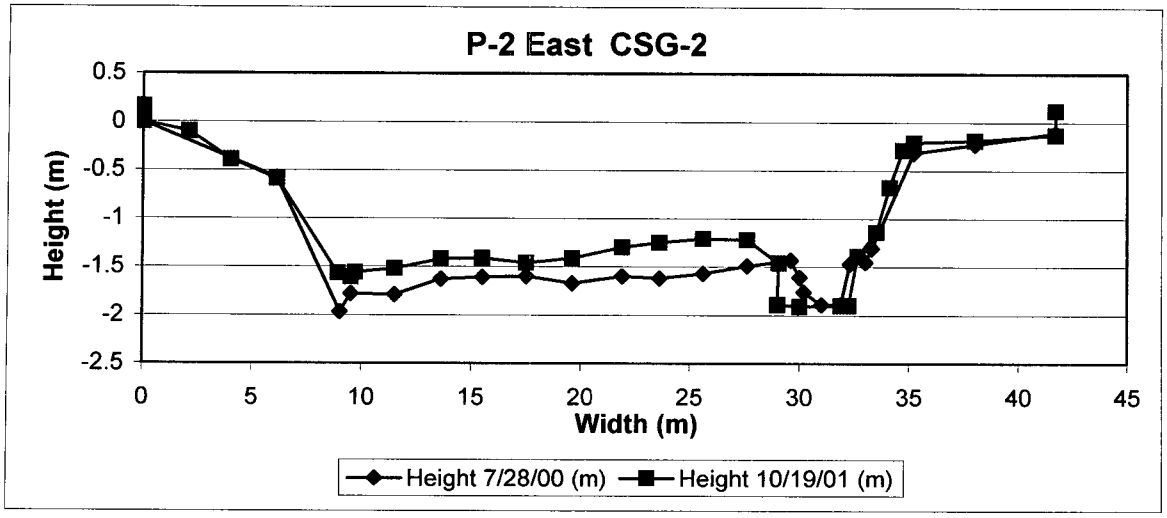
Distance (m) (continued)	Height 9/3/98 (m) (continued)	Height 10/4/01 (m) (continued)	Notes (2001 unless noted) (continued)
71.45		-2.18	C1 / break in slope
71.7	-1.83	-2.22	C1 sand
73	-1.84	-2.2	C1 sand
73.2	-1.77		C1b? (1998)
73.7		-2.22	Base of bank C1
73.95		-1.6	Top of bank
74.8		-1.4	C1b
75.8	-1.73	-1.35	South edge C1b
76.8		-0.58	High water line 7/2/01
78.35		0.75	Top of bank
78.8	0.79	0.83	Qc?
82		0.92	Flag on slope
91.2		1.13	Base of stake
91.4	1.24		Rebar beside road (1998)

A-20. Cross sections and notes for P-2 East CSG-1



Distance (m)	Height 7/28/00 (m)	Height 10/23/01 (m)	Notes (2001 unless noted)
0		0.13	Top of rebar
0	0	0	Base of rebar
0.4		0	High water 7/2/01
3.4		-0.08	Top of slope
4.7	-0.21	-0.22	Top of steep slope
8.1		-1.23	Base of slope
8.5	-1.45	-1.24	Rebar
9.9	-1.58	-1.3	Rill on floodplain
10.4	-1.55	-1.29	Floodplain
12.5	-1.63	-1.36	Rill in floodplain
14.5	-1.59	-1.35	Alluvial pins
16.5	-1.62	-1.28	Rilled overbank
18.5	-1.57	-1.29	Overbank
20.5	-1.45	-1.32	Rilled overbank
22.5	-1.47	-1.29	Rilled overbank
24.5	-1.43	-1.22	Rebar
26.5	-1.4	-1.2	Slight levy
28.5	-1.35	-1.17	Rebar
29.9		-1.21	Top of bank
30.5	-1.32	-1.33	Rebar on bank
31	-1.35		Top of north bank (2000)
31.1		-1.61	Point on bank
31.15		-1.88	North edge channel
31.5	-1.48		North edge of channel (2000)
31.5	-1.64		Base of crest stage gauge (2000)
32	-1.65	-1.85	Channel
32.8	-1.64		South edge channel (2000)
33.1	-1.43		South bank (2000)
33.15		-1.84	South edge channel
33.45		-1.35	Top of bank
34.2	-1.46	-1.3	C2 surface?
34.8	-1.31	-1.27	Base of slope
36.5	-0.05	0.05	Top of bank
40	0.08	0.12	Qt surface
44.6	0.19	0.21	Base of rebar
44.6		0.38	Top of rebar

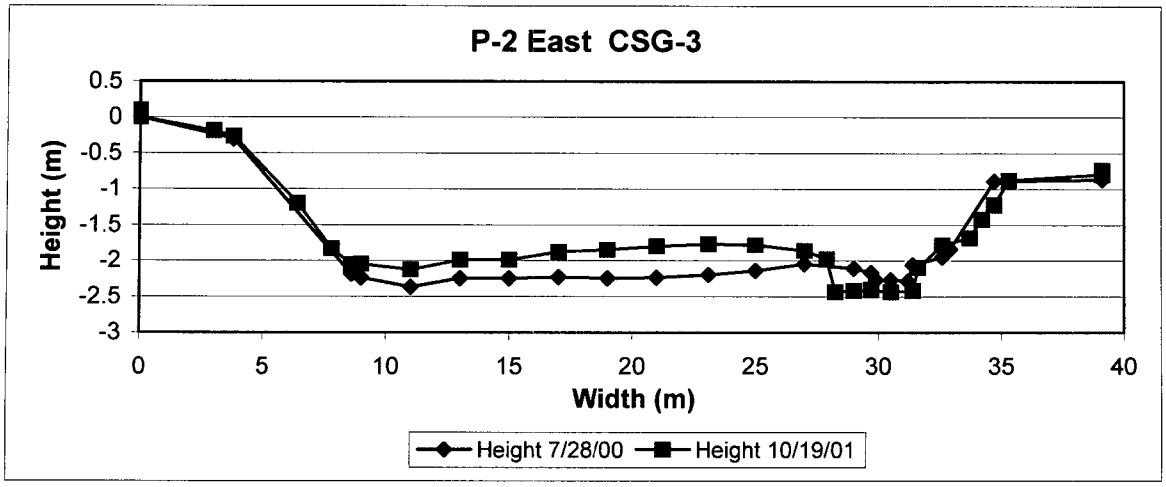
A-21. Cross sections and notes for P-2 East CSG-2



Distance (m)	Height 7/28/00 (m)	Height 10/19/01 (m)	Notes (2001 unless noted)
0		0.16	Ttop of rebar
0	0	0	Base of rebar
2.1		-0.1	Qc slope
4		-0.39	High water 7/2/01
6.1	-0.58	-0.59	Top of slope / stump
8.9		-1.57	Base of slope
9	-1.97		2000 high water mark (2000)
9.5	-1.78	-1.61	Stake on overbank rill
9.7		-1.56	South side of trough
11.5	-1.79	-1.52	Stake in trough
13.6	-1.63	-1.42	Stake on overbank
15.5	-1.61	-1.41	Stake on overbank
17.5	-1.6	-1.46	Stake
19.6	-1.67	-1.41	Overbank
21.9	-1.6	-1.3	Coarse gravel on overbank
23.6	-1.62	-1.25	Overbank
25.6	-1.57	-1.21	Overbank
27.6	-1.49	-1.22	Top of small slope
29.05		-1.46	Base of slope / top of bank
29		-1.89	Slight undercut
29.6	-1.43		Alluvial stake (2000)
30	-1.61	-1.91	Channel
30.2	-1.76		North edge channel (2000)
31	-1.89		Channel
31.9	-1.89	-1.9	Channel
32.25		-1.9	South edge channel
32.3	-1.47		South edge bank
32.65		-1.39	Top of bank
33	-1.45		South edge C2
33.3	-1.31		2000 high water mark (2000)
33.5		-1.14	South edge C2?

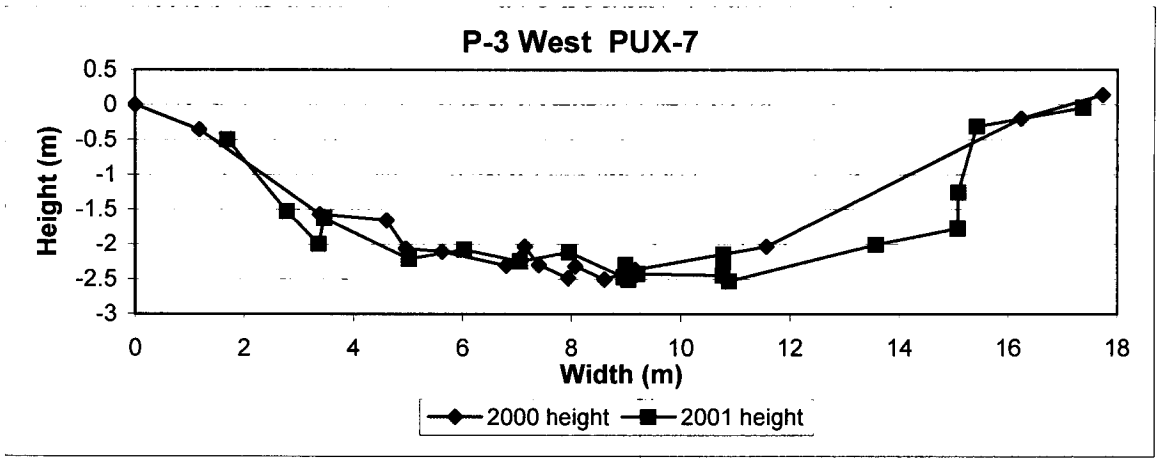
Distance (m) (continued)	Height 9/3/98 (m) (continued)	Height 10/4/01 (m) (continued)	Notes (2001 unless noted) (continued)
34.1		-0.67	High water 7/2/01
34.7		-0.29	Top of slope
35.2	-0.32	-0.21	Qc
38	-0.23	-0.19	Qc surface
41.7	-0.11	-0.13	Base of rebar
41.7		0.12	Top of rebar

A-22. Cross sections and notes for P-2 East CSG-3

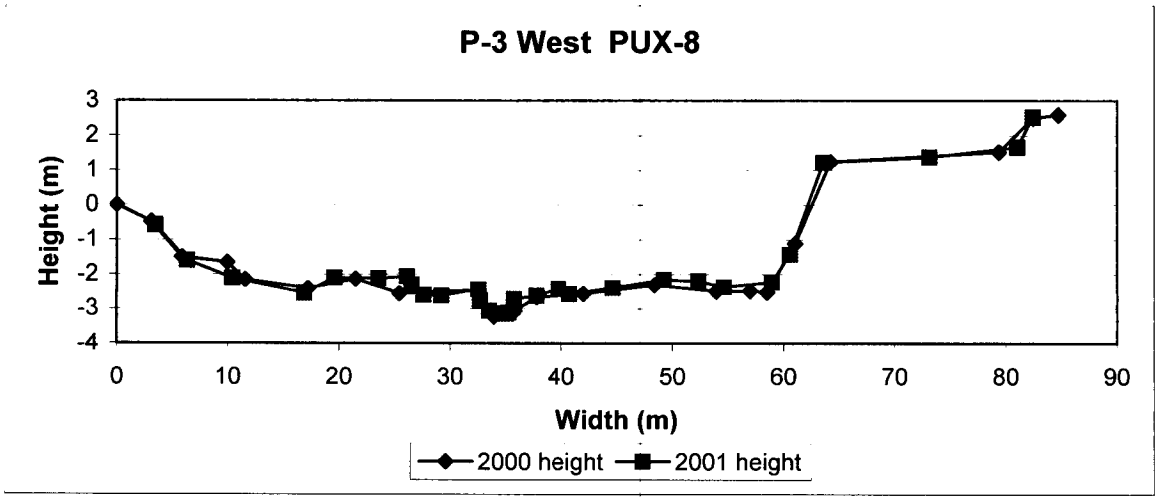


Distance (m)	Height 7/28/00 (m)	Height 10/19/01 (m)	Notes (2001 unless noted)
0	0	0.1	Top of rebar
0		0	Base of rebar
3		-0.19	F1? Surface
3.8	-0.3	-0.265	Slope break
6.4		-1.2	High water 7/2/01
7.8		-1.83	Slope break
8.6	-2.19	-2.06	North side rilled overbank
9	-2.24	-2.05	Overbank
11	-2.37	-2.13	Overbank
13	-2.25	-1.99	Overbank
15	-2.25	-1.99	Overbank
17	-2.23	-1.88	Overbank
19	-2.25	-1.85	Overbank
21	-2.24	-1.8	Overbank
23.1	-2.2	-1.77	Overbank
25	-2.14	-1.78	Overbank
27	-2.05	-1.86	Overbank
27.9		-1.98	Top of bank
28.25		-2.44	Base of bank
29	-2.11	-2.42	Channel
29.7	-2.17	-2.41	Channel
29.9	-2.27		North edge channel (2000)
30.5	-2.27	-2.44	Thalweg
31.2	-2.29		South edge channel (2000)
31.4	-2.06	-2.42	South edge channel
31.6		-2.1	Top of bank
32.6	-1.95	-1.78	C1 / C2? Break
32.9	-1.84		2000 high water mark (2000)
33.7		-1.68	Base of slope
34.2		-1.42	High water 7/2/01
34.7	-0.89	-1.22	On slope
35.3		-0.88	Top of bank
39.1	-0.87	-0.8	Base of replaced rebar
39.1		-0.74	Top of replaced rebar

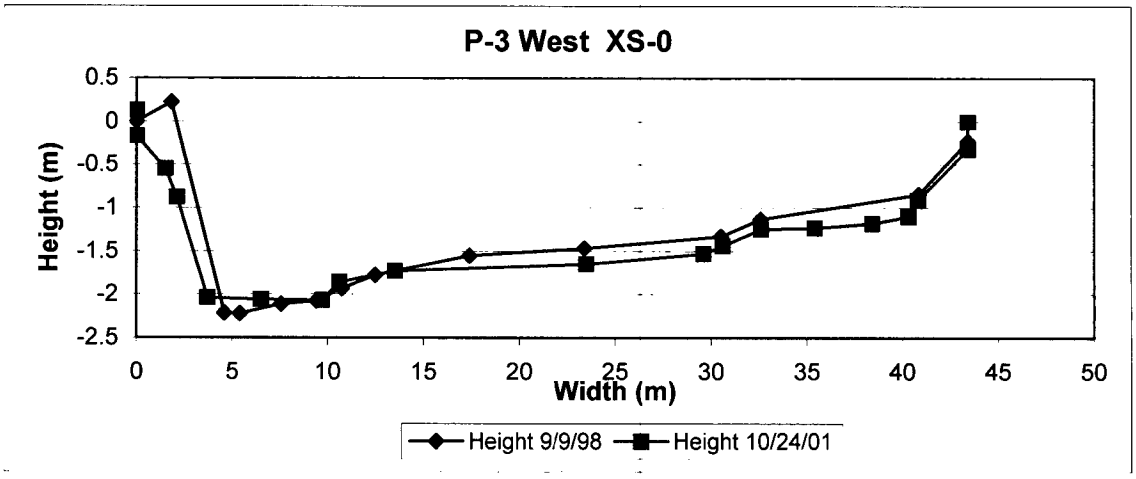
A-23. Cross sections PUX-7



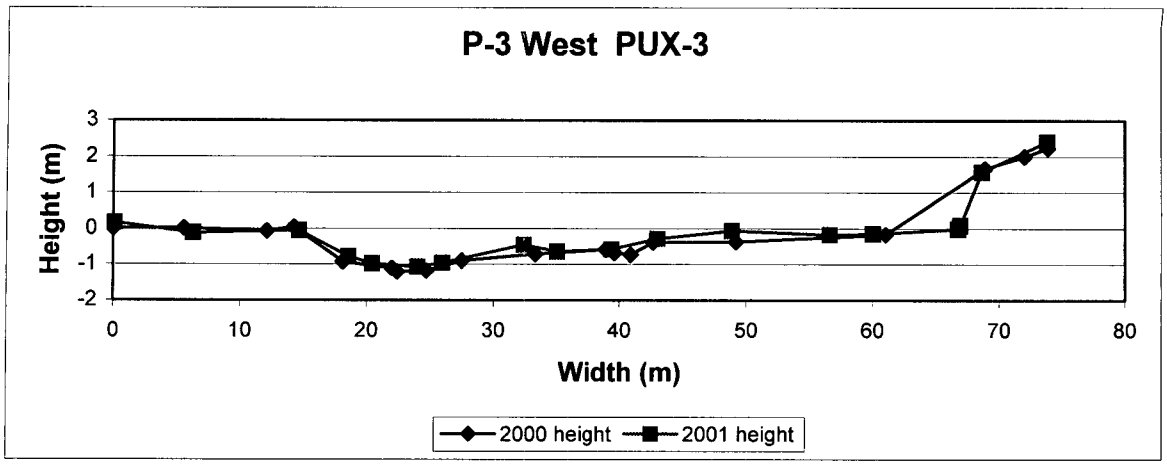
A-24. Cross sections PUX-8



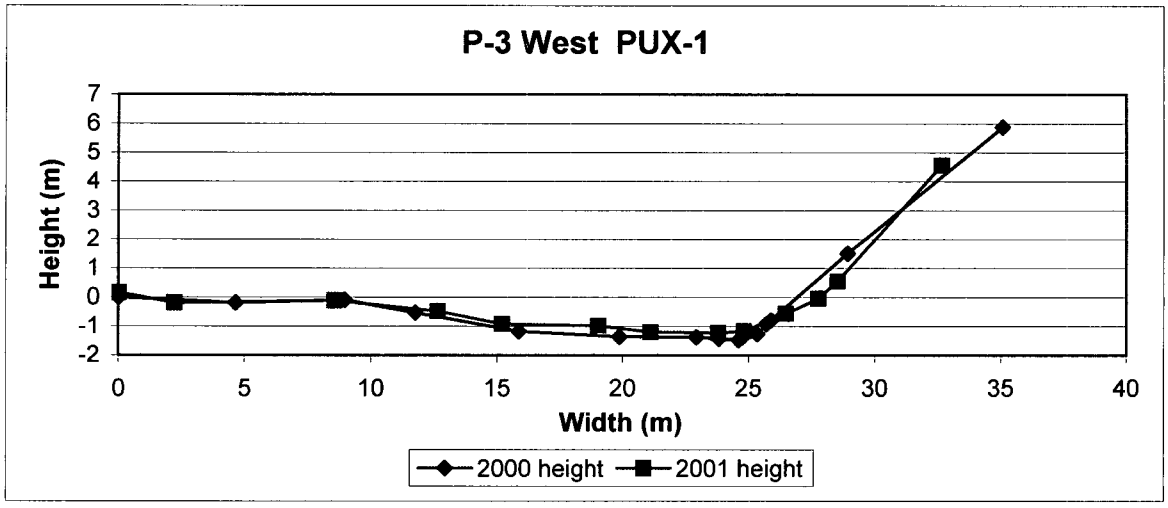
A-25. Cross sections XS-0



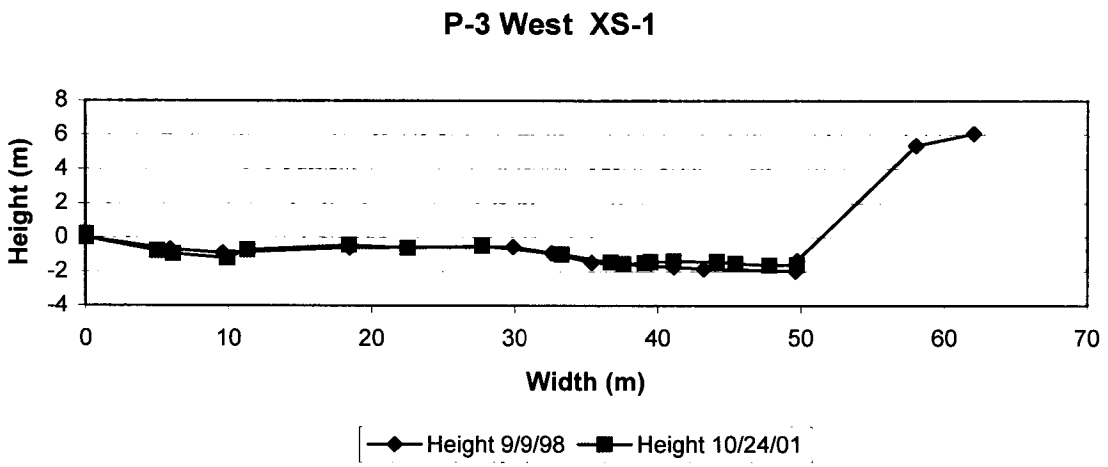
A-26. Cross sections PUX-3



A-27. Cross sections PUX-1

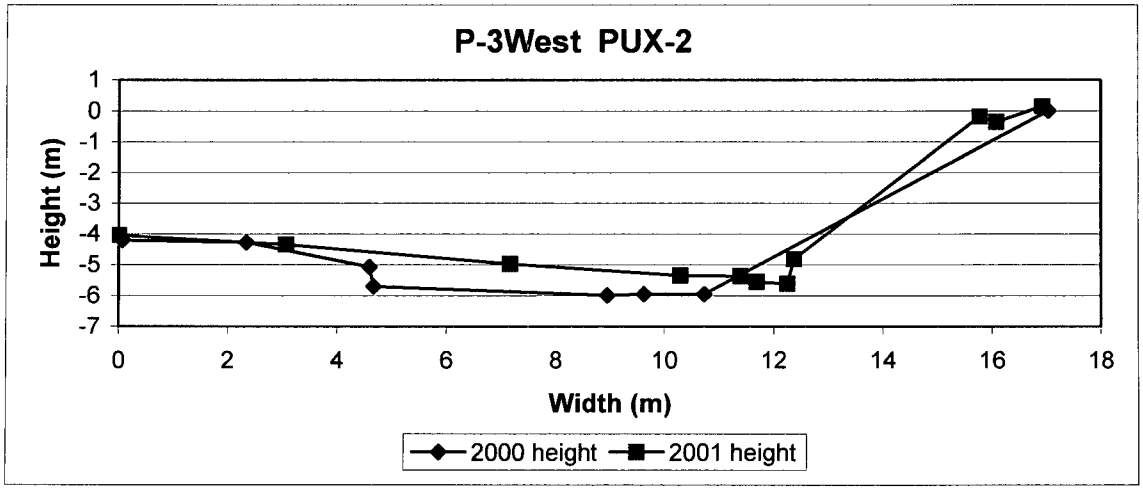


A-28. Cross sections and notes for P-3 West XS-1

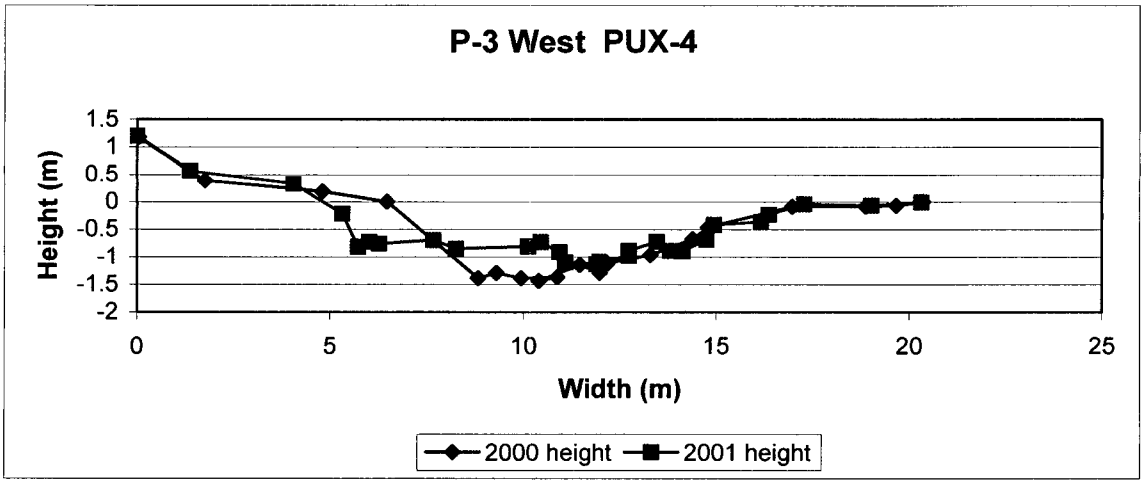


Distance (m)	Height 9/9/98 (m)	Height 10/24/01 (m)	Notes (2001 unless noted)
0		0.21	Top of rebar
0	0	0	Base of rebar
5		-0.78	Slope aboove road
5.9	-0.693		North edge of road 91998)
6.1		-0.95	North edge of road
9.6	-0.914		South edge of road (1998)
9.9		-1.2	South edge of road
11.3		-0.73	Slope above road / F1?
18.4		-0.45	F1? Overbank
18.45	-0.605		Overbank (1998)
22.5		-0.62	Overbank
27.7		-0.51	Bushes
29.85	-0.555		Top of slope (1998)
32.6	-0.913		Slope (1998)
33.3		-0.98	High water mark 7/2/01
35.4	-1.467		Edge of C2 (1998)
36.7		-1.45	Inner edge of channel
37.6		-1.54	Thalweg
39.1		-1.49	South edge inner channel
39.5		-1.43	Edge of bar
41.1		-1.39	Channel bar of gravel and sand
44.1		-1.41	Outer edge of bar
41.13	-1.725		C1 (1998)
43.2	-1.836		C1 (1998)
45.4		-1.53	South edge outer channel
47.8		-1.62	Channel
49.6	-1.963		South edge channel (1998)
49.7	-1.364	-1.59	Outer edge of channel
58	5.374		Top of slope (1998)
62.05	6.069		Base of rebar (1998)

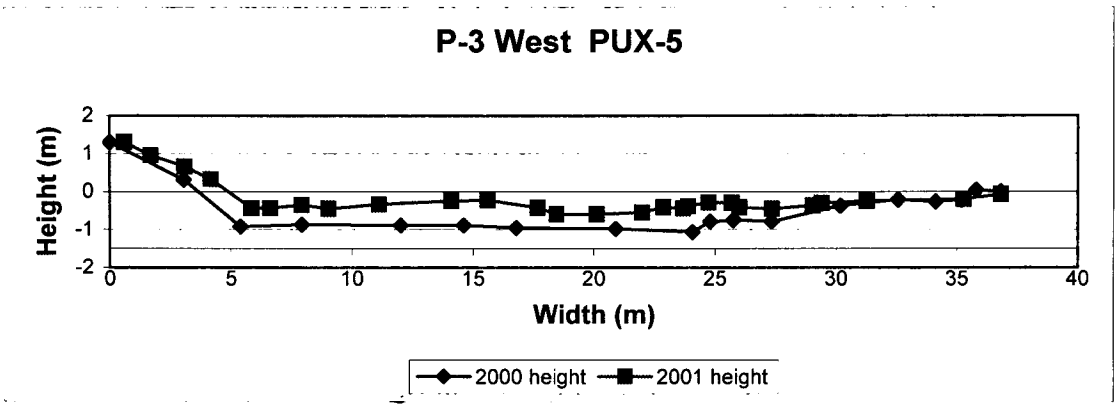
A-29. Cross sections PUX-2



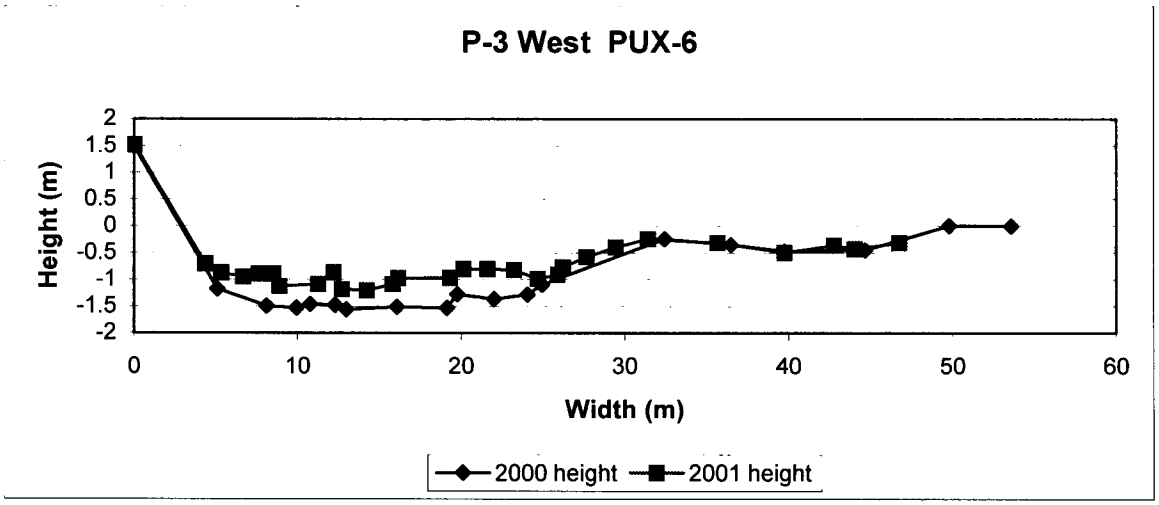
A-30. Cross sections PUX-4



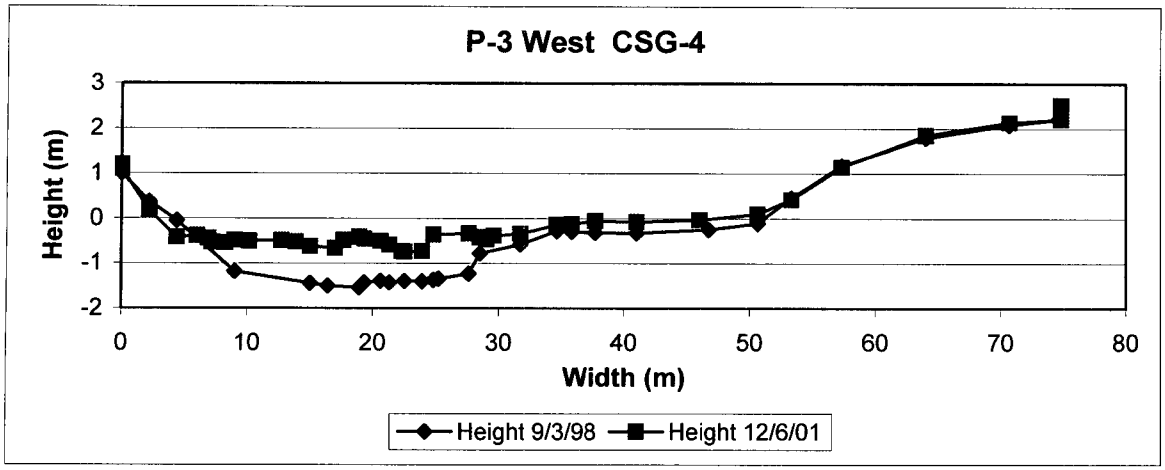
A-31. Cross sections PUX-5



A-32. Cross sections PUX-6



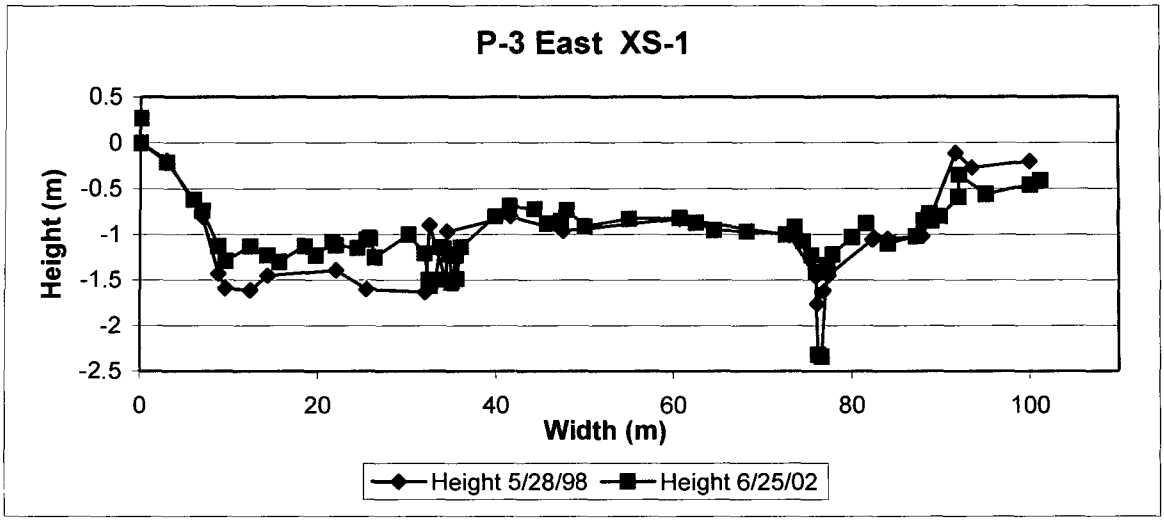
A-33. Cross sections and notes for P-3 West CSG-4



Distance (m)	Height 9/3/98 (m)	Height 12/6/01 (m)	Notes (2001 unless noted)
0		1.2	Top of stake
0	1	1.1	Base of stake
2.2	0.37	0.17	Slope
4.4	-0.05	-0.42	North edge channel
6		-0.38	Sand bar
6.9		-0.44	Fill
7.2		-0.53	Sand bar
8.25		-0.54	Sand bar
9	-1.18	-0.48	Sand bar
10.15		-0.5	Fill (1998)
12.7		-0.49	Channel
13.85		-0.52	Channel
15	-1.44	-0.62	Channel
16.4	-1.5		Channel (1998)
17		-0.66	Gravel and cobble bar
17.65		-0.48	Gravel and cobble bar
18.9	-1.54	-0.41	Gravel and cobble bar
19.3	-1.43	-0.45	Gravel and cobble bar
20.6	-1.39	-0.5	Gravel and cobble bar
21.3	-1.43	-0.59	Gravel and cobble bar
22.3		-0.73	Gravel and cobble bar
22.5	-1.39	-0.74	Thalweg
23.9	-1.4	-0.73	Channel
24.8	-1.37	-0.36	Channel
25.2	-1.34		Sample PU-0145
27.6	-1.23	-0.33	Sand bar
28.5	-0.78	-0.42	Sand bar
29		-0.46	Sand bar
29.6		-0.38	Sand bar
31.7	-0.58	-0.34	Sand bar
34.6	-0.28	-0.14	C1b?
35.8	-0.29	-0.12	C1b?

Distance (m) (continued)	Height 9/3/98 (m) (continued)	Height 10/4/01 (m) (continued)	Notes (2001 unless noted) (continued)
37.7	-0.31	-0.05	C1b?
41	-0.32	-0.07	C1b?
46		-0.03	C1b?
46.7	-0.24		C1b? (1998)
50.6	-0.11	0.1	Break in slope
53.3	0.46	0.42	Slope
57.3	1.17	1.14	Slope
64	1.79	1.85	Slope
70.7	2.08	2.14	Slope
74.6	2.21		Rebar near road (1998)
74.8		2.21	Base of stake
74.8		2.52	Top of stake

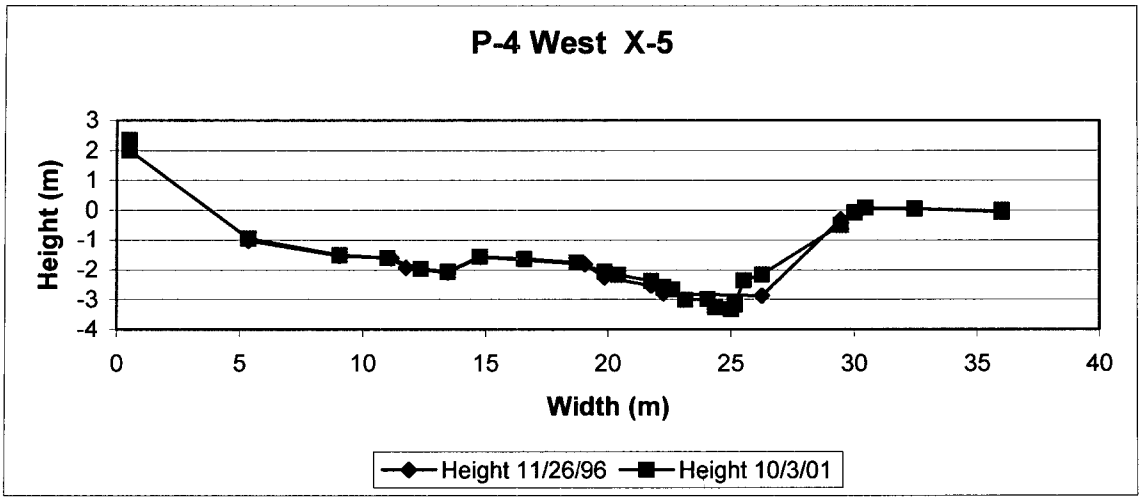
A-34. Cross sections and notes for P-3 East XS-1



Distance (m)	Height 5/28/98 (m)	Height 6/25/02 (m)	Notes (2002)
0		0.27	Top of stake
0	0	0	Base of stake
3	-0.19	-0.21	Top of slope
6		-0.62	Slope
7	-0.8	-0.74	High water mark 6/22/02
8.8	-1.43	-1.13	Edge F1 / very fine sand
9.6	-1.59	-1.29	Floodplain / very fine sand
12.4	-1.61	-1.13	Pumice
14.3	-1.45	-1.23	Tree / very fine sand
15.6		-1.3	Low point in floodplain / fine sand
18.5		-1.13	Floodplain channel / very fine sand
19.7		-1.23	Silt to fine sand in channel
21.6		-1.08	Very fine sand
22	-1.39	-1.12	Silt to very fine sand
24.4		-1.15	Grass / very fine sand
25.4	-1.6	-1.06	Hummocky grass
25.8		-1.04	Very fine sand mound
26.35		-1.25	Trough
30.15		-1	Very fine sand
31.95		-1.21	Top of bank
32	-1.63		North edge channel
32.35		-1.5	South edge channel
32.5	-0.9		Top of island
32.55		-1.56	Island center
33.15		-1.5	Top of small bank
33.65		-1.14	Base of small bank
34.1		-1.15	Island center
34.3	-1.51		Thalweg active channel (1998)
34.5	-0.97		Top of bank
34.7		-1.22	Top of small bank
34.95		-1.53	Base of small bank

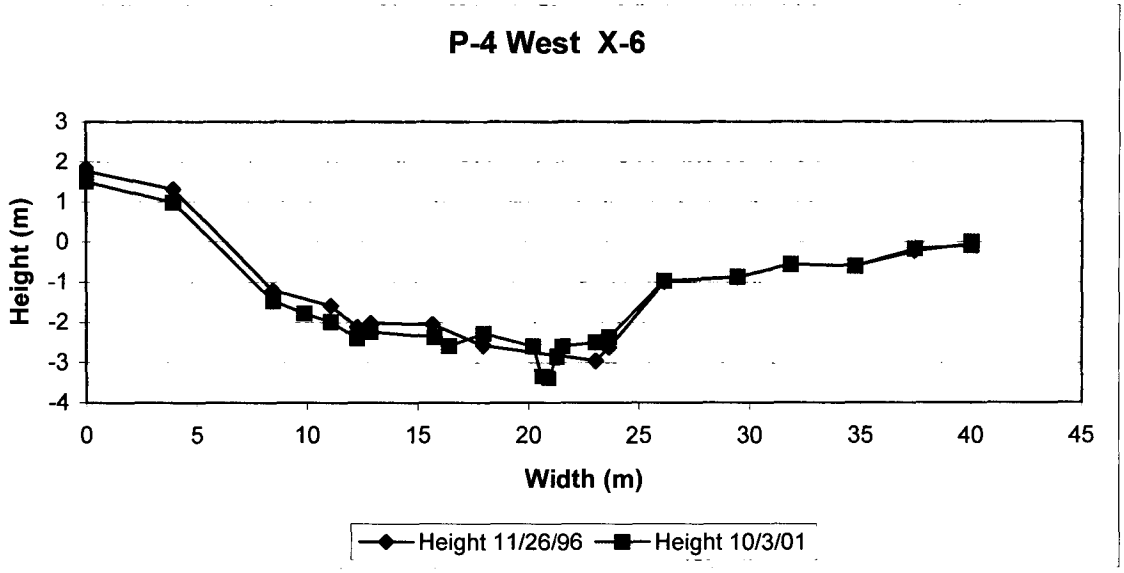
Distance (m) (continued)	Height 9/3/98 (m) (continued)	Height 10/4/01 (m) (continued)	Notes (2002) (continued)
35.45		-1.23	South edge channel
35.5		-1.49	Top of bank
36		-1.14	Silt and very fine sand in floodplain
39.9		-0.8	High water mark 6/22/02
41.5		-0.69	Floodplain
41.58	-0.8		Floodplain
44.3		-0.72	High water mark 6/22/02
45.7		-0.88	Channel in floodplain
47.3		-0.85	Near sample / silt
47.5	-0.96		Break in slope
47.9		-0.73	Local high
50		-0.91	Shallow fill with silt
55		-0.83	Silt
60.7	-0.83	-0.82	Floodplain with very fine sand
62.5		-0.87	Very fine sand
64.5		-0.95	Edge of trough
68.2		-0.97	Local low with sitl
72.6		-1	Grass with fine sand
73	-1.01		Top of bank (1998)
73.6		-0.92	Local high
74.5		-1.075	Very fine sand in grass
75.45		-1.23	Top of bank
75.9	-1.46	-1.41	Top of inner bank
76.1	-1.76		Thalweg (1998)
76.15		-2.32	Edge of inner channel
76.55		-2.34	Thalweg
76.8	-1.62		South edge channel (1998)
77.25		-1.34	Top of bank
77.3	-1.45		Top of bank (1998)
77.8		-1.22	Pumice and gravel in grass
80		-1.03	Grass on slope
81.6		-0.88	Stake
82.3	-1.06		North side road (1998)
84	-1.05	-1.1	Road
87.2		-1.02	Road
87.9	-1.02		South side road (1998)
88.1		-0.85	Fan on road
88.65		-0.77	Top of mound
88.95		-0.85	South edge mound
89.9		-0.8	Silt
91.7	-0.11		Top of stake (1998)
91.95		-0.59	Base of stake
92		-0.35	Top of stake
93.5	-0.27		F1?
95		-0.56	Base of slope
100	-0.2	-0.46	F1? surface
101.2		-0.41	Tree

A-35. Cross sections and notes for P-4 West X-5



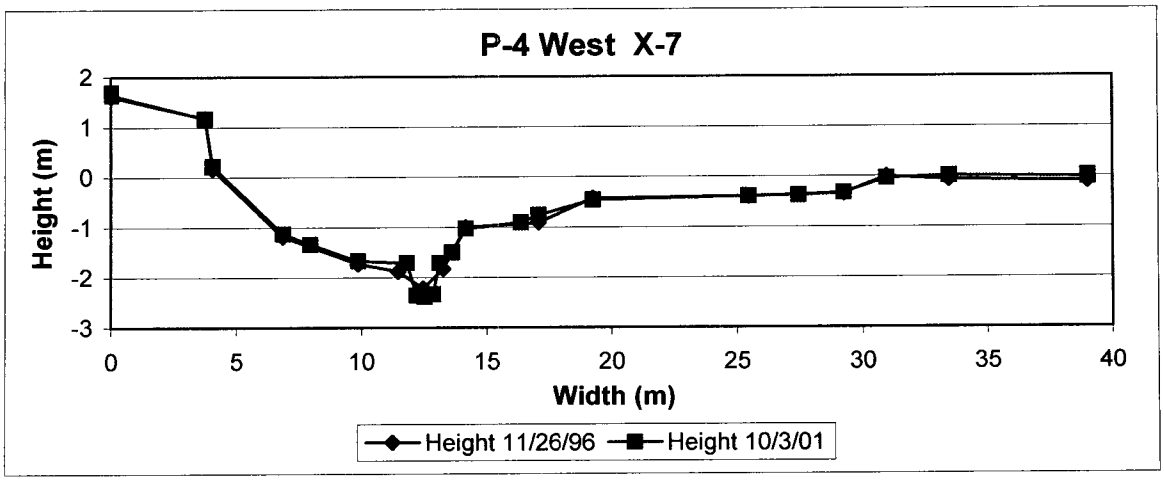
Distance (m)	Height 11/26/96 (m)	Height 10/3/01 (m)	Notes (2001 unless noted)
0	2.39		Top of stake (1996)
0	2.3		Base of stake (1996)
0.5		2.34	Top of new stake
0.5		2.01	Base of new stake
5.35	-1.02	-0.94	Slope in break / fan
9.05	-1.53	-1.5	Slight scour
11		-1.6	Top of slope
11.15	-1.61		Top of slope (1996)
11.75	-1.93		Break in slope (1996)
12.35		-1.96	Edge of trough
13.45	-2.09	-2.06	Base of trough
14.75	-1.56	-1.55	Chamisa
16.55		-1.63	Chamisa
18.7		-1.75	Chamisa
19.05	-1.81		Break in slope (1996)
19.85	-2.25	-2.06	Base of low bank
20.4		-2.16	Silt
21.75	-2.52	-2.36	Grass
22.25	-2.79	-2.57	Slope
22.6		-2.65	Slope
23.15		-3.01	Back edge low terrace
24.05		-2.98	Edge of low inset terrace
24.35		-3.25	Edge of channel
25		-3.33	Thalweg
25.15		-3.17	Base of bank
25.5		-2.34	Top of bank
26.25	-2.87	-2.15	Base of slope
29.45	-0.31	-0.49	Slope
30		-0.08	Top of bank
30.45	0.08	0.08	Terrace near bank
32.45	0.05	0.05	Terrace
36	-0.04	-0.06	Base of rebar / terrace
36	0	0	Top of rebar

A-36. Cross sections and notes for P-4 West X-6



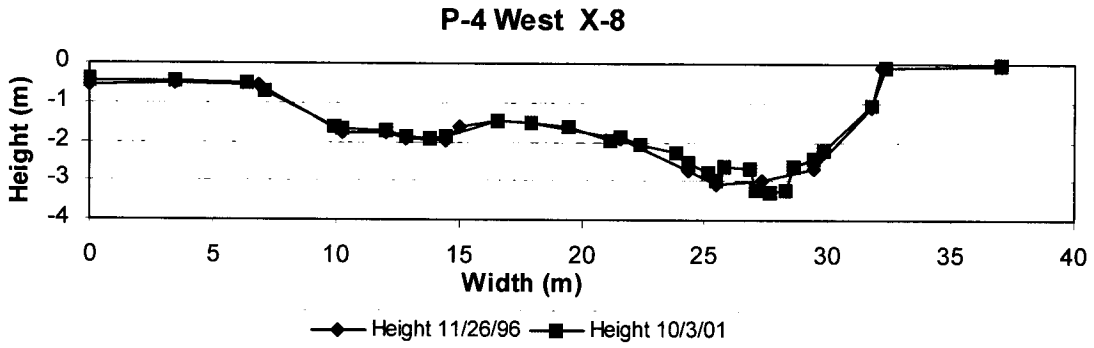
Distance (m)	Height 11/26/96 (m)	Height 10/3/01 (m)	Notes (2001 unless noted)
0	1.84	1.55	Top of stake
0	1.77	1.5	Base of stake
3.95	1.31	0.98	Top of bank
8.45	-1.21	-1.47	Base of slope
9.85		-1.78	C2
11.05	-1.59	-1.99	C2
12.25	-2.12	-2.4	Edge of C2 surface
12.85	-2.02	-2.24	Trough
15.65	-2.05		Chamisa
15.75		-2.37	Edge of C2 surface
16.4		-2.59	Back edge inset terrace
17.95	-2.59	-2.29	Edge of grass
20.2		-2.6	Top of bank / grass
20.6		-3.34	Base of bank / channel
20.9		-3.38	Thalweg
21.3		-2.85	Base of bank / channel
21.55		-2.6	Top of bank / grass
23.05	-2.95	-2.5	1996 thalweg
23.65	-2.63	-2.37	Base of bank
26.15	-0.99	-0.96	Top of bank
29.45	-0.88	-0.87	C4a?
31.85	-0.56	-0.56	Break in slope
34.75	-0.6	-0.6	C4b
37.45	-0.23	-0.17	C5
40	-0.05	-0.09	Base of stake
40	0	0	Top of stake

A-37. Cross sections and notes for P-4 West X-7



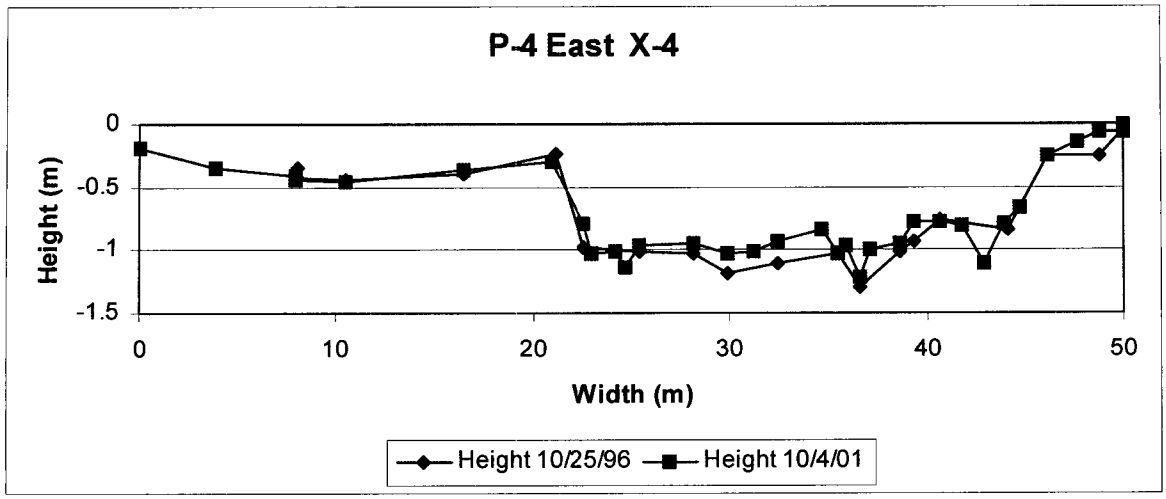
Distance (m)	Height 11/26/96 (m)	Height 10/3/01 (m)	Notes (2001 unless noted)
0	1.71	1.7	Top of rebar
0	1.62	1.65	Base of rebar
3.75	1.18	1.17	Top of bank
4.05	0.17	0.22	Slope
6.85	-1.19	-1.13	Base of slope
7.95		-1.34	Chamisa
9.85	-1.73	-1.67	Edge of grass
11.45	-1.88		North edge channel (1996)
11.8		-1.71	Top of bank
12.2		-2.36	Base of bank / channel
12.45	-2.22		Thalweg (1996)
12.5		-2.38	Channel
12.85		-2.33	Base of bank / channel
13.1		-1.71	Top of bank
13.25	-1.83		South edge channel (1996)
13.6		-1.5	Base of C2 step
14.15	-1	-1.03	Top of bank
16.35		-0.91	C2a?
17.05	-0.91	-0.76	C2a?
19.25	-0.43	-0.46	Chamisa on C2
25.45	-0.4	-0.39	Chamisa on C2
27.45		-0.38	Chamisa on C2
29.25	-0.34	-0.33	Back edge of C2
30.95	-0.01	-0.04	C4a
33.45	-0.07	0	C4a
39	-0.1	-0.02	Base of rebar
39	0	0	Top of rebar

A-38. Cross sections and notes for P-4 West X-8



Distance (m)	Height 11/26/96 (m)	Height 10/3/01 (m)	Notes (2001 unless noted)
0	-0.46	-0.38	Top of rebar
0	-0.57	-0.44	Base of rebar
3.45	-0.51	-0.44	C4a
6.4		-0.49	C4a
6.85	-0.56		Top of slope (1996)
7.15		-0.72	Upper slope
9.9		-1.6	Base of bank
10.25	-1.76	-1.65	C2
12.05	-1.77	-1.74	C2
12.85	-1.93	-1.88	C2 chamisa
13.8		-1.94	Middle of trough
14.45	-1.97	-1.87	Edge of trough
15.05	-1.62		C2 chamisa
16.55	-1.47	-1.48	C2 chamisa
17.95	-1.53	-1.5	C2 scour channel
19.45		-1.6	C2 chamisa
21.2		-1.95	C2 chamisa
21.55	-1.93	-1.89	C2 mound / chamisa
22.4		-2.07	C2 chamisa
23.8		-2.26	Top of step
24.35	-2.73	-2.53	Base of step
25.15		-2.76	Top of old bank
25.45	-3.11	-2.99	Old thalweg
25.8		-2.63	Top of old bank
26.8		-2.69	Top of bank
27.1		-3.25	Base of bank
27.35	-2.99		Channel (1996)
27.6		-3.3	Thalweg
28.25		-3.23	Base of bank
28.6		-2.64	Top of bank
29.45	-2.66	-2.42	Grass
29.85		-2.24	Base of slope
31.75	-1.13	-1.06	Slope
32.15	-0.11		Break in slope (1996)
32.3		-0.11	Top of bank
37	-0.07	-0.06	Base of rebar
37	0	0	Top of rebar

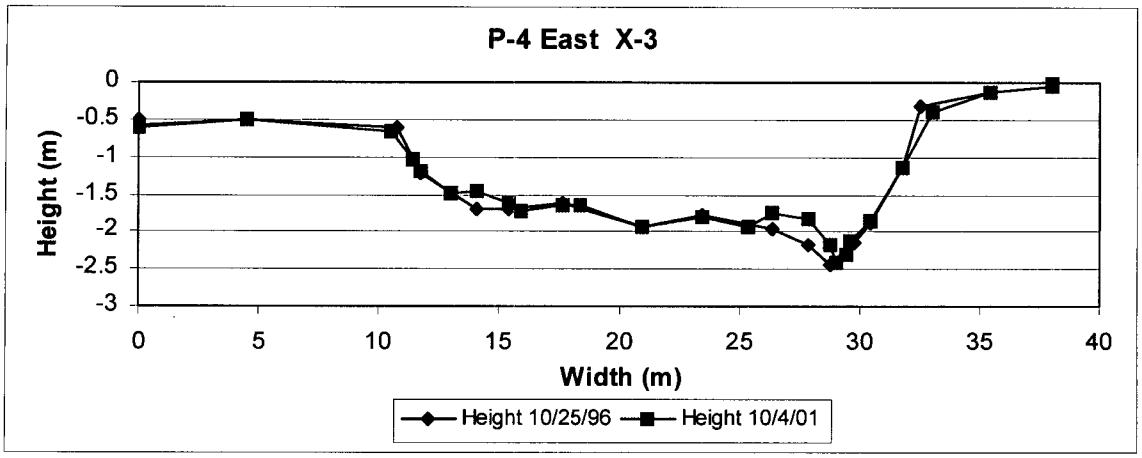
A-39. Cross sections and notes for P-4 East X-4



Distance (m)	Height 10/25/96 (m)	Height 10/4/01 (m)	Notes (2001 unless noted)
0		-0.19	Slope
3.9		-0.35	High water 7/2/01
7.9		-0.41	Top of rebar
7.9		-0.44	Base of stake
8	-0.35		C3
8	-0.42		C3
10.45	-0.44	-0.45	C3
16.45	-0.4	-0.37	Slope
20.95		-0.3	Top of slope
21.15	-0.24		Top of slope
22.55	-0.98	-0.79	Narrow scour feature
23		-1.03	Dead grass
23		-1.03	Tall grass
24.15		-1.01	Tall grass
24.7		-1.13	Trough
25.45	-1.01	-0.97	Tall grass
28.15	-1.02	-0.94	Tall grass
29.85	-1.18	-1.03	Tall grass
31.15		-1.01	Tall grass
32.45	-1.1	-0.93	Tall grass
34.7		-0.83	Top of bank
35.45	-1.03	-1.02	Base of small slope
35.85		-0.97	Tall grass
36.55	-1.29	-1.22	Thalweg
37.05		-0.99	Top of bank
37.05		-0.99	Tall grass
38.65	-1.01	-0.94	Tall grass
39.35	-0.93	-0.77	Tall grass
40.65	-0.76	-0.77	Edge of tall grass
41.8		-0.8	Top of low bank
42.9		-1.1	Knick point in trough

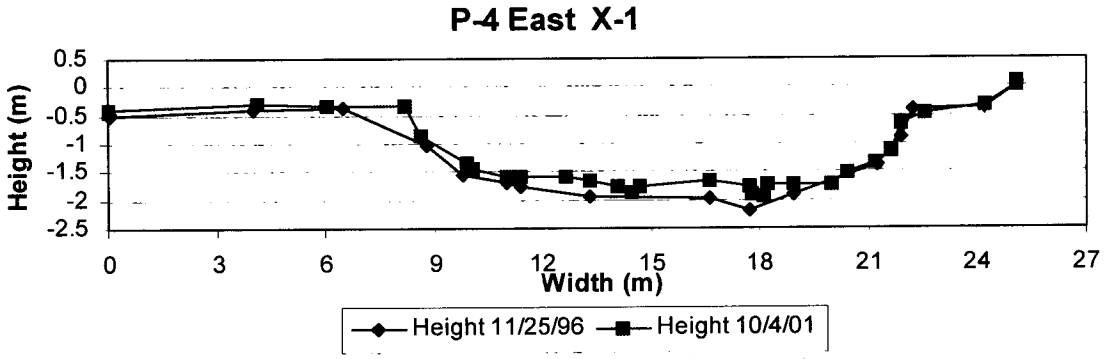
Distance (m) (continued)	Height 9/3/98 (m) (continued)	Height 10/4/01 (m) (continued)	Notes (2001 unless noted) (continued)
43.9		-0.79	Top of low bank
44.15	-0.83		Base of slope
44.7		-0.67	Base of bank
46.15	-0.25	-0.26	Near top of bank
47.7		-0.15	High water 7/2/01
48.75	-0.25	-0.07	Edge of terrace
50	-0.05	-0.06	Base of bank
50	0	0	Top of bank

A-40. Cross sections and notes for P-4 East X-3



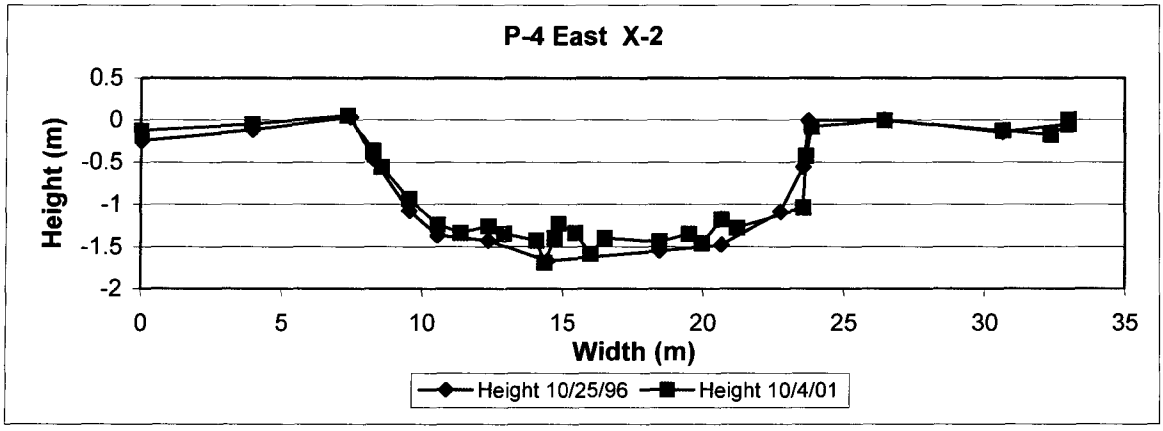
Distance (m)	Height 10/25/96 (m)	Height 10/4/01 (m)	Notes (2001 unless noted)
0	-0.51	-0.59	Top of rebar
0	-0.58	-0.61	Base of rebar
4.45	-0.51	-0.5	Chamisa on F1
10.5		-0.66	Top of bank
10.75	-0.62		Top of bank (1996)
11.4		-1.04	High water 7/2/01
11.75	-1.22	-1.2	Slope
12.95		-1.48	Base of slope
14.05	-1.69	-1.47	Chamisa
15.35	-1.71	-1.62	Edge of scour hole
15.9		-1.73	Depositional surface
17.65	-1.61	-1.65	Tall grass
18.4		-1.65	Chamisa on bar
20.95	-1.93	-1.93	Tall grass
23.45	-1.79	-1.81	Chamisa on bar
25.4		-1.95	Tall grass
26.35	-1.97	-1.75	Tall grass
27.85	-2.19	-1.84	Tall grass
28.75	-2.44	-2.18	Channel
29		-2.41	Thalweg
29.4		-2.31	Base of bank
29.6		-2.12	Top of C1 bank
29.75	-2.14		Edge of channel (1996)
30.45	-1.89	-1.86	Base of bank
31.75	-1.15	-1.13	Slope
32.55	-0.31		Top of slope (1996)
33		-0.39	Top of bank
35.45	-0.12	-0.14	Local high
38	-0.05	-0.05	Base of stake
38	0	0	Top of stake

A-41. Cross sections and notes for P-4 East X-1



Distance (m)	Height 11/25/96 (m)	Height 10/4/01 (m)	Notes (2001 unless noted)
0		-0.44	Top of stake
0		-0.41	Base of stake
0.05	-0.48		Top of stake (1996)
0.05	-0.52		Base of stake (1996)
4	-0.4		C3 surface
4.15		-0.31	Flooded C3
6.05		-0.32	Flooded C3
6.5	-0.36		Top of slope (1996)
8.2		-0.35	Top of bank
8.65		-0.87	Base of step in bank
8.8	-1.04		Slope (1996)
9.8	-1.57		Base of slope (1996)
9.9		-1.36	Flood debris
10.05		-1.45	Base of bank
11	-1.69	-1.58	Edge of grass
11.4	-1.78	-1.61	Grass
12.65		-1.59	Grass on mound
13.3	-1.93	-1.67	Grass
14.1		-1.75	Top of bank
14.45		-1.86	Thalweg
14.7		-1.75	Top of bank
16.6	-1.97	-1.67	Grass
17.7	-2.2	-1.78	Top of bank
17.75		-1.91	Base of bank / channel
18.1		-1.93	In channel
18.2		-1.74	Top of bank in grass
18.9	-1.9	-1.72	Grass on C1
19.95		-1.72	Edge of C1
20.4		-1.53	C1b? Surface
21.15		-1.36	Base of bank
21.2	-1.4		Slope (1996)
21.6		-1.15	Slope
21.9	-0.91	-0.66	High water line 7/2/01
22.2	-0.4		Top of slope (1996)
22.55		-0.46	Top of bank
24.2	-0.36	-0.33	South edge terrace
25.05	0	0	Base of rebar
25.05	0.06	0.07	Top of rebar

A-42. Cross sections and notes for P-4 East X-2



Distance (m)	Height 10/25/96 (m)	Height 10/4/01 (m)	Notes (2001 unless noted)
0	-0.18	-0.13	Top of rebar
0	-0.25	-0.13	Base of rebar
3.95	-0.12	-0.05	C3?
7.35		0.05	Top of bank
7.45	0.03		Top of slope (1996)
8.25	-0.46	-0.37	Slope
8.55		-0.56	High water line 7/2/01
9.55	-1.08	-0.94	Slope
10.55	-1.37	-1.24	Edge of grass
11.35		-1.34	Grass in trough
12.35	-1.43	-1.26	Grass
12.9		-1.35	Grass in trough
14.05		-1.43	Top of bank
14.35		-1.69	Thalweg
14.45	-1.67		Thalweg (1996)
14.7		-1.4	Inset terrace
14.85		-1.23	Top of bank
15.45		-1.34	Grass on mound
16		-1.59	Scour hole
16.5		-1.4	Grass on mound
18.45	-1.55	-1.44	Grass in trough
19.5		-1.35	Grass on mound
19.95		-1.46	Grass in trough
20.65	-1.48	-1.18	Grass on mound
21.2		-1.28	Edge of C1 / heavy grass
22.75	-1.09		Break in slope (1996)
23.55	-0.56	-1.04	Base of bank
23.65		-0.43	High water line 7/2/01
23.75	-0.01		Top of bank (1996)
23.85		-0.08	Top of bank
26.45	0	-0.01	C3 terrace
30.65	-0.15	-0.13	Back edge of terrace
32.35		-0.18	Break in slope
33	-0.05	-0.06	Base of rebar
33	0	0	Top of rebar

Appendix B: GPS Locations of cross section endpoints.

Cross section locations are given in New Mexico State Plane 1983 coordinates of the New Mexico Central Zone. The northing and easting measurements are accurate within 5 cm. The elevation measurements are accurate within 20 cm.

Cross-section	Northing (ft.)	Easting (ft)	Elevation (ft.)	Notes
P2W XS-1 North	1777447.592	1634110.246	6646.02	Top of rebar unless noted
P2W XS-1 South	1777383.55	1634121.94	6647.412	
P2W XS-2 North	1777440.838	1634266.675	6641.684	
P2W XS-2 South	1777356.578	1634222.857	6649.702	
P2W XS-3 North	1777406.39	1634353.859	6642.521	
P2W XS-3 South	1777321.507	1634284.707	6640.086	
P2W CSG-1 North	1777359.295	1634391.954	6639.303	
P2W CSG-1 South	1777293.881	1634306.143	6643.971	
P2E XS-1 North	1777168.737	1636509.551	6603.789	
P2E XS-1 South	1777025.387	1636547.398	6603.058	
P2E XS-2 North	1777226.271	1636651.176	6601.293	
P2E XS-2 South	1777037.912	1636618.294	6600.596	
P2E XS-3 North	1777251.107	1636711.473	6598.722	
P2E XS-3 South	1777072.131	1636758.942	6601.255	
P2E CSG-1 North	1777251.107	1636711.473	6598.722	
P2E CSG-1 South	1777077.345	1636780.516	6604.257	
P2E CSG-2 North	1777271.783	1636829.418	6606.862	
P2E CSG-2 South	1777061.367	1636810.724	6604.048	
P2E XS-5 North	1777249.016	1636881.937	6599.781	Approximate location
P2E XS-5 South	1777069.226	1636881.937	6601.028	
P2E XS-6 North	1777226.265	1637042.558	6598.384	
P2E XS-6 South	1776900.614	1637060.324	6607.502	
P2E XS-7 North	1777067.555	1637351.954	6589.932	
P2E XS-7 South	1776789.364	1637305.387	6585.843	
P2E XS-8 North	1777069.717	1637415.855	6589.691	
P2E XS-8 South	1776766.948	1637375.298	6586.868	
P2E XS-9 North	17776983.15	1637586.997	6583.652	
P2E XS-9 South	1776809.069	1637560.666	6586.138	
P2E CSG-4 North	1777036.554	1638562.408	6517.501	
P2E CSG-4 South	1776772.659	1638427.602	6521.898	
P2E XS-14 North	1777051.573	1638644.531	6517.565	
P2E XS-14 South	1776756.034	1638609.122	6520.439	Base of rebar
P2E CSG-1 North	1776954.186	1639040.875	6510.232	
P2E CSG-1 South	1776820.895	1639098.508	6510.98	
P2E CSG-2 North	1776969.623	1639092.967	6510.991	East end changed
P2E CSG-2 South	1776840.214	1639132.128	6508.005	
P2E CSG-3 North	1776982.607	1639125.548	6511.016	
P2E CSG-3 South	1776860.896	1639157.31	6508.096	
P3W PUX7 North	1775886.824	1642267.956	6512.92	

Cross-section	Northing (ft.)	Easting (ft)	Elevation (ft.)	Notes
P3W PUX7 South	1775856.175	1642087.708	6514.027	
P3W PUX8 North	1775886.824	1642267.956	6512.92	
P3W PUX8 South	1775699.599	1642055.628	6521.943	
P3W XS-0 North	1775811.643	1642352.724	6508.398	
P3W XS-0 South	1775679.297	1642302.036	6508.093	
P3W PUX3 North	1775846.527	1642416.725	6504.266	
P3W PUX3 South	1775610.316	1642363.459	6511.846	
P3W PUX1 North	1775846.527	1642416.725	6504.266	
P3W PUX1 South	1775730.347	1642498.123	6524.202	
P3W XS-1 North	1775884.565	1642374.861	6446.325	
P3W XS-1 South	1775750.753	1642526.723	6528.184	
P3W PUX2 North	1775846.527	1642416.725	6504.266	
P3W PUX2 South	1775863.361	1642553.277	6517.985	
P3W PUX4 North	1776011.923	1642406.375	6505.726	
P3W PUX4 South	1775986.802	1642627.893	6501.815	
P3W PUX5 North	1776090.366	1642479.204	6499.501	
P3W PUX5 South	1776049.941	1642584.935	6437.758	Approximate location
P3W PUX6 North	1776121.2	1642552.25	6497.43	
P3W PUX6 South	1776037.35	1642629.75	6499.25	
P3W CSG-4 North	1776227.098	1642951.607	6498.647	
P3W CSG-4 South	1775984.427	1642920.947	6502.892	

This report has been reproduced directly from the best available copy. It is available electronically on the Web (http://www.doe.gov/bridge).

Copies are available for sale to U.S. Department of Energy employees and contractors from:
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831
(865) 576-8401

Copies are available for sale to the public from:
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
(800) 553-6847

Los Alamos
NATIONAL LABORATORY
EST. 1943

RRES-RS Document Signature Form **Read/Write Access Person Making Entry is WIN/115424/Unknown (Created on 3/10/2005)**

Home | Update | Delete | Reset | Bottom

Printable Page

Document Catalog Number ER2005-0136 **(Please prefix the name of all electronic versions of this document with this number.)**

* Required Field

***Document Title / Subject**	Characterization of Erosion and Deposition of Sediment in Pueblo Canyon, Los Alamos, New Mexico, Following the Cerro Grande Fire
PRSs	None
Associated Document Catalog Number(s)	None
***Author**	Lyman, Jared E 667-9525 elyman@lanl.gov
***Author Organization**	No Organization Defined
Document Team	Katzman, Danny Proj Ldr 667-6333, 667-0599 katzman@lanl.gov Lyman, Jared E Author 667-9525 elyman@lanl.gov Martinez, Saundra Doc Mgr 665-6771 saundra@lanl.gov Sachdeva, Meena Editor 665-0929 sachdeva@lanl.gov Vidlak, Cheryl J Peer Review Coord 667-2728 cvidlak@lanl.gov
***Document Type**	Technical Papers/Report, Journa Article **Former OU** N/A
Date Due	**Date Final Complete** **Date Sent to DOE**
Date Sent to NMED	**Date Sent to RPF (Paper & Electronic)** 7/29/05
Received Per RPF	**RPF ER ID Number**
CT No	**LA-UR Number**
Performance Measure No	
AA Deliverable ☐	**Certification Required** ☐ **Force Peer Review** ☐
Distribution TO:	
Distribution FROM:	
Distribution COPY:	
Distribution THRU:	
Attachment Notes	
Status/Comments	

Reviewer Signatures: (By signing, the reviewer indicates that he/she **reviewed** and **approves** the document.)

Reviewer (Print reviewer's name under title)	Signature	Date
Author JARED LYMAN	Jared Lyman	5/18/05
Peer Review Chair STEVE PEARSON	Steve Pearson	5/19/05
Solid Waste Regulatory Compliance (SWRC) N/A	—	—
LANL Legal Reviewer ELLEN LOUDERBOUGH	Ellen T. Louderbough	5/20/05
DOE/LASO Reviewer TOM WHITACRE	Tom Whitacre	5/25/05
Project Leader DANNY KATZMAN	[illegible]	5-18-05
Program Manager JEAN DEWART	Jean Dewart	5/25/05

Document Catalog Number ER2005-0136

Top

completed June 2005