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Sediment Samples and Channel-geometry Data, Lower Platte River Watershed, Nebraska, 2010

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Prepared in cooperation with the United States Army Corps of Engineers

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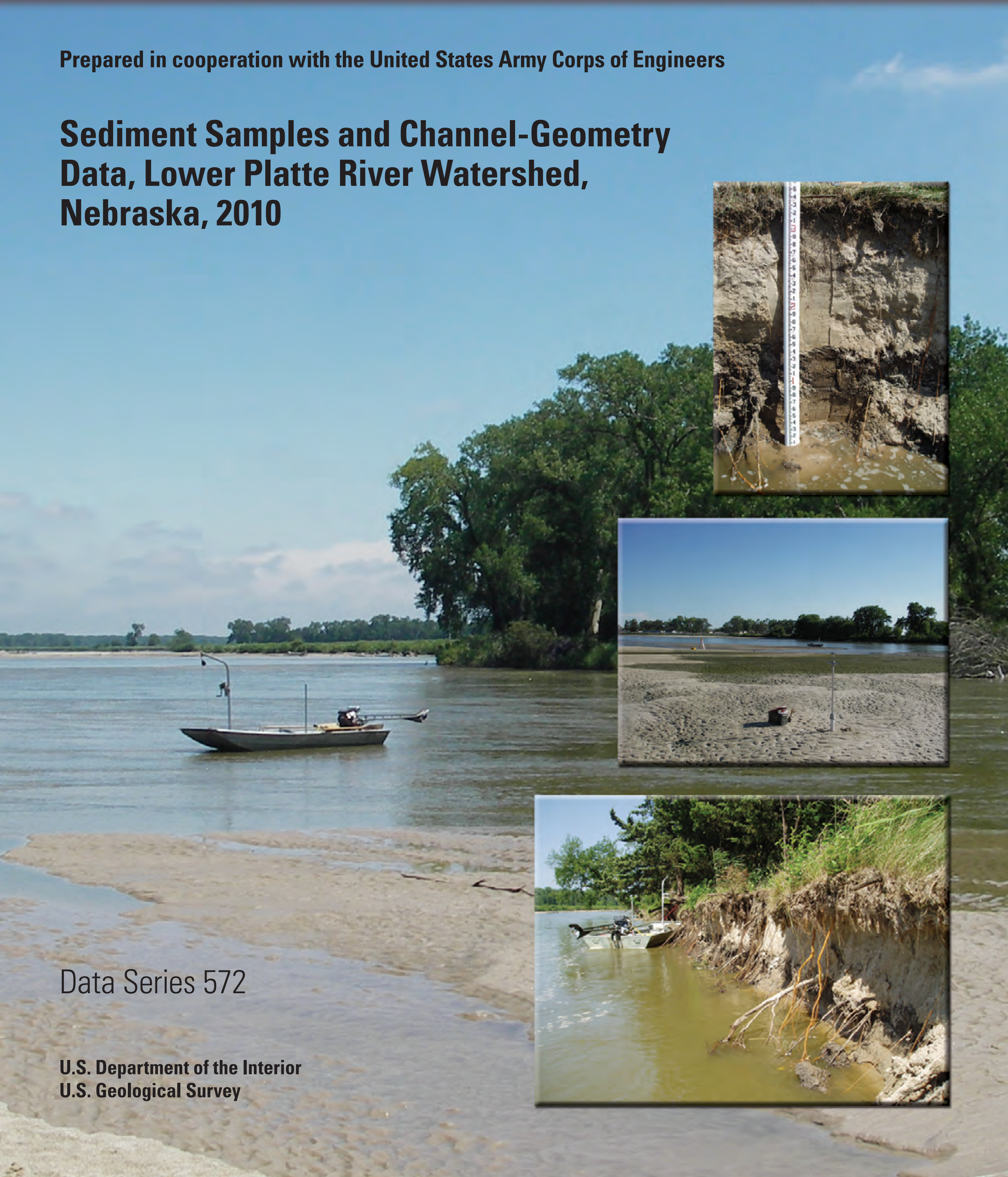

Data Series 572

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Cover. The Platte River in Nebraska (background photograph).
Upper right photograph: Typical bank of Platte River after bank was prepared for sampling.
Middle right photograph: Platte River sandbar with US BMH–53 sampler in foreground and rotating laser level and boat in background.
Lower right photograph: Platte River bank, typical of the type of banks selected for bank sampling.
Photographs by Nathaniel Schaepe, U.S. Geological Survey.

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Conversion Factors

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Flow rate	
foot per second (ft/s)	0.3048	meter per second (m/s)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Sediment Samples and Channel-Geometry Data, Lower Platte River Watershed, Nebraska, 2010

By Nathaniel J. Schaepe and Jason S. Alexander

Abstract

The relation between channel width and stream physical habitat in the lower Platte River in eastern Nebraska was studied as part of the lower Platte River Cumulative Impact Study. The purpose of this component was to document the grain-size distribution of sediment deposited as specific types of physical features, such as sandbars, banks, and stream beds within different hydraulic habitats, within the lower Platte River system. In so doing, the major sources of sediment for sandbar creation downstream are described. Sediment samples were collected from 11 reaches of the lower Platte River from Silver Creek, Nebraska, to the mouth of the Platte River, and from 4 tributary streams. Two bed-material samples, 2 bank-material samples, and 3 sandbar-material samples were collected at main-stem sampling sites, and 1 sample each of bed material and bank material was collected at each tributary sampling site. Aspects of channel geometry, such as channel width, sandbar height and width, and bank height, were measured at each sampled site. This report presents the channel-geometry results and documents the sample-collection methods.

Introduction

The Platte River in Nebraska is a wide, shallow stream with a bed predominantly of sand, often characterized by multiple channel threads separated by wooded islands or sandbars. This type of channel morphology is ideal for nesting, foraging, and roosting habitat for certain migratory bird species because it provides a local aquatic food source along with protection from terrestrial predators. Two bird species known to use the Platte River, the interior least tern and whooping crane, are federally listed as endangered, and another species, the piping plover, is listed as threatened. Prior to development of upstream diversions and storage reservoirs, the typical morphology of the Platte River throughout Nebraska was a wide, shallow, sparsely wooded channel, with numerous barren mid-channel sandbars and wooded islands (Williams, 1978; Johnson and Boettcher, 2000). Reductions in flow and sediment transport of the Platte River since 1860 have resulted in changes to channel morphology (Eschner and others, 1983). The generalized pattern of channel morphologic changes can be described as narrowing, deepening, and coarsening (Eschner and others, 1983; Lyons and Randle, 1988; Johnson, 1994; Holburn and others, 2006; Joeckel and Henebry, 2008). Channel narrowing (reduction in overall channel width) has resulted from the establishment of riparian vegetation on sandbars, and likely has had the greatest overall negative impact on bird habitat, because nesting habitats for terns and plovers mainly are found on vegetated sandbars (Brown and Jorgensen, 2008). The magnitude of channel morphologic changes has been greatest upstream of Columbus, Nebraska (fig. 1), because two large downstream tributaries, the Loup River and Elkhorn River, have fewer dams and diversions than reaches upstream, and still contribute substantial volumes of water and sediment to the main stem (Joeckel and Henebry, 2008). Throughout this report, the Platte River upstream of the Loup River confluence is referred to as the central Platte River (CPR), and the Platte River downstream from the Loup River confluence is referred to as the lower Platte River (LPR) (fig. 1).

In cooperation with the U.S. Army Corps of Engineers (USACE), Omaha District, the U.S. Geological Survey (USGS) sampled river sediment and recorded channel-geometry data in the LPR as a component of a larger Cumulative Impact Study (CIS). The CIS was undertaken in response to concerns expressed by fish and wildlife managers that bank stabilization measures and levee projects could have an adverse effect on the endangered species that depend on the LPR for habitat (U.S. Army Corps of Engineers, 2008). Several Federal and State agencies have partnered in the CIS to study the cumulative effects of changes in bank protection, channelization, and flood-control practices on habitat in the LPR. Previous phases of the CIS investigated changes in land use (U.S. Army Corps of Engineers, 2008) and hydrology (Ginting and others, 2008) along the LPR over several series of time increments. Bank stabilization has the potential to decrease the amount of fine-grained sediments entering the active river channel. Additional bank stabilization is a main concern because sediment from banks alone can account for as much as 30 to 80 percent of a watershed's sediment yield

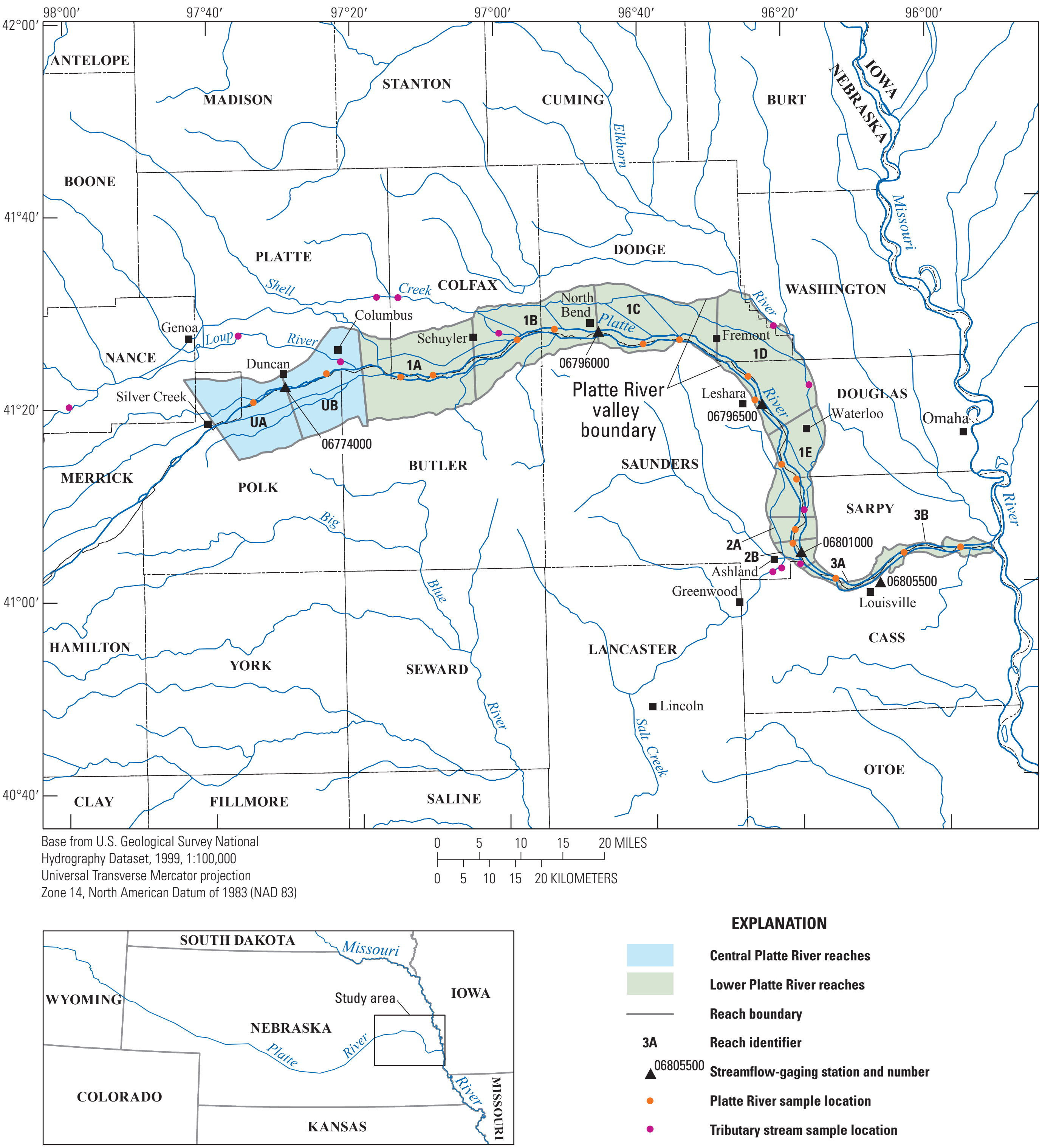

Figure 1. Map showing location of study area, stream gages, sample-collection sites, and river reaches

(Bull and Kirkby, 1997; Simon and Darby, 1999; Sekely and others, 2002; Evans and others, 2006). Additionally, the effects of more constricted, deeper flow during floods (because of levees) on sandbar formation and geometry are unknown.

Purpose and Scope

The purpose of this report is to describe the study locations, methods, quality control, and channel-geometry data associated with a sediment-sampling effort in the LPR and its major tributaries. The sampling effort was performed as part of the third phase of the LPR CIS, and was completed in July and August of 2010. For the purposes of the larger CIS study, the major tributaries supplying sediment and water to the LPR are the CPR, Loup River, Shell Creek, Elkhorn River, and Salt Creek (fig. 1). Except for quality-control results, the data for grain-size distributions from the sediment-sampling effort described in this report are contributing to other study components to be reported by partner agencies and, therefore, are not presented in this report.

Previous Sediment Data Collections and Studies

Several previous studies have sampled bed and bank materials in various reaches of the Platte River in Nebraska (U.S. Army Corps of Engineers, 1935; Smith, 1971; Kircher, 1981; Kinzel and others, 1999; Holburn and others, 2006; HDR and others, unpub. data, 2009; Ayres Associates and Olsson Associates, 2009). These previous sampling efforts had varying spatial resolution, sampling techniques, and have occurred under varying hydrologic contexts (Kinzel and Runge, 2010), with most of the sampling focused in reaches of the CPR. The results of these previous studies indicate that in 1931 the median bed-sediment grain sizes in the LPR were similar to CPR reaches upstream. Since that time, grain sizes in reaches upstream from the Loup River have coarsened and become more variable (Kinzel and Runge, 2010). An investigation of the reasons for this pattern in grain-size variation that accounts for differences between sampling techniques, as well as the hydrologic and geomorphologic contexts of each sampling effort, has not been completed. None of the previous studies in the LPR incorporated a sampling strategy designed to investigate the variation in grain sizes between sandbar material, bed material, and bank material, nor how grain size in the main stem varies in relation to grain sizes in the bed and banks of major tributaries. An extensive study of grain-size characteristics in the LPR could provide valuable information about the sources of sediment in the LPR and the grain sizes necessary to create sandbar habitats useful for endangered bird species.

Hydrologic Context

Sediment grain sizes composing a river bed and sandbars are a result of several factors, including the volume and grain-size distribution of sediment sources and the nature of the localized hydraulic-flow field (Bridge, 2003). The primary sources of sediment contributing to a trunk stream are the tributary streams, the banks of the channel, floodplain gullying, and direct hillslope contributions (Reid and Dunne, 1996). Consequently, grain-size distributions of the bed and sandbars at any particular sampling moment are a combined reflection of the most recent or instantaneous flow conditions in the river channel, as well as recent hydrologic system history affecting the supplied volume and sizes of sediment from the primary sources.

Streamflow in the LPR and associated tributaries was substantially above normal during June and July 2010 (fig. 2). Heavy spring rains and late snowmelt in the Rocky Mountains combined to produce high flows basinwide. Of 34 streamflow-gaging stations with at least 25 years of record in the Platte River watershed within Nebraska, 11 had instantaneous peak stages in 2010 that were among the 3 highest stages ever recorded (J.M. Lambrecht, USGS Nebraska Water Science Center, written commun., 2010). Streamflow of the Platte River near Ashland (USGS station-identification number 06801000, fig. 1), was above the 80th percentile of its long-term daily mean streamflow rate from June 9 to July 4 (fig. 2). The provisional 2010 instantaneous peak flow near Ashland of 99,900 cubic feet per second (ft^3/s), was just less than the 4-percent probability flow (25-year recurrence interval) computed by Soenksen and others (1999). Valid temporal comparisons of the data collected for the lower Platte River CIS with those from other studies will take into account differences in hydrologic context between study periods.

The LPR daily-streamflow regime is substantially affected by hydroelectric operations on the Loup River. Power generation cycles associated with the Loup River Hydroelectric Facility near Columbus, Nebraska, cause a diurnal fluctuation in streamflow between the hydroelectric tailrace, approximately 1.8 miles (mi) downstream from the Platte River confluence with the Loup River, and the Missouri River. In the tailrace, maximum streamflow is 4,800 ft^3/s, causing a maximum variation in Platte River instantaneous discharge of the same magnitude at the confluence of the hydroelectric tailrace and the LPR. The amplitude of this fluctuation in streamflow attenuates in the downstream direction and results in daily-stage fluctuations of approximately 1.7 feet (ft) at the streamflow-gaging station at North Bend (station number 06796000) and approximately 0.4 ft at the streamflow-gaging station near Louisville (station number 06805500). During the time period of sample collection, daily streamflow minima and

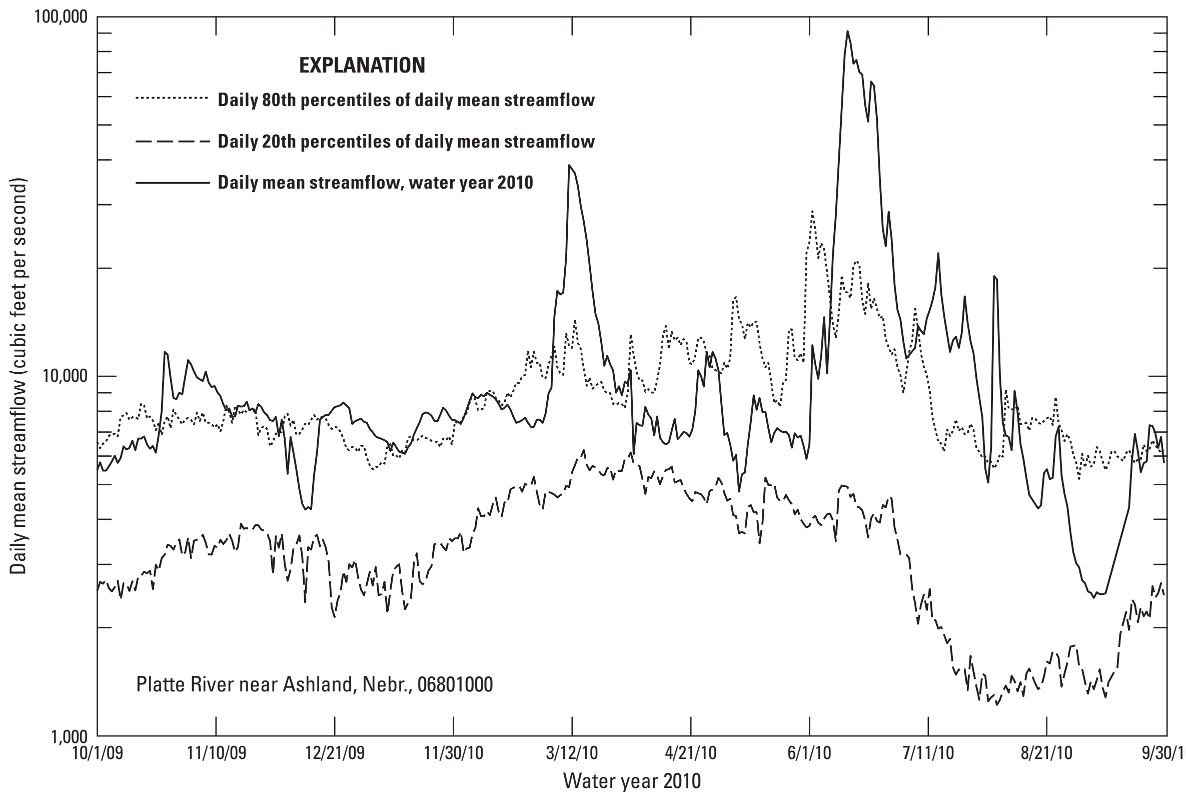

Figure 2. Graph showing daily mean streamflow for Platte River near Ashland, Nebraska, for water year 2010, and selected daily percentiles of mean streamflow for 21 years of record (1989–2009).

maxima differed by between 3,000 and 6,000 ft^3/s, depending on the day and site (fig. 3). Because of this diurnal stage change, some of the sandbars that were sampled might have been submerged during the peak stage of the day, and some of the shallow bed-material samples might have been exposed at the low stage of the day.

Methods

The approach used for the effort described in this report was to determine the variation in sediment grain sizes by sampling various sources and sinks of sediment as well as measuring variation among contrasting hydraulic environments. In the case of the LPR, the considered sources of sediment were major tributaries upstream, the CPR, and the LPR channel. Bank material is a source, and was considered also to be a sink for indefinite storage, of sediment. The bed and sandbars were considered temporary sinks of sediment, becoming sources during high-magnitude flow events when the channel scours. The complex mixture of shallow- and deep-water environments also indicated that an additional stratification based on hydraulics potentially would document co-variation of the grain-size distribution of the bed material with depth and velocity combinations. Channel-geometry data were collected to document the correlations of grain size and sandbar width with channel width.

Site Selection and Layout

Seventeen samples distributed among 11 reaches were collected along the Platte River from Silver Creek, Nebr., to the mouth, and 12 samples were collected along 4 major

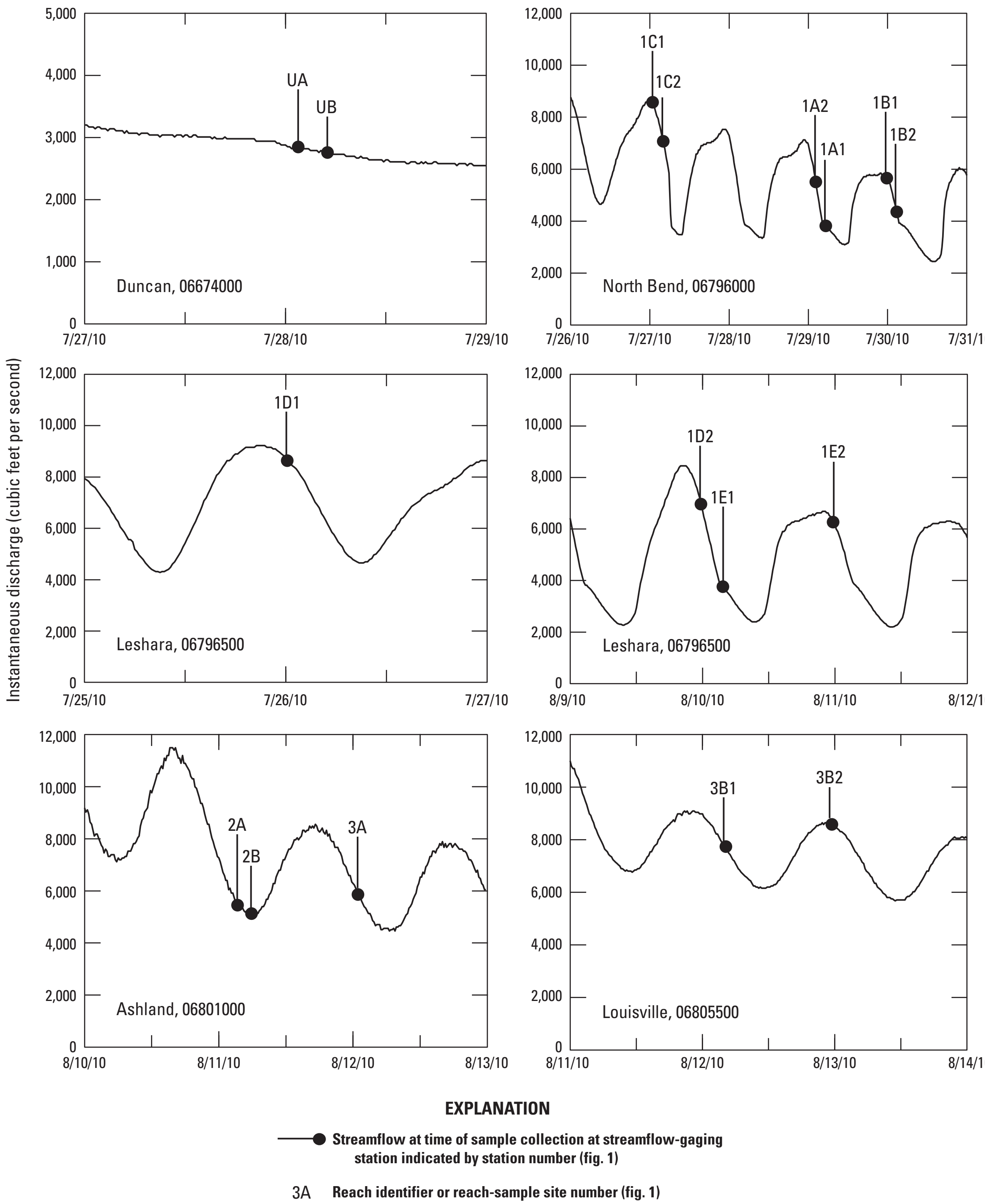

Figure 3. Platte River hydrographs showing short-term hydrologic conditions at sediment-sample collection times by pairing each sample location with nearest streamflow-gaging station

tributaries to the LPR (fig. 1). The number of each type of collected sample and the sampling strategy varied between main-stem and tributary locations. At each main-stem sample location, two composited bed-material samples, two bank-material samples, and three sandbar-material samples were collected. At each sample location along major tributaries, one bed-material sample and one bank-material sample were collected. At main-stem locations, composited bed-material samples were intended to broadly represent two hydraulic microhabitats of the Platte River channel, one a deeper-swifter microhabitat representing channel thalwegs (deep-swift habitat type), and the other a shallow microhabitat with more slowly flowing current (shallow-slow), representing the habitat type commonly located at the submerged periphery of channel sandbars. The hydraulic characteristics used to define the physical distinction in the field were the combination of water 2 ft deep and a current velocity of 2 feet per second (fps), based, in part, on the hydraulic microhabitat criteria presented in Ginting and Zelt (2008) for the LPR. Three sediment samples were collected in channel hydraulic environments deeper and swifter than this boundary and composited to represent the deep-swift microhabitat type. Another three samples were collected in hydraulic environments shallower and slower than this boundary, and composited to represent the shallow-slow microhabitat type.

Systematic spacing between sampling sites was intended to maintain even spacing between sampling sites within the boundaries of the river reaches designated by the USACE (table 1). In shorter reaches (less than 10 mi) of the main stem, only one sample location was designated, and the target location was the midpoint of the reach (fig. 1). In longer reaches (greater than 10 mi), two sampling locations were designated, and the target sampling locations were points at one- and two-thirds distance from the upstream or downstream boundary. In tributaries, one sample was designated for collection within the broader Platte River valley, near the confluence, and two were designated for collection upstream of the valley boundary (fig. 1). Since a substantial portion of the Elkhorn River resides within the Platte River valley, all three samples were collected within the Platte River valley, but one was collected near the Platte River confluence and two were collected a minimum of 5 mi upstream from the confluence. Actual sampling locations were chosen based on a combination of the 2007 National Agriculture Imagery Program aerial photographs (Farm Service Agency, 2007) and field-based assessments of geomorphic features. An ideal sampling situation would have been a river cross section exactly at the targeted sampling location that included three emergent sandbars, three deep-swift threads, numerous shallow-slow habitat environments, and exposed (recently eroded) vertical channel banks on at least one side of the river. In almost every case, such sampling situations did not exist at the targeted sampling locations. Instead, after navigating by global positioning system (GPS) receiver to the coordinates of the targeted sampling location, a buffer of 1 mi upstream and downstream from the target was examined to locate a segment of river that had the array of adequate sampling conditions.

Sediment Sampling

Once the sampling location was identified, all samples were collected within a cross-sectional band having an arbitrary maximum length (streamwise) of 4,500 ft. Geographic coordinates of all sample points were recorded with a handheld GPS receiver while the Wide-Area Augmentation System, an accuracy-improvement feature, was enabled.

Bed-material samples were collected in each of two different hydraulic microhabitat types at each sampling location. Deep-swift threads of flow were located visually and water depths and current velocities were investigated and confirmed using a graduated wading rod and an acoustic Doppler velocimeter (ADV). Samples at locations that had multiple channel threads were a composite of subsamples from three separate channels that shared the same hydraulic microhabitat type. Bed-material samples were collected with a US BMH–60 sampler (Edwards and Glysson, 1999; Davis, 2005). This sampler is cast aluminum, and its fins help maintain its orientation to the current. A half-cylinder trap on the bottom of the sampler is used to collect the sample. With the half-cylinder trap locked in an open position, the sampler was lowered to the streambed while suspended on a handline or cable. Once the sampler contacts the bed, line tension is released, allowing the trap to rotate and enclose the bed-material sample. Deep-swift microhabitats were sampled with the aid of a winch mounted on a boat. Shallow-slow habitats were sampled while wading. The distance of each channel sample point from the nearest bank was measured with a laser range finder. Water depth and current velocity were measured at each sampling point using a graduated wading rod and ADV.

Three sandbar-material samples were collected within each sampling location. Sandbar samples were collected with a US BMH–53 bed-material sampler (Edwards and Glysson, 1999; Davis, 2005). This sampler features an 8-inch long cylinder that contains a tight-fitting brass piston. The sampler is driven into the soil or sediment deposit as the piston moves upward, allowing sample material to enter the container. After removing the sampler from the deposit, the piston is pushed back down, forcing the sample out into a container. To ensure that the thicknesses of each sampled volume were approximately the same for bed-material samples and sandbar-material samples, a stop indicator was placed on the US BMH–53 so that the cylinder sampling depth was approximately the same as the radius of the half-cylinder trap on the US BMH–60. If three or more emergent sandbars were present, the highest sandbar and two other sandbars were sampled, collecting from the highest point of each of the three sandbars. When only two sandbars were present, the largest sandbar was sampled in two different locations based on the formation of the sandbar. A sample was taken at a high point of the sandbar and then at either a lower point of the sandbar

Table 1. Lower Platte River sediment-sampling plan.

[Reach identifiers correspond to figure 1; river miles are referenced to the river mouth; NA, not applicable; Hwy, highway]

Reach identifier	Number of sampling sites	Platte River reach description	Reach location, in river miles	Reach length, in miles
UA	1	Silver Creek, Hwy 139 bridge to midpoint between Silver Creek, Hwy 139 and confluence with Loup River	123.1 to 113.2	9.9
UB	1	Midpoint between Silver Creek, Hwy 139 bridge and confluence with Loup River to confluence with Loup River	113.2 to 103.3	9.9
1A	2	Confluence with Loup River to Schuyler, Hwy 15 bridge	103.3 to 88.6	14.7
1B	2	Schuyler, Hwy 15 bridge to North Bend, Hwy 79 bridge	88.6 to 72.4	16.2
1C	2	North Bend, Hwy 79 bridge to Fremont, Hwy 77 bridge	72.4 to 56.9	15.5
1D	2	Fremont, Hwy 77 bridge to midpoint between Fremont, Hwy 77 bridge and the Elkhorn River confluence	56.9 to 44.9	12
1E	2	Midpoint between Fremont, Hwy 77 bridge and the Elkhorn River confluence to the Elkhorn River confluence	44.9 to 32.8	12.1
2A	1	Elkhorn River confluence to midpoint between Elkhorn River confluence and Salt Creek confluence	32.8 to 29.4	3.4
2B	1	Midpoint between Elkhorn River confluence and Salt Creek confluence to Salt Creek confluence	29.4 to 25.9	3.5
3A	1	Salt Creek confluence to Louisville stream gage	25.9 to 16.5	9.4
3B	2	Louisville stream gage to the Platte River mouth	16.5 to 0	16.5
		Tributary	Sample site location	
NA	3	Loup River	1 within Platte River valley boundary, 2 upstream from Platte River valley boundary.	
NA	3	Shell Creek	1 within Platte River valley boundary, 2 upstream from Platte River valley boundary.	
NA	3	Elkhorn River	1 near Platte River confluence, 2 a minimum of 5 miles upstream from Platte River confluence.	
NA	3	Salt Creek	1 within Platte River valley boundary, 2 upstream from Platte River valley boundary.	

or at a point of the sandbar that appeared to have been deposited more recently than the other areas of the sandbar. In cases where only one emergent sandbar was present, the sandbar was sampled at three different locations, selected to represent variations in the sandbar elevations. The height of the sandbar relative to the water surface was measured at each sample point using a rotating laser level. The distances to the left and right edges of the sandbar (along a transect parallel to the channel cross section) from each sample point were measured with a laser range finder.

Two bank-material samples were collected at each sampling location. Bank-sampling locations were selected based on three general criteria: (1) the bank section could not include, or be affected by, revetments or structures such as riprap, jetties, or coarse debris; (2) the bank was vertical or nearly vertical, allowing for easy access to the full bank stratum; and (3) either the vegetation on top of the bank was well established, or the bank stratigraphy itself clearly indicated that the stratum incorporated both channel and overbank sediments from several flow events. Once a bank-sampling location was identified, the bank was "cleaned" with a trowel and square shovel. "Cleaning" involved removing roots, bank sluff, and ravel, and scraping the face of the bank with the trowel or shovel to expose the in-place sediments. This was necessary because often the base of the bank appeared to be fine-grained sediment, but the cleaning procedure revealed it to be slope ravel. Once the bank was cleaned, it was divided vertically into two sample intervals based on textural differences in the sediment. In most cases, a distinct break in textures was present, usually between coarser sediment near the base and the finer sediment in the uppermost portion. In some cases, multiple textural layers were present, and in such instances the bank-sampling section was divided at less obvious textural breaks, often near the halfway point on the bank. An integrated sample of each section was taken by scraping the square shovel vertically along the cleaned bank, while ensuring that the rate of sediment removal was approximately equal across all strata. This method yields samples in which all strata are represented in proportion to their presence at the exposed section. The vertical location of the top of each sampled interval and the total height of the bank were measured relative to the water surface with a graduated wading rod. In cases where the sampled bank was a significant distance away from the water surface, a hand level was used in conjunction with the graduated wading rod to obtain height measurements.

Sediment samples were collected between July 23 and August 13, 2010. The sample locations and associated measurements are shown in tables 2–5. Sediment samples were delivered to the USACE, Omaha District office, for laboratory processing. Grain-size-distribution results are available upon request at the USACE, Omaha District.

Quality Assurance

To document the reach-scale variation in grain size within an individual sample site, replicate samples of bed material, sandbar material, and bank material were collected. One replicate sample of bed material, 1 replicate sample of bank material, and 2 replicate samples of sandbar material were collected within each of the 3 main-stem sections (corresponding to reach-identifier prefixes, "1" to "3;" fig. 1). These samples were collected between 100–300 ft upstream or downstream from the primary samples. Bed-material replicate samples were collected as a paired replicate of one of the primary bed-material subsamples and do not replicate the entire composited primary sample.

To provide some assurance that similar sediment samples were collected by the US BMH–53 and the US BMH–60, as well as to provide some indication of local-scale variation in grain size between samples collected by a single sampler, 6 samples were collected on a sandbar within a few inches from each other, 3 were collected with the US BMH–53, and 3 with the US BMH–60. Laboratory determinations of particle-size distributions of quality-assurance samples were done by dry sieve analysis at the USGS Kentucky Water Science Center Sediment Laboratory (Guy, 1969). The results are shown in figure 4, and the plotted data are shown in the appendix. Except for the finest sieve size, the results for all samples were within 17 percent of the overall mean percentage finer than each indicated grain size, and variability was less than 6 percent for grain size of 0.5 millimeters or larger.

Channel-Geometry Data

Platte River bank heights ranged from 2.2 ft above the local water surface at reach UA (table 3) to 6.2 ft at reaches 2B and 3B (table 3). Platte River sandbar heights, relative to the water surface, ranged from 0.4 ft at reach UA to 4.8 ft at reach 3B (table 4). The widest sandbar measured was 1,308 ft wide at reach 1C (table 4), and the narrowest sandbar measured was 15 ft wide in reach UB (table 4). Sandbar widths were measured along a transverse line at the channel cross section where the sandbar-material sample was collected, so the measured width does not necessarily reflect the maximum width of the sandbar. Similarly, sandbar heights reported were the maximum height only locally where sandbar-material samples were collected, not necessarily representative of reach or river extremes. Total bank height relative to the water surface for tributary streams varied from 3.6 to 10.8 ft for Loup River sites, 9.5 to l7.2 ft for Shell Creek sites, 5.4 to 9.1 ft for Elkhorn River sites, and 8.2 to 17.3 ft for Salt Creek sites. Platte River current velocity (table 5) varied in relation to water depth, from 0.43 fps in 0.5 ft of water (reach 1C) to 3.29 fps in 2.4 ft of water (reach 1E).

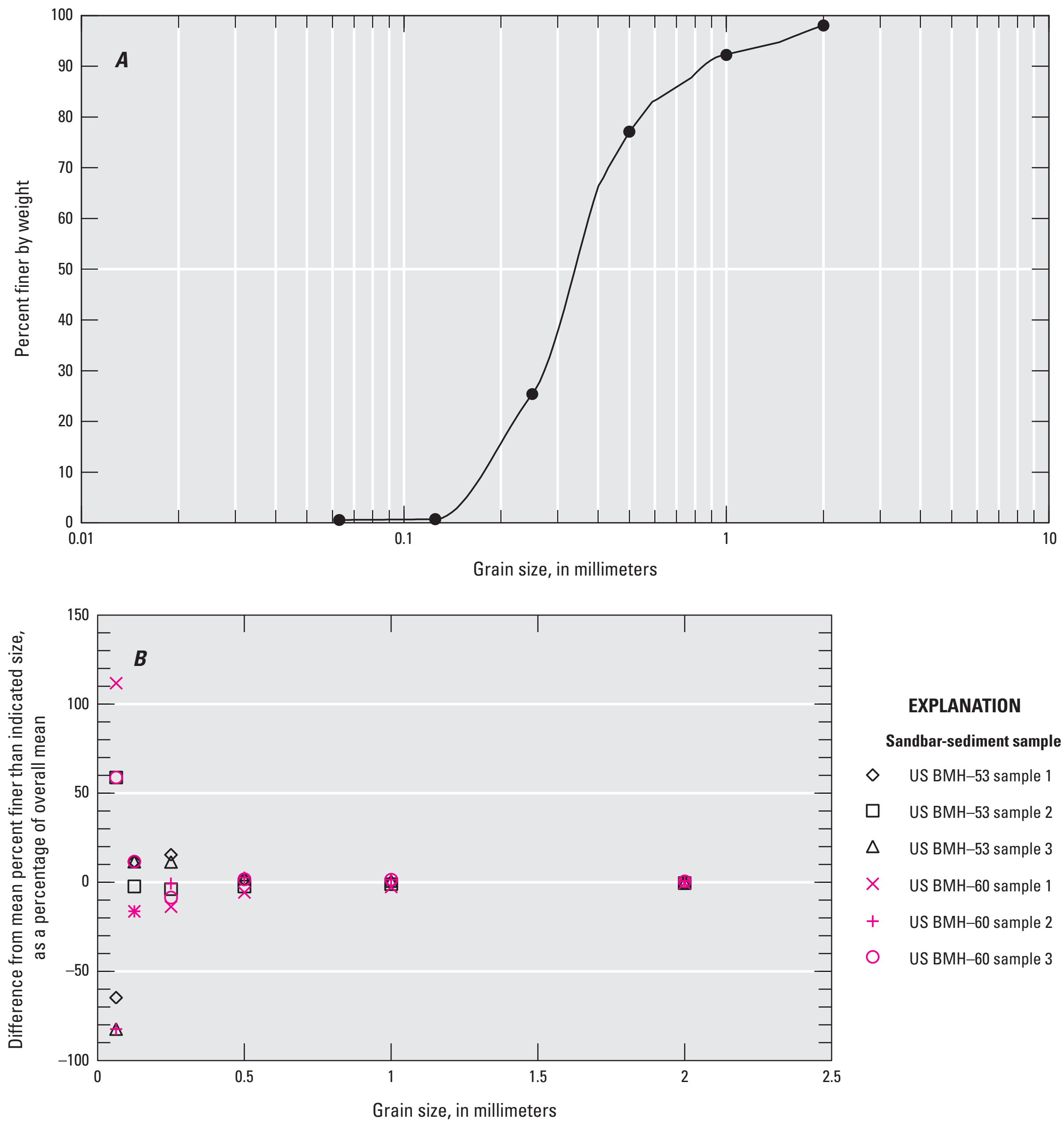

Figure 4. Graphs showing grain-size information for six sandbar-sediment samples collected with two different samplers at a single location on the lower Platte River, Nebraska, 2010

Table 2. Summary of sediment-sampling sites in lower Platte River watershed, Nebraska, 2010.

[Reach identifiers correspond to figure 1; NA, not applicable]

Reach identifier	Sampling site number	Active channel width at cross section (feet)	Total wetted width at cross section (feet)	Number of bars at cross section	Width of bars at cross section (feet)	Total non-wetted width at cross section (feet)	Number of bars sampled	Total width of sampled bars (feet)
				Platte River				
UA	1	[1]1,280	960	1	56	[1]320	2	123
UB	1	[1]1,333	1,244	3	89	89	3	89
1A	1	[1]2,010	1,878	1	132	132	2	516
1A	2	[1]1,350	690	1	660	660	1	660
1B	1	[1]1,577	1,286	1	291	291	3	921
1B	2	1,557	1,077	2	480	480	3	690
1C	1	[1]1,761	1,431	1	330	330	2	1,482
1C	2	1,840	1,190	1	273	650	2	859
1D	1	1,109	786	1	273	323	2	322
1D	2	1,566	1,272	1	294	294	3	867
1E	1	1,464	1,428	1	36	36	2	861
1E	2	1,287	942	1	345	345	3	1,125
2A	1	[1]1,550	872	1	678	678	1	777
2B	1	1,842	852	1	990	990	1	[2]1,020
3A	1	2,268	1,848	1	420	420	3	930
3B	1	1,344	486	1	858	858	2	1,392
3B	2	[1]1,655	1,340	1	315	315	3	1,098
				Loup River				
A	1	[1]780	528	3	100	[1]252	NA	NA
B	1	408	194	1	204	214	NA	NA
C	1	495	300	1	195	195	NA	NA
				Shell Creek				
A	1	84	28	0	0	56	NA	NA
B	1	81	33	0	0	48	NA	NA
C	1	81	45	0	0	36	NA	NA
				Elkhorn River				
A	1	264	255	0	0	9	NA	NA
B	1	291	279	0	0	12	NA	NA
C	1	414	410	0	0	4	NA	NA
				Salt Creek				
A	1	120	108	0	0	12	NA	NA
B	1	158	147	0	0	11	NA	NA
C	1	270	174	1	96	96	NA	NA

[1]Estimated using georeferenced 2007 National Agricultural Imagery Program (Farm Service Agency, 2007) digital orthophotographs.

[2]Estimated based on distances measured to nearby features.

Table 3. Sample locations and data associated with bank-sediment samples, lower Platte River watershed, Nebraska, 2010.

[Reach identifiers correspond to figure 1; Sample site number "1" is most upstream and sample site number "2" is most downstream within indicated reach]

Sample identifier code	Reach identifier	Sampling site number	Sample number	Date	Time	Latitude	Longitude	Horizontal accuracy (feet)	Distance from nearest edge of water (feet)	Total bank height relative to water surface (feet)	Bank angle (degrees)	Sampled interval, as height relative to water surface (feet)
Platte River												
2010006	UA	1	1	7/28/2010	14:40	41° 20' 31.57"	97° 34' 12.50"	17	0	2.2	45	0.0–2.0
2010007	UA	1	2	7/28/2010	14:50	41° 20' 31.57"	97° 34' 12.50"	17	0	2.2	45	2.0–2.2
2010013	UB	1	1	7/28/2010	16:00	41° 23' 25.43"	97° 23' 58.75"	15	0	2.9	70	.0–.6
2010014	UB	1	2	7/28/2010	16:10	41° 23' 25.43"	97° 23' 58.75"	15	0	2.9	70	.6–2.9
2010020	1A	1	1	7/29/2010	16:20	41° 22' 49.12"	97° 13' 50.05"	14	0	3.2	90	.0–2.5
2010021	1A	1	2	7/29/2010	16:30	41° 22' 49.12"	97° 13' 50.05"	14	0	3.2	90	2.5–3.2
2010027	1A	2	1	7/29/2010	13:30	41° 23' 01.17"	97° 09' 18.99"	9	660	5.6	55	.0–1.5
2010028	1A	2	2	7/29/2010	13:40	41° 23' 01.17"	97° 09' 18.99"	9	660	5.6	55	1.5–5.6
2010034	1B	1	1	7/30/2010	12:12	41° 26' 46.20"	96° 57' 26.65"	15	0	4.7	90	.0–2.4
2010035	1B	1	2	7/30/2010	12:20	41° 26' 46.20"	96° 57' 26.65"	15	0	4.7	90	2.4–4.7
2010043	1B	2	1	7/30/2010	13:40	41° 27' 18.19"	96° 52' 30.76"	15	0	4.8	90	.0–2.9
2010044	1B	2	2	7/30/2010	13:50	41° 27' 18.19"	96° 52' 30.76"	15	0	4.8	90	2.9–4.7
2010053	1C	1	1	7/27/2010	11:30	41° 25' 53.67"	96° 40' 15.07"	16	0	3.4	90	.0–.7
2010054	1C	1	2	7/27/2010	11:40	41° 25' 53.67"	96° 40' 15.07"	16	0	3.4	90	.7–1.4
2010055	1C	1	3	7/27/2010	11:40	41° 25' 53.67"	96° 40' 15.07"	16	0	3.4	90	1.4–3.4
2010061	1C	2	1	7/27/2010	14:52	41° 26' 14.60"	96° 35' 57.78"	12	0	3.0	90	.0–1.1
2010062	1C	2	2	7/27/2010	15:00	41° 26' 14.60"	96° 35' 57.78"	12	0	3.0	90	1.1–3.0
2010068	1D	1	1	7/26/2010	12:05	41° 22' 13.88"	96° 25' 51.55"	8	0	3.0	80	.0–1.7
2010069	1D	1	2	7/26/2010	12:10	41° 22' 13.88"	96° 25' 51.55"	8	0	3.0	80	1.7–3.0
2010075	1D	2	1	8/10/2010	10:55	41° 19' 22.85"	96° 24' 16.35"	11	0	3.9	90	1.0–3.9
2010076	1D	2	2	8/10/2010	10:48	41° 19' 22.85"	96° 24' 16.35"	11	0	3.9	90	.0–1.0
2010082	1E	1	1	8/10/2010	16:35	41° 13' 03.53"	96° 21' 22.91"	15	0	3.2	90	.0–1.2
2010083	1E	1	2	8/10/2010	16:45	41° 13' 03.53"	96° 21' 22.91"	15	0	3.2	90	1.2–3.2
2010089	1E	2	1	8/11/2010	10:55	41° 11' 15.30"	96° 19' 39.98"	16	0	4.3	90	.0–1.9
2010090	1E	2	2	8/11/2010	11:05	41° 11' 15.30"	96° 19' 39.98"	16	0	4.3	90	1.9–4.3
2010091	1E	[1]2	1	8/11/2010	13:00	41° 11' 16.85"	96° 19' 43.13"	16	0	4.3	90	.0–2.3
2010097	2A	1	1	8/11/2010	14:40	41° 06' 13.23"	96° 19' 53.15"	12	0	4.3	90	.0–2.1
2010098	2A	1	2	8/11/2010	14:50	41° 06' 13.23"	96° 19' 53.15"	12	0	4.3	90	2.1–4.3
2010106	2B	1	1	8/11/2010	16:53	41° 04' 32.79"	96° 19' 56.44"	11	0	6.2	90	.0–2.9

Table 3. Sample locations and data associated with bank-sediment samples, lower Platte River watershed, Nebraska, 2010.—Continued

[Reach identifiers correspond to figure 1; Sample site number “1” is most upstream and sample site number “2” is most downstream within indicated reach]

Sample identifier code	Reach identifier	Sampling site number	Sample number	Date	Time	Latitude	Longitude	Horizontal accuracy (feet)	Distance from nearest edge of water (feet)	Total bank height relative to water surface (feet)	Bank angle (degrees)	Sampled interval, as height relative to water surface (feet)
Platte River—Continued												
2010107	2B	1	2	8/11/2010	16:59	41° 04’ 32.79”	96° 19’ 56.44”	11	0	6.2	90	2.9–6.2
2010111	2B	[1]1	1	8/11/2010	17:10	41° 04’ 35.73”	96° 19’ 57.87”	11	0	5.7	90	.0–1.6
2010117	3A	1	1	8/12/2010	11:55	41° 01’ 08.95”	96° 14’ 55.68”	20	0	4.7	90	.0–1.4
2010118	3A	1	2	8/12/2010	12:00	41° 01’ 08.95”	96° 14’ 55.68”	20	0	4.7	90	1.4–4.7
2010126	3B	1	1	8/12/2010	15:05	41° 03’ 17.52”	96° 05’ 50.63”	16	0	5.5	90	.0–3.0
2010127	3B	1	2	8/12/2010	15:10	41° 03’ 17.52”	96° 05’ 50.63”	16	0	5.5	90	3.0–5.5
2010131	3B	[1]1	1	8/12/2010	15:30	41° 03’ 16.81”	96° 05’ 55.47”	20	0	6.2	90	.0–2.6
2010137	3B	2	1	8/13/2010	10:35	41° 03’ 30.19”	95° 57’ 21.99”	17	0	4.7	30	.0–1.5
2010138	3B	2	2	8/13/2010	10:45	41° 03’ 30.19”	95° 57’ 21.99”	17	0	4.7	30	1.5–4.7
Loup River												
2010140	A	1	1	7/23/2010	12:15	41° 20’ 15.53”	97° 59’ 34.65”	19	0	3.6	50	0.0–3.6
2010142	B	1	1	7/29/2010	8:26	41° 27’ 27.01”	97° 36’ 06.47”	17	0	10.8	20	.0–6.9
2010143	B	1	2	7/29/2010	8:30	41° 27’ 27.01”	97° 36’ 06.47”	17	0	10.8	20	6.9–10.8
2010145	C	1	1	7/29/2010	10:47	41° 24’ 01.71”	97° 19’ 38.61”	21	0	6.1	60	.0–6.1
Shell Creek												
2010147	A	1	1	8/20/2010	11:47	41° 31’ 33.13”	97° 16’ 52.72”	24	0	15.2	45	0.0–1.8, 13.4–15.2
2010149	B	1	1	8/20/2010	12:15	41° 31’ 08.61”	97° 13’ 58.91”	23	6	17.2	55	4.0–5.6, 12.2–14.2
2010151	C	1	1	8/20/2010	9:50	41° 27’ 13.56”	97° 00’ 07.24”	17	36	9.5	90	2.4–9.5
Elkhorn River												
2010153	A	1	1	8/19/2010	15:30	41° 27’ 13.98”	96° 22’ 11.51”	19	1	6.7	76	0.0–3.8
2010155	B	1	1	8/19/2010	13:40	41° 21’ 01.16”	96° 17’ 30.54”	16	2	9.1	52	.0–2.8
2010157	C	1	1	8/11/2010	13:48	41° 08’ 03.14”	96° 18’ 42.08”	20	0	5.4	90	.0–5.4
Salt Creek												
2010159	A	1	1	8/19/2010	9:30	41° 01’ 43.31”	96° 23’ 17.13”	22	0	17.3	64	1.0–2.6
2010161	B	1	1	8/19/2010	11:50	41° 02’ 05.34”	96° 22’ 03.99”	25	6	13.6	48	1.7–5.9
2010163	C	1	1	8/12/2010	10:47	41° 02’ 26.36”	96° 19’ 24.76”	25	0	8.2	90	.0–5.3

[1]Sample is a replicate of sample same-numbered, but was located 100-300 feet upstream or downstream from primary sample location.

Table 4. Sample locations and data associated with sandbar-sediment samples, lower Platte River, Nebraska, 2010.

[Reach identifiers correspond to figure 1; Sample site number “1” is most upstream and sample site number “2” is most downstream within indicated reach]

Sample identifier code	Reach Identifier	Sampling site number	Sample number	Date	Time	Latitude	Longitude	Horizontal accuracy (feet)	Bar height above water surface elevation (feet)	Distances measured along line of transverse section at bar			
										Bar width (feet)	Distance from left bank (feet)	Distance from left edge of bar (feet)	Distance from right edge of bar (feet)
2010003	UA	1	1	7/28/2010	12:55	41° 20’ 27.75”	97° 34’ 13.54”	14	0.4	93	[2]315	42	51
2010004	UA	1	2	7/28/2010	13:03	41° 20’ 27.44”	97° 34’ 14.42”	10	.8	56	[2]293	20	36
2010005	UA	1	3	7/28/2010	13:21	41° 20’ 28.67”	97° 34’ 04.30”	16	.7	30	525	10	20
2010010	UB	1	1	7/28/2010	16:45	41° 23’ 21.90”	97° 24’ 04.69”	11	.8	15	123	5	10
2010011	UB	1	2	7/28/2010	17:00	41° 23’ 22.37”	97° 23’ 54.54”	14	.6	56	390	42	12
2010012	UB	1	3	7/28/2010	18:00	41° 23’ 16.61”	97° 23’ 51.62”	16	.9	20	1,005	10	10
2010017	1A	1	1	7/29/2010	17:00	41° 22’ 52.75”	97° 13’ 46.43”	16	.5	132	[2]1,640	96	36
2010018	1A	1	2	7/29/2010	17:52	41° 23’ 04.32”	97° 13’ 54.80”	20	2.9	349	[2]336	10	339
2010019	1A	1	3	7/29/2010	18:01	41° 23’ 03.67”	97° 13’ 57.83”	15	.7	384	390	174	210
2010024	1A	2	1	7/29/2010	13:10	41° 22’ 57.13”	97° 09’ 15.67”	12	2.6	660	255	255	405
2010025	1A	2	2	7/29/2010	14:05	41° 22’ 57.78”	97° 09’ 05.03”	14	1.8	640	240	240	400
2010026	1A	2	3	7/29/2010	14:15	41° 23’ 00.50”	97° 09’ 00.27”	11	.6	285	10	275	10
2010031	1B	1	1	7/30/2010	10:39	41° 26’ 38.13”	96° 57’ 41.60”	20	1.8	267	447	111	156
2010032	1B	1	2	7/30/2010	11:30	41° 26’ 39.36”	96° 57’ 28.42”	14	2.4	363	630	267	96
2010033	1B	1	3	7/30/2010	12:57	41° 26’ 30.86”	96° 57’ 37.48”	7	1.1	291	864	234	57
2010040	1B	2	1	7/30/2010	14:30	41° 27’ 23.06”	96° 52’ 28.02”	14	1.0	150	1,275	78	72
2010041	1B	2	2	7/30/2010	15:15	41° 27’ 30.35”	96° 52’ 28.10”	8	.9	330	483	168	162
2010042	1B	2	3	7/30/2010	15:30	41° 27’ 30.42”	96° 52’ 24.97”	15	1.4	210	414	126	84
2010046	1B	[1]2	1	7/30/2010	15:20	41° 27’ 31.67”	96° 52’ 28.83”	10	1.0	228	381	90	138
2010047	1B	[1]2	2	7/30/2010	15:38	41° 27’ 29.69”	96° 52’ 23.40”	12	1.2	366	438	186	180
2010050	1C	1	1	7/27/2010	13:00	41° 25’ 47.27”	96° 40’ 15.64”	22	.5	330	645	120	210
2010051	1C	1	2	7/27/2010	13:20	41° 25’ 40.88”	96° 40’ 23.53”	16	1.9	1,308	888	258	1,050
2010052	1C	1	3	7/27/2010	14:15	41° 25’ 39.69”	96° 40’ 10.89”	7	.6	204	1,440	114	60
2010058	1C	2	1	7/27/2010	15:55	41° 26’ 11.33”	96° 35’ 19.49”	15	.8	510	516	90	420
2010059	1C	2	2	7/27/2010	16:10	41° 26’ 11.11”	96° 35’ 24.85”	16	2.3	650	690	300	350
2010060	1C	2	3	7/27/2010	16:40	41° 26’ 12.25”	96° 35’ 00.49”	18	1.8	309	186	186	123
2010065	1D	1	1	7/26/2010	12:25	41° 22’ 11.40”	96° 25’ 50.77”	10	.6	49	171	36	13
2010066	1D	1	2	7/26/2010	13:00	41° 22’ 03.04”	96° 25’ 53.86”	20	.6	216	1,071	78	138
2010067	1D	1	3	7/26/2010	13:07	41° 22’ 01.27”	96° 25’ 53.59”	20	2.0	273	1,080	180	93

Table 4. Sample locations and data associated with sandbar-sediment samples, lower Platte River, Nebraska, 2010.—Continued

[Reach identifiers correspond to figure 1; Sample site number "1" is most upstream and sample site number "2" is most downstream within indicated reach]

Sample identifier code	Reach Identifier	Sampling site number	Sample number	Date	Time	Latitude	Longitude	Horizontal accuracy (feet)	Bar height above water surface elevation (feet)	Distances measured along line of transverse section at bar			
										Bar width (feet)	Distance from left bank (feet)	Distance from left edge of bar (feet)	Distance from right edge of bar (feet)
2010072	1D	2	1	8/10/2010	10:05	41° 19' 19.37"	96° 24' 20.51"	15	2.2	306	333	174	132
2010073	1D	2	2	8/10/2010	12:27	41° 19' 24.12"	96° 24' 32.91"	14	1.6	294	1,260	129	165
2010074	1D	2	3	8/10/2010	12:55	41° 19' 35.84"	96° 24' 25.93"	15	2.1	267	540	111	156
2010079	1E	1	1	8/10/2010	14:50	41° 13' 06.73"	96° 21' 28.18"	14	1.8	825	686	480	345
2010080	1E	1	2	8/10/2010	15:05	41° 12' 55.33"	96° 21' 24.34"	15	3.3	654	375	204	450
2010081	1E	1	3	8/10/2010	15:51	41° 13' 09.14"	96° 21' 44.11"	15	2.4	36	1,152	18	18
2010086	1E	2	1	8/11/2010	12:01	41° 11' 02.64"	96° 19' 28.62"	16	3.0	489	336	36	453
2010087	1E	2	2	8/11/2010	12:22	41° 11' 15.34"	96° 19' 24.78"	11	2.0	291	234	234	57
2010088	1E	2	3	8/11/2010	12:50	41° 11' 17.20"	96° 19' 37.26"	15	2.6	345	990	309	36
2010094	2A	1	1	8/11/2010	15:30	41° 05' 58.31"	96° 19' 54.63"	16	4.0	678	408	408	270
2010095	2A	1	2	8/11/2010	16:00	41° 05' 54.16"	96° 20' 03.32"	20	4.1	777	615	615	162
2010096	2A	1	3	8/11/2010	16:08	41° 05' 51.01"	96° 20' 03.52"	14	4.0	663	519	519	144
2010103	2B	1	1	8/11/2010	18:06	41° 04' 27.17"	96° 20' 02.21"	9	2.0	270	[2]555	162	108
2010104	2B	1	2	8/11/2010	18:30	41° 04' 35.87"	96° 20' 20.74"	10	3.5	[2]1,020	1,560	[2]912	108
2010105	2B	1	3	8/11/2010	19:10	41° 04' 35.62"	96° 20' 05.72"	17	3.7	[2]996	603	105	[2]891
2010109	2B	[1]1	1	8/11/2010	18:40	41° 04' 37.46"	96° 20' 20.86"	12	2.6	[2]990	[2]1,512	[2]864	126
2010110	2B	[1]1	2	8/11/2010	19:17	41° 04' 34.41"	96° 20' 04.43"	10	3.6	[2]951	603	60	[2]891
2010114	3A	1	1	8/12/2010	12:25	41° 01' 00.16"	96° 14' 46.46"	8	3.0	420	471	168	252
2010115	3A	1	2	8/12/2010	13:05	41° 00' 51.78"	96° 14' 37.07"	15	1.1	315	483	81	234
2010116	3A	1	3	8/12/2010	13:40	41° 00' 50.57"	96° 15' 04.74"	15	2.1	195	1,938	48	147
2010123	3B	1	1	8/12/2010	16:15	41° 03' 07.08"	96° 05' 53.92"	10	3.2	336	1,014	105	231
2010124	3B	1	2	8/12/2010	17:05	41° 03' 16.16"	96° 05' 10.64"	18	4.5	858	606	120	738
2010125	3B	1	3	8/12/2010	17:30	41° 03' 14.22"	96° 05' 28.65"	16	2.0	1,056	801	267	789
2010129	3B	[1]1	1	8/12/2010	16:20	41° 03' 07.68"	96° 05' 52.18"	14	3.3	378	990	156	222
2010130	3B	[1]1	2	8/12/2010	17:15	41° 03' 15.13"	96° 05' 12.54"	14	4.3	798	1,008	150	648
2010134	3B	2	1	8/13/2010	11:20	41° 03' 30.65"	95° 57' 29.73"	19	1.4	183	1,611	90	93
2010135	3B	2	2	8/13/2010	11:40	41° 03' 39.58"	95° 57' 26.05"	18	2.4	315	531	54	261
2010136	3B	2	3	8/13/2010	12:30	41° 03' 37.09"	95° 58' 01.38"	8	4.8	600	420	420	180

[1]Sample is a replicate of sample same-numbered, but was located 100–300 feet upstream or downstream from primary sample location.

[2]Estimated based on distances measured to nearby features.

Table 5. Sample locations and channel-geometry data associated with bed-sediment subsamples, lower Platte River watershed, Nebraska, 2010.

[Reach identifiers correspond to figure 1; Sample site number "1" is most upstream and sample site number "2" is most downstream within indicated reach]

Sample identifier code	Reach identifier	Sampling site number	Sample set number	Date	Time	Latitude	Longitude	Horizontal accuracy (feet)	Distance from left bank (feet)	Current velocity (feet per second)	Water depth (feet)
					Platte River						
2010001	UA	1	1	7/28/2010	13:51	41° 20' 28.75"	97° 34' 05.67"	15	468	2.37	2.3
2010001	UA	1	1	7/28/2010	14:00	41° 20' 30.38"	97° 34' 09.63"	12	174	2.69	3.0
2010001	UA	1	1	7/28/2010	14:16	41° 20' 31.52"	97° 34' 10.99"	8	42	2.39	2.4
2010002	UA	1	2	7/28/2010	12:37	41° 20' 29.07"	97° 34' 10.25"	18	303	1.59	.6
2010002	UA	1	2	7/28/2010	13:38	41° 20' 23.33"	97° 34' 11.09"	15	1,230	1.72	1.4
2010002	UA	1	2	7/28/2010	14:30	41° 20' 30.25"	97° 34' 14.22"	18	123	1.82	1.6
2010008	UB	1	1	7/28/2010	16:21	41° 23' 25.23"	97° 23' 58.86"	8	15	2.17	2.7
2010008	UB	1	1	7/28/2010	17:23	41° 23' 22.00"	97° 23' 53.70"	7	450	2.72	3.5
2010008	UB	1	1	7/28/2010	17:40	41° 23' 19.86"	97° 23' 50.47"	12	600	2.53	2.4
2010009	UB	1	2	7/28/2010	16:35	41° 23' 24.31"	97° 23' 59.54"	15	114	1.69	1.3
2010009	UB	1	2	7/28/2010	17:15	41° 23' 22.52"	97° 23' 53.70"	10	420	.93	1.0
2010009	UB	1	2	7/28/2010	17:50	41° 23' 16.76"	97° 23' 52.29"	14	984	1.49	.9
2010015	1A	1	1	7/29/2010	16:40	41° 22' 50.73"	97° 13' 49.46"	16	[2]1,776	3.19	2.2
2010015	1A	1	1	7/29/2010	17:25	41° 22' 57.54"	97° 13' 44.42"	15	1,077	2.96	3.1
2010015	1A	1	1	7/29/2010	17:35	41° 23' 06.58"	97° 13' 54.05"	19	87	2.45	2.6
2010016	1A	1	2	7/29/2010	16:48	41° 22' 52.26"	97° 13' 47.09"	15	[2]1,650	1.28	.8
2010016	1A	1	2	7/29/2010	17:12	41° 22' 56.00"	97° 13' 39.38"	15	1,068	1.12	.5
2010016	1A	1	2	7/29/2010	17:43	41° 23' 05.07"	97° 13' 54.76"	10	261	1.49	1.0
2010022	1A	2	1	7/29/2010	14:30	41° 22' 58.16"	97° 09' 01.32"	18	30	1.84	1.5
2010022	1A	2	1	7/29/2010	15:15	41° 22' 54.18"	97° 09' 08.06"	15	15	1.61	1.1
2010022	1A	2	1	7/29/2010	15:30	41° 22' 54.26"	97° 09' 19.52"	12	30	.94	1.6
2010023	1A	2	2	7/29/2010	14:45	41° 23' 02.56"	97° 08' 55.57"	15	120	2.58	2.7
2010023	1A	2	2	7/29/2010	14:55	41° 22' 52.60"	97° 09' 04.19"	19	315	2.45	3.3
2010023	1A	2	2	7/29/2010	15:03	41° 22' 51.07"	97° 09' 11.60"	15	690	2.26	2.3
2010029	1B	1	1	7/30/2010	10:45	41° 26' 39.97"	96° 57' 39.72"	12	354	1.11	1.8
2010029	1B	1	1	7/30/2010	11:15	41° 26' 37.30"	96° 57' 38.15"	12	648	1.67	1.4
2010029	1B	1	1	7/30/2010	12:46	41° 26' 30.52"	96° 57' 35.79"	18	1,110	1.47	.8
2010030	1B	1	2	7/30/2010	11:00	41° 26' 40.80"	96° 57' 39.10"	13	297	2.15	2.4
2010030	1B	1	2	7/30/2010	11:45	41° 26' 43.38"	96° 57' 30.50"	12	198	2.22	2.5
2010030	1B	1	2	7/30/2010	12:37	41° 26' 30.05"	96° 57' 34.52"	20	1,557	2.67	2.6
2010036	1B	2	1	7/30/2010	14:00	41° 27' 19.32"	96° 52' 31.61"	15	1,464	2.24	2.9
2010037	1B	2	1	7/30/2010	14:50	41° 27' 26.08"	96° 52' 30.57"	14	192	2.96	2.4

Table 5. Sample locations and channel-geometry data associated with bed-sediment subsamples, lower Platte River watershed, Nebraska, 2010.—Continued

[Reach identifiers correspond to figure 1; Sample site number "1" is most upstream and sample site number "2" is most downstream within indicated reach]

Sample identifier code	Reach identifier	Sampling site number	Sample set number	Date	Time	Latitude	Longitude	Horizontal accuracy (feet)	Distance from left bank (feet)	Current velocity (feet per second)	Water depth (feet)
						Platte River—Continued					
2010038	1B	2	1	7/30/2010	16:10	41° 27' 33.63"	96° 52' 21.62"	16	48	2.07	1.9
2010039	1B	2	2	7/30/2010	14:40	41° 27' 21.97"	96° 52' 26.80"	13	1,311	.82	.6
2010039	1B	2	2	7/30/2010	15:06	41° 27' 27.81"	96° 52' 28.58"	15	768	1.35	1.6
2010039	1B	2	2	7/30/2010	16:02	41° 27' 31.97"	96° 52' 25.55"	6	279	1.66	.7
2010045	1B	[1]2	1	7/30/2010	14:05	41° 27' 19.54"	96° 52' 27.82"	20	1,644	2.48	3.0
2010048	1C	1	1	7/27/2010	11:54	41° 25' 52.47"	96° 40' 15.92"	16	123	3.17	2.7
2010048	1C	1	1	7/27/2010	12:17	41° 25' 50.55"	96° 40' 15.04"	20	315	2.13	3.9
2010048	1C	1	1	7/27/2010	13:45	41° 25' 43.76"	96° 40' 12.85"	14	1,110	2.17	2.7
2010049	1C	1	2	7/27/2010	12:30	41° 25' 49.01"	96° 40' 15.25"	16	486	1.49	1.1
2010049	1C	1	2	7/27/2010	13:30	41° 25' 45.12"	96° 40' 14.76"	17	891	1.75	.8
2010049	1C	1	2	7/27/2010	14:00	41° 25' 40.59"	96° 40' 12.53"	21	1,479	.43	.5
2010056	1C	2	1	7/27/2010	15:20	41° 26' 14.21"	96° 35' 15.30"	15	162	3.14	3.0
2010056	1C	2	1	7/27/2010	17:00	41° 26' 03.43"	96° 35' 24.15"	18	1,380	3.23	2.8
2010056	1C	2	1	7/27/2010	17:19	41° 26' 03.68"	96° 35' 12.33"	20	1,233	2.13	2.6
2010057	1C	2	2	7/27/2010	15:35	41° 26' 11.38"	96° 35' 17.56"	17	474	1.59	.8
2010057	1C	2	2	7/27/2010	15:40	41° 26' 09.16"	96° 35' 15.16"	25	678	.58	1.1
2010057	1C	2	2	7/27/2010	17:09	41° 26' 05.27"	96° 35' 26.49"	8	918	1.33	.8
2010063	1D	1	1	7/26/2010	10:55	41° 22' 05.17"	96° 25' 51.89"	10	811	2.40	2.0
2010063	1D	1	1	7/26/2010	11:04	41° 22' 08.26"	96° 25' 52.23"	8	570	2.31	3.2
2010063	1D	1	1	7/26/2010	11:20	41° 22' 10.44"	96° 25' 51.76"	7	194	2.74	3.2
2010064	1D	1	2	7/26/2010	11:40	41° 22' 11.43"	96° 25' 51.51"	10	90	1.77	1.1
2010064	1D	1	2	7/26/2010	12:40	41° 22' 07.23"	96° 25' 53.42"	11	360	1.94	1.3
2010064	1D	1	2	7/26/2010	13:30	41° 22' 02.52"	96° 25' 51.15"	17	903	1.25	1.3
2010070	1D	2	1	8/10/2010	12:01	41° 19' 19.21"	96° 24' 17.29"	17	84	2.51	2.8
2010070	1D	2	1	8/10/2010	12:19	41° 19' 27.54"	96° 24' 29.88"	22	1,065	2.14	2.9
2010070	1D	2	1	8/10/2010	13:20	41° 19' 25.15"	96° 24' 36.40"	18	171	1.98	2.4
2010071	1D	2	2	8/10/2010	10:25	41° 19' 21.87"	96° 24' 20.79"	16	357	1.93	1.0
2010071	1D	2	2	8/10/2010	12:38	41° 19' 24.69"	96° 24' 31.06"	15	1,146	1.70	1.2
2010071	1D	2	2	8/10/2010	13:09	41° 19' 28.47"	96° 24' 36.67"	14	1,500	1.85	1.3
2010077	1E	1	1	8/10/2010	15:24	41° 12' 56.50"	96° 21' 33.17"	15	1,098	2.44	2.4
2010077	1E	1	1	8/10/2010	15:36	41° 12' 49.60"	96° 21' 37.24"	20	1,644	3.29	2.4

Table 5. Sample locations and channel-geometry data associated with bed-sediment subsamples, lower Platte River watershed, Nebraska, 2010.—Continued

[Reach identifiers correspond to figure 1; Sample site number “1” is most upstream and sample site number “2” is most downstream within indicated reach]

Sample identifier code	Reach identifier	Sampling site number	Sample set number	Date	Time	Latitude	Longitude	Horizontal accuracy (feet)	Distance from left bank (feet)	Current velocity (feet per second)	Water depth (feet)
Platte River—Continued											
2010077	1E	1	1	8/10/2010	16:18	41° 13’ 04.51”	96° 21’ 24.50”	18	45	2.56	2.2
2010078	1E	1	2	8/10/2010	15:16	41° 12’ 56.36”	96° 21’ 32.47”	14	1,041	1.85	.9
2010078	1E	1	2	8/10/2010	16:05	41° 13’ 08.09”	96° 21’ 43.64”	14	1,176	1.23	1.3
2010078	1E	1	2	8/10/2010	16:25	41° 13’ 03.05”	96° 21’ 24.74”	14	141	1.86	1.0
2010084	1E	2	1	8/11/2010	11:20	41° 11’ 15.84”	96° 19’ 39.85”	15	1,185	2.42	2.8
2010084	1E	2	1	8/11/2010	11:29	41° 11’ 14.51”	96° 19’ 34.89”	15	1,029	2.39	2.5
2010084	1E	2	1	8/11/2010	11:39	41° 11’ 12.23”	96° 19’ 26.81”	20	479	2.79	2.0
2010085	1E	2	2	8/11/2010	11:50	41° 11’ 07.76”	96° 19’ 27.22”	15	585	1.45	.9
2010085	1E	2	2	8/11/2010	12:26	41° 11’ 14.83”	96° 19’ 25.48”	20	330	1.60	1.1
2010085	1E	2	2	8/11/2010	12:35	41° 11’ 16.07”	96° 19’ 37.91”	24	1,095	1.75	.8
2010092	2A	1	1	8/11/2010	14:48	41° 06’ 12.16”	96° 19’ 51.00”	17	1,356	2.00	2.4
2010092	2A	1	1	8/11/2010	15:00	41° 06’ 04.62”	96° 19’ 58.58”	14	[2]1,146	2.43	2.9
2010092	2A	1	1	8/11/2010	15:07	41° 05’ 49.92”	96° 20’ 10.15”	16	840	2.04	2.2
2010093	2A	1	2	8/11/2010	15:20	41° 06’ 01.67”	96° 20’ 00.92”	20	1,155	.94	1.0
2010093	2A	1	2	8/11/2010	15:50	41° 05’ 54.14”	96° 20’ 05.95”	18	777	1.50	1.3
2010093	2A	1	2	8/11/2010	16:20	41° 05’ 49.40”	96° 20’ 09.51”	17	1,797	1.75	1.3
2010102	2B	1	1	8/11/2010	17:18	41° 04’ 34.05”	96° 20’ 00.87”	15	300	2.92	2.6
2010102	2B	1	1	8/11/2010	17:30	41° 04’ 19.95”	96° 19’ 53.59”	15	141	2.27	2.5
2010102	2B	1	1	8/11/2010	17:40	41° 04’ 24.98”	96° 20’ 06.69”	18	720	2.81	2.6
2010099	2B	1	2	8/11/2010	17:48	41° 04’ 25.02”	96° 20’ 03.80”	9	720	1.66	1.3
2010100	2B	1	2	8/11/2010	18:20	41° 04’ 36.51”	96° 20’ 22.77”	19	[2]1,653	1.83	1.5
2010101	2B	1	2	8/11/2010	19:00	41° 04’ 34.05”	96° 20’ 02.77”	18	450	1.12	1.7
2010108	2B	[1]1	1	8/11/2010	18:00	41° 04’ 26.42”	96° 20’ 07.06”	15	939	1.47	.9
2010112	3A	1	1	8/12/2010	12:35	41° 01’ 02.32”	96° 14’ 46.51”	15	258	2.67	2.7
2010112	3A	1	1	8/12/2010	12:50	41° 00’ 46.47”	96° 14’ 34.17”	11	639	2.90	2.6
2010112	3A	1	1	8/12/2010	13:25	41° 00’ 48.37”	96° 14’ 55.54”	17	1,809	2.90	2.2
2010113	3A	1	2	8/12/2010	12:15	41° 01’ 01.72”	96° 14’ 47.03”	15	324	1.30	1.1
2010113	3A	1	2	8/12/2010	13:15	41° 00’ 50.02”	96° 14’ 39.14”	13	732	1.67	1.4
2010113	3A	1	2	8/12/2010	13:50	41° 00’ 55.51”	96° 15’ 07.90”	14	1,821	1.35	1.7
2010119	3B	1	1	8/12/2010	15:40	41° 03’ 13.30”	96° 05’ 56.64”	14	345	2.34	2.1
2010120	3B	1	1	8/12/2010	16:35	41° 03’ 07.41”	96° 05’ 41.30”	18	1,134	2.91	2.7
2010121	3B	1	1	8/12/2010	16:48	41° 03’ 18.16”	96° 05’ 14.98”	16	666	2.25	2.5

Table 5. Sample locations and channel-geometry data associated with bed-sediment subsamples, lower Platte River watershed, Nebraska, 2010.—Continued

[Reach identifiers correspond to figure 1; Sample site number "1" is most upstream and sample site number "2" is most downstream within indicated reach]

Sample identifier code	Reach identifier	Sampling site number	Sample set number	Date	Time	Latitude	Longitude	Horizontal accuracy (feet)	Distance from left bank (feet)	Current velocity (feet per second)	Water depth (feet)
Platte River—Continued											
2010122	3B	1	2	8/12/2010	16:00	41° 03' 04.93"	96° 05' 52.05"	16	1,263	1.54	0.6
2010122	3B	1	2	8/12/2010	16:55	41° 03' 17.52"	96° 05' 11.33"	17	780	1.09	.8
2010122	3B	1	2	8/12/2010	17:25	41° 03' 17.00"	96° 05' 31.11"	23	471	1.39	.9
2010128	3B	[1]1	1	8/12/2010	15:50	41° 03' 15.28"	96° 05' 42.55"	16	345	2.44	2.6
2010132	3B	2	1	8/13/2010	11:00	41° 03' 30.35"	95° 57' 21.86"	17	1,305	1.57	1.2
2010132	3B	2	1	8/13/2010	11:31	41° 03' 36.28"	95° 57' 26.27"	19	876	1.21	.9
2010132	3B	2	1	8/13/2010	12:15	41° 03' 35.24"	95° 57' 58.61"	15	138	1.75	1.3
2010133	3B	2	2	8/13/2010	11:10	41° 03' 33.16"	95° 57' 27.51"	15	1,350	2.84	2.1
2010133	3B	2	2	8/13/2010	11:55	41° 03' 40.17"	95° 57' 19.93"	15	210	2.14	2.4
2010133	3B	2	2	8/13/2010	12:10	41° 03' 41.20"	95° 57' 44.99"	20	357	2.64	2.8
Loup River											
2010139	A	1	1	7/23/2010	12:30	41° 20' 15.17"	97° 59' 34.31"	11	25	2.09	1.5
2010141	B	1	1	7/29/2010	8:38	41° 27' 27.17"	97° 36' 06.83"	20	351	1.88	1.6
2010144	C	1	1	7/29/2010	11:05	41° 24' 01.32"	97° 19' 38.65"	16	42	2.17	3.4
Shell Creek											
2010146	A	1	1	8/20/2010	11:38	41° 31' 34.00"	97° 16' 52.75"	25	14	0.80	3.3
2010148	B	1	1	8/20/2010	12:30	41° 31' 08.49"	97° 13' 58.95"	20	13	.50	3.1
2010150	C	1	1	8/20/2010	10:05	41° 27' 13.01"	97° 00' 06.38"	16	20	1.01	1.2
Elkhorn River											
2010152	A	1	1	8/19/2010	15:45	41° 27' 13.78"	96° 22' 11.65"	18	90	1.20	4.0
2010154	B	1	1	8/19/2010	13:20	41° 20' 59.59"	96° 17' 30.89"	20	135	2.64	2.2
2010156	C	1	1	8/11/2010	14:04	41° 08' 04.48"	96° 18' 39.71"	14	204	1.88	1.7
Salt Creek											
2010158	A	1	1	8/19/2010	10:00	41° 01' 43.52"	96° 23' 16.64"	18	81	0.51	4.6, 3.0
2010160	B	1	1	8/19/2010	11:25	41° 02' 05.40"	96° 22' 04.02"	22	81	.45	3.2
2010162	C	1	1	8/12/2010	11:05	41° 02' 26.75"	96° 19' 26.29"	21	135	[3].25	8.0

[1]Sample is a replicate of sample same-numbered, but was located 100-300 feet upstream or downstream from primary sample location.

[2]Estimated based on distances measured to nearby features.

[3]Estimated based on visual observation.

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Appendix

412723096522801 Platte River below Murphy Isle, near North Bend, Nebr.

Lower Platte Basin
Lower Platte-Shell Subbasin

LOCATION.--Lat 41°27'23.06", long 96°52'28.03" referenced to North American Datum of 1983, in NW ¼ SE ¼ sec.8, T.1 7., R.5 E., Dodge County, NE, Hydrologic Unit 10200201.

WATER-QUALITY RECORDS

WATER-QUALITY DATA
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

Part 1 of 2

[mm, millimeter; mm, millimeters]

Date	Sample start time	Medium name	Sample type	Sampler type	Bed sediment, dry sieved, sieve diameter, percent smaller than 0.0625 mm	Bed sediment, dry sieved, sieve diameter, percent smaller than 0.125 mm	Bed sediment, dry sieved, sieve diameter, percent smaller than 0.25 mm
07-30-2010	1630	Bottom material	Replicate	Sampler US BMH-53	1	1	29
07-30-2010	*1631*	*QC sample - Bottom material*	*Replicate*	*Sampler US BMH-53*	*.0*	*1*	*24*
07-30-2010	*1632*	*QC sample - Bottom material*	*Replicate*	*Sampler US BMH-53*	*1*	*1*	*28*
07-30-2010	*1633*	*QC sample - Bottom material*	*Replicate*	*Sampler US BMH-60*	*.0*	*1*	*22*
07-30-2010	*1634*	*QC sample - Bottom material*	*Replicate*	*Sampler US BMH-60*	*1*	*1*	*25*
07-30-2010	*1635*	*QC sample - Bottom material*	*Replicate*	*Sampler US BMH-60*	*.0*	*1*	*23*

WATER-QUALITY DATA
WATER YEAR OCTOBER 2009 TO SEPTEMBER 2010

Part 2 of 2

[mm, millimeter; mm, millimeters]

Date	Bed sediment, dry sieved, sieve diameter, percent smaller than 0.5 mm	Bed sediment, dry sieved, sieve diameter, percent smaller than 1 mm	Bed sediment, dry sieved, sieve diameter, percent smaller than 2 mm	Bed sediment, dry sieved, sieve diameter, percent smaller than 4 mm
07-30-2010	78	92	98	100
07-30-2010	*75*	*91*	*98*	*100*
07-30-2010	*79*	*93*	*98*	*100*
07-30-2010	*73*	*90*	*98*	*100*
07-30-2010	*79*	*94*	*99*	*100*
07-30-2010	*78*	*94*	*99*	*100*

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