

Memorandum

To: Programs, Projects and Operations Subcommittee

Subject: Lower Platte River Corridor Alliance – Sandbar & Bank Stabilization Studies

Date: March 1, 2011

From: Gerry Bowen

As has been reported to you in previous months through the Lower Platte River Corridor Alliance (LPRCA) Monthly Reports, the Obstruction Removal Project has been “shelved” for the present due to the change in permitting from the Corps of Engineers Regulatory Division. The new requirement to build a temporary bridge instead of an earthen causeway to remove the old bridge piers makes the project too expensive to pursue further at the present time.

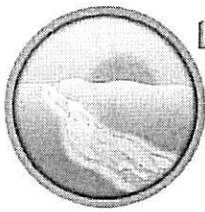
The current LPRCA Budget includes approximately \$165,000 (\$55,000 from each NRD) that has accumulated over the past three years to fund the next phase of this obstruction removal project.

Two other projects have been recommended by the LPRCA group (see attached January Monthly reports from Meghan Sittler), but have not been approved for funding by the NRDs. They include a USGS study of sandbar dynamics in the lower Platte River and a continuation of the Cumulative Impacts Study by the Corps of Engineers.

The USGS Sandbar Pilot study (see attached) was initially proposed to cover the area from Columbus to the mouth (see attached) for a total cost of \$87,990. The Lower Platte South NRD Board approved the study, but Lower Platte North NRD Board did not. It is now proposed to conduct the study from Fremont to the mouth (see attached communication from Jason Alexander with USGS) in a cooperative project between the USGS, the Lower Platte South and Papio-Missouri River NRDs. The cost of the revised study is \$66,217. The USGS would cost share 30%, or \$19,865, with the remaining 70%, or \$46,351 split between the two NRDs, or \$23,176 each. It is proposed to use a portion of the funds previously set aside for the river obstruction removal project, therefore no additional funds from the NRDs are necessary. Staff recommends approval.

The other proposed project is a reconnaissance level inventory of formal and informal bank stabilization and levees along the lower Platte River. This is proposed to be accomplished by the Corps of Engineers as a part of the on-going Lower Platte River Cumulative Impacts Study. The proposed study would provide a necessary link to better understand land use impacts to the river's hydrology and geomorphology. The estimated cost of the study is \$100,000, with the local share being 50%, or \$50,000. The Corps has proposed using federal funds from a Congressional continuing resolution to provide their share. The chances of this study being initiated are questionable considering the status of federal funds for all projects. Should this project move forward, it is proposed that a portion of the funds previously reserved for river obstruction removal be applied to this study as well. Neither the Lower Platte South nor Lower Platte North NRD Boards have approved funding this study, but have indicated favoring this concept. Staff recommends approval subject to the other NRD Boards participation.

- **It is recommended that the Subcommittee recommend to the Board that the District approve both the proposed LPRCA-sponsored USGS Sandbar Study on the Lower Platte River between Fremont and the mouth for a maximum P-MRNRD contribution of \$23,176 subject to participation by the LPSNRD, and the USACE Inventory of Bank Stabilization and Levees Study for a maximum P-MRNRD contribution of \$16,667, subject to participation of the LPSNRD and LPNNRD, both utilizing funds previously set aside for the river obstruction removal by the LPRCA.**



Lower Platte River CORRIDOR ALLIANCE

January 2011

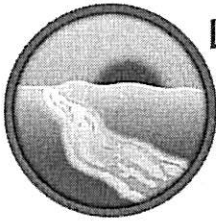
Monthly Report for January 2011

Meghan Sittler, Coordinator

Programs / Projects / Activities

- **Cumulative Impact Study:** The draft documents from the USGS work under Phase III were delivered to the USACE & LPRCA at the end of December. The draft reports, "Geomorphic Classification and Evaluation of Channel Width and Emergent Sandbar Habitat Relationships on the Lower Platte River, Nebraska" and "Sediment Samples and Channel-Geometry Data, Lower Platte River Watershed, 2010" were reviewed by USACE and the LPRCA and are currently being finalized by USGS. USACE is currently having the sediment samples analyzed and will then formulate the actual sediment budget. I also began working with the USACE further on the conceptual model for the Lower Platte River. We will hope to hold another workshop in February or March and develop a draft model and associated materials during the next month. Finally, I began discussing next steps for the CIS with USACE and hope to have ideas better formulated in early February.
- **Environmental Suitability Assessment:** I reviewed the LSA model adjustments following the ground truthing of the model done in the fall. We are working to schedule a meeting with members of the technical advisory committee for the LSA in February to continue to make the final refinements. Additionally the ESA viewer is being finalized. LPNNRD is currently undergoing a server upgrade so the ESA viewer will be migrated onto the Mapmaker site once that transition is complete.
- **USGS Sandbar Monitoring Proposal:** In early January I met with USGS, NGPC and the Tern & Plover Partnership representatives to discuss the 3-year sandbar monitoring proposal as well as an interim 1 year pilot study to document sandbar location and size given the high flows from last year. USGS and I will be discussing this opportunity with the NRDs in February.
- **Water Budget:** Dana Divine (ENWRA coordinator) and I continued formulating the study design and tasks for the development of a water budget for the Lower Platte River. We will focus our initial effort on the stretch of the Lower Platte from Fremont to Plattsmouth and then hope to replicate it further up river once we have evaluated the success of the developed water budget. At the end of January I participated in the ENWRA technical committee meeting to further discuss this. Dana and I will be meeting with some members of the technical committee and any other interested individuals in February to further discuss our plan of attack.
- **Quarterly Meeting:** The LPRCA Quarterly meeting was held on Tuesday January 18th at 9:30 a.m. at LPNNRD. The agenda included discussion of the problems with the river obstruction removal, the current CIS, an ESA update and the proposed sandbar monitoring work. The main presentation was by Kelly Helm Smith of the National Drought Mitigation Center. Kelly provided an overview of the Drought Ready Communities project that I assisted with and discussion centered on local application. I will continue to work with the NDMC on this effort and hope to present it to a national conference in May. The next Quarterly Meeting will be Wednesday, April 20th at 9:30 at NGPC.
- **UNL Environmental Studies Seminar:** I presented to the UNL Environmental Studies Senior Seminar in mid-January. The LPRCA has served as a "client" for the students in this seminar for the past several years. I will be working with them related to threatened and endangered species throughout this semester.
- **Upcoming meetings/conferences/events:**
 - **UNL Water Seminar Series:** Wednesdays, 3:30 p.m., Hardin Hall east campus. More information: watercenter.unl.edu

- **NARD Annual DC Conference:** March 12-16, 2011, Washington, DC
- **LPRCA Quarterly Meeting:** Wednesday, April 20, 2011. 9:30 a.m., NGPC, Lincoln
- **Water For Food Conference:** May 1-4, Cornhusker, Lincoln, NE
Registration open, February 1. More information available at waterforfood.nebraska.edu
- **UNL Water Tour:** July 12-14, based from Ainsworth and Valentine. Contact Steve Ress (472-9549) for the latest information!



Lower Platte River CORRIDOR ALLIANCE

January 2011

Monthly Report for January 2011

Meghan Sittler, Coordinator

Proposal from USGS to Investigate Spatial and Temporal Dynamics of Sandbars in the Lower Platte River

The proposed study would be conducted in partnership with USGS and the Tern & Plover Partnership. The one-year pilot study would identify the following characteristics of sandbars on the lower Platte River: frequency/abundance; location; area; height; bank attachment; and vegetation density through two separate surveys. Most of the data related to the characteristics will be collected only on bars 2.0 acres or larger in size with the exception of frequency/abundance & location. Sandbars of 2 acres or larger are generally considered to be what is needed for Tern & Plover nesting habitat. The initial survey would be conducted following "ice-off" in April/early May and the second would be following the high flow period in late June or July.

The pilot study would comprise a baseline data set for an expanded 3-year study to be included within a Nebraska Environmental Trust proposal and/or the next phase of the Cumulative Impact Study. Additionally, this data set will help further the sediment budget analysis currently being developed as part of Phase III of the Cumulative Impact Study and get to the end goal of developing a predictive model to understand how land use changes are impacting the river. Finally, the proposed work would continue to support the investigation and understanding of Tern & Plover habitat on the lower Platte River.

The total cost of the pilot study is \$87,990. USGS will contribute \$26,397 (30%). The Lower Platte River Corridor Alliance share of the project costs would be \$61,593 (70%). No new funds would be requested to meet the LPRCA share of the study costs. Banked funds for the river obstruction removal effort could be utilized for this study. Given significant permitting issues and elevated costs the obstruction removal effort at Two Rivers State Recreation Area will be postponed indefinitely.

Cumulative Impact Study--Corps of Engineers Reconnaissance Study of Bank Stabilization Features on the Lower Platte River

As part of the Cumulative Impact Study, a full reconnaissance of formal and informal bank stabilization and levees throughout the lower Platte River has been discussed as a necessary link to better understand how land use has impacted the river's hydrology and geomorphology. The Corps has approached the LPRCA about utilizing federal FY2011 funds under the continuing resolution to initiate this study. The projected cost of the study is \$100,000 with \$50,000 coming from federal funds and \$50,000 from the LPRCA. If the funds are able to be used, existing funds from the river obstruction removal effort would be utilized to meet the LPRCA's 50% cost-share obligation for this work.

A Proposal to Investigate Spatial and Temporal Dynamics of Sandbars in the LPR—2011 Pilot Study

A Proposed Cooperative Partnership between the USGS, Lower Platte River Corridor Alliance
and Nebraska Tern & Plover Partnership

Jason S. Alexander & Ron B. Zelt, USGS

Introduction

The Platte River of Nebraska provides important stopover, nesting, and foraging habitat for migratory shorebirds of the Central North American flyway. The abundance of mid-channel sandbars and diversity of in-channel hydraulic environments, make the Platte River a particularly attractive habitat for migratory and nesting shorebirds. In fact, for some species, it is a critically important habitat. Unfortunately, many of the natural morphological and hydrological characteristics of the Platte River have been substantially altered by water development, channelization, hydropower, and invasive vegetation encroachment (Williams, 1978; Johnson, 1994; National Research Council, 2005; Ginting and Zelt, 2008). These alterations have resulted in a general reduction in the amount of in-channel habitats suitable for migratory and nesting shorebirds by reducing the overall channel width and the area of barren mid-channel sandbars (National Research Council 2005).

The lower Platte River (LPR), defined here as the 103-mile reach of the Platte River between the Loup River confluence and the Missouri River, although narrower in channel width than in the late 19th and early 20th centuries (Joeckel and Henebry 2008), still retains many of the geomorphologic and hydrologic characteristics important to migratory and nesting shorebirds. The LPR corridor provides important nesting and foraging habitats for numerous migratory bird species, including two state and federally listed shorebird species, the endangered Interior Least Tern (terns; *Sternula antillarum athalassos*), and the threatened Piping Plover (plovers; *Charadrius melodus*). Informed corridor management and protection of important riverine habitat requires increased understanding of the physical and biological dynamics of the lower Platte River corridor. In particular, an understanding of sandbar dynamics, and human influences on those dynamics, is essential to inform future management and potential development of water, mineral, energy, and recreational resources, because these affect the quality and quantity of lower Platte River physical habitats.

Background

One of the primary characteristics of braided rivers is the presence of macroforms, which are large, transient, sedimentary deposits, often referred to simply as “bars.” The surfaces of these mid-channel bars are the primary on-river nesting habitat unit for terns and plovers in the LPR. Although numerous studies have investigated the stratigraphy and sedimentology of bars in braided river systems, relatively little is published concerning the factors controlling their formation, persistence, and geometry. The height of bars is known to scale with the depth (stage) of high-magnitude (bankfull or greater) discharges (Bridge, 2003), however, other factors such as the characteristics of the local flow regime, rate of sediment supply, grain size, channel width, and channel/valley slope are also thought to play an important role in determining their overall geometry, persistence, and abundance in a river

channel (Crowley, 1983). Bar persistence, in particular the persistence of a bar's overall height, is important for nesting, especially during years of relatively low-magnitude peak flows when overall bar volume or area may be diminished, making bars vulnerable to inundation by moderate rises in stage.

The LPR retains many of its natural morphologic and hydrological characteristics because its two primary tributaries, the Loup and Elkhorn Rivers, retain a generally natural flow regime, and contribute large volumes of water and sediment, that diminish the magnitude of impacts from water developments in the Platte River Basin upstream from the Loup River confluence. However, two of the most prominent anthropogenic changes that have altered the hydrology and geomorphology of the LPR are: (1) power generation (hydrocycling) from the Loup River Hydroelectric project and (2) bank protection and levees. The effects of these alterations on sandbar formation, nesting-season sandbar geometry, and sandbar persistence are poorly documented.

Study Approach

The proposed pilot study will investigate both depositional and erosional components of sandbar dynamics in the LPR which currently are not well understood:

1. Where do sandbars tend to form in the LPR relative to sediment sources, changes in channel characteristics, and human-built channel-control structures?
2. Does the depositional geometry, in particular height and area, of sandbars vary spatially in an along-stream pattern? Does sandbar geometry vary somewhat randomly, or does it change in a systematic way along the LPR? Is the pattern spatially coincident with human pressures, hydrologic alterations, or local or downstream channel geometry?
3. Does the erosional persistence of sandbar height and area vary spatially? If so, what are the broader-scale hydrologic, hydraulic and/or sediment controls affecting sandbar persistence in different reaches?

The proposed study would be a pilot investigation to collect a synoptic baseline dataset and to test new monitoring methods for rapidly acquiring sandbar geometry measurements and supplemental data. The sandbar geometry data collected for this pilot study also would serve as the baseline for a larger, longer-term investigation, currently in preparation for a Nebraska Environmental Trust (NET) grant application, which, if funded, would begin in calendar year 2012. Additionally, the larger study would use the information gathered in this pilot study to improve its overall study design and methods. Supplemental data to be collected during the study period include 15-minute recording of river stage at selected locations; and low-altitude aerial photography scheduled for collection in June 2011 as part of a separate, but related, study by NGPC.

Sandbar Monitoring Data Collection and Methods Pilot

The proposed pilot surveys initiate what is intended to become a comprehensive sandbar monitoring study spanning from the Platte River near Duncan, Nebraska, downstream to approximately 7 miles upstream from the Missouri River. The sandbar pilot survey would be completed twice in calendar year 2011. The initial survey would occur after ice breakup, but before the spring high-flow

period; the second survey would occur after the spring high flow and primarily is intended to demonstrate the capability and sensitivity of the methods for change detection.

The sandbar survey will characterize the - frequency/abundance, location, area, height, bank attachment, and vegetation density of barren to sparsely vegetated sandbars (sandbars with potential as nesting habitat for terns and plovers). The following methods will be used to survey each of these characteristics:

- a) **Frequency/abundance** - Counts of sandbars will be made of individual sandbars while boating through each reach. All barren or sparsely vegetated sandbars will be counted regardless of size.
- b) **Location** – Location of bars will be recorded in one of two ways. For each bar under approximately 2.0 acres, a GPS coordinate will be recorded using a mobile mapping GPS device at the estimated longitudinal (upstream to downstream) center while boating by the bar. The GPS mobile mapping device will have an accuracy of approximately less than 1 meter for most horizon scenarios. For each bar larger than 2.0 acres, the entire boundary of the bar at the edge of water will be surveyed with the GPS mobile mapping device (see c below).
- c) **Area** - Bar area will be surveyed at every sandbar estimated to be greater than 2.0 acres. Methods will be compared at a subset of bars to quantify uncertainty and compare efficiencies for data collection. Methods will include azimuth-capable laser rangefinder combined with a mobile mapping GPS system, off-the-shelf GPS receiver (WAAS enabled), and RTK-GPS base/rover pair (survey grade).
- d) **Height** – maximum bar height for each bar larger than 2.0 acres will be will be calculated as the difference in elevation between the height of the high banks and the maximum bar height relative to the water surface at the time of the survey. Bar height will be surveyed using a rotating laser level. The height of the high banks relative to the water surface will be surveyed using a hand level and stadia rod. Where possible, other indices of bar height, such as height relative to mean daily low stage, mean daily high stage, instantaneous low stage, and instantaneous high stage will also be calculated.
- e) **Bank attachment** – for each bar larger than 2.0 acres a simple, “yes” or “no” will be recorded for attachment to bank. The degree of attachment may be assessed on proximity to the high bank, as well as the depth of waters between the bar and the bank. For example, some bars may have a shallow thread of water between the bank and the margin of the bar.
- f) **Vegetation density** – For each bar larger than 2.0 acres included in the initial survey, a visual estimation of vegetation density will be made and recorded using a series of frequency bins (less than 10%, 10 to 40%, 40% to 75%, or greater than 75%). This full range of bins is necessary because bars suitable for bird nesting may initially have sparse

or no vegetation but, if the survey is funded for several years, vegetation density may increase dramatically. Also, the type of vegetation will be recorded using generalized bins (woody, herbaceous, or mixed). If woody, the diameter at breast height (DBH) will be measured by use of calipers for 5 stems in the largest size class, and location(s) of largest-size-class group(s) of stems recorded using GPS receiver.

- g) Field documentation – for each bar larger than 2.0 acres, a photographic station will be established using a mobile mapping GPS device, and panoramic photographs will be taken in all directions from the site to provide site documentation.

River Stage Monitoring Methods Pilot

The interpretive value of sand bar height and area data collected for the proposed pilot surveys will be enhanced if it can be related to the daily and annual stage fluctuations of the Platte River during and prior to the study period. Although the USGS operates an existing network of streamflow gaging stations on the lower Platte River, the spacing of the gages does not provide enough information to assess how the magnitude of stage changes varies over spans of less than approximately 20 to 25 miles. For example, the daily stage changes associated with power cycling at the Loup River Power District have a maximum magnitude near the tailrace just downstream of the Loup River confluence, but the first streamflow gaging station on the Platte River downstream of the tailrace is North Bend, approximately 35 miles. The proposed study will supplement the existing network of 5 gages from Duncan to Louisville with an additional 6 gages. The pilot gages will read stage-only using stage plates and time-lapse photography; the stage of the river at each of the supplemental gages will be recorded every 15 minutes throughout the year. Daily maximum and minimum will be recorded and entered into a database. This low-cost method is expected to yield accuracy of at worst 0.03 to 0.05 ft. Among the key locations proposed for stage-only gages are the short reach between the Loup River mouth and the Loup Power Canal tailrace outfall, within the first few river miles downstream from the tailrace outfall, and near Schuyler, Nebr.

Timeline

- March 2011 – begin planning first sandbar survey
- April/early May 2011 – perform first sandbar survey; put out cameras and stage plates at key locations (i.e., stage-only gages)
- May-June 2011 – process data from first sandbar survey
- June 2011 – NGPC-sponsored aerial photography of LPR to be collected.
- June-July 2011 – complete second sandbar survey; download photos at stage-only gages
- July-September 2011 – finalize data analysis
- October-November 2011 – write USGS Open-File Report draft
- November-December 2011 – draft OFR to review.

-December-January 2011 – draft OFR back from review.

-February-March 2011 – regional approval of OFR.

-April-May 2011 – final publication of OFR through USGS system.

Summary Budget

Total project cost: \$87,990

LPRCA Contribution: \$61,593 (70%)

USGS COOP Share: \$26,397 (30%)

From: Jason Alexander [mailto:jalexand@usgs.gov]
Sent: Wednesday, February 23, 2011 4:34 PM
To: Meghan Sittler
Cc: Ronald B Zelt
Subject: RE: Update RE: presentation for tommorrow

Meghan,

Good to talk with you today. Glad to hear the project has had positive reviews at LPS. If we need to scale back, we believe that the dataset that would best meet the longer-term goals of the project would be to do 1 complete longitudinal survey, as opposed to 2 surveys of a shorter reach. This is mainly because, as you already know, we would like to examine the spatial variation in bar elevation and area, and be able to see how well a host of predictor variables (channel width, channel slope, valley width, sinuosity, sediment supply etc.) explain variation in these characteristics. Also, a complete survey would provide a baseline to compare data if we are lucky enough to get NET funding in the future. We think we could still do a study to examine our ability to measure change, but instead of following up with a second entire longitudinal dataset, we would simply need to focus on 1 or 2 individual shorter reaches where we know bars will form. Also, after talking about it, we think that if we only have a chance to do 1 survey, we should do it after the peak flood this year...this year will undoubtedly be a fairly large discharge, and the baseline dataset would then be referenced to the bars as they are shaped after the high flow, and would make for a better comparative dataset if we were to get started with NET money next spring.

So...I reran the numbers with a scaled back survey which includes the following basic elements:

- (a) 1 complete longitudinal survey from Duncan to 7 miles upstream of the Missouri
- (b) 1 or 2 reaches with 2 datasets for assessing change (1 survey before high flow, 1 survey after high flow); time-lapse photography at each reach.
- (c) a USGS Open-File Report to be delivered in late spring 2012.

ALL TASKS

	FY11	FY12	FY13	FY14	FY15	FY16	TOTAL
Salaries	\$33,439.68	\$17,323.36	\$0.00	\$0.00	\$0.00	\$0.00	\$50,763.04
Overtime	\$1,339.12	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,339.12
Travel	\$534.07	\$274.31	\$0.00	\$0.00	\$0.00	\$0.00	\$808.38
Vehicles	\$3,714.59	\$360.03	\$0.00	\$0.00	\$0.00	\$0.00	\$4,074.62
Training	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Equipment	\$1,091.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,091.00
Supplies	\$2,078.09	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,078.09
HIF Equipment	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Contracts	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
USGS Labs	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
non-USGS Labs	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Shipping	\$55.07	\$115.65	\$0.00	\$0.00	\$0.00	\$0.00	\$170.72
Publications	\$0.00	\$5,891.40	\$0.00	\$0.00	\$0.00	\$0.00	\$5,891.40
SV & Miscellaneous	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Total	\$42,251.63	\$23,964.74	\$0.00	\$0.00	\$0.00	\$0.00	\$66,216.37

Of this cost...the NRD's would need to contribute \$46,351 (70%); USGS would contribute \$19,865 (30%)

Let me know if you need anything else. I can make the Papio-MO meeting on the 8th. 6:30 pm, right?

Cheers,

Jason S. Alexander

jalexand@usgs.gov

Hydrologist, USGS Nebraska Water Science Center

U.S. Geological Survey, WRD

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Bowen, Gerry

From: Greenwald, Jeffrey R NWO <Jeffrey.R.Greenwald@usace.army.mil>
Sent: Monday, February 28, 2011 3:44 PM
To: Bowen, Gerry
Cc: Meghan Sittler
Subject: RE: CIS (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Gerry, here's a general summary of the proposed work.

A bank stabilization and levee inventory would provide accurate information for local, state, and federal agencies regarding the current bank stabilization levels along the lower Platte River. Currently a reliable dataset does not exist and due to the often unregulated nature of bank stabilization and difficulty in assessing it using aerial photography, a ground truth survey is required. This effort will likely require collaboration with resource agencies to develop a scientific method for surveying the river via boat. The dataset would help supplement ongoing geomorphic studies of the river, identify potential problems, identify potential opportunities for restoration, and provide a baseline for future inventories.

I'm out of town next Tuesday evening otherwise I would have attended.

Thanks,
Jeff

-----Original Message-----

From: Bowen, Gerry [mailto:gbowen@papionrd.org]
Sent: Monday, February 28, 2011 2:22 PM
To: Greenwald, Jeffrey R NWO
Subject: CIS

Jeff,

Do you have a summary paragraph about the proposed inventory of bank stabilization and levees study? We will be presenting this additional CIS work to our Board next Tuesday evening. I realize the funding is questionable, but would appreciate the information anyway.

Can you attend the Subcommittee meeting next week in case there are questions? The meeting is March 8th at 6:30 p.m.

Gerry Bowen