2009 Interior Least Tern and Piping Plover Monitoring, Research, Management, and Outreach Report for the Lower Platte River, Nebraska

NONGAME BIRD PROGRAM

TERN & PLOVER CONSERVATION PARTNERSHIP

2009
Interior Least Tern and Piping Plover Monitoring, Research, Management, and Outreach Report
For the Lower Platte River, Nebraska

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Preface

This is a preliminary report on our monitoring, research, management, and outreach activities during the past 12 months (2009). This document was prepared to inform our partners, cooperating agencies, funding sources, and others of our activities and to provide a preliminary summary of our results.

The data, data analyses, results, summaries, and interpretations found in this document are not final and should be considered as such when being cited or referred to in documents, reports, proposals, or presentations.

In effort to make the document more accessible and readable, it is divided into five (5) sections: Introduction, Monitoring, Research, Management, and Outreach.

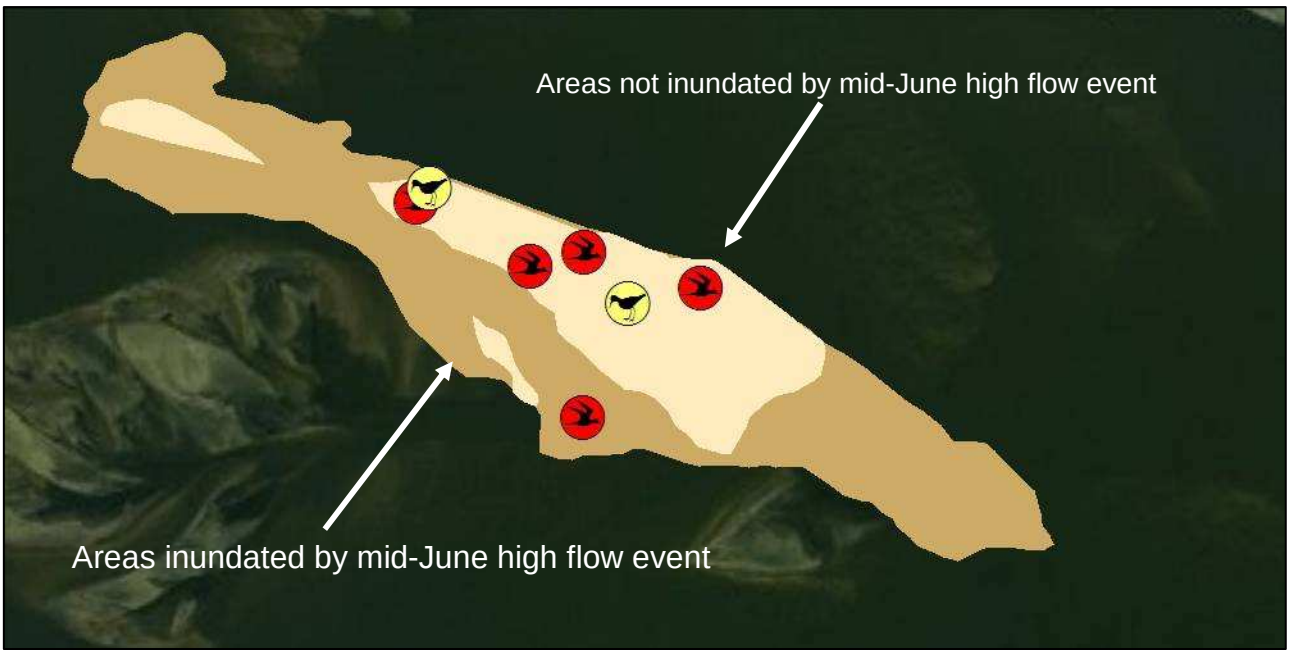
> Introduction: This section describes details of the project area and summarizes conditions during the 2009 field season.
>
> Monitoring: This section describes data that are collected annually for basic demographic analysis and includes the number of nests, adults, chicks, and fledglings found in the focus area. These data are collected and summarized in a form that allows comparison across the entire range of each species.
>
> Research: This section describes details of data collection and the analysis of these data relative to specific research objectives.
>
> Management: This section describes our activities designed to protect Interior Least Terns and Piping Plovers and nests from human and non-human interference.
>
> Education-Outreach: This section describes our efforts to increase public awareness and understanding of Interior Least Terns and Piping Plovers in particular and to promote environmental literacy in general.

Topics within the Monitoring and Research sections follow the standard organization of introduction, methods, results, and discussion. By necessity, our approach and techniques differed between river and off-river habitats; we describe these differences in the text.

The following icons are used on maps to designate nest locations.

 Interior Least Tern nest  Piping Plover nest

On schematic maps found throughout this document, sandbars are shown in two shades of brown. The lighter brown shows the areas of the sandbar that were not inundated by water during the mid-June high flow event; the darker brown shows the entire area of the sandbar on the day it was measured (see Assessing On-River Nesting Habitat for details). The darker brown part of the sandbar was inundated by water during the mid-June high flow event.



"Fortunately protection has come in time to save this beautiful species from complete extermination with which it certainly was threatened."

Arthur Cleveland Bent
Life Histories of North American Gulls and Terns

Introduction

The Tern and Plover Conservation Partnership (TPCP), based at the University of Nebraska-School of Natural Resources and the Nongame Bird Program (NBP), based at the Nebraska Game and Parks Commission (NGPC) work cooperatively on Interior Least Tern and Piping Plover monitoring, research, management, and education-outreach activities. While the proximate focus of our work is the Lower Platte, Loup, and Elkhorn rivers in eastern Nebraska, we address tern and plover issues across the state and region. Our joint program includes terns and plovers nesting at on-river habitats (midstream river sandbars) and off-river or human-created habitats (sand and gravel mines and lakeshore housing developments). The TPCP leads our efforts at off-river habitats; the NBP leads our efforts at on-river habitats.

Focus Animals

The Interior Least Tern (*Sternula antillarum athalassos*) is a state and federally endangered species (50 Federal Register 21784–21792); the species was listed on 27 June 1985 and the recovery plan was issued in September 1990. The listing status of this species is managed under the auspices of the Federal Endangered Species Act (1973) and the Nebraska Nongame and Endangered Species Conservation Act (Neb. Rev. Stat. § 37-801 -11). The Least Tern was first described as a species in 1847 from a type specimen collected in Guadeloupe, West Indies (Checklist of the Birds of North America 1998. American Ornithologists' Union). A 5-year review of the species' recovery status was initiated in 2009 and will be completed in 2010 (J. Ledwin, pers. comm.)

The Piping Plover (*Charadrius melodus*) is a state and federally threatened species (50 Federal Register 50726-50734); the species was listed on 10 January 1986 and the recovery plan was issued in May 1988. The Great Lakes population is listed federally as endangered. The listing status of this species is also managed under the auspices of the Federal Endangered Species Act (1973) and the Nebraska Nongame and Endangered Species Conservation Act (Neb. Rev. Stat. § 37-801 -11). Critical habitat in Montana, Nebraska, South Dakota, and Minnesota for the Northern Great Plains breeding population was designated on 11 September 2002 (67 Federal Register 57637). The United States District Court vacated the Nebraska portion of the critical habitat on 13 October 2005; to date, it has not been reinstated. Piping Plovers were first described as a species in 1824 from a type specimen collected in New Jersey (Checklist of the Birds of North America. 1998. American Ornithologists' Union). A 5-year review of the species' recovery status was completed in 2009 (C. Aron, pers. comm.).

Meriwether Lewis and William Clark observed Least Terns in Nebraska on their 1803–1805 "Voyage of Discovery", referring to them as a 'frequently observed bird'. They also observed Piping Plovers in Nebraska, referring to them as 'small kildee'. John James Audubon traveled along the Missouri River and through Nebraska in 1843. He reported seeing Least Terns in northeastern Nebraska, near the confluence of the Vermillion and Missouri rivers, in present day Dixon County. In 1820, members of the Major Stephen Long Expedition reported finding Least Terns nesting along the Missouri River in the Engineer Cantonment area, in present day Washington County. In 1823, Paul Wilhelm, the Duke of Wurttemberg, reported finding Least Terns nesting near the mouth of the Platte River, in present day Cass County. Members of the Gouverner Kemble Warren Expedition (1855–1857) reported finding Least Terns and Piping Plovers nesting together near the confluence of the Loup and Platte rivers, an area they called the Loup Fork, in present day Platte

County. Ferdinand Hayden, traveling with the Expedition, commented that Least Terns and Piping Plovers were very abundant and nested on sandbars in the Platte River. Least Terns were reported, in 1859, to be nesting along the North Platte River, east of Ash Hollow, in Keith County. Reports from the 1860s and 1870s indicate that Least Terns were nesting in Cedar, Dixon, Lancaster, and Sarpy counties and Piping Plovers were nesting in Dakota, Dixon, Sarpy, and Wayne counties.

Both species of birds rely on bare or sparsely vegetated expanses of sand for nesting and overwintering habitat. In Nebraska, nesting habitat includes sandbars found within river channels, which are created and maintained by hydro-morphological processes, and areas located outside of the river channel that are created and maintained by industrial or commercial activities. The amount of river sandbar nesting habitat has been reduced by the construction of dams and reservoirs, river channelization, bank stabilization, island armoring, hydropower generation, and water diversion. Overwintering habitat includes sandy beaches and barrier islands along the United States Gulf Coast, extending southward into northeastern Mexico and the Caribbean basin. Threats to overwintering habitat include sea level rise due to global climate change and residential, industrial, and commercial development. For the Great Plains populations of species, the broad-scale alteration or destruction of natural river systems that historically provided suitable nesting habitat, in combination with overwintering habitat loss, are considered the likely causes of their population decline.

Focus Area

The focus area includes the Lower Platte, Elkhorn, and Loup River systems in eastern Nebraska (Figures 1 and 2). The Loup, Elkhorn, and Central Platte Rivers are all tributaries of the Lower Platte River. The Lower Platte River is the focus of the majority of this report because of its importance to Interior Least Tern and Piping Plover recovery and because it supports the majority of the birds in the focus area. The Lower Platte River is defined as the 103 river miles lying between the Loup River (near Columbus, Platte County) and Missouri River (near Plattsmouth, Cass County) confluences. River mile 0 is defined as the Missouri-Platte River Confluence. The Lower Platte River passes through eight counties: Platte, Colfax, Butler, Dodge, Saunders, Douglas, Sarpy, and Cass. The Lower Platte River passes through four Natural Resources Districts: Lower Platte South, Lower Platte North, Papio-Missouri, and Lower Loup.

View of the Lower Platte River near the Salt Creek confluence.

In the Lower Platte River, on-river habitat includes midstream sandbars used for nesting, and the river channel which is used for foraging. Off-river (also referred to as human-created) habitat includes sand and gravel mines and lakeshore housing developments.

At off-river habitats, the birds use the waste sand piles for nesting and the 'pit' lakes for foraging. In eastern Nebraska, off-river habitats are rarely found more than three miles from a river, and birds nesting at off-river habitats often travel to the river to forage. See Table 1 for a listing of off-river habitat used by terns and plovers in 2009.

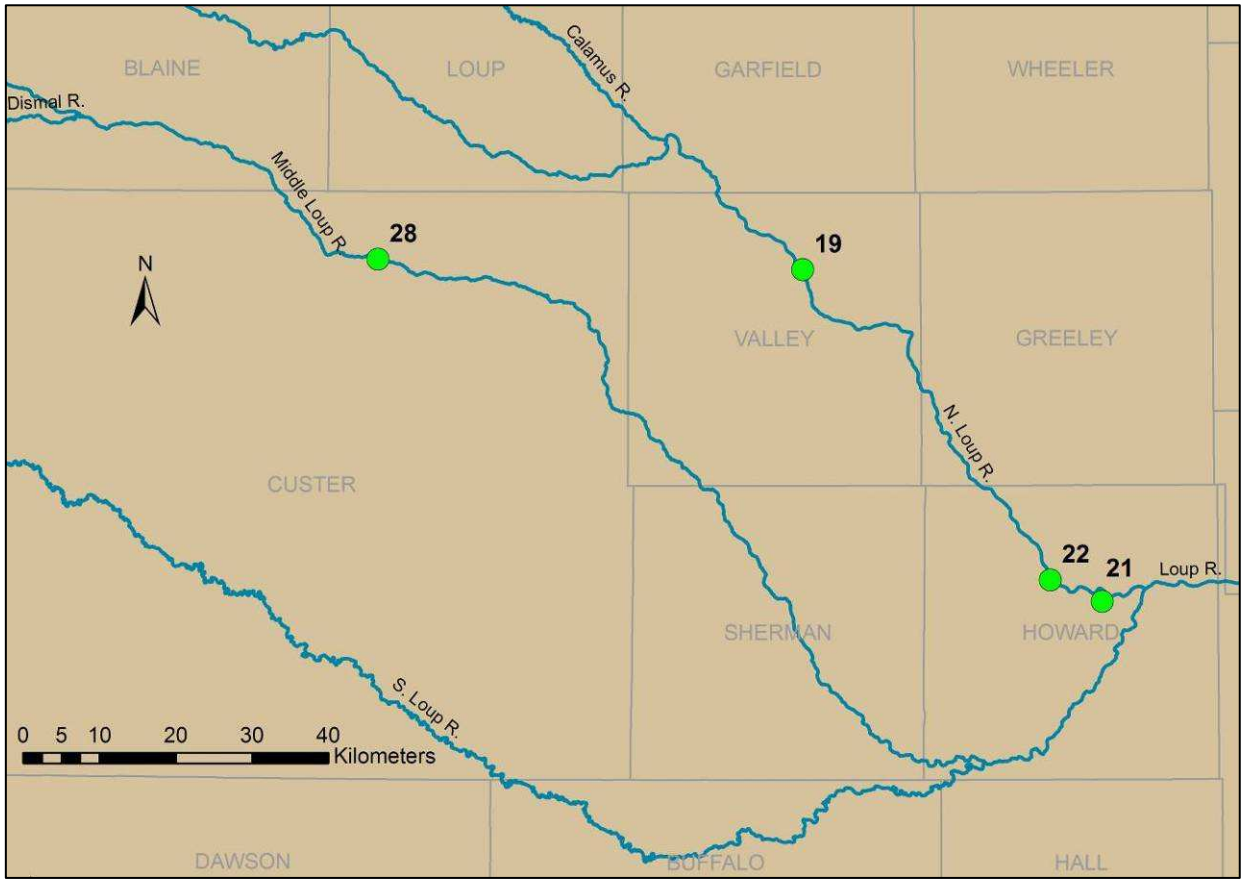


Figure 1. Locations of off-river Interior Least Tern and Piping Plover nesting areas in the Middle and North Loup Rivers, Nebraska. Off-river sites can be matched to numbers in Table 1.

Adult Piping Plover with a 3 – 4 day old chick.

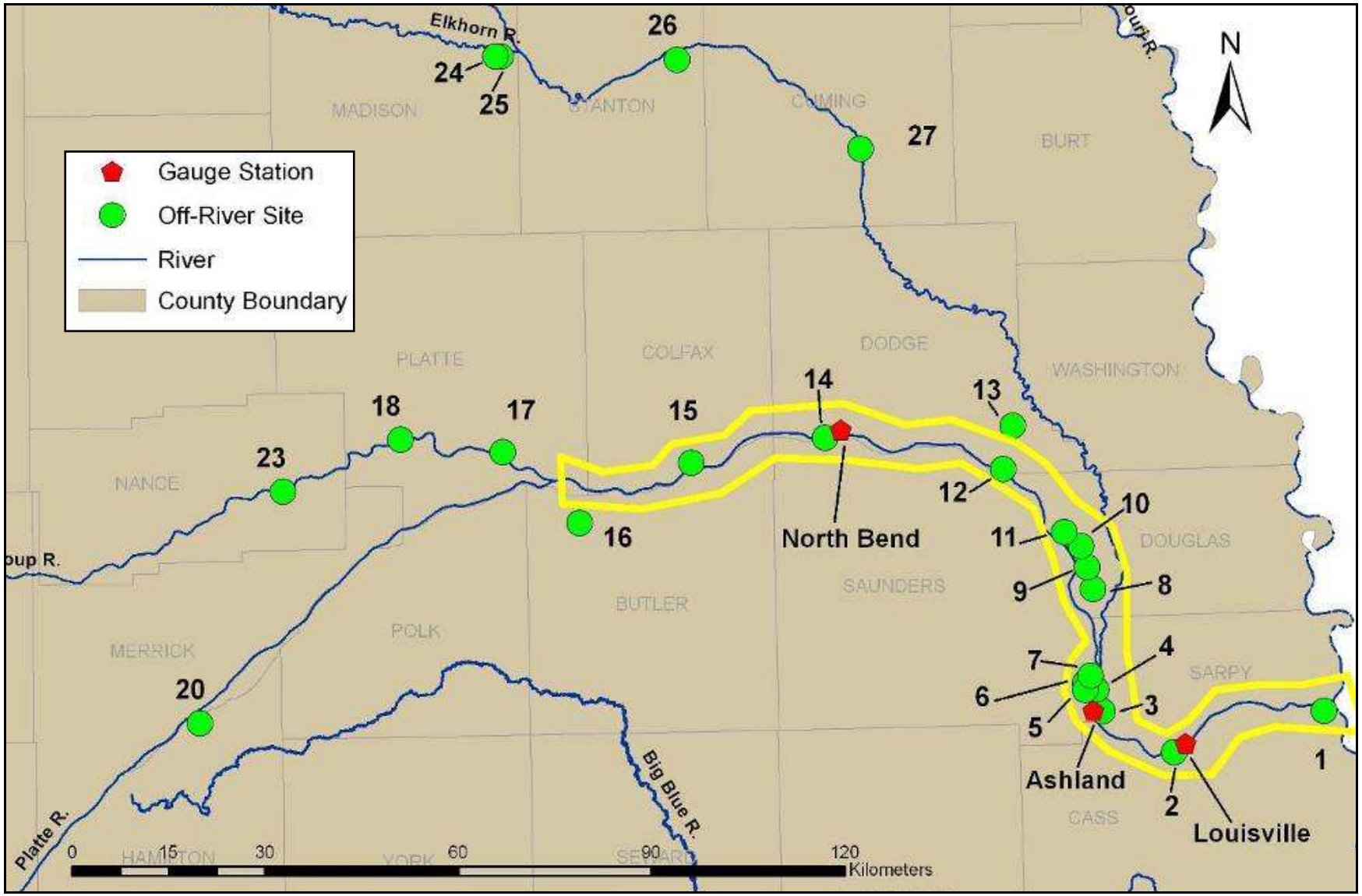


Figure 2. Locations of all known off-river Interior Least Tern and Piping Plover nesting areas in eastern Nebraska; our focus area is outlined in yellow. Off-river sites can be matched to numbers in Table 1.

Table 1. Off-river Interior Least Tern and Piping Plover nesting sites; site numbers correspond with Figures 1 and 2.

Site	Site Name*	River	Owner	Site Type	County
1	Four Mile Creek (Oreopolis)	Platte	Lyman Richey	Active Mine	Cass
2	Louisville Lakes (Louisville)	Platte	Western Sand and Gravel	Active Mine	Sarpy
3	Linoma Beach (Linoma Beach)	Platte	Lyman Richey	Active Mine	Sarpy
4	Melia (Melia)	Platte	Private	Inactive Mine	Sarpy
5	Riverside (Thomas Lakes)	Platte	Western Sand and Gravel	Active Mine	Saunders
6	NW Riverside (Sand Creek)	Platte	Western Sand and Gravel	Active Mine	Saunders
7	Big Sandy (Big Sandy)	Platte	Homeowners' Association	Housing Development	Saunders
8	OMG-Venice (OMG)	Platte	Old Castle Materials Group	Active Mine	Douglas
9	Lake Clagus (Lyman Richey Waterloo)	Platte	Lyman Richey	Active Mine	Douglas
10	Timber Lake Lodge (Mallard Landing)	Platte	Dial Development	Housing Development	Douglas
11	Pleasure Lake (Lyman Richey Valley)	Platte	Lyman Richey	Inactive Mine	Douglas
12	N Woodcliff (Western Fremont)	Platte	Western Sand and Gravel	Active Mine	Dodge
13	NE Fremont (NE Fremont)	Platte	Lyman Richey	Active Mine	Dodge
14	Riverview Shores (Riverview Shores)	Platte	Homeowners' Association	Housing Development	Dodge

Site	Site Name*	River	Owner	Site Type	County
15	Socorro Lake (Lake Socorro)	Platte	Homeowners' Association	Housing Development	Colfax
16	Wilson Creek (Bellwood)	Platte	Central Sand and Gravel	Active Mine	Butler
17	Shady Lake Road (Columbus)	Loup	Central Sand and Gravel	Active Mine	Platte
18	W Lookingglass Creek WMA (Monroe)	Loup	Central Sand and Gravel	Inactive Mine	Platte
19	Haskell Creek (Ulrich's)	Loup	Ulrich Sand and Gravel	Active Mine	Valley
20	Overland (Central City)	Loup	Overland Sand and Gravel	Active Mine	Hamilton
21	North Loup SRA (North Loup)	Loup	Central Sand and Gravel	Active Mine	Howard
22	E Elba (Tri-County)	Loup	Tri-County Sand and Gravel	Active Mine	Howard
23	LPPD-Genoa Loup Diversion (Sandpile)	Loup	Preferred Rocks of Genoa-LPPD	Active Mine	Nance
24	Medelman's Lake (Medelman's)	Elkhorn	Central Sand and Gravel	Active Mine	Madison
25	Andy's Lake (Andy's)	Elkhorn	Pilger Sand and Gravel	Inactive Mine	Madison
26	Red Fox WMA (Red Fox)	Elkhorn	Pilger Sand and Gravel	Inactive Mine	Stanton
27	Horseshoe Lake (Stalps')	Elkhorn	Stalp Sand and Gravel	Active Mine	Cumming
28	Paulsen Gates (Gates)	Loup	Paulsen Sand and Gravel	Active Mine	Custer

*Site name as recorded in Nebraska Game and Parks Commission database; informal site names are in parentheses.

2009 River Conditions

The amount of on-river sandbar habitat that is available to nesting terns and plovers is unpredictable from year to year. It is dependent on the volume and depth of water flowing in the river, seasonal and daily fluctuations in river flow, stochastic events, ground water levels, and river channel morphology that allows for sandbar development and maintenance. General flow conditions on the Lower Platte River were monitored by checking USGS water monitoring station gage levels (http://waterdata.usgs.gov/ne/nwis/rt), by visual inspection of the river at bridge crossings, and by direct inspection via canoe and kayak. Figures 3 and 4 illustrate river sandbar conditions at the time birds were initiating nests in 2009.

River sandbar conditions, in 2009, were largely the result of the high flows that occurred during late May and early June of the previous year, 2008. The high flows of 2008 followed seven years of drought in the central Great Plains that resulted in unusually low annual river flows (D. Ginting, D., R.B. Zelt, and J.I. Linard. 2008. U.S. Geological Survey Scientific Investigations Report 2007-5267). The peak flow recorded in 2008 at the Louisville gage was 96,600 cubic feet per second (cfs) on 31 May. The peak flow recorded in 2008 at the North Bend gage was 45,500 cfs on 30 May. These high flows deposited sediment that created new sandbars and scoured and refurbished pre-existing sandbars. The 2008 peak flows measured at both of these gages were substantially higher than the flow (38,170 cfs) recommended as necessary to maintain nesting sandbar habitat in the Lower Platte River (J. Parnham, 2007. Hydrologic analysis of the lower Platte River from 1954 – 2004, with special emphasis on habitat of the endangered Least Tern, Piping Plover, and Pallid Sturgeon. Bishop Museum, Honolulu, HI). Figures 5 through 8 graphically illustrate flow conditions on the Lower Platte River through the 2009 nesting season, as measured at the Louisville and North Bend USGS gaging stations.

In 2009, river flows during the early part of the nesting season (May and early June) were low in comparison to 2008. Maximum discharge levels during this period were less than 7,500 cfs at the North Bend gage and less than 10,000 cfs at the Louisville gage. These low flow conditions exposed extensive sandbar complexes along the entire length of the Lower Platte River. Rainfall upstream of the Lower Platte River during early to mid-June produced substantial flow increases. Peak seasonal flows reached 15,300 cfs at North Bend on 21 June and 26,500 cfs at Louisville on 22 June 2009. These peak flows completely inundated many sandbars. After water levels dropped, the surfaces of the inundated sandbars were coated with silt, which is not suitable for tern or plover nesting. The silted areas did not fully dry until the first week of July. Flows steadily declined during the remainder of the nesting season following the June peak flows. Figure 9 is an example of sandbar inundation caused by the 21 – 22 June 2009 high water flows.

2009 Off-River Conditions

In 2009, off-river conditions were largely unchanged from 2008. The nationwide economic downturn affected both the sand and gravel mining and lakeshore housing development industries, slowing the pace of their on-the-ground expansion. Several sand and gravel mining companies did modify their operations by opening new pits, relocating dredges, or moving slurry pipes, but no new waste sand habitat suitable for nesting was created that the birds colonized. Several mine sites ceased production, which allowed the birds to nest at those locations without threat of human interference. Construction at lakeshore housing developments continued at a slower pace during the off-season (August – April).

Figure 3. Lower Platte River sandbar located at river mile 99 on 3 June 2009.

Figure 4. Lower Platte River sandbar located at river mile 2 on 12 June 2009.

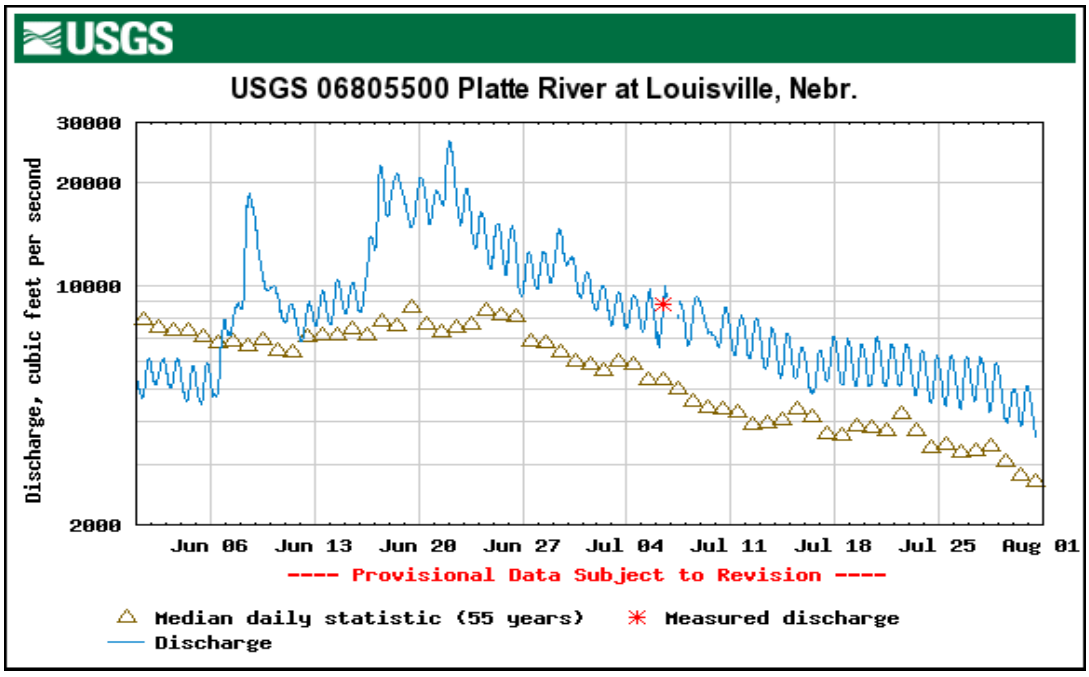


Figure 5. Daily water discharge (cubic feet per second; cfs) measured at the Louisville, Cass County USGS gage station, 2009.

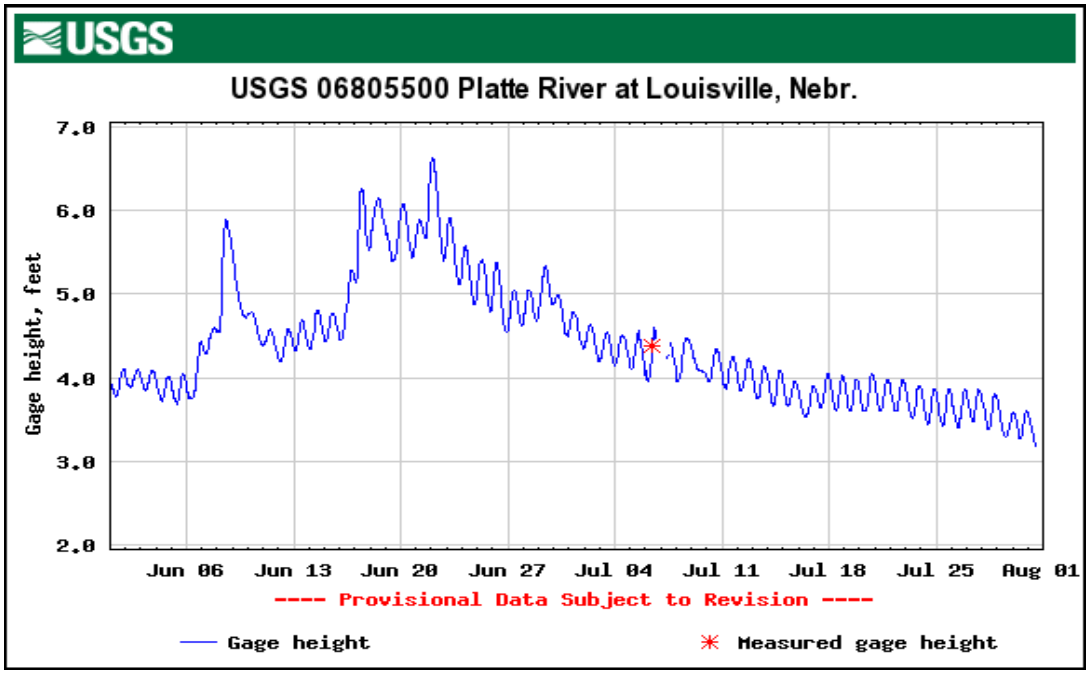


Figure 6. River height (feet) measured at the Louisville, Cass County USGS gage station, 2009.

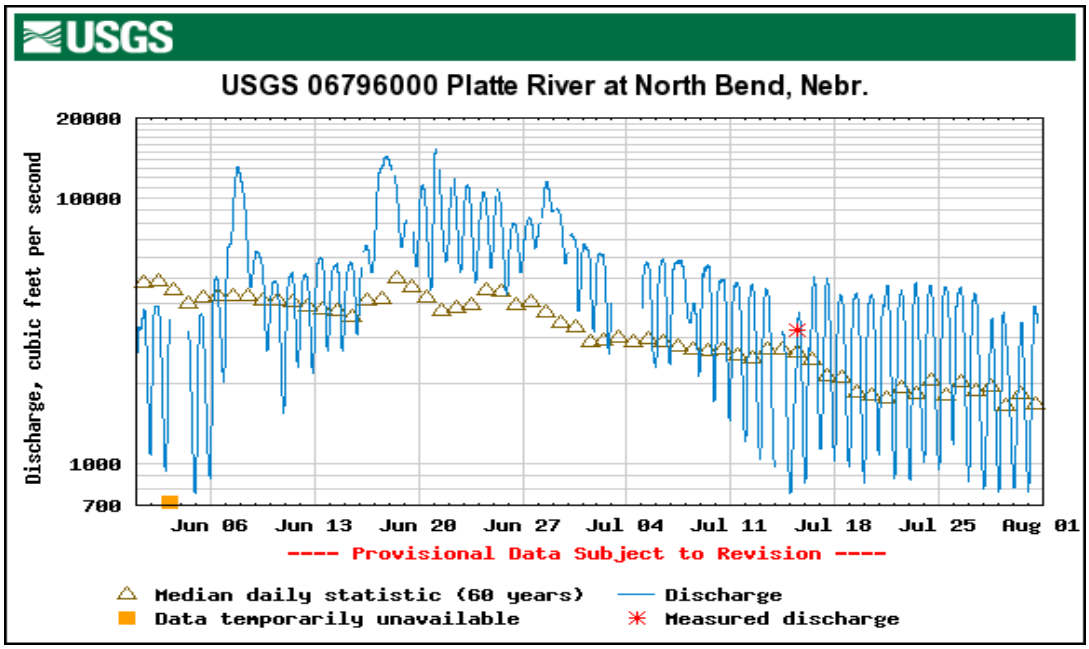


Figure 7. Daily water discharge (cubic feet per second; cfs) measured at the North Bend, Dodge County USGS gage station, 2009.

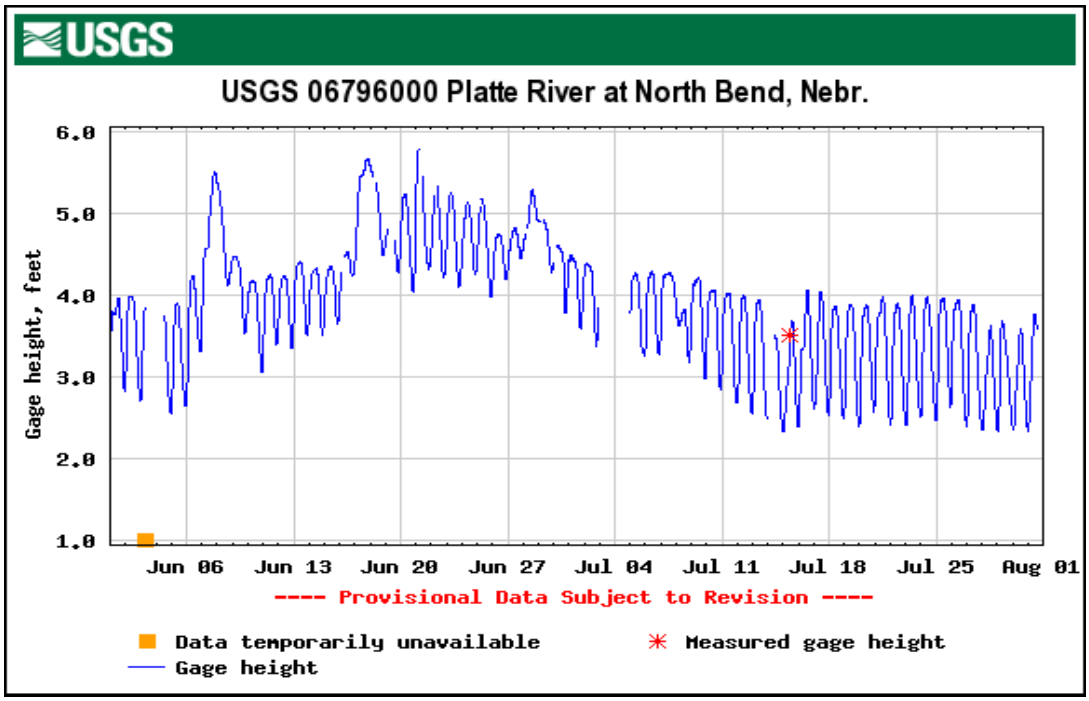


Figure 8. River height (feet) measured at the North Bend, Dodge County USGS gage station, 2009.

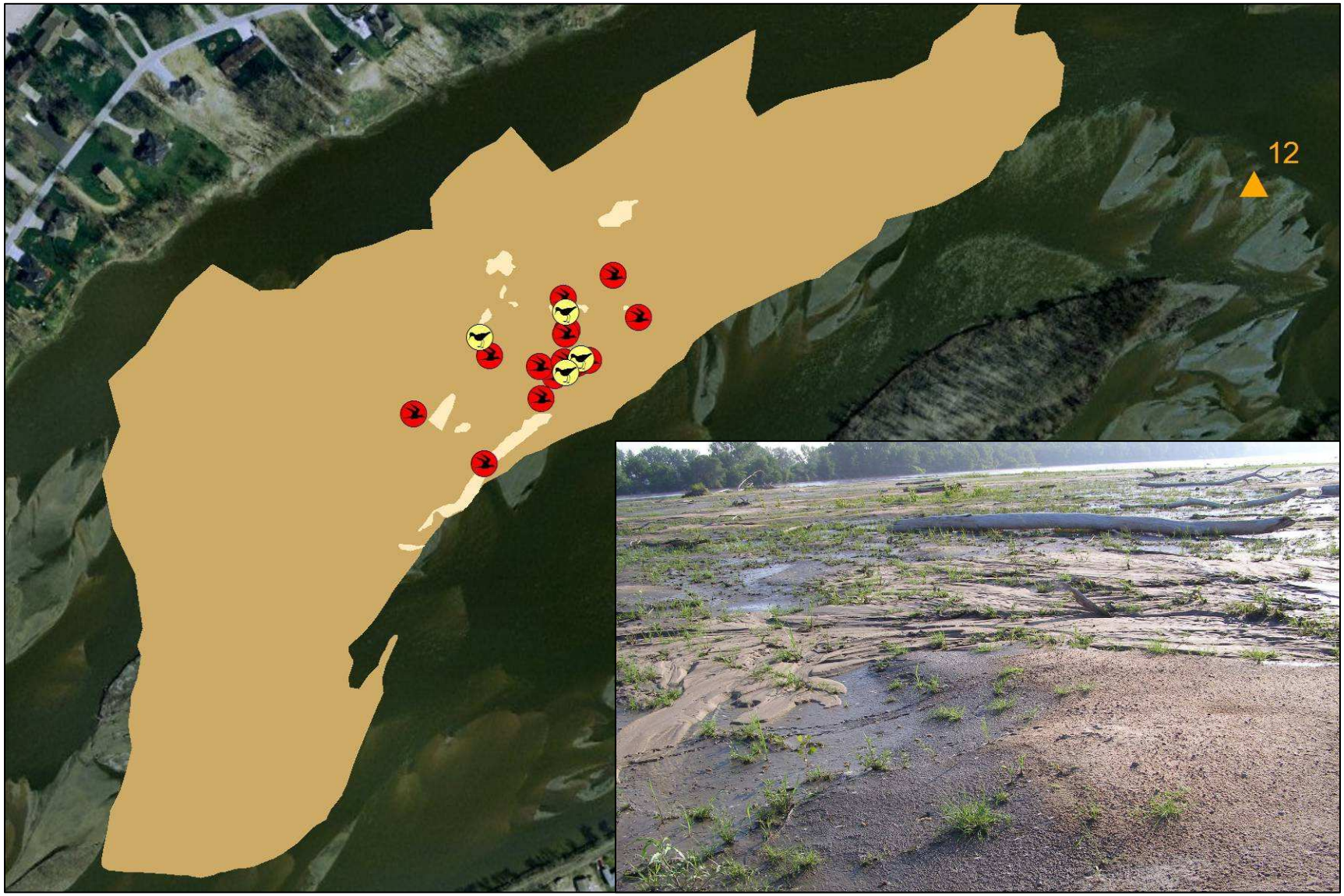


Figure 9. Nest locations at East Cedar Creek Sandbar (RM 12). The sandbar area was originally measured on 29 May and totaled 17.50 ha (darker brown). Only 0.24 ha of the sandbar was not inundated (lighter brown) by the mid-June high flow event. The photo inset shows the sandbar on 22 June 2009 following the high flow event. The bottom right corner shows an area of higher elevation that was not inundated.

Monitoring

2009 Mid-Summer Survey

Beginning in 1987, the Nebraska Game and Parks Commission Nongame Bird Program has coordinated a standardized survey of adult Interior Least Terns and Piping Plovers on the Lower Platte River. The TPCP began participating in this survey in 1999. The survey area extends 103 river miles, from near Columbus, Platte County to near Plattsmouth, Cass County. The established protocol is to survey the lower Platte River on-river sites by airboat and the off-river sites by vehicle and foot during the 4-day mid-June survey period. In 2009, the survey was planned to be conducted during the period of 15 – 19 June. High water on the Lower Platte River prevented safe access to the river; consequently our survey was limited to off-river sites during the planned survey period (15 – 19 June). Estimates from the river were informally derived from surveys conducted in the weeks after the high water receded. **A formal, statistically-based methodology was not used during these surveys and the following figures are based on raw survey numbers or estimates, which limits their utility**. Results are shown in Figures 10 through 17.

Sandbar at RM 66 on 8 July 2009

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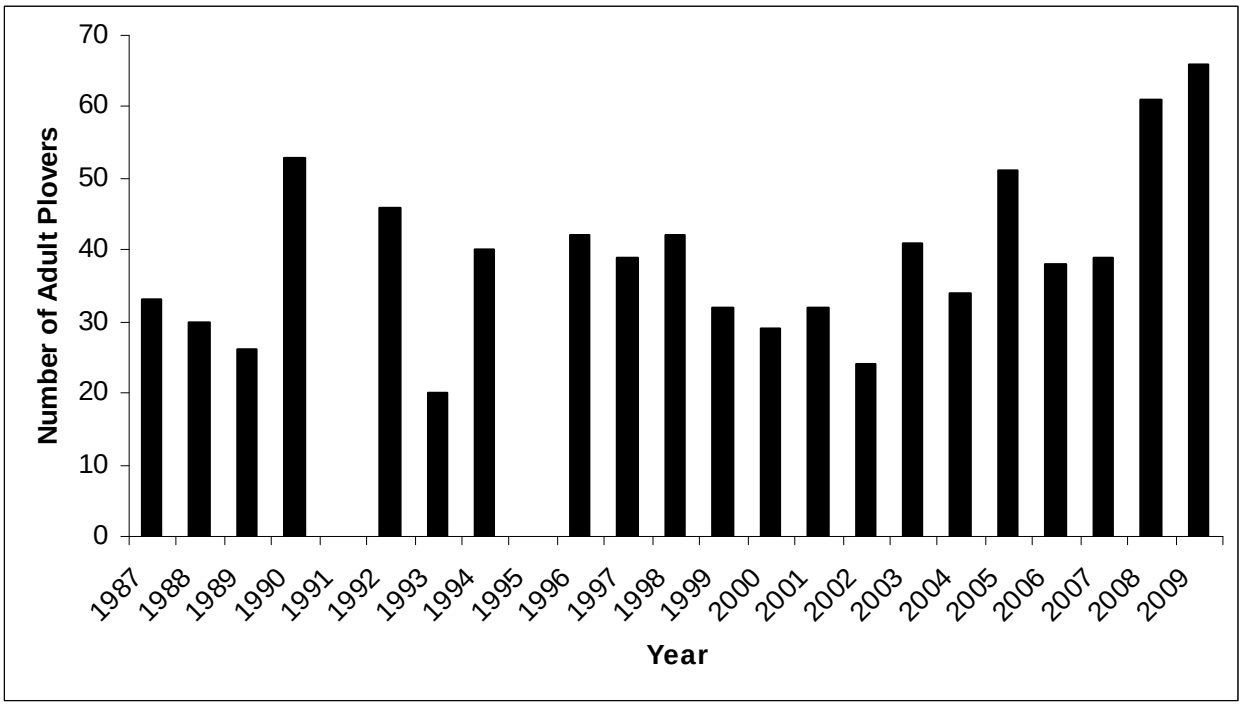


Figure 10. Number of adult Piping Plovers recorded at off-river sites along the Lower Platte River during the mid-summer survey (1987 – 2009).

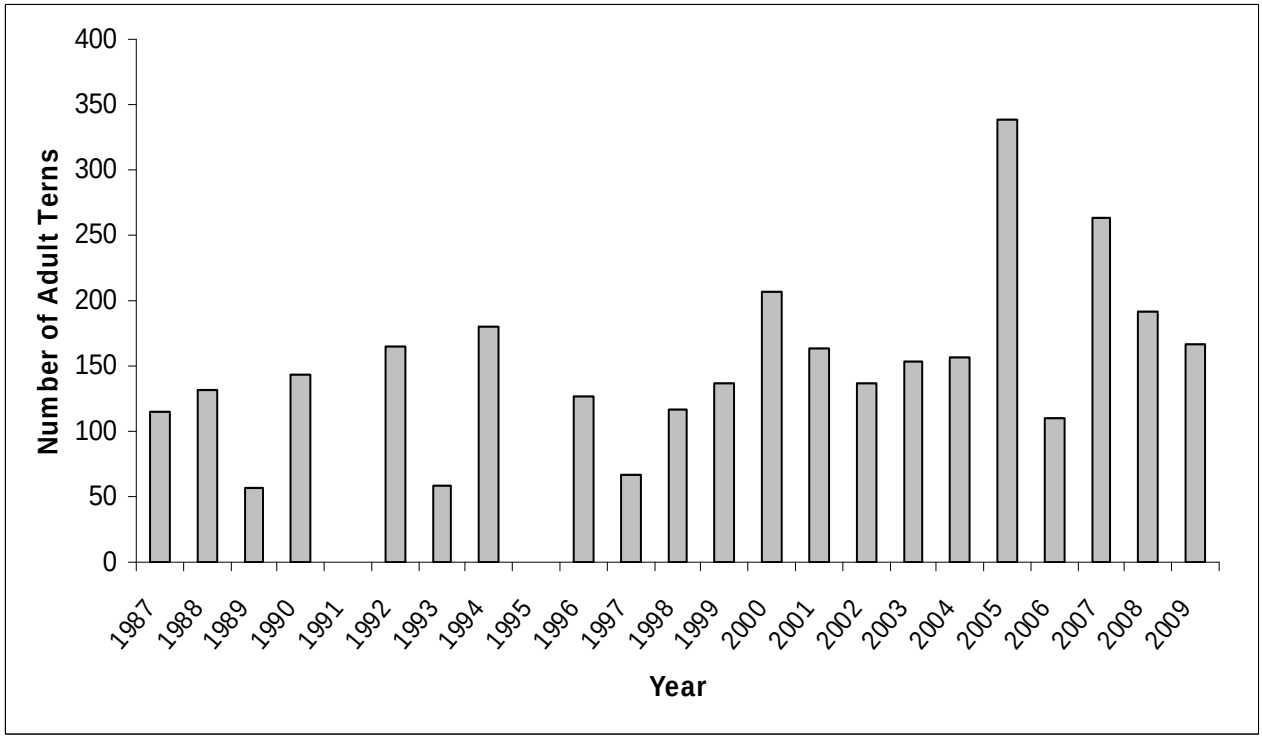


Figure 11. Number of adult Interior Least Terns recorded at off-river sites along the Lower Platte River during the mid-summer survey (1988 – 2009).

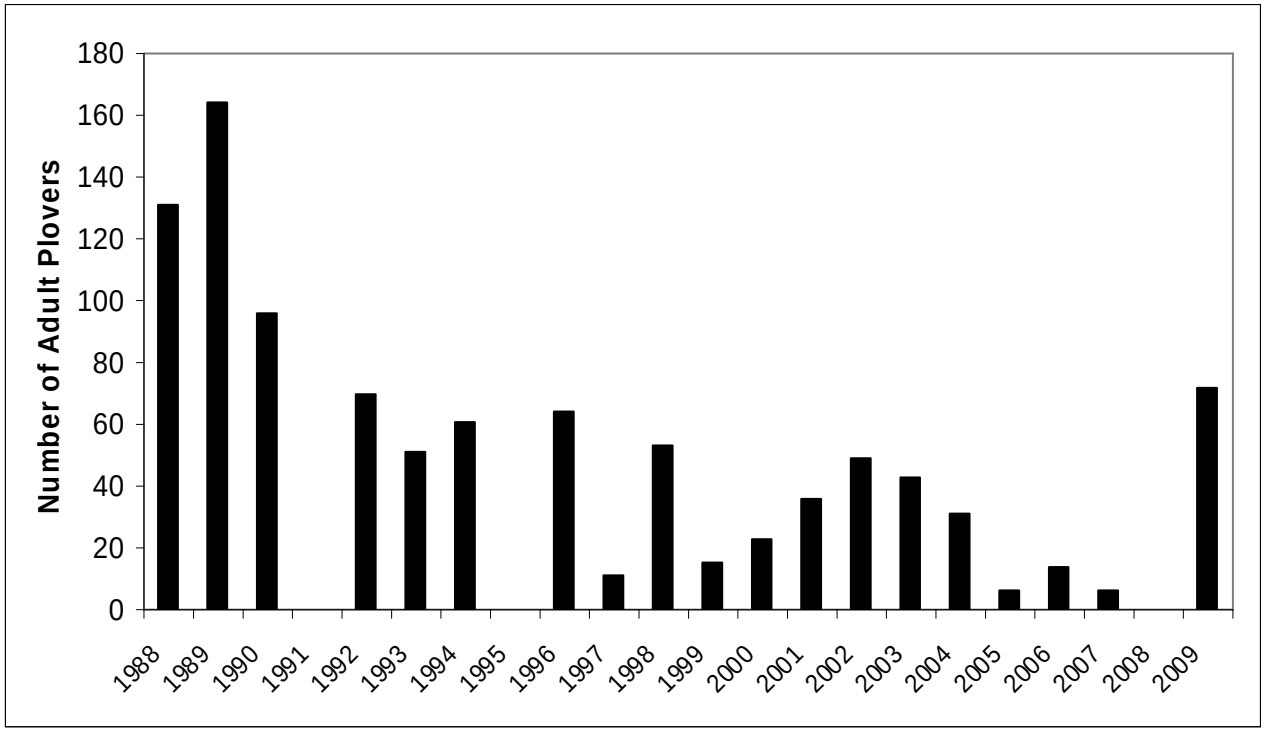


Figure 12. Number of adult Piping Plovers recorded on the Lower Platte River during the mid-summer survey (1988 – 2009).

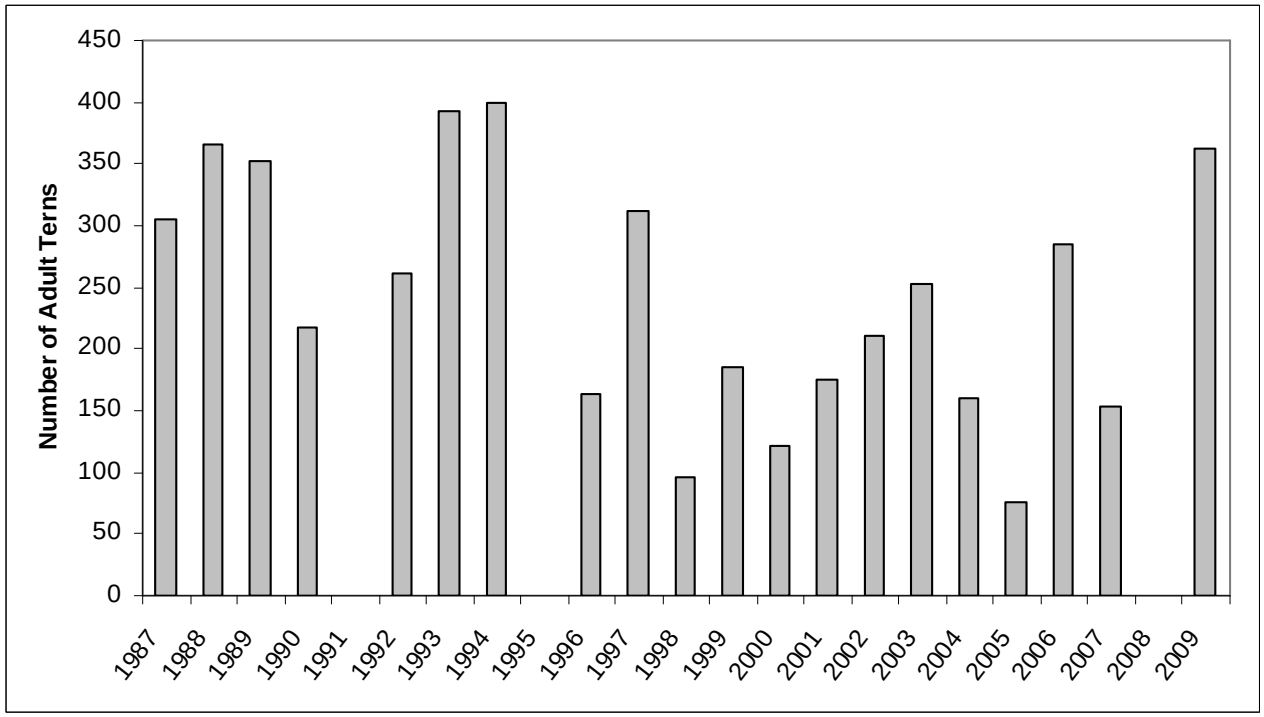


Figure 13. Number of adult Interior Least Terns recorded on the Lower Platte River during the mid-summer survey (1987 – 2009).

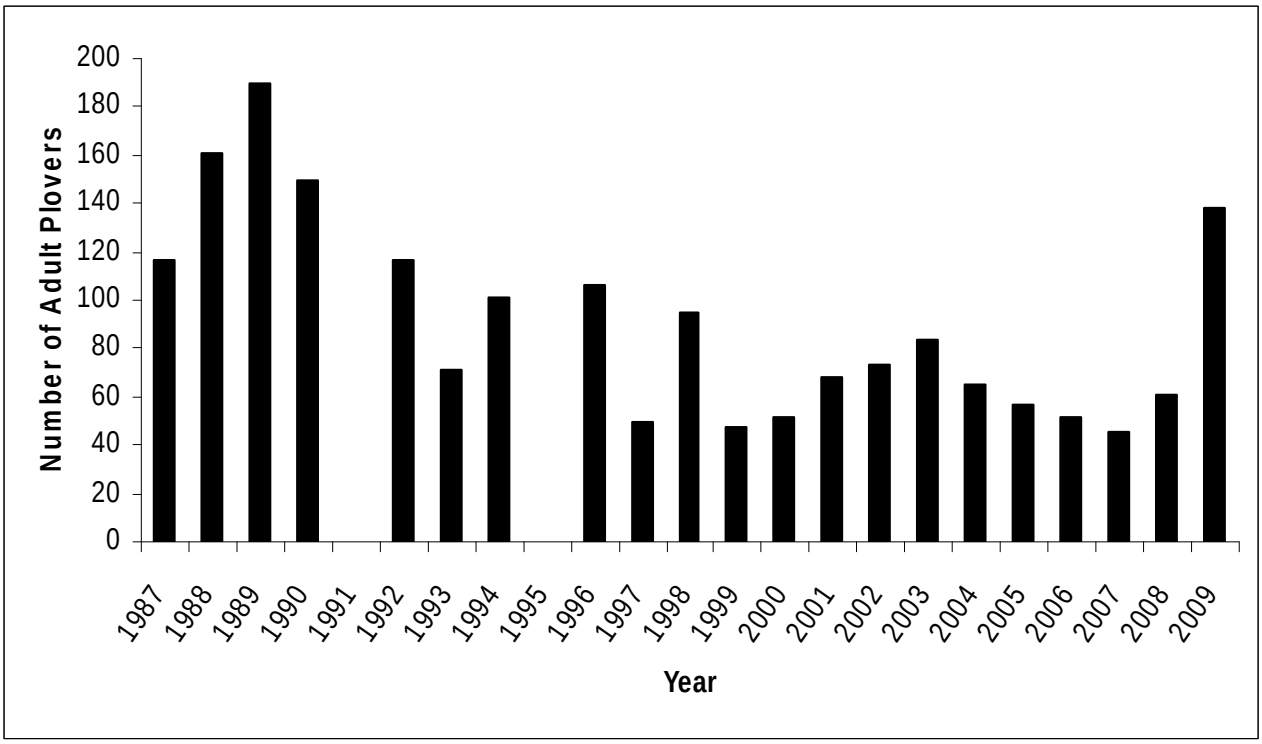


Figure 14. Total (on-river and off-river surveys combined) number of adult Piping Plovers recorded the Lower Platte River mid-summer survey (1987 – 2009).

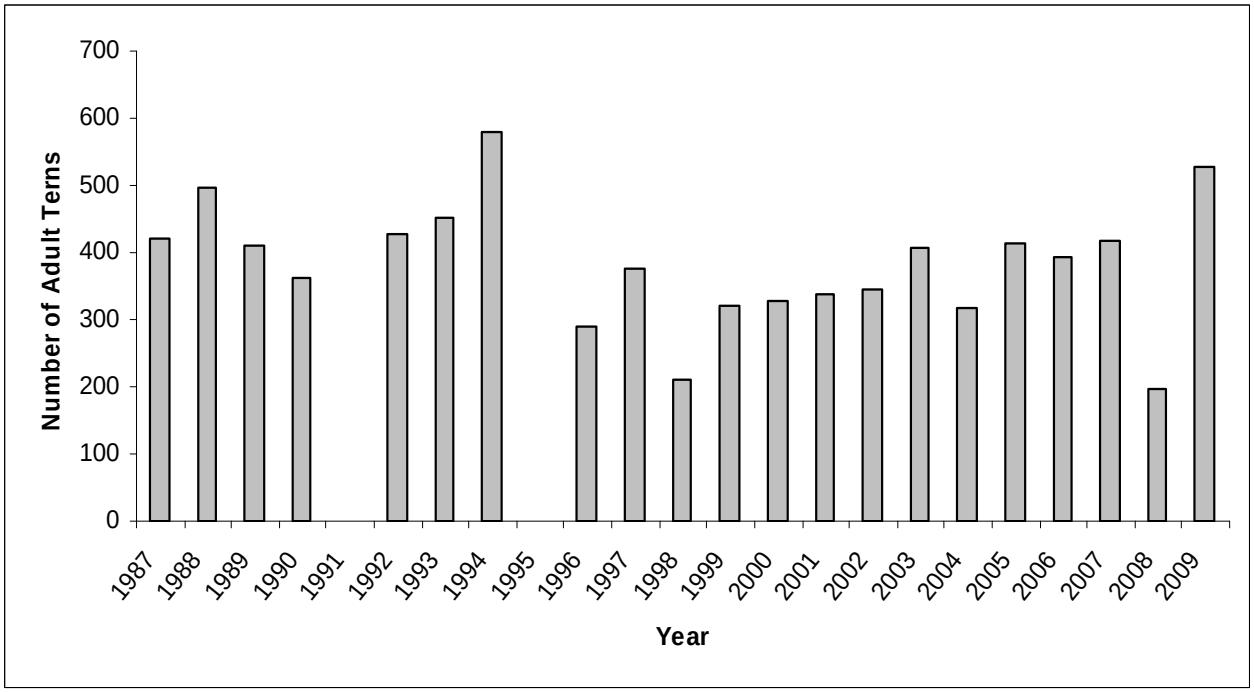


Figure 15. Total (on-river and off-river surveys combined) number of adult Interior Least Terns recorded during the the Lower Platte River mid-summer survey (1987 – 2009).

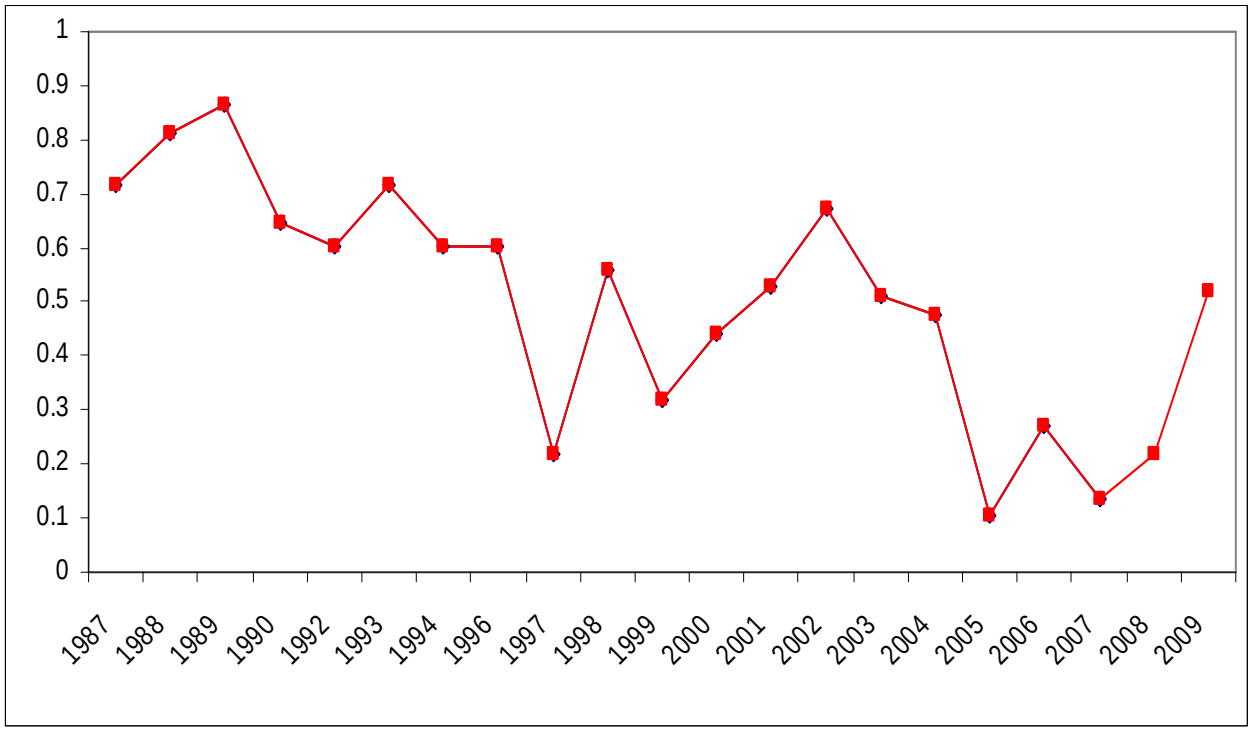


Figure 16. Proportion of adult Piping Plovers recorded at on-river habitat in the Lower Platte River during the mid-summer survey (1987 – 2009; note: 1991 and 1995 are not included because of incomplete data).

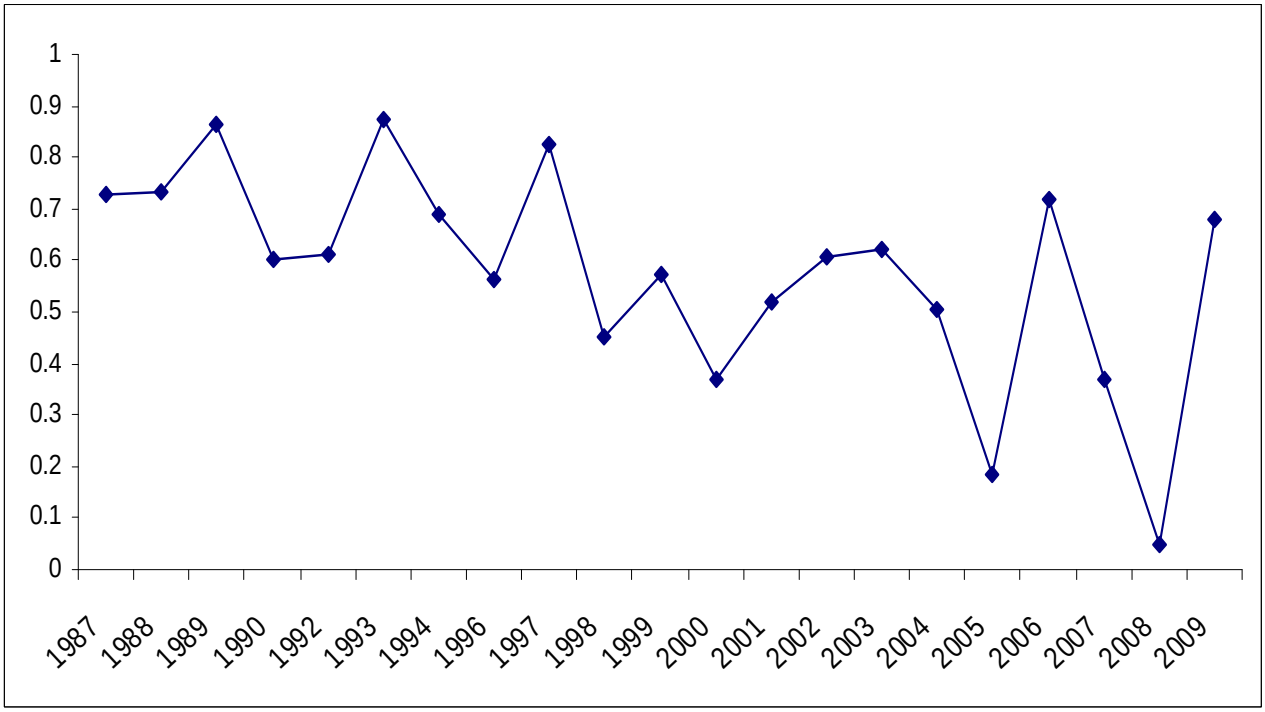


Figure 17. Proportion of adult Interior Least Terns recorded at on-river habitat in the Lower Platte River during the mid-summer survey (1987 – 2009; note: 1991 and 1995 are not included because of incomplete data).

Regional Movements of Color-banded Piping Plovers

We observed a number of previously color banded Piping Plovers in our Lower Platte River-Loup River study area in 2008 and 2009; here we present our combined 2008 and 2009 observations. We were able to identify the plovers' original banding location based on the color of the flag carried on the birds' upper leg, different colors indicate different parts of the species range. All of the plovers carrying light blue flags on their upper legs were originally banded along the Lower Platte River in 2008; none originated from the USACE Missouri River captive rearing project (G. Pavelka, pers. comm.) or the Central Platte River-Platte River Recovery Implementation Program-USGS color banding program (M. Sherfy, pers. comm.), both of which used light blue flags. All of the plovers carrying green flags on their upper legs were originally color banded along the Gavin's Point Dam reach of the Missouri River between Sioux City, Dakota County, NE and Yankton, Yankton County, SD (G. Pavelka, D. Catlin and J. Felio, pers. comm.). The plover carrying a yellow flag on its upper leg was originally color banded on Lake Sakakawea in North Dakota.

One day old Piping Plover chick carrying a light blue flag on the upper leg indicating the bird's Lower Platte River origins.

Seventeen color-banded Piping Plovers were seen in both 2008 and 2009; ten of these individuals were seen at the same site in both years and seven were seen at different sites in 2008 and 2009. Four plovers, banded as chicks along the Lower Platte River in 2008, were seen in 2009; two were found nesting along the Lower Platte River and two were seen on the USACE constructed sandbar at Missouri River river mile 826.5 on Lewis and Clark Lake in South Dakota (South Island).

Fifteen plovers, all originally banded on the Missouri River's Gavin's Point Dam reach, were seen at five different off-river sites along the Lower Platte River in 2008 and 2009 (Figure 18). Seven were observed at the Riverview Shores housing development, three at the LPPD-Genoa Loup Diversion, two at the Timber Lake Lodge-Mallard Landing housing development, two at the N Woodcliff-Western Fremont sand and gravel mine, and one at the Wilson Creek-Bellwood sand and gravel mine. Sixteen plovers, also all from the Missouri River's Gavin's Point Dam reach, were seen on sandbars in the Lower Platte River in 2008 and 2009 (Figure 18). They were seen on sandbars at river miles 99, 90, 72, 56.5, 51.5, 46, 40, 31, 15, and at Camp Ashland South, West Cedar Creek, and Middle Cedar Creek.

One yellow flagged plover was seen in 2009 on Lower Platte River sandbar 'Interstate South' located at river mile 24.5 (Figure 18). This plover was banded near Dakota Resorts, Lake Sakakawea, North Dakota on 29 June 2008. The individual was observed with its apparent mate on 16 June 2009 attending a nest. The sandbar was inundated the following day and the bird was not re-sighted.

Five Piping Plovers, all originally banded along the Lower Platte River in 2008, were seen along the United States Gulf Coast during the winter of 2008 – 2009. A single plover was observed at the following locations: Raccoon Island, Louisiana, North Pass and Redfish Bay, Texas, Mollie Beattie, Texas, Mustang Island, Texas, and South Padre Island (Figure 19).

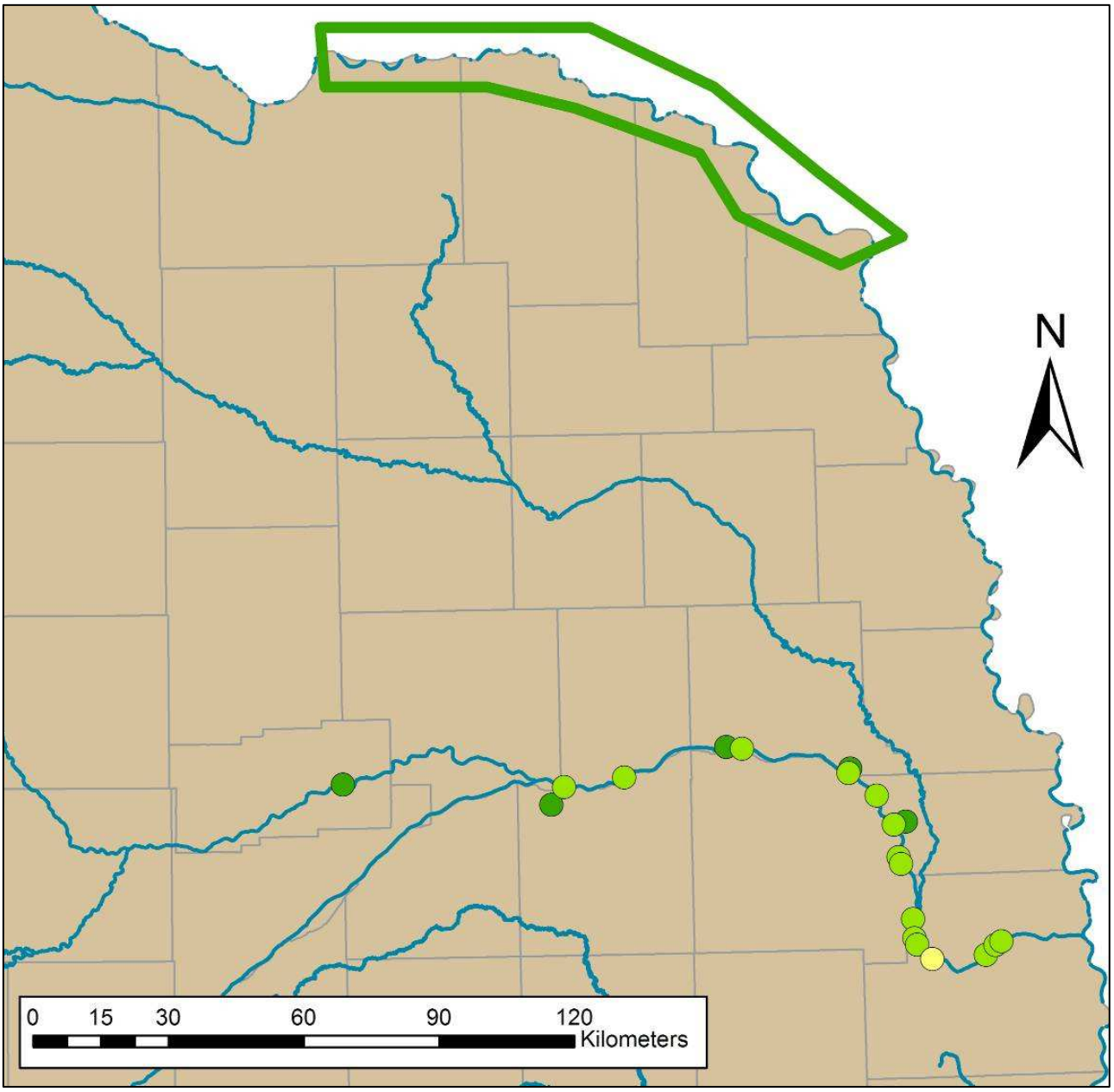


Figure 18. Resighting locations of previously color banded Piping Plovers in the Lower Platte River-Loup River study area in 2008 and 2009. All but one of these birds was originally color-banded on the Gavin's Point Dam reach of the Missouri River (green box). Dark green dots mark locations where Piping Plovers were seen at off-river sites and light green dots mark locations where Piping Plovers were seen on river sandbars. The single yellow dot marks the location where the bird originally banded at Lake Sakakawea was seen on the Lower Platte River.

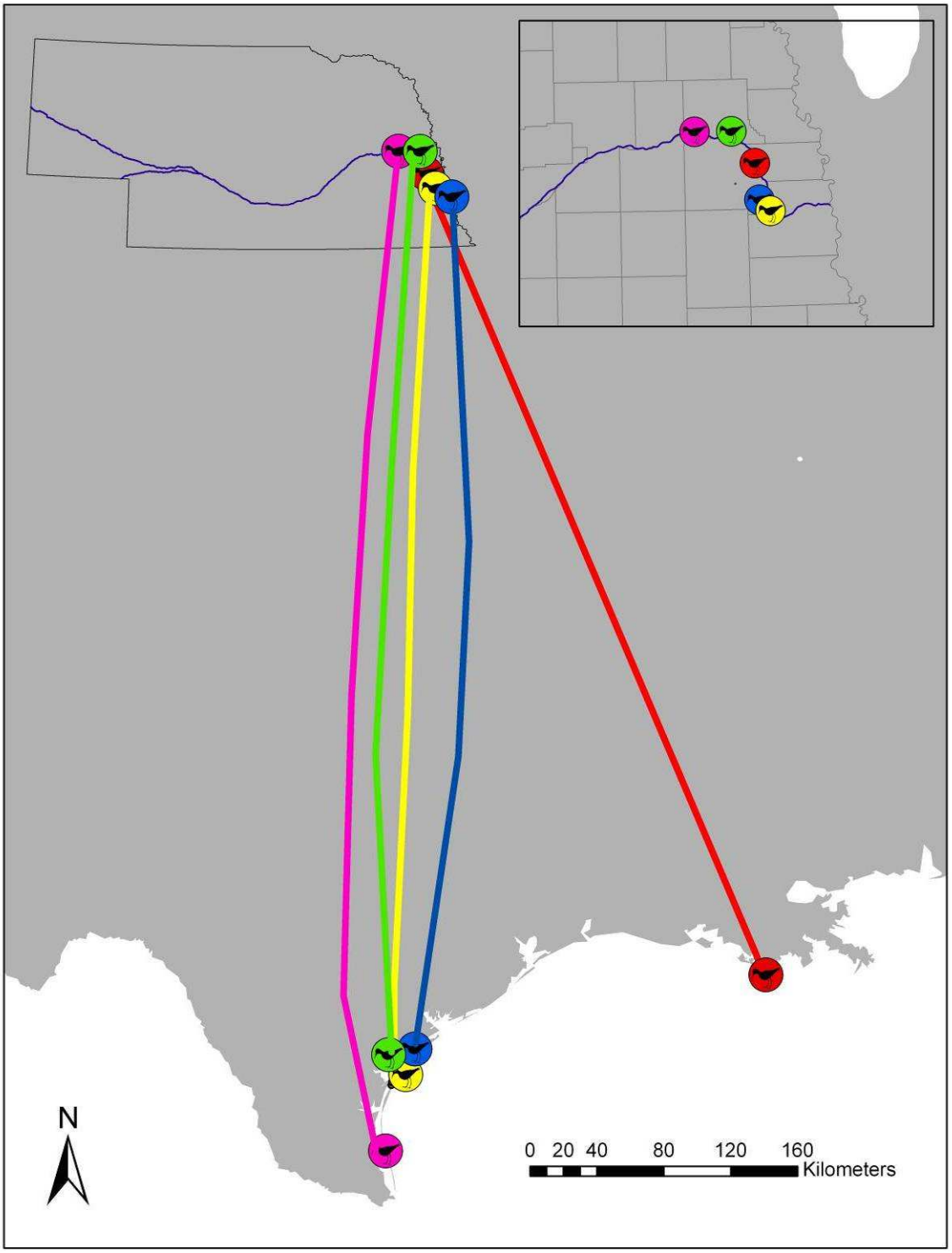


Figure 19. Re-sighting locations of Piping Plovers originally color banded on the Lower Platte River and seen during the winter on the Gulf Coast.

Nest Monitoring

Methods – Off-river habitat

Beginning in mid-April, we began visiting all sand and gravel mines and lakeshore housing developments in the focus area. Terns and plovers in the Lower Platte River are fairly philopatric and return first to areas where they have nested successfully in the past before they colonize new locations; therefore, we chose to concentrate our early season attention on sites that supported nesting terns and plovers in the past. Each site was visited regularly, every 4 – 5 days, and thoroughly surveyed for birds. The same observers surveyed the same sites in an effort to minimize inter-observer bias. When individuals of either species were located, they were observed to determine, behaviorally, whether they were migrants or potential breeders. When potential breeders were observed at a site, the open sandy areas were thoroughly searched for nests or evidence of nest scrapes. Most often nests were located by observing adult birds sitting on nests incubating eggs. We recorded the location of every tern and plover nest we found using a handheld GPS unit (Garmin Geko models 201 or 301) and each nest was assigned a unique number. Following the method of Hays and LeCroy (H. Hays and M. LeCroy 1972 Wilson Bulletin 83: 425 – 429), we floated the eggs in each nest to determine when they were laid; nearly all nests were located from 1 – 6 days after the first egg was laid. Using this egg floating data we calculated the eggs' expected hatching date, assuming a 28-day incubation period for plovers and a 21-day incubation period for terns. We continued to locate nests throughout the season. All nests at off-river sites were visited every 4 – 5 days during the incubation period to check for the presence of incubating adults and to count the number of eggs present. We scored the status of each tern and plover nest based on the following criteria:

> Confirmed successful: 'pipped' eggs or newly-hatched chick(s) observed in or in the immediate vicinity (< 1 meter) of the nest cup
> Likely successful: empty but intact nest cup found with or without pieces of eggshell on or after the expected hatch date
> Confirmed failure: nest cup and/or eggs found destroyed
> Likely lost: nest not relocated on repeat visits prior to expected hatch date

At off-river sites, particularly sand and gravel mines, some terns and plovers placed their nests in areas that were not accessible to us for safety reasons. In these cases, we only recorded the number of nests, adults, juveniles, fledglings, and chicks that were visible to us from a safe distance.

Floating an Interior Least Tern egg; the position of an egg when placed, momentarily, in a cup of water is indicative of how 'old' the egg is; 'older' eggs float higher in the water column than 'younger' eggs. The egg in this photograph is approximately 1 – 2 days old.

On each of the regular visits to each site, the total number of active nests and the total number of terns and plovers of each age class were recorded. The age classes were as follows:

Adults: birds of both sexes in full adult plumage
Chicks: 1 – 3 days, 4 – 10 days, 11 – 15 days, based on photos provided by USACE
Juveniles: chicks older than 15 days, but still dependent on their parents
Fledglings: chicks capable of sustained flight and independent of their parents

If any birds, adults or chicks, with colored leg bands were observed, the color band combination was recorded. Any miscellaneous observations, including evidence of disturbance, weather, or injuries were recorded.

Nesting locations at sand and gravel mines; the wire structure in the right photograph is a Piping Plover nest exclosure (see Management for details).

Results Off-River

Nesting Interior Least Terns and Piping Plovers were distributed across 16 off-river sites in the entire study area (four along the Loup River and ten along the Lower Platte River) in 2009. This included four lakeshore housing developments and ten sand and gravel mines. All of these sites had been used for nesting in previous years. We are not aware of any new or previously unused off-river sites being colonized for nesting in 2009; however, isolated nests could have escaped our detection. See Figures 20 and 21 for nest distribution across the focus area. See Table 1 for description and location information for all sites, used and unused, in the focus area.

Nesting locations at lakeshore housing development; the wire structures are Piping Plover nest exclosures (see Management for details).

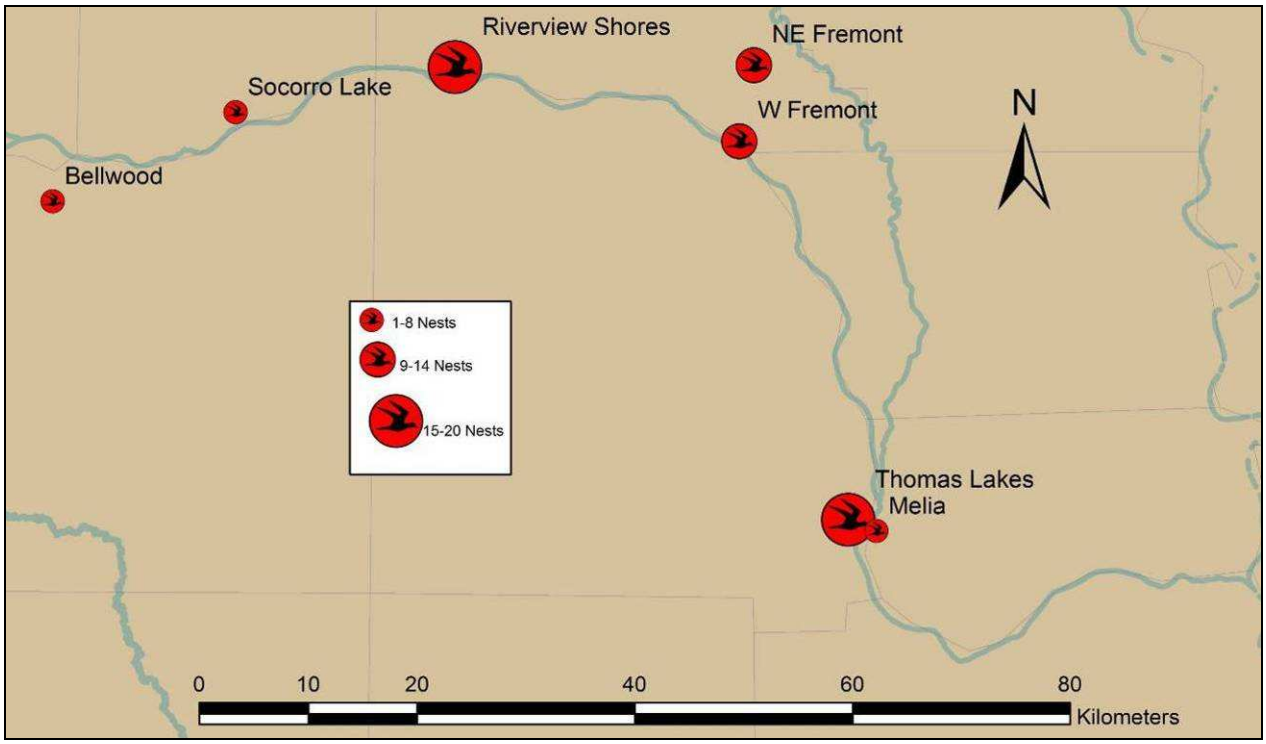


Figure 20. Location of 2009 Lower Platte River off-river (sand and gravel mines and lakeshore housing developments) Interior Least Tern nesting sites

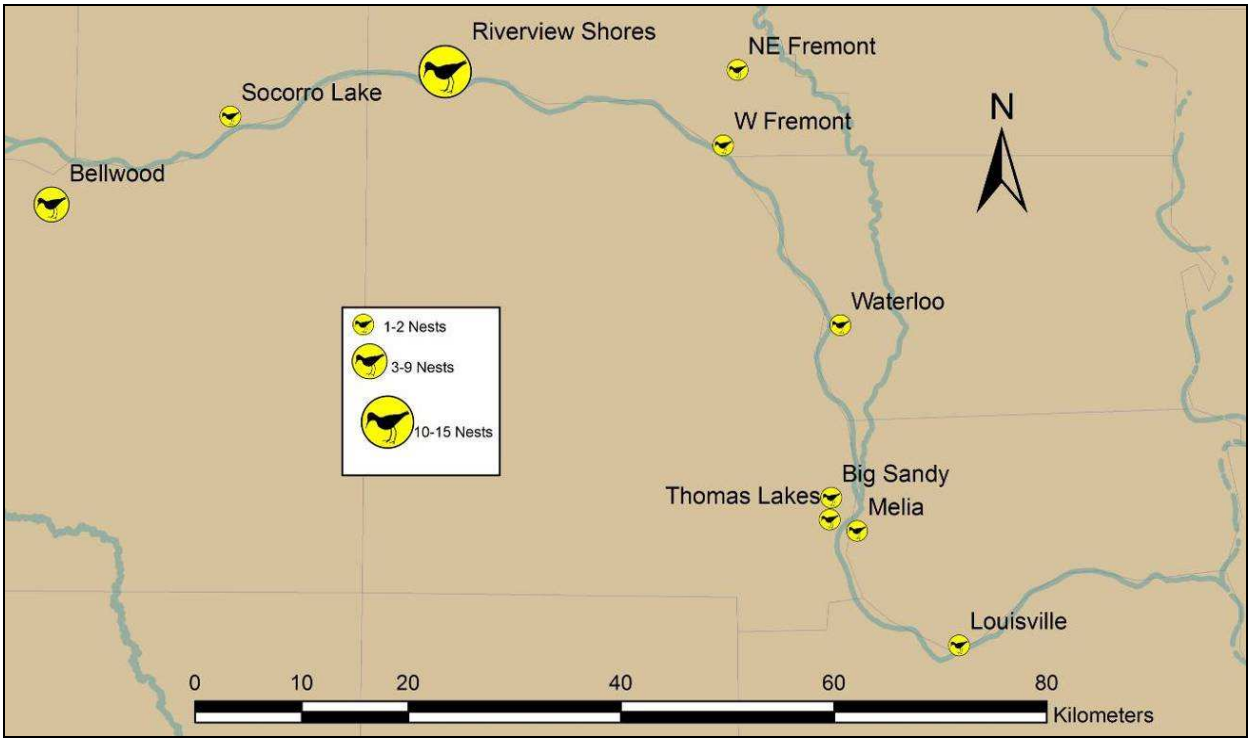


Figure 21. Location of 2009 Lower Platte River off-river (sand and gravel mines and lakeshore housing developments) Piping Plover nesting sites.

Terns and plovers returned to, and began nesting at, the off-river sites earlier in the season than at the on-river sites. Plovers began arriving in the focus area in late April. The first off-river sighting was at Socorro Lake (lakeshore housing development) on 15 April 2009, when two birds were seen. Terns began arriving in the focus area in mid May. The first off-river sighting was of two birds at Melia (inactive sand and gravel mine) on 14 May 2009.

Based on egg floating data, the first off-river plover egg was laid on 3 May 2009 at Big Sandy (lakeshore housing development) and the last was laid on 21 June 2009 at NW Riverside-Thomas Lakes (active sand and gravel mine); a span of 50 days. The first off-river tern egg was laid on 27 May 2009 at N Woodcliff-Western Fremont (active sand and gravel mine) and the last was laid on 13 July 2009 at NW Riverside-Sand Creek (active sand and gravel mine); a span of 48 days.

The first off-river plover egg hatched on 29 May 2009 at Big Sandy (lakeshore housing development) and the last hatched on 14 July 2009 at LPPD-Genoa Loup Diversion (active sand and gravel mine); a span of 47 days. The first off-river tern egg hatched on 16 June 2009 at N Woodcliff-Western Fremont (active sand and gravel mine) and the last hatched on 23 July 2009 at LPPD-Genoa Loup Diversion (active sand and gravel mine); a span of 38 days.

The last sighting of an off-river plover was on 22 July 2009 at Wilson Creek-Bellwood (active sand and gravel mine). The last sighting of an off-river tern was at N Woodcliff-Western Fremont (active sand and gravel mine) on 6 August 2009.

In the upper Loup River area, the first Interior Least Terns were seen on 28 May (Paulsen-Gates, Haskell Creek-Ulrich's, and E Elba-Tri County) and the last were seen on 24 July (Paulsen-Gates, Haskell Creek-Ulrich's, and E Elba-Tri County). The first Piping Plovers were seen on 28 May (Haskell Creek-Ulrich's) and the last were seen on 10 July (Paulsen-Gates, Haskell Creek-Ulrich's, and E Elba-Tri County.

Table 2. Interior Least Terns and Piping Plovers in the upper Loup River area.

Site	Number Adults	Number Nests	Success
Paulsen-Gates	6 terns	2 tern	chicks observed
	3 plovers	0 plover	no chicks observed
Haskell Creek-Ord	13 terns	4 tern	chicks observed
	4 plovers	1 plover	no chicks observed
E Elba-Tri County	18 terns	12 tern	chicks observed
	4 plovers	2 plover	chicks observed

Methods – On-river habitat

Because river conditions are unpredictable and access to nesting sites differs markedly from off-river sites, we took a different approach to monitoring the terns and plovers nesting on midstream river sandbars. Early in the nesting season, rather than surveying the river for birds, we monitored river conditions for the presence of sandbar habitat. Once river flows decreased, exposing sandbars, we began regularly surveying the river for the presence of terns and plovers.

Surveys of on-river habitat in the Lower Platte River began on 29 May 2009 and continued through 21 July 2009. The majority of the nesting colonies were located in three reaches of the river: Cedar Creek to Plattsmouth (river miles 13 to 3), Two Rivers State Recreation Area (SRA) to Schramm State Park (river miles 39 to 20), and Hormel Park to Two Rivers State Park (river miles 57 to 39). These reaches were regularly surveyed every 2 – 7 days or as conditions allowed, by canoe or kayak until the nesting season ended. Certain portions of the river were surveyed on only one occasion during the nesting season to assess habitat availability and locate nesting colonies. The portion of the river from Schuyler to North Bend was not surveyed during 2009.

Canoe and kayak surveys provide the advantage of moving slowly (< 10 kph) and quietly on the river which limits the amount of disturbance to nesting terns and plovers. The presence of birds foraging in the river indicated to us that nesting might be occurring on a nearby sandbar. Nest locations were usually identified by the vocal, aggressive behavior of adult terns once the observers landed the canoe and began walking on the sandbar.

When a colony was located, the sandbar was thoroughly surveyed for nests. Once found, nest locations were recorded with a handheld GPS unit (Garmin Geko models 201 or 301), the number of eggs was recorded, and the eggs were floated to determine the nest initiation date (see H. Hays and M. LeCroy 1971 Wilson Bulletin 83: 425 – 429). Nesting colonies were visited every 2 – 7 days. The nests were not disturbed during these visits; the visits were to check for the presence of incubating adults and to count the number of eggs present. We scored the status of each tern and plover nest based on the following criteria:

> Confirmed successful: 'pipped' eggs or newly-hatched chick(s) observed in or in the immediate vicinity (< 1 meter) of the nest cup
> Likely successful: empty but intact nest cup found with or without pieces of eggshell on or after the expected hatch date
> Confirmed failure: nest cup and/or eggs found destroyed
> Likely lost: nest not relocated on repeat visits prior to expected hatch date

Results – On-river

During 2009, we located 264 Interior Least Tern and 47 Piping Plover nests in 29 colonies on sandbars in the Lower Platte River. Of these nests, 184 Interior Least Tern nests and 47 Piping Plover nests were monitored through the entire incubation period. All nests were located between river miles 2 and 99. See Table 3 and Figures 22 and 23 for description and location information for these sites and Table 4 for the fate of Lower Platte River on-river nests.

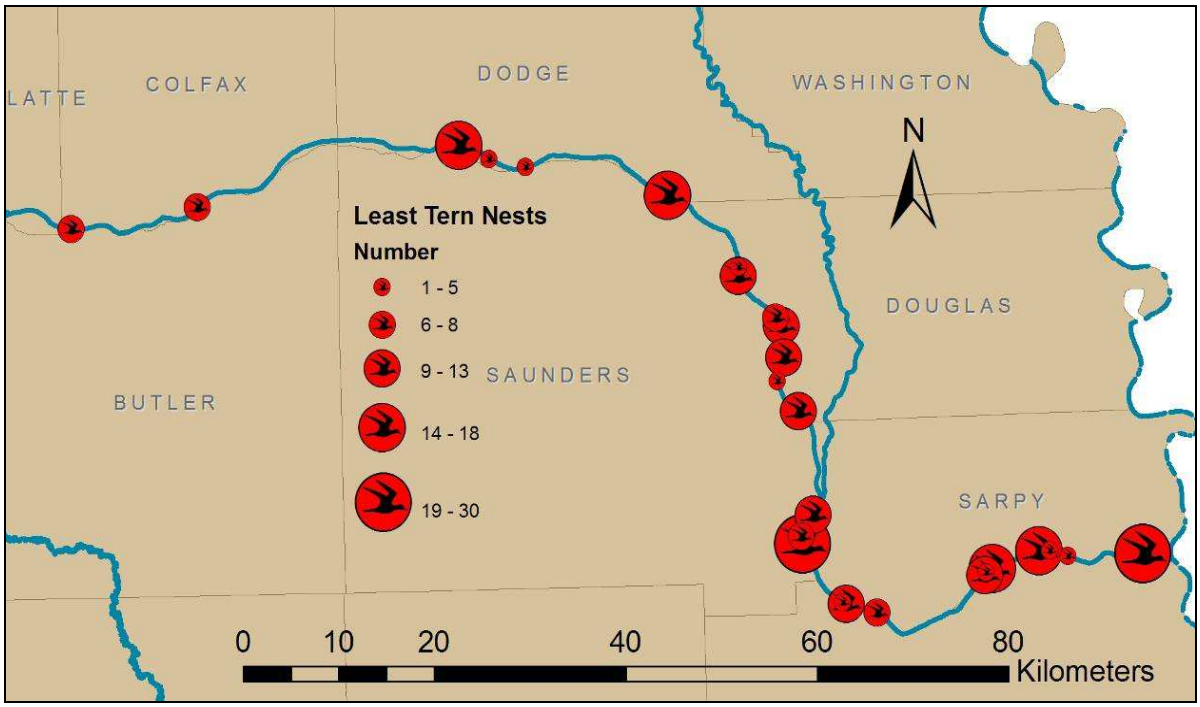


Figure 22. Location of 2009 Lower Platte River on-river sandbar Piping Plover nesting sites.

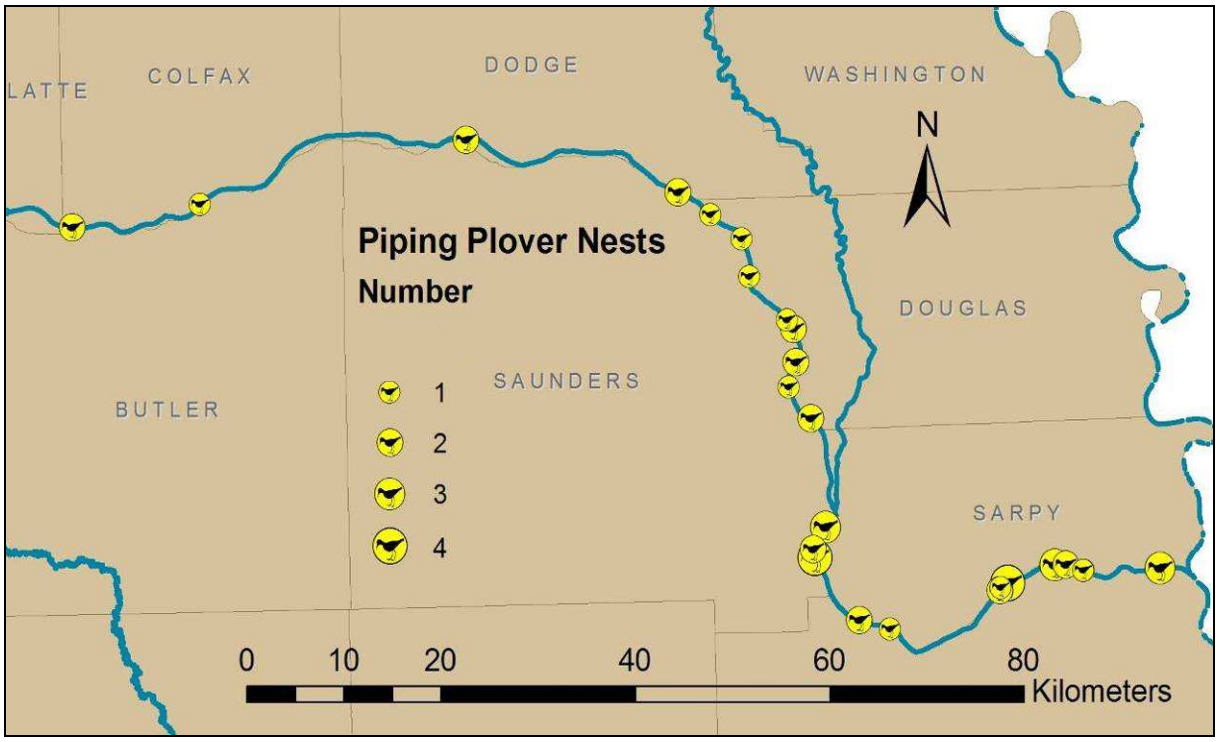


Figure 23. Location of 2009 Lower Platte River on-river sandbar Piping Plover nesting sites.

Table 3. The location of Interior Least Tern and Piping Plover nesting colonies found on sandbars in the Lower Platte River. RM = river mile.

Colony Name	River Mile	Number of Tern Nests	Number of Plover Nests
RM 2	2.0	26	3
Cullom	7.0	3	1
RM 8	8.4	5	2
Gun Club	9.0	14	3
East Cedar Creek	12.3	15	4
Middle Cedar Creek	12.8	2	1
West Cedar Creek	12.9	12	2
RM 15	15.0	0	1
Schramm	22.0	8	1
Interstate North	24.4	1	0
Interstate South	24.4	12	2
North Camp Ashland	29.1	8	2
South Camp Ashland	28.5	30	4
RM 31	31.3	11	3
RM 38.75	38.8	11	2
RM 41	41.0	4	1
RM 43	42.7	12	2
RM 45	44.9	13	2
RM 46	45.5	6	1
Highway 64	49.0	11	1
North Highway 64	49.5	3	0
RM 51.5	51.5	0	1
RM 54	53.6	0	1
RM 56.5	56.4	18	2
RM 66	66.5	3	0
RM 69	69.0	1	0
RM 71	71.1	14	2
RM 90	90.0	8	1
RM 99	99.0	7	2

Table 4. The fate of Lower Platte River Interior Least Tern and Piping Plover nests on river sandbars.

Fate	Interior Least Tern	Piping Plover
Confirmed Hatched	57	7
Likely Hatched	53	5
Depredated	23	5
Inundated	50	14
Undetermined	73	16
Abandoned	5	0
Total	261	47

At on-river sites, the first Interior Least Tern eggs were laid on 26 May 2009 (based on egg-floating data; RM 37) and the last on 20 July 2009 (RM 24.5); a span of 35 days. The first on-river tern nest hatched on 16 June 2009 (South Camp Ashland), which is 25 days earlier than the first 2008 hatch date (11 July 2008). The last on-river tern nests were found hatching on 21 July 2009 (various sandbars); a span of 35 days. A few nests were still being attended by adults after this date; the fate of these nests is unknown. The first on-river Piping Plover nest hatched on 16 June 2009 (North Camp Ashland) and the last on-river Piping Plover nests hatched on 24 July 2009 (East Cedar Creek and RM 8); a span of 38 days.

Interior Least Tern nest #92 at the North Camp Ashland sandbar. Water from the mid-June high flow event reached this nest and the eggs. The adults continued to incubate the eggs and they hatched on 10 July

Research

Estimating Survival Rates

Accurately estimating demographic parameters, such as daily and seasonal survival probabilities for individual birds and nests, will lead to a better understanding of Interior Least Tern and Piping Plover population dynamics on both local and regional scales. This understanding will prove crucial in developing effective management strategies for these two species. In 2009, we continued to improve and refine our estimates of nest, adult, and chick survival by using advanced statistical modeling techniques (Program MARK and R). We analyzed tern and plover chick growth rates, refined our chick growth curve utility, and assembled reproductive synchrony patterns.

Methods

We captured, banded, and color marked adult Piping Plovers during incubation; we did not attempt to capture adult Interior Least Terns. Banding was authorized by the USGS Banding Laboratory and the U.S. Fish and Wildlife Service through an inter-agencies agreement with the Nebraska Game and Parks Commission (MBB holds Federal Master Bird Bander Permit # 23545, with Threatened and Endangered Species endorsements and Nebraska Educational and Scientific Permit # 905; the TPCP holds Federal Threatened and Endangered Species handling permit #TE 070027-1; JGJ holds Federal Master Bird Bander Permit #20259, with Threatened and Endangered Species endorsements). Color-banding schemes were coordinated prior to the field season with the species coordinator, Greg Pavelka (USACE) and others with an interest in plover color banding, including Cheri Gratto-Trevor (Canadian Wildlife Service), Mark Sherfy (USGS), Dan Catlin (Virginia Tech University), and Joy Felio (Virginia Tech University). Out concern for the birds' safety, we used a simple box trap placed over the nest for capture (see Figure 24). Box traps have no moving parts, so the nesting birds and their eggs cannot be injured during capture; the bird walks through the door, settles on its nest, and is captured.

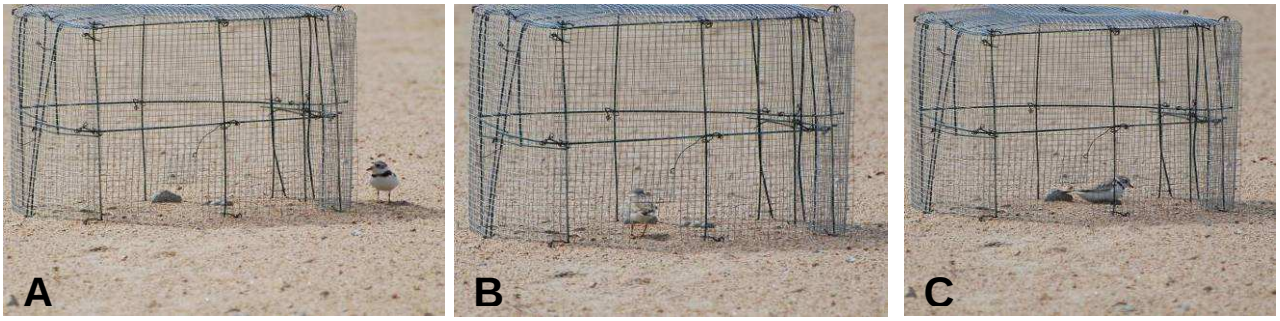


Figure 24. Wire box trap placed over a Piping Plover nest showing the bird approaching the trap (A), entering through the open "door" (B), and settling on the nest (C). Time elapsed is less than one minute.

Our capture, bird handling, and banding protocols, which were the same as used in 2008, were developed to avoid problems and minimize disturbance to nesting birds. We exercised caution when handling and banding birds. We did not capture or band birds during extreme weather (cold, windy, rainy, or when inclement weather was forecast) or when the temperature was above 85 °F (30°C). Birds were observed closely after banding and on subsequent days to determine if there were any behavioral changes or visible signs of injury. As part of our protocol, we were to suspend all banding activities and conduct an investigation if problems or injuries were observed at any

time. We did not observe any problems or injuries to birds as a result of capture, handling, or banding.

Each plover received an individually numbered USGS size 1A band on the upper right leg. On the upper left leg, each bird received a light blue plastic flag; the light blue color indicates that the bird was banded along the Platte River. The Lower Platte River blue flags are 'half length' and not crimped when placed on the bird's leg. On the lower left leg, each bird received a unique combination of 1 – 2 color bands indicating its individual identity. On the lower right leg, each bird received 2 color bands, red over green, red over red or red over yellow; these color combinations indicate that the bird was banded at an off-river site in 2009.

Left. Adult Piping Plover with colored leg bands. Right. Wing chord being measured on an adult Piping Plover.

After banding, the mass of each plover was measured by placing the bird in a cloth bag and suspending it from a Pesola™ scale (± 0.3 % accuracy). The following standard morphological measurements were taken from every adult plover captured: left and right unflattened wing chord length (wrist to the distal end of the outermost primary feather ± 1 mm); left, right, and middle tail feathers (±1 mm); left and right tarsi length (unfeathered leg above the hallux, ± 0.1 mm); exposed midline ridge of the beak or culmen length (± 0.1mm); beak width at the nostrils or nares (± 1mm); and total skull length (distal end of the beak to the posterior end of the skull occiput, ± 0.1 mm). All measurements were taken by one individual (MBB) to minimize measurement error and variation. Each morphological measurement was taken twice so a "repeatability index" can be calculated and all measurements adjusted if necessary. A composite metric of all these measurements will be calculated (the geometric mean) to provide an index of each individual bird's overall morphological size. The left and right sides of each bird were measured so a measure of bilateral symmetry (fluctuating asymmetry) can be calculated. Symmetry (absolute value of the right minus left side length) is a commonly used measure of an individual bird's "quality". The symmetry of skeletal parts reflects the nutrition and health of an individual during development. The symmetry of structures, such as feathers, that are grown or replaced regularly reflects the current nutrition and health of the individual. Measurements of symmetry will give us a metric to access the "quality" of birds hatched at different types of nesting sites, on-river versus off-river and in different years. This metric also gives us a way to assess the quality of the over wintering habitat for the birds; better foraging habitat would provide better over wintering survival, nutrition and health for nesting birds.

At off-river sites, we captured Piping Plover chicks by picking them up off of the sand or from their nests. Plover chicks' legs are long enough that we were able to band and color mark them in the

same way as we did adult plovers. We measured each chick's body mass by placing chicks on a digital scale (Ohaus® SP401) which was accurate to ± 0.1 gram. Scales were calibrated using a standardized 200 g weight before and after chicks were weighed to ensure accuracy. We did not take any morphological measurements of plover chicks.

At off-river sites, we captured Interior Least Tern chicks by picking them up off of the sand or from their nests. Tern chick's legs are very short so we only put an individually numbered USGS size 1A band on each bird's lower right leg and a split color (yellow-green) band on its lower left leg. The yellow-green split color band indicates that the bird was banded at an off-river site along the Lower Platte River. We did not take any morphological measurements of tern chicks.

At on-river sites, we captured Interior Least Tern and Piping Plover chicks by picking them up off of the sand or from their nests. All tern chicks were banded with an individually numbered USGS size 1A band on the right lower leg. They did not receive any colored leg bands. At on-river sites, all Interior Least Tern and Piping Plover chicks were weighed using a digital scale (Ohaus® SP401) which was accurate to ± 0.1 gram. Scales were calibrated using a standardized 200 g weight before and after chicks were weighed to ensure accuracy. On subsequent visits, chicks were recaptured and reweighed. We did not take any morphological measurements of tern chicks.

Survival analyses: After individual Piping Plover adults and chicks and Interior Least Tern chicks were banded and color marked, we re-sighted (recaptured) them as frequently as possible. Upon re-sighting we noted where they were seen, which birds they were seen with, and their behavior. We used this capture – recapture dataset to calculate daily and seasonal individual survival probabilities.

After individual tern and plover nests were located, we returned to them throughout the nesting season to monitor their progress (see Monitoring for details). We used information from this monitoring dataset to calculate daily and seasonal nest survival probabilities.

We estimated survival probabilities with the software program MARK (G.C. White and K.P. Burnham 1999. Bird Study 46: S120 – S139). We used the general methods of J.-D. Lebreton et al (Ecological Monographs 1992. 62: 67 – 118), K. P. Burnham and D. R. Anderson (2002. Model Selection and Multimodel Inference: a Practical Information-Theoretic Approach 2nd edition, New York: Springer), and S.J. Dinsmore and J.J. Dinsmore (Studies in Avian Biology 2007. 34: 73 – 83). Model fit for each analysis was assessed by the AIC (Akaike's Information Criterion); the model with the lowest AIC was considered the model that best fit the data.

Individual Survival Analysis

Individual encounter histories were constructed for all Piping Plover adults and chicks that were captured, recaptured or observed at off-river sites throughout the nesting season. All of the adult plovers included in this analysis were color-banded along the Lower Platte River (light blue leg flags) or along the Missouri River (green leg flags; D. Catlin and J. Felio, pers. comm.). All of the plover chicks included in this analysis were hatched and banded locally (along the Lower Platte River). All of the Interior Least Tern chicks included in this analysis were hatched and banded locally (along the Lower Platte River). Because of our small sample sizes we combined all off-river sites together and all on-river sites together.

We did not include any covariates in the models. We tried to fit models with varying degrees of time-dependence to the data, but the model that included constant survival

and constant recapture probabilities {phi(c), p(c)}, was always the best-fitting model based on AIC; this is most likely due to our small sample sizes.

Nest Survival Analysis

We used data from nest monitoring (see Monitoring and Management sections) to conduct nest-incubation period survival analysis. Nest survival probabilities were calculated using the nest-survival model utility in Program MARK. Because of our small sample sizes we did not include any covariates in our model, combined all off-river sites together, combined all on-river sites together, and assumed constant survival across the season. We constructed the encounter histories by summarizing the day each nest was found (*k*), the last day the nest was found active (*l*), the last day the nest was checked for activity (*m*), and the fate of the nest (*f*).

Growth Curve Analysis

Our growth curve analysis included Interior Least Tern chicks hatched at on-river and off-river sites and Piping Plover chicks hatched at off-river sites. All tern and plover chicks were banded and weighed when they were first encountered. They were weighed again every time they were subsequently encountered. In the cases where the chick was banded while still in or very close to their natal nest, we could 'age' them based on the nest's known hatching date. If the chicks were banded after they left their natal nest, we estimated their age from an age-based time series of photographs.

Nest Initiation (Egg-Laying) and Hatching Synchrony Analysis

We used the temporal position of each nest with respect to others in the nesting area as a measure of the nest's synchrony. To measure synchrony, we ranked each nest's initiation (day first egg laid in nest) and hatching (day first egg hatched) dates. We used our egg floating data to estimate the first egg date of nests that we found after the clutch was complete. We calculated the hatching date using the known incubation periods (28 days for plovers and 21 days for terns) and the egg floating data for nests that we did not visit on the actual hatching day. We calculated the standard deviation of nest initiation and hatching dates and the modal nest initiation and hatching dates. Each nest was assigned, based on its initiation and hatching dates, to the appropriate number of standard deviations on either side of the modal date. This technique will allow us to analyze synchrony data between habitat (on-river and off-river) types and between years since they will be measured on the same scale. See Figures 32 – 35.

Statistical Analysis

All statistical analyses were performed using either SAS (SAS Institute. 1990. SAS/STAT User's Guide, Version 6. Cary, NC: SAS Institute) or Prism (GraphPad Prism, Version 3.00 for Windows, Graph Pad Software, San Diego, CA, www.graphpad.com). Due to small sample sizes, we used nonparametric statistical tests for all of our analyses; statistical significance was set at $P < 0.05$. Means (± 1 SE) are reported.

Results

Daily and Seasonal Survival of Interior Least Terns and Piping Plovers

We captured and banded 18 adult Piping Plovers at off-river nesting sites. We re-sighted 13 plovers that we had banded along the Lower Platte River in 2008 (two were banded as chicks and 11 were banded as adults). We also saw 14 adult plovers that were banded with green (Missouri River) flags. We did not band any plovers at on-river sites. We captured and banded 18 plover chicks at off-river nesting sites. All plover chicks were less than one week old when banded.

We captured and banded 69 Interior Least Tern chicks at off-river nesting sites. We captured and banded 101 tern chicks at on-river sites. Most tern chicks were less than two weeks old when banded. We did not attempt to capture and band adult terns at either off-river or on-river sites.

Adult Piping Plover Survival: Based on our population of color-marked adult Piping Plovers, the estimated apparent daily survival probability at off-river sites in 2009 was 0.9670 ± 0.0070 (see Figure 25). When that daily survival probability is extended over the 28 day incubation period, we estimate that adult plovers in 2009 had an apparent survival probability of 0.391 (probability of surviving the incubation period). Based on the same calculation, we estimate that the apparent probability of adult plovers surviving the 28 day brood rearing period is also 0.391. We estimate that the apparent daily recapture probability for adult plovers in 2009 was 0.1414 ± 0.0189. We believe these survival and recapture estimates are biased low, likely due to extremely small sample sizes and the inability of Program MARK, or any capture-recapture analysis technique, to adequately distinguish between true mortality and permanent emigration; hence we refer to them as apparent and suggest that these survival estimates are the minimum likely survival probabilities.

Chick Piping Plover Survival: Based on our population of color-marked Piping Plover chicks, the estimated apparent daily survival probability at off-river sites was 0.9678 ± 0.0218 (see Figure 25). When that daily survival probability is extended over the 28 day fledging period, we estimate that plover chicks in 2009 had an apparent 0.299 probability of surviving to fledging. We estimate that the apparent daily recapture probability for plover chicks in 2009 was 0.2129 ± 0.0744. Again, we believe these survival and recapture estimates are biased low, likely due to extremely small sample sizes and the inability of Program MARK, or any capture-recapture analysis technique, to adequately distinguish between true mortality and permanent emigration; hence we refer to them as apparent and suggest that these survival estimates are the minimum likely survival probabilities. We expect to refine these estimates in the future as our population of banded individuals in the population increases.

Least Tern chicks

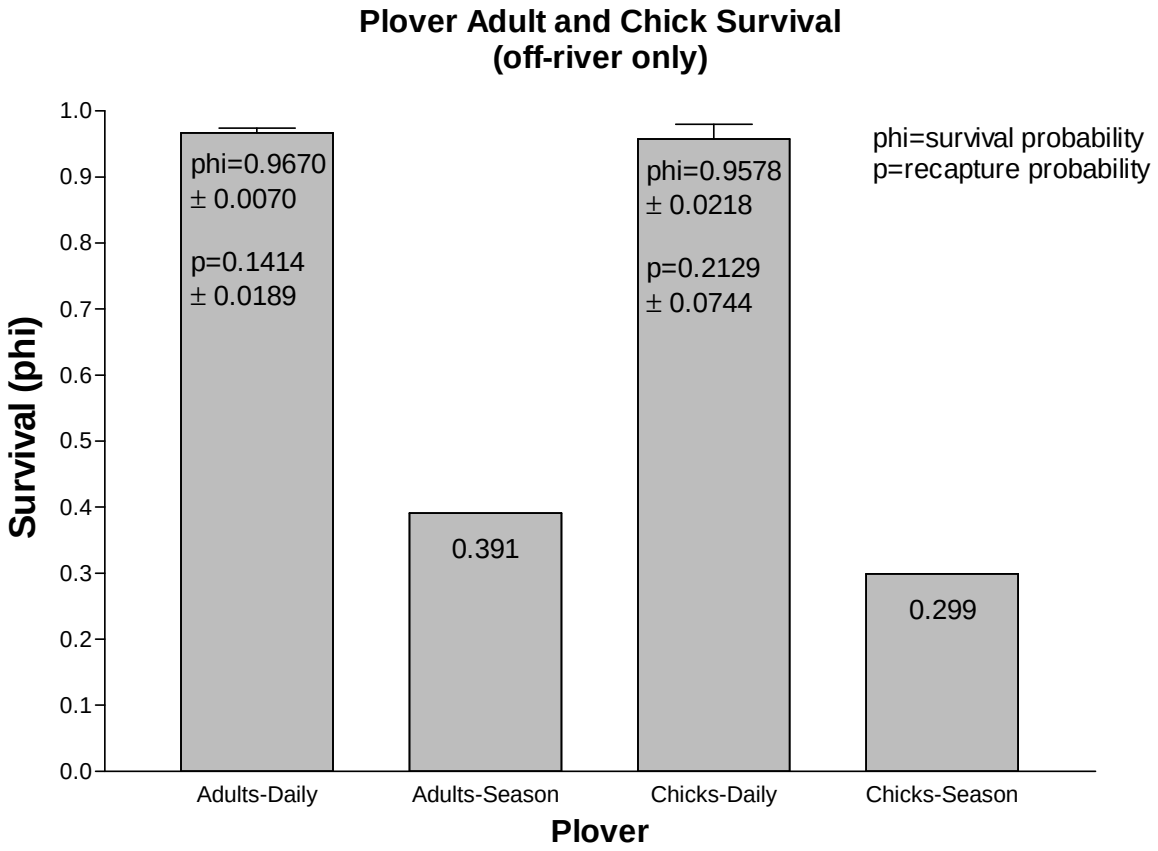


Figure 25. Piping Plover (adult and chick) apparent daily and seasonal survival probabilities and recapture probabilities.

Piping Plover Nest Survival: We based our estimate of Piping Plover nest survival on a population of 80 nests, 33 were off-river and 47 were on-river. All of the accessible off-river nests were protected with wire mesh exclosures; none of the on-river nests were protected with exclosures (see Management). Off-river nests in 2009 had an apparent daily survival probability estimate of 0.9874 ± 0.0042; on-river nests in 2009 had an apparent daily survival probability estimate of 0.9666 ± 0.0095. When those daily survival probabilities are extended over the 28 day incubation period, we estimate that off-river plover nests in 2009 had an apparent 0.7011 probability of surviving and that on-river nests in 2009 had an apparent 0.3863 probability of surviving (Figure 26). Off-river nests had a 0.3148 greater probability of surviving to the egg hatching stage than did on-river nests in 2009.

We based the calculation of our Piping Plover chick growth curve on our population of banded plover chicks produced at off-river sites. The curve that best fits our data suggests that plover chicks grow at a fairly constant rate for the first two weeks of life. Our data also suggests that plover chicks reach their fledging body mass at about 17 days and remain at that mass until fledging at 28 days (see Figure 27).

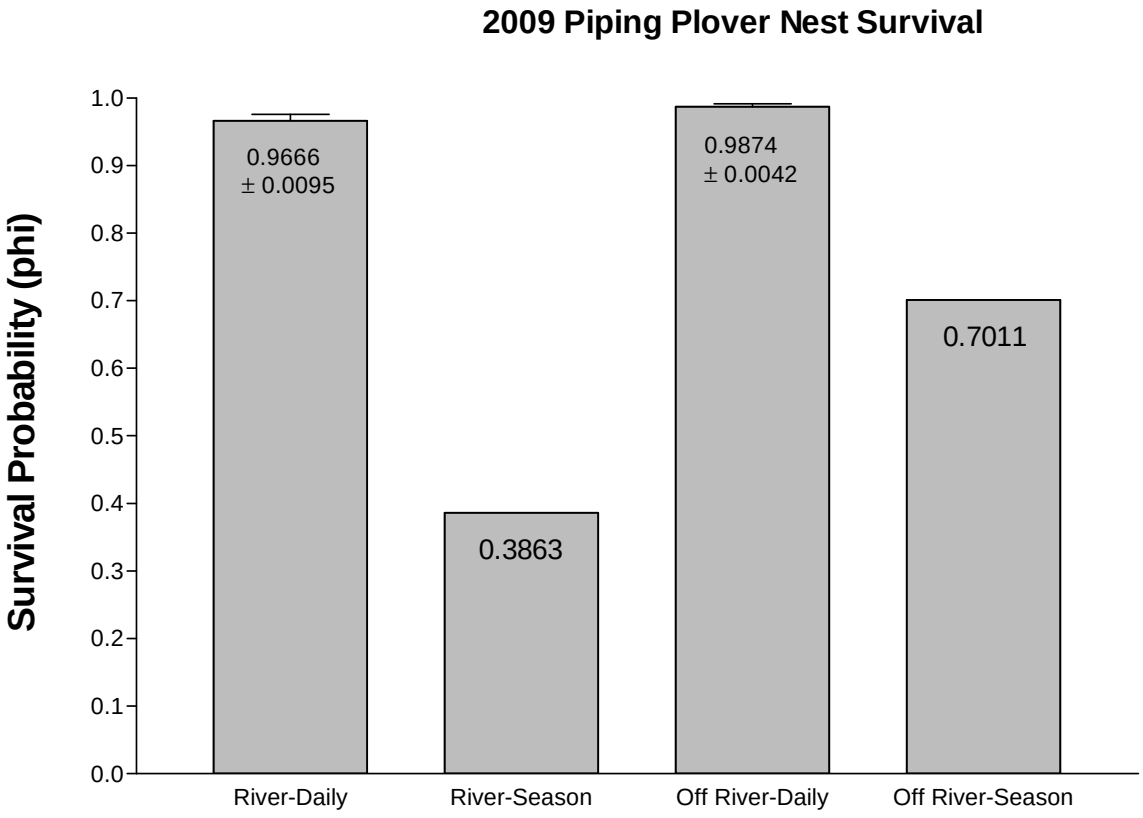


Figure 26. On-river and off-river Piping Plover apparent daily nest survival probability and 28-day incubation period survival probability.

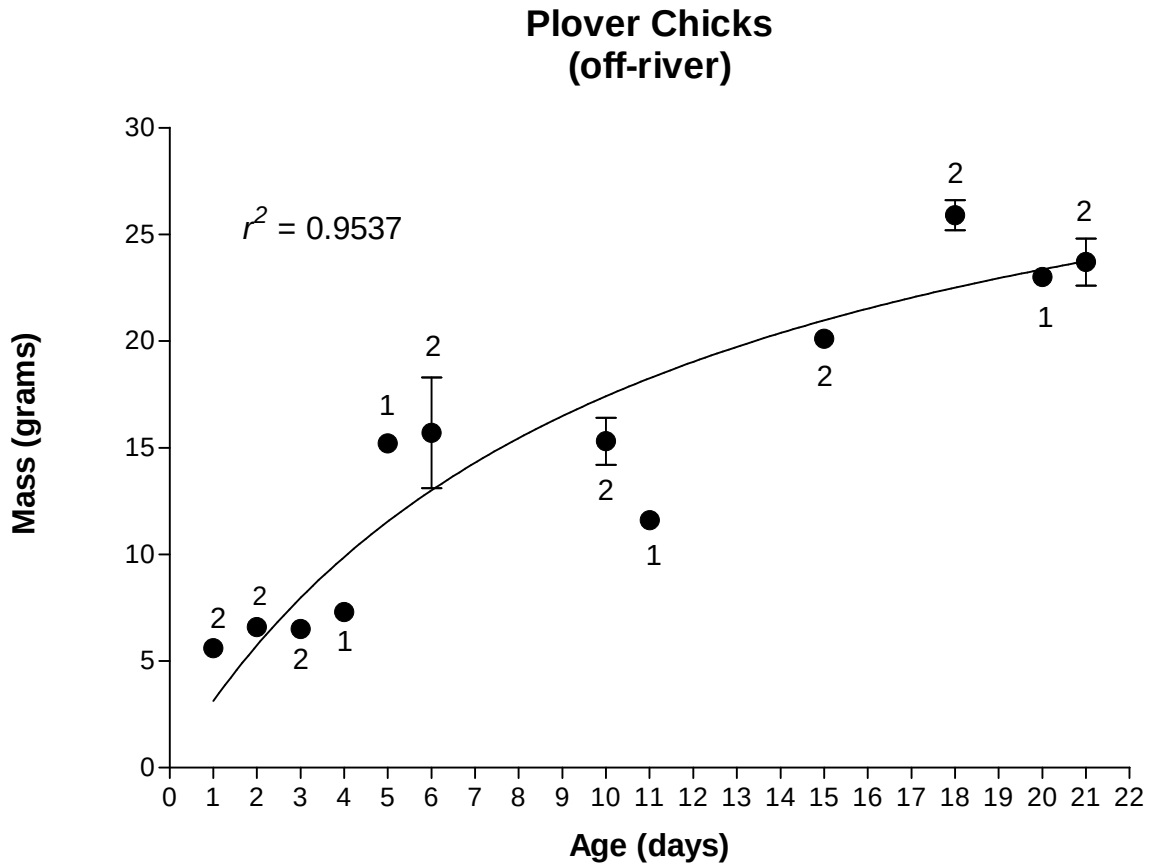


Figure 27. Growth rate of Piping Plover chicks from off-river nests (r_s^2= 0.9537).

Piping Plover chick (4 – 5 days old) with colored leg bands.

Interior Least Tern Nest Survival: We based our estimate of Interior Least Tern nest survival on a population of 347 nests. Of these nests, 83 were at off-river sites and 264 were at on-river sites. At off-river sites, we estimate that tern nests in 2009 had an apparent daily survival probability of 0.952 ± 0.005. Nests at on-river sites in 2009 had an apparent daily survival probability of 0.953 ± 0.006. When the daily survival probability is extended over the 21 day incubation period, we estimate that tern nests at off-river sites had an apparent 0.6322 probability of surviving to the egg hatching stage and those nests at on-river sites had an apparent 0.7910 probability of surviving to the egg hatching stage. Interior Least Tern nests at on-river sites had a 0.1588 greater probability of surviving the incubation period than did nests at off-river sites (Figure 28).

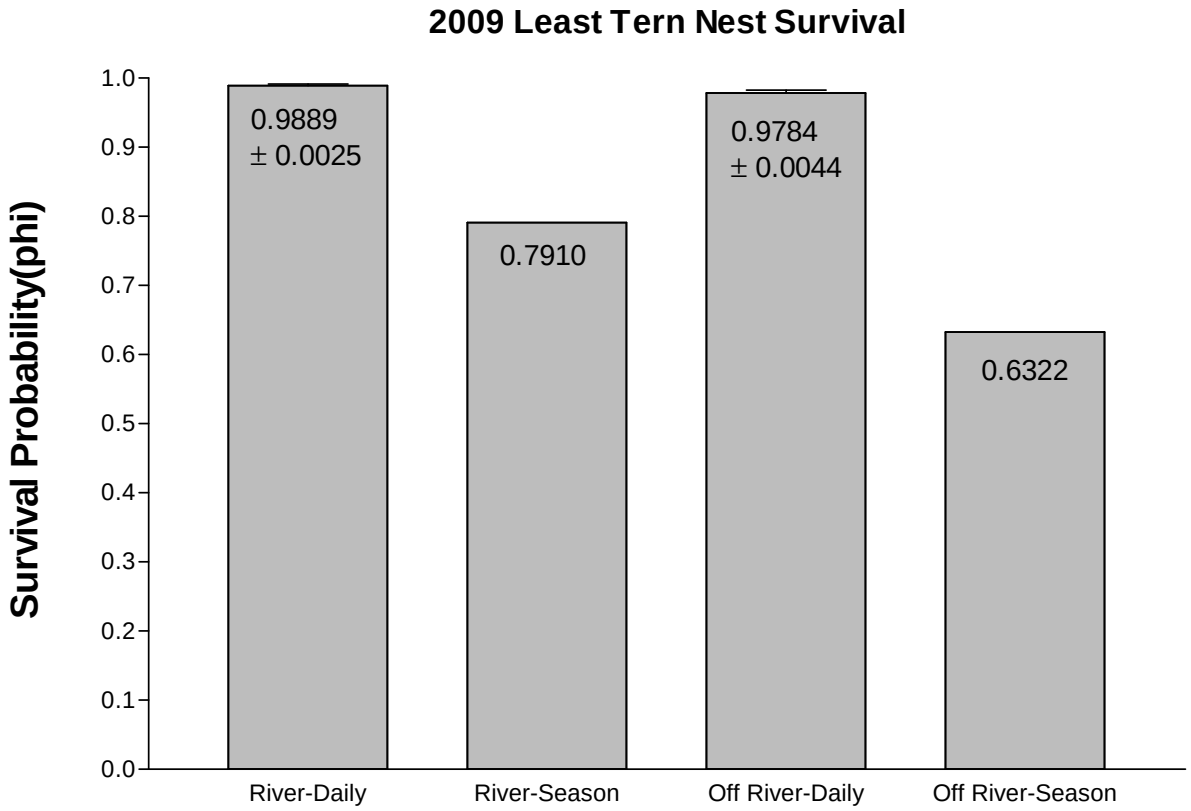


Figure 28. Interior Least Tern nest apparent daily survival and 21-day incubation period survival.

Interior Least Tern Chick Survival: We based our estimate of Interior Least Tern chick daily survival on our population of chicks at on-river and off-river sites. We estimate that on-river tern chicks in 2009 had an apparent daily survival probability of 0.9705 ± 0.0255 and off-river tern chicks in 2009 had an apparent daily survival probability of 0.8739 ± 0.0317. When that daily survival probability is extended over the 21 day fledging period, we estimate that in 2009, on-river tern chicks had an apparent 0.533 probability of fledging and off-river tern chicks had an apparent 0.0590 probability of surviving to fledging. Again, we believe these survival and recapture estimates are biased low, likely due to extremely small sample sizes and the inability of Program MARK, or any capture-recapture analysis technique, to adequately distinguish between true

mortality and permanent emigration; hence we refer to them as apparent and suggest that these survival estimates are the minimum likely survival probabilities. See Figure 29.

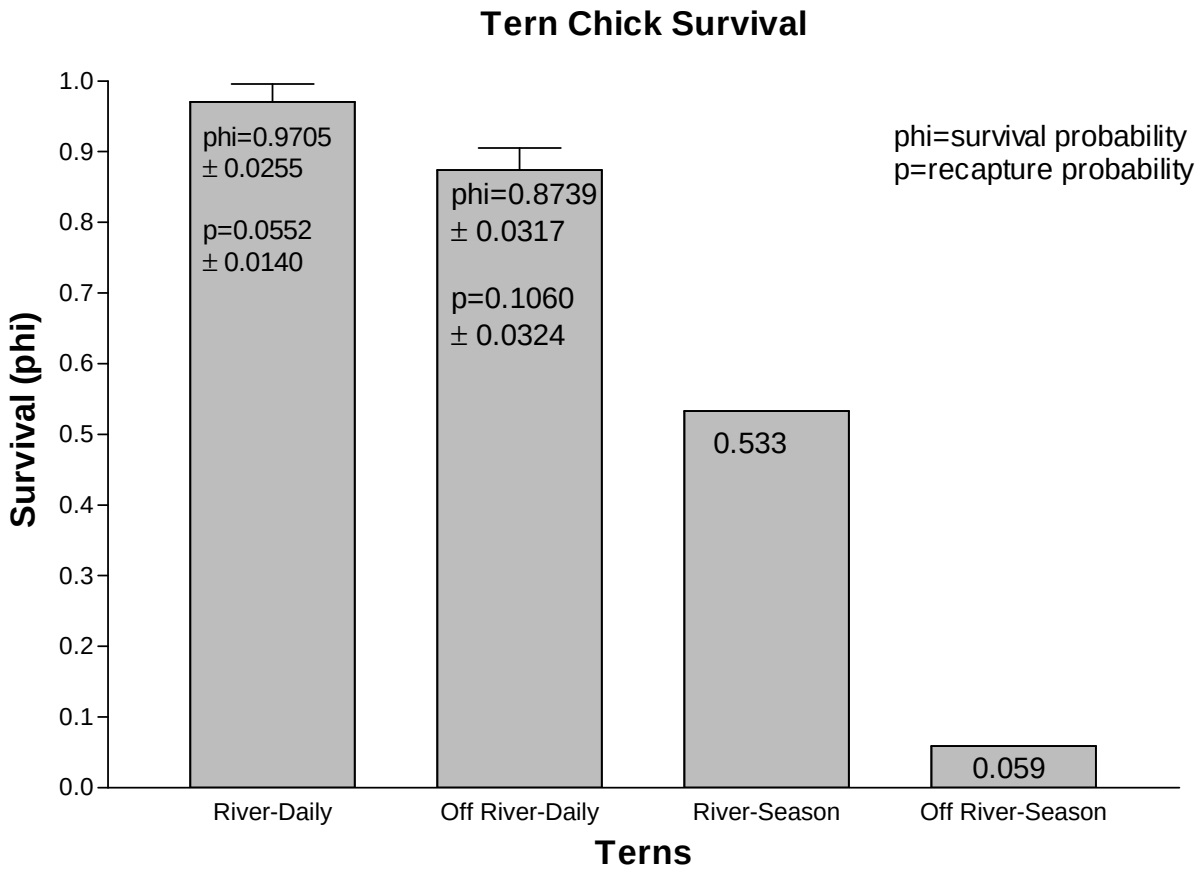


Figure 29. Interior Least Tern chick apparent daily survival probability and probability of survival to fledging.

Interior Least Tern Chick Growth Curve: We based the calculation of our Interior Least Tern chick growth curve on our population of banded tern chicks produced at on-river and off-river sites. The curve that best fits our data suggests that tern chicks grow at a fairly constant rate for the first two weeks of life. Our data also suggests that tern chicks reach their fledging body mass at about 15 days and remain at that mass until fledging at 21 days of age (Figures 30 and 31).

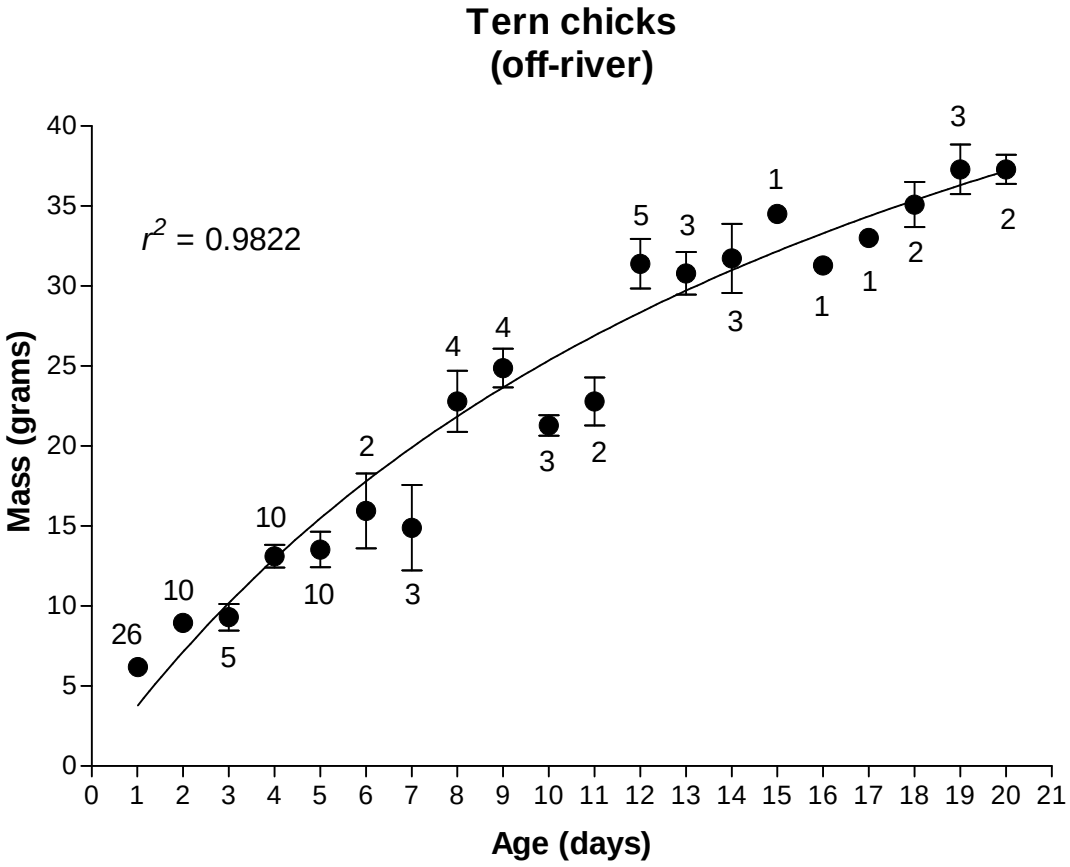


Figure 30. Growth curve of Interior Least Terns chicks from off-river sites (r_s^2= 0.9822).

Interior Least Tern Chick being weighed

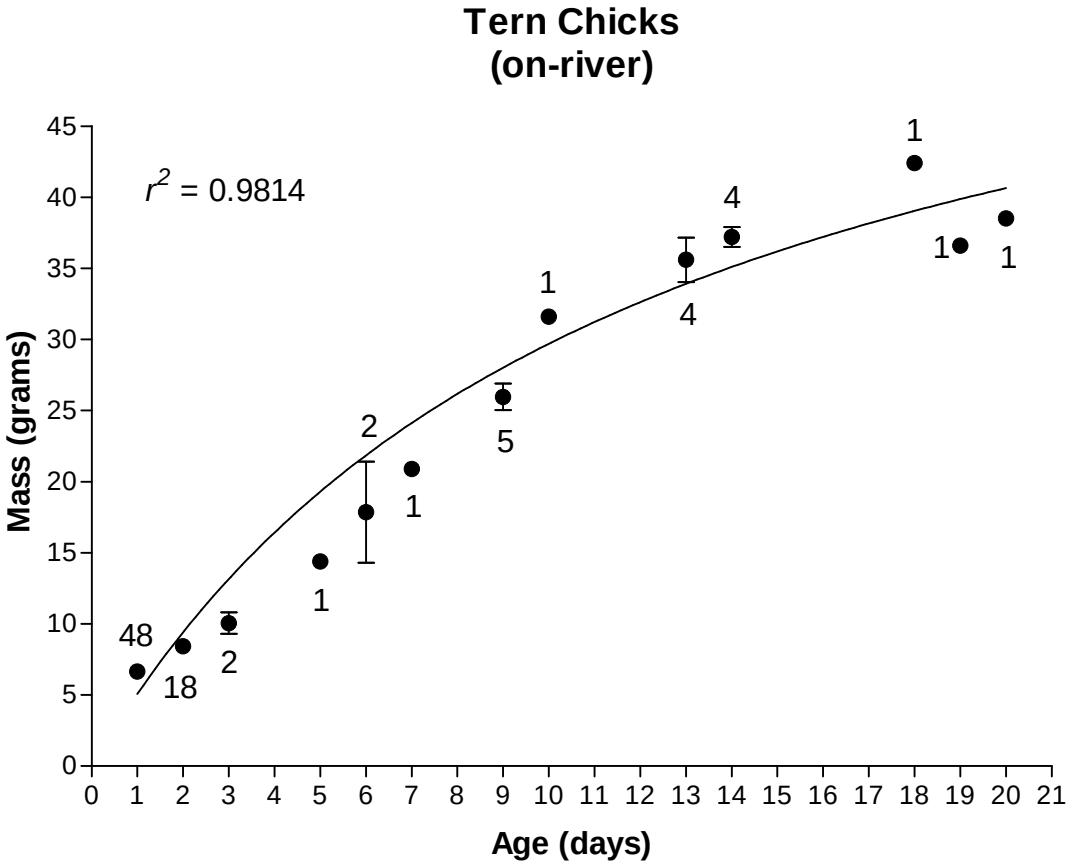


Figure 31. Growth curve of Interior Least Tern chicks from on-river sites (r_s^2= 0.9814).

Comparison of Off-river and On-river Interior Least Tern and Piping Plover nesting success

The traditional index of nesting success for terns and plovers that is reported, and used for comparison between sites, is 'fledge ratio'. Fledge ratio is calculated as the number of fledglings per adult pair over a defined spatial or temporal area. The number of fledglings used in the calculation is based on numbers of birds directly observed. Unless these birds are individually marked, the errors of repeat and incomplete observations (only a proportion of chicks at a colony are detected during a visit) are introduced into the calculation. Using fledge ratios with inherent errors may lead to inappropriate management decisions. We calculated fledge ratios in two ways and compared the two results. We used the traditional 'fledglings per nest' method and the survival analyses method based on our capture-recapture dataset and Program MARK.

At off-river sites, the traditional method of calculation suggests a Piping Plover fledge ratio of 3.30 chicks per nest and a Least Tern fledge ratio of 1.55 chicks per nest. The survival analysis method suggests a plover fledge ratio of 1.18 chicks per nest and a tern fledge ratio of 0.135 chicks per nest.

At on-river sites, the traditional method of calculation suggests a Piping Plover fledge ratio of 1.57 chicks per nest and a Least Tern fledge ratio of 0.74 chicks per nest. The survival analysis method

suggests a plover fledge ratio of 0.96 chicks per nest and a tern fledge ratio of 0.85 chicks per nest.

As we accumulate a larger capture-recapture dataset that will allow us to do more sophisticated survival analyses, these survival estimates will become more refined and robust.

Interior Least Tern chick seeking shade.

Synchrony*:* Piping Plover on-river and off-river and Interior Least Tern on-river and off-river nest initiation and hatching synchrony patterns are illustrated in Figures 32 through 35. The nests found in the +3 SD categories are most likely second nesting attempts by birds that lost their nests earlier in the season. In the following graphs the x-axis, labeled 'DATE', refers to the Julian Day where 1 January = 1.

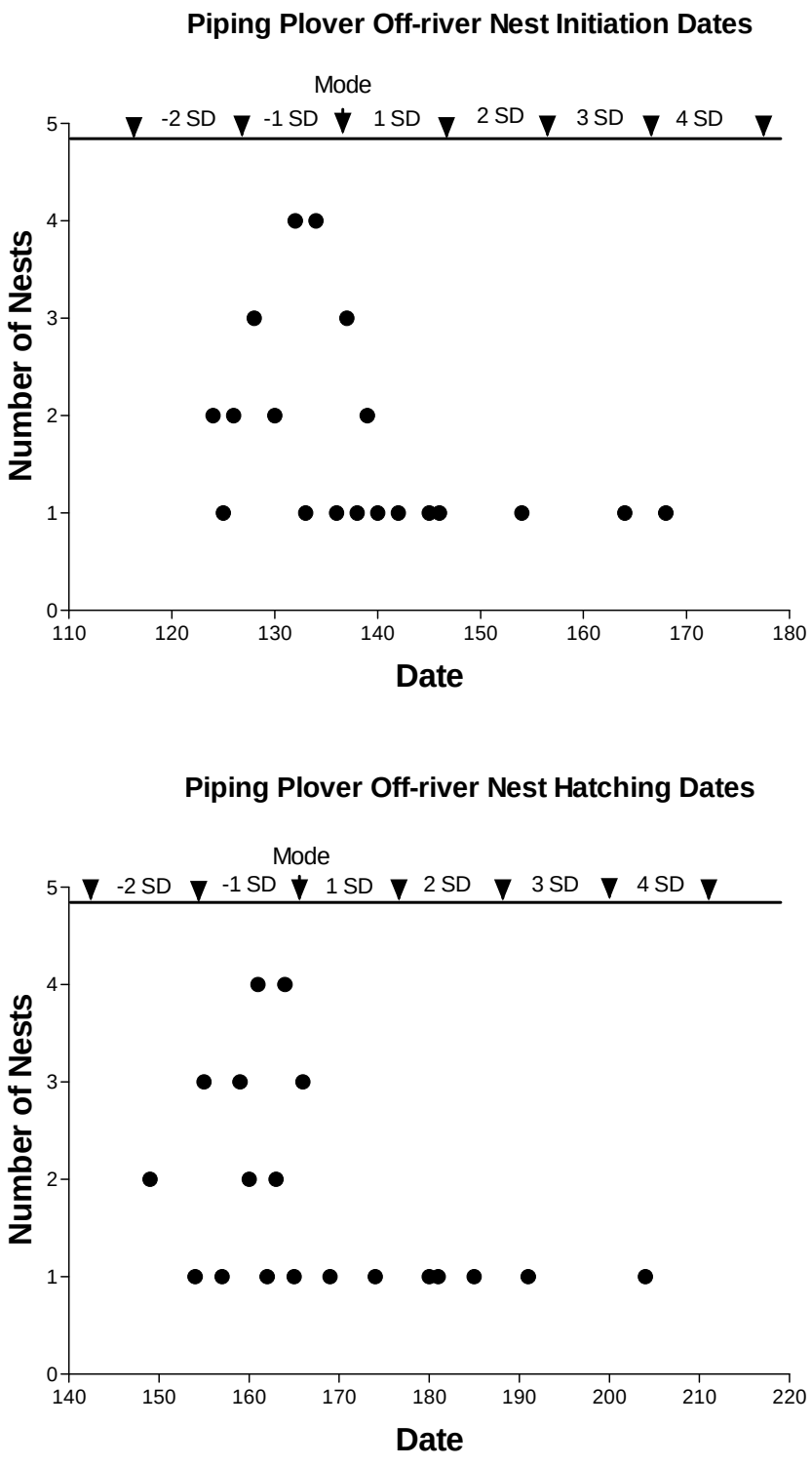


Figure 32. Piping Plover nest initiation (upper; mode = 16 May 2009) and hatching synchrony (lower; mode = 14 June 2009) at off-river nesting sites.

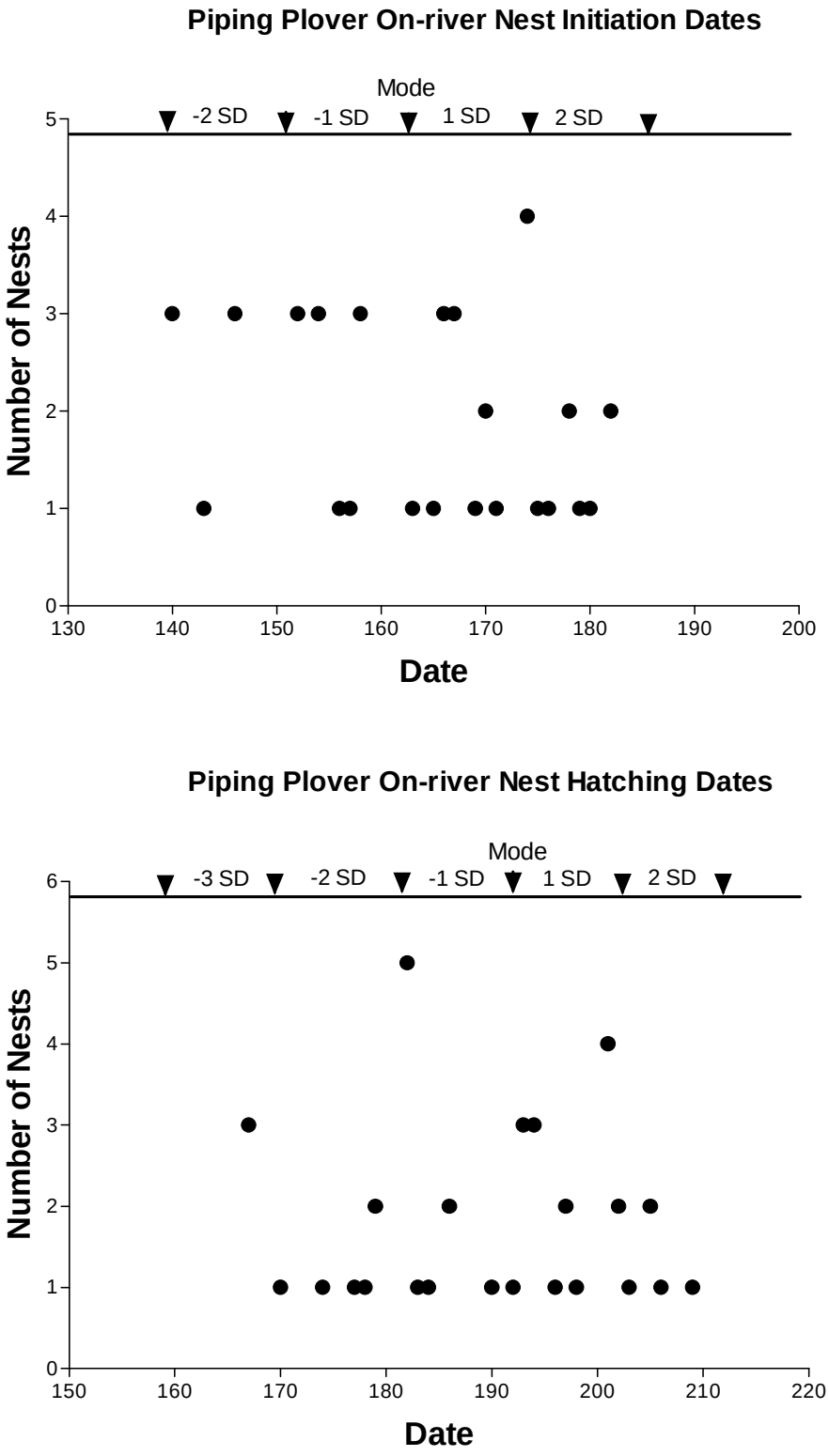


Figure 33. Piping Plover nest initiation (upper; mode = 11 June 2009) and hatching synchrony (lower; mode =9 July 2009) at on-river nesting sites.

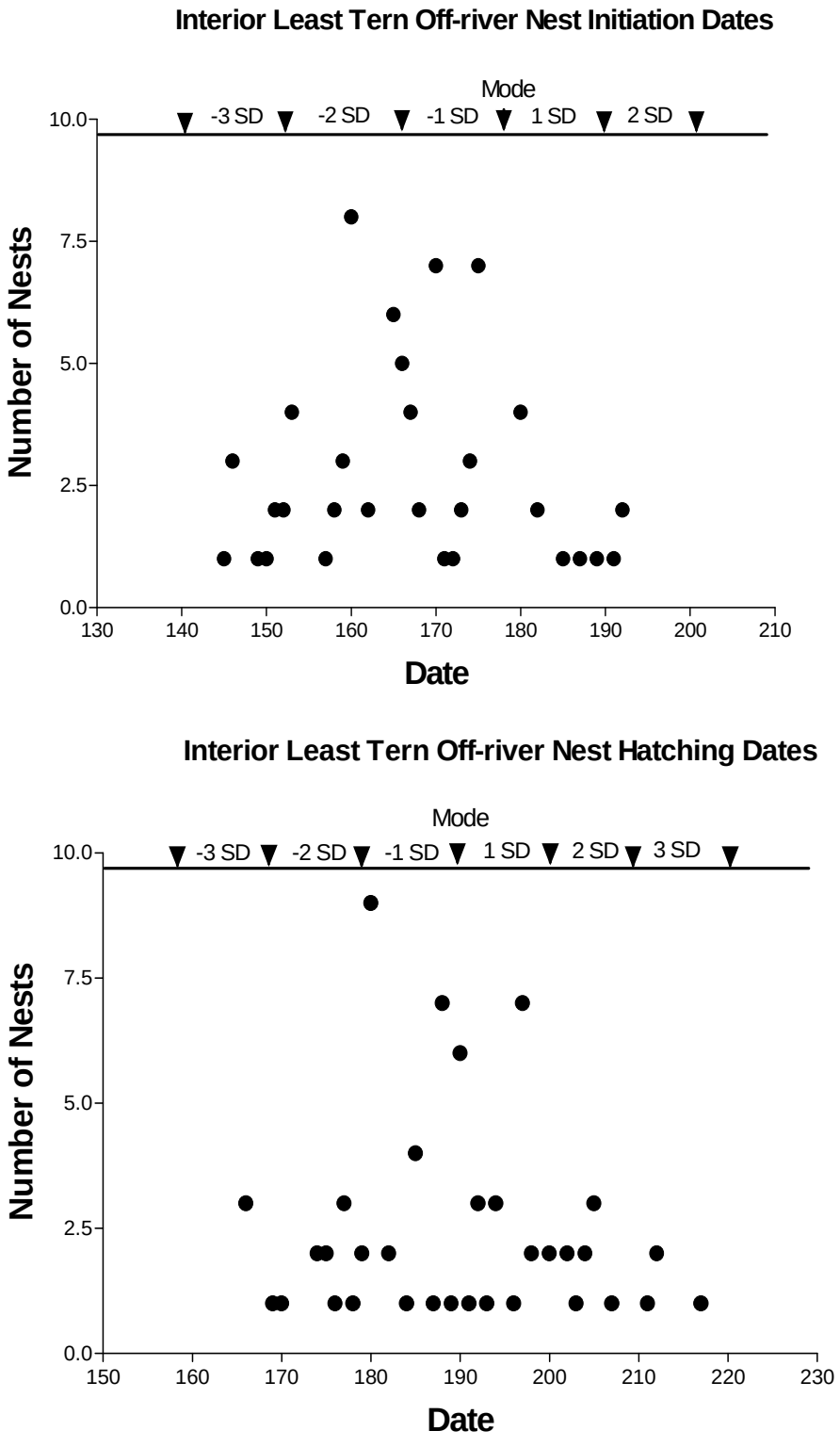


Figure 34. Interior Least Tern nest initiation (upper; mode = 16 June 2009) and hatching synchrony (lower; mode = 8 July 2009) at off-river sites.

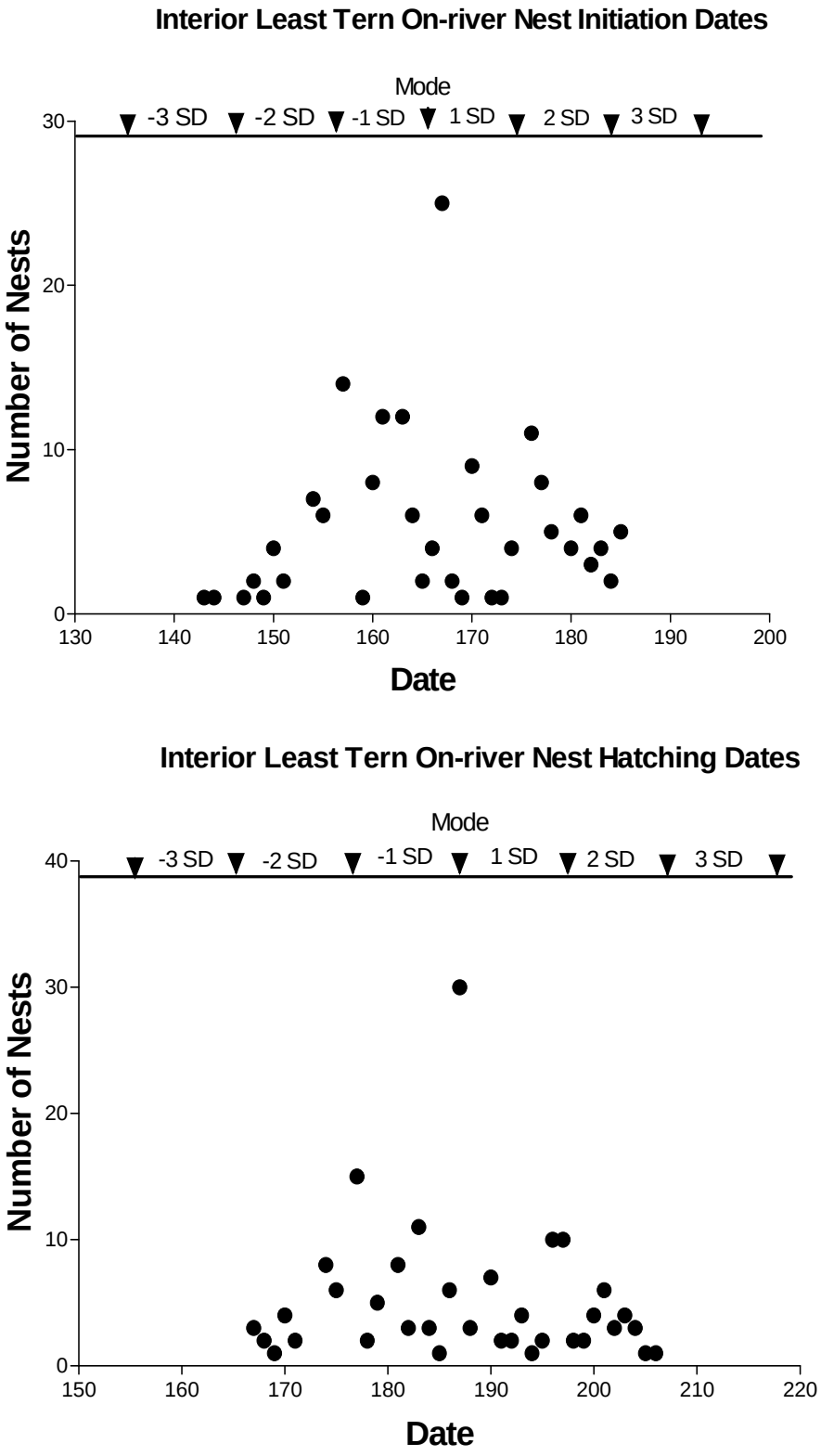


Figure 35. Interior Least Tern nest initiation (upper; mode = 15 June 2009) and hatching synchrony (lower; mode = 6 July 2009) at on-river nesting sites.

Assessing On-River Nesting Habitat

We evaluated the amount and quality of sandbar habitat in the Lower Platte River available to the terns and plovers by systematically measuring the physical characteristics of sandbars with nesting birds and, for comparison, a sample of sandbars without nesting birds. The likelihood that a nesting colony on a sandbar will be inundated and nests destroyed is determined by the height of the sandbar remaining above the fluctuating river water level. Our 2009 field protocol was similar to that of 2008 (see Brown and Jorgensen 2008). After evaluating our 2008 results, we modified our analytical protocol in 2009. Habitat assessment was done from river mile 0 to river mile 103, excluding the reach between river miles 73 and 89 (Schuyler to North Bend; see Monitoring). The objectives of assessing river sandbar habitat are twofold: to provide a straightforward method for rapidly assessing sandbar habitat that allows for between year comparisons and to assess the relationship between sandbar habitat and subsequent risk of within year inundation.

Methods

Nesting sandbars were defined as any sandbar that supported at least one active tern or plover nest. The sandbars we used for comparison were those located at every third river mile as measured from river mile 103; the sandbar located closest to the selected river mile, with a surface area of greater than 0.2 ha and with no nests, was chosen for measurement. If there was no such sandbar within one half mile of the river mile point, then “no habitat” was recorded.

We recognize that sandbar areas are dependent on variable river flow conditions, so sandbars with and without nesting colonies were measured on the same days in each river reach. Comparisons between sandbar sizes in the following analyses should be viewed as a relative index of size rather than an absolute index of size because measurements between reaches were conducted during different river flow conditions.

The size of each sandbar was measured using the same protocol. Here, we define sandbar size as a composite of the surface area of the sandbar and its elevation above the water line. The sandbar surface area was measured by walking the perimeter with a handheld GPS unit (Garmin Geko models 201 or 301) and marking waypoints at approximately 10 meter intervals. In cases where the perimeter of the sandbar was irregular, more waypoints were recorded so a more accurate area could be calculated. Waypoints were downloaded and imported in ArcMap (ESRI Inc 2006, Version 9.2, Redlands, CA, www.esri.com). A shape file was created in ArcCatalog and imported into ArcMap. The GPS unit, waypoint file, and ArcMap were set to the same projection (North American Datum 1983, UTM Zone 14). The perimeter of each sandbar was digitized using the outline established by the waypoints to create individual polygons in the shape file. An ArcMap utility was used to estimate the size of each polygon; this estimate was used as the surface area of the sandbar.

Using the same protocol, we also measured the area of sandbars with nesting colonies that were not inundated by the mid-June high river flow event. These peak flows completely inundated several sandbars (see 2009 River Conditions). The extent of inundation of the sandbars was readily visible after the water receded. After water levels dropped, the surfaces of the inundated sandbars were coated with silt. The silted areas did not fully dry until the first week of July. Silted areas remained moist for 1-2 weeks after water receded and were not used for re-nesting by terns or plovers. For more information see Nest Monitoring-Results On-River.

The elevation of each sandbar was measured using an automatic level (CST Berget® PAL/SAL "N" Series) and stadia. All automatic level measurements were taken by one person (JGJ) to minimize measurement error. We limited the time we spent in and around nesting colonies to minimize disturbance to nesting birds. Transects were run perpendicularly to the river channel, beginning and ending at the sandbar-water interface (waterline). The automatic level was set-up at the mid-point of each transect line to limit error. Measurements were taken at 2–20 m intervals along the length of the transect line. Measurement points were recorded with a handheld GPS unit. To measure the highest elevation along each transect and sandbar, several measurements were taken in the portion of the sandbar that we visually estimated had the highest elevation. We also took elevation measurements in the areas where tern and plover nests were located. Measurements were taken in this manner because we were interested in identifying the highest portion of the sandbar, which is also the area selected by nesting terns and plovers in most instances. We deemed it unnecessary to provide a complete topographic description of the sandbar. All of the sandbars had 'table top' topography, and by taking multiple measurements of the table top area, we captured a representative summary of the maximum sandbar height. Sandbar heights were calculated by subtracting the waterline measurements from the sandbar measurements. All height measurements were recorded in feet and are reported in that unit to be consistent with gage station measurements.

Sandbar elevations and surface area are dependent on the river flow at the time the measurements are taken. We used river flow measurements from gage stations in order to reference sandbar heights (http://waterdata.usgs.gov/ne/nwis/rt). The sandbars located below the Salt Creek confluence were referenced to the Louisville gage. The sandbars above the Salt Creek confluence and below the Elkhorn River confluence were referenced to the Ashland gage. The sandbars above the Elkhorn River confluence were referenced to the Leshara gage. The sandbars above Fremont were referenced to the North Bend gage. See Figure 36 for reference gage locations for the four different river reaches. River reaches are identified by their corresponding gage station name.

We identified the highest and lowest river flow measurements at the reference gage station within the 24 hour period that each sandbar was measured. These measurements provided the upper and lower limits of water elevation on the day the sandbar was measured. This approach allows us to quantify a range of values within which the actual sandbar height measurement exists and to quantify the uncertainty associated with the field measurement.

The measured elevation with the largest value recorded at each sandbar was selected as the highest sandbar height. The highest sandbar height was then adjusted to the 15 June mean flow for each reference gage height. This was done to provide consistency across the season. The specific 15 June mean reference gage measurements used were 4.48 ft at Louisville, 16.35 ft at Ashland, 4.86 ft at Leshara, and 4.19 ft at North Bend. We used the difference between the sandbar elevation and changes in river flow at the gage station to determine whether a sandbar was inundated during the nesting season. If both the minimum and maximum highest sandbar elevation remained positive during the nesting season, it is unlikely that the sandbar was inundated and tern and plover nests destroyed. The closer the minimum and maximum highest sandbar elevation approached to zero or were negative, it is increasingly likely that the sandbar was inundated and nests destroyed. Sandbars with nests were visited regularly during nest checks and monitored to determine whether nests, or the entire sandbar, had been inundated by rising river water.

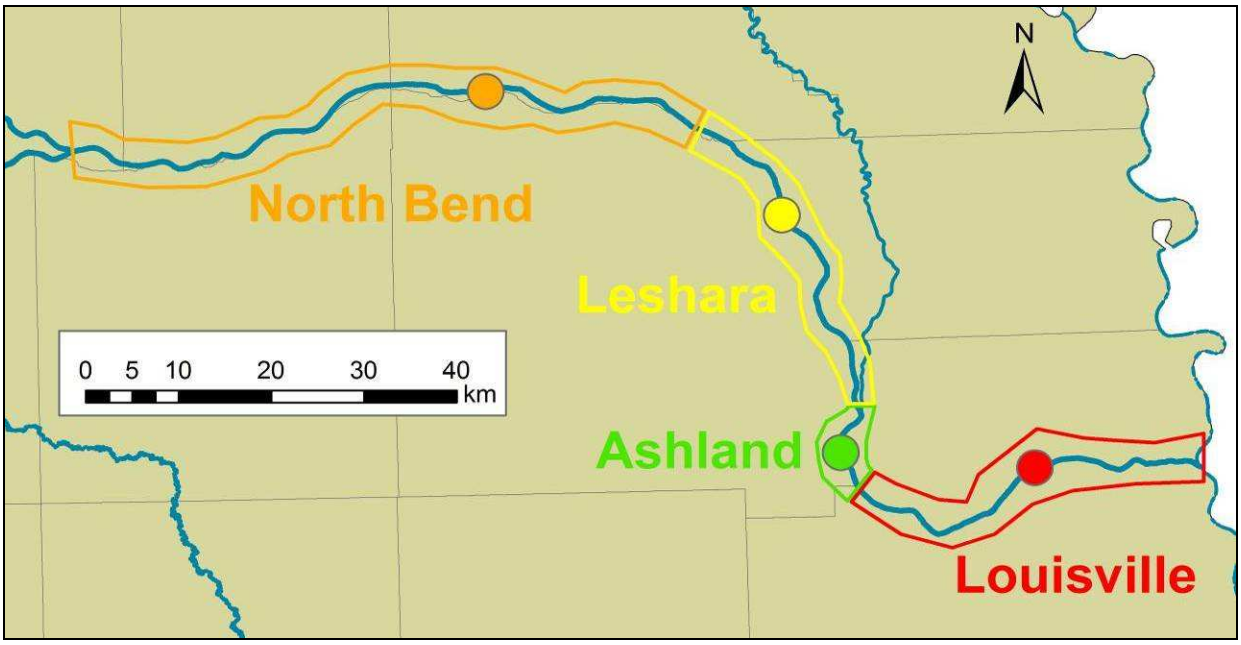


Figure 36. River reaches (colored boxes) and reference gage station locations (colored dots) used to reference sandbar elevation data.

We developed scatterplots using a locally weighted regression smoothing (LOESS) utility that included both the minimum and maximum highest sandbar heights to illustrate the relationship of sandbar height and river mile. We then used a generalized additive model (GAM) to describe the relationship between minimum and maximum highest sandbar heights and river mile. The scatterplots and GAMs only use data from sandbars with nesting colonies; sandbars that did not support nests are not considered in this analysis. All analyzes were done using Program R 2.9.2 (R Core Development Team 2009, http://www.r-project.org/).

Results

We assessed sandbar habitat metrics at 26 sandbars with nesting colonies and at 11 sandbars without nesting colonies (10 sandbars and 1 site with "no habitat") from 29 May 2009 through 8 July 2009. The "no habitat" measurement is relevant when considering habitat availability, but is not considered further in this analysis of sandbar habitat. The small sample size (n = 10) of sandbars without nesting colonies limits the complexity of the following analysis.

The mean surface area (x ± 1 SE) of sandbars without nesting colonies (6.03 ± 2.08) was greater than that of sandbars with nesting colonies (5.34 ± 1.10; Figure 37). The mean height (x ± 1 SE) of sandbars with nesting colonies (2.12 ± 0.13) was also greater than that of sandbars without nesting colonies (1.78 ± 0.28; Figure 38). Scatterplots and GAMs of both the minimum and maximum highest sandbar heights show that sandbar height consistently increases as one travels downstream in the Lower Platte River (Figures 39-42). The rate of change increases dramatically at approximately the Platte and Elkhorn River confluence near river mile 33 (Figures 39-42).

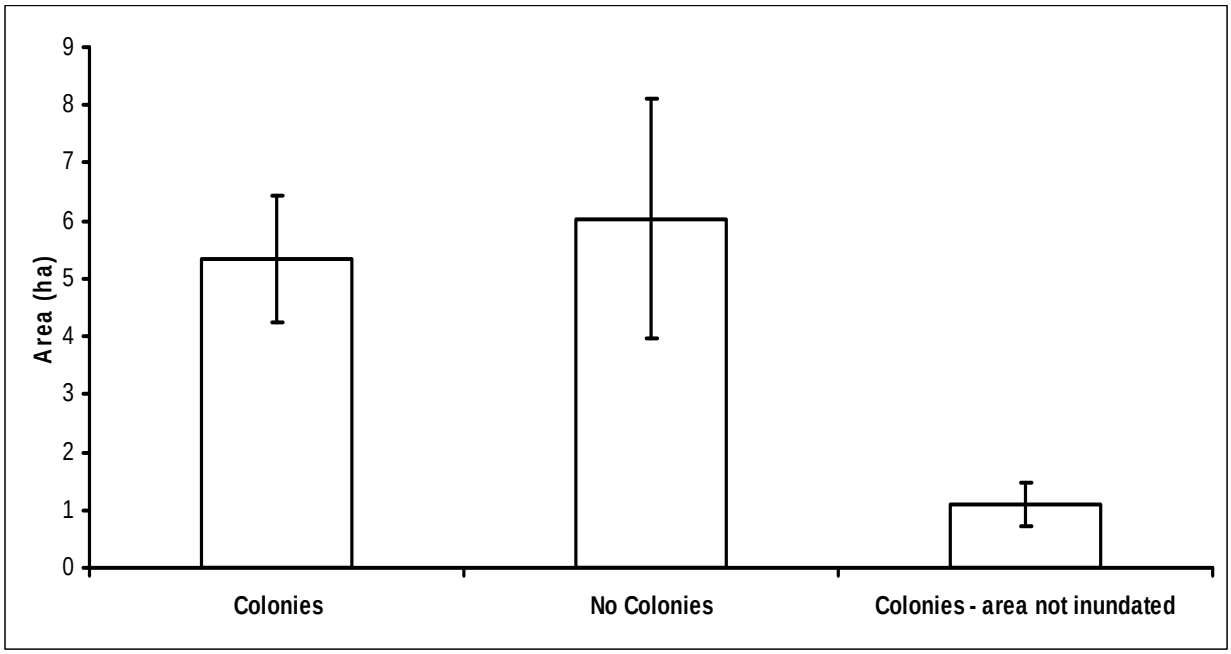


Figure 37. Area (ha) of sandbars with and without nesting colonies and the area of the sandbars with colonies that was not inundated by the mid-June high flow event at sandbars with nesting colonies.

Figure 38. The maximum height of sandbars with and without nesting colonies in 2009.

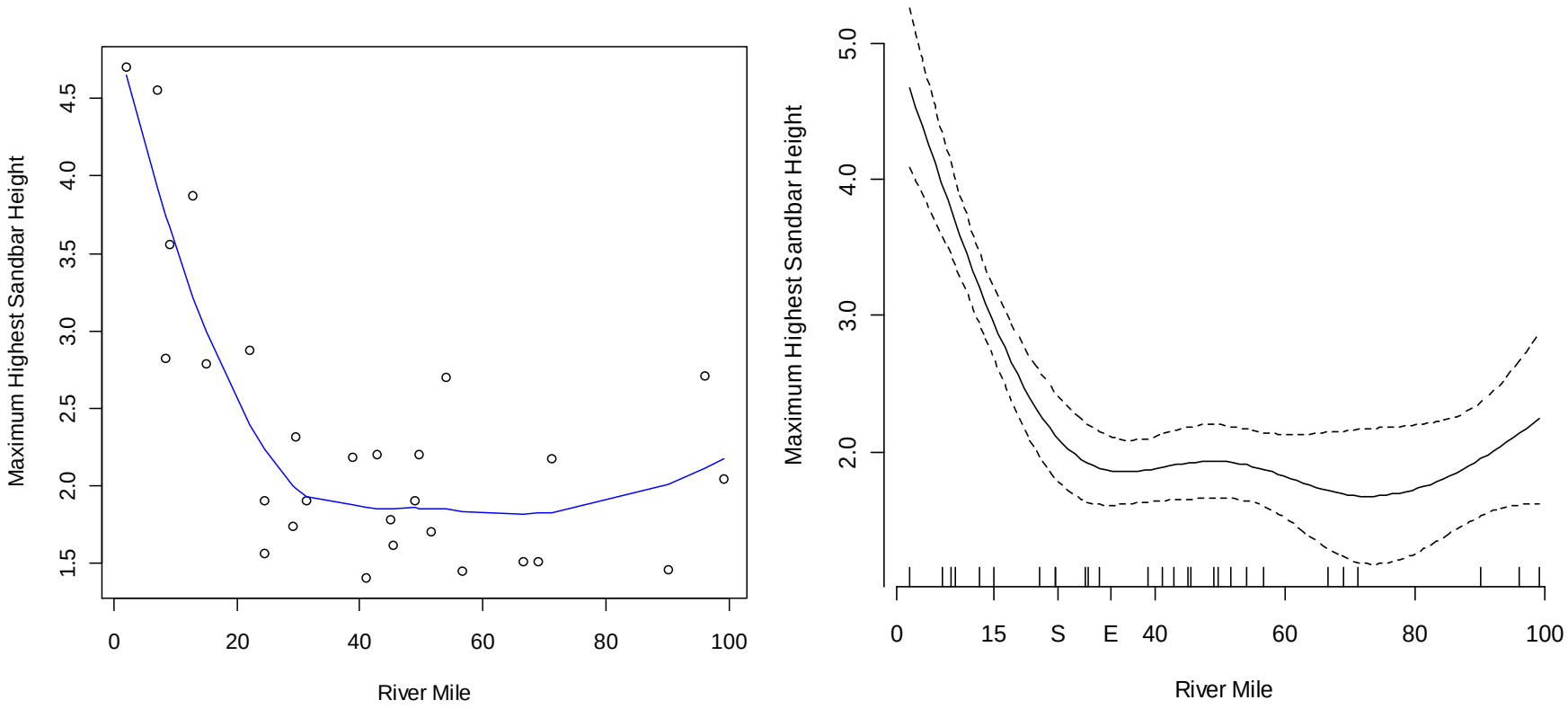


Figure 39. 2009 Maximum highest sandbar elevation relative to 15 June mean of reference gage versus river mile (river mile 0 = Platte-Missouri River confluence, river mile 103 = Platte-Loup River confluence). *Left*: Regression line describing all maximum highest sandbar elevations, open circles are the actual measurements. *Right*: Smoothing function from the generalized additive model applied to the same data (deviance explained = 77.1%, EDF = 4, $F = 19.39$, $P < 0.001$). Solid line is the estimated smoother, dashed lines are point-wise 95% confidence bands. On the x-axis, S is location of the Salt Creek confluence and E is the location of the Elkhorn River confluence. The short vertical lines reference location of data points used in the calculation.

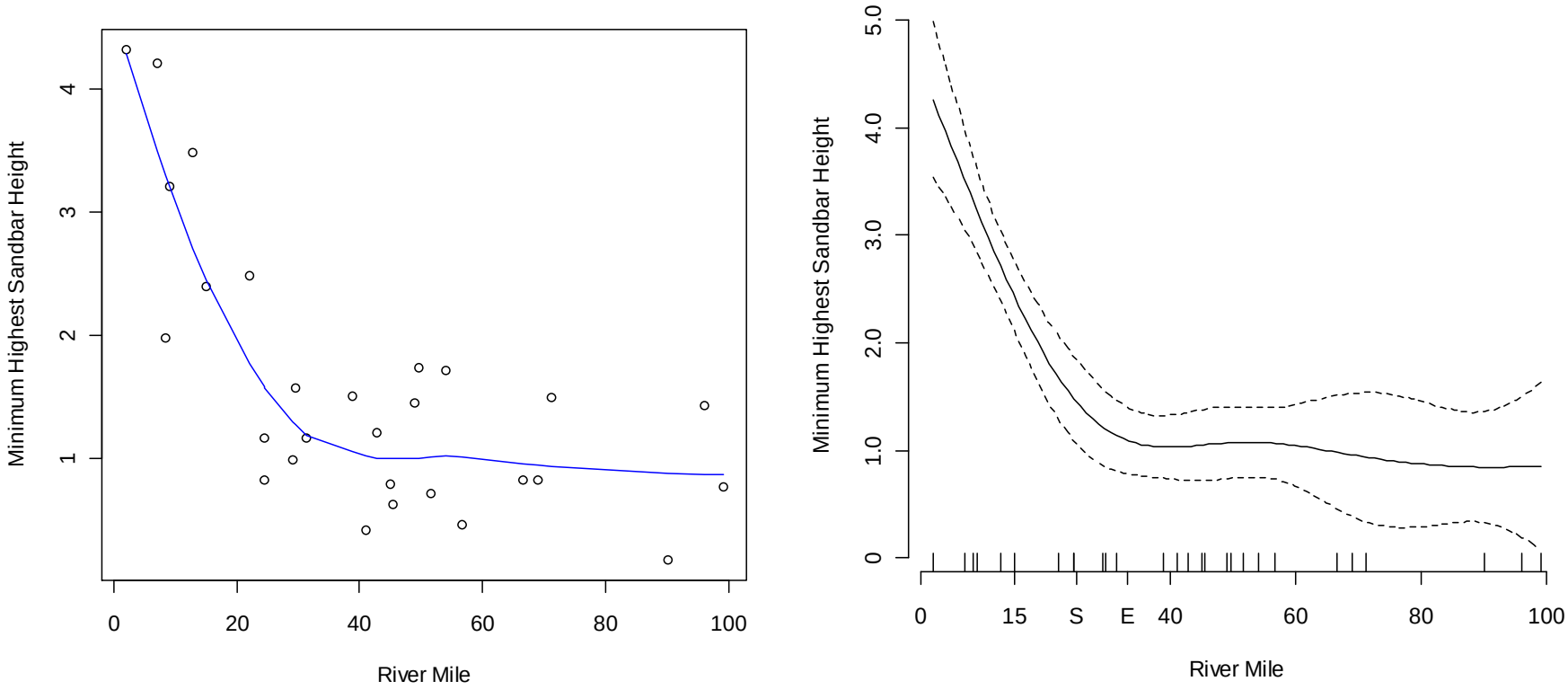


Figure 40. 2009 Minimum highest sandbar elevation relative to 15 June mean of reference gage against river mile (river mile 0 = Platte-Missouri River confluence, river mile 103 = Platte-Loup River confluence). *Left*: Regression line describing all minimum highest sandbar elevations; open circles are the actual measurements. *Right*: Smoothing function from the generalized additive model applied to the same data (deviance explained = 75.1%, EDF = 4, $F = 18.30$, $P < 0.001$). Solid line is the estimated smoother, dashed lines are point-wise 95% confidence bands. On the x-axis, S is location of the Salt Creek confluence and E is the location of the Elkhorn River confluence. The short vertical lines reference location of data points used in the calculation.

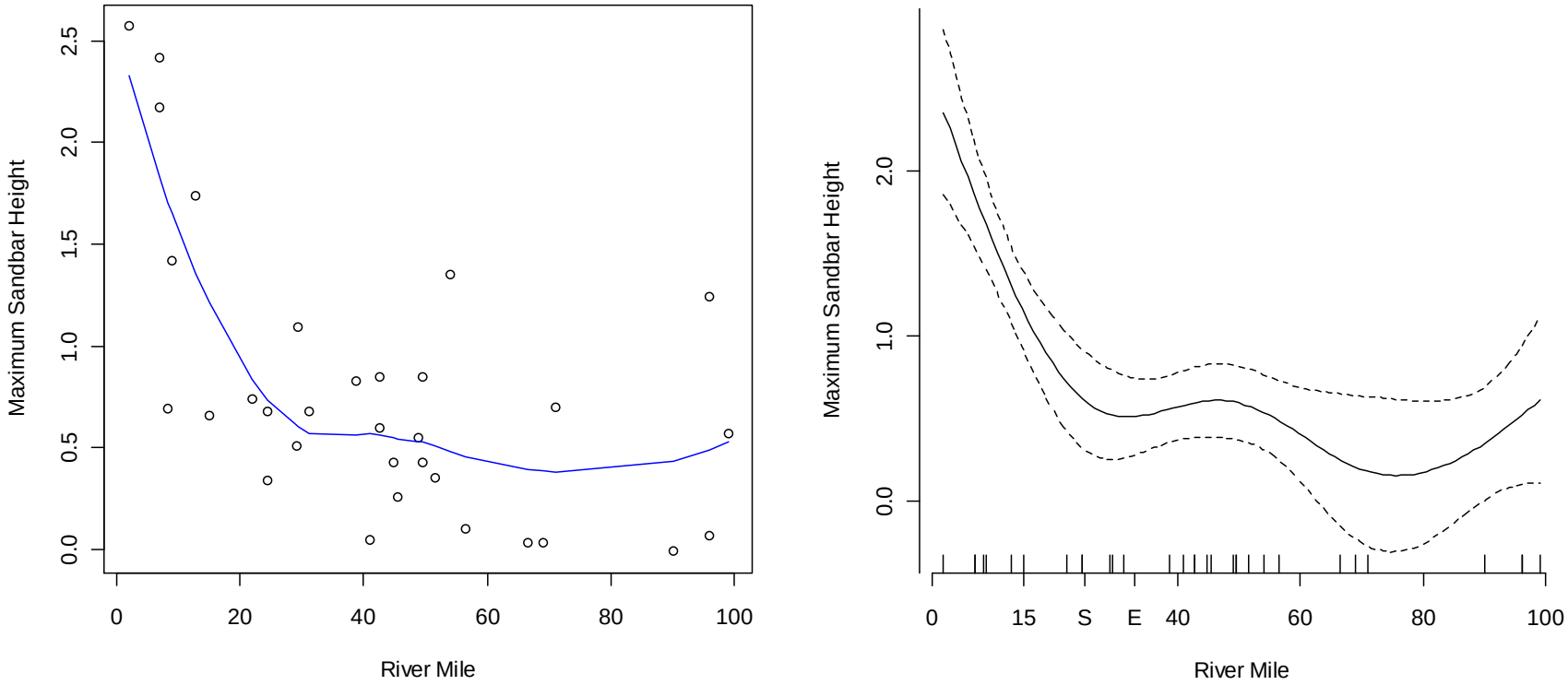


Figure 41. 2009 Maximum highest sandbar elevation referenced to breeding season high flow in relation to river mile (river mile 0 = Platte-Missouri River confluence, river mile 103 = Platte-Loup River confluence). Graphs depict relationship between sandbar height and inundation risk. *Left*: Regression line describing all maximum sandbar elevations, open circles are the actual measurements. *Right*: Smoothing function from the generalized additive model applied to the same data (deviance explained = 63.6%, EDF = 4, F = 11.78, $P < 0.001$). Solid line is the estimated smoother, dashed lines are point-wise 95% confidence bands. On the x-axis, S is location of the Salt Creek confluence and E is the location of the Elkhorn River confluence. The short vertical lines reference location of data points used in the calculation.

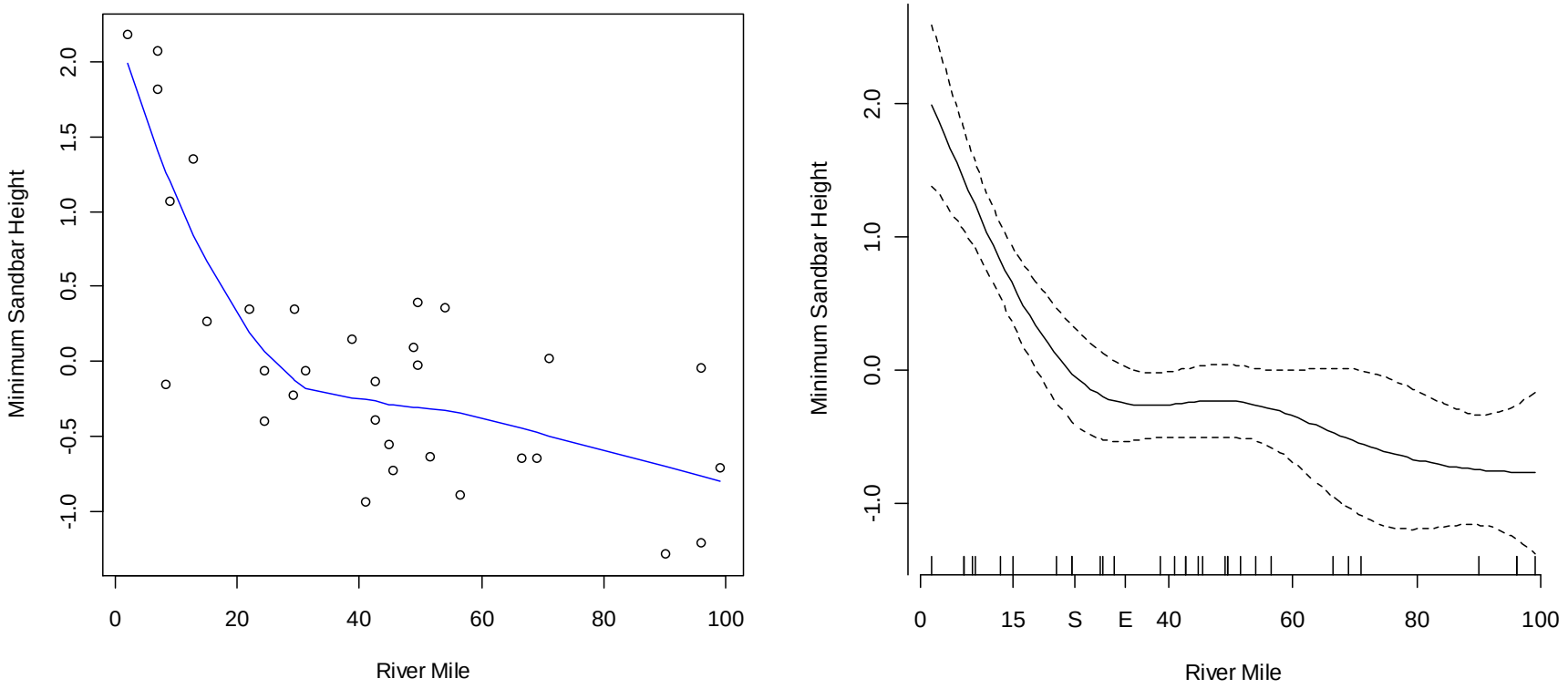


Figure 42. 2009 Minimum highest sandbar elevation referenced to breeding season high flow in relation to river mile (river mile 0 = Platte-Missouri River confluence, river mile 103 = Platte-Loup River confluence). Graphs depict relationship between sandbar height and inundation risk. *Left*: Regression line describing all maximum sandbar elevations, open circles are the actual measurements. *Right*: Smoothing function from the generalized additive model applied to the same data (deviance explained = 68.6%, EDF = 4, F = 14.72, $P < 0.001$). Solid line is the estimated smoother, dashed lines are point-wise 95% confidence bands. On the x-axis, S is location of the Salt Creek confluence and E is the location of the Elkhorn River confluence. The short vertical lines reference location of data points used in the calculation.

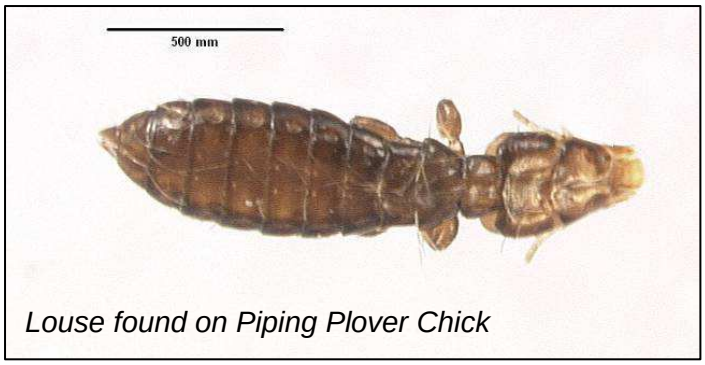
For some of the sandbars, the values of the minimum and maximum highest sandbar height at the mid-June peak flow event were near or less than zero, indicating that the sandbars were most likely inundated. Visual inspections of these sandbars and nests during monitoring visits following the mid-June high flow event showed that water rarely completely inundated these sandbars. We observed that, when a large portion, but not all, of the sandbar was inundated, the tern and plover nests were located on the portion that remained dry, in several instances, only a small area (<1 m) around nest cups was not inundated. Nest cups are usually placed on the highest portions of sandbars. One nest (#92, North Camp Ashland sandbar) was inundated, but the eggs were not washed away. The adult(s) continued to attend the nest and the eggs hatched on 10 July. See photograph on page 32.

Interior Least Terns and Piping Plovers often nest on sandbars in the Lower Platte River that are at risk of inundation from mid-summer river rises. Other analyses demonstrate that sandbar habitat elevation is determined by the previous 1.5 year peak river flow (*sensu* J. Parnham, 2007. Hydrologic analysis of the lower Platte River from 1954 – 2004, with special emphasis on habitat of the endangered Least Tern, Piping Plover, and Pallid Sturgeon. Bishop Museum, Honolulu, HI). All sandbars that Interior Least Terns and Piping Plovers used in 2008 were still present and used by nesting birds in 2009, although these sandbars were reduced in size from lateral erosion (Figure 43). Sandbars used in 2008 – 2009 were not present in 2007 (JGJ, pers. obs.) and were formed by the 2008 late May-early June high flow event (see Brown and Jorgensen 2008).

River flows during the nesting season are modified by a variety of factors. Weather events, such as thunderstorms, can produce large amounts of precipitation in very short periods of time, and the subsequent run-off often results in river rises that increase the risk of sandbar inundation. While it is difficult to anticipate extreme weather events, it is clear that reductions in the intensity and regularity of "habitat-forming" flows will reduce sandbar height, which will certainly increase the probability of sandbar inundation. Any event that reduces the difference between sandbar height and water flow levels (or sandbar habitat - waterline compression), such as water diversion or hydropeaking after nests have been initiated, increases the probability that colonies will be inundated and nests of these imperiled species lost.

Ectoparasites

The ectoparasite fauna of Piping Plovers is fairly well known; they are the avian host for four species of louse: Suborder Amblycera; Menoponiidae-2 species and Suborder Ischnocera: Philopteridae-2 species. On 22 June 2009, we found an adult louse on a 10 day old Piping Plover chick at the Big Sandy lakeshore housing development. It was identified as Ischnocera: Philopteridae: *Quadraceps macrocephalus* (Waterston, 1914) by Robert C. Dalgleish, Department of Entomology, San Diego Natural History Museum, San Diego, CA and National Museum of Natural History, Washington DC. We have not previously found an ectoparasite of any sort on a tern or a plover in the Lower Platte River.



Louse found on Piping Plover Chick

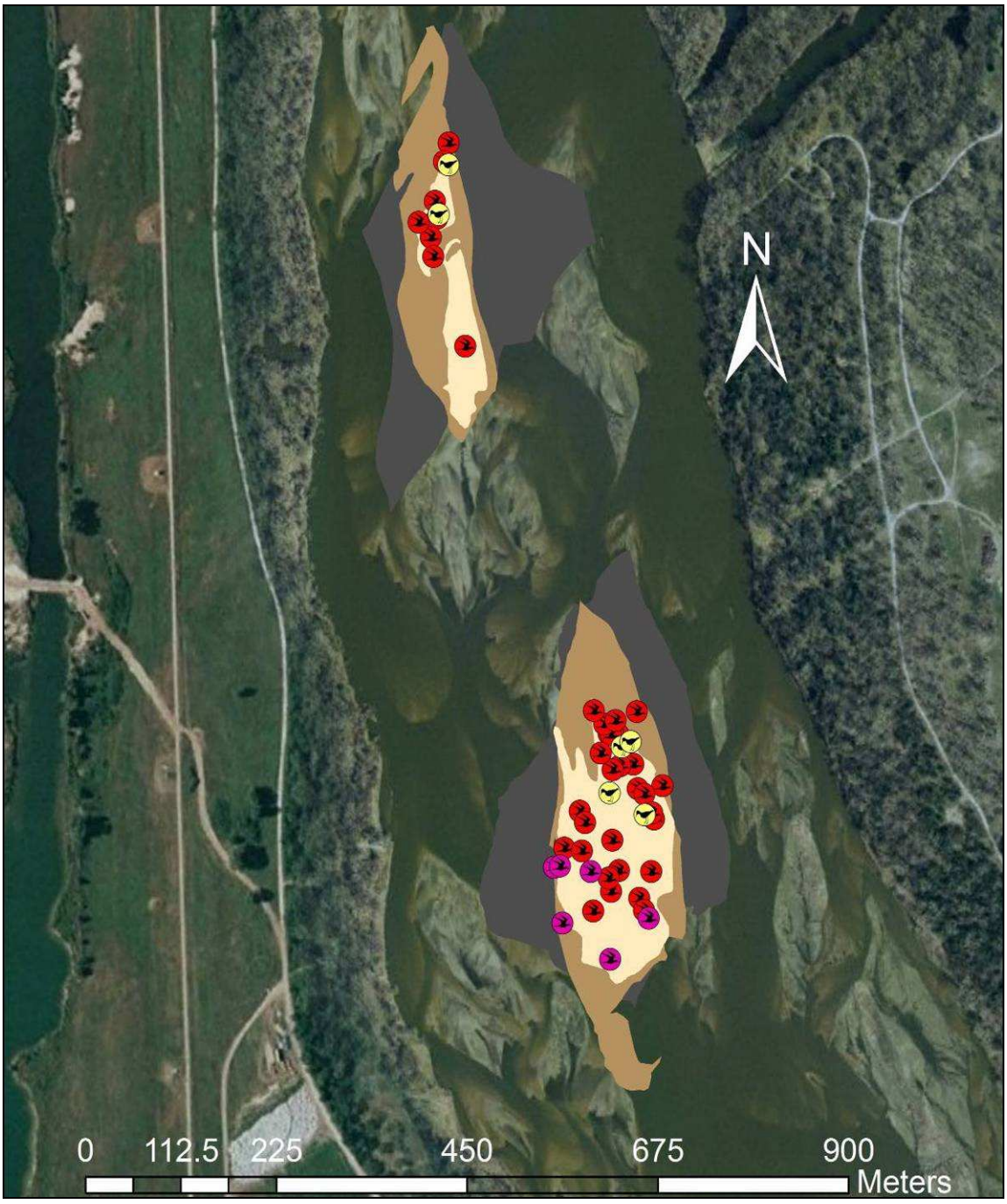


Figure 43. Areas of sandbars at RM 29.1 (top) and 28.5 (bottom) in 2008 (charcoal gray) and 2009 (dark and light brown). Area of RM 29.1 sandbar was 7.02 ha when measured 30 June 2008; mean discharge at the Ashland gage on this date was 7,800 cfs. Area of RM 28.5 sandbar was 8.77 ha when measured on 12 July 2008; mean discharge at the Ashland gage on this date was 7,820 cfs. Area of RM 29.1 sandbar was 3.02 ha on 2 July 2009 and area of RM 28.5 sandbar was 5.45 ha the same day; discharge at the Ashland gage was approximately 8,000 cfs on 2 July (data unavailable from USGS at the time of this writing). Schematic shows reductions in lateral size of sandbars caused by erosion since the sandbars were formed by the 2008 high flow event. Purple icons represent 2008 Interior Least Tern nest locations.

Management

The Tern and Plover Conservation Partnership uses a voluntary, proactive approach to avoid and minimize bird-people conflicts and to reduce or eliminate the need for law enforcement personnel to be involved in tern and plover management. There were no conflicts or need for law enforcement recorded in 2009, as was the case in 2008.

Before terns and plovers returned to Nebraska and the field season began, TPCP met with the production managers of all area sand and gravel mines. At these meetings, we discussed the mining companies' production plans for the season, safety regulations, and site access. We paid particular attention to concerns mine personnel had regarding previous on-site activities of the TPCP and changes to MSHA (Mine Safety and Health Administration) policy as it applies to non-mine personnel. We also met with homeowners associations at the lakeshore housing developments. At these meetings, we discussed the construction plans for the area and site access. We paid particular attention to property owners' concerns regarding previous on-site activities of the TPCP. See Table 1 for a list of active and inactive sand and gravel mines and lakeshore housing developments in the Lower Platte River.

A result of each of these meeting was site-specific management and monitoring plans; an equally valuable result was becoming acquainted with the people living and working at these sites. As the season progressed, this made our management efforts easier to implement. Throughout the season, we maintained close contact with these individuals so we could respond to any on-site changes that developed as the season progressed.

Protecting Interior Least Tern and Piping Plover Nests

In order to protect tern and plover nests, we put up "Keep Out" signs around the perimeter of all off-river nesting areas; these signs were designed in 2008 by the TPCP and are being adopted for use across Nebraska. In areas where considerable human foot or vehicle traffic was expected, additional barriers were added. These barriers consisted of a black cord tied between all of the "Keep Out" sign posts; we tied red-silver Mylar™ streamers to the cord to make it more visible.

Placing signs and fencing around a colony

Based on our pre-nesting season conversations with mine production managers and homeowners' associations, we mapped out the areas where it would be best if the terns and plovers did not nest. These were the areas within the mine property that were going to be dredged during the nesting season or where heavy equipment was going to be operating. At the housing developments, these were the areas where buildings were to be constructed or utilities were to be installed. We know that terns and plovers will not nest in areas where the substrate is disturbed by raking, where there is any surface vegetation, where the substrate particle size is either too large or too small or where there is any physical disturbance (J. Marcus, J. Dinan, R. Johnson, E. Blakenship, and J. Lackey 2007. Waterbirds 30: 251 – 258). Planting vegetation, resurfacing the sand and raking the substrate are labor intensive, so we opted for the physical disturbance method of discouraging the birds from nesting in an area. In areas where we did not want the birds to nest, we put up grids of three foot tall poles with 16 foot long streamers of red-silver Mylar™ flagging attached to them. The poles are set 16 feet apart. When the streamers blow in the wind, they make a crackling sound and sweep the ground which dissuades the birds from attempting to nest in the area. We placed protective wire mesh nest exclosures around all accessible plover nests at off-river sites in 2009. We did not put exclosures around plover nests on sandbars or where property owners asked us not to for safety reasons. The wire mesh in these exclosures measures 2 x 4 inches which is large enough to allow access by adult plovers, but small enough to exclude most terrestrial predators. The bottom of the exclosure is buried in the sand substrate to prevent predators from digging under the exclosure and accessing the nest. The exclosures are approximately 3 x 3 feet square with wire prongs protruding from the top which prevents access by most avian predators. See photographs in Nest Monitoring for examples.

Mylar flagging

We did not put exclosures around tern nests, as they will not accept any structures around their nests.

<u>Preferred Rocks of Genoa-Loup Public Power District Bird Management Area</u>

In March 2008, the United States Fish Wildlife Service, Nebraska Game and Parks Commission, and Preferred Rocks of Genoa entered into a Memorandum of Understanding (MOU) outlining the management of the Interior Least Terns and Piping Plovers nesting on the North Sand Management Zone (NSMZ) which is immediately adjacent to the Loup Public Power District's (LPPD) Loup Diversion and settling basin near Genoa, Nance County, NE. The TPCP and LPPD are cooperators, not signatories, to the MOU. Preferred Rocks of Genoa constructed a small pond and a 315 acre 'bird management area' on the NSMZ (see Figure 44). This area is surrounded by a 10 – 15 foot tall sand berm to protect it from slurry outflow water coming from LPPD's dredging operation at the settling basin. The slurry water flows across the NSMZ from the northeast to the southwest, resembling a miniature Platte River complete with small fish and sandbars. As part of their standard policy, LPPD stopped dredging the settling basin when the birds arrived and began nesting; they resumed dredging after the birds departed. We are not

aware of any nests being washed away by slurry water. The sand outside of the berm was windrowed by Preferred Rocks of Genoa to discourage the birds from nesting in unsafe areas. No terns or plovers nested in the windrowed areas. Nests of both species were found in the 'bird management area', in areas surrounding the windrowing, and in the dry sections of the "river channel" on the NSMZ. With the assistance of two Preferred Rocks of Genoa employees, Kenton Zimmer, Maintenance Supervisor and Richard Plumtree, Production Supervisor, the TPCP monitored the birds nesting at the NSMZ.

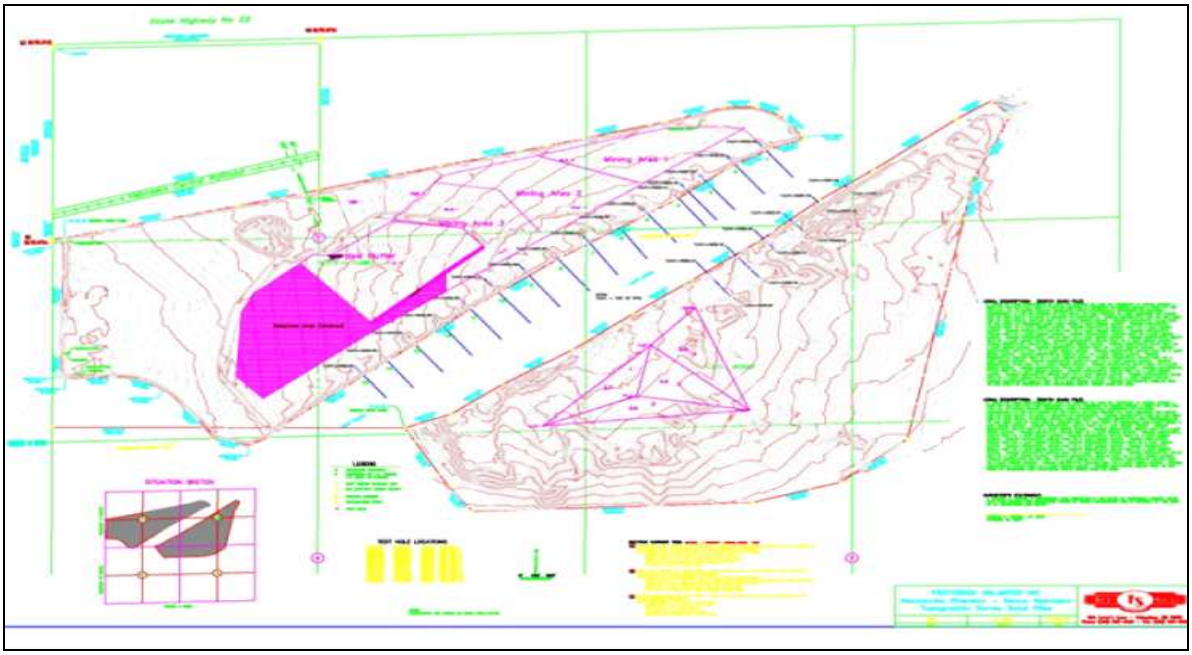


Figure 44. Schematic diagram of the "bird management area" or "bird buffer" found at the LPPD-Preferred Rocks of Genoa Sand Management Zone. The solid pink area was windrowed to discourage nesting birds.

Scenes from the LPPD-Preferred Rocks of Genoa Sand Management Zone.

Loup Public Power District-FERC (Federal Energy Regulatory Commission) relicensing project. In 2009, Loup Public Power District, which owns the North Sand Management Zone near the Loup Diversion and settling basin near Genoa, Nance County, NE (see Preferred Rocks of Genoa-Loup Public Power District Bird Management Area above for details) initiated the process to renew their 25 year-license for the hydropower generating facilities near Monroe and Columbus, Platte County, NE. The TPCP is working in cooperation with FERC, LPPD, HDR Engineering, United States Fish and Wildlife Service, Nebraska Game and Parks Commission, United States National Parks Service, and others on this relicensing project. Our role is to serve as threatened and endangered species experts, and in particular, Interior Least Tern and Piping Plover experts.

Lake McConaughy Interior Least Tern and Piping Plover Nesting. Lake McConaughy, near Ogallala, Keith County, NE, is home to the second largest nesting concentration of Piping Plovers in the world, after Lake Oahe in North Dakota. The lake is owned and operated for irrigation and hydropower generation by Central Nebraska Public Power and Irrigation District (CNPPID). Under their FERC operating license, CNPPID is obligated to protect the Interior Least Terns and Piping Plovers nesting on the sandy beaches surrounding the lake, with the supervision of the United States Fish and Wildlife Service (USFWS), and Nebraska Game and Parks Commission (NGPC). In 2009, the TPCP provided CNPPID with a full-time assistant to help monitor and protect the terns and plovers nesting at the lake. This assistant also helped CNPPID carry out the observational study requested by the USFWS and NGPC.

United States Army Corps of Engineers-Papio-Missouri Natural Resources District Janzen Pit Project. In 2009, the United States Army Corps of Engineers, Nebraska National Guard-Camp Ashland, and Papio-Missouri Natural Resources District began construction on a project to renovate the flood control levees along the Lower Platte River near Camp Ashland (Ashland, Saunders County, NE). The construction area lies between the off-river nesting site "Melia" and the on-river nesting site "Camp Ashland sandbar", so there were a number of nesting terns and plovers in the immediate vicinity of the construction site. The TPCP monitored the progress of the construction throughout the nesting season to ensure that no nesting terns and plovers were interfered with.

MSHA (Mine Safety and Health Administration). In 2009, the TPCP provided MSHA approved mine safety training (with endorsement for scientific workers) for all individuals working with terns and plovers on sand and gravel mines in the Lower Platte and Loup rivers. This training is mandated by the United States Department of Labor 30 CFR Part 46 regulations.

USFWS Spotlight Species (Piping Plover) Action Plan. The TPCP is prominently featured in the Spotlight Species Action Plan prepared by the USFWS Endangered Species Program and is a recommended part of the future recovery strategy for the species.

USFWS Piping Plover *(Charadrius melodus)* 5-Year Review: Summary and Evaluation. The TPCP is prominent in this mandated review of the progress towards the species' recovery and is a recommended part of future recovery strategy for the species.
http://www.fws.gov/northeast/endangered/PDF/Piping_Plover_five_year_review_and_summary.pdf

Nebraska's Congressional Delegation. During the 2009 nesting season, we met with Senator Ben Nelson's and Congressman Jeff Fortenberry's offices to discuss Nebraska's threatened and endangered species, in general, and Interior Least Terns and Piping Plovers, in particular.

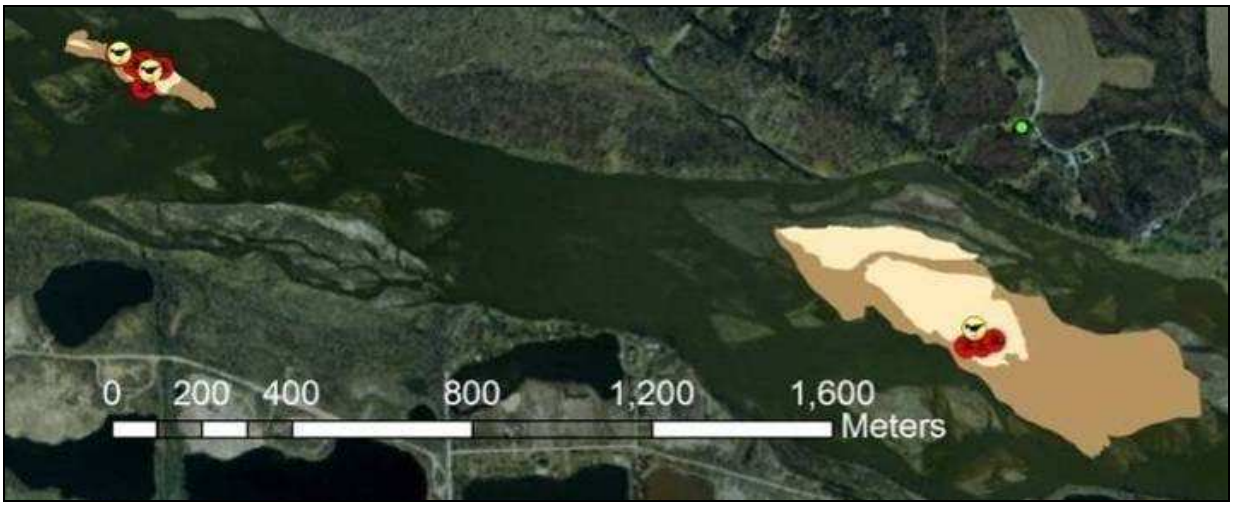


Figure 45. Location of the two sandbars near Camp Maha that will be cleared of vegetation to make them appropriate for Interior Least Tern and Piping Plover nesting.

Girl Scouts-Spirit of Nebraska Camp Maha sandbar restoration project. In cooperation with the Girl Scouts-Spirit of Nebraska Camp Maha and Camp Catron, the USFWS Nebraska Partners for Fish and Wildlife Program, and NGPC, we initiated a project to restore a sandbar in the Lower Platte River owned by Camp Maha (near Papillion, Cass County, NE). The sandbar will be cleared of vegetation in August-September 2010 using bulldozers (K. Dinan and K. Schroeder, pers. comm.). As part of an environmental education program led by the TPCP, the sandbar will be maintained by Girl Scout troops working to earn merit badges. The Girl Scout Camp managers (M. Dietz and R. Anderson) have spoken with property owners adjacent to Camp Maha about the project; to date, one property owner has asked that their sandbar be included in the restoration project. See Figure 45 for the location of the two sandbars that will be restored.

TPCP Program Coordinator Mary Bomberger Brown with Rep. Jeff Fortenberry

Education and Outreach

A substantial part of our mission to protect Interior Least Terns and Piping Plovers involves education and outreach. The TPCP is becoming an important entity in Nebraska's conservation and environmental education community. We are frequently called upon to give presentations, assist with symposia, workshops and festivals, participate in workgroups, and serve on committees. While the majority of our education and outreach efforts are focused on terns and plovers in Nebraska's Lower Platte River, we appreciate that we have a broader role in improving environmental literacy locally, regionally, and nationally. We take advantage of every opportunity to reach as many different constituencies as possible with our message of common sense conservation.

TPCP Outreach Coordinator, Chris Thody in action

Nebraska Interior Least Tern and Piping Plover Meeting

We organized and hosted the 3rd annual Nebraska Interior Least Tern and Piping Plover Meeting. The meeting was held in Hardin Hall on the University of Nebraska campus on 23 February 2009. Sixty-one people attended the meeting (20 attended in 2007, 40 attended in 2008). Attendees hailed from eight states (Colorado, Idaho, Minnesota, Missouri, Nebraska, Oregon, North Dakota, and South Dakota). Attendees represented a variety of agencies and organizations (American Bird Conservancy, Central Nebraska Public Power and Irrigation District, Central Platte Natural Resources District, HDR Engineering, Headwaters Corporation, Lower Platte River Corridor Alliance, Lower Platte South Natural Resources District, Nebraska Cooperative Fish and Wildlife Research Unit, Nebraska Environmental Trust, Nebraska Game and Parks Commission, Nebraska Ornithologists' Union Breeding Bird Atlas Project, Nebraska Public Power District, New Zealand Land and Pelagic Bird Tours, Oregon State University, Platte River Recovery Implementation Program, Rocky Mountain Bird Observatory, The Nature Conservancy, University of Nebraska, United States Army Corps of Engineers, United States Department of Agriculture, United States Fish and Wildlife Service, United States Geological Survey, Northern Prairie Wildlife Research Center, United States National Park Service).

The 2010 Nebraska Interior Least Tern and Piping Plover Meeting is scheduled for Tuesday, 23 February 2010 and is to be held in Hardin Hall on the University of Nebraska campus.

2009 Nebraska Least Tern and Piping Plover Meeting
February 23, 2009

7:45-8:15	Registration	
8:15-8:30	Welcome	Mark Kuzila, UNL Joel Jorgensen, NGPC
8:30-8:55	Least Terns and Piping Plovers On the Central Platte River—Monitoring and Adaptive Management	Chad Smith, Headwaters Corporation
9:00-9:25	Defining and Measuring Sandbar Nesting Habitat for Least Terns	Casey Lott, ABC
9:25-9:50	Population genetic structure in the Piping Plover	Susan Haig, USGS
9:50-10:15	Piping Plover 5-year Review	Carol Aron, USFWS
10:15-10:30	Break	
10:30-11:00	Subspecies Definition and Genetic Structure in the Least Tern	Susan Haig, USGS
11:00-11:30	The 2006 International Piping Plover Census: Reflections on the Populations Status of an Endangered Species Over 15 Years	Elise Elliott-Smith, USGS
11:30-11:50	Finding a Balance: Water Use and Protected Species in the Lower Platte River	Kristal Stoner, NGPC
11:50-1:00	Lunch - Second Floor Lobby	Catering by Diane Pratt
1:00-1:30	Terns, Plovers, Sand, and Water: putting it all together to forecast the future.	Drew Tyre, UNL
1:30-2:00	Least Terns on the Gavin's Point Reach of the Missouri River 2006-2008	Jennifer Stucker, USGS
2:00-3:30	2008 River Reports	
	• 2008 Adult Census and Productivity of Least Terns and Piping Plovers on the Missouri River—Nebraska	Greg Pavelka, USACE
	• Niobrara Update	Stephen Wilson, NPS
	• Lake McConaughy Update	Gabe Wilson, CNPPID
	• Central Platte Update	Jim Jenniges, NPPD and Mark Czaplewski, CPNRD
	• Loup River Update	Ben Wheeler, NGPC
	• Elkhorn Update	Mary Bomberger Brown, TPCP
	• Lower Platte Update	
3:30-4:00	Lower Platte River 2008-High Water and Habitat	Joel Jorgensen, NGPC
4:00	Closing	

UNL—University of Nebraska-Lincoln
NGPC—Nebraska Game and Parks Commission
FWS—US Fish and Wildlife Service
USGS—US Geological Survey
ABC—American Bird Conservancy
USACE—US Army Corps of Engineers
NPS—National Park Service
NPPD—Nebraska Public Power District
CNPPID—Central Nebraska Public Power and Irrigation District
TPCP—Tern and Plover Conservation Partnership
CPNRD—Central Platte Natural Resources District

Attendance for the Nebraska Tern and Plover Meeting Monday, February 23, 2009

First Name	Last Name	Affiliation
Frank	Albrecht	Nebraska Game and Parks Commission
Nick	Altadonna	United States Geological Survey
Carol	Aron	United States Fish and Wildlife Service
Adam	Beemer	Nebraska Game and Parks Commission
Bart	Bly	Rocky Mountain Bird Observatory
Mary	Bomberger Brown	Tern and Plover Conservation Partnership
Gene	Bormann	United States Army Corps of Engineers
Mark	Brohman	Nebraska Environmental Trust
Ron	Case	University of Nebraska-Lincoln Emeritus
Mark	Czaplewski	Central Nebraska Natural Resources District
Carrie	Elliott	United States Geological Survey
Elise	Elliott-Smith	United States Geological Survey
Mike	Fritz	Nebraska Game and Parks Commission
Dionne	Gioia	United States Department of Agriculture
Matt	Giovanni	University of Nebraska-Lincoln
Susan	Haig	United States Geological Survey
Emily	Hiatt	Nebraska Game and Parks Commission
Rick	Holland	Nebraska Game and Parks Commission
Robb	Jacobson	United States Geological Survey
Jim	Jenniges	Nebraska Public Power District
Joel	Jorgensen	Nebraska Game and Parks Commission
Drew	Kessler	UNL School of Natural Resources
Mark	Kuzila	UNL School of Natural Resources
Jeanine	Lackey	Nebraska Game and Parks Commission
Casey	Lott	American Bird Conservancy
Melissa	Marinovich	HDR
Courtney	McCusker	
Jamie	McFadden	University of Nebraska-Lincoln
Wayne	Molhoff	Nebraska Breeding Bird Atlas
Greg	Pavelka	United States Army Corps of Engineers
Sue Ellen	Pegg	University of Nebraska-Lincoln
Mark	Peyton	Central Nebraska Public Power and Irrigation District
Matt	Pillard	HDR
RaeAnn	Powers	Nebraska Game and Parks Commission
Diane	Pratt	Tern and Plover Conservation Partnership
Sarah	Rehme	University of Nebraska-Lincoln
Steve	Riley	Nebraska Game and Parks Commission
Melissa	Santiago	Nebraska Game and Parks Commission
Todd	Schlmelfenig	UNL School of Natural Resources
Rick	Schneider	Nebraska Game and Parks Commission

Mark	Sherfy	United States Geological Survey
Ross	Silcock	New Zealand Land and Pelagic Bird Tours
Rachel	Simpson	Nebraska Game and Parks Commission
Chad	Smith	Headwaters Corporation
Larry	Snyder	Rocky Mountain Bird Observatory
Jared	Stirling	United States Army Corps of Engineers
Kristal	Stoner	Nebraska Game and Parks Commission
Jennifer	Stucker	United States Geological Survey
Marilyn	Tabor	Nebraska Game and Parks Commission
Martha	Tacha	United States Fish and Wildlife Service
Scott	Taylor	Nebraska Game and Parks Commission
Cynthia	Taylor	
Chris	Thody	Tern and Plover Conservation Partnership
Drew	Tyre	UNL School of Natural Resources
Rich	Walters	The Nature Conservancy
Ben	Wheeler	Nebraska Game and Parks Commission
Gabe	Wilson	Central Nebraska Public Power and Irrigation District
Stephen	Wilson	National Park Service
Greg	Wingfield	United States Fish and Wildlife Service
Carl	Wolfe	
Gene	Zuerlein	Nebraska Game and Parks Commission

TPCP Outreach Coordinator Chris Thody & TPCP Program Coordinator Mary Bomberger Brown with Nebraska Governor Dave Heineman

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Nebraska Governor Dave Heineman proclaimed 14 October 2009 as “Interior Least Tern and Piping Plover Day” in the state.

State of Nebraska – Proclamation


Proclamation

INTERIOR LEAST TERN AND PIPING PLOVER DAY

Whereas, Interior Least Terns (*Sternula antillarum athalassos*) and Piping Plovers (*Charadrius melodus*) are protected in the state of Nebraska by the Nebraska Nongame and Endangered Species Conservation Act, the federal Endangered Species Act, and the federal International Migratory Bird Treaty Act; and

Whereas, the Tern and Plover Conservation Partnership works proactively and cooperatively with the aggregate mining industry, electrical power companies, other utility companies, Natural Resources Districts, real estate development companies, construction companies, local governments, property owners, homeowners’ associations, state and federal agencies, the United States Fish and Wildlife Service, the Nebraska Game and Parks Commission, the University of Nebraska School of Natural Resources, the Nebraska Environmental Trust, and others to protect Nebraska’s Interior Least Terns and Piping Plovers; and

Whereas, Interior Least Terns and Piping Plovers require open areas of sand for nesting which, in Nebraska, includes sandbars in the Platte, Loup, Elkhorn, Niobrara, and Missouri rivers, sand and gravel mine discharge piles, beaches at lakeshore housing developments, and Lake McConaughy; and

Whereas, Interior Least Terns and Piping Plovers return every year to Nebraska to nest which is critical for the recovery and survival of the two species; and

Whereas, by protecting Interior Least Terns and Piping Plovers nesting on their property, the partners of the Tern and Plover Conservation Partnership are making positive contributions to the conservation of these two imperiled species; and

Whereas, the Tern and Plover Conservation Partnership builds alliances with all interested parties to insure that Interior Least Terns and Piping Plovers remain a part of Nebraska’s rich natural heritage; and

Whereas, recognizing the 10th anniversary of the founding of the Tern and Plover Conservation Partnership gives us the opportunity to celebrate Nebraska’s natural heritage and to embrace the continued recovery of these two species.

Now, therefore, I, Dave Heineman, Governor of the State of Nebraska, do hereby recognize Wednesday, October 14, 2009, as

Interior Least Tern and Piping Plover Day

in Nebraska, and I do hereby urge all citizens to increase their understanding and awareness of Interior Least Terns and Piping Plovers in the State of Nebraska and the United States of America.

IN WITNESS WHEREOF, I have hereunto set my hand, and cause the Great Seal of the State of Nebraska to be affixed this fourteenth day of October, in the year of our Lord Two Thousand Nine.

The Tern and Plover Conservation Partnership now has a mascot—a 4-foot tall model Piping Plover. The gigantic bird will fill in integral role in the TPCP's outreach and fund raising program. After a rousing "Name that Plover" contest, the monstrous fowl is now named Pebbles.

The following is a summary of our 2009 education and outreach program.

Education Programs for the General Public

Becoming an Outdoors Woman (BOW), Halsey, NE
Camp Catron (Girl Scouts-Spirit of Nebraska), Birding 101 merit badge, Nebraska City, NE
Camp Catron (Girl Scouts-Spirit of Nebraska), Spring Fling, Nebraska City, NE
Conservation Leaders for Tomorrow, Tipton, KS
Durham Museum (Smithsonian Institution) Teachers' Night Out, Omaha, NE
Durham Museum (Smithsonian Institution) Science Day, Omaha, NE
Earth Day and the Lincoln Children's Zoo, Lincoln, NE
Earth Wellness Festival (hosted by Southeast Community College), Lincoln, NE
Family Nature Nights (coordinated by the Lower Platte South NRD): Cavett, Clinton, East Butler, Elliott, Hartley, and Maxey Elementary Schools, Lincoln Southwest High School
Fremont Eco-Fair, Fremont, NE
Groundwater Festival, Grand Island, NE
Healthy Waters of Nebraska (Lower Platte South NRD), Lincoln, NE
Informal Educators of Lincoln Teachers' Night Out, Lincoln, NE
Iowa Western Community College, Environmental Studies course, Council Bluffs, IA
Maxey Elementary School Nature Club, Lincoln, NE
National Audubon Society Bio-Blitz, Spring Creek Prairie, Denton, NE
Nebraska Nature and Visitors' Center grand opening, Grand Island, NE
Nebraska State Fair, 4-H Conservation and Wildlife Division, Lincoln, NE
Rivers and Wildlife Celebration, Kearney, NE

Sensory Safari for Visually Impaired and Special Needs Children, Lincoln Children's Zoo, Lincoln, NE
Southeast Community College Career Fair, Lincoln, NE
Spring Creek Prairie Annual Board Meeting, Denton, NE
Volunteer Partners, Lincoln, NE
Wachiska Audubon Society, Lincoln, NE
Water Quality Open Golf Tournament (Lower Platte River Corridor Alliance), South Bend, NE
Wildcat Hills Audubon Society, Scottsbluff, NE

University of Nebraska Based Education Programs

AGRI/NRES 103 Recitation
Building Sustainable Partnerships (SNR-Hardin Hall)
Career Fair (SNR-Hardin Hall)
City Campus Earth Day Celebration
City Campus Service Learning Fair
City Campus Volunteer 'Big Event'
City Campus Volunteer Fair
Center for Great Plains Studies Fellows' Speakers Bureau
Endangered Species Act/Threatened and Endangered Species (SNR Graduate Student Seminar presentation)
Future Farmers of America Tailgate Party (SNR-Hardin Hall)
McPhee Elementary School Afterschool Program (SNR graduate student program)
Osher Lifelong Learning Institute (OLLI) Course: The River Runs Through Us
Teachers' Night Out (SNR-Hardin Hall)
Upward Bound-Environmentors (National Council for Science and the Environment)
Weatherfest and Severe Weather Symposium (SNR-Hardin Hall)

Education-Curriculum Development Activities

"Discover the Waters of Nebraska" Project WET children's book, project writer/reviewer
Durham Museum (Smithsonian Institution) Teachers Night Out, Omaha, NE
High School Student-Professional Job Shadowing program (introduce students to the realities of a career in conservation biology)
Informal Educators of Lincoln Network (IEN; working group of educators from area museums, galleries, NGOs, agencies, and others)
Iowa Western Community College Environmental Studies Program, Council Bluffs, IA
Nebraska Alliance of Conservation and Environment Educators
NIH-SEPA program to develop science and environmental science curricula for Native American K – 12 schools (program administered by University of Nebraska Medical Center)
"Project BEAK", web-based environmental-conservation curricula, NPABC Education Workgroup product
Rowe Audubon Sanctuary Distance Education Program Partner, Gibbon, NE, threatened and endangered species experts
Teachers Night Out, Lincoln, NE (sponsored by IEN)

Conferences and Symposia

American Ornithologists' Union, Philadelphia, PA (elective member and hold seat on Council)

Association of Field Ornithologists' and Wilson Ornithological Society, Pittsburgh, PA (hold seat on Council and committee chair)
Building Sustainable Partnerships, University of Nebraska, Lincoln, NE
Darwin Symposium, Center for Great Plains Studies, University of Nebraska, Lincoln, NE
EnvironMentors, National Council for Science and the Environment, Washington DC
Lower Platte River Corridor Alliance (LPRCA), Lincoln, NE
Midwest Ecology and Evolution Conference (MEEC), Lincoln, NE
Nebraska Ornithologists' Union, York, NE
Nebraska Alliance for Conservation and Environment Education, Kearney, NE
Nebraska Chapter of the Wildlife Society, Lincoln, NE
Nebraska Cooperative Fish and Wildlife Research Unit—Coordinating Committee, Lincoln, NE
Nebraska Environmental Trust 5-year Strategic Planning and Policy Review, Kearney, NE
Nebraska Partnership for All-Bird Conservation-NPABC (now Nebraska Bird Partnership-NBP), Ainsworth, Kearney, and Grand Island, NE
Nebraska Weed Control Association, Hastings, NE
PACE (Planning, Aggregate, Community, Environment), Grand Island, NE
Platte River Basin Science and Resource Management Symposium, Kearney, NE
Rivers and Wildlife Celebration, Kearney, NE

Professional Committees and Workgroups

Adopt-a-Stream (statewide citizen science program)
American Ornithologists' Union, Council and Nominating Committee
Capacity Building Workgroup, Nebraska Partnership for All-Bird Conservation-NPABC (now Nebraska Bird Partnership-NBP)
Communication Workgroup, Nebraska Partnership for All-Bird Conservation-NPABC (now Nebraska Bird Partnership-NBP)
Conservation Strategies and Implementation Workgroup, Nebraska Partnership for All-Bird Conservation-NPABC (now Nebraska Bird Partnership-NBP)
Education Workgroup, Nebraska Partnership for All-Bird Conservation-NPABC (now Nebraska Bird Partnership-NBP)
Lake McConaughy Piping Plover and Interior Least Tern Management
PACE (Planning, Aggregate, Community, Environment)
Platte River Recovery Implementation Program (provide tern and plover information)
Rivers and Wildlife Celebration planning committee
Science Advisory Workgroup, Nebraska Partnership for All-Bird Conservation-NPABC (now Nebraska Bird Partnership-NBP)
SNR Social Event Committee, University of Nebraska
SNR Staff Advisory and Professional Development Committee, University of Nebraska
SNR Sustainability Committee, University of Nebraska
Steering Committee, Nebraska Partnership for All-Bird Conservation-NPABC (now Nebraska Bird Partnership-NBP)
Teaming with Wildlife steering committee, Nebraska Game and Parks Commission
Wachiska (Lincoln, NE) Audubon Society, Board of Directors, Education Committee
Wilson Ornithological Society, Council, Chair of Publications Committee, Chair of Local Organizing Committee 2011 annual meeting

Miscellaneous

Facebook

http://ternandplover.unl.edu/tern%20and%20plover%20facebook.htm

Featured in media

"Bomberger Brown an Eminent Ornithologist", SNR webpage, University of Nebraska

"Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region", Final Report of Synthesis and Assessment Product 4.1 (http://www.climatescience.gov)

"Cooperation in Conservation: the Tern and Plover Conservation Partnership, Babbling Brook, Wachiska Audubon newsletter, May 2009

"Cooperation in Conservation: the Tern and Plover Conservation Partnership", Prairie Fire, July 2009

"Cyber Fair", Nebraska State Fair, Lincoln, NE

"Giant Piping Plover (and This One's 4 Feet Tall) Needs a Name", Lincoln Journal-Star newspaper, 18 October 2009

"Interior Least Terns and Piping Plovers", Non-Game Bird Program Report, February-July 2009, Nebraska Game and Parks Commission

"Kudos to Mary Bomberger Brown", SNR Director's Report, University of Nebraska

"Loup Public Power District, Least Terns and Piping Plovers", Generator (LPPD employee newsletter), Summer 2009

"Mary Bomberger Brown Recognized as Eminent Ornithologist", News Release from IANR News Service, University of Nebraska, 4 September 2009

"Name the Giant Plover", http://wildbirdsbroadcasting.blogspot.com/2009/10/proclamation-designates-tern-and-plover.html

"National Group Recognized Brown as Eminent Ornithologist", Scarlet, 17 September 2009

"Non-Game Bird TV", Time Warner local access cable television broadcast, 2 30-minute broadcasts per week

"Non-Game Bird TV", YouTube videos

"Opinion", Omaha World Herald newspaper, 15 September 2009

"Piping Plover is Now Pebbles", Lincoln Journal Star, 1 November 2009

"Predators, People, and High Water Creating Problems for Terns, Plovers", Lincoln Journal-Star newspaper, 15 July 2009 (front page)

"Proclamation Declares Tern and Plover Day in Nebraska", http://wildbirdsbroadcasting.blogspot.com/2009/10/proclamation-designates-tern-and-plover.html

"Rare", photography book by Joel Sartore and published by National Geographic Society

"Tern and Plover Conservation Partnership", Central Loess Hills Newsletter, published by Pheasants Forever and Nebraska Game and Parks Commission

"Tern and Plover Conservation Partnership", Resource, Nebraska Environmental Trust newsletter, July 2009

"Tern and Plover Conservation Partnership", Resource, Nebraska Environmental Trust newsletter, November 2009

"Tern and Plover Conservation Partnership", Nebraska Environmental Trust—KOLN/KGIN Channel 10/11 television commercial (to be aired approximately 960 times in 12 months)

"Tern and Plover Conservation Partnership: Protecting Two Little Known Birds", Environmental Education Connections, Nebraska Alliance for Conservation and Environment Educators

"Tern, Plover Group's Mascot Needs Name", Omaha World Herald newspaper, Friday, 16 October 2009

"The Christmas Bird Count?", Prairie Fire, December 2009.

Fundraising

AGRI/NRES 103 Recitation

www.goodsearch.com and www.goodshop.com

Tern and plover products (t-shirts, tote bags, hats, tumblers, plush animals) in SNR Maps and More Store (on-line and Hardin Hall)

Photographs taken with giant plover—free will donation

Contracts—IMBTA and GBEPA surveys

Preferred Rocks of Genoa stipend

Seminar honoraria

Grants

Nebraska Environmental Trust "Advancing Tern and Plover Common Sense Conservation into the Future", 2nd year operating funds allocated

Nebraska Game and Parks Commission State Wildlife Grant "Advancing Interior Least Tern and Piping Plover Common Sense Conservation into the Future ", no-cost extension approved to provide 2nd year of funding

Nebraska Game and Parks Commission State Wildlife Grant "Restoring Interior Least Tern and Piping Plover Populations by Restoring Lower Platte River Sandbar Habitat", grant awarded full funding

Nebraska Partnership for All-Bird Conservation "A Common Sense Approach to Interior Least Tern and Piping Plover Conservation in Nebraska", no-cost extension approved to provide 2nd year of funding

Nebraska Partnership for All-Bird Conservation "The Tern and Plover Conservation Partnership: Habitat Restoration and Public Education Advances Common Sense Conservation in Nebraska", proposal submitted

Homeowners' Association presentations

Big Sandy, Cedar Creek, Lake Socorro, Mallard Landing, Riverview Shores

Publications

Brown, M.B., J.G. Jorgensen, and S. Rehme. 2009. Endangered species responses to natural habitat declines: Nebraska's Interior Least Terns (*Sternula antillarum athalassos*) and Piping Plovers (*Charadrius melodus*) nesting in a human-created habitat. Nebraska Bird Review 76: 72 – 80.

Brown, M.B., D. H. Caitlin, J. Felio, and J.G. Jorgensen. In prep. Piping Plovers (*Charadrius melodus*) color-banded on the Platte and Missouri river re-sighted on nesting and wintering areas. Nebraska Bird Review.

Thody, C.M. and J. Swerczek. 2010. What laws protect wildlife? Piping Plovers and Interior Least Terns. Trail Tails. Spring 4 – 7.

Thody, C.M., R.J. Held, R.J. Johnson, J.F. Marcus, and M.B. Brown. 2009 Grassroots conservation: Volunteers contribute to threatened and endangered species projects and foster a supportive public. Journal of Extension (http://www.joe.org/joe/2009/february/)

Posters

Brown, M.B. and J.G. Jorgensen. Poster. Daily and seasonal survival probabilities of Interior Least Terns and Piping Plovers along the lower Platte River in Nebraska. Platte River Basin: Science and Resource Management Symposium, 14–15 October 2009, Kearney, NE.

Thody, C.M., R.J. Held, R.J. Johnson, J.F. Marcus, and M.B. Brown. Poster. Grassroots conservation: Volunteers contribute to threatened and endangered species projects and foster a supportive public. Platte River Basin: Science and Resource Management Symposium, 14–15 October 2009, Kearney, NE.

Dietz, M. and R. A. Anderson (M.B. Brown-collaborator), Restoring Lower Platte River Sandbars with the Girl Scouts, Platte River Basin: Science and Resource Management Symposium, 14–15 October 2009, Kearney, NE.

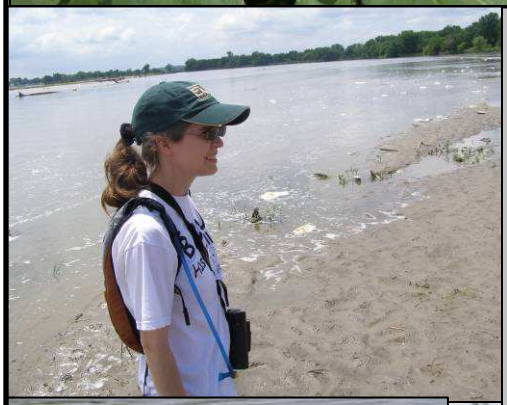
Reviewers

Nebraska Environmental Trust grants
National Park Service Niobrara River Assessment
Narumalani, S., G.D. Willson, C.K. Lockert, and P.B.T. Merani. 2009. Niobrara National Scenic River condition assessment. Natural Resource Report NPS/XXXX/NRXX—20XX/XXX. National Park Service, Fort Collins, Colorado, USA.
Wilson Journal of Ornithology

Videos

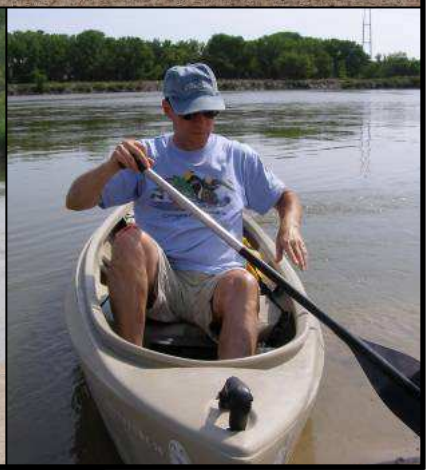
"Respect the Signs, Respect the Birds", video produced for YouTube
"Points About Plovers: An Afterschool Special", video produced for YouTube

Special thanks to Melissa Santiago (left) and Courtney McCusker for helping monitor and protect terns and plovers in 2009…we're sure the birds are grateful for their help.



Thanks to our special guest paddlers and river field assistants.

Clockwise from right are: Scott Taylor, Rick Schneider, Jeanine Lackey, Kristal Stoner, and Michelle Koch.



Lower Platte River at dawn near Two Rivers State Recreation Area

TERN & PLOVER CONSERVATION PARTNERSHIP

NONGAME BIRD PROGRAM