Nest success and flow relationships on the central Platte River

Gary R. Lingle
Platte River Whooping Crane Maintenance Trust, 2550 N. Diers Ave., Suite H,
Grand Island, NE 68803

The Platte River is a highly regulated system of dams and canals managed primarily to provide water for irrigation and hydropower production. Peak discharge at Grand Island usually occurs in late May through June and coincides with snowmelt in the Colorado Rocky Mountains where the waters of the Platte originate.

The destruction of the natural processes within the watershed began in the mid-1800s when the first irrigation ditch was dug and has continued largely unabated to the present time. Contemporary attitudes of the power districts that manage the river in Nebraska are that water is "wasted" if it remains in the river below Kearney during the summer rather than being used to irrigate crops.

The effect of this "development" is that the water now flowing past Grand Island is about 30% of what it was in pre-European settlement times (Williams 1978). A floodplain forest of cottonwoods and willows has replaced over 60% of the braided, unobstructed riverbed which characterized the Platte (Currier *et al* 1985).

The endangered least tern and threatened piping plover nest on the barren sandbars of the Platte River. I monitored the effects of river stage on tern and plover nests and/or chicks along an 80-mile reach of the Platte River from Lexington downstream to Grand Island (Fig 1).

Flows in this section of the river are diverted upstream during the summer irrigation season. Water is returned to the river at the J-2 Return, or it is sent down the Phelps County canal to be used for irrigation. Only when the irrigation demand decreases, due to local precipitation, is water allowed to return to the river via J-2.

Discharge information was obtained at the J-2 Return from the Nebraska Department of Water Resources and from the U.S. Geological Survey gauging station at Grand Island. Potential chick losses were based on the estimated number of young which had not attained flight stage and which were present during a flood event. These numbers should be considered a maximum estimate since chick mortality may have occurred for other reasons and some of the chicks may have survived flood events.

In 5 of the 7 years from 1985 through 1991, failures in 37% of the unsuccessful tern and 61% of the unsuccessful plover nests were due to flooding (Table 1).

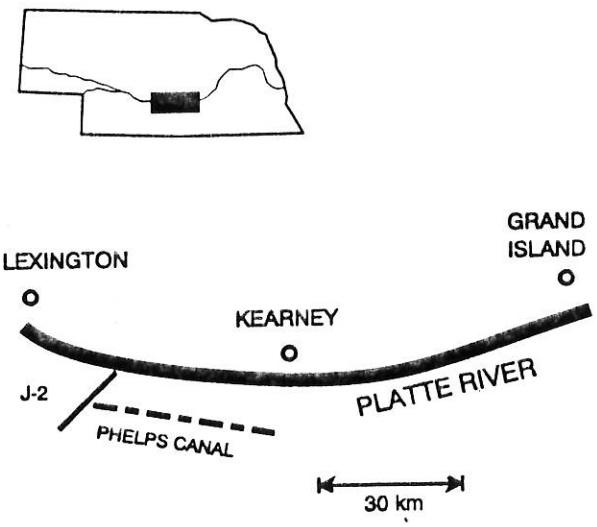
The worst nest losses were in 1988 when 79% of the unsuccessful tern and 75% of the unsuccessful plover nests were flooded. Water flows that summer were characterized by multiple spikes in the hydrograph (Fig 2).

The frequency and timing of these summer spikes indicates magnitude of loss. For example, in 1987 only nests were flooded because timing of releases did not allow hatching. In 1990, only chicks were flooded since the spike occurred well after hatching (Figs 3 and 4).

Releases from the J-2 Return coupled with local thundershowers exacerbate flooding. For example, during the 44-day period from June 29 to August 11, 1990, the J-2 Return flow was 0 cfs despite the fact that over 2100 cfs was being diverted into the Tri-County Canal. The flow at Grand Island reached a low of 38 cfs on 10 August. One week later, the flow at Grand Island was 2220 cfs due to a combination of precipitation and releases of up to 1173 cfs from the J-2 Return.

Fish die-offs occurred in 6 of the 7 years studied; 1986 being the

Fig 1. Study area.



only exception. Lethal conditions for forage fish generally occurred when flows were below 400 cfs and ambient air temperatures were greater than 95 F.

The years from 1988 through 1991 were especially bad for fish. Sustained periods of low flows coupled with high air temperatures were common, and massive numbers of fish succumbed. The effects of these losses on the nesting success of least terns was not determined; however, there is no question that the food base for terns was negatively impacted.

The percentage of nests initiated on the river has generally declined since 1985. An annual attrition of suitable riverine habitat has occurred since the record high flow years of 1983 and 1984.

Nest tenacity was pronounced in both species. The most extreme case was of a least tern pair which remained faithful to their eggs even after they were washed out of the nest bowl by rising water. The river stage rose from 720 cfs on July 6, 1987, to 3210 cfs on July 9 at Kearney following a 5-inch thundershower. I visited the nest on July 10 and found two eggs about 1 foot downstream from the nest bowl. They were still being attended by the adults, and both eggs hatched on July 24.

Table 1. Potential mortality of nests and young due to summer flows.

		1985	*1986*	*1987*	*1988*	*1989*	*1990*	*1991**	*Total*
Least tern	# nests	0	3	1	11	2	0	0	17
	# chicks	0	0	0	0	3	6	0	9
Piping plover	# nests	0	5	2	6	6	0	0	19
	# chicks	0	2	0	6	27	11	0	46
Combined	# nests	0	8	3	17	8	0	0	36
	# chicks	0	2	0	6	30	17	0	55

* Only two riverine colonies were monitored.

Management recommendations

As vegetation encroachment continues to degrade riverine nesting habitat, it has become increasingly apparent that adequate instream flows must be protected. Fish kills in 6 of the last 7 years since 1984 are symptomatic of an ecosystem in trouble. During this same period nests and chicks have been flooded in 5 years. Not only were nests destroyed, but the food base for least terns was degraded. Therefore, the following recommendations are offered:

1) Maintain adequate annual instream flows to satisfy the life requisites of forage fish species, to maintain suitable nesting habitat, and to provide secure nest sites. A summer flow (June through August) of 1000 cfs, as measured at Grand Island, would be adequate. Under no circumstances should the flow be allowed to drop below 400 cfs at any time during the year.

Fig 2. Platte River summer flows, 1988.

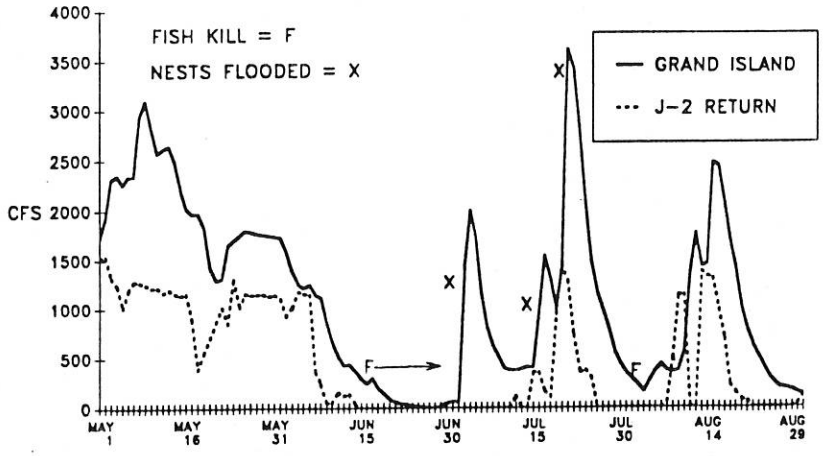


Fig 3. Platte River summer flows, 1987.

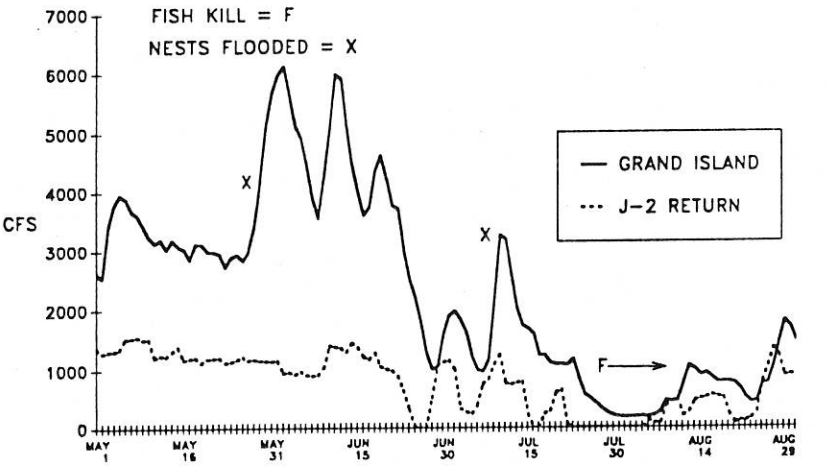
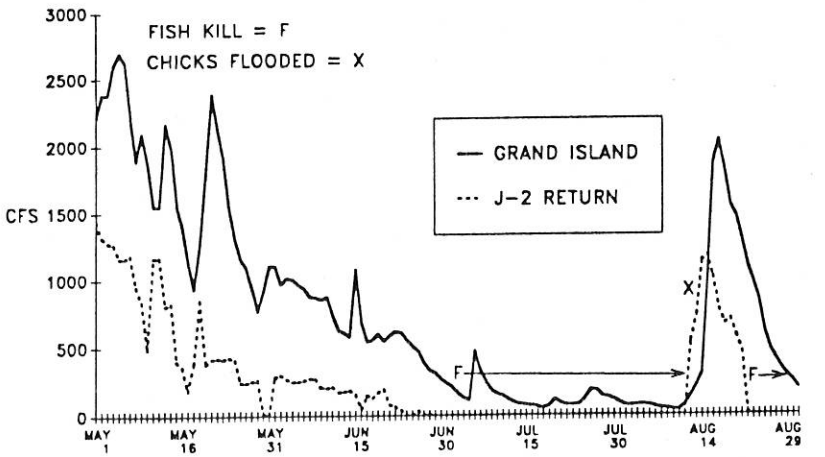


Fig 4. Platte River summer flows, 1990.



2) The Nebraska Game and Parks Commission should continue the attempt to secure an instream flow right from the Nebraska Department of Water Resources. Since Nebraska's instream flow law allows only the Nebraska Game and Parks Commission or a Natural Resources District (NRD) to secure such a right, it follows that the Commission would be the logical state agency to apply for and secure an instream flow right.

3) Implement a plan whereby the Central Nebraska Public Power and Irrigation District and the Nebraska Public Power District curtail releases to the river via J-2 during local thundershowers to minimize the potential of flooding of nests or young. Their current management program jeopardizes the safety of these federally listed species annually because they ignore the impacts of their operations on the river. By the same token, the districts should provide for releases to maintain the fishery on the central Platte River and to prevent nesting within the riverbed during dry periods at levels described above. These conditions should be imposed by the Federal Energy Regulatory Commission (FERC) on the districts as part of their new license, the proceedings for which are currently under way.

4) The U.S. Fish and Wildlife Service should insist that FERC condition the districts' long-term licenses under the authority of the Endangered Species Act as amended.

Acknowledgments

I wish to thank the following people who assisted with the field work and data input: Paul Bedell, Marianne Devries, Bill Whitney, and Jerry Ziewitz. Personnel from the Nebraska Game and Parks Commission, the U.S. Fish and Wildlife Service, and the Bureau of Reclamation provided sighting information and aided in locating colony sites. The Platte River Whooping Crane Maintenance Trust funded this study.

Literature cited

Currier, P., G. Lingle, and J. VanDerwalker. 1985. Migratory bird habitat on the Platte and North Platte rivers in Nebraska. Platte River Whooping Crane Maintenance Trust, Grand Island, NE. 177pp.

Williams, G. 1978. The case of the shrinking channels - North Platte and Platte rivers in Nebraska. U.S. Geol Súrv Circ 781. 48pp.