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## IS THE DISTRIBUTION OF SANDHILL CRANES ON THE PLATTE RIVER CHANGING?

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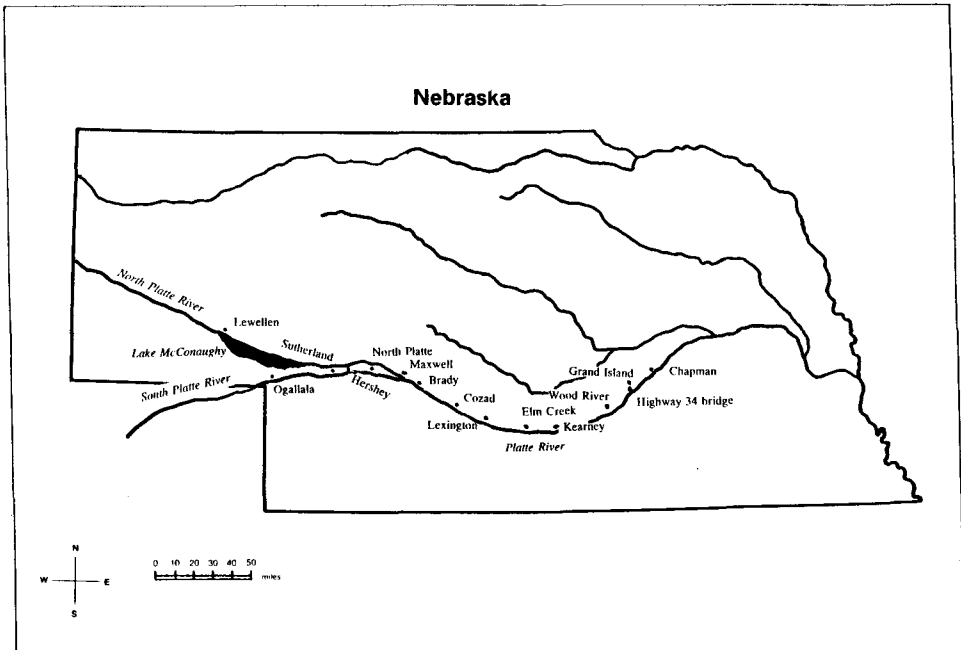
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**Abstract.** *Data collected during 1957-1989 on the Platte and North Platte rivers was analyzed to detect changes in the temporal and spacial distribution of staging sandhill cranes. The data indicate that a significant west-to-east shift in crane distribution has developed since the late 1960s. The most negative changes have occurred between Lexington and Kearney, Nebraska, where vegetation encroachment has been most pronounced. A significant increase in crane numbers between the Wood River and Highway 34 bridges is attributed to the result of vegetation scouring flows and active removal of woody vegetation.*

Each spring, nearly 80% (about 500,000 birds) of the world's sandhill cranes (*Grus canadensis* L.) stage on the Platte and North Platte rivers in Nebraska (Faanes 1992). The cranes forage diurnally in cropland and wet meadows adjacent to the river channel. Nocturnal roosting typically occurs in wide reaches of unvegetated channels.

Upstream water diversions have created significant changes in the character of riverine habitats used by cranes and other wildlife (Currier et al. 1985; U.S. Fish and Wildlife Service 1981). Up to 70% of the flow through the "Big Bend" reach (Lexington to Chapman) of the Platte River has been diverted for consumptive uses upstream (Williams 1978; Krapu et al. 1982). An 85-91% reduction in the area of active channel in some river segments has occurred concomitant with water development (Sidle et al. 1989). As a result woody vegetation has become established in the channel throughout much of the central Platte River (Sidle et al. 1989).



Map showing Platte River and study locations in Nebraska.

Increases in channel vegetation may have led to a change in the distribution of sandhill cranes in the river valleys. We analyzed data from annual sandhill crane surveys (Benning and Johnson 1987) and earlier census attempts to determine changes in sandhill crane distribution.

#### Study Area and Methods

Two sets of sandhill crane distribution data extending from 1957 through 1989 were analyzed. Sandhill crane survey data were transformed to percentages of the total numbers counted during the one to two-day survey periods. This procedure reduces biases in the data that may have been introduced by changes in the survey technique and in observers between years.

The data from ocular and photographic surveys conducted yearly during 1977 through 1989 (Benning and Johnson 1987) were also examined. For this analysis we divided the entire study area into four distinct subregions occupied by sandhill cranes. Using aerial photographs, we measured mean channel

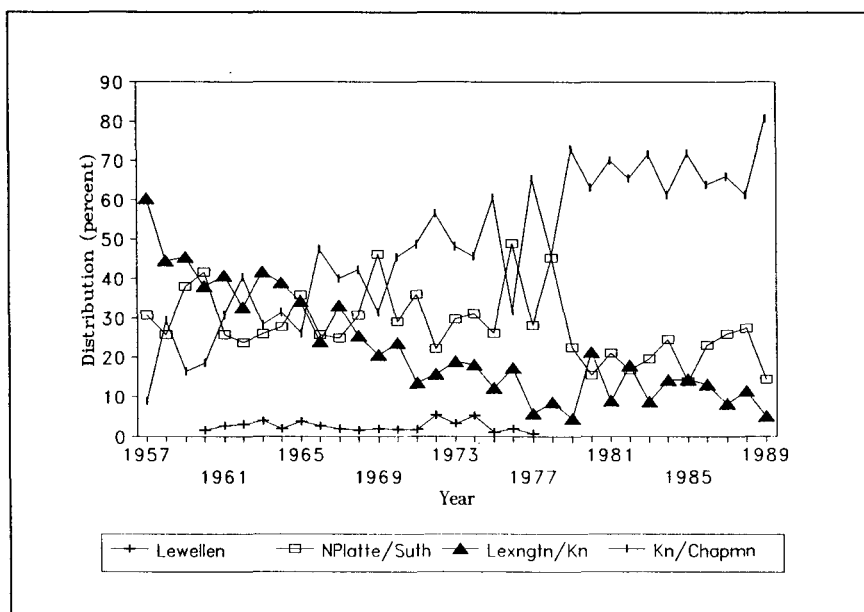


Figure. 1. Changes in the number of sandhill cranes occupying various Platte River staging areas, 1957 - 1989.

widths in each of the principal sandhill crane staging areas and utilized river flow data obtained from U.S. Geological Survey gauging stations at different locations along the rivers to complete our analysis.

### Results and Discussion

The 1957 to 1989 data show an obvious shift in use by sandhill cranes from west to east in the central Platte River valley (Fig. 1). The shifting pattern of population distribution, especially for the central Platte River, has been consistent through time. The number of cranes observed per river km in the central Platte River ranged from 108 between Lexington and Kearney, to 708 between Wood River and Chapman (Table 1). Mean channel widths in areas occupied by sandhill cranes ranged from 123 to 216 m (Table 1). Channel widths in the 113 km reach from North Platte downstream to Lexington that is no longer used by cranes ranged from 16 to 69 m, roughly half or less than in the downstream areas (Table 1).

TABLE 1

DISTRIBUTION AND DENSITIES OF SANDHILL CRANES ON THE  
PLATTE AND NORTH PLATTE RIVERS IN RELATION TO UNOB-  
STRUCTED CHANNEL WIDTH AND AREA OF WET MEADOWS

River Reach	Number of cranes river km	Unobstructed channel width (m)	Hectares of wet meadows per river km
Kearney - Chapman	560 <sup>1</sup>	192 <sup>2</sup>	73 <sup>3</sup>
Kearney - Wood River	407	173	36
Wood River - Chapman	708	216	108
Lexington - Kearney	143	129	27
Lexington - Elm Creek	169	137	58 <sup>4</sup>
Elm Creek - Kearney	108	123	11
North Platte - Lexington	0	49	57 <sup>5</sup>
North Platte - Maxwell	0	16	na
Maxwell - Brady	0	26	61 <sup>5</sup>
Brady - Cozad	0	59	86 <sup>5</sup>
Cozad - Lexington	0	69	23 <sup>5</sup>
Sutherland - North Platte	482	90	81
Sutherland - Hershey	562	81	139
Hershey - North Platte	477	90	57

<sup>1</sup> Mean number of sandhill cranes from annual spring survey data, 1979-1989.

<sup>2</sup> Mean of maximum unobstructed channel widths measured every km. (U.S. Fish and Wildlife Service 1981).

<sup>3</sup> Estimates for Chapman-Overton and North Platte-Sutherland segments from Currier et al. (1985) based on 11.3 km wide corridor with river at center.

<sup>4</sup> Estimate is for Elm Creek-Overton.

<sup>5</sup> Estimates from Johnson (1990) based on 3.2 km-wide corridor with river at center. Data are for 29-km segments which do not conform to bridge segmentation.

TABLE 2

PEARSON CORRELATION COEFFICIENTS OF CHANGES  
IN SANDHILL CRANE NUMBERS RECORDED ON AERIAL SURVEYS  
IN EACH OF FOUR STAGING AREAS ON THE NORTH PLATTE AND  
PLATTE RIVERS, 1978-1989

Staging Area	Birds	R <sup>2</sup>	Significance
A. North Platte	14965	0.48	P = 0.04 (ns)
B. Lexington-Kearney Bridge	7724	0.39	P = 0.11 (ns)
C. Kearney Bridge-Wood River	11315	0.72	P = 0.0007 (*)
D. Wood River - Highway 34	22052	0.78	P = 0.0001 (*)

ns = No significant difference

\* = Highly significant difference

The study includes an examination of the proportional distribution of sandhill cranes on four staging areas over a broad scale during 1957 to 1989. Staging areas include:

- A - Lewellen (upper end of Lake McConaughy)
- B - Sutherland to North Platte
- C - Lexington to Kearney Bridge
- D - Kearney Bridge to Highway 34 Bridge

The results of the study are depicted in Figure 1.

These data reinforce other analyses suggesting that the number of cranes in Staging Area B has remained essentially stable. On the other hand the number of cranes occupying Staging Area C has declined steeply, while the number of cranes in Staging Area D has increased steeply. In 1957, about 60% of the birds were recorded in Area C, and about 9% in Area D. Fifteen years later, the respective distributions were 18% and 46%. By 1989, only 5% of the birds were in Area C; 81% occupied Area D.

Our analysis of 1978 to 1989 data indicate there has been no significant decline in the number of cranes in Staging Area A (North Platte) (Table 2). The data very weakly suggest no change in crane numbers in Staging Area B. On

TABLE 3

MEAN ANNUAL CHANGE IN THE PROPORTION OF SANDHILL  
CRANES OCCUPYING THREE STAGING AREAS IN THE BIG BEND  
REACH OF THE PLATTE RIVER, 1978-1989

Staging Area	Fraction	Correlation Coefficient	% Annual Change
B. Lexington-Kearney Bridge	- 0.093	0.71	- 0.17
C. Kearney Bridge - Wood River	- 0.387	0.11	- 0.50
D. Wood River - Highway 34	+ 0.267	0.28	+ 0.70

the other hand, the number of sandhill cranes occupying Staging Areas C and D has increased during the same time period (Table 2). The increases are highly significant ( $P = 0.0007$  and  $P = 0.0001$ ).

The average annual change in the proportion of sandhill cranes occupying staging areas B, C, and D in the Big Bend reach are shown in Table 3. Cranes at North Platte (Staging Area A) are excluded from this analysis because they are separated by about 100 miles distance. Inclusion of those data would have skewed the proportional distribution information. This analysis revealed that the proportion of cranes in Staging Area B has declined about 0.2% per year (Table 3). The proportion of cranes in Staging Area 3 has declined at 0.5% annually. However, the proportion of cranes in Staging Area 4 is increasing at a rate of 0.7% annually.

Our data suggest that the area of suitable sandhill crane roosting habitat is presently limited on the Platte River. Sandhill cranes select the widest available channels for roosting and those river reaches with sufficient wet meadow habitats adjacent to the river channel (Table 1). Sandhill cranes have abandoned those river reaches which do not conform to these requirements. Essential habitats are not uniformly distributed throughout the central Platte River and along the North Platte River. The shift in crane use along the central and upper Platte River is consistent with recent use of the river by migrating whooping crane (*Grus americana* L.) (U.S. Fish and Wildlife Service, unpublished data).

The trend to lower numbers of sandhill cranes occupying specific river reaches has been observed since the early 1950s. H. Miller (U.S. Fish and Wildlife Service, personal communication) reported that sandhill cranes still occupied Willow Island between Gothenburg and Cozad, Nebraska, as late as 1951. At that time the greatest percentage of crane staging was concentrated in the Lexington-Overton area. Walkinshaw (1956) mentioned that in the early 1950s, sandhill cranes roosted in the Platte River from Grand Island upstream to west of Cozad. Currently that same reach is entirely encroached with woody vegetation providing no habitat suitable for roosting sandhill cranes. Therefore, we believe that the eastward shift in sandhill crane use of the Big Bend of the Platte River by sandhill cranes is related to vegetation encroachment in upper reaches, and intensive habitat management in lower reaches.

In 1982, the Platte River Whooping Crane Trust initiated efforts to clear vegetation from riverine islands. Most of their work was centered in the Wood River Bridge to Highway 281 Bridge area. Vegetation clearing coincided with high flows during May through July, 1983 which helped to scour the channel. Peak flows at Overton, Nebraska, in 1983 exceeded 15,000 cfs for 35 days, the highest flows of that duration since 1944. The maximum daily flow was 22,000 cfs on 22 June (U.S. Geological Survey, unpublished data).

Between 1984 and 1989, in the absence of adequate scouring flows, the Trust has cleared vegetation from over 10 km of river in a 35 km reach. Most of the vegetation was cleared in the reach from 5 km upstream of the Wood River Bridge downstream to the Highway 281 Bridge. We believe there is a relationship between the presence of vegetation clearing which began in 1982, and the scouring flows of 1983, because there has been an increase in the amount of roosting habitat available to the cranes in the Wood River to Highway 281 reach. As a result the number of cranes occupying this reach almost quintupled between 1984 and 1989.

The most reasonable explanation for the increase in numbers is an eastward shift in the distribution of sandhill cranes. Given the downward trend in numbers of cranes in the Lexington to Kearney area and the increase in numbers of cranes downstream from Kearney, we can only conclude that the birds are abandoning the heavily encroached reach (Lexington to Kearney) and are now occupying the more open river reach that is intensively managed below the Wood River bridge. A quintupling in numbers of birds in the lower river reach cannot be explained solely by an increase in population. The increase can best be explained by a shift in the population to more open, scoured areas provided by the Platte River Trust and by adequate scouring flows.



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