

Fifteen Years of Breeding Bird Censuses at Four Wet Meadow Sites within the Central Platte River Valley of Nebraska.

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The Big Bend reach of the Platte River is world renowned for its concentration of Sandhill Cranes in the spring (Johnsgard 1991). In addition to cranes, over 300 species of migratory birds have been recorded in this area, including six federally endangered/threatened species (Lingle 1994). Since European settlement began in the 1840s, significant changes in this habitat has occurred (Currier et.al. 1985). Most dramatic was the conversion of about 73% of the wet meadows/lowland grasslands. The Nebraska Game and Parks Commission ranked wet meadows/wetlands along the central Platte River as a Priority 1 habitat in 1991 (Walker 1997).

Grassland birds have exhibited the largest proportion and steepest population declines of any bird guild in North America, including neotropical migrants (Knopf 1994). The paucity of long-term population data on nesting grassland birds from specific sites hinders meaningful conclusions with respect to the population trends of these species. This study had three objectives:

1. Provide baseline information on nesting avifauna populations from selected wet meadow habitats over a 15-year period.
2. Determine the population of grassland birds at the local level and compare these with regional and national trends.
3. Determine the response of the nesting avifauna community to weather and land management actions including haying, prescribed burns, rest, and grazing.

Study Area and Methods

Breeding bird censuses were conducted on four 40-acre wet meadow plots on Mormon Island Crane Meadows (MICM) in Hall County using the mapping technique (Robbins 1970, VanVelzen 1972). These plots were within 1.2 mi of each other. The property was owned by the Platte River Whooping Crane Maintenance Trust and comprised the largest contiguous tract (1,000+ ac) of wet meadow habitat in the central Platte River valley (Lingle 1981). Census results were published for the 1981-1984, 1988-1990, and 1993-1995 breeding seasons (Hay and Lingle 1982, Lingle and Whitney 1983, Lingle and Haugh 1984, Lingle and Labeledz 1985, Lingle and Bedell 1989a, Lingle and Bedell 1990, Lingle and Whitney 1991, Lingle et al. 1994, Lingle 1995, Lingle 1996 respectively). An observer systematically walked about 1.25 miles within each plot on 8 mornings during the breeding season. Each territorial male present, its behavior, and the location of all nests found were mapped. In the case of Brown-headed Cowbirds, only females were counted and they were not censused in 1980. Counts were conducted between 0605 and 1159 CDT within the period between May 23 and June 25 for each of 15 years from 1980 to 1996 (no censuses were conducted in 1991 and 1992). Plot 4 was censused 14 years (1981 was not censused).

Plots 3 and 4 had never been plowed due to a high water table and expanse of wetland habitat. They were characterized by intermittent relic channels dominated by aquatic sedge *Carex aquatilis* which formed hummocks as a result of grazing (see plot descriptions in Hay and Lingle 1982; Lingle and Whitney 1983). False indigo *Amorpha fruticosa* became more prominent in Plot 3 in 1986, the first of four consecutive years of below normal precipitation

(Lingle pers. obs.). Plot 1 had the highest densities of goldenrod *Solidago* sp., Maximilian sunflower *Helianthus maximiliani*, and yellow sweetclover *Melilotus officinalis*; species that also thrived during the dry years. Portions of Plots 1 and 2 had been plowed (Hay and Lingle 1982) and were drier; Plot 2 was the driest of all of the plots.

Population trends for 7 of the 23 bird species (hereinafter target species) encountered during this study were compared to trends derived from the Breeding Bird Survey (BBS) (Sauer et al. 2005) over the same period of time. The 7 target species were selected based on their consistent occurrence (frequency of occurrence $\geq 80\%$) and abundance (relative abundance $>7\%$). The target species were Upland Sandpiper, Grasshopper Sparrow, Dickcissel, Bobolink, Red-winged Blackbird, Western Meadowlark, and Brown-headed Cowbird. BBS trends were examined survey-wide (National), by physiographic region (High Plains Border), and within Nebraska. These trends were compared to local (MICM) population trends found during this study.

Land management activities were noted including grazing by cattle and/or haying either during or immediately prior to censusing and whether the plot was prescribed burned prior to censusing either that spring or the previous fall. Plots 1, 3, and 4 were in pastures while Plot 2 was divided by a fence such that 30% was in a pasture and 70% was native hay. Implementing a 4-pasture grazing rotation system in Plots 1, 2, and 3 in 1982 resulted in reduced grazing pressure and an increase in vegetation stature and residual cover at least once every 4 years. The same was true in Plot 4 which went from season-long grazing to a 3-pasture rotation in 1988. Rotation haying in Plot 2 began in 1991. This technique left a portion of the field idle each year which increased litter, residual cover, and stature. Weather conditions and standing water at the time of the census were noted also. The amount of standing water and residual cover in each plot was not consistently recorded annually; however, inferences were made where specific data were lacking based on experience.

Results

Of the 115 species known to nest in the central Platte River Valley (Lingle 1994), 14 species are considered grassland/wet meadow species of greatest conservation concern as determined by various groups. Of the 23 species found during this study, 11 of them are of greatest conservation concern (Table 1).

Table 1. Grassland birds of greatest conservation concern found within the central Platte River valley.

| Species | Partners In Flight Priority Rank | Nebraska Natural Heritage Rank* | USFWS List of Birds of Conservation Concern (Draft) | Platte River Wet Meadows from this study |
|---------------------|----------------------------------|---------------------------------|---|--|
| Upland Sandpiper | 21 | | X | X |
| Wilson's Snipe | 14 | S2 | | X |
| Wilson's Phalarope | 25 | | X | X |
| Least Bittern | 17 | S2 | | X |
| Sedge Wren | 19 | S2 | X | X |
| Field Sparrow | 18 | | | |
| Lark Bunting | 21 | | X | |
| Henslow's Sparrow | 23 | | X | |
| Grasshopper Sparrow | 20 | | X | X |

| | | | | |
|--------------------|----|----|---|----|
| Swamp Sparrow | 15 | S3 | | X |
| Dickcissel | 23 | | X | X |
| Bobolink | 18 | | X | X |
| Eastern Meadowlark | 15 | | | X |
| Western Meadowlark | 17 | | | X |
| Number of species | 14 | 4 | 8 | 11 |

* data from Nebraska Game and Parks Commission, Lincoln.

Census

Coverage of these censuses totaled about 332 hours of observation and 590 miles walked. A total of 1,868.75 territories comprised of twenty-three species of birds were mapped on the census plots during all years combined. The total number of territories per plot for all years was 406.25, 352.75, 563, and 546.75 territories per 40 acres for Plots 1-4 respectively. Populations fluctuated considerably on an annual basis from a low of 87.5 territories per 160 ac in 1993 to a high of 169.5 territories in 1989 (Figure 1). Seven species were recorded in only 1 year (FO= 7%) while 5 species were recorded each year (FO=100%) (Table 2). The most abundant species was Bobolink (26.8% of the total) followed by Red-winged Blackbird (20.6%) and Brown-headed Cowbird (11.1%) (Table 2).

Figure 1. Total number of territories censused on MICM by year.

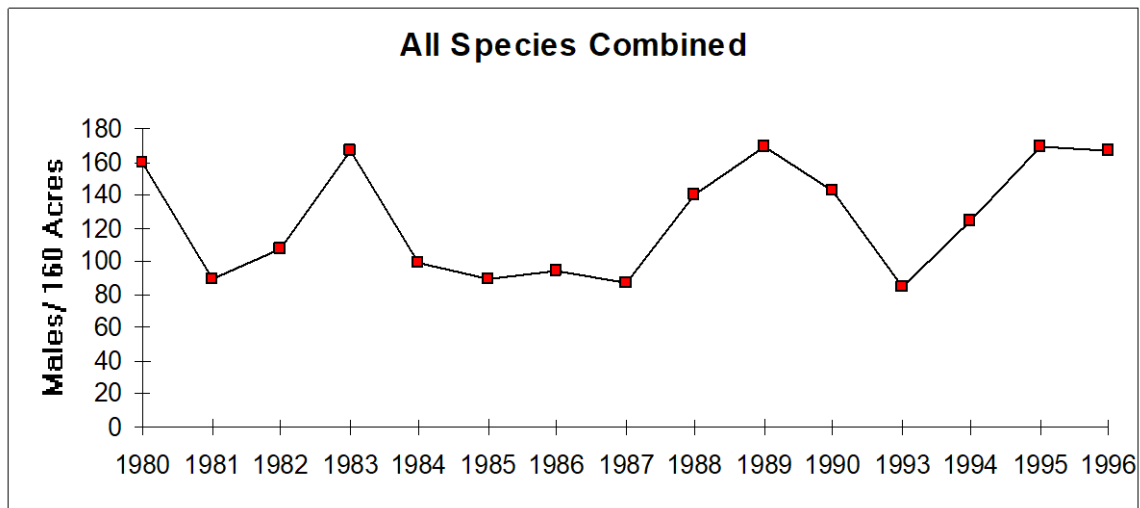


Table 2. List of territorial species and their relative abundance (RA), frequency of occurrence (FO), and number of nests found. (Target species are in bold).

| | # territories | RA | FO (N=15) | # nests* |
|---|---------------|-------|-----------|----------|
| Wood Duck <i>Aix sponsa</i> | .5 | <0.1% | 7% | |
| Mallard <i>Anas platyrhynchos</i> | 16 | 0.9% | 60% | 9 |
| Blue-winged Teal <i>Anas discors</i> | 19.25 | 1.0% | 53% | 10 |
| Ring-necked Pheasant <i>Phasianus colchicus</i> | 1 | <0.1% | 13% | 4 |
| Northern Bobwhite <i>Colinus virginianus</i> | 1.5 | 0.1% | 7% | |
| Least Bittern <i>Ixobrychus exilis</i> | 1.5 | 0.1% | 7% | |
| Virginia Rail <i>Rallus limicola</i> | 1 | <0.1% | 7% | |
| Killdeer <i>Charadrius vociferus</i> | 24.5 | 1.3% | 80% | 7 |

| | | | | |
|---|--------|-------|------|----|
| Upland Sandpiper <i>Bartramia longicauda</i> | 135.25 | 7.2% | 100% | 43 |
| Wilson's Snipe <i>Gallinago delicata</i> | 2.5 | 0.1% | 20% | |
| Wilson's Phalarope <i>Phalaropus tricolor</i> | 30 | 1.6% | 67% | |
| Mourning Dove <i>Zenaida macroura</i> | 22.25 | 1.2% | 67% | |
| Sedge Wren <i>Cistothorus platensis</i> | 15 | 0.8% | 27% | 12 |
| Common Yellowthroat <i>Geothlypis trichas</i> | 1.5 | 0.1% | 7% | |
| Grasshopper Sparrow <i>Ammodramus savannarum</i> | 165 | 8.8% | 100% | 6 |
| Swamp Sparrow <i>Melospiza georgiana</i> | 2 | 0.1% | 13% | |
| Dickcissel <i>Spiza americana</i> | 193.25 | 10.4% | 80% | 5 |
| Bobolink <i>Dolichonyx oryzivorus</i> | 501.5 | 26.8% | 100% | 10 |
| Red-winged Blackbird <i>Agelaius phoeniceus</i> | 384.75 | 20.6% | 93% | 77 |
| Eastern Meadowlark <i>Sturnella magna</i> | 8.5 | 0.5% | 33% | |
| Western Meadowlark <i>Sturnella neglecta</i> | 132.5 | 7.1% | 100% | 18 |
| Yellow-headed Blackbird <i>X. xanthocephalus</i> | 2 | 0.1% | 7% | |
| Brown-headed Cowbird <i>Molothrus ater</i> | 207.5 | 11.1% | 100% | |

*includes nests found outside of census plots.

The relative abundance between the plots varied from 18% (Plot 2) to 31% (Plot 4) (Table 3). In other words, Plot 2 contained 18% of the average number of territories and so

Table 3. Relative abundance of target species by plot.

| | Plot 1 | Plot 2 | Plot 3 | Plot 4 |
|----------------------|--------|--------|--------|--------|
| Upland Sandpiper | 29% | 27% | 23% | 21% |
| Grasshopper Sparrow | 27% | 47% | 12% | 15% |
| Dickcissel | 29% | 17% | 38% | 16% |
| Bobolink | 25% | 24% | 27% | 24% |
| Red-winged Blackbird | 8% | 1% | 46% | 45% |
| Western Meadowlark | 31% | 28% | 17% | 23% |
| Brown-headed Cowbird | 22% | 18% | 30% | 30% |
| Percent of total | 21% | 18% | 30% | 31% |

on. The relative abundance and frequencies of the target species varied by plot as well (Tables 3 and 4). The most uniformly distributed species between the plots was Bobolink in terms of abundance (Table 3) and Brown-headed Cowbirds in terms of frequency (Table 4). Likewise, Red-winged Blackbirds showed the greatest variation between plots in both abundance and frequency (Tables 3 and 4). The 7 target species comprised 88-99% of the territories in each plot (Table 4).

Table 4. Relative frequency (RF) and frequency of occurrence (FO) of target species by plot.

| | Plot 1 | | Plot 2 | | Plot 3 | | Plot 4 | |
|----------------------|--------|------|--------|------|--------|------|--------|------|
| | RF | FO | RF | FO | RF | FO | RF | FO |
| Upland Sandpiper | 10% | 93% | 10% | 93% | 6% | 100% | 5% | 86% |
| Grasshopper Sparrow | 11% | 87% | 22% | 100% | 3% | 67% | 5% | 71% |
| Dickcissel | 14% | 73% | 10% | 67% | 13% | 87% | 6% | 43% |
| Bobolink | 31% | 93% | 34% | 100% | 24% | 100% | 22% | 100% |
| Red-winged Blackbird | 8% | 80% | 1% | 20% | 31% | 93% | 32% | 100% |
| Western Meadowlark | 10% | 100% | 11% | 100% | 4% | 93% | 6% | 100% |
| Brown-headed Cowbird | 11% | 100% | 11% | 100% | 11% | 100% | 12% | 100% |
| Percent of total | 95% | - | 99% | - | 92% | - | 88% | - |

Local weather conditions and management activities varied considerably from year to year (Table 5). The wettest year was 1983 followed by 1996 and 1990 while the driest was 1994. The coolest season was 1995 and the warmest was 1988. Burning, grazing, and haying prior to the census reduced the amount of residual cover, vegetation stature, and ground litter in the plot. The presence of surface water was affected by precipitation and river stage. In general, above normal precipitation resulted in increased standing water on the plots. Conversely, below normal precipitation resulted in little or no standing water on the plots.

The effect of weather conditions on the abundance and diversity of the nesting avifauna was confounded by the effect of management activities on the plots. Wet and cool springs generally resulted in the greatest number of territories (Table 6). The exception was Plot 1 which had the most territories during a dry and warm spring. Years with the fewest number of territories did not follow any particular weather pattern (Table 6). Plots 3 and 4, the wettest plots, had fewest territories during dry and warm springs. The fewest territories in Plots 1 and 2 occurred during wet years; however, both were years of poor residual cover (Table 5).

Table 6. Year and weather conditions of the maximum and minimum number of territories in each plot.

| | Plot 1 | | Plot 2 | | Plot 3 | | Plot 4 | |
|---------|----------|----------|----------|----------|----------|----------|----------|----------|
| | Maximum | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum | Minimum |
| Year | 1988 | 1984 | 1983 | 1990 | 1995 | 1987 | 1996 | 1986 |
| Number | 43 | 11.5 | 39 | 15.5 | 54 | 18 | 59.5 | 21.5 |
| Weather | dry/warm | wet/warm | wet/cool | wet/cool | wet/cool | dry/warm | wet/cool | dry/warm |

Wood Duck, Virginia Rail, Common Yellowthroat, Swamp Sparrow, and Yellow-headed Blackbird were unique to Plot 4. Yellow-headed Blackbird appeared following flooding in 1983 (Lingle and Haugh 1984). Least Bittern, Wilson's Snipe, and Wilson's Phalarope were unique to Plots 3 & 4; the ones with the most wetlands. Mallard and Blue-winged Teal occurred on every plot although Plots 3 and 4 had the highest frequency of occurrence. Killdeer and Sedge Wren did not occur in Plot 2, the driest plot, and were most frequently observed in Plot 4 (FO=79% and 29% respectively). Ring-necked Pheasant and

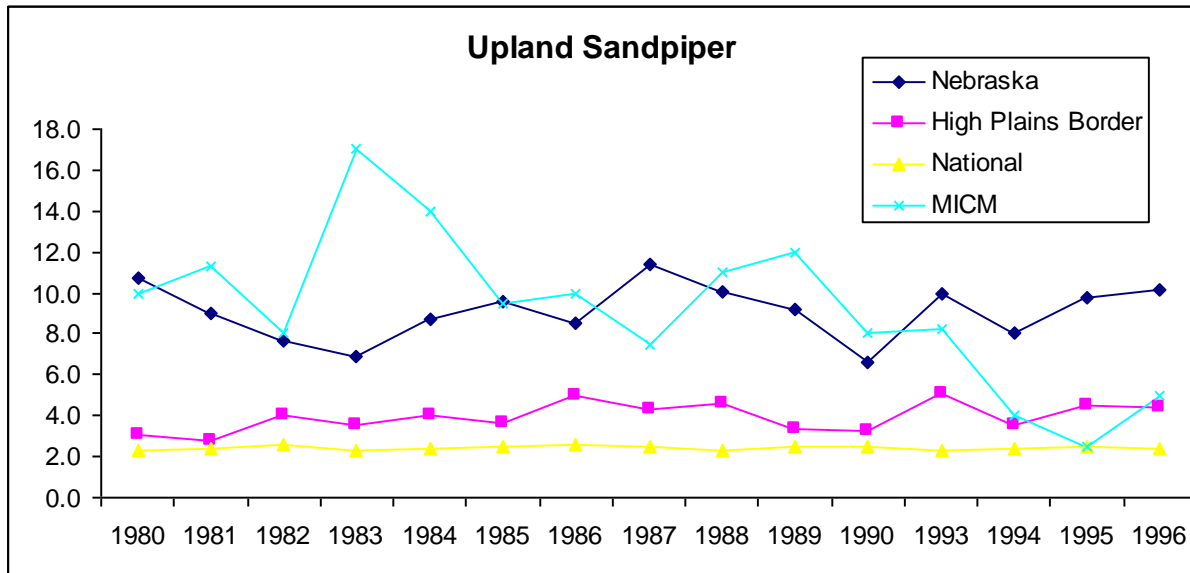
Northern Bobwhite were found only in Plots 1 & 2. Mourning Dove and Eastern Meadowlark occurred in every plot. All of these species had a relative abundance <2% (Table 2) and were minor components of the avifauna.

Target species accounts

Upland Sandpiper-- There was a general decline in numbers of Upland Sandpipers on MICM (Figure 2). Plots 1 & 2 had the greatest relative frequency although Plot 3 was the only plot where they occurred every year (Table 4). Plot 1 had the most Upland Sandpipers (29%) while Plot 4 had the fewest (21%) (Table 3).

Trend results from the BBS were mixed although none of them were statistically significant (Sauer et al. 2005). Nationally there was a slight decline while in the High Plains Border and Nebraska there was a slight increase on the BBS routes (Table 7, Figure 2).

Figure 2. Population trends of Upland Sandpipers (territories/160 ac on MICM).



Of the 43 nests found on MICM (Table 1), two were parasitized by Brown-headed Cowbirds. Both nests were abandoned. Egg dates were from May 10 to June 27 (Faanes and Lingle 1995).

Upland Sandpipers was most numerous on Plots 1 & 2 (Table 3). Not only were they the driest of the 4 plots, they were most impacted by grazing and burning and least impacted by flooding. Portions (15-30%) of Plot 2 were hayed in late summer which resulted in minimal residual cover/litter and reduced vegetation stature. The greatest number of Upland Sandpipers was recorded in 1983, the wettest year of the survey (Figure 2). The second highest number was in 1984 which also had a high percentage of standing water on the plots (Table 3). Their abundance may have been due to increased visibility due to nests/young flooded in June rather than a real increase in numbers.

Table 7. Population trends of target species during 1980-1996.

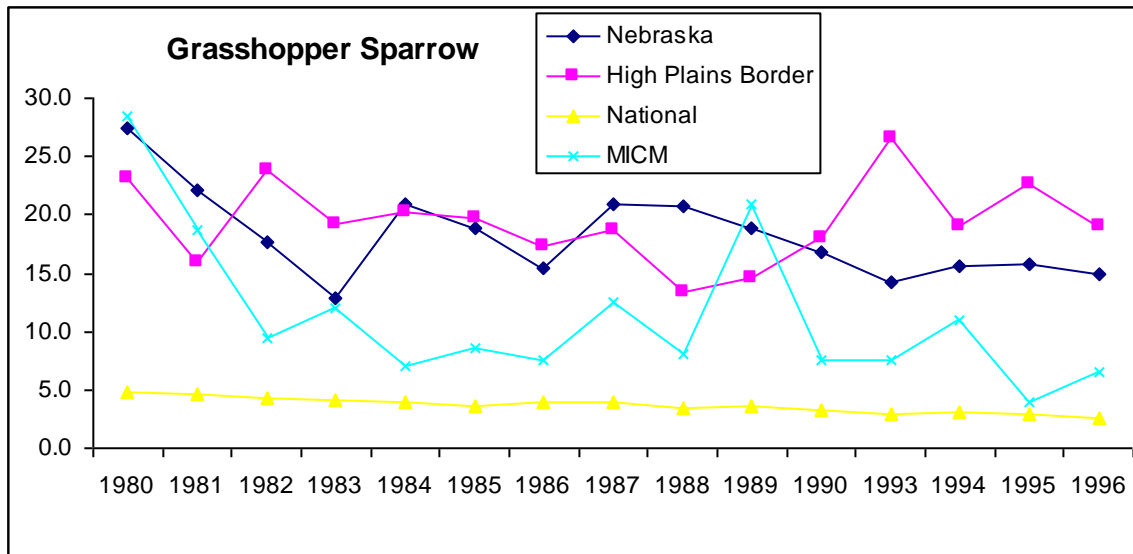
| Species | National ¹ | High Plains Border ¹ | Nebraska ¹ | MICM |
|----------------------|-----------------------|---------------------------------|-----------------------|----------|
| Upland Sandpiper | -1.01NS | 2.23NS | 1.45NS | - |
| Grasshopper Sparrow | -2.0* | -1.6NS | .7NS | - |
| Dickcissel | .45NS | 2.46* | 1.99NS | 0 |
| Bobolink | -3.78* | 20.01* | 5.46NS | + |
| Red-winged Blackbird | -1.22* | -.30NS | 1.25* | + |
| Western Meadowlark | -.42* | -1.03* | .16NS | 0 |
| Brown-headed Cowbird | -10.33* | No data | No data | + |

¹Breeding Bird Survey data from Sauer et al. (2005).

* statistically significant (P<0.1); NS=non-significant (P>0.1)

Grasshopper Sparrow.— Grasshopper Sparrows exhibited a decline in number of territorial males on MICM (Figure 3). Plot 2 had the greatest number of territorial males and greatest relative frequency while Plot 3 had the fewest and the lowest (Tables 3 and 4). Results from the BBS routes showed a significant decline nationally, a non-significant decline in the High Plains Border, and a non-significant increase in Nebraska (Sauer et al. 2005) (Table 7, Figure 3).

Figure 3. Population trends of Grasshopper Sparrows (males/160 ac on MICM).



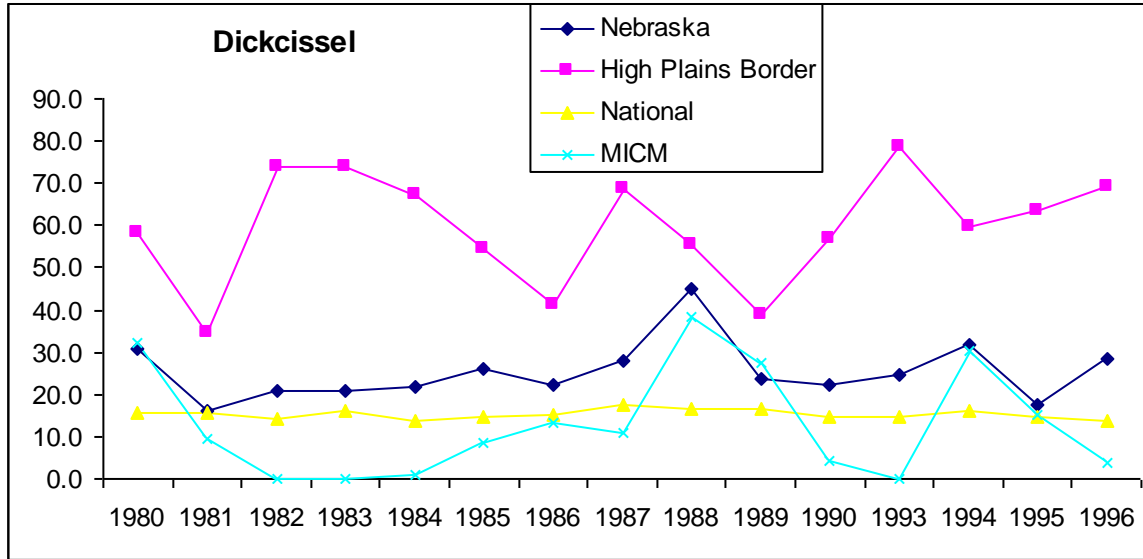
Six nests were found and 4 (67%) were parasitized by cowbirds. Egg dates were from June 4-21 (Faanes and Lingle 1995).

Grasshopper Sparrows were not present in Plots 3 and 4 in 1983 or 1984. Prolonged inundation of these plots those years precluded them from nesting. The hayed portion of Plot 2 hosted the greatest number of Grasshopper Sparrows. Plot 2 was the only plot that had 100% frequency of occurrence for this species (Table 4).

Dickcissel.— The numbers of Dickcissels recorded on MICM fluctuated greatly from year to year such that their population trend was characterized as no change (Figure 4). They

occurred on all plots. Plot 1 had the highest relative frequency of Dickcissels while Plot 3 had the greatest frequency of occurrence (Table 4). Plot 3 had the greatest number of territorial males while Plot 4 had the fewest (Table 3). BBS trends showed increases for each category although only the High Plains Border was significant (Sauer et al. 2005) (Table 7, Figure 4).

Figure 4. Population trends of Dickcissels (males/160 on MICM).

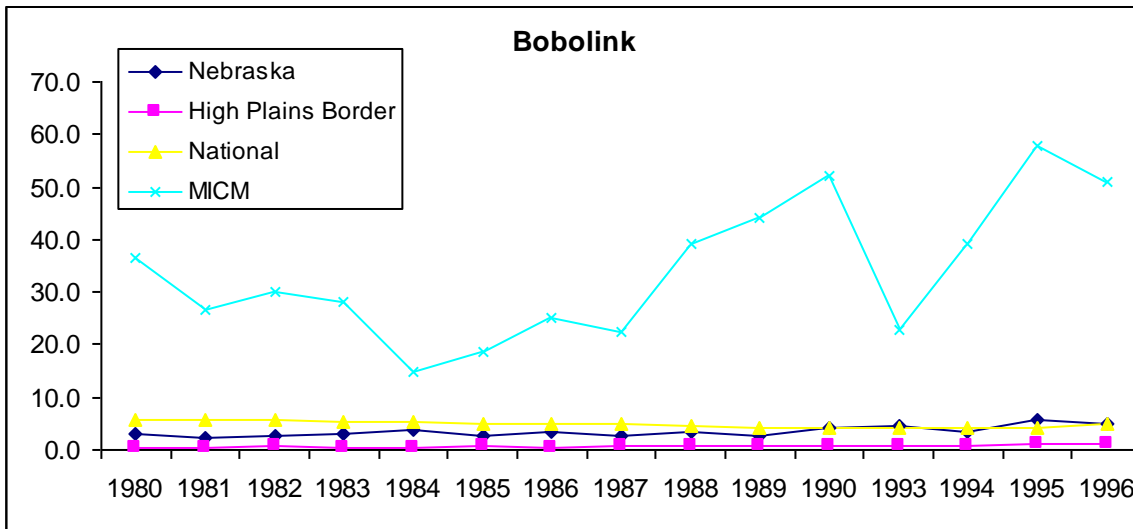


Three of the 5 nests (60%) found were parasitized by cowbirds. Egg dates were from June 23- July 18 (Faanes and Lingle 1995).

Dickcissels were absent in 1983 and 1984, years that exhibited the greatest amount of standing water (Table 5, Figure 4). In general, the more water, the fewer Dickcissels present. Their absence in 1993 (a normal year for precipitation) and low abundance in 1981 (a dry year) contradicted that generalization. Their greater abundance in Plots 1 and 3 may be related to the higher vegetation stature provided by forbs such as Maximilian sunflower and false indigo respectively, plants that provided favored perches. An influx of Dickcissels was noted in Plot 1 in 1982 (Lingle and Whitney 1983) and Plot 2 in 1981 and 1984 (Hay and Lingle 1982; Lingle and Labeledz 1985) midway through the censuses following alfalfa harvest in nearby fields.

Bobolink.— Numbers of Bobolinks trended upward on MICM (Figure 5). Plot 2 exhibited the greatest relative frequency of Bobolinks (Table 4). Their abundance was relatively uniform between the plots although Plot 3 had slightly more (Table 3). BBS trends were mixed; nationally there was a significant decrease while in the High Plains Border and Nebraska there was an increase (Sauer et al. 2005) (Table 7, Figure 5).

Figure 5. Population trends of Bobolinks (males/160 ac on MICM).

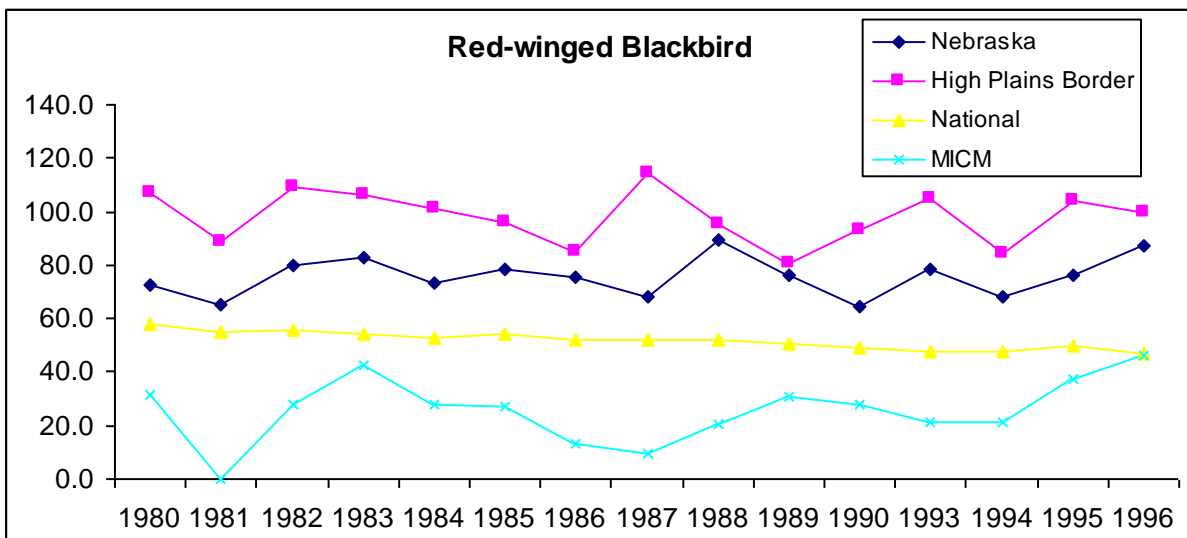


Eighty percent of the 10 nests found were parasitized by cowbirds. Egg dates were from June 6-21 (Faanes and Lingle 1995).

In 1983, Plot 2 had an influx of Bobolinks as neighboring plots flooded (Lingle and Haugh 1984). They were recorded on every plot each year except Plot 1 in 1984, a year when this plot had extremely poor residual cover due to intense grazing and burning and was partially inundated (Tables 4 and 5).

Red-winged Blackbird.— Red-winged Blackbirds showed a slight upward trend in numbers on MICM (Figure 6). Plots 3 & 4 contained 91% of the territories mapped while Plot 2 had only 1% (Table 3). Plots 3 & 4 also had the greatest relative frequencies of this species (Table 4). BBS trends were negative in all categories and significantly so nationally and in Nebraska (Sauer et al. 2005) (Table 7, Figure 6).

Figure 6. Population trends of Red-winged Blackbirds (males/160 ac on MICM).

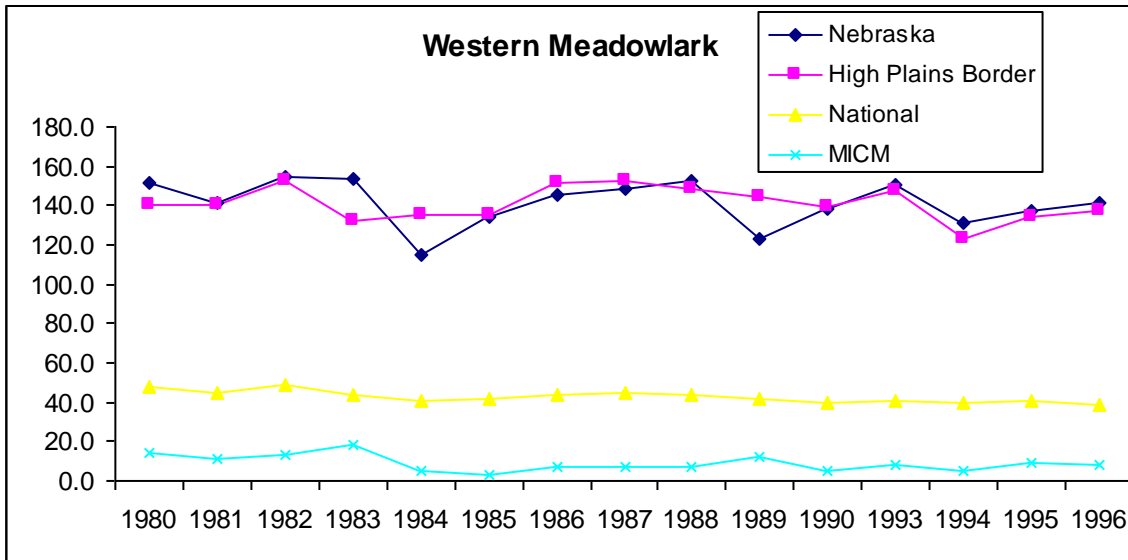


A total of 77 nests were located (one contained 15 eggs) and 53 (69%) were parasitized by cowbirds. Egg dates were from May 24- June 25 (Faanes and Lingle 1995).

The two wettest years, 1983 and 1996, had the greatest number of territorial males (Table 5, Figure 6). An influx of Red-winged Blackbirds was noted in Plot 1 in 1983 following flooding (Lingle and Haugh 1984). Red-winged Blackbirds occurred on every plot although they were absent 4 of 15 years in Plot 1 and 12 of 15 years in Plot 2 (Table 4). In 1981, they were not recorded and there was no obvious explanation for this except that there was no surface water present in any of the plots.

Western Meadowlark.— Western Meadowlark populations showed no change on MICM (Figure 7). Plot 1 had the most territories while Plot 3 had the fewest (Table 3). Relative frequencies were lowest in Plots 3 and 4 (Table 4). BBS trends showed a significant decline nationally and in the High Plains Border and a non-significant increase in Nebraska (Sauer et al. 2005) (Table 7, Figure 7).

Figure 7. Population trends of Western Meadowlarks (territories/160 ac on MICM).

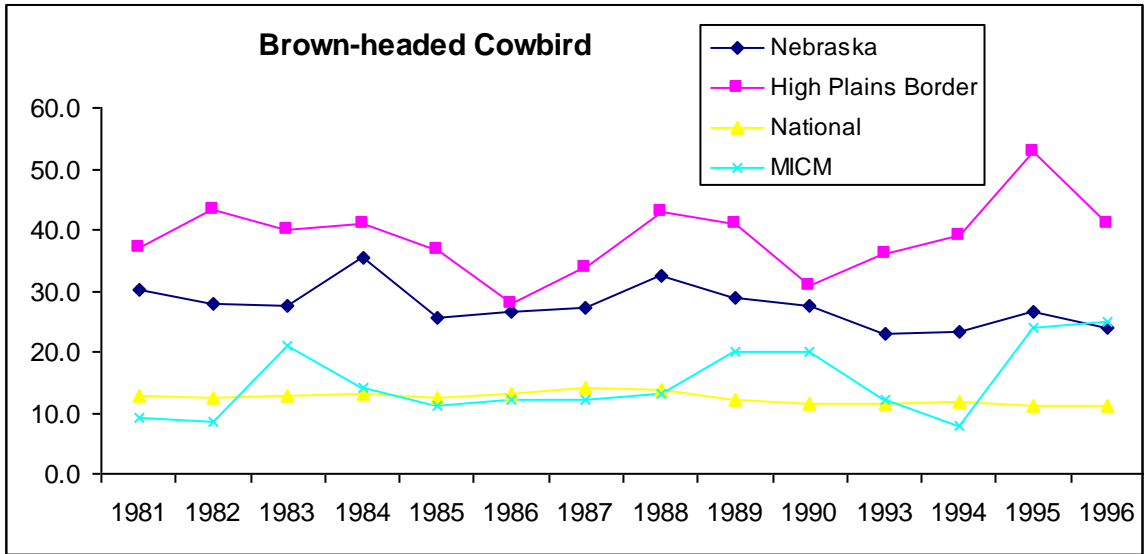


Eighteen nests were located and 10 (56%) were parasitized by cowbirds. Egg dates were from May 19-June 14 (Faanes and Lingle 1995).

The greatest number of Western Meadowlarks occurred in 1983, the wettest year during this study (Figure 7, Table 5). Again, this increase may have been an artifact of increased visibility due to flooding, rather than a true population increase. Like Bobolinks, Western Meadowlarks were recorded on every plot each year except Plot 3 in 1994 (Table 4).

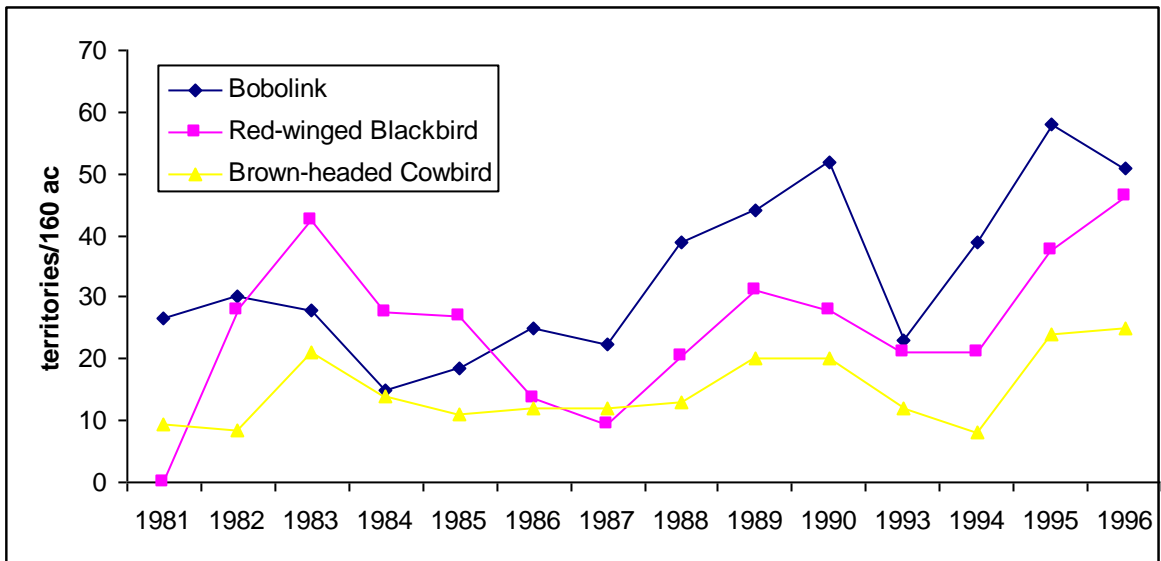
Brown-headed Cowbird.— Brown-headed Cowbirds trended slightly upward on MICM (Figure 8). They were most abundant on Plots 3 and 4 (Table 3). The relative frequency of cowbirds by plot was the most uniform of any of the target species (Table 4). Nationally they showed a statistically significant decline and non-significant declines in the High Plains Border and Nebraska (Sauer et al. 2005) (Table 7, Figure 8).

Figure 8. Population trends of Brown-headed Cowbirds (females/160 ac on MICM).



Cowbirds parasitized the 7 target species as well as 1 Ring-necked Pheasant nest on MICM. Egg dates were from May 24-June 30 (Faanes and Lingle 1995). Cowbird abundance mirrored that of Bobolinks and Red-winged Blackbirds fairly well (Figure 9). The greatest number of Brown-headed Cowbirds occurred in 1996, a year which had the greatest number of Bobolinks and Red-winged Blackbirds combined. Not only were Bobolinks and Red-winged Blackbirds the two most abundant species recorded, they also had the highest percentage of cowbird brood parasitism. They were the major host species on MICM. Brown-headed Cowbird was the only species recorded on every plot each year (Table 4).

Figure 9. Comparison of population trends between Bobolinks (males), Red-winged Blackbirds (males), and Brown-headed Cowbirds (females) on MICM.



Discussion and Conclusions

The nesting avifauna populations on the 4 study plots were dynamic over time. Having a data set of 15 years duration provided a unique opportunity to compare local population trends on MICM to regional and national trends during the same time period. The results were mixed and conflicting. None of the target species exhibited uniform trends in all four categories examined (Table 7). The most consistent species were Grasshopper Sparrow and Dickcissel. Grasshopper Sparrow showed a significant decline nationally and a general decline regionally and locally except for a weak increase in Nebraska while Dickcissel showed an increase in 3 of the 4 categories with no change locally. In contrast, Red-winged Blackbird numbers declined nationally and regionally but increased in Nebraska and locally. The most contradictory example was Bobolink, a species that had a significant decline nationally yet had a significant increase regionally and increased in Nebraska and locally.

Caution must be used when attempting to characterize population trends. Observer bias, weather, length of coverage, species detectability rates, and natural population cycles affect census results and conclusions. Looking at a 2 or 3 year time period in this study could lead to exact opposite conclusions with respect to population trends for essentially all of the target species except Western Meadowlark. Breeding Bird Survey data has inherent problems that are well documented. As volunteers age, their hearing and sight suffers such that species like Grasshopper Sparrow are more difficult to detect.

Explaining local population fluctuations was problematic, being confounded by the interaction of biotic and abiotic factors. Temperature, precipitation, and river stage influenced the amount of standing water on plots while management activities of burning, haying, and grazing effected vegetation density, composition, and stature. All of these factors influenced avifauna composition and abundance. Reduced stocking rates coupled with the rotation grazing system favored forb and woody plant development i.e. false indigo. Renfrew et al. (in review) found that Grasshopper Sparrow, Bobolink, and Western Meadowlark strongly avoided woody cover and preferred less exposed soil, less lying litter, and lower vegetation height-density in the central Platte River valley. When vegetation height-density was low, bird density was higher when litter depth was higher for these species as well. For Common Yellowthroat, Sedge Wren, Dickcissel, and Red-winged Blackbird; bird densities were higher with more exposed soil, more litter, greater vegetation height-density, and more woody cover (Renfrew et al. in review). Results from this study concur.

While management affects vegetation structure and composition, perhaps the biggest influence directly impacting nesting on these plots was the amount of standing water present. The proximity of MICM to the Platte River and the high water table made these sites prone to wide fluctuations in surface water occurrence and expanse. Wetland species such as waterfowl, Least Bittern, Virginia Rail, Wilson's Snipe, Wilson's Phalarope, Red-winged Blackbird, and Yellow-headed Blackbird responded positively during the high water years of 1982-1984 and 1995-1996 while Dickcissel responded negatively. In 1983 in particular, record June flows in the Platte River essentially flooded MICM. Nest success of the ground nesting species was negatively impacted as well.

Sedge Wren first appeared in this census in 1990 in Plot 4, although they were known to nest on MICM in August 1988, 1989, and 1992 following the completion of these censuses (Lingle and Bedell 1989b, Bedell 1996). Their habit of late summer nesting may result on them being missed during "typical" breeding season surveys in June such as the Breeding

Bird Survey (Bedell 1996). Sedge Wren have been recorded annually on MICM in June since 1994 (Platte River Whooping Crane Trust, unpubl. data). The vegetation structure that has developed due to management has provided suitable habitat for Sedge Wren.

Efforts to reduce Brown-headed Cowbird brood parasitism include direct approaches such as trapping and poisoning and indirect methods such habitat manipulation to reduce edge and potential perches (Shaffer et al. 1999). Managing large blocks of grasslands, removal of unnecessary fences, and maintaining grass at taller heights (>5cm) all reduced parasitism (Shaffer et al. 1999). Shaffer et al. (1999) recommended maintaining large colonies of Red-winged Blackbird in wetlands to reduce brood parasitism of other species by Brown-headed Cowbird; however, Dechant et al. (2003b) reported higher rates of brood parasitism in Dickcissel when nesting near Red-winged Blackbird.

Management Implications

Management recommendations for several of the target species have been published as follows: Upland Sandpiper (Kirsch and Higgins 1976, Dechant et al. 1999), Grasshopper Sparrow (Dechant et al. 2003a), Dickcissel (Dechant et al. 2003b), Bobolink (Dechant et al. 2003c), Western Meadowlark (Dechant et al. 2003d), and Brown-headed Cowbird (Shaffer et al. 2003). In addition, Herkert (2003) provided recommendations for Henslow's Sparrow *Ammodramus henslowii*, a species first observed nesting on MICM in June 1995 outside of the study plots and has been present each year through 2005 (Platte River Whooping Crane Trust, unpubl. data). Common Yellowthroat, Sedge Wren, and Swamp Sparrow have occurred consistently since 1995 as well.

Based on these published accounts and the results from this study, maintaining habitat heterogeneity will provide optimum conditions for this guild of grassland species. Prescribe burn every 3-5 years on a rotation basis to help control woody vegetation and maintain vegetation quality in all fields. On pastures, maintain a rotation or a rest-rotation grazing system with moderate stocking rates. For hayfields, mow after July and harvest on a rotation basis as well. This will provide a mosaic of habitats with varying amounts of litter, vegetation height-density, and residual cover suitable for grassland species. These techniques were initiated on MICM in 1982 by the Platte River Whooping Crane Trust and have continued through 2005.

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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 Trust, Grand Island NE. 177pp.
- Bedell, P. 1996. Evidence of dual breeding ranges for the Sedge Wren in the central High Plains Border. Wilson Bull. 108:115-122.

- Dechant, J. A., M. F. Dinkins, D. H. Johnson, L. D. Igl, C. M. Goldade, B. D. Parkin, and B. R. Euliss. 1999. Effects of management practices on grassland birds: Upland Sandpiper. Northern Prairie Wildlife Research Center, Jamestown, ND. 33pp.
- Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, and B. R. Euliss. 2003a. Effects of management practices on grassland birds: Grasshopper Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/grsp/grsp.htm> (Version 12AUG2004).
- Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, A. L. Zimmerman, and B. R. Euliss. 2003b. Effects of management practices on grassland birds: Dickcissel. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/dick/dick.htm> (Version 12DEC2003).
- Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, A. L. Zimmerman, and B. R. Euliss. 2003c. Effects of management practices on grassland birds: Bobolink. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/bobo/bobo.htm> (Version 12DEC2003).
- Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, A. L. Zimmerman, and B. R. Euliss. 2003d. Effects of management practices on grassland birds: Western Meadowlark. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/weme/weme.htm> (Version 12AUG2004).
- Faanes, Craig A. and Gary R. Lingle. 1995. Breeding birds of the Platte River Valley of Nebraska. Jamestown, ND: Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.govplatte.htm> (Version 02SEP99).
- Hay, M., and G. Lingle. 1982. Breeding bird censuses along the Platte River in south central Nebraska. *Am. Birds* 36:105-106.
- Herkert, J. R. 2003. Effects of management practices on grassland birds: Henslow's Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/hesp/hesp.htm> (Version 12DEC2003).
- Johnsgard, P. 1991. Crane Music: a natural history of American cranes. Smithsonian Institution Press, Washington, D.C. 136pp.
- Kirsch, L. and K. Higgins. 1976. Upland Sandpiper nesting and management in North Dakota. *Wildl. Soc. Bull.* 4(1):16-20.
- Knopf, F. 1994. Avian assemblages on altered grasslands. Pp. 232-246 *in* J. Jehl and N. Johnson, eds. A century of avifaunal change in western North American. *Studies in Avian Biology* No.15.
- Lingle, G. 1981. Mormon Island Crane Meadows - Protecting habitat for cranes along the Platte River, Nebraska. Pages 17-21 *in* J.C. Lewis, ed. Proceedings 1981 Crane Workshop, Nat. Audubon Soc., Tavernier, FL.
- Lingle, G.R., and W.S. Whitney. 1983. Breeding birds on Mormon Island Crane Meadows. *Am. Birds.* 37:101,104.

- Lingle, G.R., and K.L. Haugh. 1984. Breeding birds on Mormon Island Crane Meadows. *Am. Birds*. 38:120,124,125.
- Lingle, G.R., and T.E. Labeledz. 1985. Breeding birds on Mormon Island Crane Meadows. *Am. Birds* 39:114.
- Lingle, G.R., and P.A. Bedell. 1989a. Breeding bird census. *J. Field Ornithol.* 60:60,65,66.
- Lingle, G.R., and P.A. Bedell. 1989b. Nesting ecology of Sedge Wrens in Hall County, Nebraska. *Nebr. Bird Rev.* 57:47-49.
- Lingle, G.R., and P.A. Bedell. 1990. Breeding bird census. *J. Field Ornithol.* 61:72,73,78,79.
- Lingle, G.R. and W.S. Whitney. 1991. 1990 breeding bird census. *J. Field Ornithol.* 62:77,78,84,85.
- Lingle, G. 1994. *Birding Crane River: Nebraska's Platte*. Harrier Publishing, Grand Island, NE. 124pp.
- Lingle, G.R., S. Bergman, and J. Liske. 1994. 1993 breeding bird census. *J. Field Ornithol.* 65:107,108,122,123.
- Lingle, G.R. 1995. 1994 breeding bird census. *J. Field Ornithol.* 66:100,101,111,112.
- Lingle, G.R. 1996. 1995 breeding bird census. *J. Field Ornithol.* 67:76,77,86,87.
- Renfrew, R.B., D.H. Johnson, G.R. Lingle, and D.A. Robinson. in review. Avian response to meadow restoration in the central High Plains Border. *Ecological Restoration*.
- Robbins, C. 1970. Recommendations for an international standard for a mapping method in bird census work. *Audubon Field Notes* 24:723-726.
- Sauer, J. R., J. E. Hines, and J. Fallon. 2005. The North American breeding bird survey, Results and Analysis 1966 – 2004. <http://www.mbr-pwrc.usgs.gov/bbs/>.
- Shaffer, Jill A., Christopher M. Goldade, Meghan F. Dinkins, Douglas H. Johnson, Lawrence D. Igl, and Betty R. Euliss. 2003. Brown-headed Cowbirds in grasslands: their habitats, hosts, and response to management. *Prairie Naturalist* 35(3):145-186. Jamestown, ND: Northern Prairie Wildlife Research Center Online. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/bhco/bhco.htm> (Version 28MAY2004).
- VanVelzen, W. 1972. Breeding-bird census instructions. *Am. Birds* 26:1007-1110.
- Walker, S., ed. 1997. *Nebraska wetland resources: a summary of the issues involving conservation of Nebraska's wetlands*. Nebr Dept of Environmental Quality, Lincoln. 95pp.

Table 3. Land management actions, weather, and habitat conditions on plots.

| Year | Plot 1 | | | | Plot 2 | | | | | Plot 3 | | | | Plot 4 | | | | Precip* Departure (Inches) | Temp* Departure (F) |
|------|--------|--------|--------------------------------|-------------------|--------|--------|---------|--------------------------------|-------------------|--------|--------|--------------------------------|-------------------|--------|--------|--------------------------------|-------------------|----------------------------------|---------------------------|
| | Burned | Grazed | Standing Water ¹ | Residual Cover | Burned | Grazed | Hayed** | Standing Water ¹ | Residual Cover | Burned | Grazed | Standing Water ¹ | Residual Cover | Burned | Grazed | Standing Water ¹ | Residual Cover | | |
| 1980 | No | Yes | No data | No data | No | Yes | Yes | No data | No data | No | Yes | No data | No data | No | Yes | No data | No data | -2.5 | 2.7 |
| 1981 | No | Yes | dry | No data | No | No | Yes | dry | No data | No | Yes | dry | No data | No | Yes | No data | No data | -3.3 | -1.2 |
| 1982 | Yes | No | wet | No data | No | No | Yes | wet | No data | No | No | wet | No data | No | Yes | wet | No data | 4.53 | -6.3 |
| 1983 | No | Yes | 95% | No data | Yes | No | Yes | 50% | No data | Yes | Yes | 85% | No data | No | Yes | 60% | No data | 5.01 | -6.5 |
| 1984 | Yes | Yes | 35% | poor | Yes | Yes | Yes | 30% | poor | No | No | 80% | good | No | Yes | 90% | good | 3.96 | 1.4 |
| 1985 | Yes | Yes | dry | No data | Yes | No | Yes | No data | No data | No | No | No data | No data | No | Yes | No data | No data | 1.18 | 1.3 |
| 1986 | No | No | dry | No data | Part | No | Yes | dry | No data | No | No | 5% | No data | No | Yes | dry | No data | -1.3 | 4.9 |
| 1987 | 30% | No | No data | No data | No | No | Yes | No data | No data | No | Yes | No data | No data | No | Yes | No data | No data | -1.22 | 6.9 |
| 1988 | No | No | dry | No data | Yes | Yes | Yes | No data | poor | Yes | No | 10% | No data | Part | Yes | 5% | No data | -1.26 | 10.1 |
| 1989 | No | Yes | dry | No data | No | No | Yes | dry | No data | Yes | No | dry | No data | Yes | Yes | dry | No data | -0.66 | -1.6 |
| 1990 | No | No | No data | good | No | No | Yes | No data | poor | No | No | No data | good | No | No | No data | good | 4.94 | -1.4 |
| 1993 | No | Yes | dry | No data | No | No | 50% | dry | good | No | No | wet | good | No | Yes | wet | No data | 0.74 | -5 |
| 1994 | Yes | No | 20% | No data | No | Yes | Yes | No data | poor | No | No | 5% | No data | 25% | No | 5% | No data | -3.34 | 5 |
| 1995 | No | No | 75% | good | 15% | No | 25% | 60% | poor | No | No | 90% | good | No | No | 70% | good | 1.48 | -9.2 |
| 1996 | No | No | No data | good | Yes | 25% | 50% | 10% | poor | No | No | 30% | good | No | No | 40% | good | 4.99 | -3.3 |

*May & June combined; National Weather Service, Hastings NE.

**Hayed in late summer the previous year; regrowth moderate.

¹Percent inundated.