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Revisiting the Historic Distribution and Habitats of the Whooping Crane

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CHAPTER

3

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INTRODUCTION

Understanding the historic range and habitats of an endangered species can assist in conservation and reintroduction efforts for that species. Individuals reintroduced into a species' historic core range have a higher survival rate compared to individuals introduced near the periphery or outside the historic range (Falk and Olwell, 1992; Griffith et al., 1989). Individuals on the periphery of a species' range tend to occupy less favorable habitats and have lower and more variable densities than those near the core of their range (Brown, 1984; Brown et al., 1995, 1996). Such conclusions, however, presume that historic habitats have not changed since a species was extirpated from core areas – a difficult assumption for many areas, and particularly for wetland habitat (Prince, 1997). Many endangered species persist only on the periphery of their historic range because of habitat loss or modification in their core range (Channell and Lomolino, 2000), which can bias our understanding of the species' habitat preferences. Further, habitat models based on locations where species persist necessarily emphasize local conditions rather than historical conditions (Kuemmerle et al., 2011). For example, habitat models for the European bison (*Bison bonasus*) suggested it was a woodland species, but assessment of the bison's historic range indicated it preferred mosaic-type landscapes and had a more eastern and northern distribution than previously reported (Kuemmerle et al., 2011, 2012). Hence, accurate determination of the historic range and habitat conditions for endangered species can improve

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our understanding of their ecology and assist in conservation and reintroduction efforts. Examining the historic range from an ecological perspective can also help identify where appropriate habitat still exists that could sustain a population.

The main source of information on the historic distribution of Whooping Cranes is a monograph, *The Whooping Crane*, a detailed report by Allen (1952). Allen collected and analyzed all available information about Whooping Cranes, including historic observations. From these observations, Allen constructed a historic Whooping Crane distribution map (Allen, 1952, p. 2) to illustrate historic breeding and wintering distribution and habitat use. Allen's maps and information have been utilized by many sources since their initial publication (e.g., Doughty, 1989; Meine and Archibald, 1996; Walkinshaw, 1973), including the International Whooping Crane Recovery Plan (Canadian Wildlife Service and U.S. Fish and Wildlife Service, 2005), and Allen's report remains a crucial source for Whooping Crane biology today. However, it has never been updated and questions remain about some areas identified by Allen. For example, when comparing recorded observations and the historical principal range map in Allen (1952, p. 2), many observations listed are not included in the map (e.g., southern Michigan), and some observations indicated on the map are not found in the table (Allen 1952, pp. 51–64). Also, some areas encompassed by the former breeding (e.g., northern Illinois) or wintering ranges that Allen described do not appear to be supported by his tabular data.

Given the influence of Allen's (1952) report in planning reintroduction efforts and the need to manage for a growing Aransas-Wood Buffalo Population (AWBP), Allen's original analyses deserved a review. In this chapter, we update Allen's work with records found subsequent to the publication of *The Whooping Crane*, and evaluate the accuracy of Allen's range maps and habitat use descriptions, taking advantage of newly discovered information, new tools such as geographic information systems (GIS), and contemporary knowledge of wetland and species ecology. We review the historic range, adjust the ecological niche for Whooping Cranes described by Allen by linking historic habitat use patterns to the life history of Whooping Cranes (most of which was developed after Allen's publication), and discuss how our analysis could help to direct current and future reintroduction efforts. Finally, we hypothesize that the ecological niche for Whooping Cranes is defined primarily by wetland productivity, which meets three primary needs in the annual cycle: rapid chick growth in spring and summer, habitat for molting birds in summer, and acquisition of large energy reserves in winter. We focus our results and discussion on breeding, summering, and wintering records; we do not consider habitat use during migration.

METHODS

All location records contained in *The Whooping Crane* (Allen 1952, pp. 51–64), as well as records published after that document was published, were entered into a tabular database (available on USGS ScienceBase; doi:10.5066/F7QZ282R). We used online search tools to find observations of Whooping Cranes in the literature published after 1952; some records were also found in early publications that are now available electronically that may not have been available to Allen. We used only observations up to 1941, the low point of 15 or 16 Whooping Cranes in the AWBP (Allen, 1952), to determine their historic distribution. Thus, our evaluation of Allen's work was constrained to the period before the intensification of agricultural practices that occurred after the 1940s, but encompassed the years of rapid settlement and cropland expansion across the Great Plains during the 1870s–1930 (Waisanen

and Bliss, 2002). Records were organized by date, location (place, city, county, state, country, and latitude/longitude), type of record (nesting, observation, specimen, or captured bird), and life-history stage (breeding, summering, migrating, or wintering). We categorized observations or specimens of a nest, eggs, or flightless chick as breeding; other observations between mid-May and 30 August were categorized as summering. For observations or specimens that included a year but no date, we categorized life-history stage as unknown. We included observer identity, if known, source for each record, and, for birds that were killed or collected, current location of existing specimens. Some records lacked information on multiple aspects (e.g., observer name, specific location, season) and, without other supporting information, were included in the database but not included in analyses. Records were exported to a GIS, ArcMap10 (ESRI, Redlands, CA, USA), and sorted by life-history stage and season.

Landscape features and patterns of habitat use were derived by overlaying locations and range polygons on the World Wildlife Fund (WWF) terrestrial biomes and ecoregions (Abell et al., 2008). These data layers were selected because of their use of a comprehensive set of characteristics at the ecoregion level (wetlands, climate, topography, and vegetation). Additional information was obtained from two other ecoregion classification systems: the Canadian Ecological Framework (CEF), which closely matches the WWF ecoregion boundaries (ESWG, 1995), and the Prairie Pothole Region (PPR) in the northern Great Plains (Euliss et al., 1999). Finally, we used descriptions of habitat types in Allen (1952), landscape and wetland information from WWF global habitat types and ecoregions, and contemporary information about landscape and wetland characteristics in those locations to assess landscape and habitat features of Whooping Crane locations. Where locations were identified as a "lake" (biome = 98) or unknown (biome = 0), we assigned the location to the nearest adjacent biome and ecoregion. We also replicated the hand-drawn map ranges from Allen (1952, pp. 2, 19) in the GIS to the best of our ability, given uncertainty about the map projection used by Allen.

RESULTS

Updating Allen's Historic Distribution

We compiled a total of 884 records from Allen (1952), dating from 1722 to 1941: 25 (2.8%) records preceded 1850, 390 (44.1%) occurred from 1850 to 1899, 221 (25.0%) from 1900 to 1919, and 201 (22.7%) from 1920 to 1941; 47 (5.3%) had no known date specified. We added 74 records to those listed in Allen (1952): 20 breeding locations (total 87), 21 summering locations (total 169), 18 migrating locations (total 367), 5 wintering locations (total 121), and 10 unknown life-history stages (total 140) (Table 3.1; Appendix). The additional records were from 28 published sources, including eight that had been published before 1952 but either may not have been available to Allen or we felt deserved to be reinterpreted. Among the most striking additions were the 13 breeding records, 14 summering records, and 7 migration records reported for Saskatchewan by Hjertaas (1994) and 4 breeding records in southern Texas (Oberholser, 1938, 1974). Also notable were six records for Wisconsin and six each for Florida and Indiana.

Verifying the location of some records was problematic. For example, in a report of his explorations of the Canadian north, Samuel Hearne indicated that "[t]his bird visits Hudson's Bay in the Spring, though not in great numbers. They are generally seen only in pairs, and then not very often… It seldom has more than two young and retires Southward early in the fall" (Hearne, 1795, pp. 271–272). Unfortunately, Hearne did not give specific locations of

TABLE 3.1 Distribution of Historic Whooping Crane Locations by (WWF) Ecoregions (Indented) within Biomes (Bold), in Order of Total Number of Records. Breeding Records Were Those That Had Observations or Specimens of a Nest, Eggs, or Flightless Chick; Other Observations between Mid-May and 30 August Were Categorized as Summering. Observation Records in September–Mid-May or Late March–Mid-May Were Classified as Migrating and Those of December–Mid-March as Wintering. Records Lacking a Date Were Classified as Unknown.

		Total		Breeding		Summering		Migrating		Wintering		Unknown	
Biome	**Ecoregion**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Temperate Grasslands, Savannas, and Shrublands		616	69.8	61	70.9	123	72.8	341	92.9	0	0	91	65.0
	Central and Southern Mixed Grasslands	*120*	*13.6*	0	0	1	0.6	109	29.7	0	0	10	7.1
	Central Tall Grasslands	*115*	*13.1*	18	21.2	7	4.1	66	18.0	0	0	24	17.1
	Canadian Aspen Forests and Parklands	*105*	*11.9*	17	20.0	43	25.4	24	6.5	0	0	21	15.0
	Northern Mixed Grasslands	*61*	*6.9*	8	9.4	23	13.6	28	7.6	0	0	2	1.4
	Northern Short Grasslands	*61*	*6.9*	6	7.1	31	18.3	18	4.9	0	0	6	4.3
	Northern Tall Grasslands	*50*	*5.7*	12	14.1	12	7.1	22	6.0	0	0	4	2.9
	Central Forest-Grasslands Transition	*40*	*4.5*	0	0	4	2.4	27	7.4	0	0	9	6.4
	Texas Blackland Prairies	*26*	*2.9*	0	0	0	0	21	5.7	0	0	5	3.6
	Nebraska Sand Hills Mixed Grasslands	*14*	*1.6*	0	0	0	0	11	3.0	0	0	3	2.1
	Western Short Grasslands	*12*	*1.4*	0	0	1	0.6	5	1.4	0	0	6	4.3
	Flint Hills Tall Grasslands	*9*	*1.0*	0	0	0	0	8	2.2	0	0	1	0.7
	Edwards Plateau Savanna	*3*	*0.3*	0	0	1	0.6	2	0.5	0	0	0	0
Tropical and Subtropical Grasslands, Savannas, and Shrublands		120	13.6	9	10.6	7	4.1	2	0.5	87	72.5	15	10.7
	Western Gulf Coastal Grasslands	*120*	*13.6*	9	10.6	7	4.1	2	0.5	87	72.5	15	10.7
Temperate Broadleaf and Mixed Forest		52	5.9	5	5.8	10	5.9	20	5.4	4	3.3	13	9.3
	Upper Midwest Forest-Savanna Transition	*18*	*2.1*	4	4.7	5	3.0	6	1.6	0	0	3	2.1
	Southern Great Lakes Forests	*9*	*1.0*	0	0	2	1.2	4	1.1	0	0	3	2.1

Central U.S. Hardwood Forests	*7*	*0.8*	0	0	1	0.6	4	1.1	0	0	2	1.4
Mississippi Lowland Forests	*7*	*0.8*	0	0	0	0	3	0.8	2	1.7	2	1.4
Southeastern Mixed Forests	*4*	*0.4*	0	0	1	0.6	3	0.8	0	0	0	0
Northeastern Coastal Forests	*2*	*0.2*	0	0	0	0	0	0	2	1.7	0	0
East Central Texas Forests	*1*	*0.1*	1	1.2	0	0	0	0	0	0	0	0
Eastern Forest-Boreal Transition	*1*	*0.1*	0	0	0	0	0	0	0	0	1	0.7
Eastern Great Lakes Lowland Forests	*1*	*0.1*	0	0	1	0.6	0	0	0	0	0	0
Appalachian Mixed Mesophytic Forests	*2*	*0.2*	0	0	0	0	0	0	0	0	2	1.4
Deserts and Xeric Shrublands	33	3.7	0	0	1	0.6	4	1.1	17	14.2	11	7.9
Tamaulipan Mezquital	*17*	*1.9*	0	0	0	0	1	0.3	15	12.5	1	0.7
Wyoming Basin Shrub Steppe	*11*	*1.2*	0	0	1	0.6	2	0.5	0	0	8	5.7
Chihuahuan Desert	*2*	*0.2*	0	0	0	0	0	0	1	0.8	1	0.7
Great Basin Shrub Steppe	*1*	*0.1*	0	0	0	0	0	0	0	0	1	0.7
Meseta Central Matorral	*1*	*0.1*	0	0	0	0	0	0	1	0.8	0	0
Snake-Columbia Shrub Steppe	*1*	*0.1*	0	0	0	0	1	0.3	0	0	0	0
Boreal Forest/Taiga	24	2.7	9	10.6	14	8.3	0	0	0	0	1	0.7
Mid-Continental Canadian Forests	*16*	*1.8*	8	9.3	8	4.7	0	0	0	0	0	0
Muskwa-Slave Lake Forests	*5*	*0.6*	1	1.2	4	2.4	0	0	0	0	0	0
Southern Hudson Bay Taiga	*2*	*0.2*	0	0	1	0.6	0	0	0	0	1	0.7
North Canadian Shield Taiga	*1*	*0.1*	0	0	1	0.6	0	0	0	0	0	0
Temperate Coniferous Forests	*21*	*2.4*	*1*	*1.2*	*5*	*3.0*	*0*	*0*	*7*	*5.8*	*8*	5.7
Southeastern Conifer Forests	*7*	*1.0*	0	0	0	0	0	0	4	4.2	4	2.9
Middle Atlantic Coastal Forests	*6*	*0.7*	0	0	0	0	0	0	2	1.7	4	2.9

(*Continued*)

TABLE 3.1 Distribution of Historic Whooping Crane Locations by (WWF) Ecoregions (Indented) within Biomes (Bold), in Order of Total Number of Records. Breeding Records Were Those That Had Observations or Specimens of a Nest, Eggs, or Flightless Chick; Other Observations between Mid-May and 30 August Were Categorized as Summering. Observation Records in September–Mid-May or Late March–Mid-May Were Classified as Migrating and Those of December–Mid-March as Wintering. Records Lacking a Date Were Classified as Unknown. (*cont.*)

		Total		Breeding		Summering		Migrating		Wintering		Unknown	
Biome	**Ecoregion**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
	South Central Rockies Forests	*4*	*0.4*	1	1.2	3	1.8	0	0	0	0	0	0
	North Central Rockies Forests	*1*	*0.1*	0	0	1	0.6	0	0	0	0	0	0
	Piney Woods Forests	*1*	*0.1*	0	0	1	0.6	0	0	0	0	0	0
Tropical and Subtropical Coniferous Forests		2	0.2	0	0	0	0	0	0	2	1.7	0	0
	Trans-Mexican Volcanic Belt Pine-Oak Forests	*2*	*0.2*	0	0	0	0	0	0	2	1.7	0	0
Tundra		*9*	1.0	0	0	9	5.3	0	0	0	0	0	0
	Arctic Coastal Tundra	*8*	*0.9*	0	0	8	4.7	0	0	0	0	0	0
	Low Arctic Tundra	*1*	*0.1*	0	0	1	0.6	0	0	0	0	0	0
Tropical and Subtropical Dry Broadleaf Forests		4	0.4	0	0	0	0	0	0	3	2.5	1	0.7
	Baja Dry Forests	*4*	*0.4*	0	0	0	0	0	0	3	2.5	1	0.7
Total		*880*	*100.0*	*85*	*9.7*	*169*	*19.2*	*367*	*41.7*	*119*	*13.5*	*140*	*15.9*

Whooping Crane nests or chicks, so his comments could apply to the broader region he explored, which extended from the Churchill River to the Great Slave Lake, then north to the Coppermine River (Hearne 1795). Therefore, Allen (1952) centralized Hearne's findings at Churchill, Manitoba, as we did. Whooping Cranes did occur near Hudson Bay; records show a Whooping Crane adult collected in 1771 at York Factory, located south of Churchill, and others observed along the Hudson Bay coast (Houston et al., 2003). Migrating Whooping Cranes were also observed around Churchill in 1953 and 1964 (Jehl and Smith, 1970). Nelson's (1876) reference of breeding pairs in central Illinois was similarly problematic, as it provided no date, specific location, observer, or note of actual nest, eggs, or chicks. An authoritative reference of the era (Ridgway, 1889) listed Whooping Crane only as a summer resident of Illinois. We considered but excluded a nesting report in Brown County, Wisconsin, reported in Carr (1890) but not cited in Allen (1952), and two observations in Florida noted in Bent (1926) but never supported in Allen (1952) or Nesbitt's (1981) review of Whooping Cranes in Florida. We chose to exclude Nelson (1876), Carr (1890), and Bent's (1926) records from our updated map and biome and ecoregion assessments because of their vague nature, but those records are included in the Appendix. We were unable to determine specific locations for two private ranches listed in Allen (1952, p. 56), but placed them near La Barca, Jalisco (west-central Mexico), as described in Allen's text. Allen's extension of the wintering range into northern Mexico is not supported by any listed locations. However, discussions with biologists with extensive knowledge of northern Mexico suggest that including that area within the wintering range may have been accurate (R. Drewein, U.S. Fish and Wildlife Service [retired], and J. Taylor, U.S. Fish and Wildlife Service [deceased], personal communications).

Our revised set of records alters the historic distribution of Whooping Cranes from that of Allen (Fig. 3.1). Additional breeding records in Iowa and North Dakota fall within the former breeding area Allen delineated, and the breeding area in Saskatchewan now appears larger. There is no direct evidence to support Allen's extension of the breeding range into northern Illinois but Allen clearly believed northern Illinois was breeding habitat for Whooping Cranes, a contradiction that was unresolvable with data that we could evaluate. Four additional breeding records were found for Texas, possibly associated with the original nonmigratory population. New records extend the occurrence of summering birds into central Saskatchewan, southern Wisconsin, and northeastern Illinois. Some of the summer observations may well suggest breeding birds (e.g., failed breeders that lacked evidence of eggs or chicks) or they may have included birds that were not yet breeding but ranging widely from their natal areas in summer (see Barzen et al., Chapter 14, this volume). Our additional summer records in Wisconsin and Illinois provide somewhat more support for Whooping Cranes breeding in that area, but no actual records of nests, eggs, or chicks exist.

We accepted one record as breeding around the Greater Yellowstone-Teton area, coinciding with summering records for that area (Fig. 3.1). Kemsies (1930) noted that "regular reports are received of the breeding of the Whooping Crane," including observation of two young and later two adults in the southwest part of Yellowstone National Park by a reputable observer. Allen (1952) included Kemsies' record but suspected his observations to be summering subadult birds in association with Sandhill Cranes. In this particular case, we believe the breeding records from Kemsies (1930) are viable, given the dates of observations and size differential between Whooping Cranes chicks near fledging (100–120 cm; Urbanek

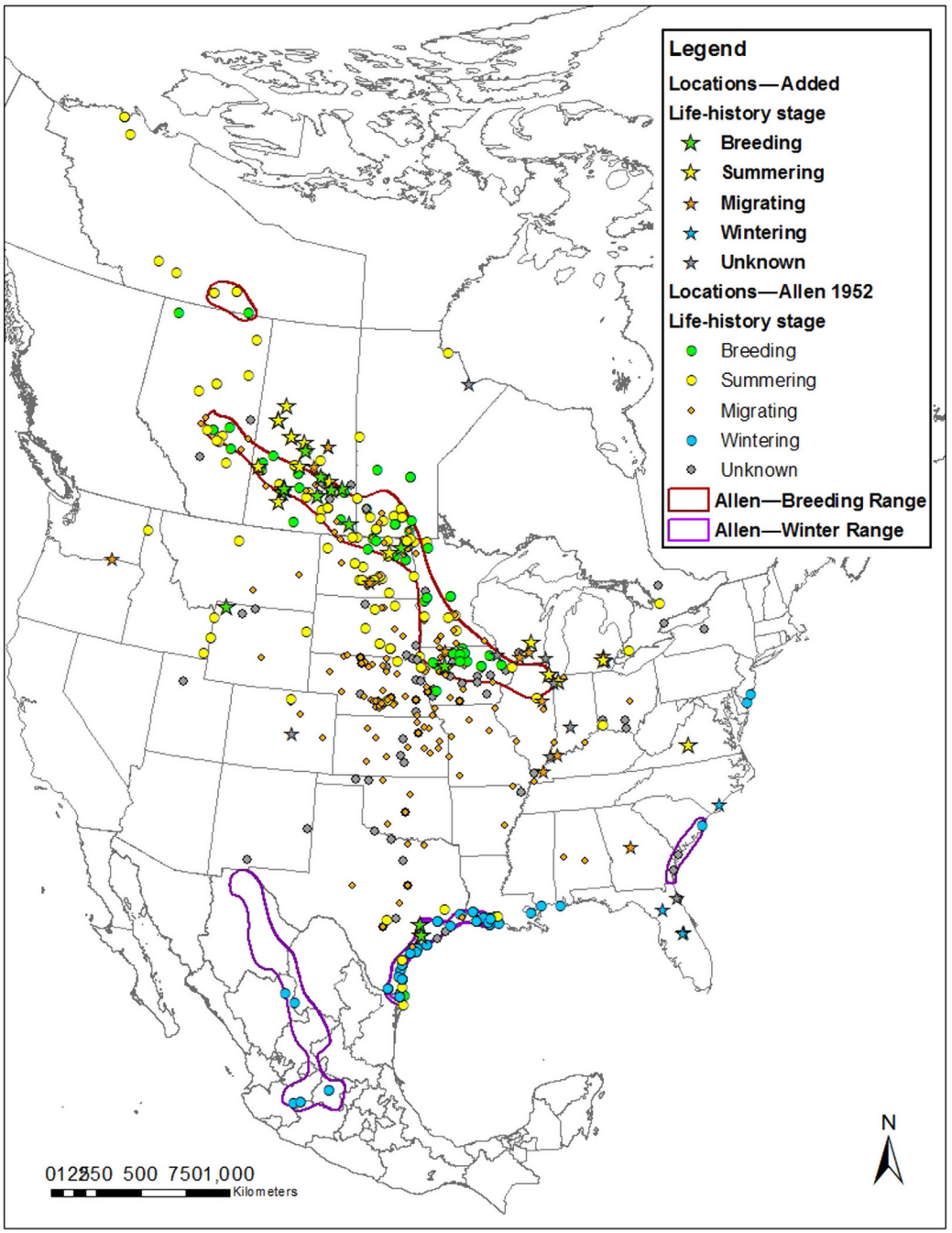

FIGURE 3.1 Distribution of historic Whooping Crane locations 1722–1941, by life-history stage. Records from Allen (1952) and additional records (this chapter), with breeding and wintering ranges delineated by Allen. Multiple records may be represented by a single symbol. Scale = 1:25,000,000.

and Lewis, 2015) and adult greater Sandhill Cranes in this region (*Grus canadensis tabida*, 130–150 cm).

Our revised distribution of wintering birds along the Gulf of Mexico is similar to that described by Allen (1952) but extended further east into Mississippi. Along the Atlantic coast we assess the range to have been much broader and to have extended from North Carolina into central Florida (Fig. 3.1). Most of the Atlantic coast records occurred before 1880, but several additional records reporting Whooping Cranes in Florida as late as 1936 suggest that a few cranes continued to winter in the state into the early 20th century.

Biome Affiliations

Historic observations of Whooping Cranes occurred across nine biomes, extending from the Tundra and Boreal Forest/Taiga of interior Canada to the Tropical/Subtropical Grasslands, Savannas, and Shrublands along the Gulf coast, and to the Desert and Xeric Shrublands of interior Mexico (Table 3.1, Fig. 3.2). Most (69.8%) of the locations, however, occurred within the Temperate Grasslands, Savannas, and Shrublands biome, which extends from the northern Great Plains to the Gulf coast. This biome also encompassed more than two-thirds of both breeding and summering records. All of the southern (nonmigratory) breeding records and two-thirds of the wintering locations occurred in the Tropical/Subtropical Grasslands, Savannas, and Shrublands biome along the Gulf coast.

Ecoregion Affiliations

Breeding and summering locations – Most breeding records were affiliated with the Central Tall Grasslands, Canadian Aspen Forest and Parkland (hereafter Aspen Parkland), and Northern Tall Grasslands (primarily in northern Iowa) ecoregions (Table 3.1, Fig. 3.3). Primary summering ecoregions also were the Aspen Parkland and Northern Mixed Grasslands, as well as adjacent Northern Short Grasslands. These ecoregions coincide with the PPR, a glacially formed region in the northern midcontinent grasslands that is largely defined by its high wetland densities (Kantrud et al., 1989; Smith et al., 1964). Clearly once an important area for Whooping Cranes, the PPR encompassed 57.6% of all breeding records, 52.1% of all summering records, and 26.7% of migrating records. Collectively, the PPR accounted for 30.1% of all 880 records. The highest density of breeding records occurred in the Central Tall Grasslands of Iowa, especially that portion of northern Iowa that corresponds to the southernmost extent of the PPR. This area was identified by Allen as likely the historic center of breeding. The Upper Midwest Forest-Savanna Transition ecoregion was used to a lesser extent; it is more mesic and found at lower latitudes than the PPR or other grasslands.

Within the Boreal Forest/Taiga biome, the majority of breeding and summering cranes were observed in the Midcontinental Canadian forests. Four summer observations and one breeding observation fall within the Muskwa-Slave Lake Forests ecoregion, which encompasses the Hay River, Slave River, Peace, and Wabasca Lowlands, Boreal Transition, and the Mid-Boreal Upland CEF ecoregions. Locations fall in areas of high wetland density, or along rivers or large lakes.

Records of nonmigratory breeding and southern summering cranes were located primarily in the Western Gulf Coast Grasslands. The last remnants of the nonmigratory population at White Lake, Louisiana, were observed in this ecoregion as late as the 1930s. The breeding location at Eagle Lake in Wharton County, Texas, appears to fall within the East Central Texas Forest ecoregion but more likely is at the edge of the Western Gulf Coast Grasslands.

Other records of breeding or summering cranes are scattered across various ecoregions

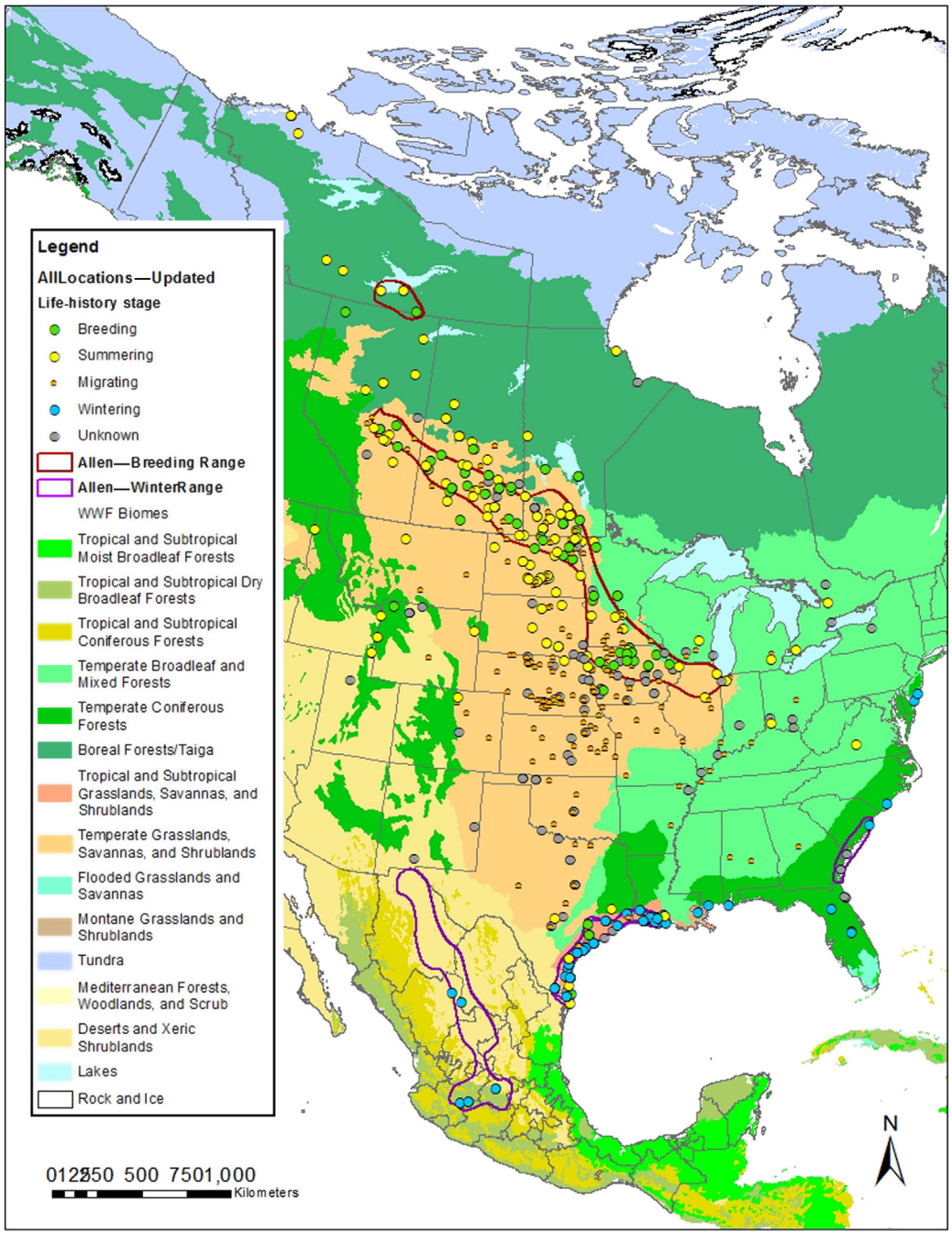

FIGURE 3.2 Distribution of historic Whooping Crane locations, 1722–1941, by life-history stage, overlain on WWF biomes. Records from Allen (1952) and additional records (this chapter). Multiple records may be represented by a single symbol. Scale = 1:28,000,000.

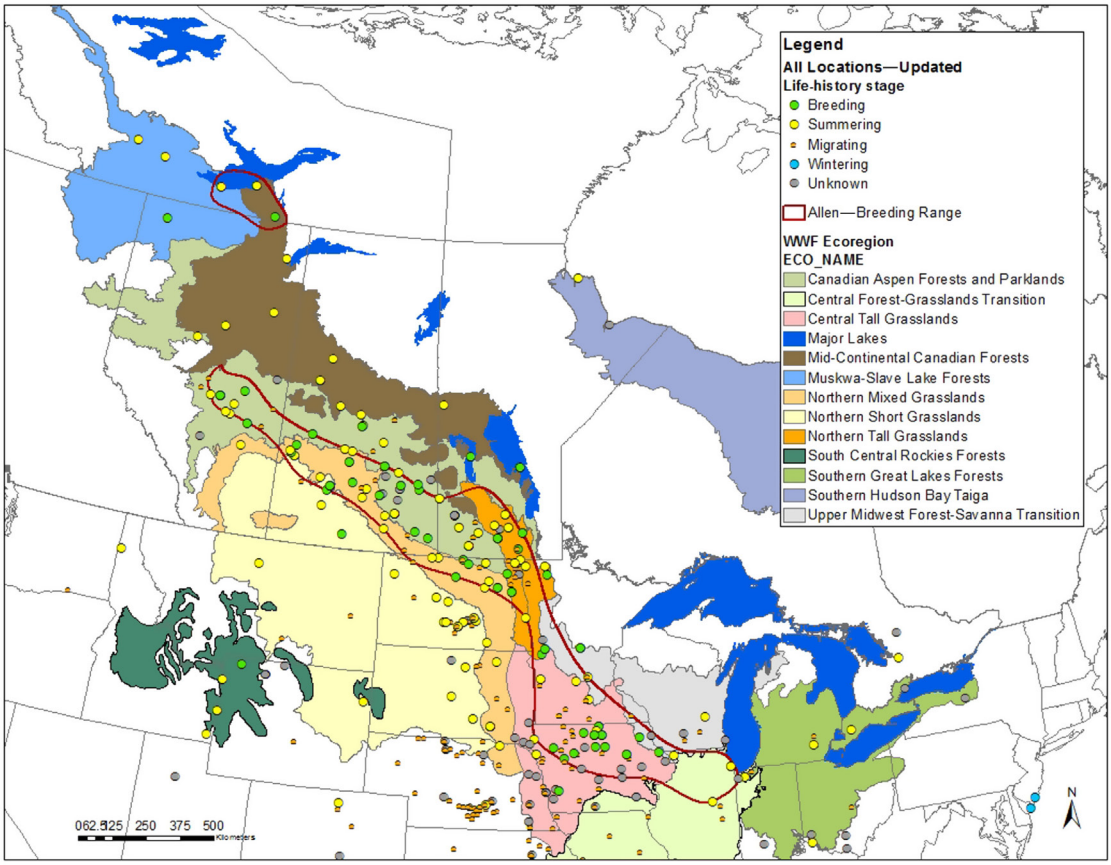

FIGURE 3.3 Locations of historic Whooping Crane records, 1722–1941, by life-history stage, in northern breeding and summering areas, overlaid on WWF ecoregions. The core breeding range was delineated by Allen (1952). Records from Allen (1952) and additional records (this chapter). Only those ecoregions having at least two breeding or summering crane records are identified in the legend. Multiple records may be represented by a single symbol. Scale = 1:15,000,000.

from the Arctic tundra and northern forest ecoregions to southern forests and grasslands. Like Allen (1952), we believe many summer records were wandering subadult or nonbreeding birds; such wandering has been documented by satellite tracking of subadult and nonbreeding cranes in the Eastern Migratory Population (Mueller et al., Chapter 11, this volume; Urbanek et al., 2014). Unlike Allen, however, we suspect some of the summering records and records of unknown life-history stage were breeding birds because we now know that, in any one year, cranes that fail at nesting still retain their nest territory (Kuyt, 1993; Novakowski, 1966; Van Schmidt et al., 2014) and can appear in late summer as adults in small groups or as pairs.

Wintering locations – The Western Gulf Coast Grasslands also was the most important wintering ecoregion, encompassing 72.5% of the wintering records, with records dispersed along much of its length (Fig. 3.4). As noted by Allen (1952, p. 28), 20 specimens were taken in the area between 1889 and 1904. Today, the AWBP Whooping Cranes still winter in this ecoregion. Allen identified another important wintering area (12.5% of winter records)

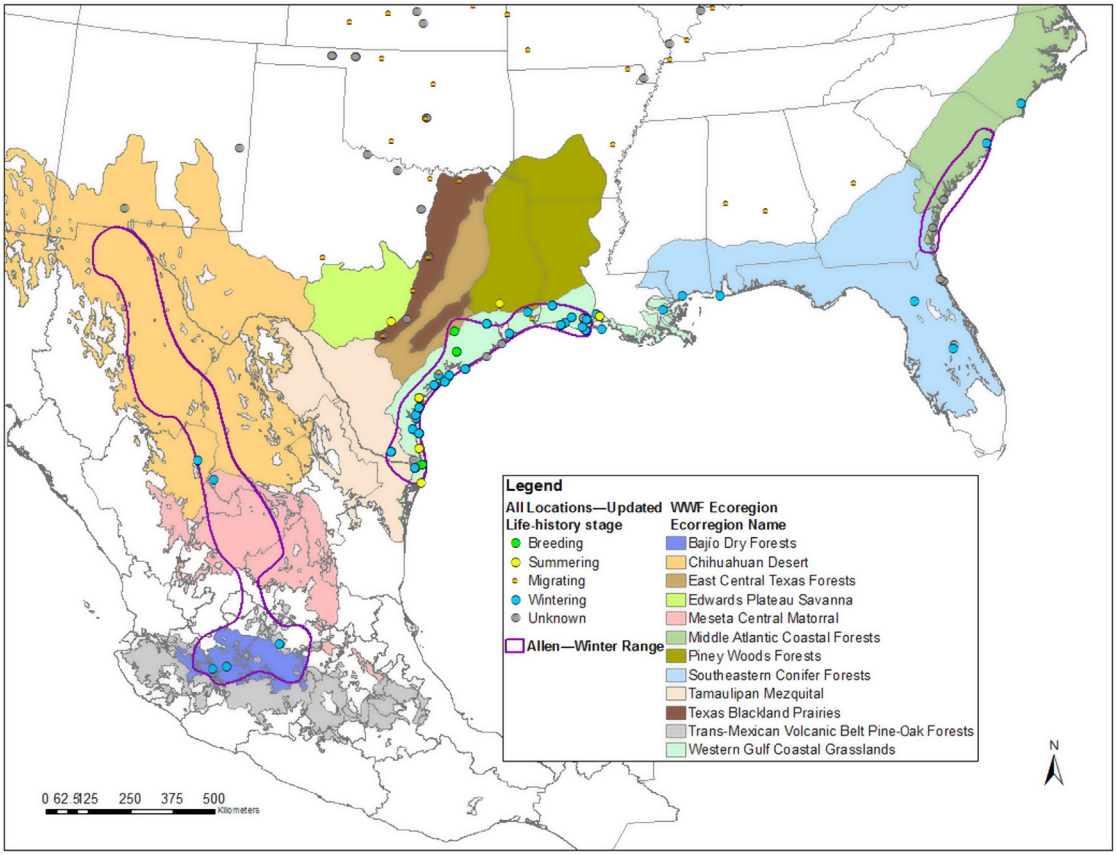

FIGURE 3.4 Distribution of historic Whooping Crane locations, 1722–1941, in southern breeding and wintering areas, with ranges delineated by Allen, overlain on WWF ecoregions. Records from Allen (1952) and additional records (this chapter). Only those ecoregions having at least two breeding, summering, or wintering crane records are identified in the legend. Multiple records may be represented by a single symbol. Scale = 1:18,000,000.

along the mouth of the Rio Grande River near Brownsville, Texas, located within the Tamaulipan/Mezquital ecoregion, just inland from the Western Gulf Coast Grasslands ecoregion. Whooping cranes were found wintering in the interior of Florida and along the Atlantic coast in association with the Southeastern Coniferous Forest and the Northern, Middle Atlantic, and Southeastern coastal forests. All coastal locations were associated with coastal wetlands or river deltas (e.g., Savannah River and Waccamaw River, South Carolina). Inland locations in Florida were likely associated with wetlands embedded in prairie (e.g., Kissimmee prairie).

Allen (1952) listed 10 records for wintering cranes in the interior of Mexico; we found no additional records. None of the records supported Allen's extension of the wintering range into the northern interior highlands of Mexico. Whooping cranes were observed at Bolson del Mapimi, Chihuahua (Chihuahan Desert); on the Plains of Silao, Guanajuato (Trans-Mexican Volcanic Belt Pine-oak Forests); near

Lerdo, Durago (Mesata Central Matorral); and in the state of Jalisco (Bajio Dry Forests; the southernmost locations), all of which appear to be associated with large playa lake or riparian systems. The latter included three records somewhere near La Barca, possibly along the Rio Lerma or Rio Santiago, and one on marshes of Lake Chapala, the largest freshwater lake in Mexico (1,112 km^2).

DISCUSSION

Allen's (1952) description of the historic breeding and wintering distribution of Whooping Cranes appears to be largely accurate. The additional 70 locations, however, combined with GIS-based information about landscape and wetland features within ecoregions, provide new insights about the landscapes and habitats used by the species before some of the major environmental alterations of habitats occurred in the mid to late 1900s. We discuss the life-history strategies of Whooping Cranes as understood under contemporary conditions, then reexamine and redefine Allen's description of niche based on habitat features of the ecoregions and ecological processes. Here we define the species' ecological niche in terms of habitat – that is, as the noninteractive (scenopoetic) variables and environmental conditions on broad scales, relevant to understanding coarse-scale ecological and geographic properties of the species (Soberón, 2007, p. 1117), such as climate, terrain, and land cover features.

Habitat Attributes Important to Life Strategies

Historic and current patterns of Whooping Crane distribution demonstrate that breeding and wintering populations use a diversity of wetland and wet grassland habitats. The dependence of Whooping Cranes on fresh and brackish wetlands across life-history stages is well recognized (Canadian Wildlife Service and U.S. Fish and Wildlife Service, 2005; Urbanek and Lewis, 2015; Walkinshaw, 1973). The species' large body size, energetic demands, and flightlessness during wing molt (Urbanek and Lewis, 2015) necessitate a reliance on productive wetland habitat that maintains permanent water for safety from predators and ensures sufficient food resources for themselves and, during breeding, for their chicks (Wellington et al., 1996, p. 82). Foods consumed by Whooping Cranes during breeding and wintering periods tend toward higher trophic levels, such as crabs, snakes, minnows, and small mammals; energy-rich tubers, berries, corn, wheat, and acorns are also seasonally important (Allen, 1952; Pugesek et al., 2013; Urbanek and Lewis, 2015; International Crane Foundation, unpublished data). Abundance of high-energy foods on the wintering grounds is critical to the survival of over-wintering Whooping Cranes (Chavez-Ramirez, 1996; Hunt and Slack, 1989; Pugesek et al., 2013), as well as for the acquisition of sufficient fat reserves to provision energy demands to support their 4,000-km spring migration (Chavez-Ramirez, 1996; Urbanek and Lewis, 2015) and egg formation upon arrival. Territorial fidelity in breeding and winter periods confers benefits through greater familiarity with habitat quality (e.g., nest sites, food resources) and risks of predation or disturbance (Piper, 2011; Switzer, 1993).

Periodic drawdown is important to sustaining wetland productivity (Mitsch and Gosselink, 2000) and hence important to sustain long-term habitat quality for cranes. However, drawdown conditions may limit both food resources and safe feeding areas and contribute to poor chick survival (Kuyt, 1981a; Spalding et al., 2009). Drawdown conditions may be similarly detrimental to adult Whooping Cranes in summer, as adults become flightless during a synchronous remigial molt every 2–3 years (Folk et al., 2008; Lacy

and McElwee, 2014). Wetlands or wetland complexes would therefore need to be large enough to maintain some water in a substantial portion of the cranes' territory so as to provide safe areas for foraging and molting habitat (i.e., shallow open water and flooded emergent vegetation) in summer, while also having the ecological processes in place to support high productivity (Mitsch and Gosselink, 2000). Areas where most wetlands dry out entirely annually or in most years would not provide suitable habitat for breeding or flightless Whooping Cranes. For deltaic or coastal wetlands, productivity is sustained by inflow of nutrients via flooding or tidal influxes but may similarly be reduced during low-water conditions (Mitsch and Gosselink, 2000).

Given these life history features, areas with extensive productive wetlands would be most likely to support crane territories on the breeding grounds in most years, provide safe feeding and molting sites in summer (molt cycles are variable, and thus unpredictable, among individual birds; Folk et al., 2008), and provide adequate food to support cranes during winter. Further, shallow flooded habitat provides for isolation of nests, chicks, flightless cranes, and roost sites (all seasons) from mammalian predators. Habitats that are visually open (i.e., little vertical vegetation obstructing view) enhance cranes' ability to detect threats and have long been recognized as an important feature of areas used by cranes throughout their life cycle (Armbruster, 1990; Howe, 1989; Timoney, 1999).

Redefining Allen's Niche Description

Allen (1952) provided the first detailed assessment of habitats used by whooping cranes. He frequently referred to their "biotic niche" – habitat features that were similar across breeding and wintering locations. Allen (1952, p. 48) described the "preferred niche, especially for nesting, as a flat or slightly rolling, open area interspersed with bulrush, cattail, and sedge marshes and swales, covered with standing water and having the biotic characteristics found in the willow communities of the Aspen Parkland. There must be a great abundance of small animal life, including basic invertebrate forms. The entire area must be several hundred (or even several thousand) acres in size and completely isolated from human disturbance of any sort." These features have been used to inform selection of new sites for reintroduction efforts (Canadian Wildlife Service and U.S. Fish and Wildlife Service, 2005, p. 150; Cannon, 1999). Allen's general features are consistent with findings of contemporary habitat-use studies at Wood Buffalo National Park (WBNP) (Kuyt, 1981b, 1993; Olson and Olson, 2003; Timoney et al., 1997; Timoney, 1999), ANWR (Labuda and Butts, 1979), and southwestern Lousiana (Kang and King, 2014).

Based on our evaluation of the habitat features of the historic locations and contemporary knowledge of wetland ecology and Whooping Crane life history (see Barzen, Chapter 15, this volume), we identify four features that are important for nesting and wintering habitats. First, habitats used by Whooping Cranes have gentle to rolling topography with an interspersion of wetland and low meadow or prairie habitats and relatively sparse cover of trees and shrubs. Second, Whooping Cranes were commonly found in areas having high densities of wetlands or wetland complexes that provide open, shallowly flooded habitat. Primary examples of such conditions are found in the PPR, portions of the southern boreal-taiga region, inland river deltas, large playa lakes in the high plains of Mexico, the Chenier Plain of coastal Louisiana and Texas, and estuarine or deltaic systems along the Gulf Coast. Third, wetland complexes collectively provide reliable habitat conditions important for nesting, brood rearing, molt, or feeding in most years, even though hydrological variation within an individual wetland might be large. Fourth, historical locations were usually in areas that are considered highly productive due to fertile soils,

hydrological pulsing, periodic inflow of nutrients, or other periodic perturbations such as fire or storms (Euliss et al., 1999; Mitsch and Gosselink, 2000; Prince, 1997). Allen (1952) touched on many of the features we examine in more detail below but lacked the depth of knowledge about ecological processes important to sustaining these conditions. In the following sections, we discuss the significance of these four features in the three primary regions used by breeding and wintering Whooping Cranes: PPR and northern grasslands, boreal forest and taiga, and southern region.

PPR and northern grasslands – As recognized by Allen (1952, pp. 24–25), the greatest number of historic nesting records occurred in the Canadian Aspen Parkland, Central Tall Grasslands, and Northern Tall Grasslands, largely corresponding to the PPR (Fig. 3.3). Compared to boreal regions, frequent nest records from the PPR and northern grasslands may be explained in part by the greater opportunity for detection by explorers and early settlers in the late 1800s and the growth of interest in ornithology in that era. However, the density of records also indicates these regions were historically important for breeding and summering Whooping Cranes.

The PPR is broadly delineated by its glacial history, with high wetland densities, high soil fertility, warm summers, and seasonal and interannual hydrological pulsing (Acton et al., 1998; Euliss et al., 1999; Mitsch and Gosselink, 2000; van der Valk, 1998). Precipitation in the PPR increases to the east and north (Millett et al., 2009); therefore, the more northern and eastern portions of the ecoregions tend to have more reliable water conditions across years and are less prone to extended periods of drought than the more westerly PPR ecoregions (Acton et al., 1998; Smith et al., 1964). This corresponds to Whooping Crane locations in the PPR, which were largely in the Aspen Parkland and the Northern Tall Grasslands (Table 3.2, Fig. 3.3). A cluster of nesting records in northern Iowa, which Allen considered the historic center of breeding, corresponds to the southernmost extent of the PPR. Before European settlement, wetlands in that portion of Iowa were predominantly temporarily flooded to saturated wetlands (84% of wetland area; Miller et al., 2012), embedded in tallgrass prairie. By the 1870s, much of Iowa was settled, and most wetlands were drained by the 1930s (Prince, 1997; Schrader, 1955). Severe drought during the 1930s, combined with hunting and other persecution, appeared to be key factors in the extirpation of Whooping Cranes from the Saskatchewan prairies (Hjertaas, 1994) and likely elsewhere in the PPR.

Crane observations in the Northern Tall Grasslands largely fall within the area of rich, deep lake deposits of glacial Lake Agassiz, which once extended along the Red River Valley from northern South Dakota, across the northern third of Minnesota, and extending into Manitoba and western Ontario. This flat, open prairie region once had a fractured system of low intersecting ridges and shallow wetlands (Augustadt, 1955). The deep rich soils, relatively high annual precipitation, hydrological pulses of wet/dry years, and wildfires would have supported highly productive wetlands and grasslands, and periodic extensive flooding and wildfires would have severely limited woody growth. Most wetlands in this region were lost to extensive drainage efforts in the 1920s and 1930s (Prince, 1997).

Extensive wet prairies and wetlands also occurred in northern and central Illinois and northeastern Indiana (Prince, 1997; Robertson et al., 1997), which fall within the Central Forest-Grassland Transition ecoregion. Whooping cranes were known to frequent that area, largely as migrants (Butler, 1898; Woodruff, 1907). The Upper Midwest Forest-Savanna Transition supported some breeding and summering cranes, largely in locations having extensive lake, wetland, and bog complexes. The relatively few records suggest these two ecoregions were of

TABLE 3.2 Distribution of Historic Whooping Crane Breeding and Summering Locations within the PPR by WWF Ecoregion. Breeding Records Were Those That Had Observations or Specimens of a Nest, Eggs, or Flightless Chick; Other Observations between Mid-May and 30 August Were Categorized as Summering. Observation Records in September–Mid-May or Late March–Mid-May Were Classified as Migrating and Those of December–Mid-March as Wintering. Records Lacking a Date Were Classified as Unknown.

	Total		Breeding		Summering		Migrating		Wintering		Unknown	
Ecoregion	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Canadian Aspen forests and parklands	88	32.6	12	24.5	39	44.3	17	17.3	0	0	20	57.1
Northern mixed grasslands	58	21.5	8	16.3	22	25.0	26	26.3	0	0	2	5.7
Central tall grasslands	53	19.6	13	26.5	4	4.5	31	31.6	0	0	5	14.3
Northern tall grasslands	40	14.8	10	20.4	7	7.9	19	19.4	0	0	4	11.4
Northern short grasslands	29	10.7	6	12.4	15	17.0	5	5.1	0	0	3	8.6
Upper Midwest Forest-Savanna Transition	2	0.7	0	0	1	1.1	0	0	0	0	1	2.9
Total	*270*	*100.0*	*49*	*18.1*	*88*	*32.6*	*98*	*36.3*	*0*	*0*	*35*	*13.0*

less importance when compared to Northern Tall Grasslands, and cranes in some of these far-flung locations may have been summer wanderers or birds that were unable to complete migration. Only one observation (summering) occurred at Horicon Marsh, a 12,950-ha extinct glacial lake within the Upper Midwest Forest-Savanna Transition of southeastern Wisconsin. Horicon Marsh had been manipulated by damming, drainage, and restoration during the 1800s, coinciding with much of the period when Whooping Crane records were acquired.

The westernmost cluster of Whooping Crane observations falls within the Greater Yellowstone Ecosystem, located in the juncture of Montana, Idaho, and Wyoming (Ricketts et al., 1999). This region has extensive riparian wet meadow systems and some large shallow wetlands, fed largely by spring run-off from mountain snowpack, which support diverse waterbird communities (Austin and Pyle, 2004; Cody, 1996; Debinski et al., 1999), including breeding Sandhill Cranes in the Rocky Mountain Population (Gerber et al., 2014). Allen considered the Whooping Cranes reported in southeastern Idaho and northwestern Wyoming to be summer wanderers rather than breeding birds. However, the frequency of reports of Whooping Cranes in the Greater Yellowstone Area during 1906–35 and information in Kemsies (1930) suggest there might have been a small population in the central Rocky Mountains. Moreover, the historic locations of Whooping Cranes are similar to areas used by breeding and summering Greater Sandhill Cranes (*Grus canadensis tabida*) of the Rocky Mountain Population (Drewien et al., 1999). Breeding in this region may have been constrained, however, by cool climate and short growing season. The disappearance of Whooping Cranes from the Greater Yellowstone

Area coincides with the decline of Sandhill Crane numbers as the region was settled during the early 1900s (Drewien and Bizeau, 1974), both likely the victims of shooting.

Boreal forest and taiga – Observations of Whooping Cranes in the huge expanse of the Boreal Forest/Taiga biome and its ecoregions were much scarcer. Observations are likely biased toward locations near large rivers and lakes, as these were the main travel routes of explorers and settlers who recorded biological information, and these geographic features were among the relatively few named features of the landscape. Despite imprecise locations, the features for existing records correspond to our proposed ecological niche. Broadly, the landscapes where cranes were observed have flat or rolling topography and high wetland densities – lowlands, river deltas, and shoreline wetlands on large lakes. Ten locations occurred in association with river deltas or large riparian-wetland complexes. Such areas have a high density and interspersion of wetlands, extensive shorelines, diverse wildlife, rich growth of emergent and submergent vegetation supported by river inflows, sediments, and annual spring floods, relatively warm summers, and long summer day length, which maximize the growing season for that latitude (Mitsch and Gosselink, 2000; Peters et al., 2006). Allen (1952) also often recognized the importance of marshes associated with river deltas.

Lakes used by Whooping Cranes were located in areas with extensive wetland and lake complexes. Four records were reported on two huge lakes in central Manitoba (three on Lake Winnipeg and one on Lake Winnipegosis) in the late 1800s. While vague in location, these two lakes are remnants of glacial Lake Agassiz and lie within large lowland areas of extensive shallow palustrine wetlands and peatlands.

Crane locations in and around WBNP fall at the edge of the Hay River Lowlands and Northern Alberta Uplands CEF ecoregions, in an area having a high density of small ponds interspersed with sedge (*Carex*) meadows and sparse shrubs and conifers. The area is typified by long summer day length and short growing season, but climate varies among these CEF ecoregions from cool to warm summers (ESWG, 1995). The current breeding area in WBNP is in an area with high densities of shallow wetland complexes and sparse woody cover (Novakowski, 1966; Olson and Olson, 2003; Timoney, 1999). Many wetlands currently used by breeding Whooping Cranes are associated with smaller creeks or rivers. Riparian flow, periodic drought, and fire likely support wetland productivity, although it is relatively low. During dry years, cranes tended to shift use areas closer to riparian habitat, which would provide more stable water conditions and provided foods, such as minnows (Kuyt, 1993). In this system, cranes likely need large breeding territories (averaging 4.1 km^2; Kuyt, 1993) that encompass both the more stable riparian-supported wetlands and those that dry more frequently and may be more productive.

Interestingly, the current breeding area lies just north of the Peace-Athabasca Delta, the largest freshwater inland delta in the world, recognized for high productivity, ecological diversity, and high densities of breeding waterfowl (Mitsch and Gosselink, 2000). Despite European settlements starting in the late 1700s and active research in the area over the last 50 years or more, only one Whooping Crane observation was recorded in those deltaic wetlands (Fort Chipewyan in 1898). We speculate that breeding cranes may be unable to establish territories or successfully nest in the large delta due to the magnitude or timing of flood pulses and limited availability of unflooded habitat during the early breeding season, but it doesn't explain the absence of summering birds. Traditional ecological knowledge of the aboriginal communities of the area may yield further insights into this uncertainty.

A few summering cranes were observed in the far north in the Taiga Plains of the Northwest Territories. This is an expansive area

encompassing several major river deltas and other areas that have high densities of small lakes and fens, dominated by sedges and *Sphagnum* moss, interspersed with shrubby tundra (ESWG, 1995; Ricketts et al., 1999). The area has a very short growing season, long summer day length, a subarctic climate, and continuous permafrost that would support limited productivity of larger animal food resources important to Whooping Cranes.

Southern areas for wintering and nonmigratory breeding cranes – Records added to Allen's (1952) wintering range indicate a more extensive if spotty distribution along the south Atlantic and Gulf coast (e.g., North Carolina and Florida), as well as three inland sites in Florida. Most of the eastern records are coastal locations associated with river mouths (deltas) or coastal freshwater to brackish wetland systems. The majority of winter records fall within the Western Gulf Coast Grasslands ecoregion, which also sustained the only known nonmigratory breeding population at White Lake, Louisiana. This ecoregion is one of the most wetland-rich regions of the world, with high productivity sustained through tidal pulsing and nutrient-rich inflows of fresh water (Esslinger and Wilson, 2001; Mitsch and Gosselink, 2000; Smith et al., 1989). It is characterized by flat topography, high soil fertility, high average rainfall, and a long growing season. Periodic disturbance from wildfire, grazing (bison historically, domestic cattle since the early 1900s), and hurricanes, and nutrient inflow from river inflows, storm surges, and daily tidal fluctuations sustain the high productivity of the wetland and grassland systems of the region (Frost, 1995). Importantly, the inland portion of this ecoregion encompasses what was once tallgrass prairie, interspersed with numerous small wetlands and scattered oak savanna (Esslinger and Wilson, 2001), where cranes could forage and find freshwater water when food availability in coastal wetlands was low (Blankenship, 1976; Labuda and Butts, 1979). Juxtaposition of these habitats for foraging, drinking water, and safe roost sites appears to be an important aspect of this ecoregion for wintering birds. Allen (1952, pp. 28–39) identified 10 different habitat types within this ecoregion, ranging from tallgrass prairie inland to coastal lagoons and beaches, and noted differences in use by wintering versus breeding birds (discussed later). Much of the inland portion was converted to rice production by 1900 (Gomez et al., 2003), but remaining freshwater marshes in the region sustain a high biodiversity (Esslinger and Wilson, 2001).

Eight of the 10 southern breeding records also fall within the Western Gulf Coast Grasslands. Four of the added breeding records were away from the coast in Texas, possibly in Allen's prairie swale and prairie marsh type. Five of the breeding records were in the vicinity of White Lake, an area of extensive and highly productive shallow marshes located in the Chenier Plain of western Louisiana (see King et al., Chapter 22, this volume). These marshes were described in the 1930s as 16,000 ha in area, 12–20 cm deep, and largely inaccessible until the Intracoastal Waterway was extended in 1929–30 (J. Lynch, in Drewien et al., 2001). The freshwater, maidencane (*Panicum hemitomon*) marshes such as those found at White Lake were considered the most important to breeding birds (Allen, 1952; Lynch in Drewien et al., 2001) but little used by wintering birds. White Lake today is relatively intact ecologically and is one of the largest undeveloped freshwater marshes in the southeastern United States (Gomez et al., 2003). Recent assessment of the coastal Louisiana habitats and food resources demonstrated that the freshwater marshes could support Whooping Cranes, particularly in spring and summer (Kang and King, 2014). The final one of the 10 southern breeding records was located on Boca del Rio (mouth of the Rio Grande), a once-extensive coastal delta of the Rio Grande near Bagdad Matamoros, Tamaulipas, Mexico.

The wetlands in the interior of Mexico once supported some wintering Whooping Cranes. Deltiac areas associated with large interior lakes, such as the marshes of Lake Chapala, were likely important wintering sites. River inflows would have provided nutrient inputs, periodic flooding disturbance, and reliable water conditions in most years. Other observations in the Mexican interior were in areas of semiarid to arid shrub/grasslands with small to large ephemeral lakes that were often brackish or saline (Henrickson and Johnston, 1986; Saunders and Saunders, 1981). Under good water conditions, such basins provided safe roost sites and high productivity of aquatic plant foods (Goldman, 1951). However, interannual variability in water conditions of these playa-like basins may have been too large to support consistent winter use. The Whooping Crane's wintering distribution in interior Mexico may therefore have shifted annually in response to changing water and wetland conditions and food availability, as observed for Sandhill Cranes (Drewien et al., 1996; Saunders and Saunders, 1981). Intensified land and water use have degraded many of Mexico's interior wetlands, including those at Lake Chapala (Cervantes and Abarca, 1996; Drewien et al., 1996; Limón and Lind, 1990; Perez-Arteaga et al., 2002; Saunders and Saunders, 1981).

Allen's winter distribution extended into the interior highlands of northcentral Mexico but he provided no specific records associated with that area. That delineation appears to be based on communications about Sandhill Crane migration and wintering areas described in communications to Allen from George B. Saunders, a U.S. Fish and Wildlife Service biologist who spent many years surveying waterfowl and other birds across Mexico (Allen, 1952, pp. 37–38). Saunders's descriptions of wetlands used by wintering Sandhill Cranes match those noted above for Whooping Cranes (broad, shallow lake basins, surrounded by grasslands, or extensive marshes and wet meadows in river deltas). Allen did not speculate on the source of the Whooping Cranes in interior Mexico, as he did for birds wintering in Louisiana and Texas. We speculate that a small, western group of Whooping Cranes once migrated from the Idaho-Wyoming area through Great Salt Lake, Utah (Allen, 1952, p. 17) down the Front Range of the Rocky Mountains to winter along the Rio Grande, New Mexico, and on interior Mexican wetlands, similar to the path now taken by the Rocky Mountain Population of Sandhill Cranes. Riparian and shallow lake habitats along that path (e.g., San Luis Valley, Colorado, Rio Grande in New Mexico) would have provided appropriate habitats for migrant cranes. Additional evidence suggesting a western flyway and wintering area includes the depiction of a Whooping Crane on Kiva murals in New Mexico (Hibben, 1975), observations of Whooping Cranes at Fort Thorn on the Rio Grande in southern New Mexico in 1855 (Bailey, 1928), and observations of "*G. americantus*" in New Mexico during migration in March and October (Henry, 1859). Further research into historic Spanish and Native American resources may yield additional support for this possible migration path.

Most sources used by Allen (1952) for his historic distribution map came from English, French, and American explorers and ornithologists. There are various sources that have yet to be examined that may yield new information, particularly older Spanish sources for Mexico, southwestern United States, Florida, and possibly Cuba. Tapping into the traditional ecological knowledge of aboriginal societies also may yield greater insights into distribution and the ecology of areas historically used by Whooping Cranes.

SUMMARY AND OUTLOOK

Ideally, priority for reintroduction sites should be placed within areas where Whooping Cranes historically bred and wintered. Unfortunately,

this option is often not feasible due to habitat loss or degradation. Wetland and grassland habitats through much of the central portion of the Whooping Crane's historic breeding range have been dramatically altered, primarily by agriculture (Dahl and Gifford, 1996; Prince, 1997; Samson et al., 1998). Agriculture and industrial development (chiefly timber harvest and oil development; Foote and Krogman, 2006) also are expanding into the southern boreal forest (midcontinent Canadian forest ecoregion). In the boreal plain of Saskatchewan, Hobson et al. (2002) reported 73% of the forest in the historic boreal transition zone was converted to agriculture between 1966 and 1994. Human impacts on habitats in other boreal ecoregions are substantially less (Kerr and Deguise, 2004). Although northern areas unaffected by habitat change may be promising for alternative reintroduction sites, they conflict with the current recovery goal of establishing biologically separate Whooping Crane populations (Canadian Wildlife Service and U.S. Fish and Wildlife Service, 2005). Breeding Whooping Cranes from new reintroduction sites in northern areas would likely overlap with the current AWBP outside the breeding season. Further, many currently intact habitats are at risk on the main wintering grounds. Coastal wetlands continued to be threatened by development, pollution, invasive species, and erosion (Dahl and Gifford, 1996; Güneralp et al., 2013; Montagna et al., 2011).

These challenges suggest that the most promising opportunities for reintroduction or restoration may lie in the periphery of the historic range, where suitable habitats are more intact and less likely to be impacted in the near future (Channell and Lomolino, 2000). Iowa has lost 89% of its original wetlands, but immediately to the northeast, Wisconsin – most of which is in the Upper Midwest Forest-Savanna Transition ecoregion – has retained just over 50% of its wetlands (Dahl, 1990). Those key habitat features that should be present in any remaining core or peripheral area are (1) subtle to rolling topography with an interspersion of wetland and low meadow or prairie habitats, with relatively sparse cover of trees and shrubs; (2) high densities of shallow, open wetlands or wetland complexes; (3) hydrological regimes providing reliable conditions for nesting, brood rearing, and flightless adults; and (4) high productivity due to fertile soils, hydrological pulsing, periodic inflow of nutrients, or other periodic perturbations. Some important wetland areas within the historic range but outside of ANWR and WBNP remain relatively intact and have been protected under state, provincial, or federal ownership or wetland regulations (e.g., Quill Lakes, Saskatchewan; Hails, 1997). Both traditional and more innovative approaches (e.g., conservation agreements with private landowners and industry) may be needed to protect additional reintroduction sites that have potential. Reintroduction evaluations additionally should consider potential impacts of changing climate, in particular the potential impacts on wetland hydrology and food resources. Further research into the hydrology regimes and wetland productivity of current reintroduction sites would be valuable to deepen our understanding of the ecological niche and seasonal habitat needs of cranes.

This study provides new insights into the historic distribution and habitats used by Whooping Cranes during the 1700s to mid-1900s. We believe site-specific studies of current habitat use by Whooping Cranes would benefit from greater consideration of hydrological regime and site productivity, and the ecological processes that sustain productivity at higher trophic levels (e.g., seasonal hydrological cycles, nutrient dynamics, vulnerability to long-term drought). These historic data and insights should stimulate new discussions about habitats assessments used for selection of reintroduction locations and ultimately enhance the long-term success of recovery efforts.

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APPENDIX

Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)		Killam		AB	Can	52.780	−111.850	1905				F.L. Farley
Allen (1952)	Jackfish Creek			AB	Can	54.420	−110.620	1917				Bobbie Herron
Allen (1952)	Reed Deer River			AB	Can	52.070	−114.150					Dr. George
Allen (1952)		Killam		AB	Can	52.780	−111.850	1904			Breed	F.L. Farley
Allen (1952)		Edmonton		AB	Can	53.550	−113.470	1906			Breed	Sidney Stansell
Allen (1952)		Edmonton		AB	Can	53.550	−113.470	1907			Breed	Sidney Stansell
Allen (1952)		Edmonton		AB	Can	53.550	−113.470	1908			Breed	Sidney Stansell
Allen (1952)	Whitford Lake			AB	Can	53.870	−112.250	1909			Breed	F.L. Farley
Allen (1952)		Edmonton		AB	Can	53.550	−113.470	1909			Breed	Sidney Stansell
Allen (1952)	Wood Buffalo National Park	Wainright		AB	Can	59.320	−118.460	1914			Breed	Park keeper
Allen (1952)	Battle River	Camrose		AB	Can	53.020	−112.830	1886			Migr	F.L. Farley
Allen (1952)	Battle River	Camrose		AB	Can	53.020	−112.830	1886			Migr	F.L. Farley
Allen (1952)	Buffalo Lake			AB	Can	52.770	−111.000	1906	Oct	11	Migr	C. H. Davis
Allen (1952)	Buffalo Lake			AB	Can	52.770	−111.000	1910	Oct		Migr	C. H. Davis
Allen (1952)		Islay		AB	Can	53.400	−110.550	1919	Oct	15	Migr	J. Dewey Soper
Allen (1952)	Birch Lake			AB	Can	53.750	−114.530	1922	Apr		Migr	C. E. Mills
Allen (1952)	Paddle River			AB	Can	54.080	−114.250	1933			Migr	J. P. Gillese
Allen (1952)		Fort Chipewyan		AB	Can	58.700	−111.130	1835	Jun	22	Summ	Richard King
Allen (1952)	Willow River			AB	Can	55.970	−113.920	1905	May	13	Summ	H. H. Jones
Allen (1952)		Fort McMurray		AB	Can	56.730	−111.380	1907	Oct	16	Summ	Seton and Preble
Allen (1952)		Stony Plain		AB	Can	53.530	−114.000	1909	May	21	Summ	Sidney Stansell
Allen (1952)	Swan River			AB	Can	55.430	−115.300	1913	May		Summ	F.L. Farley
Allen (1952)		Tofield		AB	Can	53.370	−112.670	1919			Summ	F.L. Farley

(Continued)

Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)	Sullivan Lake			AB	Can	52.000	−112.000	1920	Sep	13	Summ	F.L. Farley
Allen (1952)		Camrose		AB	Can	53.020	−112.830	1923	Jun	4	Summ	F.L. Farley
Allen (1952)	Bittern Lake	Camrose		AB	Can	53.050	−113.080	1927	Sep	22	Summ	F.L. Farley
Allen (1952)	Willow River			AB	Can	55.970	−113.920				Summ	
Allen (1952)	Mulberry Creek	Prattville	Autauga	AL	US	32.379	−86.506	1899	Nov	30	Migr	Thomas Hook
Allen (1952)	Cypress Slough	Millwood	Hale	AL	US	32.661	−87.751				Migr	Unknown
Allen (1952)	Dauphin Island		Mobile	AL	US	30.249	−88.184				Wint	Captain Sprinkle
Allen (1952)	White River	Crockett's Bluff	Arkansas	AR	US	34.444	−91.220	1882	Nov	5	Migr	D. B. Wiler
Allen (1952)		Corning	Clay	AR	US	36.408	−90.580	1914	Apr	22	Migr	Spencer
Bailey and Niedrach (1965)		Colorado Springs	El Paso	CO	US	38.834	−104.821	1880				
Allen (1952)		Loveland	Larimer	CO	US	40.398	−105.074	1889	Apr	8	Migr	Smith
Allen (1952)		Loveland	Larimer	CO	US	40.398	−105.074	1890	Apr	16	Migr	Smith
Allen (1952)	Kit Carson Refuge		Cheyenne	CO	US	38.761	−102.789	1941	Oct	13	Migr	F. F. Poley and E. R. Kalmbach
Allen (1952)			Adams	CO	US	39.867	−104.383				Migr	Hershey and Rockwell
Allen (1952)	Fort Collins		Larimer	CO	US	40.585	−105.084	1931	Jun	20	Summ	Mrs. Clara Gordon
Allen (1952)		Lerdo		DR	Mex	25.330	−103.320	1889			Wint	Dr. Fischer
Allen (1952)	Bolson del Mapimi			DR	Mex	25.817	−103.850	1894			Wint	T. S. Van Dyke
Allen (1952)	Rivers near city	Saint Augustine	Saint Johns	FL	United States	29.895	−81.323	1722				
Allen (1952)	Rivers near city	Saint Augustine	Saint Johns	FL	US	29.895	−81.323	1723				

Hallman (1965)	Saint Mark's Pond		Saint John's	FL	US	29.989	−81.398	1927				Lloyd Crichlow
Sprunt (1954)	East of Kissimmee River and Lake Okechobee		Osceola	FL	US	28.193	−81.282					Captain Dummit
Shaffer (1940)	East of Kissimmee River		Osceola	FL	US	28.193	−81.282	1936	Jan	19	Wint	
Harmon (1954)		Micanopy	Alachua	FL	US	29.504	−82.280	1911			Wint	
Bent (1926)*		Hastings	Saint John's	FL	US	29.718	−81.508				Wint	
Bent (1926)*			Lee	FL	US	26.567	−81.883				Wint	
Allen (1952)	Altamaha	Darien	McIntosh	GA	US	31.364	−81.373	1722				
Allen (1952)	Savannah River	Savannah	Chatham	GA	US	32.057	−80.923	1722				A white man
Allen (1952)	Savannah River	Savannah	Chatham	GA	US	32.057	−80.923	1723				A white man
Allen (1952)	Altamaha	Darien	McIntosh	GA	US	31.364	−81.373	1723				
Griffin (1957)		Macon	Bibb	GA	US	32.841	−83.633	1885	Nov	12	Migr	Edward Hodgkins
Allen (1952)	Plains of Silao			GU	Mex	21.010	−101.170	1869			Wint	Alfred Duges
Allen (1952)	Plains of Silao			GU	Mex	21.010	−101.170	1891			Wint	Alfred Duges
Allen (1952)			Jefferson	IA	US	41.033	−91.950	1870				
Allen (1952)			Decatur	IA	US	40.751	−93.783	1872				Parker
Allen (1952)			Jefferson	IA	US	41.033	−91.950	1873				
Allen (1952)			Tama	IA	US	41.967	−92.557	1873				Parker
Allen (1952)	Lake Mills		Winnebago	IA	US	43.420	−93.538	1873				John Krider
Allen (1952)	Lake Mills		Winnebago	IA	US	43.420	−93.538	1879				
Allen (1952)		Cedar Rapids	Linn	IA	US	42.008	−91.644	1880				Sinclair
Allen (1952)			Poweshiek	IA	US	41.683	−92.533					Kelsey

(Continued)

Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)			Jackson	IA	US	42.167	−90.583					
Allen (1952)			Pottawat-tamie	IA	US	41.333	−95.533					Trostler
Allen (1952)			Mills	IA	US	41.033	−95.617					Trostler
Allen (1952)		Jefferson	Greene	IA	US	42.015	−94.377					Hall
Allen (1952)			Polk	IA	US	41.628	−93.583					Johnson
Allen (1952)		Humboldt	Humboldt	IA	US	42.721	−94.215					
Allen (1952)	Eagle Lake		Hancock	IA	US	43.129	−93.734					
Allen (1952)			Sac	IA	US	42.383	−95.117	1868			Breed	S. Tiberghin
Allen (1952)			Dubuque	IA	US	42.483	−90.867	1868	Apr	25	Breed	Blackburn
Allen (1952)			Black Hawk	IA	US	42.467	−92.317	1871	May	12	Breed	J. H. Bowles
Allen (1952)			Black Hawk	IA	US	42.467	−92.317	1871	May	15	Breed	John Krider
Allen (1952)	Oakland Valley		Pottawata-mie	IA	US	41.310	−95.397	1874	May	6	Breed	E. Dickinson
Allen (1952)			Cherokee	IA	US	42.733	−95.617	1877	May	8	Breed	W. Rice
Dinsmore (1994)		Pomeroy	Calhoun	IA	US	42.551	−94.684	1877			Breed	
Allen (1952)	Lake Mills		Winnebago	IA	US	43.420	−93.538	1879	May	12	Breed	John Krider
Allen (1952)			Franklin	IA	US	42.733	−93.267	1880	May	2	Breed	W. C. Reice
Allen (1952)	Clear Lake		Cerro Gordo	IA	US	43.143	−93.386	1880	May	4	Breed	S. Howland
Allen (1952)			Kossuth	IA	US	43.200	−94.217	1881	May	14	Breed	C. M. Jones
Allen (1952)			Wright	IA	US	42.733	−93.717	1881	May	8	Breed	C. M. Jones
Allen (1952)	Clear Lake		Cerro Gordo	IA	US	43.143	−93.386	1882	May	2	Breed	
Allen (1952)		Midway	Floyd	IA	US	43.005	−91.697	1883			Breed	Farmer
Allen (1952)	Eagle Lake		Hancock	IA	US	43.129	−93.734	1883	May	4	Breed	J. W. Preston

Allen (1952)	Eagle Lake		Hancock	IA	US	43.129	−93.734	1894	May	26	Breed	R. M. Anderson
Allen (1952)	Eagle Lake		Hancock	IA	US	43.129	−93.734	1897	Jun	5	Breed	Local farmers
Allen (1952)	Eagle Lake		Hancock	IA	US	43.129	−93.734	1897	May	5	Breed	R. M. Anderson
Allen (1952)			Decatur	IA	US	40.751	−93.783	1871	Nov	10	Migr	Parker
Allen (1952)		Waterloo	Black Hawk	IA	US	42.493	−92.192	1873	Apr		Migr	
Allen (1952)	Spirit Lake		Dickinson	IA	US	43.424	−95.110	1876	Oct		Migr	D. O. of B.
Allen (1952)	Cedar Creek		Calhoun	IA	US	42.495	−94.500	1877	Oct	30	Migr	Sandpiper
Allen (1952)	Wolf Creek Slough		Woodbury	IA	US	42.383	−96.033	1884	Apr	13	Migr	
Allen (1952)	Storm Lake		Buena Vista	IA	US	42.643	−95.202	1884	Mar	26	Migr	Bond
Allen (1952)		Iowa City	Johnson	IA	US	41.661	−91.530	1884	Mar	29	Migr	Preston
Allen (1952)		Emmetsburg	Palo Alto	IA	US	43.108	−94.674	1885	Apr	1	Migr	Cline
Allen (1952)		Sioux City	Woodbury	IA	US	42.500	−96.400	1885	Apr	5	Migr	Scougal
Allen (1952)		Emmetsburg	Palo Alto	IA	US	43.108	−94.674	1885	Mar	23	Migr	Cline
Allen (1952)		Sioux City	Woodbury	IA	US	42.500	−96.400	1885	Mar	30	Migr	Scougal
Allen (1952)		La Porte City	Black Hawk	IA	US	42.315	−92.192	1885	Mar	30	Migr	Peck
Allen (1952)	Spirit Lake		Dickinson	IA	US	43.424	−95.110	1886	Apr	7	Migr	Mosker
Allen (1952)	Storm Lake		Buena Vista	IA	US	42.643	−95.202	1886	Mar	22	Migr	Bond
Allen (1952)		Holly Springs	Woodbury	IA	US	42.271	−96.078	1887	Apr		Migr	Talbot
Allen (1952)		Sioux City	Woodbury	IA	US	42.500	−96.400	1887	Apr	3	Migr	Scougal
Allen (1952)		Holly Springs	Woodbury	IA	US	42.271	−96.078	1887	Apr	8	Migr	Talbot
Allen (1952)		Sioux City	Woodbury	IA	US	42.500	−96.400	1887	Apr	8	Migr	Scougal
Allen (1952)	Storm Lake		Buena Vista	IA	US	42.643	−95.202	1887	Mar	25	Migr	Bond
Allen (1952)	Storm Lake		Buena Vista	IA	US	42.643	−95.202	1888	Apr	3	Migr	Bond
Allen (1952)	Storm Lake		Buena Vista	IA	US	42.643	−95.202	1888	Mar	25	Migr	Bond

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)	Storm Lake		Buena Vista	IA	US	42.643	−95.202	1888	Mar	30	Migr	Bond
Allen (1952)		Garner	Hancock	IA	US	43.104	−93.602	1889	Apr	2	Migr	Byington
Allen (1952)		Hawarden	Sioux	IA	US	42.996	−96.485	1890			Migr	Johnson
Allen (1952)		Glidden	Carroll	IA	US	42.057	−94.729	1891	Apr	3	Migr	Collett
Allen (1952)		Indianola	Warren	IA	US	41.358	−93.557	1900	Apr	1	Migr	Jeffrey
Allen (1952)		Alden	Harding	IA	US	42.520	−93.376	1900	Apr	2	Migr	Bigelow
Allen (1952)		Indianola	Warren	IA	US	41.358	−93.557	1900	Apr	2	Migr	Jeffrey
Allen (1952)		Indianola	Warren	IA	US	41.358	−93.557	1900	Mar	29	Migr	Jeffrey
Allen (1952)		Indianola	Warren	IA	US	41.358	−93.557	1900	Mar	30	Migr	Jeffrey
Allen (1952)		Indianola	Warren	IA	US	41.358	−93.557	1900	Sep	23	Migr	Jeffrey
Allen (1952)	Wall Lake		Sac	IA	US	42.271	−95.093	1904	Mar	21	Migr	J. A. Spurrell
Allen (1952)		Sioux City	Woodbury	IA	US	42.500	−96.400	1906	Apr	10	Migr	Rich
Allen (1952)		Webb	Clay	IA	US	42.949	−95.012	1911	Apr	9	Migr	Ira N. Gabrielson
Dinsmore (1994)	High Lake		Emmet	IA	US	43.304	−94.715	1922	Apr		Migr	
Allen (1952)		Sioux City	Woodbury	IA	US	42.500	−96.400	1885	May	7	Summ	Scougal
Allen (1952)		Hawarden	Sioux	IA	US	42.996	−96.485	1890			Summ	Berry
Allen (1952)		Forest City	Winnebago	IA	US	43.262	−93.633	1897	Jun	5	Summ	Anderson
Allen (1952)		Forest City	Winnebago	IA	US	43.262	−93.633	1897	May	15	Summ	Anderson
Allen (1952)		Sioux City	Woodbury	IA	US	42.500	−96.400	1909	May	5	Summ	Rich
Allen (1952)	Bear River	Montpelier	Bear Lake	ID	US	42.297	−111.309	1834	Jul	8	Summ	J. K. Townsend and Thomas Nuttall
Allen (1952)		Rathdrum	Kootenai	ID	US	47.813	−116.896	1899	Apr	8	Summ	Danby
Allen (1952)*	Cemtral Illinois marshes	Peoria	Peoria	IL	US	40.620	−89.630	1870s			Breed	Nelson 1877

Allen (1952)		Cairo	Alexander	IL	US	36.990	−89.186	1880				Fuchs
Allen (1952)			Champaign	IL	US	40.133	−88.200	1871	Mar	27	Migr	
Bogardus (1878)			Ford	IL	US	40.583	−88.251	1877			Migr	Adam H. Bogardus
Allen (1952)		Warsaw	Hancock	IL	US	40.359	−91.434	1879	Oct	23	Migr	
Allen (1952)		Mount Carmel	Wabash	IL	US	38.411	−87.761		Mar	6	Migr	
Baird et al. (1884)		Chicago	Cook	IL	US	41.850	−87.650	1858	Jun		Summ	T. Blackney
Allen (1952)		Weston	McLean	IL	US	40.747	−88.622	1881	Apr	15	Summ	
Allen (1952)	Old Apple River		Jo Daviess	IL	US	42.350	−90.183	1891	Apr		Summ	
Woodruff (1907)		Chicago	Cook	IL	US	41.850	−87.650		Aug	6	Summ	B. T. Gault
Baczkowski (1955)			Porter	IN	US	41.473	−87.061	1905				F. Baczkowski
Butler (1898)		Bloomington	Monroe	IN	US	39.165	−86.526					Charles Dury
Butler (1898)	Lower Wabash Valley		Posey	IN	US	37.798	−88.027					Dr. Stein
Coale (1912)			Lake	IN	US	41.417	−87.365					
Allen (1952)			La Porte	IN	US	41.611	−86.723	1881	Mar	28	Migr	
Butler (1898)			Porter	IN	US	41.473	−87.061	1887	Apr	25	Summ	Trouslot
Allen (1952)		La Barca		JL	Mex	20.280	−102.570	1894				Jouy
Allen (1952)	Lago de Chapala			JL	Mex	20.190	−102.950	1890			Wint	E. W. Wilson
Allen (1952)		La Barca		JL	Mex	20.280	−102.570	1903	Jan		Wint	
Allen (1952)		La Barca		JL	Mex	20.280	−102.570	1903	Jan		Wint	
Allen (1952)		Manhattan	Riley	KS	US	39.184	−96.571	1878				D. E. Lantz
Allen (1952)			Sedgwick	KS	US	37.717	−97.450	1907				H. D. Burchell and Dr. R. Mathews
Allen (1952)		Burton	Harvey	KS	US	38.024	−97.669	1912				C. B. Heinricks

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)	Saline River		Saline	KS	US	38.858	−97.506					
Allen (1952)		Burlington	Coffey	KS	US	38.194	−95.743	1867	Apr	15	Migr	A. Crocker
Allen (1952)			Riley	KS	US	39.184	−96.571	1882	Apr	8	Migr	Blachly
Allen (1952)			Riley	KS	US	39.184	−96.571	1884	Mar	18	Migr	D. E. Lantz
Allen (1952)		Emporia	Lyon	KS	US	38.404	−96.181	1884	Mar	27	Migr	Kellogg
Allen (1952)		Emporia	Lyon	KS	US	38.404	−96.181	1885	Mar	18	Migr	Kellogg
Allen (1952)		Richmond	Franklin	KS	US	38.403	−95.254	1885	Mar	21	Migr	Smith
Allen (1952)		Richmond	Franklin	KS	US	38.403	−95.254	1887	Apr	15	Migr	
Allen (1952)		Richmond	Franklin	KS	US	38.403	−95.254	1887	Apr	8	Migr	
Allen (1952)		Richmond	Franklin	KS	US	38.403	−95.254	1887	Mar	28	Migr	
Allen (1952)		Richmond	Franklin	KS	US	38.403	−95.254	1887	Mar	7	Migr	
Allen (1952)			Riley	KS	US	39.184	−96.571	1890	Mar	18	Migr	D. E. Lantz
Allen (1952)			Riley	KS	US	39.184	−96.571	1891	Apr	18	Migr	D. E. Lantz
Allen (1952)			Jackson	KS	US	39.400	−95.833	1893			Migr	J. A. Bryant
Allen (1952)			Riley	KS	US	39.184	−96.571	1896	Apr	6	Migr	
Allen (1952)		Durham	Marion	KS	US	38.486	−97.228	1903	Apr		Migr	F.L. Jaques
Allen (1952)		Baldwin	Douglas	KS	US	38.775	−95.186	1904	Mar	18	Migr	Monahan
Allen (1952)		Hays	Ellis	KS	US	38.879	−99.326	1905			Migr	
Allen (1952)		Blue Rapids	Marshall	KS	US	39.682	−96.659	1906	Mar	31	Migr	P. B. Peabody
Allen (1952)			Ford	KS	US	37.700	−99.900	1906	Oct	13	Migr	W. M. McClom
Allen (1952)			Stafford	KS	US	37.962	−98.600	1907			Migr	Hal G. Everts
Allen (1952)		Onaga	Pottawato-mie	KS	US	39.489	−96.170	1907	Oct	18	Migr	Crevecoeur
Allen (1952)		Onaga	Pottawato-mie	KS	US	39.489	−96.170	1907	Oct	20	Migr	Crevecoeur
Allen (1952)			Stafford	KS	US	37.962	−98.600	1919			Migr	Hal G. Everts
Allen (1952)			Stafford	KS	US	37.962	−98.600	1922			Migr	Hal G. Everts
Allen (1952)			Graham	KS	US	39.350	−99.883	1929			Migr	

Allen (1952)		Louisville	Jefferson	KY	US	38.254	−85.759	1810	Mar	20	Migr	J. J. Audubon and A. Wilson
Mengel (1965)		Henderson	Henderson	KY	US	37.836	−87.590	1810	Oct	28	Migr	Audubon and Wilson
Mengel (1965)	Mouth of Tennessee River		Livingston	KY	US	37.065	−88.563	1820	Nov	14	Migr	Audubon
Allen (1952)		Hickman	Fulton	KY	US	36.571	−89.186	1886	Aug	20	Migr	
Allen (1952)	Grand Chenier to Johnson's Bayou		Cameron	LA	US	29.767	−92.975	1895				Duncan Crain
Allen (1952)	Hellhole		Vermilion	LA	US	29.817	−92.300	1895				Grevillen Chote
Allen (1952)	White Lake Marsh		Cameron	LA	US	29.717	−93.111	1901				O'Neil and Nunez
Allen (1952)	White Lake Marsh		Cameron	LA	US	29.717	−93.111	1934				L. J. Merovka
Allen (1952)	Avery Island		Iberia	LA	US	29.898	−91.906					E. A. McIlhenny
Allen (1952)		Pecan Island	Vermilion	LA	US	29.642	−92.433					Ulyese Veazey
Allen (1952)	White Lake Marsh		Vermilion	LA	US	29.858	−92.403					Duncan Crain
Allen (1952)	White Lake Marsh		Vermilion	LA	US	29.858	−92.403	1883			Breed	Mrs. Gaspard
Allen (1952)	White Lake Marsh		Cameron	LA	US	29.717	−93.111	1890			Breed	O'Neil and Nunez
Allen (1952)	White Lake Marsh		Cameron	LA	US	29.717	−93.111	1900			Breed	O'Neil and Nunez
Allen (1952)	White Lake Marsh		Cameron	LA	US	29.717	−93.111	1939	May	15	Breed	J. J. Lynch
Allen (1952)	White Lake Marsh		Cameron	LA	US	29.717	−93.111				Breed	Duncan Crain
Allen (1952)	White Lake Marsh		Cameron	LA	US	29.717	−93.111	1937	Jun	5	Summ	E. A. McIlhenny
Allen (1952)	Avery Island		Iberia	LA	US	29.898	−91.906	1937	Jun	5	Summ	E. A. McIlhenny
Allen (1952)		New Orleans	Orleans	LA	US	29.986	−89.949	1821	Apr		Wint	J. J. Audubon

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)	Big Bayou Constance		Cameron	LA	US	29.894	−92.744	1895			Wint	Delcambre
Allen (1952)		Delcambre	Iberia	LA	US	29.948	−91.989	1895			Wint	Delcambre
Allen (1952)	Chenier la Croix	Marsh Island	Iberia	LA	US	29.566	−91.846	1895			Wint	Delcambre
Allen (1952)	Tall Grass Prairies		Calcasieu	LA	US	30.233	−93.350	1899			Wint	Bailey
Allen (1952)	Louisiana State Refuge		Vermilion	LA	US	29.817	−92.300	1916			Wint	
Allen (1952)	Big Bayou Constance		Cameron	LA	US	29.894	−92.744	1916	Feb		Wint	S. C. Arthur
Allen (1952)	Chenier au Tigre		Vermillion	LA	US	29.817	−92.300	1916	Nov		Wint	A. M. Bailey and S. C. Arthur
Allen (1952)	Chenier au Tigre		Vermillion	LA	US	29.817	−92.300	1917			Wint	A. M. Bailey
Allen (1952)	Tall Grass Prairies		Calcasieu	LA	US	30.233	−93.350	1918			Wint	Alcie Daigle
Allen (1952)	Big Bayou Constance		Cameron	LA	US	29.894	−92.744	1928			Wint	S. C. Arthur
Allen (1952)		Pecan Island	Vermilion	LA	US	29.642	−92.433	1928	Mar	11	Wint	E. W. Nelson and Ulyese Veazey
Allen (1952)	Chenier au Tigre		Vermillion	LA	US	29.817	−92.300	1929			Wint	
Allen (1952)		Pecan Island	Vermilion	LA	US	29.642	−92.433	1929	Jan	7	Wint	Ulyese Veazey
Allen (1952)	Chenier au Tigre		Vermillion	LA	US	29.817	−92.300	1930			Wint	
Allen (1952)	Chenier au Tigre		Vermillion	LA	US	29.817	−92.300	1931			Wint	
Allen (1952)	Mulberry Island		Vermilion	LA	US	29.547	−92.363	1931			Wint	Ralph Sagrera

Allen (1952)	Mulberry Island	Vermilion	LA	US	29.547	−92.363	1932			Wint	Ralph Sagrera
Allen (1952)	Mulberry Island	Vermilion	LA	US	29.547	−92.363	1933			Wint	Ralph Sagrera
Allen (1952)	White Lake Marsh	Cameron	LA	US	29.717	−93.111	1933	Jan		Wint	R. B. Worthen
Allen (1952)	Chenier au Tigre	Vermillion	LA	US	29.817	−92.300	1934			Wint	Trappers
Allen (1952)	Mulberry Island	Vermilion	LA	US	29.547	−92.363	1934			Wint	Ralph Sagrera
Allen (1952)	Chenier au Tigre	Vermillion	LA	US	29.817	−92.300	1934	Dec	16	Wint	Lionel LeBlanc
Allen (1952)	Mulberry Island	Vermilion	LA	US	29.547	−92.363	1935			Wint	Ralph Sagrera
Allen (1952)	White Lake Marsh	Cameron	LA	US	29.717	−93.111	1935	Dec		Wint	Jno. Gaspard and Ovid Abshire
Allen (1952)	White Lake Marsh	Cameron	LA	US	29.717	−93.111	1935	Nov	23	Wint	Ambrose Daigre
Allen (1952)	White Lake Marsh	Cameron	LA	US	29.717	−93.111	1936			Wint	George Welch
Allen (1952)	White Lake Marsh	Cameron	LA	US	29.717	−93.111	1936	Apr		Wint	Jno. Gaspard and Ovid Abshire
Allen (1952)	White Lake Marsh	Cameron	LA	US	29.717	−93.111	1937			Wint	C. E. Gillham
Allen (1952)	White Lake Marsh	Cameron	LA	US	29.717	−93.111	1937	Jan	16	Wint	J. H. Baker and Richard Gordon
Allen (1952)	White Lake Marsh	Cameron	LA	US	29.717	−93.111	1937	Jan	27	Wint	A. Simmons, R. Gordon and Schexnayder
Allen (1952)	White Lake Marsh	Cameron	LA	US	29.717	−93.111	1939	Jan	30	Wint	J. J. Lynch
Allen (1952)	White Lake Marsh	Cameron	LA	US	29.717	−93.111	1940			Wint	J. J. Lynch

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)	Grand Chenier to Johnson's Bayou		Cameron	LA	US	29.767	−92.975	1941			Wint	A. O. U. Committee
Allen (1952)	Chenier au Tigre		Vermillion	LA	US	29.817	−92.300				Wint	
Allen (1952)	Tall Grass Prairies		Calcasieu	LA	US	30.233	−93.350				Wint	E. A. McIlhenny
Houston et al. (2003)	York Factory			MB	Can	57.000	−92.310	1771				F. Jacobs
Allen (1952)		Portage la Prairie		MB	Can	49.970	−98.300	1884				F. Cresswell
Allen (1952)		Winnipeg		MB	Can	49.880	−97.150	1890				William Hine
Allen (1952)		Carberry		MB	Can	49.870	−99.370	1890				E. E. Thompson
Allen (1952)	Shoal Lake			MB	Can	50.400	−100.620	1890				E. E. Thompson
Allen (1952)	Whitewater Lake			MB	Can	50.000	−100.360	1895				
Allen (1952)	Shoal Lake			MB	Can	50.400	−100.620	1901				Ward brothers
Allen (1952)	Whitewater Lake			MB	Can	50.000	−100.360	1904				
Allen (1952)	Shoal Lake			MB	Can	50.400	−100.620	1916				Ward Brothers
Allen (1952)	Shoal Lake			MB	Can	50.400	−100.620	1917				Ward brothers
Allen (1952)	Shoal Lake			MB	Can	50.400	−100.620	1924				F. C. Ward
Allen (1952)		Winnipeg		MB	Can	49.880	−97.150	1871	Aug		Breed	
Allen (1952)	Lake Winnipeg			MB	Can	52.130	−97.270	1877			Breed	L. D. Schultz
Allen (1952)	Lake Winnipeg			MB	Can	52.130	−97.270	1883	May	18	Breed	
Allen (1952)	Oak Point			MB	Can	50.500	−98.030	1885			Breed	A. T. Small
Allen (1952)	Lake Winnipegosis			MB	Can	52.450	−99.920	1885	May	9	Breed	
Allen (1952)	Shoal Lake			MB	Can	50.400	−100.620	1886			Breed	

Allen (1952)	Lake Winnipeg		MB	Can	52.130	−97.270	1891			Breed	W. Raine
Allen (1952)	Oak Lake		MB	Can	49.700	−98.400	1891	Jun	17	Breed	Walter Raine
Allen (1952)	Oak Lake		MB	Can	49.700	−98.400	1893	May	21	Breed	Walter Raine
Allen (1952)	Oak Lake		MB	Can	49.700	−98.400	1894	May	13	Breed	Walter Raine
Allen (1952)	Oak Lake		MB	Can	49.700	−98.400	1900	May	16	Breed	
Allen (1952)	Oak Lake		MB	Can	49.700	−98.400	1900	May	18	Breed	
Allen (1952)	Morris River		MB	Can	49.350	−97.350	1906	May	30	Breed	C. P. Forge
Allen (1952)	Oak Point		MB	Can	50.500	−98.030	1885	Apr	15	Migr	A. T. Small
Allen (1952)	Shell River		MB	Can	50.970	−101.400	1890	Apr	16	Migr	E. Calcutt
Allen (1952)		Aweme	MB	Can	49.720	−99.600	1895	Apr	12	Migr	Talbot Criddle
Allen (1952)		Neepawa	MB	Can	50.230	−99.470	1896	Apr	10	Migr	Wemyss
Allen (1952)		Neepawa	MB	Can	50.230	−99.470	1896	Apr	17	Migr	Wemyss
Allen (1952)		Reaburn	MB	Can	50.080	−97.870	1897	Apr	15	Migr	Wemyss
Allen (1952)		Reaburn	MB	Can	50.080	−97.870	1897	Apr	19	Migr	Wemyss
Allen (1952)		Reaburn	MB	Can	50.080	−97.870	1900	Apr	19	Migr	Wemyss
Allen (1952)		Aweme	MB	Can	49.720	−99.600	1900	Apr	6	Migr	Talbot Criddle
Allen (1952)		Reaburn	MB	Can	50.080	−97.870	1900	Apr	9	Migr	Wemyss
Allen (1952)	Morris River		MB	Can	49.350	−97.350	1900	Oct	19	Migr	C. K. Worthen
Allen (1952)		Aweme	MB	Can	49.720	−99.600	1904	Oct	12	Migr	Talbot Criddle
Allen (1952)		Churchill	MB	Can	58.750	−94.080	1748			Summ	Isham
Allen (1952)		Carberry	MB	Can	49.870	−99.370	1882	Apr	19	Summ	E. E. Thompson
Allen (1952)	Oak Point		MB	Can	50.500	−98.030	1884	May	1	Summ	A. T. Small
Allen (1952)	Shell River		MB	Can	50.970	−101.400	1885	Apr	30	Summ	E. Calcutt
Allen (1952)	Shell River		MB	Can	50.970	−101.400	1885	May	3	Summ	E. Calcutt
Allen (1952)		Westbourne	MB	Can	50.130	−98.580	1890			Summ	C. W. Nash
Allen (1952)		Westbourne	MB	Can	50.130	−98.580	1890			Summ	C. W. Nash
Allen (1952)		Reaburn	MB	Can	50.080	−97.870	1898	May	23	Summ	Wemyss
Allen (1952)		Reaburn	MB	Can	50.080	−97.870	1898	May	27	Summ	Wemyss

(Continued)

Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)	Whitewater Lake			MB	Can	50.000	−100.360	1905	Sep	15	Summ	A. M. Laing
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1909	Apr	25	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1909	Apr	29	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1909	Aug	10	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1909	Jul	14	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1909	Oct	20	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1911	Aug	10	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1911	Aug	20	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1911	Sep	12	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1912	Apr	18	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1912	Apr	27	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1912	May	10	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1912	May	3	Summ	Black
Allen (1952)		Margaret		MB	Can	49.400	−99.850	1913	Apr	12	Summ	Black
Allen (1952)	Rocky Lake			MB	Can	54.150	−101.500	1936			Summ	Cree Indian
Barrows (1912)		Brighton	Livingstone	MI	US	42.529	−83.780	1882	Apr		Migr	Charles Cushing
Bailey (1881)		Ann Arbor	Washtenaw	MI	US	42.271	−83.726				Migr	
Barrows (1912)		Geddesburg	Washtenaw	MI	US	42.251	−83.850	1877	Jun	8	Summ	
Allen (1952)		Fergus Falls	Otter Trail	MN	US	46.283	−96.077	1890				Washburn
Allen (1952)		Brainerd	Morrison	MN	US	46.017	−94.300	1874	Jul		Breed	R. B. Christ
Allen (1952)		Brainerd	Morrison	MN	US	46.017	−94.300	1874	Jun	10	Breed	R. B. Christ
Allen (1952)	Elbow Lake		Grant	MN	US	46.006	−96.008	1876	May	20	Breed	J. N. Sanford
Allen (1952)	Elbow Lake		Grant	MN	US	46.006	−96.008	1876	May	21	Breed	G. B. Sennet
Allen (1952)		Herman	Grant	MN	US	45.809	−96.143	1879	Jun		Breed	T. S. Roberts
Allen (1952)	Thief Lake		Marshall	MN	US	48.483	−95.883	1889	Jun	19	Breed	E. L. Brown
Allen (1952)	Southern Minnesota			MN	US	44.000	−95.000	1864	Feb	27	Migr	Hatch

Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1884	Mar	30	Migr	Miller
Allen (1952)		Lanesboro	Fillmore	MN	US	43.721	−91.977	1884	Mar	31	Migr	J. C. Huoslef
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1885	Apr	3	Migr	P. B. Peabody
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1885	Mar	31	Migr	P. B. Peabody
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1885	Nov	13	Migr	P. B. Peabody
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1887	Apr	12	Migr	P. B. Peabody
Allen (1952)		North Star	Nicollet	MN	US	44.291	−94.079	1888	Apr	11	Migr	Schrooten
Allen (1952)		North Star	Nicollet	MN	US	44.291	−94.079	1888	Apr	14	Migr	Schrooten
Allen (1952)		North Star	Nicollet	MN	US	44.291	−94.079	1888	Apr	15	Migr	Schrooten
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1888	Apr	3	Migr	P. B. Peabody
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1888	Apr	7	Migr	P. B. Peabody
Allen (1952)		Waverly	Wright	MN	US	45.076	−93.966	1889	Apr	7	Migr	Schrooten
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1889	Mar	20	Migr	P. B. Peabody
Allen (1952)		Waverly	Wright	MN	US	45.076	−93.966	1889	Mar	28	Migr	Schrooten
Allen (1952)		Waverly	Wright	MN	US	45.076	−93.966	1889	Mar	30	Migr	Schrooten
Allen (1952)		North Star	Nicollet	MN	US	44.291	−94.079	1890	Apr	7	Migr	Schrooten
Allen (1952)		North Star	Nicollet	MN	US	44.291	−94.079	1890	Mar	28	Migr	Schrooten
Allen (1952)		North Star	Nicollet	MN	US	44.291	−94.079	1890	Mar	30	Migr	Schrooten
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1891	Apr	17	Migr	P. B. Peabody
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1891	Apr	6	Migr	P. B. Peabody
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1891	Mar	25	Migr	P. B. Peabody
Allen (1952)		Warren	Marshall	MN	US	48.197	−96.773	1892	Apr	12	Migr	B. M. Slee
Allen (1952)		Warren	Marshall	MN	US	48.197	−96.773	1892	Apr	15	Migr	C. B. Miller
Allen (1952)		Dawson	Lac Qui Parle	MN	US	44.993	−96.054	1893	Apr	10	Migr	Albert Lano
Allen (1952)	14 miles south of Madison		Lac Qui Parle	MN	US	44.809	−96.194	1895	Apr	10	Migr	G. T. Oium
Allen (1952)	Heron Lake		Jackson	MN	US	43.798	−95.286	1895	Apr	19	Migr	P. B. Peabody

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)		Saint Vincent	Kittson	MN	US	48.968	−97.225	1896	Apr	15	Migr	P. B. Peabody
Allen (1952)		Saint Vincent	Kittson	MN	US	48.968	−97.225	1896	Apr	16	Migr	P. B. Peabody
Allen (1952)			Faribault	MN	US	43.667	−93.933	1898	Mar	29	Migr	A. Hewitt
Allen (1952)		Brainerd	Morrison	MN	US	46.017	−94.300	1873			Summ	Coues
Allen (1952)		Cedar Mills	Meeker	MN	US	44.943	−94.522	1878	Sep	17	Summ	William Howling
Allen (1952)		Saint Peter	Nicollet	MN	US	44.324	−93.958	1883			Summ	
Allen (1952)		Waverly	Wright	MN	US	45.076	−93.966	1889	Apr	25	Summ	Schrooten
Allen (1952)		Madison	Lac Qui Parle	MN	US	45.010	−96.196	1894	Apr	21	Summ	Albert Lano
Allen (1952)		Hallock	Kittson	MN	US	48.774	−96.946	1899	Apr	29	Summ	P. B. Peabody
Allen (1952)		Badger	Roseau	MN	US	48.783	−96.014	1917	Apr	23	Summ	A farmer
Allen (1952)	The Grand Prairie		Dunklin	MO	US	36.108	−90.097	1864				
Allen (1952)		Saint Louis	Saint Louis	MO	US	38.627	−90.198	1884	Mar	17	Migr	
Allen (1952)		Mount Carmel	Audrain	MO	US	39.236	−91.871	1885	Mar	25	Migr	Musik
Allen (1952)		Freistatt	Lawerence	MO	US	37.018	−93.898	1886	Mar	27	Migr	Hy Nehrling
Allen (1952)		Saint Louis	Saint Louis	MO	US	38.627	−90.198	1888	Mar	25	Migr	Otto Widmann
Allen (1952)		Laclede	Linn	MO	US	39.786	−93.166	1889	Mar	20	Migr	P. L. Ong
Allen (1952)			Jackson	MO	US	39.017	−94.350	1893			Migr	J. A. Bryant
Allen (1952)		Stotesbury	Vernon	MO	US	37.972	−94.563	1894	Mar	10	Migr	T. Surber
Allen (1952)		Stotesbury	Vernon	MO	US	37.972	−94.563	1894	Mar	15	Migr	T. Surber
Allen (1952)		Stotesbury	Vernon	MO	US	37.972	−94.563	1894	Mar	9	Migr	T. Surber
Allen (1952)			Jackson	MO	US	39.017	−94.350	1904	Apr	14	Migr	Charles Dankers
Allen (1952)			Jackson	MO	US	39.017	−94.350	1906			Migr	Charles Dankers
Allen (1952)		Corning	Atchison	MO	US	40.439	−95.421	1907	Mar	23	Migr	Charles Dankers
Allen (1952)		Corning	Atchison	MO	US	40.439	−95.421	1907	Mar	26	Migr	Charles Dankers
Allen (1952)			Jackson	MO	US	39.017	−94.350	1913	Mar	27	Migr	Charles Dankers

Allen (1952)		Corning	Atchison	MO	US	40.439	−95.421	1913	Mar	27	Migr	Charles Dankers
Allen (1952)		Bay Saint Louis	Hancock	MS	US	30.309	−89.330	1902	Apr	15	Wint	
Allen (1952)		Terry	Prairie	MT	US	46.794	−105.313	1904	Oct	5	Migr	Cameron
Allen (1952)		Billings	Yellowstone	MT	US	45.783	−108.500	1918	Apr	8	Migr	Thomas
Allen (1952)		Big Sandy	Chouteau	MT	US	48.179	−110.113	1903	May	1	Summ	Coubeaux
Bailey (1881)		Wilmington	New Hanover	NC	US	34.226	−77.945	1875	Apr	22	Wint	
Allen (1952)		Big Slough	Pembina	ND	US	48.854	−97.388	1899				W. H. Williams
Allen (1952)		Mandan	Morton	ND	US	46.827	−100.889	1908				
Allen (1952)		Lakota	Nelson	ND	US	48.043	−98.336	1919				W. H. Williams
Allen (1952)		Cashel	Walsh	ND	US	48.485	−97.298	1935				H. V. Williams
Allen (1952)		Calvin	Cavalier	ND	US	48.853	−98.935					
Allen (1952)		Dawson	Kidder	ND	US	46.869	−99.751					Mershon
Allen (1952)		Dawson	Kidder	ND	US	46.869	−99.751					William B. Mershon
Allen (1952)		Ina	Rolette	ND	US	48.783	−99.814	1871	Jun	3	Breed	Delos Hatch
Allen (1952)		Larimore	Grand Forks	ND	US	47.907	−97.626	1894	May	18	Breed	Eastgate
Allen (1952)		Lakota	Nelson	ND	US	48.043	−98.336	1908			Breed	Eastgate
Hibbard (1956)		Adams	Walsh	ND	US	48.497	−97.862	1909	May	18	Breed	Hibbard
Allen (1952)		Towner	McHenry	ND	US	48.346	−100.405	1915			Breed	
Allen (1952)			Rolette	ND	US	48.942	−100.066	1917			Breed	E. T. Judd
Allen (1952)	Mouth of the Little Missouri River		Dunn	ND	US	47.597	−102.323	1805	Apr	11	Migr	Lewis and Clark
Allen (1952)		Couteau des Prairies	Burke	ND	US	48.767	−102.533	1876			Migr	C. E. McChesney
Allen (1952)		Couteau des Prairies	Burke	ND	US	48.767	−102.533	1876			Migr	C. E. McChesney

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)		Couteau des Prairies	Burke	ND	US	48.767	−102.533	1877			Migr	C. E. McChesney
Allen (1952)		Couteau des Prairies	Burke	ND	US	48.767	−102.533	1877			Migr	C. E. McChesney
Allen (1952)		Couteau des Prairies	Burke	ND	US	48.767	−102.533	1878			Migr	C. E. McChesney
Allen (1952)		Couteau des Prairies	Burke	ND	US	48.767	−102.533	1878			Migr	C. E. McChesney
Allen (1952)		Menoken	Burleigh	ND	US	46.821	−100.531	1885	Apr	12	Migr	Tyler
Allen (1952)		Menoken	Burleigh	ND	US	46.821	−100.531	1885	Apr	5	Migr	Tyler
Allen (1952)		Dawson	Kidder	ND	US	46.869	−99.751	1889	Oct	11	Migr	Louis A. Yorke
Allen (1952)		Bathgate	Pembina	ND	US	48.877	−97.476	1890	Apr	18	Migr	Bowen
Allen (1952)			Towner	ND	US	48.683	−99.200	1890	Oct	5	Migr	E. T. Judd
Allen (1952)		Larimore	Grand Forks	ND	US	47.907	−97.626	1893	Apr	8	Migr	Eastgate
Allen (1952)			Rolette	ND	US	48.942	−100.066	1894			Migr	E. T. Judd
Allen (1952)		Bathgate	Pembina	ND	US	48.877	−97.476	1894	Apr	10	Migr	Bowen
Allen (1952)		Bathgate	Pembina	ND	US	48.877	−97.476	1895	Apr	11	Migr	Bowen
Allen (1952)		Glasston	Pembina	ND	US	48.706	−97.447	1899	Apr		Migr	W. H. Williams
Allen (1952)	Devils Lake		Ramsey	ND	US	48.028	−98.931	1903	Apr	11	Migr	Bowman
Allen (1952)		Inkster	Grand Forks	ND	US	48.151	−97.644	1904	Oct	18	Migr	Colling
Allen (1952)	Lake George		Kidder	ND	US	46.733	−99.489	1910			Migr	
Allen (1952)		Hamilton	Pembina	ND	US	48.809	−97.453	1912	Apr	12	Migr	D. D. Warren
Allen (1952)	Chase Lake		Stutsman	ND	US	47.009	−99.443	1913	Oct	11	Migr	H. H. McCumber
Allen (1952)			Rolette	ND	US	48.942	−100.066	1917	Apr	13	Migr	E. T. Judd
Allen (1952)		LeRoy	Pembina	ND	US	48.923	−97.752	1919			Migr	
Allen (1952)		Steele	Kidder	ND	US	46.855	−99.916	1920	Oct	18	Migr	G. Bruening

Allen (1952)	Long Lake		Kidder	ND	US	46.709	−100.174	1921	Oct	2	Migr	C. E. Boardman
Allen (1952)		Bismark	Burleigh	ND	US	46.808	−100.783	1922	Apr	8	Migr	Russell Reid
Allen (1952)		Edinburg	Walsh	ND	US	48.497	−97.862	1923			Migr	H. B. Williams
Allen (1952)	Slough west of Edinburg		Walsh	ND	US	48.500	−97.900	1923			Migr	H. B. Williams
Allen (1952)		Grafton	Walsh	ND	US	48.412	−97.410	1923	Apr		Migr	H. B. Williams
Bent (1926)	Long Lake		Kidder	ND	US	46.709	−100.174	1923	Oct	1	Migr	C. E. Boardman
Allen (1952)		Grafton	Walsh	ND	US	48.412	−97.410	1924	Oct	15	Migr	H. V. Williams
Allen (1952)		Hazelton	Emmons	ND	US	46.485	−100.279	1933	Oct		Migr	
Allen (1952)	Fort Union		Williams	ND	US	48.303	−103.433	1833	Sep	22	Summ	Maximilian
Allen (1952)		Fort Stevenson	McLean	ND	US	47.642	−101.300	1874	Jun		Summ	Elliot Coues
Allen (1952)		Pembina	Pembina	ND	US	48.966	−97.243	1879	Jul	6	Summ	W. L. Abbott
Allen (1952)		Fort Berthold	McLean	ND	US	47.642	−101.300	1881	Sep		Summ	W. J. Hoffman
Allen (1952)			Dickey	ND	US	46.209	−98.762	1883	Aug	2	Summ	E. S. Gaylord
Allen (1952)		Mandan	Morton	ND	US	46.827	−100.889	1891	Jun		Summ	
Allen (1952)		Larimore	Grand Forks	ND	US	47.907	−97.626	1893	Apr	21	Summ	Eastgate
Allen (1952)		Bathgate	Pembina	ND	US	48.877	−97.476	1893	May	6	Summ	Bowen
Allen (1952)		Bathgate	Pembina	ND	US	48.877	−97.476	1894	Apr	17	Summ	Bowen
Allen (1952)		Argusville	Cass	ND	US	47.052	−96.934	1894	Apr	28	Summ	Edwards
Allen (1952)	Devils Lake		Ramsey	ND	US	48.028	−98.931	1903	Apr	16	Summ	Bowman
Allen (1952)		Calvin	Cavalier	ND	US	48.853	−98.935	1907	Apr	20	Summ	W. R. Ross
Allen (1952)	Chase Lake		Stutsman	ND	US	47.009	−99.443	1908	May	1	Summ	H. H. McCumber
Allen (1952)		Antler	Bottineau	ND	US	48.971	−101.282	1908	May	3	Summ	Currie
Allen (1952)		Sherwood	Renville	ND	US	48.960	−101.632	1908	Sep	19	Summ	A. J. Clark
Allen (1952)		Mandan	Morton	ND	US	46.827	−100.889	1912	May	14	Summ	J. D. Allan
Hibbard (1956)		Edmone	Ramsey	ND	US	48.233	−98.733	1912	May	2	Summ	Hibbard
Allen (1952)	Chase Lake		Stutsman	ND	US	47.009	−99.443	1913	May	7	Summ	H. H. McCumber

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)		Bismark	Burleigh	ND	US	46.808	−100.783	1920	Sep	16	Summ	Russell Reid
Allen (1952)		Medina	Stutsman	ND	US	46.894	−99.299	1921	Jun	24	Summ	N. A. Wood
Allen (1952)	Long Lake		Kidder	ND	US	46.709	−100.174	1922	Sep	1	Summ	
Allen (1952)	Long Lake		Kidder	ND	US	46.709	−100.174	1922	Sep	15	Summ	
Allen (1952)	Long Lake		Kidder	ND	US	46.709	−100.174	1922	Sep	8	Summ	
Allen (1952)	Long Lake		Kidder	ND	US	46.709	−100.174	1923	Sep		Summ	C. E. Boardman
Allen (1952)	Long Lake		Kidder	ND	US	46.709	−100.174	1930	Aug	13	Summ	Bernie Maurek
Allen (1952)		Mercer	McLean	ND	US	47.491	−100.711	1930	Aug	13	Summ	Bernie Maurek
Allen (1952)		Steele	Kidder	ND	US	46.855	−99.916	1931	Sep	29	Summ	T. G. Pearson
Allen (1952)		Steele	Kidder	ND	US	46.855	−99.916	1932	Sep	30	Summ	Bernie Maurek and Russell Reid
Allen (1952)		Lincoln	Lancaster	NE	US	40.833	−96.686	1900				J. S. Hunter
Allen (1952)		Omaha	Douglas	NE	US	41.251	−95.931	1918				A hunter
Allen (1952)	Red Deer Lake		Cherry	NE	US	42.565	−100.498	1918				F. G. Caldwell
Allen (1952)		Brady Island	Lincoln	NE	US	41.027	−100.468	1936	May			
Allen (1952)		Grand Island	Hall	NE	US	40.926	−98.342					F. J. Brezee
Allen (1952)		Valentine	Cherry	NE	US	42.873	−100.551					J. M. Bates
Allen (1952)			Holt	NE	US	42.450	−98.767					L. Bruner
Allen (1952)			Gage	NE	US	40.267	−96.683					F. A. Colby
Allen (1952)		West Point	Cuming	NE	US	41.842	−96.708					L. Bruner
Allen (1952)		Craig	Burt	NE	US	41.786	−96.364					L. Bruner
Allen (1952)		Omaha	Douglas	NE	US	41.251	−95.931					L. Bruner and L. Skow
Allen (1952)		Omaha	Douglas	NE	US	41.251	−95.931					
Allen (1952)			Washington	NE	US	41.456	−96.026	1820	Mar	19	Migr	Thomas Say
Allen (1952)		Alda	Hall	NE	US	40.869	−98.468	1884	Mar	24	Migr	Powell

Allen (1952)	Elm Creek		Buffalo	NE	US	40.719	−99.372	1884	Nov	7	Migr	
Allen (1952)	Wood River		Hall	NE	US	40.819	−98.600	1884	Oct	24	Migr	
Allen (1952)		O'Neill	Boyd	NE	US	42.900	−98.783	1887	Apr	2	Migr	Miller
Allen (1952)		O'Neill	Boyd	NE	US	42.900	−98.783	1887	Apr	9	Migr	Miller
Allen (1952)		Gibbon	Buffalo	NE	US	40.749	−98.844	1889	Apr	10	Migr	Thatcher
Allen (1952)		Falls City	Richardson	NE	US	40.061	−95.602	1890	Mar	16	Migr	Wilson
Allen (1952)		Gibbon	Buffalo	NE	US	40.749	−98.844	1890	Mar	19	Migr	Powell
Allen (1952)		Chambers	Boyd	NE	US	42.205	−98.749	1891	Apr	11	Migr	Earl
Allen (1952)		Falls City	Richardson	NE	US	40.061	−95.602	1891	Sep	19	Migr	
Allen (1952)		Valentine	Cherry	NE	US	42.873	−100.551	1893	Oct	1	Migr	J. M. Bates
Allen (1952)		Valentine	Cherry	NE	US	42.873	−100.551	1894	Apr	1	Migr	J. M. Bates
Allen (1952)		Gresham	York	NE	US	41.028	−97.402	1896	Oct	11	Migr	Dickinson
Allen (1952)		Gothenburg	Dawson	NE	US	40.926	−100.163	1897			Migr	J. Kennedy
Allen (1952)		Long Pine	Brown	NE	US	42.534	−99.699	1897	Mar	31	Migr	Bates
Allen (1952)		Holdrege	Harlan	NE	US	40.436	−99.369	1898			Migr	Loren Bunney
Allen (1952)		Holdrege	Harlan	NE	US	40.436	−99.369	1898			Migr	Loren Bunney
Allen (1952)		Grand Island	Hall	NE	US	40.926	−98.342	1899			Migr	Fred Gunther
Allen (1952)		Neligh	Antelope	NE	US	42.129	−98.029	1899	Mar	20	Migr	Merritt Cary
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1899	Oct	12	Migr	Colt
Allen (1952)		Neligh	Antelope	NE	US	42.129	−98.029	1899	Oct	15	Migr	Merritt Cary
Allen (1952)		Lincoln	Lancaster	NE	US	40.833	−96.686	1899	Oct	27	Migr	Wolcott
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1900	Apr	18	Migr	Colt
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1900	Mar	23	Migr	Colt
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1900	Oct	8	Migr	Colt
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1901	Apr	12	Migr	
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1901	Apr	6	Migr	Colt
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1901	May	14	Migr	Colt
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1901	Oct	1	Migr	Colt
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1901	Oct	22	Migr	Colt

(Continued)

Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1902	Apr	18	Migr	Colt
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1902	Apr	24	Migr	Colt
Allen (1952)		Gibbon	Buffalo	NE	US	40.749	−98.844	1902	Apr	6	Migr	Ashburn
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1902	May	11	Migr	Colt
Allen (1952)		Lincoln	Lancaster	NE	US	40.833	−96.686	1903			Migr	L. Brunter and Myron Swenk
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1903	Apr	30	Migr	Colt
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1903	Apr	6	Migr	Colt
Allen (1952)		Badger	Gage	NE	US	40.088	−96.595	1903	Oct	5	Migr	Colt
Allen (1952)		Gothenburg	Dawson	NE	US	40.926	−100.163	1905	Oct		Migr	William Kennedy
Allen (1952)		Grand Island	Hall	NE	US	40.926	−98.342	1907	Oct	18	Migr	Fred Gunther
Allen (1952)		Harvard	Clay	NE	US	40.617	−98.097	1908	Mar	12	Migr	George Schupan
Allen (1952)		Atkinson	Holt	NE	US	42.533	−98.978	1909	Apr	22	Migr	
Allen (1952)	Wood Lake		Cherry	NE	US	42.639	−100.238	1912	Oct	16	Migr	H. T. Clark and Mr. Quick
Allen (1952)		Grand Island	Hall	NE	US	40.926	−98.342	1912	Oct	20	Migr	Goose hunters
Allen (1952)		Greenwood	Cass	NE	US	40.963	−94.441	1913	Mar	29	Migr	J. Armstrong
Allen (1952)		Newark	Kearney	NE	US	40.641	−98.963	1914	Apr		Migr	Ed Larson
Allen (1952)		Prosser	Adams	NE	US	40.687	−98.576	1915			Migr	L. Pitcarthley
Allen (1952)		Gothenburg	Dawson	NE	US	40.926	−100.163	1915			Migr	J. Kennedy
Allen (1952)		Ogallala	Keith	NE	US	41.123	−101.719	1915	Mar	10	Migr	J. Koehr
Allen (1952)	Post Lake		Brown	NE	US	42.433	−99.950	1915	Oct	10	Migr	
Allen (1952)		Overton	Dawson	NE	US	40.739	−99.537	1916			Migr	Link Milburn
Allen (1952)		Mindern	Kearney	NE	US	40.503	−98.950	1917			Migr	
Allen (1952)		Loup City	Sherman	NE	US	41.276	−98.966	1917	Apr		Migr	H. Jenner
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1917	Oct	3	Migr	Hunter
Allen (1952)		Omaha	Douglas	NE	US	41.251	−95.931	1918	Mar	12	Migr	

Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1918	Mar	15	Migr	Hunter
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1919	Mar	29	Migr	Harry Connor
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1920	Apr	2	Migr	C. A. Black
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1920	Oct	15	Migr	C. A. Black
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1920	Oct	7	Migr	C. A. Black
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1921	Apr	2	Migr	C. A. Black
Allen (1952)	Red Deer Lake		Cherry	NE	US	42.565	−100.498	1921	Oct	14	Migr	Farm boy
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1921	Oct	20	Migr	C. A. Black
Allen (1952)		Gibbon	Buffalo	NE	US	40.749	−98.844	1922	Apr	14	Migr	C. A. Black
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1922	May	1	Migr	A. R. Golay
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1922	Oct	20	Migr	C. A. Black
Allen (1952)	Red Deer Lake		Cherry	NE	US	42.565	−100.498	1922	Oct	22	Migr	
Allen (1952)		Inland	Clay	NE	US	40.594	−98.224	1923	Sep		Migr	A. Nooka
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1924	Apr	13	Migr	C. A. Black
Allen (1952)		Amherst	Buffalo	NE	US	40.769	−99.269	1924	Apr	2	Migr	C. A. Black
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1924	Oct	16	Migr	C. A. Black
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1925	Apr	5	Migr	L. Pitcarthley, C. A. Black, Guy Smith
Allen (1952)		Odessa	Buffalo	NE	US	40.702	−99.257	1925	Oct	12	Migr	R. Swanson and William Hicks
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1925	Oct	19	Migr	George Tracy and Oscar Blevens
Allen (1952)		Odessa	Buffalo	NE	US	40.702	−99.257	1925	Oct	25	Migr	William Hicks
Allen (1952)		Overton	Dawson	NE	US	40.739	−99.537	1925	Oct	25	Migr	J. Q. Holmes
Allen (1952)		Odessa	Buffalo	NE	US	40.702	−99.257	1926	Apr	18	Migr	A. Webert
Allen (1952)		Odessa	Buffalo	NE	US	40.702	−99.257	1926	Apr	26	Migr	Roy Knapp
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1926	Apr	4	Migr	Golay, Lilga, Black, Garvin
Allen (1952)		Lowell	Kearney	NE	US	40.648	−98.847	1926	Apr	5	Migr	J. C. Chapman
Allen (1952)		Wilcox	Kearney	NE	US	40.365	−99.170	1926	Apr	8	Migr	

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)		Axtel	Kearney	NE	US	40.478	−99.126	1926	Apr	8	Migr	
Allen (1952)		Odessa	Buffalo	NE	US	40.702	−99.257	1926	Oct	20	Migr	C. A. Black
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1927	Apr	1	Migr	A. R. Golay
Allen (1952)		Newark	Kearney	NE	US	40.641	−98.963	1927	Oct	15	Migr	Farmer
Allen (1952)		Antioch	Sheridan	NE	US	42.068	−102.582	1927	Oct	9	Migr	Keller
Allen (1952)		Wilcox	Kearney	NE	US	40.365	−99.170	1928	Apr	6	Migr	A. R. Marsteller
Allen (1952)		Gibbon	Buffalo	NE	US	40.749	−98.844	1928	Apr	9	Migr	C. A. Black
Allen (1952)		Gibbon	Buffalo	NE	US	40.749	−98.844	1928	Apr	9	Migr	B. Armitage
Allen (1952)		Newark	Kearney	NE	US	40.641	−98.963	1928	Oct	24	Migr	F. R. Kingsley
Allen (1952)		Newark	Kearney	NE	US	40.641	−98.963	1928	Sep	22	Migr	L. and H. Brown
Allen (1952)		Lowell	Kearney	NE	US	40.648	−98.847	1929	Apr	10	Migr	Charles Radborn
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1929	Apr	18	Migr	A. R. Golay
Allen (1952)		Merriman	Cherry	NE	US	42.920	−101.700	1929	Mar		Migr	Phillip Mensinger
Allen (1952)		Odessa	Buffalo	NE	US	40.702	−99.257	1929	Mar	27	Migr	B. Armitage
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1929	Oct	12	Migr	C. A. Black
Allen (1952)		Wilcox	Kearney	NE	US	40.365	−99.170	1930	Apr	19	Migr	A. R. Marsteller
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1930	Apr	2	Migr	A. R. Golay, H. Ligga, C. A. Black. Mrs. Frances Garvin
Allen (1952)		Eli	Cherry	NE	US	42.944	−101.491	1930	Oct	6	Migr	A hunter
Allen (1952)	Wood River		Hall	NE	US	40.819	−98.600	1931			Migr	Mrs. Will Burmwood
Allen (1952)		Gothenburg	Dawson	NE	US	40.926	−100.163	1931			Migr	J. P. Kennedy
Allen (1952)	Elm Creek		Buffalo	NE	US	40.719	−99.372	1931	Oct	25	Migr	Anthony Roeser
Allen (1952)		Wilcox	Kearney	NE	US	40.365	−99.170	1932	Apr	5	Migr	A. R. Marsteller
Allen (1952)		Gothenburg	Dawson	NE	US	40.926	−100.163	1933			Migr	J. P. Kennedy
Allen (1952)		Overton	Dawson	NE	US	40.739	−99.537	1933	Apr	4	Migr	B. Armitage

Allen (1952)	Elm Creek		Buffalo	NE	US	40.719	−99.372	1933	Apr	6	Migr	Herbert Richardson
Allen (1952)		Odessa	Buffalo	NE	US	40.702	−99.257	1933	Oct	1	Migr	J. Flannery
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1934	Apr	1	Migr	C. A. Black and Procter
Allen (1952)		Lowell	Kearney	NE	US	40.648	−98.847	1934	Apr	15	Migr	Chris Zwink
Allen (1952)	Wood River		Hall	NE	US	40.819	−98.600	1934	Apr	17	Migr	G. H. Phillips
Allen (1952)		Cozad	Dawson	NE	US	40.775	−99.740	1936	Apr	1	Migr	Conober and Foley
Allen (1952)		Alda	Hall	NE	US	40.869	−98.468	1936	Apr	1	Migr	Adams
Allen (1952)		Overton	Dawson	NE	US	40.739	−99.537	1936	Mar	31	Migr	C. Lanphear
Allen (1952)		Kearney	Buffalo	NE	US	40.695	−99.081	1937	Apr	10	Migr	George Eaglestrom
Allen (1952)		Gibbon	Buffalo	NE	US	40.749	−98.844	1937	Apr	2	Migr	J. Shields
Allen (1952)		Cozad	Dawson	NE	US	40.775	−99.740	1939	Oct	22	Migr	
Allen (1952)		Gothenburg	Dawson	NE	US	40.926	−100.163	1941	Apr	19	Migr	C. Swanson
Allen (1952)	Niobrara River		Knox	NE	US	42.776	−98.047	1889	Jun	24	Summ	Baker
Allen (1952)	Wood River		Hall	NE	US	40.819	−98.600	1934	May	2	Summ	S. W. Wells
Allen (1952)	Cape May		Cape May	NJ	US	38.959	−74.928	1810			Wint	Alexander Wilson
Allen (1952)	Beesley's Point		Cape May	NJ	US	39.277	−74.637	1857			Wint	William P. Turnbull
Allen (1952)	Fort Thorn		Dona Ana	NM	US	32.312	−106.778	1853				Dr. T. C. Henry
Allen (1952)		Portales	Roosevelt	NM	US	34.186	−103.334	1938				W. G. Vinzant
Allen (1952)		Fort Resolution		NT	Can	61.170	−113.670	1864			Breed	J. Lockhart
Allen (1952)	Salt River			NT	Can	60.120	−112.230				Breed	J. Lockhart
Allen (1952)		Fort Simpson		NT	Can	61.870	−121.350	1861	Jun	10	Summ	B. R. Ross
Allen (1952)	Anderson River	Fort Anderson		NT	Can	69.700	−129.000	1862			Summ	R. R. MacFarlane
Allen (1952)	Anderson River	Fort Anderson		NT	Can	69.700	−129.000	1862			Summ	R. R. MacFarlane

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)	Anderson River	Fort Anderson		NT	Can	69.700	−129.000	1863			Summ	R. R. MacFarlane
Allen (1952)	Anderson River	Fort Anderson		NT	Can	69.700	−129.000	1863			Summ	R. R. MacFarlane
Allen (1952)		Fort Resolution		NT	Can	61.170	−113.670	1864			Summ	J. Lockhart
Allen (1952)	Anderson River	Fort Anderson		NT	Can	69.700	−129.000	1864			Summ	R. R. MacFarlane
Allen (1952)	Anderson River	Fort Anderson		NT	Can	69.700	−129.000	1864			Summ	R. R. MacFarlane
Allen (1952)	Anderson River	Fort Anderson		NT	Can	69.700	−129.000	1865	Jun		Summ	R. R. MacFarlane
Allen (1952)	Anderson River	Fort Anderson		NT	Can	69.700	−129.000	1865	May	25	Summ	R. R. MacFarlane
Allen (1952)	Mackenzie River Delta			NT	Can	61.500	−119.500	1900			Summ	Douglas Oniak
Allen (1952)	Hay River			NT	Can	60.870	−115.730	1908	May	12	Summ	
Allen (1952)	Hay River			NT	Can	60.870	−115.730	1923			Summ	Slavey Indian
Allen (1952)	70 miles in from Eskimo Point			NT	Can	68.750	−127.750	1930			Summ	Koonook
Allen (1952)	Cayuga Lake		Cayuga	NY	US	42.947	−76.736					
Allen (1952)		Cincinnati	Hamilton	OH	US	39.310	−84.430	1876				
Allen (1952)	Scioto River		Scioto	OH	US	38.731	−83.013	1902				
Allen (1952)		Waverly	Pike	OH	US	39.127	−82.986	1902				
Allen (1952)		Granville	Licking	OH	US	40.068	−82.520	1887	Mar	28	Migr	Tight
Allen (1952)	Little Miami River	Indian Hill Station	Hamilton	OH	US	39.078	−84.433	1895	Aug		Summ	F. B. Magill
Allen (1952)			Cleveland	OK	US	35.200	−97.300	1901				C. D. Bunker
Allen (1952)			Cleveland	OK	US	35.200	−97.300	1902				C. D. Bunker
Allen (1952)			Beaver	OK	US	36.767	−100.483	1909				

Allen (1952)			Harper	OK	US	36.767	−99.683	1909				W. E. Lewis
Allen (1952)			Beaver	OK	US	36.767	−100.483	1910				
Allen (1952)			Harper	OK	US	36.767	−99.683	1910				
Allen (1952)			Beaver	OK	US	36.767	−100.483	1911				
Allen (1952)			Harper	OK	US	36.767	−99.683	1911				
Allen (1952)			Beaver	OK	US	36.767	−100.483	1912				
Allen (1952)			Harper	OK	US	36.767	−99.683	1912				
Allen (1952)			Cleveland	OK	US	35.200	−97.300	1832	Oct	29	Migr	Latrobe
Allen (1952)			Comanche	OK	US	34.609	−98.390	1899	Oct		Migr	W. A. Mayer
Allen (1952)			Woods	OK	US	36.767	−98.800	1907	Apr	7	Migr	
Allen (1952)		Stillwater	Payne	OK	US	36.116	−97.058	1928	Oct		Migr	A hunter
Allen (1952)		Toronto		ON	Can	43.650	−79.380	1880				William Loane
Allen (1952)		Emsdale		ON	Can	45.530	−79.320	1895				Handy
Allen (1952)		Camden		ON	Can	42.580	−82.080	1871	Sep	27	Summ	Wesley Potter
Allen (1952)		Ardtrea		ON	Can	44.680	−79.420	1885	May	9	Summ	Blair
Allen (1952)	Waccamaw River		Georgetown	SC	US	33.358	−79.257	1850			Wint	
Allen (1952)			Clay	SD	US	42.917	−96.958	1885				G. S. Agersborg
Allen (1952)			Union	SD	US	42.817	−96.694	1885				G. S. Agersborg
Allen (1952)			Yankton	SD	US	43.050	−97.383	1885				G. S. Agersborg
Allen (1952)	12 miles SW of Bowdle		Walworth	SD	US	45.355	−99.736	1888				Oliver
Allen (1952)		Sioux Falls	Minnehaha	SD	US	43.556	−96.723	1905				
Allen (1952)		Mobridge	Walworth	SD	US	45.537	−100.428					
Allen (1952)			Edmunds	SD	US	45.400	−99.200	1883	Oct	19	Migr	C. K Worthen
Allen (1952)		Huron	Bradle	SD	US	44.363	−98.214	1887	Oct	13	Migr	Cheney
Allen (1952)		Grandview	Brule	SD	US	43.644	−99.297	1888	Apr	6	Migr	Blanchard
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1889	Oct	18	Migr	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1889	Oct	26	Migr	Colt

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1890	Apr	2	Migr	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1890	Mar	25	Migr	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1890	Oct	15	Migr	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1890	Oct	8	Migr	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1891	Apr	11	Migr	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1891	Apr	5	Migr	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1891	Nov	1	Migr	Colt
Allen (1952)		Ipswich	Edmunds	SD	US	45.444	−99.029	1893	Apr	10	Migr	
Allen (1952)		Ipswich	Edmunds	SD	US	45.444	−99.029	1893	Apr	5	Migr	
Allen (1952)		Roswell	Miner	SD	US	44.007	−97.696	1898	Oct	4	Migr	
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1899	Apr	7	Migr	
Allen (1952)	12 miles SW of Bowdle		Walworth	SD	US	45.355	−99.736	1885	Sep		Summ	Oliver
Allen (1952)		Grandview	Brule	SD	US	43.644	−99.297	1888	Apr	22	Summ	Blanchard
Allen (1952)		Grandview	Brule	SD	US	43.644	−99.297	1888	May	1	Summ	Blanchard
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1889	Sep	12	Summ	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1889	Sep	25	Summ	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1890	Apr	29	Summ	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1890	Sep	12	Summ	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1890	Sep	8	Summ	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1891	May	15	Summ	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1891	Sep	14	Summ	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1891	Sep	24	Summ	Colt
Allen (1952)		Harrison	Douglas	SD	US	43.430	−98.527	1891	Sep	8	Summ	Colt
Allen (1952)			Brown	SD	US	45.553	−98.308	1893	Apr	22	Summ	
Allen (1952)		Pierre	Hughes	SD	US	44.368	−100.351	1909	May	3	Summ	H. E. Lee

Allen (1952)	Loon Creek		SK	Can	50.970	−104.380	1858				H. Y. Hind
Allen (1952)	Indian Head		SK	Can	50.330	−103.670	1858				H. Y. Hind
Allen (1952)	Touchwood Hills		SK	Can	51.570	−104.270	1858				Hind
Allen (1952)	White Sand River		SK	Can	51.570	−101.930	1884				Christy
Allen (1952)		Prince Albert	SK	Can	53.200	−105.770	1892				Thomas McKay
Allen (1952)	Indian Head		SK	Can	50.330	−103.670	1908				C. G. Harold
Allen (1952)	Beaver Hills	Ituna	SK	Can	51.300	−103.430	1913				A farmer
Allen (1952)		Ituna	SK	Can	51.170	−103.500	1919				Indian
Allen (1952)		Balcarres	SK	Can	50.800	−103.550	1920				
Allen (1952)		Ituna	SK	Can	51.170	−103.500	1925				Indian
Hjertaas (1994)	Big Quill Lake		SK	Can	51.920	−104.370	1872	Aug	12	Breed	Framk Fleming and John Macoun
Allen (1952)	Moose Mountain		SK	Can	49.780	−102.580	1880	Jul		Breed	Macoun
Allen (1952)	North Saskatchewan River	Battleford	SK	Can	52.730	−108.320	1884			Breed	Macdonald
Allen (1952)	Twelve Mile Lake		SK	Can	49.480	−106.230	1895	Jun	6	Breed	Macoun
Hjertaas (1994)		Prince Albert	SK	Can	53.200	−105.770	1896	Jun	10	Breed	Hugh Richardson
Allen (1952)		Yorkton	SK	Can	51.220	−102.470	1900	May	16	Breed	Cowboy Brown
Hjertaas (1994)	Cussed Creek		SK	Can	51.400	−102.550	1900			Breed	William Fernie
Hjertaas (1994)	Beaver Hills	Ituna	SK	Can	51.300	−103.430	1901	May	21	Breed	Edward Arnold
Hjertaas (1994)		Wauchope	SK	Can	49.600	−101.900	1902			Breed	
Hjertaas (1994)		Demaine	SK	Can	50.900	−107.250	1907			Breed	Ernest J. Demaine and Fred Swann
Allen (1952)		Davidson	SK	Can	51.270	−105.980	1911			Breed	R. Lloyd

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)		Bradwell		SK	Can	51.950	−106.230	1911			Breed	L. G. Moore
Hjertaas (1994)	Shallow Lake			SK	Can	54.620	−108.300	1911			Breed	Archie Smith
Hjertaas (1994)		Southey		SK	Can	50.930	−104.500	1911	Jun		Breed	H. M. Dahl
Allen (1952)		Bradwell		SK	Can	51.950	−106.230	1912			Breed	L. G. Moore
Hjertaas (1994)	Shallow Lake			SK	Can	54.620	−108.300	1921			Breed	W. W. Smith
Allen (1952)		Baliol		SK	Can	52.020	−109.280	1922	May	19	Breed	Neil Gilmour
Allen (1952)	Kiyiu Lake			SK	Can	52.320	−109.100	1922	May	28	Breed	Fred Bradshaw
Hjertaas (1994)	Shallow Lake			SK	Can	54.620	−108.300	1928			Breed	Archibald Smith
Hjertaas (1994)	Luck Lake			SK	Can	51.080	−107.080	1929			Breed	Frank Miller
Hjertaas (1994)	Luck Lake			SK	Can	51.080	−107.080	1929	Aug		Breed	Steve West
Hjertaas (1994)	Luck Lake			SK	Can	51.080	−107.080	1929	Oct		Breed	Steve West
Allen (1952)	Indian Head			SK	Can	50.330	−103.670	1904	Oct	2	Migr	Lang
Allen (1952)		Semans		SK	Can	51.420	−104.730	1913			Migr	Thomas L. James
Allen (1952)		Forget		SK	Can	49.650	−102.870	1914	Oct		Migr	
Hjertaas (1994)		Lake Lenore		SK	Can	52.400	−104.980	1919	Oct	8	Migr	N. T. Kingsley
Allen (1952)		Liberty		SK	Can	51.130	−105.430	1927	Nov	3	Migr	
Allen (1952)		Estevan		SK	Can	49.130	−102.980	1927	Oct	29	Migr	A farmer
Hjertaas (1994)	White Fox River			SK	Can	53.530	−104.020	1927			Migr	Andrew Wytoski
Hjertaas (1994)	White Fox River			SK	Can	53.530	−104.020	1927			Migr	Andrew Wytoski
Hjertaas (1994)	White Fox River			SK	Can	53.530	−104.020	1928			Migr	Andrew Wytoski
Hjertaas (1994)	White Fox River			SK	Can	53.530	−104.020	1928			Migr	Andrew Wytoski

Hjertaas (1994)	White Fox River		SK	Can	53.530	−104.020	1929			Migr	Andrew Wytoski
Hjertaas (1994)	White Fox River		SK	Can	53.530	−104.020	1929			Migr	Andrew Wytoski
Allen (1952)		Isham	SK	Can	51.080	−108.570				Migr	R. H. Carruthers
Allen (1952)	Saskatchewan River		SK	Can	53.250	−105.680	1827	May	7	Summ	
Allen (1952)	Indian Head		SK	Can	50.330	−103.670	1884	Apr	28	Summ	Guernsey
Hjertaas (1994)	Rush Lake		SK	Can	50.400	−107.400	1891	Jun	13	Summ	MacDonald
Allen (1952)		Osler	SK	Can	52.370	−106.550	1893	May	1	Summ	Colt
Allen (1952)		Osler	SK	Can	52.370	−106.550	1893	May	25	Summ	Colt
Allen (1952)	Indian Head		SK	Can	50.330	−103.670	1901	Apr	20	Summ	Cates
Allen (1952)	Indian Head		SK	Can	50.330	−103.670	1904	Apr	19	Summ	Lang
Allen (1952)	Indian Head		SK	Can	50.330	−103.670	1904	Apr	24	Summ	Lang
Allen (1952)	Indian Head		SK	Can	50.330	−103.670	1904	Sep	25	Summ	Lang
Allen (1952)	Indian Head		SK	Can	50.330	−103.670	1905	Apr	26	Summ	Lang
Allen (1952)	Indian Head		SK	Can	50.330	−103.670	1905	May	1	Summ	Lang
Allen (1952)		Yellow Grass	SK	Can	49.800	−104.170	1905	Sep		Summ	
Allen (1952)		Lajord	SK	Can	50.230	−104.150	1908	May		Summ	H. H. Hanson
Allen (1952)		Resource	SK	Can	52.730	−104.530	1909			Summ	
Allen (1952)	Big Quill Lake		SK	Can	51.920	−104.370	1909			Summ	Ferry
Allen (1952)	Last Mountain Lake and vicinity		SK	Can	51.080	−105.230	1909	Apr		Summ	
Allen (1952)	Indian Head		SK	Can	50.330	−103.670	1910	Apr	27	Summ	Lang
Hjertaas (1994)	Foam Lake		SK	Can	51.720	−103.620	1910			Summ	H. C. Grose
Allen (1952)		Kerrobert	SK	Can	51.920	−109.130	1913			Summ	E. Margaret Estlin

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Hjertaas (1994)		Big River		SK	Can	53.830	−107.020	1916	Jun		Summ	H. Sharpe
Allen (1952)	Indian Head			SK	Can	50.330	−103.670	1920	Apr	15	Summ	Lang
Allen (1952)	Indian Head			SK	Can	50.330	−103.670	1921			Summ	J. R. Garden
Allen (1952)		Kerrobert		SK	Can	51.920	−109.130	1921			Summ	E. Margaret Estlin
Hjertaas (1994)		Luseland		SK	Can	52.080	−109.400	1921			Summ	J. V. Finley and Joe Perry
Hjertaas (1994)	Shallow Lake			SK	Can	54.620	−108.300	1922	Sep	30	Summ	Hoyes Lloyd
Allen (1952)	Indian Head			SK	Can	50.330	−103.670	1923			Summ	
Allen (1952)		Findlater		SK	Can	50.780	−105.400	1924	May	3	Summ	H. L. Felt
Hjertaas (1994)	Luck Lake			SK	Can	51.080	−107.080	1925	May		Summ	Neil Gilmour
Allen (1952)		Wiseton		SK	Can	51.320	−107.650	1926	Apr	18	Summ	Miss B. M. Dickson
Hjertaas (1994)	Luck Lake			SK	Can	51.080	−107.080	1926	Jun	10	Summ	Neil Gilmour
Hjertaas (1994)	Ladder Lake			SK	Can	53.830	−107.000	1927	Aug	10	Summ	G. H. Cartwright
Hjertaas (1994)		Vonda		SK	Can	52.320	−106.100	1930	Jun	13	Summ	
Hjertaas (1994)	Luck Lake			SK	Can	51.080	−107.080	1930	May	15	Summ	Fred Bradshaw
Hjertaas (1994)	Luck Lake			SK	Can	51.080	−107.080	1930	May	27	Summ	Fred Bradshaw
Hjertaas (1994)	Emma Lake			SK	Can	53.600	−105.900	1932			Summ	John N. Hachett
Hjertaas (1994)	Luck Lake			SK	Can	51.080	−107.080	1935	Aug	12	Summ	Emil Lestin
Hjertaas (1994)	Beaver River			SK	Can	55.430	−107.750	1936	Aug		Summ	George Bauman
Allen (1952)	Boca del Rio Grande	Bagdad		TM	Mex	26.000	−97.260	1863	Jun		Breed	H. E. Dresser
Allen (1952)		Matamoros		TM	Mex	25.520	−97.300	1863	Jun		Summ	H. E. Dresser
Allen (1952)	Mouth of Brazos River		Brazoria	TX	US	28.876	−95.378	1860				
Allen (1952)	Galveston Island		Galveston	TX	US	29.222	−94.909	1860				
Allen (1952)		Port Isabel	Cameron	TX	US	26.117	−97.517	1863				H. E. Dresser

Allen (1952)		San Antonio	Bexar	TX	US	29.424	−98.493	1863		H. E. Dresser
Allen (1952)	Blackjack Peninsula		Aransas	TX	US	28.124	−96.946	1885		J. A. Brundett
Allen (1952)		Waco	McLennan	TX	US	31.549	−97.146	1886		Elanoides
Allen (1952)		Waco	McLennan	TX	US	31.549	−97.146	1888		Elanoides
Allen (1952)		Waco	McLennan	TX	US	31.549	−97.146	1889		Elanoides
Allen (1952)	Worsham Ranch, 8 miles east of Henrietta	Henrietta	Clay	TX	US	33.817	−98.195	1908		R. L. More
Allen (1952)	Blackjack Peninsula		Aransas	TX	US	28.124	−96.946	1910		Thomas Webb
Allen (1952)		Dallas/Lake Worth	Tarrant	TX	US	32.791	−97.414	1920		Jno. B. Litsey
Allen (1952)		Dallas/Lake Worth	Tarrant	TX	US	32.791	−97.414	1927		Mrs. Bruce Reid
Allen (1952)		Maxwell	Caldwell	TX	US	29.881	−97.793	1928		R. W. Strandtmann
Allen (1952)	Matagorda Island		Calhoun	TX	US	28.227	−96.640	1938		J. O. Stevenson
Allen (1952)	Matagorda Island		Calhoun	TX	US	28.227	−96.640	1939		J. O. Stevenson
Allen (1952)	Matagorda Island		Calhoun	TX	US	28.227	−96.640	1940		J. O. Stevenson
Allen (1952)	Matagorda Island		Calhoun	TX	US	28.227	−96.640	1941		J. O. Stevenson
Allen (1952)	Red River	Vernon	Wilbarger	TX	US	34.215	−99.190			
Oberholser (1974)			Southern Wharton	TX	US	29.027	−96.275	1867	Breed	J. D. Mitchell
Oberholser (1938)			Southern Wharton	TX	US	29.027	−96.275	1869	Breed	J. D. Mitchell
Oberholser (1938)			Southern Wharton	TX	US	29.027	−96.275	1878	Breed	J. D. Mitchell
Oberholser (1938)	Eagle Lake		Colorado	TX	US	29.564	−96.342		Breed	Oliver Davie

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)		San Antonio	Bexar	TX	US	29.424	−98.493	1845	Nov		Migr	Colonel G. A. McCall
Allen (1952)		San Angelo	Tom Green	TX	US	31.464	−100.437	1884			Migr	W. Lloyd
Allen (1952)			Williamson	TX	US	30.650	−97.600	1884	Apr		Migr	G. B. Benners
Allen (1952)			Comal	TX	US	29.817	−98.300	1884	Apr		Migr	G. B. Benners
Allen (1952)			Williamson	TX	US	30.650	−97.600	1884	Mar		Migr	G. B. Benners
Allen (1952)			Comal	TX	US	29.817	−98.300	1884	Mar		Migr	G. B. Benners
Allen (1952)			Williamson	TX	US	30.650	−97.600	1884	May		Migr	G. B. Benners
Allen (1952)		San Angelo	Tom Green	TX	US	31.464	−100.437	1885			Migr	W. Lloyd
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1885	Apr	4	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1885	Mar	23	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1885	Mar	27	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1885	Mar	30	Migr	Peters
Allen (1952)		Gainesville	Cooke	TX	US	33.626	−97.133	1885	Mar	31	Migr	Ragsdale
Allen (1952)		San Angelo	Tom Green	TX	US	31.464	−100.437	1885	Mar	5	Migr	W. Lloyd
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1885	Nov	16	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1885	Nov	9	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1886	Apr	2	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1886	Apr	9	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1886	Mar	25	Migr	Peters
Allen (1952)		San Angelo	Tom Green	TX	US	31.464	−100.437	1886	Mar	5	Migr	W. Lloyd
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1888	Nov	22	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1888	Oct	15	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1888	Oct	8	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1889	Nov	18	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1889	Nov	8	Migr	Peters
Allen (1952)		Brownsville	Cameron	TX	US	25.901	−97.497	1890	Apr	2	Migr	F. B. Armstrong

Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1890	Apr	2	Migr	Peters
Allen (1952)		Bonham	Fannin	TX	US	33.577	−96.178	1890	Mar	23	Migr	Peters
Allen (1952)		Waco	McLennan	TX	US	31.549	−97.146	1899	Apr		Migr	
Allen (1952)		Port Arthur	Jefferson	TX	US	29.899	−93.929	1913	Nov	2	Migr	Mrs. Bruce Reid
Allen (1952)	Mission Lake		Calhoun	TX	US	28.468	−96.809	1932	Nov		Migr	W. H. Bauer
Allen (1952)			Comal	TX	US	29.817	−98.300	1884	May		Summ	G. B. Benners
Allen (1952)	Head of Padre Island		Kennedy	TX	US	26.844	−97.368	1891	Aug	20	Summ	W. Lloyd
Allen (1952)	Head of Padre Island		Kennedy	TX	US	26.844	−97.368	1891	Aug	30	Summ	W. Lloyd
Allen (1952)		Corpus Christi	Nueces	TX	US	27.800	−97.396	1891	Oct	7	Summ	W. Lloyd
Allen (1952)			Cameron	TX	US	26.418	−97.368	1900	May	6	Summ	Vernon Bailey
Allen (1952)	Tarkington Prairie	Cleveland	Liberty	TX	US	30.324	−94.965	1905	Apr	23	Summ	Gaut
Allen (1952)		Corpus Christi	Nueces	TX	US	27.800	−97.396	1845			Wint	Colonel G. A. McCall
Allen (1952)		Brownsville	Cameron	TX	US	25.901	−97.497	1877	Apr	1	Wint	
Allen (1952)		Brownsville	Cameron	TX	US	25.901	−97.497	1877	Mar	20	Wint	George B. Sennett
Allen (1952)	Head of Padre Island		Kennedy	TX	US	26.844	−97.368	1878	Mar		Wint	George B. Sennett
Allen (1952)		Houston	Harris	TX	US	29.763	−95.363	1881	Dec		Wint	H. Nehrling
Allen (1952)		Houston	Harris	TX	US	29.763	−95.363	1881	Nov		Wint	H. Nehrling
Allen (1952)		Houston	Harris	TX	US	29.763	−95.363	1882	Feb		Wint	W. Lloyd
Allen (1952)		Houston	Harris	TX	US	29.763	−95.363	1882	Jan		Wint	H. Nehrling
Allen (1952)		Houston	Harris	TX	US	29.763	−95.363	1882	Mar		Wint	W. Lloyd
Allen (1952)	Matagorda Peninsula, Kanes Landing		Matagorda	TX	US	28.585	−96.018	1885	Jan	23	Wint	
Allen (1952)		Beaumont	Jefferson	TX	US	30.086	−94.102	1886	Dec	23	Wint	
Allen (1952)		Brownsville	Cameron	TX	US	25.901	−97.497	1889			Wint	Worthen

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)		Corpus Christi	Nueces	TX	US	27.800	−97.396	1891	Dec	17	Wint	W. Lloyd
Allen (1952)		Padre Island	Kennedy	TX	US	26.844	−97.368	1891	Dec	20	Wint	George B. Sennett
Allen (1952)			Hidalgo	TX	US	26.333	−98.200	1891	Feb	22	Wint	F. S. Webster
Allen (1952)		Brownsville	Cameron	TX	US	25.901	−97.497	1891	Jan	5	Wint	
Allen (1952)	Head of Padre Island		Kennedy	TX	US	26.844	−97.368	1891	Nov	1	Wint	W. Lloyd
Allen (1952)	Head of Padre Island		Kennedy	TX	US	26.844	−97.368	1891	Nov	10	Wint	W. Lloyd
Allen (1952)		Corpus Christi	Nueces	TX	US	27.800	−97.396	1891	Nov	11	Wint	W. Lloyd
Allen (1952)	Head of Padre Island		Kennedy	TX	US	26.844	−97.368	1891	Nov	12	Wint	W. Lloyd
Allen (1952)	Head of Padre Island		Kennedy	TX	US	26.844	−97.368	1891	Nov	7	Wint	W. Lloyd
Allen (1952)			Hidalgo	TX	US	26.333	−98.200	1892	Dec	14	Wint	F. S. Webster
Allen (1952)			Hidalgo	TX	US	26.333	−98.200	1892	Dec	2	Wint	
Allen (1952)			Hidalgo	TX	US	26.333	−98.200	1892	Dec	7	Wint	F. S. Webster
Allen (1952)	Matagorda Peninsula, Kanes Landing		Matagorda	TX	US	28.585	−96.018	1892	Feb	20	Wint	W. Lloyd
Allen (1952)	Matagorda Peninsula, Kanes Landing		Matagorda	TX	US	28.585	−96.018	1892	Jan	6	Wint	W. Lloyd
Allen (1952)			Hidalgo	TX	US	26.333	−98.200	1892	Nov	15	Wint	F. S. Webster
Allen (1952)			Hidalgo	TX	US	26.333	−98.200	1893	Jan	2	Wint	F. S. Webster
Allen (1952)		Houston	Harris	TX	US	29.763	−95.363	1893	Jan	4	Wint	Jason Whyte
Allen (1952)		Brownsville	Cameron	TX	US	25.901	−97.497	1894	Feb	18	Wint	

Allen (1952)	Blackjack Peninsula		Aransas	TX	US	28.124	−96.946	1895			Wint	E. Hough
Allen (1952)		Padre Island	Kennedy	TX	US	26.844	−97.368	1896	Nov	29	Wint	
Allen (1952)		Padre Island	Kennedy	TX	US	26.844	−97.368	1897	Feb	20	Wint	Worthen
Allen (1952)	Matagorda Island		Calhoun	TX	US	28.227	−96.640	1900	Apr	2	Wint	H. C. Oberholser
Allen (1952)	Matagorda Island		Calhoun	TX	US	28.227	−96.640	1900	Mar	29	Wint	H. C. Oberholser
Allen (1952)		Padre Island	Kennedy	TX	US	26.844	−97.368	1904	Feb	10	Wint	F. B. Armstrong
Allen (1952)		Corpus Christi	Nueces	TX	US	27.800	−97.396	1904	Feb	3	Wint	
Allen (1952)		Padre Island	Kennedy	TX	US	26.844	−97.368	1904	Jan	16	Wint	F. B. Armstrong
Allen (1952)		Brownsville	Cameron	TX	US	25.901	−97.497	1911	Feb	15	Wint	L. R. Cowen
Allen (1952)		Brownsville	Cameron	TX	US	25.901	−97.497	1911	Feb	22	Wint	L. R. Cowen
Allen (1952)		Brownsville	Cameron	TX	US	25.901	−97.497	1911	Feb	27	Wint	L. R. Cowen
Allen (1952)		Laguna Larga	Kleberg	TX	US	27.521	−97.398	1915			Wint	Richard Kleberg
Allen (1952)		Laguna Larga	Kleberg	TX	US	27.521	−97.398	1921	Dec	23	Wint	T. G. Pearson and Richard Kleberg
Allen (1952)	South of Baffin Bay		Kennedy	TX	US	27.233	−97.498	1923	Jan		Wint	Ludlow Griscom and Maunsell Crosby
Allen (1952)		Laguna Larga	Kleberg	TX	US	27.521	−97.398	1923	Jan	12	Wint	Ludlow Griscom and Maunsell Crosby
Allen (1952)		Brownsville	Cameron	TX	US	25.901	−97.497	1924	Mar	4	Wint	R. D. Camp
Allen (1952)		Laguna Larga	Kleberg	TX	US	27.521	−97.398	1926	Feb	12	Wint	Baker
Allen (1952)	Blackjack Peninsula		Aransas	TX	US	28.124	−96.946	1931			Wint	J. G. Fuller
Allen (1952)	63 miles north of Brownsville		Kennedy	TX	US	26.938	−97.581	1933	Feb	8	Wint	T. H. Clegg
Allen (1952)	Espiritu Santo Bay		Calhoun	TX	US	28.347	−96.526	1933	Jan	10	Wint	H. C. Oberholser

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Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)	63 miles north of Brownsville		Kennedy	TX	US	26.938	−97.581	1933	Jan	23	Wint	H. C. Oberholser
Allen (1952)		Laguna Larga	Kleberg	TX	US	27.521	−97.398	1934	Jan	5	Wint	J. J. Carroll
Allen (1952)	Dewberry Island		Calhoun	TX	US	28.385	−96.511	1934	Mar	14	Wint	J. J. Carroll
Allen (1952)	Dewberry Island		Calhoun	TX	US	28.385	−96.511	1934	Mar	28	Wint	J. J. Carroll
Allen (1952)	Blackjack Peninsula		Aransas	TX	US	28.124	−96.946	1935			Wint	G. B. Saunders
Allen (1952)		Laguna Larga	Kleberg	TX	US	27.521	−97.398	1935	Mar	23	Wint	J. J. Carroll
Allen (1952)	Blackjack Peninsula		Aransas	TX	US	28.124	−96.946	1936	Feb	29	Wint	Neil Hotchkiss
Allen (1952)	Blackjack Peninsula		Aransas	TX	US	28.124	−96.946	1936	Feb	8	Wint	Neil Hotchkiss
Allen (1952)		Laguna Larga	Kleberg	TX	US	27.521	−97.398	1936	Jan	10	Wint	J. J. Carroll
Allen (1952)	31 miles south of	Corpus Christi	Kleberg	TX	US	27.322	−97.475	1936	Jan	14	Wint	Bob Snow
Allen (1952)	East Bay		Galveston	TX	US	29.511	−94.671	1936	Jan	19	Wint	Mrs. Bruce Reid
Allen (1952)	Blackjack Peninsula		Aransas	TX	US	28.124	−96.946	1936	Jan	25	Wint	Neil Hotchkiss
Allen (1952)		Laguna Larga	Kleberg	TX	US	27.521	−97.398	1936	Mar	1	Wint	Neil Hotchkiss
Allen (1952)	Blackjack Peninsula		Aransas	TX	US	28.124	−96.946	1936	Mar	3	Wint	Neil Hotchkiss
Allen (1952)	Blackjack Peninsula		Aransas	TX	US	28.124	−96.946	1936	Mar	8	Wint	Neil Hotchkiss
Allen (1952)		Laguna Larga	Kleberg	TX	US	27.521	−97.398	1937	Feb	7	Wint	J. J. Carroll
Allen (1952)		Austwell	Refugio	TX	US	28.390	−96.842	1941	Feb		Wint	J. O. Stevenson
Allen (1952)		Austwell	Refugio	TX	US	28.390	−96.842	1941	Jan		Wint	J. O. Stevens
Allen (1952)	Great Salt Lake		Davis	UT	US	40.703	−112.387	1880				

Bailey (1881)		Lynchburg	Lynchburg	VA	US	37.414	−79.143	1876	Jun	21	Summ	
Jewett et al. (1953)	Umatilla Rapids—Mouth of the Walla Walla River		Walla Walla	WA	US	46.058	−118.910	1805	Oct	19	Migr	Lewis and Clark
Kumlien and Hollister (1951)	Southwest Wisconsin	Prairie du Chien	Crawford	WI	US	43.046	−91.139	1840				P. R. Hoy
Kumlien and Hollister (1951)	Lake Michigan	Racine	Racine	WI	US	42.726	−87.783	1840				P. R. Hoy
Allen (1952)	Sugar River		Dane	WI	US	43.033	−89.660	1854				
Carr (1890)*			Brown	WI	US	44.467	−87.967				Breed	
Kumlien and Hollister (1951)			Green	WI	US	42.833	−89.600	1878	Oct		Migr	
Kumlien and Hollister (1951)	Lake Mills		Jefferson	WI	US	43.081	−88.912	1935			Migr	Douglas E. Wade
Hunt and Gluesing (1976)	Horicon Marsh		Dodge	WI	US	43.550	−88.656	1900	Apr		Summ	W. Snyder
Allen (1952)		Cody	Park	WY	US	44.526	−109.056	1906				William Richard
Allen (1952)		Cody	Park	WY	US	44.526	−109.056	1907				William Richard
Allen (1952)		Cody	Park	WY	US	44.526	−109.056	1908				William Richard
Allen (1952)		Cody	Park	WY	US	44.526	−109.056	1909				William Richard
Allen (1952)		Cody	Park	WY	US	44.526	−109.056	1910				William Richard
Allen (1952)		Cody	Park	WY	US	44.526	−109.056	1911				William Richard
Allen (1952)		Cody	Park	WY	US	44.526	−109.056	1912				William Richard
Allen (1952)	Shoshone River		Bighorn	WY	US	44.862	−108.204	1915				
Bent (1926)	Yellowstone Park		Park	WY	US	44.767	−110.233	1914	Aug	4	Breed	M. P. Skinner
Allen (1952)	Jackson Lake		Carbon	WY	US	42.437	−107.339	1906			Migr	William Richard

(Continued)

Historical Records of Whooping Crane Observations, Ordered by State/Province and Life-History Stage (*cont.*)

Source	Location	City	County	State/ province	Country	Latitude	Longitude	Year	Month	Day	Life stage	Observer
Allen (1952)	Jackson Lake		Carbon	WY	US	42.437	−107.339	1912	Feb		Migr	William Richard
Allen (1952)	Bechler River		Teton	WY	US	44.148	−110.996	1930			Summ	T. G. Pearson and Ranger Bicknell
Allen (1952)		Osage	Weston	WY	US	43.987	−104.421	1934	Apr	23	Summ	J. F. Bock
Allen (1952)	Star Valley		Lincoln	WY	US	43.123	−111.027	1934	May		Summ	Ray Wolfley
Allen (1952)	Star Valley		Lincoln	WY	US	43.123	−111.027	1935	May		Summ	Theone Wolfley

Breed, breeding; *Summ*, summering; *Migr*, migrating; *Wint*, wintering.
Records marked with an *asterisk* were questionable and not included in maps or in biome and ecoregion summaries.
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