Section-based Monitoring of Breeding Birds within the Shortgrass Prairie Bird Conservation Region (BCR 18)

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ROCKY MOUNTAIN BIRD OBSERVATORY

The mission of the Rocky Mountain Bird Observatory (RMBO) is the conservation of birds of the Rocky Mountains, Great Plains, and Intermountain West, and the habitats on which they depend. *RMBO practices a multi-faceted approach to bird conservation that integrates scientific research and monitoring studies with education and outreach programs to bring bird conservation issues to the public and other conservation partners. RMBO works closely with state and federal natural resource agencies, private landowners, schools, and other nonprofit organizations. RMBO accomplishes its mission by working in four areas:*

Research*: RMBO studies avian responses to habitat conditions, ecological processes, and management actions to provide scientific information that guides bird conservation efforts.*

Monitoring*: RMBO monitors the distribution and abundance of birds through long-term, broad-scale monitoring programs designed to track population trends for birds of the region.*

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Bill Schmoker

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Executive Summary

In 2005, Rocky Mountain Bird Observatory (RMBO) implemented its fifth year of section-based grassland bird-monitoring in Colorado and Nebraska and the third year for Kansas and Oklahoma within the Shortgrass Prairie Bird Conservation Region (BCR 18). During 2005, RMBO conducted surveys in four states (Nebraska, Colorado, Kansas, and Oklahoma) and five National Grasslands (Cimarron, Comanche, Kiowa and Pawnee and Rita Blanca). The objective of this program is to monitor population trends and distributions of grassland birds within BCR18 using section-based surveys, a road-based point count technique. A one square mile "section" is the basic land management unit of the prairie. The section-based survey technique is the most efficient and effective method for surveying and monitoring grassland birds (Hanni 2002) in a landscape dominated by private ownership.

RMBO surveyed 2,368 sections within BCR 18 during 15 May – 4 July 2005. Sections were stratified by habitat, then randomly selected for survey in proportion to habitat acreage on the landscape: 1,755 sections of native prairie habitat, 553 of dry-land agriculture habitat (of these 32 sections were converted into irrigated agriculture in KS), and 60 of land in CRP. We observed 118 bird species, including 25 species of concern or importance, as recognized by Partners in Flight (2005) and/or the participating state and federal agencies. We calculated density estimates for 47 species, analyzed by management unit and habitat type, including for 22 species of importance, as recognized by Partners in Flight and/or the participating state and federal agencies. We present distribution and abundance maps for 60 species.

We conducted initial population analyses using density estimates for species of Regional Importance, Continental Concern or Stewardship species designated by PIF, at the BCR scale in native prairie for years 2003 to 2005. We graphed density estimates with 95% confidence intervals for these three years for visual inspection to gain preliminary insights into population dynamics.

Long-term monitoring of the Shortgrass Bird Conservation Region will provide information on trends and distribution within a framework that allows land managers to make cooperative management decisions on a biologically meaningful scale. The information gathered by this bird monitoring program should prove invaluable for supporting conservation decisions related to grassland birds and will further our understanding of the complex population dynamics of grassland birds. However, the ultimate success and utility of this program is contingent upon long-term commitment by all partners in BCR18.

Introduction

The Shortgrass Prairie Bird Conservation Region (BCR18) is a unique ecosystem stretching from southern South Dakota south through western Nebraska, eastern Wyoming, eastern Colorado, western Kansas, eastern New Mexico, Oklahoma's panhandle and western Texas. Within this region approximately 52% (280,800 km^2) of historic shortgrass prairie remains (Samson et al. 2004). Historically the shortgrass prairie was characterized by dramatic variations in precipitation, fire and grazing mammals (Knopf 1988). Research has identified the need for comprehensive conservation plans to maintain this region's ecological integrity. Population trends for many species within this region are unknown, although the landscape is becoming increasingly fragmented.

Grassland birds have experienced steeper, more consistent, and geographically more widespread declines than any other guild of North American birds (Sampson and Knopf 1996). Several species found in this ecosystem are endemic (found nowhere else) or are closely associated with the Great Plains grasslands (Mengel 1970) such as Baird's Sparrow, Cassin's Sparrow, Chestnut-collared Longspur, Ferruginous Hawk, Lark Bunting, Long-billed Curlew, McCown's Longspur and Mountain Plover. Consequently, many grassland birds are of high conservation interest.

Some managers have relied on data derived from the Breeding Bird Survey (BBS), currently the most extensive bird monitoring program in the U.S., to monitor bird populations (Robbins et al. 1989, Sauer 1993). The BBS, operational in the Great Plains since 1967, uses volunteers to conduct roadside surveys of birds across North America and produces indices of population abundance at the continental scale for many common bird species (Robbins et al. 1989). BBS data and analyses are relatively inexpensive and have proven to be a valuable source of information on bird population trends. BBS data can produce continental-scale relative abundance maps. These maps provide a reasonably good indication of the relative abundance of species well sampled by the BBS. However, many species and habitats are inadequately sampled by the BBS (Robbins et al. 1993, Sauer 1993), and BBS data do not reliably predict population trends at small geographic scales such as a National Grassland, states, or even larger eco-regions (i.e., BCRs) (Sauer 2000). According to the Partners in Flight, 85% of upland species breeding in the Shortgrass Prairie Bird Conservation Region (BCR 18) lack sufficient data to address current regional population trends (PIF species assessment database 20055). For these and other reasons, BBS data generally are insufficient to guide local and regional management decisions.

In response to this need, RMBO, in cooperation with the Colorado Division of Wildlife (CDOW), assessed field techniques in 2001 to determine which was most efficient for monitoring shortgrass prairie birds. We evaluated four techniques in the shortgrass prairie of Colorado: 1) section-based point counts, conducted at the section level from roads (n = 1,237 sections); 2) interior line transects, conducted at the section level away from roads (n = 48 sections); 3) Monitoring Colorado's Birds (MCB) point transects, conducted irrespective of sections and roads (n = 22 point transects); and 4) 30-mile driving line transects, conducted along roads, through all habitat types in Colorado (n = 87 line transects). We used program DISTANCE to estimate bird densities using each of the four techniques. The results suggested

that the section-based point count technique was the most efficient in monitoring birds in the shortgrass prairie (Hanni 2002). Hereafter, we refer to this technique as section-based surveys.

RMBO designed the section-based survey technique based on the common unit of land management in the prairie, the 1 mi^2 section, hence the name 'section-based survey.' Section-based surveys provide data used to: 1) monitor bird population trends and changes in distributions of individual species; 2) relate vegetation characteristics and management practices to bird species abundance; and 3) identify geographic areas with high conservation value for grassland birds.

What makes section-based surveys unique from other bird monitoring techniques is its efficiency and effectiveness in data collection. It's efficiency is achieved by conducting the fewest number of surveys per section needed to maximize the number of species detected in each section (Hanni 2002). The efficiency, in turn, increases observer coverage of the study area and increases statistical power of analysis, while maintaining the lowest possible cost. Its effectiveness is evident in its potential to detect population trends for 46 upland breeding species in BCR 18 within 5 - 24 years (CV = 3% - 41%, respectively). Included among these monitored species are 38 species of concern, as recognized by Partners in Flight (2004) and/or participating state and federal agencies. Other advantages of RMBO's section-based bird monitoring program include: 1) stratification by habitat type; 2) sections are surveyed irrespective of landownership; and 3) data can be analyzed at a variety of scales such as county, state, National Grassland, or BCR.

In this document, we report the findings of the 2005 section-based surveys and an initial population analysis using density estimates for an interval of three years (2003 to 2005). Results are presented for BCR 18 as well as management units participating with RMBO's grassland bird monitoring program including four states (Nebraska, Colorado, Kansas, and Oklahoma) and four National Grasslands (Cimarron, Comanche, Kiowa and Pawnee). This report provides natural resource managers with information on grassland bird populations on both local and regional scales. Such knowledge can assist managers in making effective land management decisions regarding conservation of grassland birds and their habitat. Participating agencies include Colorado Division of Wildlife, Kansas Department of Wildlife and Parks, Nebraska Game and Parks Commission, Oklahoma Department of Wildlife Conservation, Oklahoma City Zoo, and United States Forest Service (USFS).

Bird taxonomy and common names in this report follow that of the American Ornithologists' Union Check-list for North American Birds, 7th edition through the Forty-sixth supplement.

Methods

Study Area

We conducted section-based surveys within the BCR 18 portions of Colorado, Kansas, Nebraska, and Oklahoma and on Cimarron, Comanche, Kiowa, Pawnee and Rita Blanca National Grasslands (Fig. 1). This arid region receives 300 - 500 mm of precipitation per year (Lauenroth 1992). Habitats surveyed include native shortgrass prairie, dry-land agriculture, and Conservation Reserve Program (CRP) lands. Native shortgrass prairie is characterized by two dominant grass species, buffalo grass (*Buchloe dactyloides*) and blue grama (*Bouteloua gracilis*).

Dry-land agriculture includes non-irrigated field crops such as wheat, hay, and sorghum, or fallow fields. Land in CRP was once in agricultural production, but now is planted with cover, either native or non-native, to improve water quality and wildlife habitat, and control soil erosion.

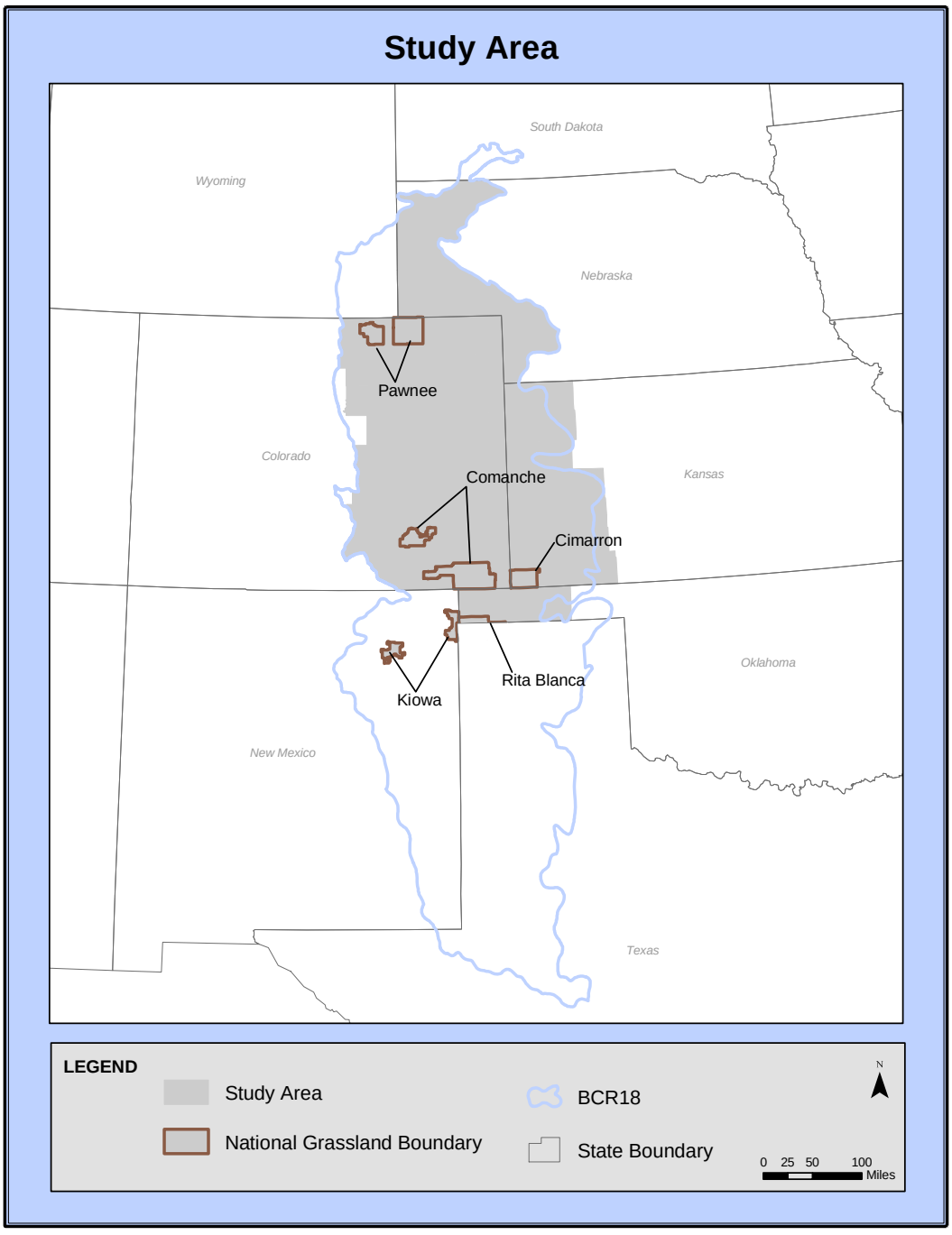

Figure 1. Section Survey 2005 study area.

Section Selection

The Public Land Survey System (PLSS) defines sections as 1-mi^2 parcels of land. Prior to the commencement of the project, we used GIS to randomly select homogenous sections (600 - 700 acres) of native prairie and dry-land agriculture that lie adjacent to at least one road.
We then randomly selected sections for survey in proportion to habitat availability in the BCR 18 region of each state. We also randomly selected additional native prairie sections for survey on the National Grasslands to ensure adequate sample size for local analyses. If during the field season, field observers determined a section was not representative of a designated habitat type, we replaced it with the closest qualifying section in a randomly selected direction. A GIS layer of CRP coverage is not available in most counties with the exception of Weld County, Colorado, so most CRP sections were identified on the ground and surveyed in replacement of non-qualifying sections or sections that were incorrectly identified as native prairie or dry-land agriculture in the GIS layer. Consequently the majority of CRP sections in Colorado are located in Weld County. In 2005, we selected 2,368 sections for survey – 1,755 of native prairie habitat, 553 of dry-land agriculture habitat (32 of these were converted into irrigated agriculture in KS), and 60 of land in CRP (Fig. 2).

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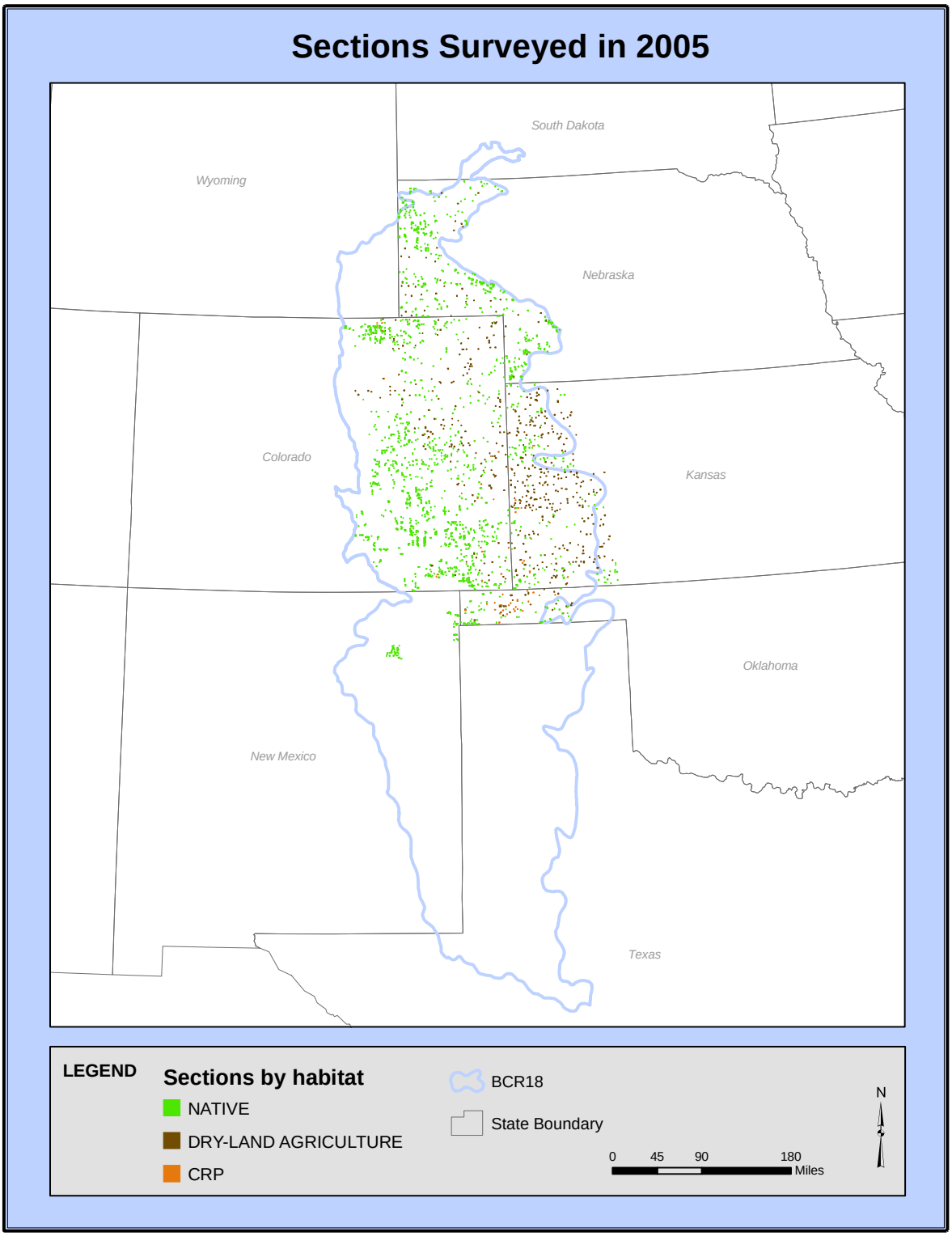

Figure 2. Sections surveyed by habitat type.

Point Count Locations at each Section

At each surveyed section, we conducted three road-based point counts. Three point counts per section maximizes the number of species detected and the number of sections surveyed per day; four counts per section do not yield significantly more species detections per section (Hanni 2002). We used a point-count data collection process, modified from Buckland et al. (1993) and Ralph et al. (1993), to establish road-based point count locations. We distributed point count locations on the roads bordering each section based on the number of roads surrounding the section (Fig. 3). For example, at sections adjacent to only one road, three point counts were conducted from that road. On sections bordered by two roads, we conducted two point counts along one road, and one point count along the other. On sections bordered by three roads, we conducted one point count along each road. Where four roads surrounded the section, we randomly selected one road for elimination, then we treated the section as a three-road section. Point count locations along each road were determined using a random number table and were recorded using a Garmin *etrex* global positioning system (GPS) unit. All point count locations were at least 0.2 mi apart and 0.1 mi from the section corners.

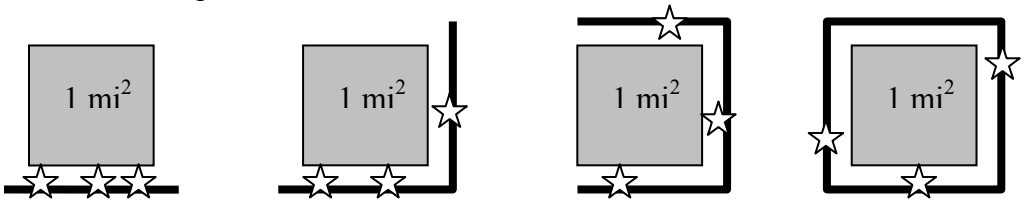

Figure 3. Examples of point count locations (stars) at a surveyed section (1-mi^2). The number of point count locations on each road (black lines) was based on the number of roads adjacent to the section. Locations of point counts along each road were determined using a random number table, spaced at least 0.2 mi apart and 0.1 mi from the section corners.

Data Collection

RMBO provided observer training at the Central Plains Experimental Range near Pawnee National Grassland, Colorado. Training consisted of three consecutive days via lecture and field practice. By the end of training, we deemed all observers proficient in grassland bird identification (visual and aural), distance estimation with rangefinders, GPS use, mapping skills, methodologies, vegetation identification and classification, and shrub cover estimation. RMBO provided each of the technicians with recordings of the songs and calls of grassland birds to continue sharpening bird identification skills after the three-day training period. Each of the technicians also received a reference guide to percent shrub cover that illustrated examples of actual percent cover for each of the different shrub species encountered in the field.

Observers conducted section-based surveys between 15 May and 4 July 2005. We considered arrival and reproductive periods of early and late-breeding bird species in our assumption that the majority of the species were on their breeding territories during this time frame. However, all birds detected were not necessarily local breeders. Observers conducted section-based counts from sunrise until no later than 1100 hours when detectable activity typically lessened or ceased. We recorded survey "start" and "end" times. Technicians did not conduct surveys during periods of rain or winds in excess of 18 mph. Observers recorded weather conditions, including percent cloud cover, wind speed (Beaufort scale), and temperature (Fahrenheit). We

documented the legal description, Township, Range, and Section (TRS), of the surveyed sections, at which the observer conducted three 5-minute point counts from the road looking 180° into the section. For each bird seen and/or heard within the section, the observer recorded species, sex (if known), distance from observer to point of first detection, method of detection (e.g., visually or aurally), and associated habitat (e.g., shrub, ground, or fence). We determined distance using a Bushnell Yardage Pro 500 Rangefinder. We recorded raptors and swallows detected at the section assuming that they were using the habitat; however, we tallied other birds flying over a section separately.

We treated all dependent detections of individual birds as part of a 'cluster' together with the first independently observed bird, rather than as separate independent observations of those individuals. This means that if detection of an individual bird is dependent upon the previous detection of another individual, the resulting observation is recorded as one independent detection with a cluster size of C, where C is the original individual detected plus the sum of any additional individuals detected as a result of the first individual revealing its presence. For example, a bird sings, and as a result, the observer detects a second individual. The resulting observation is recorded as a single detection with a cluster size of two birds. This practice ensures that we adhere more strictly to the assumption that all observations are independent of each other.

From each point count location, the observer recorded vegetation characteristics within a 150 m radius semi-circle within the section. Characteristics recorded include grass height, percent shrub cover, shrub species, and dominant shrub species. Grass height was classified as <15 cm or >15 cm (~ankle height). Where both height classifications existed, the proportion of each was recorded. Shrub cover was classified as <1%, 1%-3%, >3%-10%, or >10%.

Observers sketched locations of all Black-tailed Prairie Dog colonies and playas visible within the section onto a data sheet and a map. Observers scanned all colonies and playas with binoculars to document the occurrence of Burrowing Owls and Mountain Plovers. Raptor nests were documented by recording UTM coordinates and marking the location on a map.

Data Analysis

We used program DISTANCE version 5.0 (Thomas 1998-99) to analyze the point count data. Buckland et al. (1993) developed the notation, concepts, and analysis methods of DISTANCE . We calculated density estimates (D) for any species that had a minimum of 20 observations or had a coefficient of variation (CV) of less than 50%. We did not include flyover detections in the DISTANCE analysis except for raptors, swallows and Common Nighhawk, which were assumed to be using the section. In 2005, we obtained density estimates by analyzing the data in the form of dependent observations or "clusters". We implemented this type of analyses to improve on the assumption of independent detections for species occurring in clusters. The four models used to find the most appropriate detection function were Half-normal Cosine, Uniform Cosine, Half-normal Hermite Polynomial and Hazard-rate Simple Polynomial. Analysis using DISTANCE assumes that: 1) all birds at distance zero are detected, 2) distances of the birds close to the points or line are measured accurately, and 3) birds do not move in response to the observer's presence. In this analysis, we documented birds occurring within a 180˚ semicircle,

so, we adjusted the sampling effort to 0.5. Unfortunately, this year data from Oklahoma were excluded from density analyses due to the failure to record all distance data in that state.

Density estimates are provided for an interval of three years (2003 to 2005) at the BCR scale in native prairie habitat for species of Regional Importance, Continental Concern or Stewardship species designated by Partners in Flight.

We used Comprehensive Wildlife Conservation Strategies (CWCS) and USFS Region 2 sensitive species matrix to identify species of concern and PIF's species assessment database to designate species of importance.

We calculated the index of relative abundance, represented by graded map symbols in the species' distribution maps, to reflect the average number of birds per point count for each section. This number was calculated by dividing the total number of individuals for each species detected on the section by the number of point counts conducted on that section.

Results

BCR 18

In 2005, we observed 118 bird species (Appendix A) during section-based monitoring conducted in the BCR 18 portions of Colorado, Kansas, Nebraska and Oklahoma and on four National Grasslands; Cimarron, Comanche, Kiowa and Pawnee National Grasslands (Fig. 1). An asterisk for table 1 indicates a significant difference (confidence intervals that do not overlap) in density estimate for at least one of the years. An asterisk for 2005 density estimates represent bird species with significantly higher density estimates (confidence intervals that do not overlap) when compared to other habitat types within the same management unit.

BCR 18 (2003-2005)

There were 15 species of Regional Importance, Continental Concern or Stewardship species designated by Partners in Flight with sufficient number of detections, (2003 to 2005) for analysis at the BCR scale in native prairie habitat (Table 1). These were Scaled Quail, Swainson's Hawk, Ferruginous Hawk, Burrowing Owl, Common Nighthawk, Loggerhead Shrike, Cassin's Sparrow, Brewer's Sparrow, Lark Sparrow, Lark Bunting, Grasshopper Sparrow, McCown's Longspur, Chestnut-collared Longspur, Dickcissel and Western Meadowlark.

Table 1. Estimated densities for species of Regional and Continental Concern detected in native prairie habitat within BCR 18 during 2003-2005..

Common Name	Year	D	D LCL	D UCL	D CV	n
Scaled Quail	2003	0.20	0.13	0.31	22%	46
Scaled Quail	2004	0.28	0.17	0.44	24%	65
Scaled Quail	2005	0.37	0.23	0.59	24%	52
Swainson's Hawk	2003	0.34	0.25	0.47	17%	103
Swainson's Hawk	2004	0.28	0.21	0.36	13%	138
Swainson's Hawk*	2005	0.94	0.60	1.48	23%	117
Ferruginous Hawk	2003	0.16	0.07	0.37	43%	12
Ferruginous Hawk	2004	0.03	0.01	0.08	44%	20

Common Name	Year	D	D LCL	D UCL	D CV	n
Ferruginous Hawk	2005	0.04	0.02	0.08	37%	20
Burrowing Owl	2003	0.51	0.34	0.77	21%	74
Burrowing Owl	2004	0.44	0.32	0.61	16%	122
Burrowing Owl	2005	0.53	0.31	0.91	28%	102
Common Nighthawk	2003	1.67	1.19	2.34	17%	132
Common Nighthawk	2004	1.28	1.02	1.61	12%	220
Common Nighthawk	2005	1.03	0.83	1.29	11%	184
Loggerhead Shrike	2003	1.73	1.12	2.70	23%	69
Loggerhead Shrike	2004	0.98	0.62	1.54	23%	36
Loggerhead Shrike	2005	1.06	0.70	1.61	21%	69
Cassin's Sparrow	2003	17.38	15.24	19.82	7%	1168
Cassin's Sparrow*	2004	8.56	7.47	9.81	7%	1122
Cassin's Sparrow*	2005	11.31	9.99	12.80	6%	1226
Brewer's Sparrow	2003	0.32	0.19	0.54	28%	26
Brewer's Sparrow*	2004	1.50	0.85	2.65	29%	36
Brewer's Sparrow*	2005	2.01	1.26	3.22	24%	68
Lark Sparrow	2003	17.17	14.84	19.88	8%	641
Lark Sparrow	2004	21.27	18.12	24.97	8%	877
Lark Sparrow	2005	19.45	16.67	22.70	8%	844
Lark Bunting	2003	35.19	30.51	40.58	7%	2625
Lark Bunting	2004	38.38	34.76	42.38	5%	3692
Lark Bunting*	2005	30.25	27.23	33.61	5%	2954
Grasshopper Sparrow	2003	21.47	17.83	25.86	9%	618
Grasshopper Sparrow*	2004	10.51	8.61	12.82	10%	613
Grasshopper Sparrow*	2005	29.25	25.10	34.09	8%	879
McCown's Longspur	2003	1.54	0.94	2.53	26%	46
McCown's Longspur	2004	1.61	1.12	2.30	19%	185
McCown's Longspur	2005	1.56	1.04	2.34	21%	153
Chestnut-collared Longspur	2003	0.10	0.05	0.22	40%	20
Chestnut-collared Longspur*	2004	1.39	0.95	2.03	20%	158
Chestnut-collared Longspur	2005	0.96	0.64	1.42	20%	128
Dickcissel	2003	1.35	0.69	2.62	34%	38
Dickcissel	2004	0.51	0.28	0.91	30%	45
Dickcissel*	2005	1.85	1.26	2.71	20%	117
Western Meadowlark	2003	50.74	45.66	56.38	5%	4801
Western Meadowlark*	2004	26.24	24.58	28.02	3%	5092
Western Meadowlark*	2005	34.94	33.56	36.38	2%	5398

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D.

BCR 18 (2005)

Habitat

In program Distance our sample size by habitat was 1,694 native, 496 dry-land agriculture and 33 CRP sections (we excluded OK sections). We documented 111 species in native prairie habitat in BCR 18, of which 32 (29%) were found exclusively in native prairie habitat. We were able to obtain a sufficient number of detections to estimate density for 45 species in this habitat (Table 2). Four species had higher densities (*) in native prairie. We documented 85 species in dry-land agriculture; 20 had a sufficient number of detections to estimate density (Table 3). Highest densities (*) for two species occurred in dry-land agriculture (Table 3). We documented 36 species in CRP habitat. Of those species, five had a sufficient number of detections to estimate density (Table 3). Highest density estimates (*) for two species occurred in CRP habitat (Table 4).

Table 2. Estimated densities for species detected in native prairie habitat within BCR 18.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Ring-necked Pheasant	0.45	0.27	0.73	25%	131	
Scaled Quail	0.37	0.23	0.59	24%	52	X
Northern Bobwhite	0.25	0.16	0.39	23%	46	X
Turkey Vulture	0.10	0.07	0.16	23%	35	
Northern Harrier	0.08	0.04	0.13	29%	28	X
Swainson's Hawk	0.94	0.60	1.48	23%	117	X
Red-tailed Hawk	0.14	0.10	0.20	18%	57	
Ferruginous Hawk	0.04	0.02	0.08	37%	20	X
American Kestrel	0.29	0.20	0.43	20%	80	
Killdeer	1.75	1.32	2.31	14%	124	
Upland Sandpiper	0.19	0.10	0.33	30%	18	X
Long-billed Curlew	0.09	0.05	0.19	36%	22	X
Mourning Dove	19.90	17.49	22.64	7%	1271	
Burrowing Owl	0.53	0.31	0.91	28%	102	X
Common Nighthawk	1.03	0.83	1.29	11%	184	X
Say's Phoebe	0.64	0.42	0.98	22%	49	X
Cassin's Kingbird	0.13	0.06	0.29	40%	16	X
Western Kingbird	12.09	10.08	14.50	9%	614	
Eastern Kingbird	3.30	2.41	4.53	16%	94	
Loggerhead Shrike	1.06	0.70	1.61	21%	69	X
Horned Lark	103.40	97.37	109.80	3%	5467	
Northern Rough-winged Swallow	1.03	0.62	1.71	26%	33	
Bank Swallow	0.17	0.08	0.38	42%	19	
Cliff Swallow*	52.17	26.69	101.94	35%	191	
Barn Swallow	15.88	11.43	22.07	17%	184	
Rock Wren	0.80	0.38	1.67	39%	23	
American Robin	1.00	0.61	1.62	25%	30	
Northern Mockingbird	0.53	0.41	0.70	14%	101	
European Starling	1.17	0.78	1.75	21%	62	
Cassin's Sparrow*	11.31	9.99	12.80	6%	1226	X

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Brewer's Sparrow	2.01	1.26	3.22	24%	68	X
Vesper Sparrow	0.43	0.22	0.84	35%	27	X
Lark Sparrow*	19.45	16.67	22.70	8%	844	X
Lark Bunting	30.25	27.23	33.61	5%	2954	X
Grasshopper Sparrow	29.25	25.10	34.09	8%	879	X
McCown's Longspur	1.56	1.04	2.34	21%	153	X
Chestnut-collared Longspur	0.96	0.64	1.42	20%	128	X
Blue Grosbeak	0.83	0.42	1.66	36%	17	
Dickcissel	1.85	1.26	2.71	20%	117	X
Red-winged Blackbird	3.01	2.35	3.85	13%	247	
Western Meadowlark	34.94	33.56	36.38	2%	5398	X
Brewer's Blackbird	0.32	0.15	0.65	38%	24	
Common Grackle	1.82	1.25	2.66	19%	104	
Brown-headed Cowbird*	3.45	2.18	5.45	24%	144	
Orchard Oriole	1.79	1.03	3.11	29%	34	
Bullock's Oriole	2.19	1.21	3.97	31%	47	
House Sparrow	3.24	1.79	5.85	31%	41	

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (2005) and/or participating state and federal agencies.

Table 3. Estimated densities for species detected in dry-land agriculture within BCR 18.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Ring-necked Pheasant	2.72	2.10	3.51	13%	224	
Swainson's Hawk	0.47	0.24	0.93	35%	31	X
Killdeer	11.46	6.64	19.79	28%	23	
Mourning Dove	18.63	15.46	22.46	10%	512	
Western Kingbird	7.89	5.84	10.64	15%	127	
Horned Lark	100.99	93.25	109.37	4%	2070	
Cliff Swallow	1.35	0.69	2.63	35%	20	
Barn Swallow	16.25	11.45	23.06	18%	45	
American Robin	0.87	0.46	1.63	33%	21	
European Starling	1.18	0.66	2.11	30%	26	
Cassin's Sparrow	1.07	0.43	2.62	48%	21	X
Lark Sparrow	3.44	1.75	6.74	35%	21	X
Lark Bunting	28.39	23.70	34.01	9%	791	X
Grasshopper Sparrow	31.48	25.84	38.35	10%	291	X
Dickcissel*	4.94	3.45	7.08	18%	86	X
Red-winged Blackbird*	34.03	28.99	39.96	8%	768	
Western Meadowlark	22.52	20.07	25.27	6%	1042	X
Common Grackle	4.09	2.27	7.39	31%	85	

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Brown-headed Cowbird	0.61	0.31	1.22	35%	19	
House Sparrow	2.09	1.17	3.72	30%	32	

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (2004) and/or participating state and federal agencies.

Table 4. Estimated densities for species detected in CRP habitat within BCR 18.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Mourning Dove	35.94	19.01	67.94	33%	31	
Horned Lark	93.62	59.45	147.44	23%	54	
Lark Bunting*	72.95	42.86	124.14	27%	98	X
Grasshopper Sparrow*	155.40	106.02	227.77	19%	75	X
Western Meadowlark	39.74	28.84	54.75	16%	128	X

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (2005) and/or participating state and federal agencies.

States

Nebraska

In Nebraska we sampled 403 native prairie and 44 dry-land agriculture sections. We observed 87 species in the BCR 18 portion of Nebraska (Appendix A). Of those species, 34 had a sufficient number of observations to estimate density in native prairie habitat (Table 5). Western Meadowlark had a higher density (*) within this habitat compared to dry-land agriculture. Seven species had sufficient detections in dry-land agriculture (Table 6) with Red-winged Blackbird having a higher density (*) compared to native prairie.

Table 5. Estimated densities for species detected in native prairie within the BCR 18 portion of Nebraska.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Ring-necked Pheasant	1.12	0.76	1.67	20%	70	
Red-tailed Hawk	0.25	0.15	0.43	27%	23	
American Kestrel	0.38	0.26	0.56	20%	38	
Killdeer	0.67	0.39	1.17	29%	26	
Upland Sandpiper	0.90	0.49	1.67	32%	15	
Mourning Dove	24.62	19.34	31.33	12%	422	
Burrowing Owl	0.68	0.33	1.38	37%	25	X,NE
Common Nighthawk	0.51	0.29	0.89	29%	34	X
Say's Phoebe	0.45	0.24	0.82	32%	18	X
Western Kingbird	13.38	9.48	18.88	18%	157	
Eastern Kingbird	4.62	3.07	6.93	21%	51	
Loggerhead Shrike	0.63	0.36	1.08	28%	26	X

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Horned Lark	109.75	92.02	130.90	9%	1314	
Northern Rough-winged Swallow	2.17	1.11	4.25	35%	17	
Cliff Swallow	57.28	30.78	106.59	32%	65	
Barn Swallow	7.42	5.09	10.83	19%	62	
Rock Wren	1.84	0.90	3.77	38%	22	
American Robin	1.31	0.62	2.79	40%	21	
Northern Mockingbird	0.34	0.18	0.65	33%	19	
European Starling	1.26	0.63	2.49	36%	22	
Cassin's Sparrow	1.27	0.82	1.98	23%	34	X
Vesper Sparrow	0.90	0.37	2.19	47%	19	
Lark Sparrow	43.18	33.34	55.91	13%	335	X
Lark Bunting	25.22	17.07	37.26	20%	513	X
Grasshopper Sparrow	83.90	69.61	101.12	10%	506	X
McCown's Longspur	0.46	0.23	0.92	37%	22	X,NE
Chestnut-collared Longspur	3.23	2.10	4.97	22%	111	X,NE
Dickcissel	3.61	2.08	6.27	29%	43	X
Red-winged Blackbird	4.01	2.51	6.42	24%	63	
Western Meadowlark*	57.35	51.52	63.84	5%	1793	X
Common Grackle	3.67	1.99	6.77	32%	37	
Brown-headed Cowbird	6.99	4.86	10.07	19%	87	
Orchard Oriole	5.07	3.06	8.41	26%	25	
Bullock's Oriole	2.99	1.44	6.22	38%	25	

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X) or Nebraska's CWCS (NE).

Table 6. Estimated densities for species detected in dry-land agriculture within the BCR 18 portion of Nebraska.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Mourning Dove	14.65	9.56	22.44	22%	46	
Western Kingbird	8.39	4.16	16.94	36%	15	
Horned Lark	103.00	79.09	134.15	13%	189	
Lark Bunting	8.74	4.53	16.84	34%	28	X,NE
Grasshopper Sparrow	54.57	28.56	104.29	33%	23	X,NE
Red-winged Blackbird*	37.22	21.00	65.96	29%	51	
Western Meadowlark	24.50	17.35	34.61	18%	83	

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X) or Nebraska's CWCS (NE).

Colorado

In Colorado we sampled 1075 native prairie, 157 dry-land agriculture and 19 CRP sections. We observed 89 species in the BCR 18 portion of Colorado (Appendix A). Of those species, 33 had a sufficient number of detections to estimate density in native prairie habitat (Table 7), 11 had

sufficient numbers in dry-land agriculture (Table 8) and two species had highest densities (*) within this habitat compared to other habitats. In CRP habitat one species had a highest (*) density (Table 9) compared to other habitats.

Table 7. Estimated densities for species detected in native prairie habitat within the BCR 18 portion of Colorado.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Ring-necked Pheasant	0.17	0.10	0.29	28%	30	
Scaled Quail	0.49	0.30	0.82	26%	48	X,CO
Swainson's Hawk	0.86	0.56	1.33	22%	84	X,CO
Red-tailed Hawk	0.10	0.06	0.16	24%	36	
American Kestrel	0.34	0.19	0.60	30%	26	
Killdeer	2.04	1.12	3.73	31%	89	
Mourning Dove	17.44	14.39	21.12	10%	701	
Burrowing Owl	0.51	0.34	0.76	21%	65	X,CO
Common Nighthawk	1.06	0.78	1.43	15%	111	X
Say's Phoebe	0.56	0.33	0.96	28%	27	X
Western Kingbird	11.47	9.31	14.13	11%	384	
Eastern Kingbird	1.02	0.51	2.03	36%	26	
Loggerhead Shrike	1.21	0.69	2.14	29%	39	X,CO
Horned Lark	112.05	104.75	119.86	3%	3723	
Cliff Swallow	44.00	22.60	85.68	35%	39	
Barn Swallow	11.75	7.47	18.49	23%	80	
Northern Mockingbird	0.57	0.42	0.78	16%	81	
European Starling	1.20	0.58	2.47	38%	29	
Cassin's Sparrow	11.97	10.37	13.81	7%	904	X,CO
Brewer's Sparrow	2.93	1.82	4.73	25%	66	X,CO
Vesper Sparrow	0.20	0.09	0.48	45%	25	CO
Lark Sparrow	12.90	10.01	16.61	13%	404	X
Lark Bunting	34.84	31.13	39.00	6%	2311	X,CO
Grasshopper Sparrow	9.23	6.96	12.24	14%	154	X
McCown's Longspur	2.72	1.79	4.14	22%	123	X,CO
Chestnut-collared Longspur	0.49	0.19	1.26	51%	16	X,CO
Dickcissel	2.91	1.08	7.83	53%	23	X
Red-winged Blackbird	2.48	1.81	3.40	16%	148	
Western Meadowlark	21.68	19.31	24.34	6%	2797	X
Common Grackle	1.77	0.95	3.32	33%	48	
Brown-headed Cowbird	1.16	0.76	1.76	22%	54	
Bullock's Oriole	2.29	1.31	4.00	29%	30	
House Sparrow	4.32	1.99	9.40	41%	23	

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X) or Colorado's CWCS (CO).

Table 8. Estimated densities for species detected in dry-land agriculture within the BCR 18 portion of Colorado.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Ring-necked Pheasant*	2.08	1.09	3.97	33%	33	
Swainson's Hawk	0.73	0.37	1.45	35%	23	X,CO
Mourning Dove	26.29	20.90	33.07	12%	181	
Western Kingbird	8.38	5.12	13.71	25%	75	
Horned Lark	147.16	128.55	168.46	7%	740	
Barn Swallow	6.71	3.23	13.94	38%	19	
Lark Bunting	56.26	43.81	72.26	13%	364	X,CO
Grasshopper Sparrow	12.15	7.68	19.22	24%	44	X
Red-winged Blackbird*	13.00	9.38	18.02	17%	122	
Western Meadowlark	22.22	17.80	27.74	11%	405	X
Common Grackle	6.84	2.92	16.04	45%	27	

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X) or Colorado's CWCS (CO).

Table 9. Estimated densities for species detected in CRP habitat within the BCR 18 portion of Colorado.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Mourning Dove	21.00	8.98	49.11	44%	19	
Horned Lark	37.58	21.46	65.80	28%	23	
Lark Bunting	111.11	62.64	197.07	28%	83	X,CO
Grasshopper Sparrow*	77.40	43.05	139.15	29%	31	X
Western Meadowlark	36.76	21.63	62.45	27%	69	X

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X) or Colorado's CWCS (CO).

Kansas

In Kansas we sampled 158 native prairie, 295 dry-land agriculture and14 CRP sections. We observed 62 species in the BCR 18 portion of Kansas (Appendix A). Of those species, 16 had a sufficient number of detections to estimate density in native prairie habitat (Table 9), 11 had sufficient numbers in dry-land agriculture (Table 11) and three in CRP (Table 12). Grasshopper Sparrow occurred in highest density (*) in CRP habitat and Red-winged Blackbird occurred in highest density in dry-land agriculture compared to other habitats.

Table 10. Estimated densities for species detected in native prairie habitat within the BCR 18 portion of Kansas.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Ring-necked Pheasant	1.27	0.64	2.52	35%	30	
Northern Bobwhite	2.06	1.17	3.64	29%	24	KS

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Mourning Dove	26.43	19.59	35.66	15%	137	
Common Nighthawk	2.96	1.87	4.69	24%	44	X
Western Kingbird	9.08	5.81	14.19	23%	51	X,KS
Eastern Kingbird	16.92	8.99	31.85	33%	22	X,KS
Horned Lark	58.46	46.61	73.32	12%	272	
Cliff Swallow	47.38	23.70	94.72	36%	26	
Barn Swallow	111.16	49.71	248.58	42%	20	
Cassin's Sparrow	30.99	23.62	40.66	14%	185	X,KS
Lark Sparrow	53.61	33.79	85.04	24%	45	X,KS
Grasshopper Sparrow	43.64	33.57	56.74	13%	167	X,KS
Dickcissel	4.63	2.54	8.44	31%	33	X,KS
Red-winged Blackbird	6.42	2.87	14.33	42%	26	
Western Meadowlark	44.48	38.75	51.06	7%	666	X
Brown-headed Cowbird	3.73	2.13	6.53	29%	20	

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognizedi by Partners in Flight (X) or Kansas's CWCS (KS).

Table 11. Estimated densities for species detected in dry-land agriculture within the BCR 18 portion of Kansas.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Ring-necked Pheasant	2.56	2.04	3.23	12%	161	
Mourning Dove	24.80	17.62	34.90	18%	191	
Western Kingbird	10.05	5.80	17.43	28%	39	KS
Horned Lark	126.04	113.11	140.43	6%	1139	
Barn Swallow	43.93	25.18	76.63	29%	29	
Lark Bunting	32.43	24.57	42.81	14%	388	X,KS
Grasshopper Sparrow	45.79	35.70	58.74	13%	249	X,KS
Dickcissel	6.57	4.29	10.05	22%	69	X,KS
Red-winged Blackbird*	63.84	52.75	77.25	10%	583	
Western Meadowlark	25.52	22.24	29.29	7%	542	X
Common Grackle	2.80	1.61	4.88	29%	38	

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X) or Kansas's CWCS (KS).

Table 12. Estimated densities for species detected in CRP habitat within the BCR 18 portion of Kansas.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Horned Lark	120.83	64.83	225.23	30%	27	
Grasshopper Sparrow*	160.32	92.06	279.18	28%	45	X,KS
Western Meadowlark	52.75	33.77	82.40	23%	58	X

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X) or Kansas's CWCS (KS).

Oklahoma

We sampled 113 sections in Oklahoma of which 61 were native prarie, 27 were dry-land agriculture and 25 were CRP sections. Forty five bird species were detected in native prarie, 31 species in dry-land agriculture and 33 in CRP.

United States Forest Service

We observed 62 species on 267 sections surveyed on Pawnee, Comanche, Kiowa and Cimarron National Grasslands (Appendix A). Of those species, 17 had a sufficient number of detections to estimate density (Table 13).

Table 13. Estimated densities for species detected in native prairie habitat on USFS lands (Pawnee, Comanche, Kiowa, Cimarron and Rita Blanca National Grasslands) within BCR 18.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Swainson's Hawk	0.52	0.24	1.12	40%	20	X
Mourning Dove	27.49	11.62	65.03	45%	73	
Burrowing Owl	0.72	0.28	1.85	49%	14	X,USFS
Western Kingbird	11.68	5.93	23.02	35%	23	
Horned Lark	115.95	99.86	134.63	8%	592	
Cassin's Sparrow	25.33	19.81	32.40	13%	272	X,USFS
Brewer's Sparrow	6.34	2.51	16.03	50%	25	X,USFS
Lark Sparrow	11.53	8.07	16.47	18%	85	X
Lark Bunting	46.12	35.94	59.19	13%	364	X
Grasshopper Sparrow	16.25	10.43	25.30	23%	64	X,USFS
McCown's Longspur	8.17	4.56	14.64	30%	51	X,USFS
Western Meadowlark	26.85	22.46	32.10	9%	561	X

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X), USFS Region 2 (USFS).

Pawnee National Grassland.

We sampled 47 sections and observed 25 species on Pawnee (Appendix A). Five species had enough detections to estimate density (Table 14).

Table 14. Estimated densities for species detected in native prairie habitat on Pawnee National Grassland.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Horned Lark	303.17	231.45	397.11	14%	227	
Brewer's Sparrow	32.98	12.89	84.41	50%	24	X,USFS
Lark Bunting	79.14	52.79	118.63	21%	187	X
McCown's Longspur	39.18	23.08	66.49	27%	50	X,USFS
Western Meadowlark	22.82	14.45	36.04	23%	63	X

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X), USFS Region 2 (USFS).

Comanche National Grassland.

We sampled 133 sections and observed 38 species on Comanche (Appendix A). Nine species had enough detections to estimate density (Table 15).

Table 15. Estimated densities for species detected in native prairie habitat on Comanche National Grassland.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Mourning Dove	15.27	7.23	32.28	39%	26	
Horned Lark	39.95	32.12	49.70	11%	226	
Cassin's Sparrow	21.1	15.61	28.52	15%	208	X,USFS
Lark Sparrow	9.26	6.49	13.20	18%	60	X
Lark Bunting	7.73	5.44	10.98	18%	84	X
Grasshopper Sparrow	14.92	9.31	23.89	24%	47	X,USFS
Dickcissel	3.02	1.04	8.74	58%	16	X
Western Meadowlark	22.64	17.91	28.61	12%	201	X

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X), USDA Forest Region 2 (USFS).

Cimarron National Grassland.

We sampled 29 sections and observed 30 species on Cimarron (Appendix A). Five were detected frequently enough to estimate density (Table 16).

Table 16. Estimated densities for species detected in native prairie habitat on Cimarron National Grassland.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Mourning Dove	9.45	4.66	19.14	36%	19	
Horned Lark	66.84	33.31	134.10	36%	32	
Cassin's Sparrow	94.6	62.08	144.15	21%	81	X,USFS
Grasshopper Sparrow	58.64	37.4	91.95	23%	39	X,USFS
Western Meadowlark	47.53	35.79	63.11	14%	115	X

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recoginzed by Partners in Flight (X), USDA Forest Region 2 (USFS).

Kiowa National Grassland.

We sampled 58 sections and observed 41 species on Pawnee (Appendix A). Six species had enough detections to estimate density (Table 17).

Table 17. Estimated densities for species detected in native prairie habitat on Kiowa National Grassland.

Common Name	D	D LCL	D UCL	D CV	n	Species of Concern
Mourning Dove	37.76	18.71	76.22	36%	19	
Horned Lark	126.67	86.54	185.41	19%	118	
Cassin's Sparrow	75.10	43.59	129.4	28%	63	X
Lark Sparrow	26.51	13.24	53.11	36%	28	X
Lark Bunting	125.88	72.68	218.04	28%	98	X
Western Meadowlark	39.53	30.03	52.04	14%	129	X

D = density estimate expressed in birds/km^2, D LCL & D UCL = lower and upper 95% confidence limits of D, D CV = coefficient of variation for D, n = number of detections used to calculate D. Species of importance as recognized by Partners in Flight (X), USDA Forest Region 3 (USFS).

Discussion

Monitoring programs provide insight into the abundance, distribution, and population trends of birds that can help guide land managers in making biologically-based decisions and in developing sound resource management plans. Monitoring is important for large-scale conservation planning in that it tracks the status of habitats and species and can be used to test underlying management assumptions and hypotheses (Samson et al. 2003). The North American Bird Conservation Initiative (NABCI) has developed a framework for continental bird conservation using Bird Conservation Regions (BCRs), biologically based planning and implementation units that contain similar environments and bird communities. Monitoring, research and conservation programs that are developed and implemented at the BCR level are ultimately more biologically meaningful and cost-effective than those developed for smaller scales. However, much of the information needed to implement conservation plans (estimates of abundance, population change, survival and productivity, habitat availability and change, and bird habitat interactions) does not presently exist at the BCR scale (Sauer et al. 2003). The goal of NABCI is for states, Joint Ventures, federal agencies, and conservation groups within BCRs to develop "regionally-based, biologically driven partnerships." RMBO has been instrumental in creating these partnerships for the Shortgrass Prairie BCR by gaining the cooperation and financial support of Colorado Division of Wildlife, Nebraska Game and Parks Commission, Kansas Parks and Wildlife, United States Forest Service, and the Oklahoma Department of Wildlife Conservation, in implementing a region-wide section-based inventory and monitoring program. Long term commitment by partners is needed to achieve the multiple goals of this program. Cooperative partnerships, such as that between RMBO and its partners here, help relieve the burden on any single entity in supporting the costs of long-term monitoring and thus are an effective way to sustain long-term monitoring programs. Such partnerships also result in the use of standardized methodologies, which allow for greater comparability and enhanced interpretation of results region-wide.

Cooperation at the BCR level has allowed RMBO to provide detailed information on the distribution, abundance, and habitat use of grassland bird species across much of the Shortgrass Prairie ecosystem, something that has never before been available. Through the section-based survey program, RMBO should also be able to identify statistically significant ($\alpha = .1$) population trends for 46 upland breeding species in BCR 18 within 5 - 20 years (CV = 3%, 41% respectively), based on a power analysis using program TRENDS (Gerrodette 1987, 1991 and 1993). Included in this list are 16 species of Continental or Regional Concern within BCR 18 according to the Partners in Flight (PIF Species Assessment Database 2005). Thirteen species of concern are recognized by states and federal agencies participating in this grassland bird monitoring program.

Grasslands are characterized by their extreme weather patterns and variable vegetation structure. As a result, grassland vegetation structure such as grass height can display large annual variation. Bird density may be influenced by these local habitat characteristics but Winter et al. (2005) found few vegetation variables that clearly affected bird density for three grassland bird species in tall-grass. High variability in grassland systems warrants the need for long-term and large-scale studies to identify patterns of and understand causes for variability in grassland bird density (Winter et al., 2005). Igl and Johnson (1999) also emphasize the need for grassland nesting bird

studies to encompass a large geographical region and over several years. We intend to build a generalized linear regression model using our vegetation data to examine how proportion of grass cover (>15 cm), proportion of shrub cover and shrub species explain habitat use in the shortgrass prarie mosaic.

Data gathered using section-based surveys could also be used to identify and delineate areas important to breeding prairie birds. Using GIS, we may be able to model breeding distributions using spatial statistics. We then could create maps delineating hot spots for some species, or groups of species to help inform land managers of areas of especially high importance. Utilizing this spatial information in association with precipitation and habitat data, we should be able to model breeding bird populations to determine which geographic areas consistently hold viable populations of prairie birds.

This report provides detailed species accounts that compare density estimates of individual species among states, habitats, and management units. The ability to observe different density estimate resolutions simultaneously (grassland, state, regional) provides insight into population dynamics which may be misinterpreted without the regional (BCR) perspective. An important biological consideration tied to the possibility of misinterpreting population trends without the regional perspective is that many shortgrass prairie bird species are nomadic within their breeding range. Armed with a comprehensive perspective, local and regional land managers can enhance management for breeding shortgrass prairie bird species within BCR 18.

The North American Landbird Conservation Plan (Rich et al. 2004) acknowledges the necessity for population monitoring for all stages of conservation planning, from identifying factors affecting population change to evaluating the success of conservation actions. Three of the six species assessment factors used by Partners in Flight to assess species conservation status are population size, breeding distribution and population trend. Section Survey data provide high-resolution data on these three assessment factors for the Shortgrass Prairie Bird Conservation Region (18). Reliable estimates of population size, population trends and breeding distribution are critical to the effective management and conservation of grassland birds in this region.

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We would like to thank the Colorado Division of Wildlife, Nebraska Game and Parks Commission, Kansas Department of Wildlife and Parks, Oklahoma Department of Wildlife Conservation, and USDA Forest Service for seeing the importance of this project and giving the financial backing. We value these partnerships that were created in the pursuit of similar conservation goals. We would especially like to thank Ken Brunson, John Dinan, Dan Garcia, Melinda Hickman, David Klute, and John Sidle, for all of their administrative support. We would also like to thank Renee Rondeau and Georgia Doyle from the Colorado Natural Heritage Program for their logistical help with vegetation sampling techniques. A great deal of thought was put into determining techniques to monitor shortgrass prairie birds successfully. People involved include Mike Carter, Doug Faulkner, Scott Gillihan, Tony Leukering, Ted Toombs, and Tammy VerCauteren.

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This project could not have been completed without the help of the 2005 field crew.

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Appendix A Species detected by section-based surveys

Below is a comprehensive list of bird species detections through section-based monitoring, 15 May – 4 July 2005. Species are listed in taxonomic order.

	Colorado			Kansas			Nebraska		Oklahoma			U.S. Forest Service					
Species	CRP	AG	NATIVE	CRP	AG	NATIVE	AG	NATIVE	CRP	AG	NATIVE	Cimarron	Comanche	Kiowa	Pawnee	Rita Blanca	BCR 18
Canada Goose		1															1
Wood Duck							1	2									3
Gadwall			4				2										6
Mallard		6	13		11	9	6	13	2	3	5					2	68
Blue-winged Teal							1										1
Northern Pintail			1				3										4
Green-winged Teal								1									1
Ring-necked Pheasant	4	44	30	16	223	58	10	73	24	28	36	29	2	2		5	548
Greater Prairie-Chicken								8									8
Wild Turkey								2									2
Scaled Quail	1		50			1			3	6	10	1	5	3		1	74
Northern Bobwhite		2	4		7	38		7	2		2	10	2	1			63
American White Pelican			6														6
Double-crested Cormorant		1	2														3
Great Blue Heron		1	9					1			2						13
Green Heron			1										1				1
Black-crowned Night-Heron										1				1			2
White-faced Ibis			1														1
Turkey Vulture			24		7	6		14			3	2	14	10			64
Northern Harrier		4	16	4	11	6		8	3	1	5				1		58
Cooper's Hawk								1						1			2
Swainson's Hawk	5	25	102		11	16	3	14	2	5	7	1	5	12	5		202
Red-tailed Hawk	1	5	38		1	5	1	23							1		74
Ferruginous Hawk			13	1	5	2		2				1	2	5			28
Golden Eagle			1					3									4
American Kestrel		4	43		1	4	2	38									92
Peregrine Falcon								1									1

	Colorado			Kansas			Nebraska		Oklahoma			U.S. Forest Service					
Species	CRP	AG	NATIVE	CRP	AG	NATIVE	AG	NATIVE	CRP	AG	NATIVE	Cimarron	Comanche	Kiowa	Pawnee	Rita Blanca	BCR 18
Prairie Falcon		1	6					1									8
American Coot					2												2
Killdeer		18	168	1	86	20	20	42	2	9	8	4	3	2	1	1	376
Mountain Plover		3	18												2		21
American Avocet			6				1			1							8
Lesser Yellowlegs							1										1
Willet							3	2									5
Upland Sandpiper		2	2		1		1	38									44
Long-billed Curlew		5	23		1			34	8	1	16		17	10		10	98
Wilson's Phalarope							1										1
Franklin's Gull										3							3
Black Tern					1	1											2
Rock Pigeon		9	17		8	12	10	2	4		4	3					66
Mourning Dove	55	507	1762	38	601	334	140	823	146	73	184	46	137	54	28	10	4717
Greater Roadrunner			1														1
Great Horned Owl			2		1			1									4
Burrowing Owl		7	90		1	10	1	30	4	1	16	2	18	8	2	1	168
Short-eared Owl	1	1	7		2	1					1		3				13
Common Nighthawk	2	3	121	4	5	59		35	2	1	12	16	10	4	2	2	248
Common Poorwill					1												1
Chimney Swift							4										4
Broad-tailed Hummingbird			1					2									3
Red-headed Woodpecker			1			5	1	8				1					15
Northern Flicker			4			8	1	2									15
Olive-sided Flycatcher					1												1
Western Wood-Pewee			2					3									5
Willow Flycatcher			1														1
Eastern Phoebe					1												1
Say's Phoebe		4	31		1	3	2	21			2			6	1		70
Ash-throated Flycatcher			4										2				4

	Colorado			Kansas			Nebraska		Oklahoma			U.S. Forest Service					
Species	CRP	AG	NATIVE	CRP	AG	NATIVE	AG	NATIVE	CRP	AG	NATIVE	Cimarron	Comanche	Kiowa	Pawnee	Rita Blanca	BCR 18
Cassin's Kingbird		1	13	2	4	4		11				3	2	3			38
Western Kingbird	2	98	558	7	78	79	19	222	15	31	58	16	21	34	4	7	1201
Eastern Kingbird			32		1	31	7	71			3	1					145
Scissor-tailed Flycatcher					1	7					4						12
Loggerhead Shrike		3	45		1	1	12	28			5		1	6	3		101
Warbling Vireo								1									1
Blue Jay						1	1										2
Black-billed Magpie			4				1	2									7
American Crow		1	4	1	4	2	3	8				2					23
Chihuahuan Raven			40						1		3		19	15			59
Horned Lark	34	987	5514	52	1770	354	280	1936	123	186	149	58	441	224	299	27	11609
Tree Swallow			6					1									7
Violet-green Swallow								3									3
Northern Rough-winged Swallow		1	18			9	3	21	2				1				54
Bank Swallow							1	24	2		2						29
Cliff Swallow		9	176	2	22	60	5	110	1		17	1	5	10	2		412
Barn Swallow	2	27	138		71	54	9	89	17	16	18	4	5	15	5	3	456
Rock Wren			1			2	2	27							1		32
House Wren			1				1	6									8
Blue-gray Gnatcatcher			1														1
Western Bluebird			3										2				3
Mountain Bluebird			7					2									9
Swainson's Thrush		1															1
American Robin		9	29		4	1	20	30									93
Gray Catbird		1	1														2
Northern Mockingbird			99		3	5	1	19	1		3	2	15	8			139
Sage Thrasher			2					1									3
Brown Thrasher		1	2		1	2	1	9									16
Curve-billed Thrasher			1								1			2			4
European Starling		23	74		38	26	12	59	1			1					233

	Colorado			Kansas			Nebraska		Oklahoma			U.S. Forest Service					
Species	CRP	AG	NATIVE	CRP	AG	NATIVE	AG	NATIVE	CRP	AG	NATIVE	Cimarron	Comanche	Kiowa	Pawnee	Rita Blanca	BCR 18
Yellow Warbler		1	3					3		1							8
Spotted Towhee								1									1
Cassin's Sparrow	5	14	1191		12	254		51	19	5	198	114	381	127		17	1876
Chipping Sparrow			4		3	2				1	2						12
Brewer's Sparrow			76				3	3	2		6		2		26	3	90
Field Sparrow					2			1									3
Vesper Sparrow			27					19			4		1			3	50
Lark Sparrow		4	574		17	85	11	421	3	10	40	11	102	47	1	4	1212
Lark Bunting	124	501	3359	27	577	27	47	689	103	71	373	15	291	245	227	168	6143
Savannah Sparrow			4														4
Grasshopper Sparrow	35	45	216	60	307	196	29	604	165	36	122	52	51	12	8	11	1827
Lincoln's Sparrow											1						1
McCown's Longspur			170				4	37							91		211
Chestnut-collared Longspur			18					158							13		176
Blue Grosbeak		1	4				4	19		1	2		2	3			34
Dickcissel	7	7	42	10	108	46	14	50	1			1	20	2			287
Bobolink						1	2	13		1							17
Red-winged Blackbird	9	188	231	17	1140	67	84	115	43	127	52	22	9	2		2	2075
Eastern Meadowlark						3				1	2			2		2	8
Western Meadowlark	85	524	3276	74	708	761	97	2097	206	174	418	148	426	176	89	50	8596
Yellow-headed Blackbird			1												1		1
Brewer's Blackbird		1	30		22	7	2	27					2				89
Common Grackle	1	99	156	1	166	43	67	129	4	9	9		7	2	4		686
Great-tailed Grackle			3		6						6			4			19
Brown-headed Cowbird	4	12	93		24	57	14	216	1		4	16	1	10	11		435
Orchard Oriole			3		3	8	1	43									58
Bullock's Oriole		3	57		1	1		35	1	1	5		2	4		2	108
Baltimore Oriole								6									6
House Finch	1	5	18					5						3			32
American Goldfinch			4				3	18									25

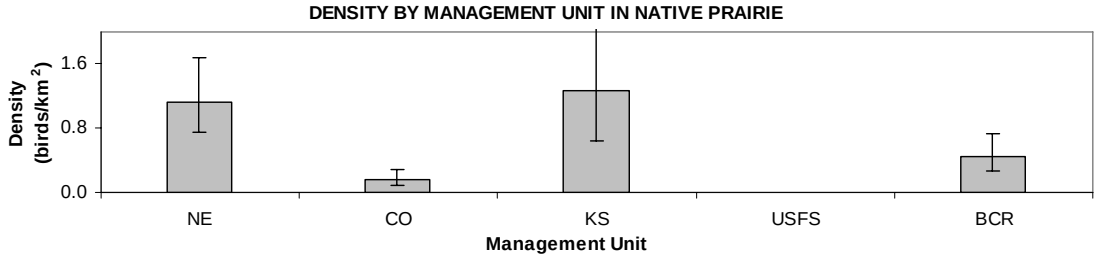
	Colorado			Kansas			Nebraska		Oklahoma			U.S. Forest Service					
Species	CRP	AG	NATIVE	CRP	AG	NATIVE	AG	NATIVE	CRP	AG	NATIVE	Cimarron	Comanche	Kiowa	Pawnee	Rita Blanca	BCR 18
House Sparrow		18	45		33	13	12	16		5	9	4				1	151

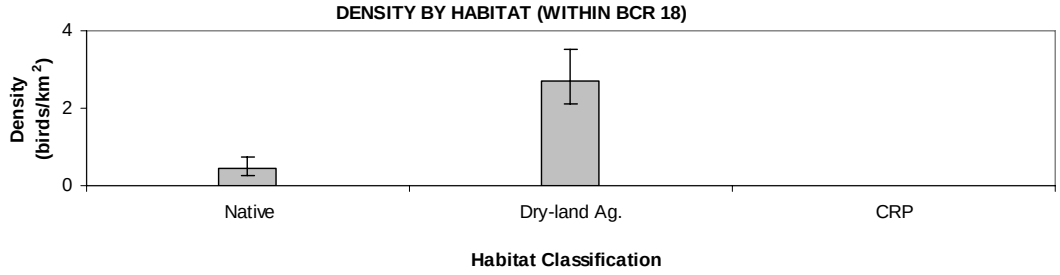
Appendix B Species Accounts

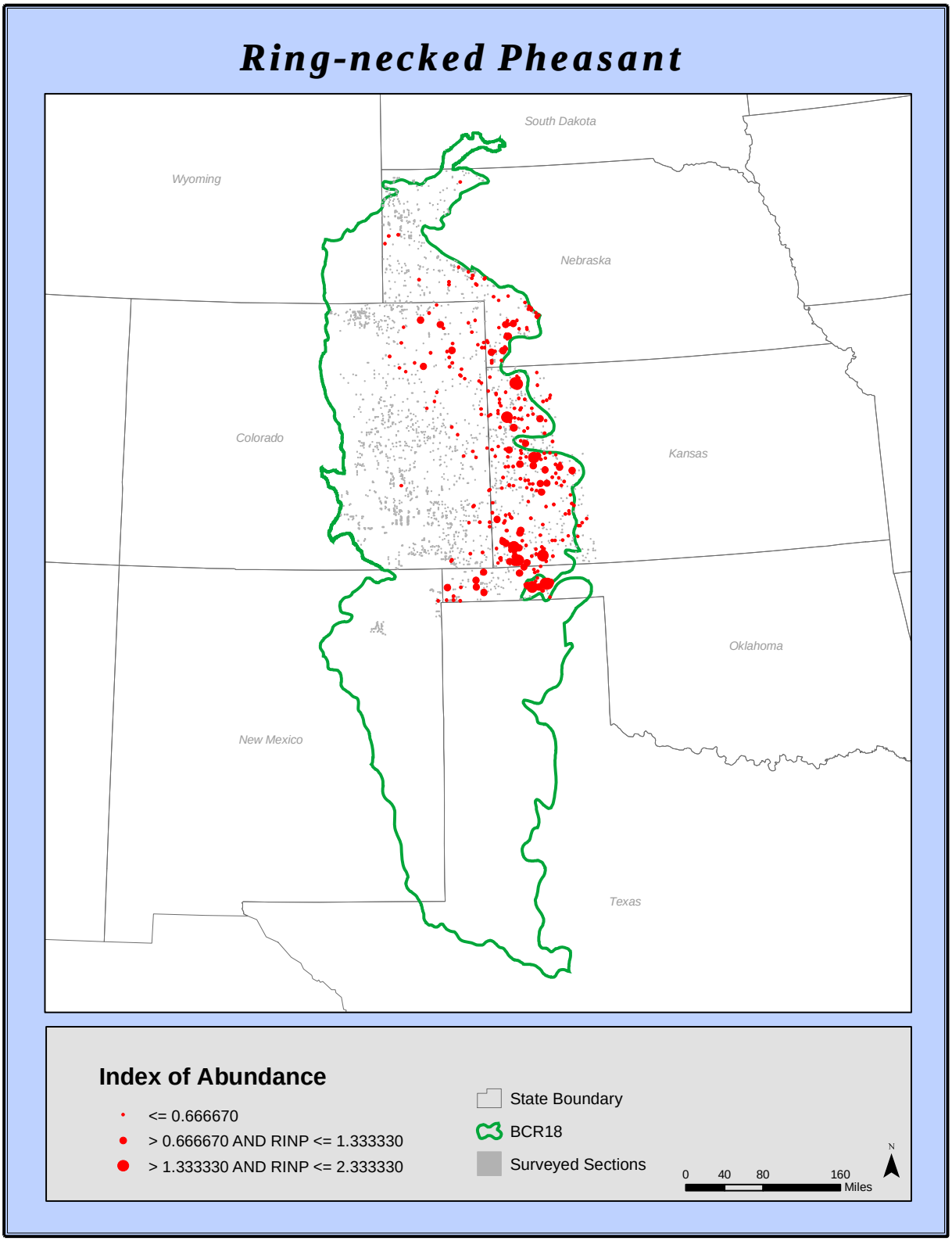
The following species accounts include species distribution maps and density estimates. In addition, density estimates in native prairie habitat at the BCR scale using three years of data are provided for species of Continental or Regional Importance, as designated by the PIF species assessment database (2005). We consulted the Comprehensive Wildlife Conservation Strategies (CWCS) from appropriate States, USFS Region 2 sensitive species matrix and PIF to indicate whether species are of concern/importance. Species distribution maps show observation locations and an index of abundance at the section level. Bird locations do not necessarily represent local breeding for the individual species, just their presence. The index of abundance, represented by graded dots, is defined as the total number of a species detected on the section divided by the number of point counts conducted on that section.

Ring-necked Pheasant
(Phasianus colchicus)

During the 2005 field season, we detected 538 Ring-necked Pheasants on 324 (14%) of the surveyed sections. Ring-necked Pheasants occur in greater abundance in the eastern part of the study area. Density was higher in dry-land agriculture habitat (D = 2.72birds/km^2, CV = 13%, *n* = 224) than in native prairie habitat (D = 0.45 birds/km^2, CV = 25%, *n* = 131) at the BCR level. Within native prairie habitat, highest density occurred in Kansas (D = 1.27 birds/km^2, CV = 35%, n = 30) and Nebraska (D = 1.12 birds/km^2, CV = 35%, n = 30). Management of this introduced upland game bird should be focused in areas of agricultural land. Detections of this species were insufficient to estimate densities at the scale of individual National Grasslands.





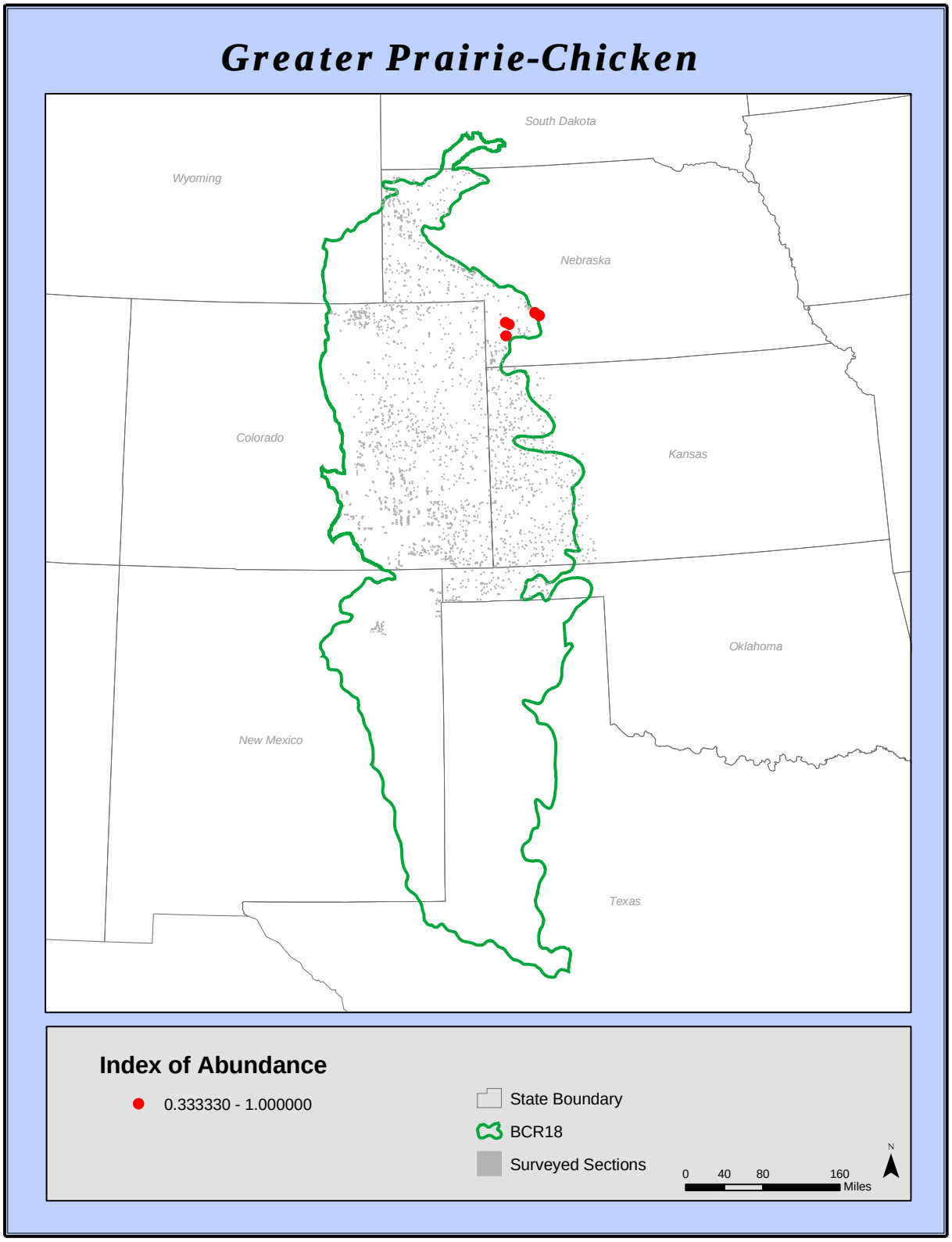


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Greater Prairie-Chicken

(Tympanuchus cupido)

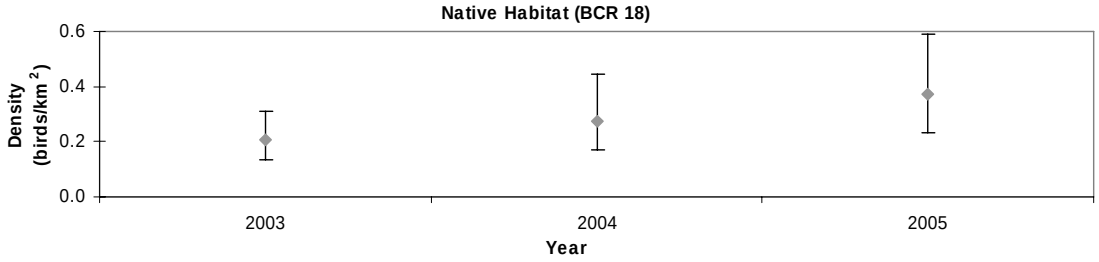
In 2005, we documented eight Greater Prairie-Chickens on five (<1%) of the surveyed sections, all of which were in Nebraska. Due to the small number of detections, we could not reliably estimate density for this species. Greater Prairie-Chicken is a species of Continental Concern and Regional Importance according to Partners in Flight. This species also is listed in Nebraska, Colorado, Kansas and Oklahoma as a species of concern. USFS Region 2 lists this species as sensitive.

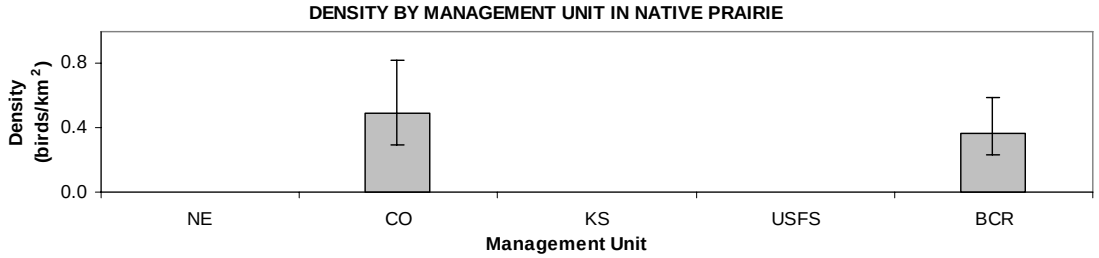


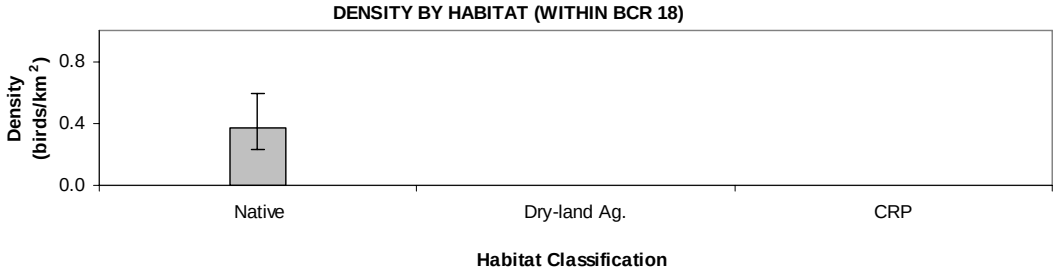
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

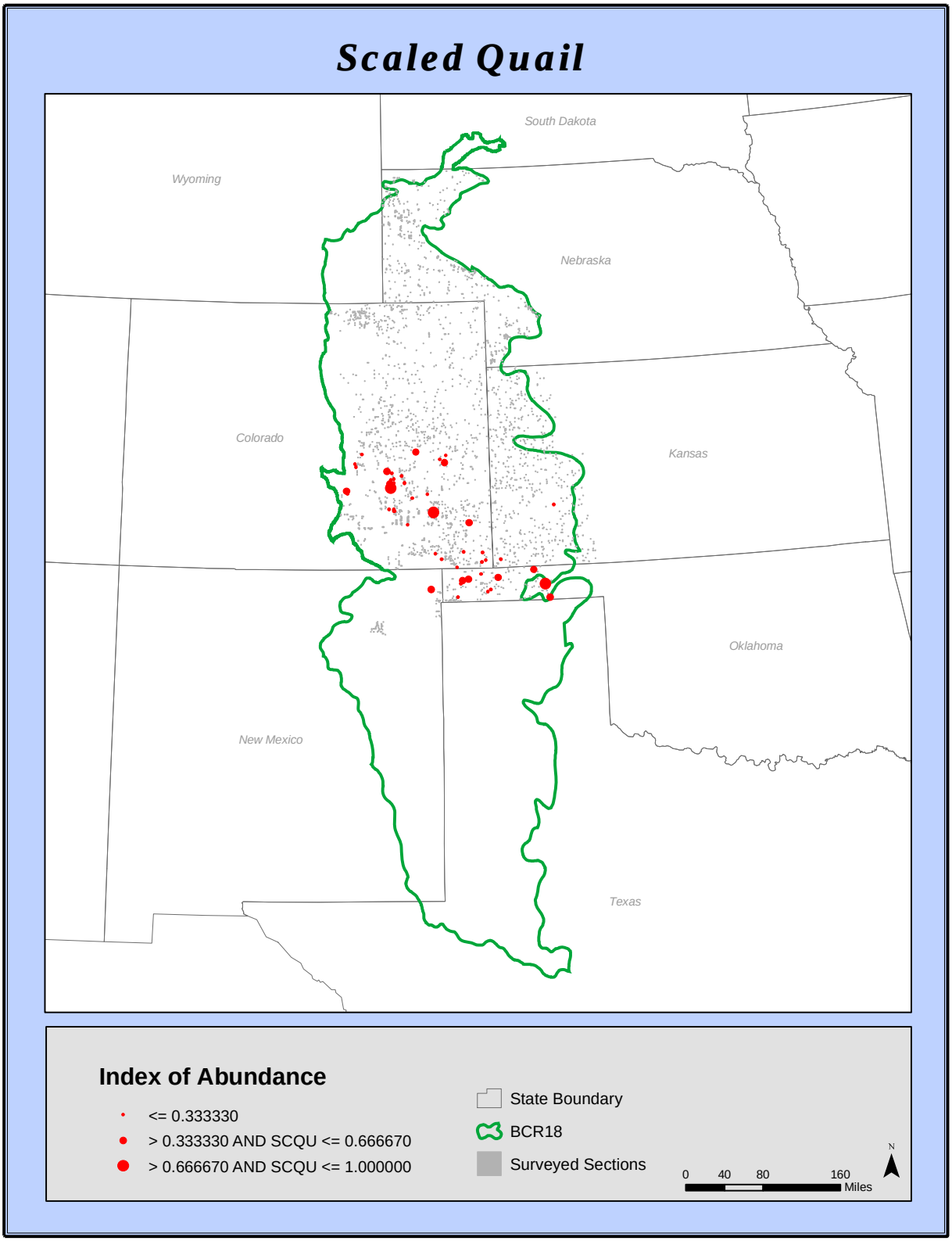
Scaled Quail
(Callipepla squamata)

In 2005, we documented 74 Scaled Quail on 56 (2%) of the surveyed sections. We estimated density for this species in native prairie habitat in BCR 18 (D = 0.37 birds/km^2, CV = 24%, *n* = 52). This species density estimate in Colorado was 0.49 birds/km^2, CV = 26%, *n* = 48. No significant change in density was detected between 2003-2005, despite a small increase in the annual estimate (2003, 0.20 birds/km^2, to 2005, 0.37 birds/km^2) in BCR 18. Scaled Quail is a species of Continental Concern and Regional Importance according to Partners in Flight. This species is also listed in Colorado, Kansas and Oklahoma as a species of concern.





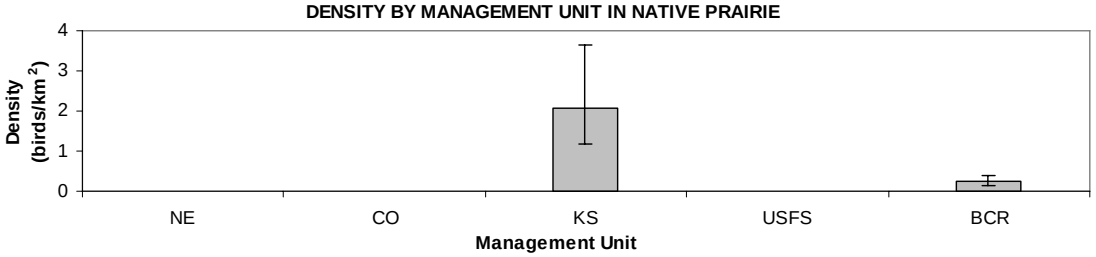


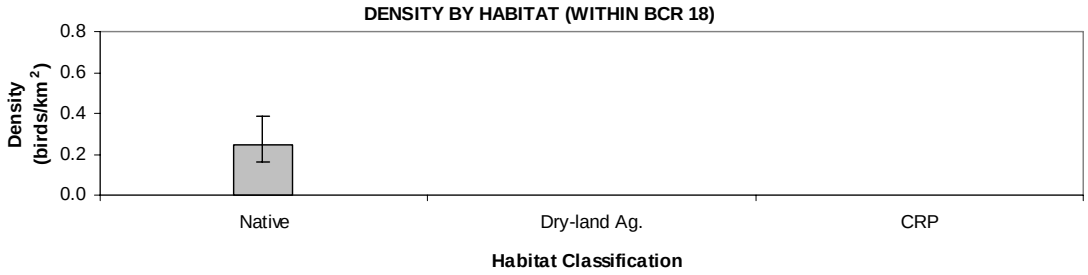


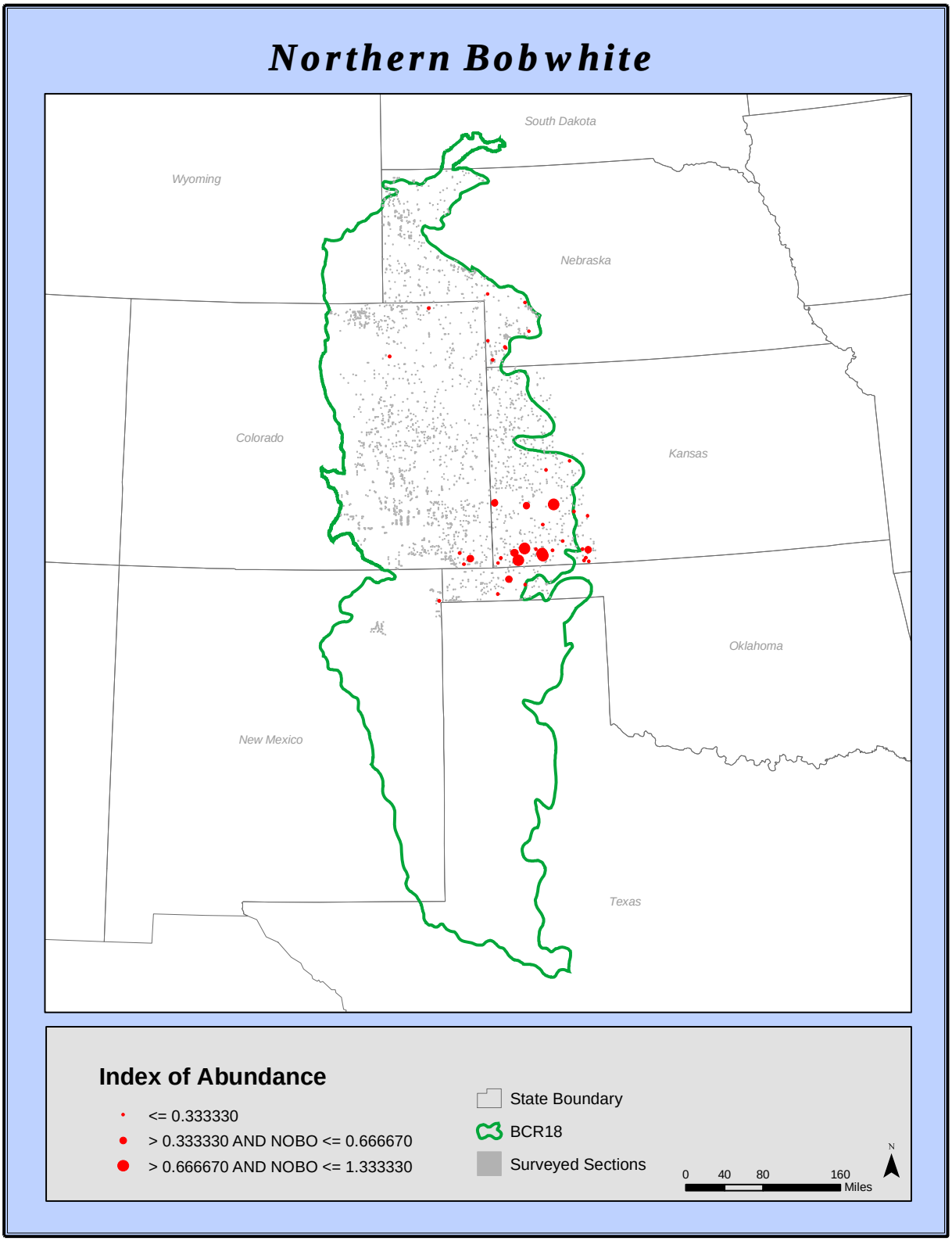
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Northern Bobwhite
(Colinus virginianus)

In 2005, we detected 63 Northern Bobwhites on 44 (1.86%) of the surveyed sections. This species was concentrated in southwest Kansas. Density for this species in BCR 18 native prairie habitat was estimated at 0.25 birds/km^2 (CV = 23%, *n* = 46). In Kansas native prairie habitat, densities were 2.06 birds/km^2 (CV = 29%, *n* = 24). Northern Bobwhite is listed as a species of concern in Nebraska, Kansas and Oklahoma.



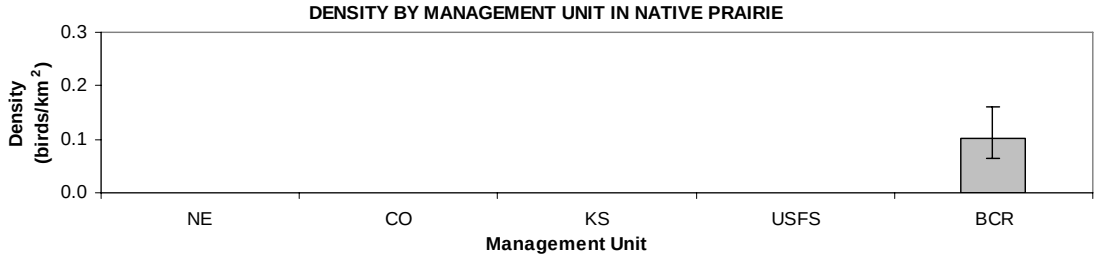


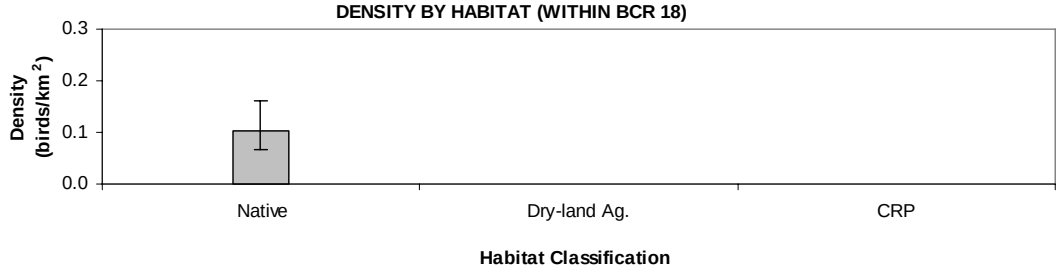


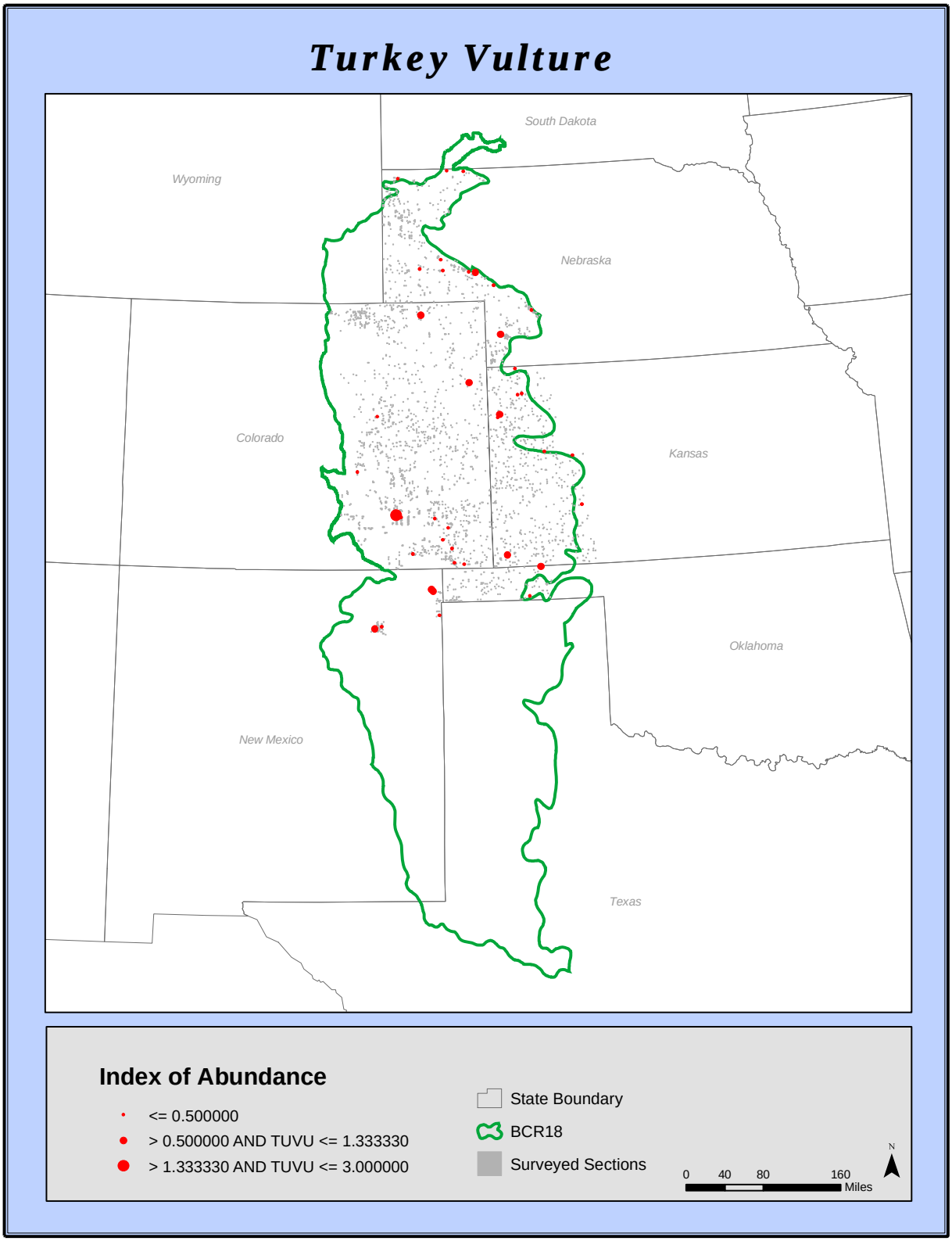
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Turkey Vulture
(Cathartes aura)

In 2005, we observed 64 Turkey Vultures on 42 (1.8%) of the surveyed sections throughout the study area. Density of this species in BCR 18 native prairie habitat was estimated at 0.10 birds/km^2 (CV = 23%, n = 35).





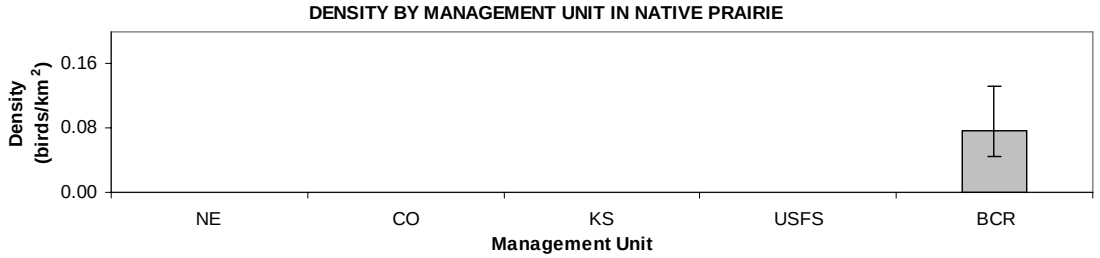


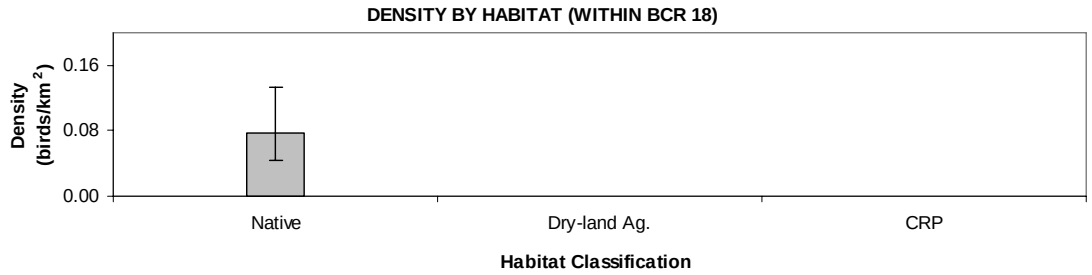
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

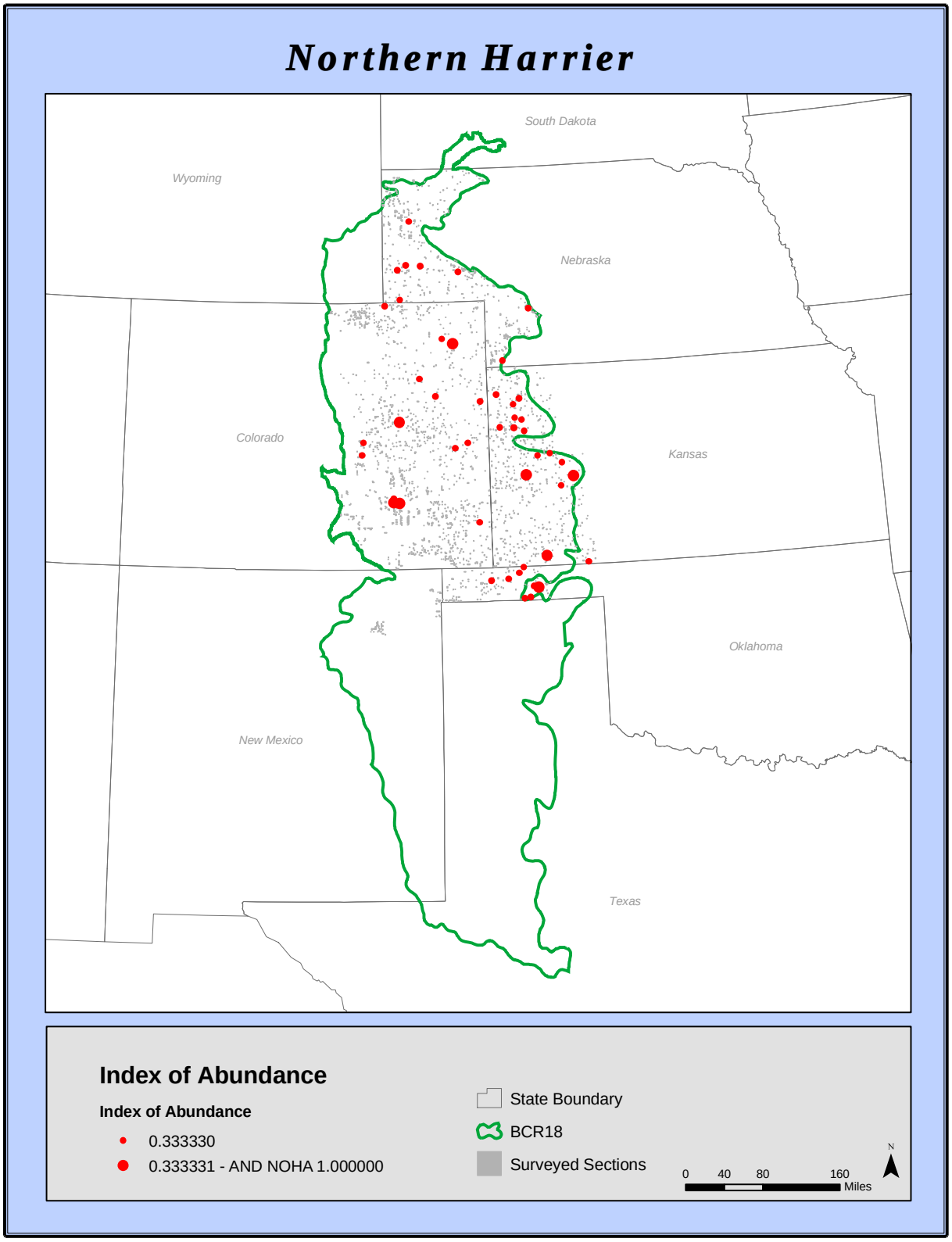
Northern Harrier
(Circus cyaneus)

In 2005, we detected 58 Northern Harriers on 49 (2%) of the surveyed sections. This species' distribution was patchy throughout the study area. Density was estimated in native prairie habitat (D = 0.08 birds/km^2, CV = 29%, *n* = 28). Dense populations of this species are associated with large undisturbed tracks of land (Macwhirte and Bildstein 1996). Northern Harriers are year round residents of the northern and central regions of BCR 18, only wintering in its southern most region. Northern Harrier is a species of concern as follows:

- Partners in Flight – Regional Importance.
- Colorado –species of concern (CWCS).
- Nebraska –species of concern (CWCS).
- USFS R2 – sensitive species.



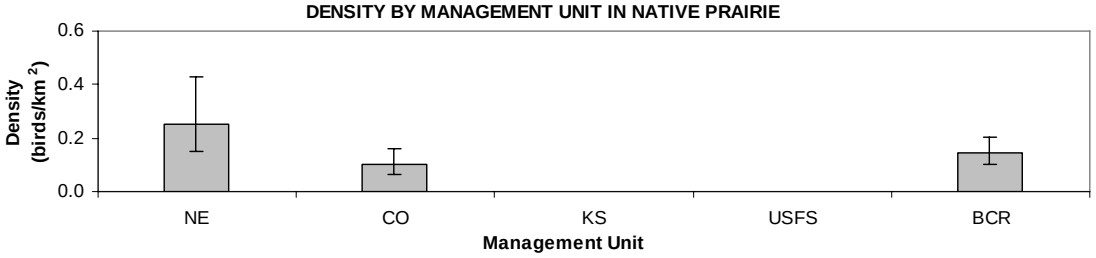


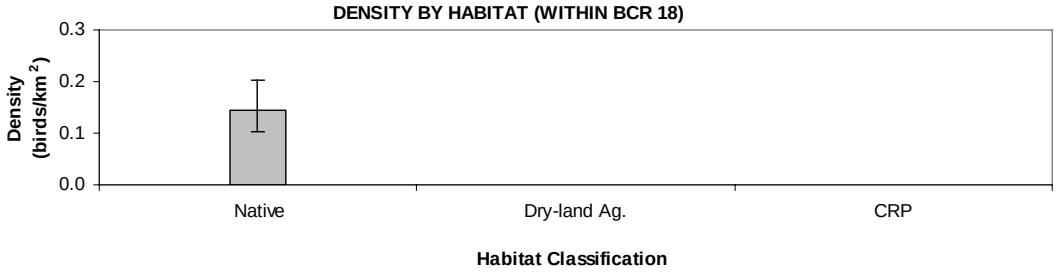


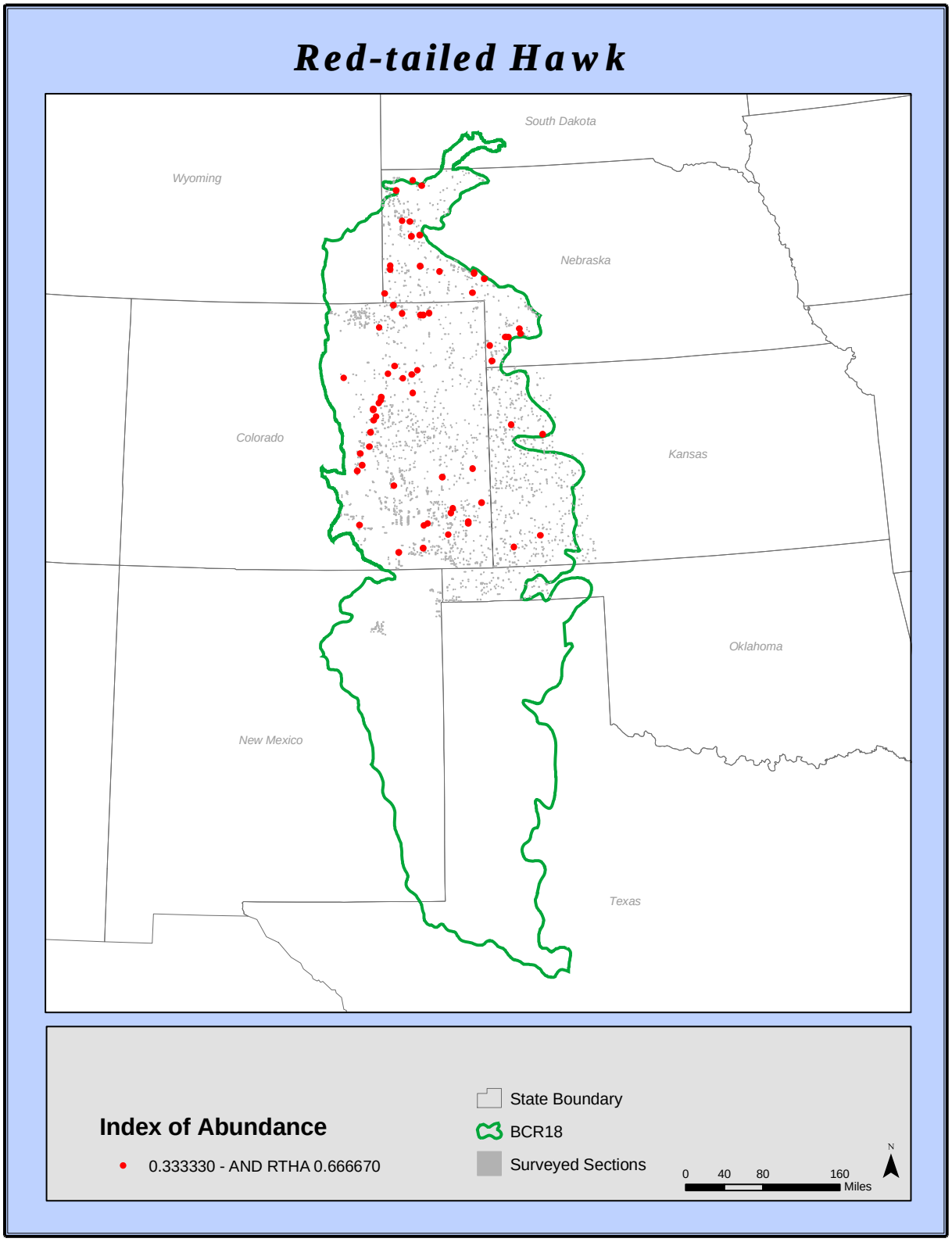
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Red-tailed Hawk
(Buteo jamaicensis)

In 2005, we detected 74 Red-tailed Hawks on 66 (2.8%) of the surveyed sections. The species was detected throughout the study area. We estimated density within native prairie at 0.14 birds/km^2 (CV = 18%, n = 57) in BCR 18. Density does not appear to be significantly different among management units.





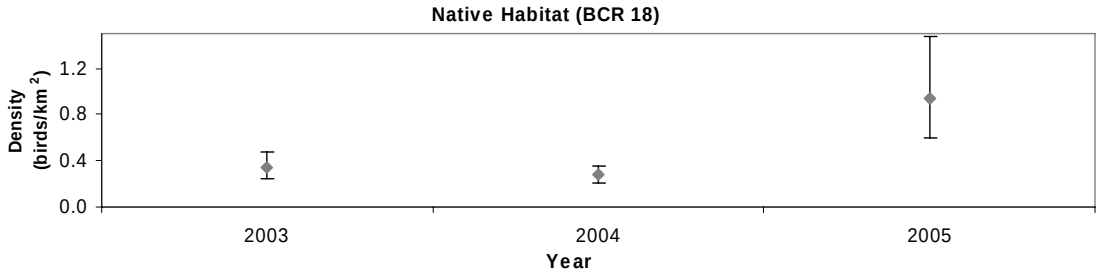


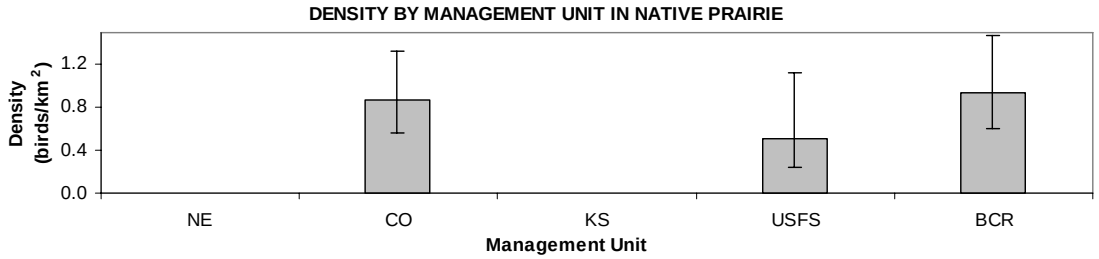
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

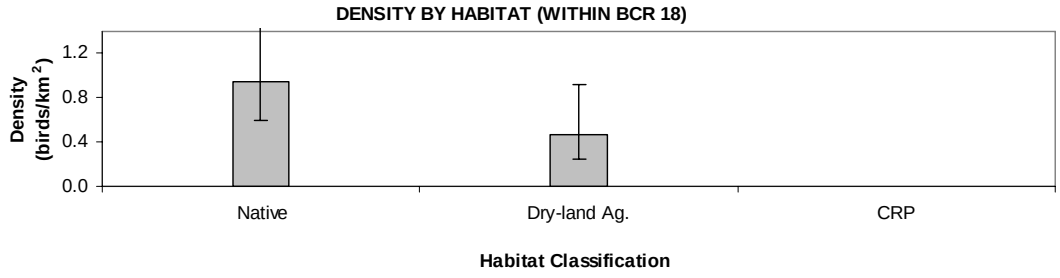
Swainson's Hawk
(Buteo jamaicensis)

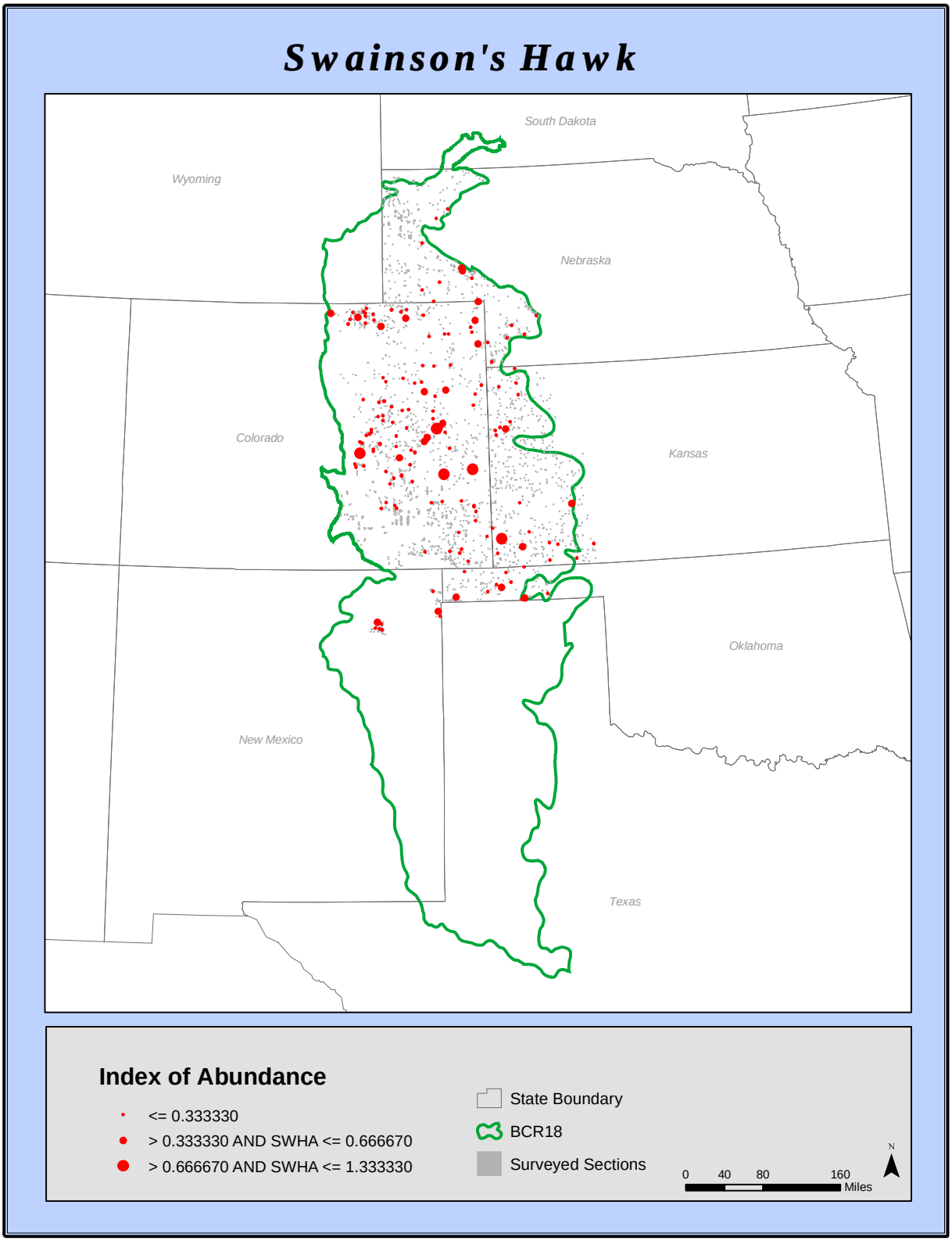
In 2005, we detected 202 Swainson's Hawks on 167 (7%) of the surveyed sections. This species was distributed across the study area. In BCR 18, density was estimated to be slightly, although not significantly, higher in native prairie (D = 0.94 birds/km^2, CV = 23%, *n* = 117) than in dry-land agriculture habitats (D = 0.47 birds/km^2, CV = 35%, *n* = 31). Density in native prairie remained relatively stable between 2003 (0.34 birds/km^2) and 2004 (0.28 birds/km^2), but increased significantly in 2005 to 0.94 birds/km^2. Swainson's Hawk is a species of concern as follows:

- Partners in Flight – Continental Concern and Stewardship Species.
- Nebraska – species of concern (CWCS).
- Kansas – species of concern (CWCS).
- Oklahoma – species of concern (CWCS).







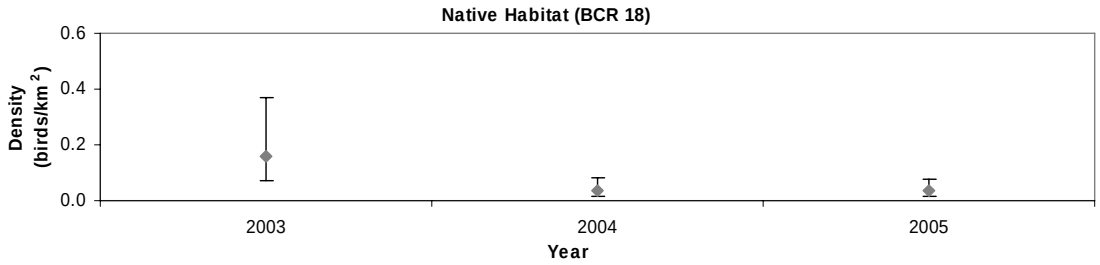


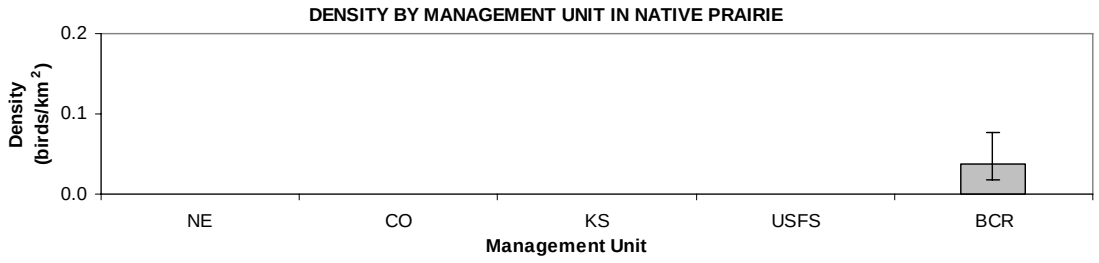
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

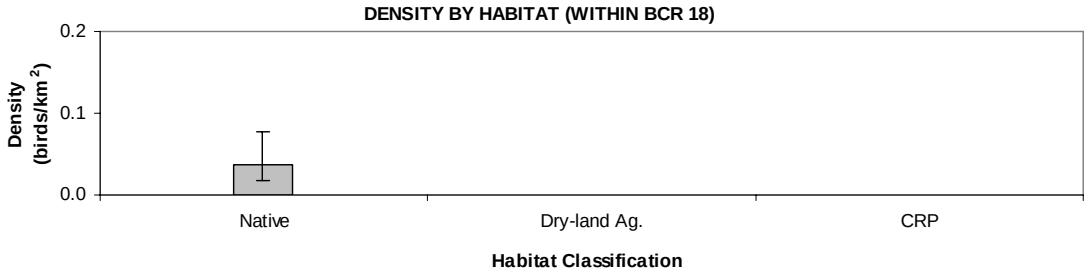
Ferruginous Hawk
(Buteo regalis)

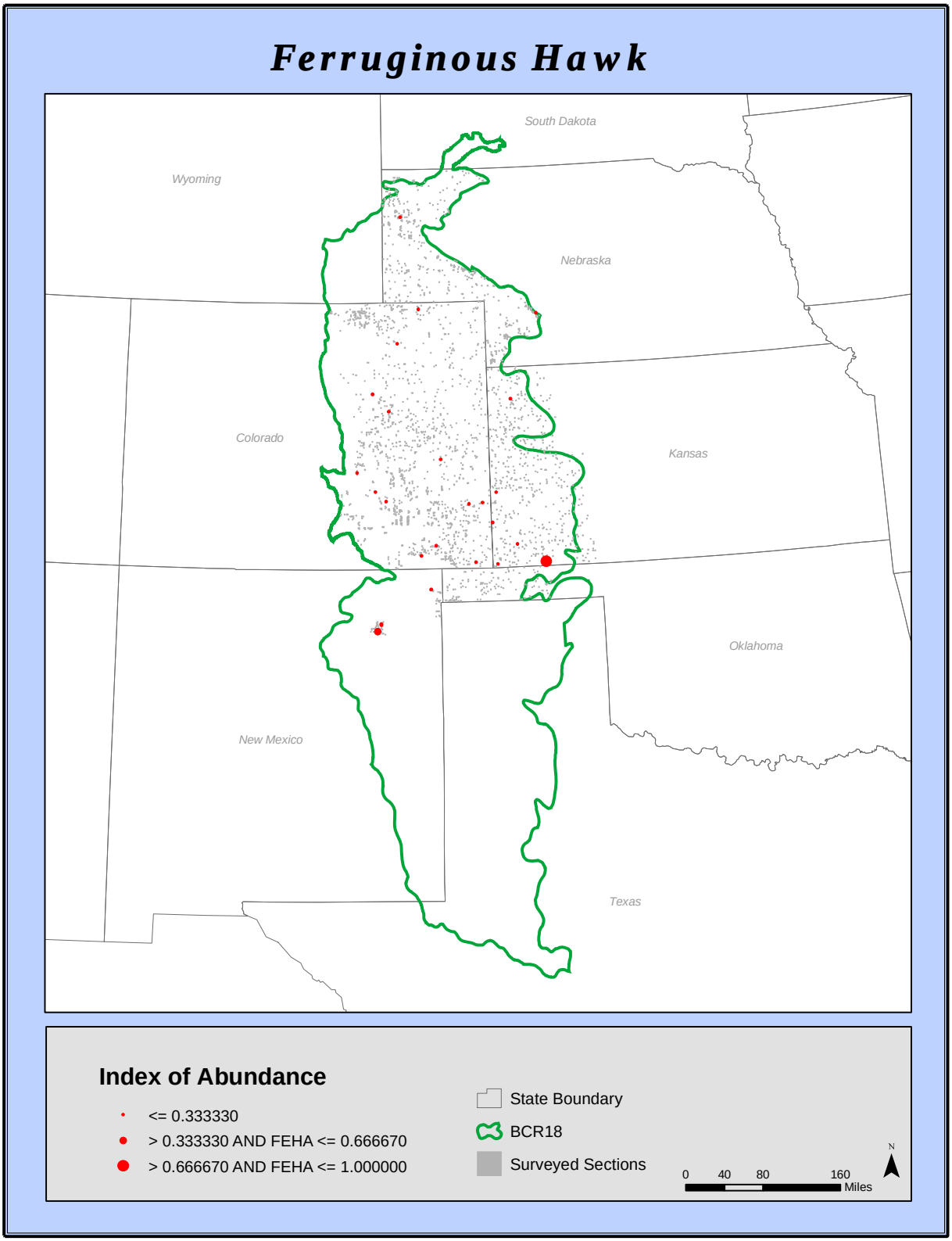
In 2005, we observed 28 Ferruginous Hawks on 25 (1.06%) of the surveyed sections. Observations were scattered throughout the study area, although most were in Colorado. Density of Ferruginous Hawks in native prairie habitat was 0.04 birds/km^2 (CV = 37%, n = 20). Ferruginous Hawk showed an insignificant decrease in density from 2003, 0.16 birds/km^2, to 2005, 0.04 birds/km^2 at the BCR level. Twenty percent of detections were on prairie dog towns; prairie dogs are an important dietary source for this species. Ferruginous Hawk is a species of concern as follows:

- Partners in Flight – Regional Importance and Stewardship Species.
- Nebraska – species of concern (CWCS).
- Colorado – species of concern (CWCS).
- Kansas – species of concern (CWCS).
- Oklahoma – species of concern (CWCS).
- USFS R2 – sensitive species.







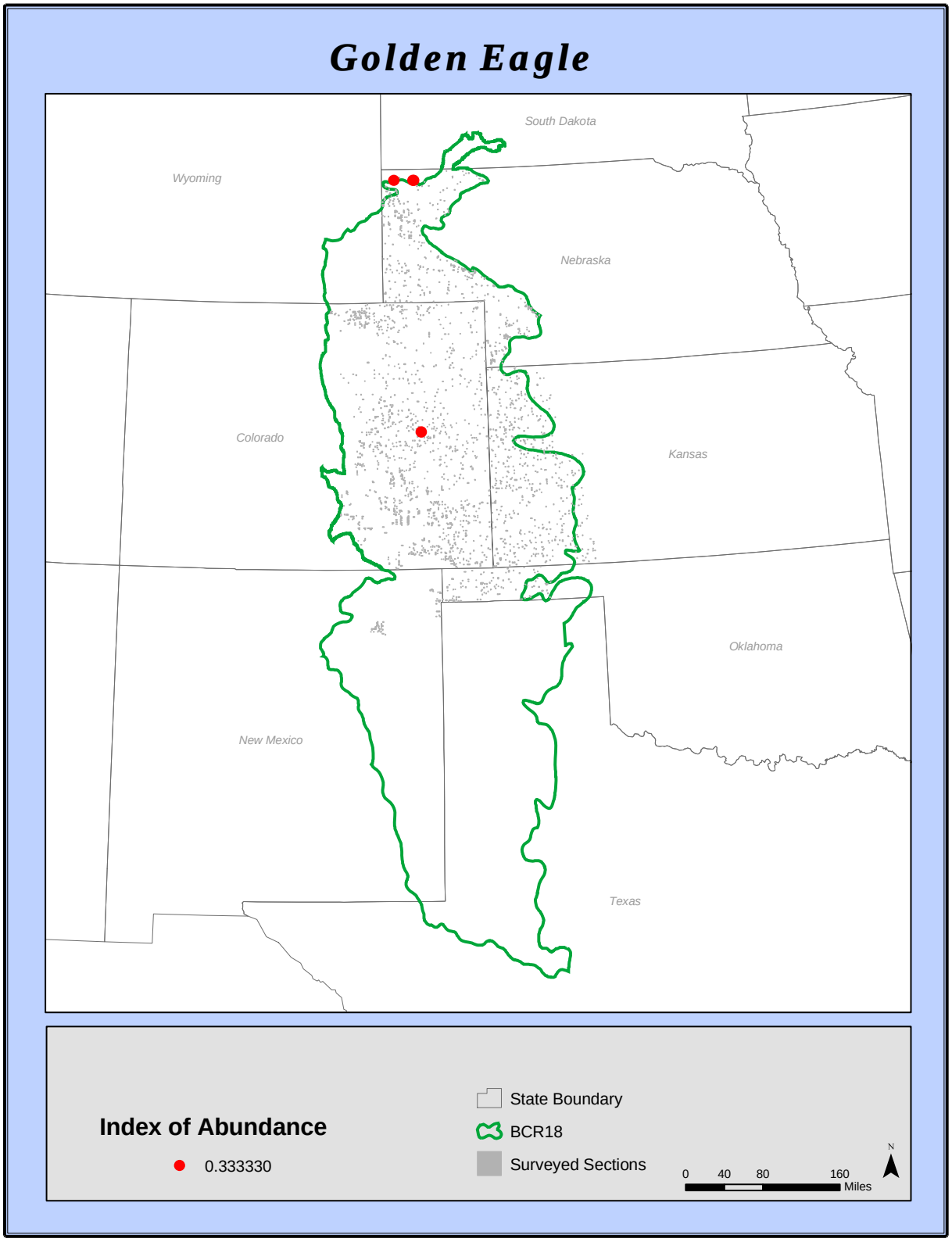


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Golden Eagle
(Aquila chrysaetos)

In 2005, we detected four Golden Eagles; one in Colorado and three in Nebraska. Golden Eagle is a species of concern as follows:

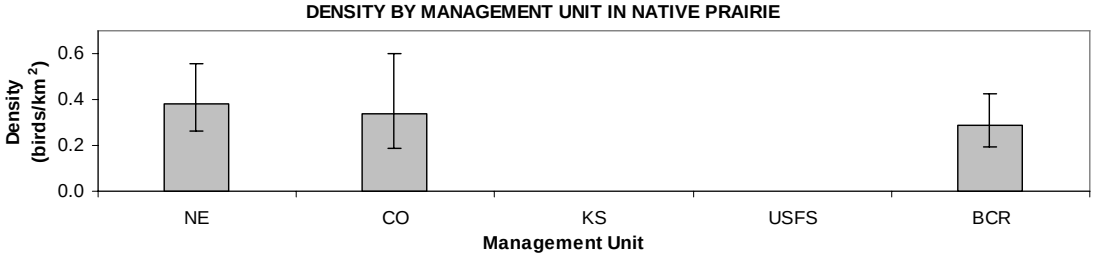
- Nebraska – species of concern (CWCS).
- Colorado – species of concern (CWCS).
- Kansas – species of concern (CWCS).

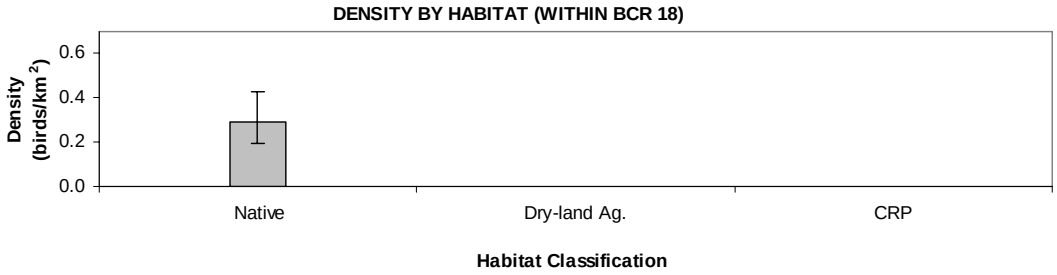


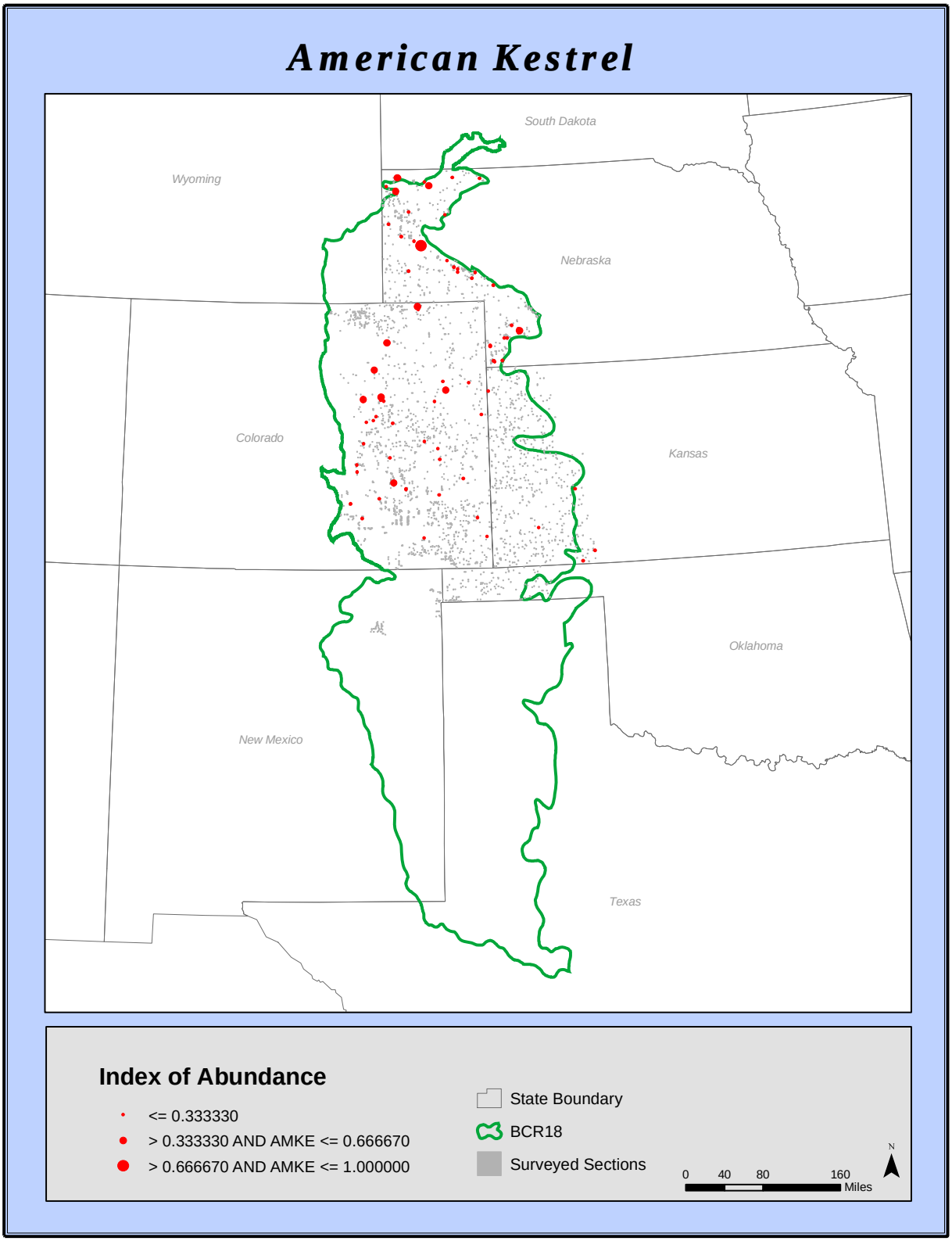
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

American Kestrel
(Falco sparverius)

In 2005, we detected 92 American Kestrels on 79 (3.35%) of the surveyed sections. This species occurs throughout the study area. We estimated density of American Kestrels in native prairie habitat in BCR 18 at 0.29 birds/km^2 (CV = 20%, n = 80). No significant difference in density exitst among management units.







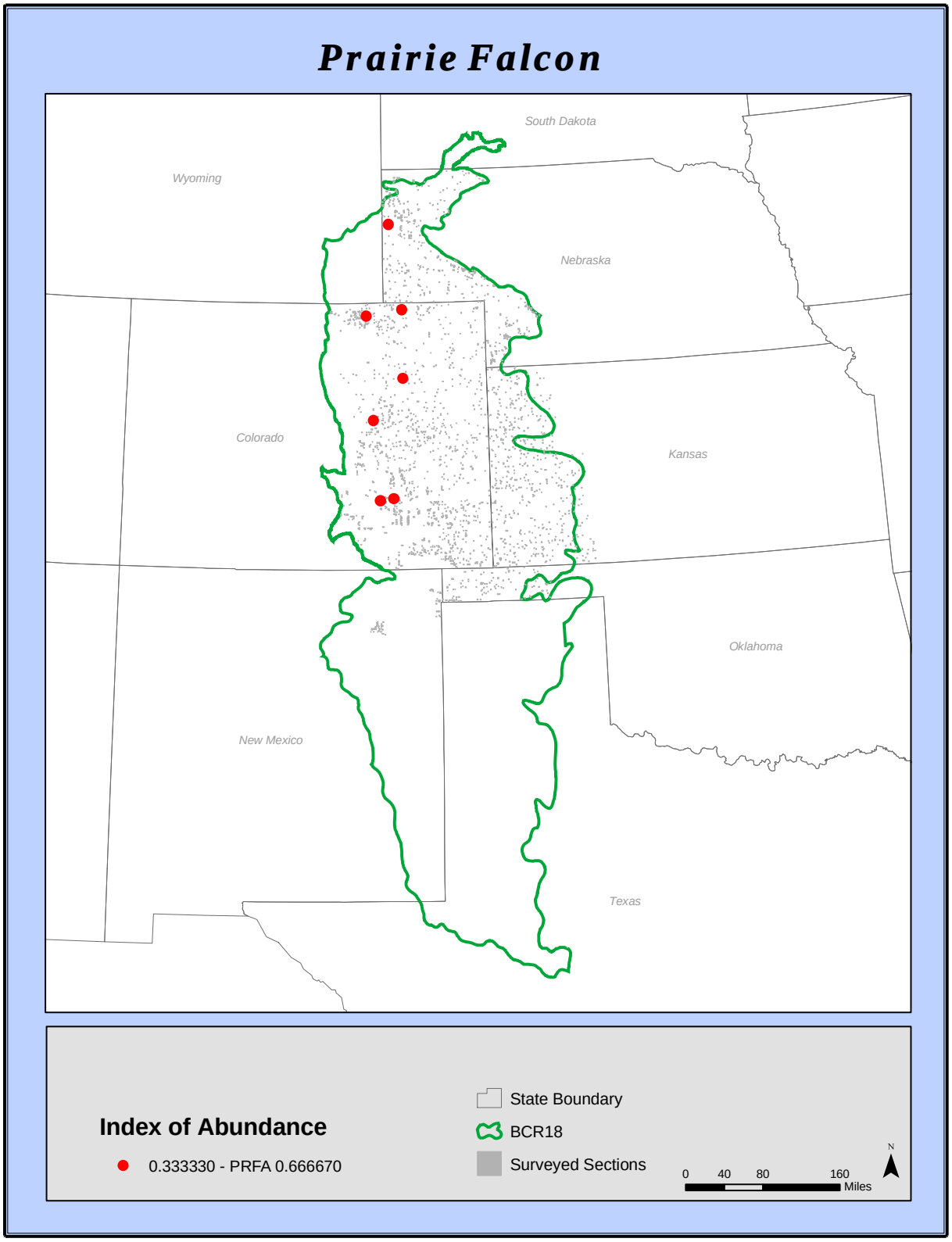
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Prairie Falcon

(Falco mexicanus)

In 2005, we detected eight Prairie Falcons on seven (<1%) of the surveyed sections. We observed seven birds in Colorado and one in Nebraska.
Prairie Falcon is a species of concern as follows:

- Partners in Flight – Regional Importance.
- Nebraska – species of concern (CWCS).
- Colorado – species of special concern (CWCS).
- Kansas – species of special concern (CWCS).
- Oklahoma – species of special concern (CWCS).

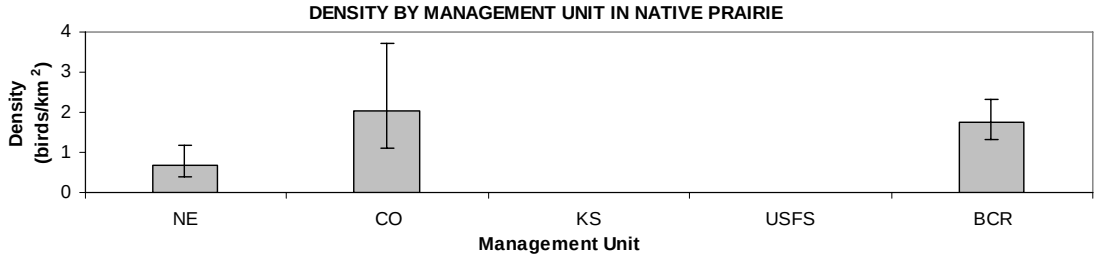


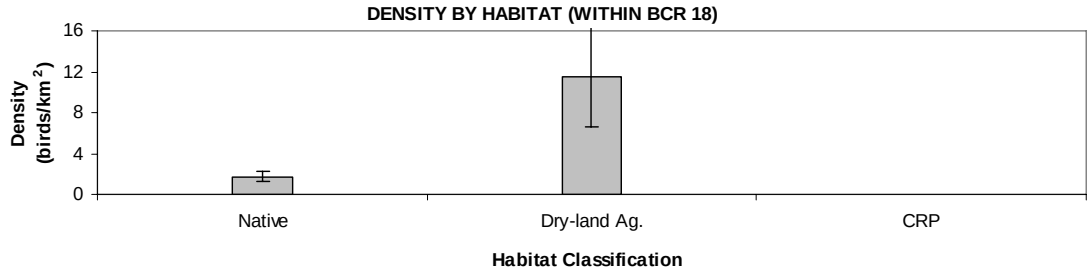
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

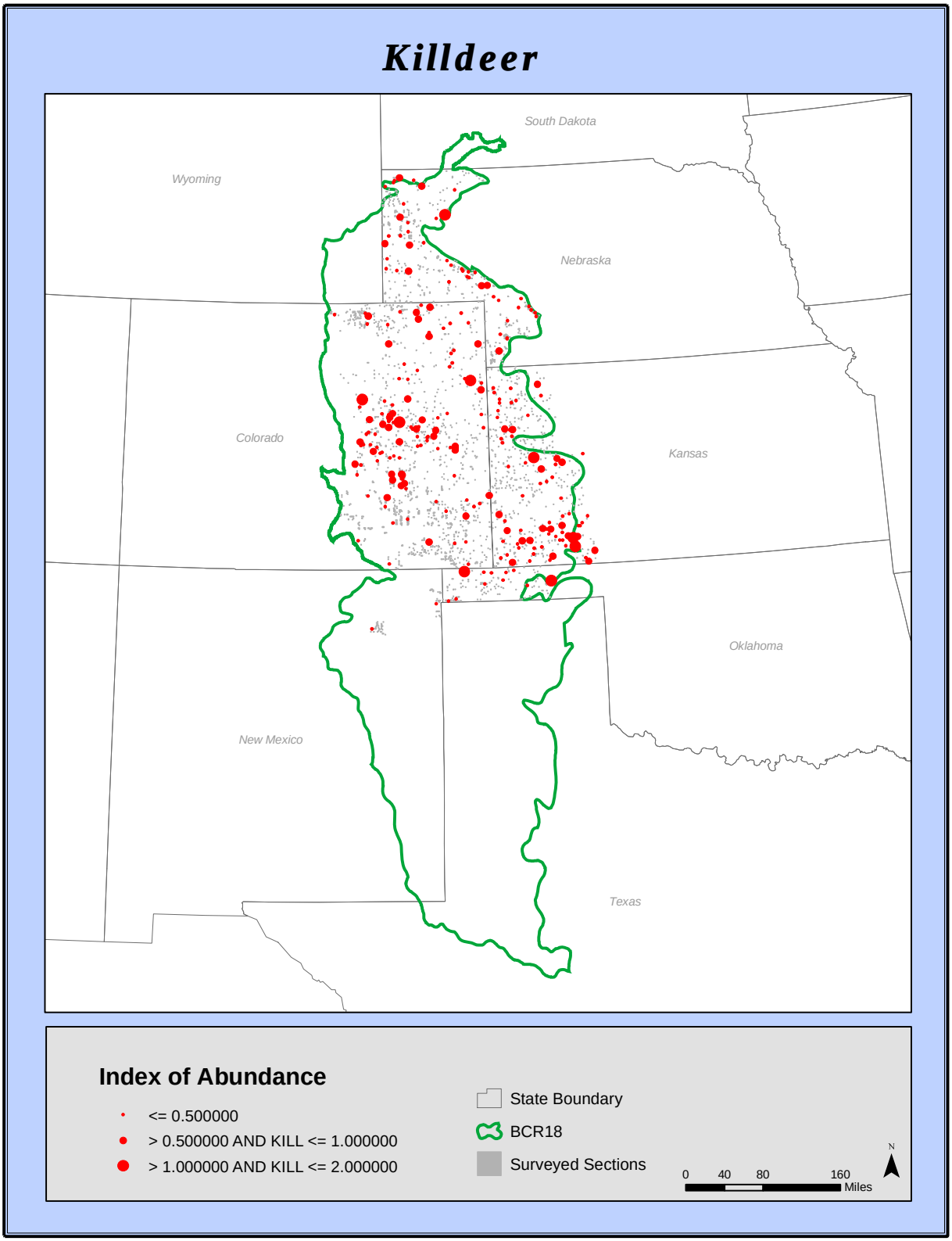
Killdeer

(Charadrius vociferus)

In 2005, we detected 376 Killdeer on 263 (11.14%) of the surveyed sections. This species occurs throughout the study area. In BCR 18, density was higher in dry-land agriculture (D = 11.46 birds/km^2, CV = 28%, *n* = 23) than in native prairie habitat (D = 1.75 birds/km^2, CV = 14%, n = 124).







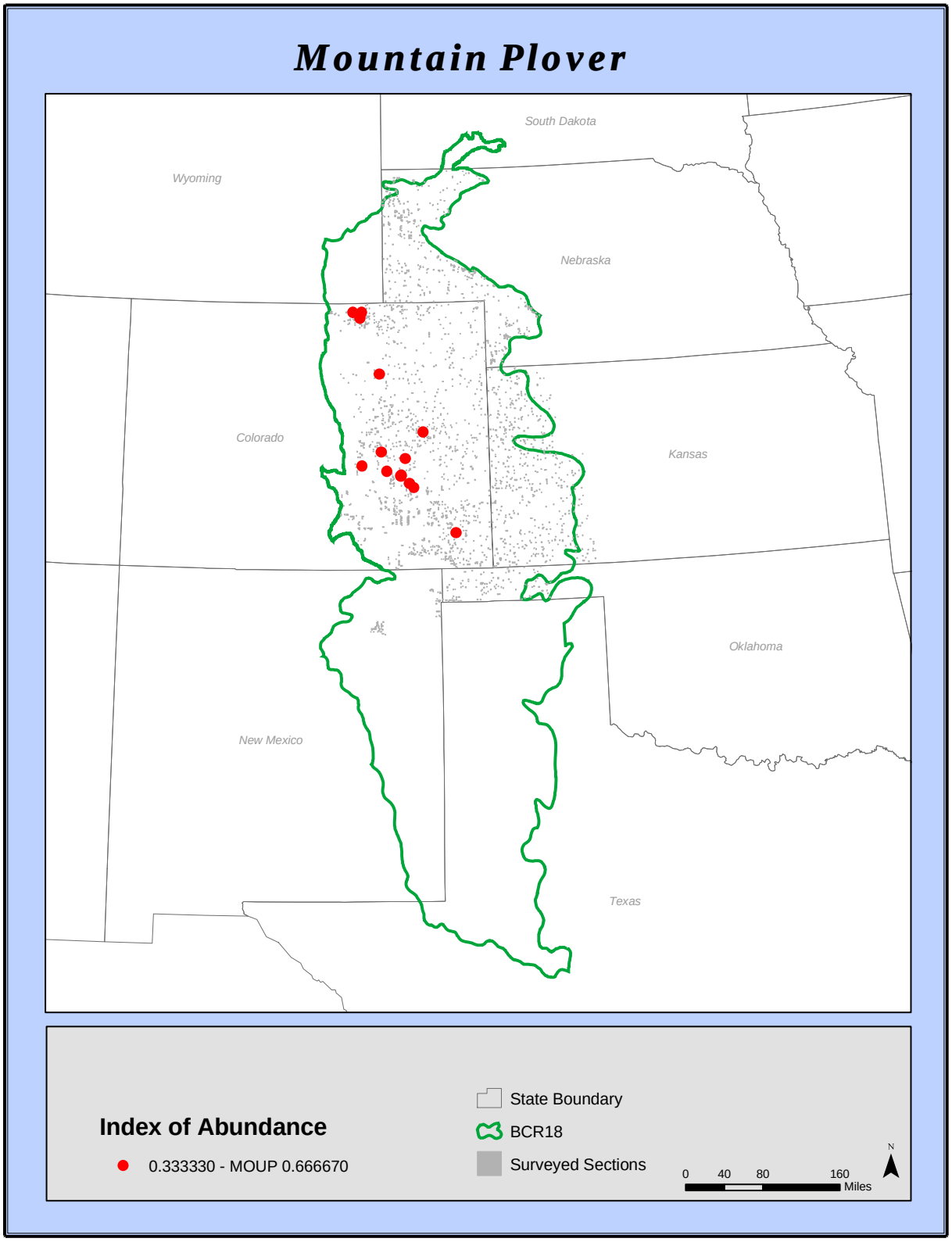
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Mountain Plover

(Charadrius montanus)

In 2005, we detected 21 Mountain Plovers on fifteen (<1%) of the surveyed sections. All observations occured in Colorado, including two on Pawnee National Grassland. Mountain Plover is a species of concern as follows:

- Nebraska – species of concern (CWCS).
- Colorado – species of concern (CWCS).
- Kansas – species of concern (CWCS).
- USFS R2 – species of concern.

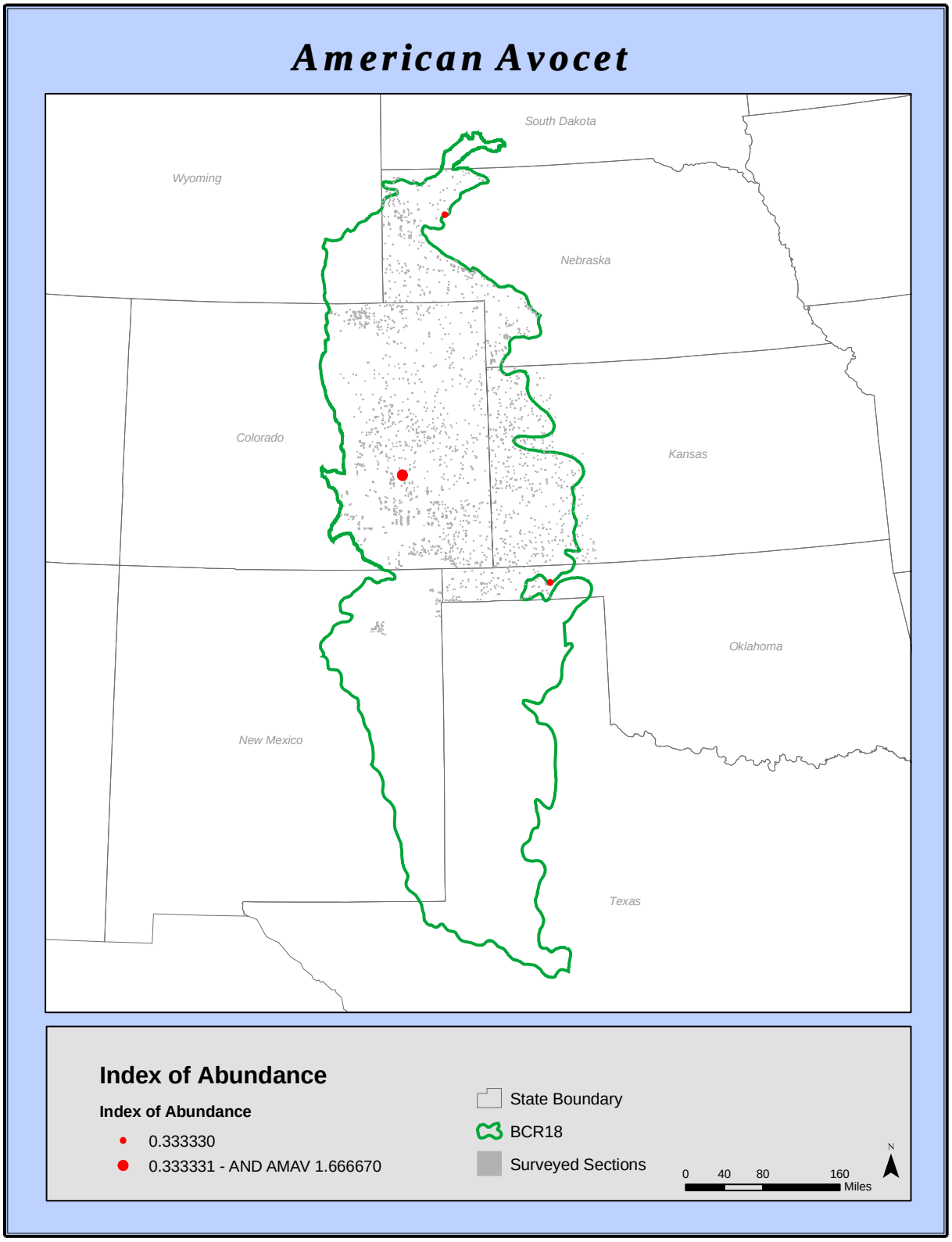


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

American Avocet
(Recurvirostra americana)

In 2005, we detected eight American Avocets on four (<1%) of the surveyed sections. We observed this species only in Colorado and Nebraska. Playas may be an important habitat for avocets. American Avocet is a species of moderate concern in Nebraska.

- Nebraska – species of concern (CWCS).
- Kansas – species of concern (CWCS).

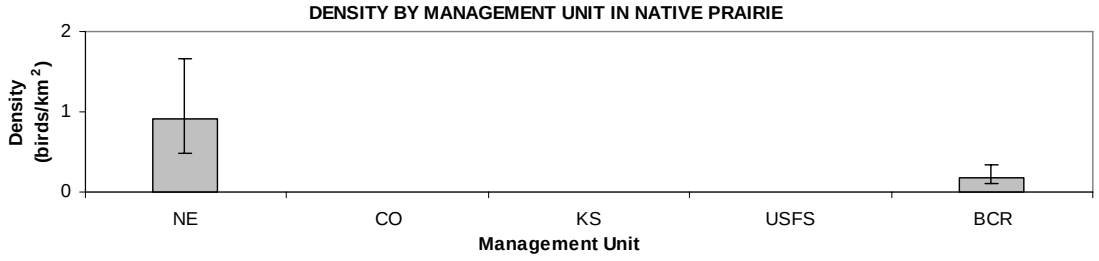


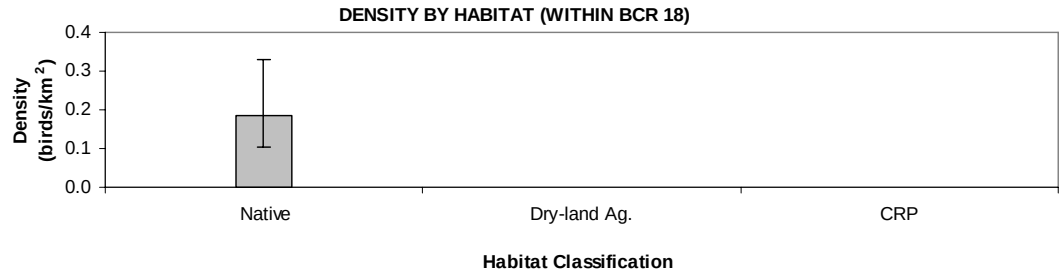
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

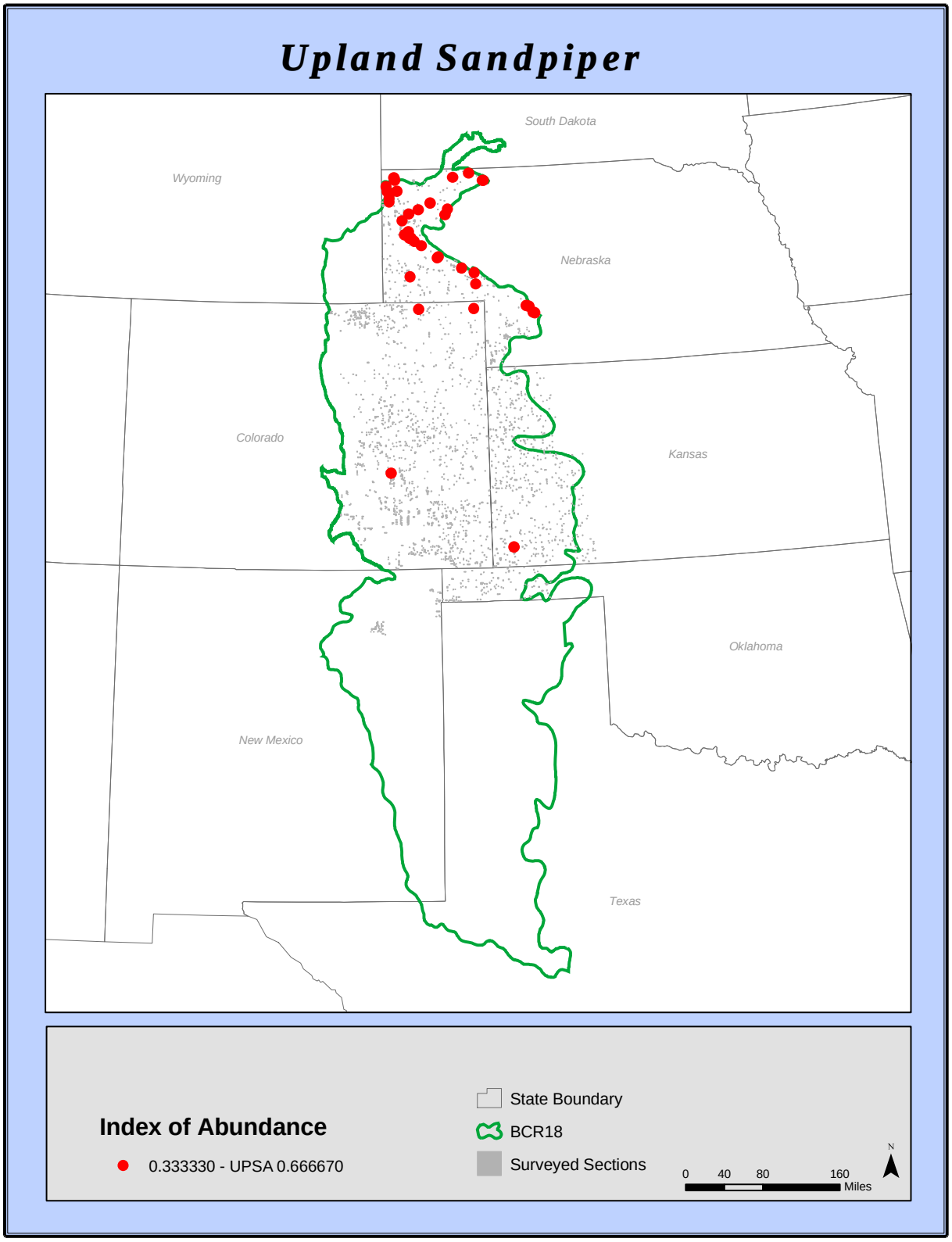
Upland Sandpiper
(Bartramia longicauda)

In 2005, we detected 44 Upland Sandpipers on 38 (1.6%) of the surveyed sections. This species' breeds mainly in the northern region of the Shortgrass Prairie BCR. Most observations were in Nebraska. In BCR 18, estimated density in native prairie habitat was 0.19 birds/km^2 (CV = 30%, n = 18). We estimated density in Nebraska at 0.90 birds/km^2 (CV = 32%, n = 15). Upland Sandpiper is a species of concern as follows:

- Kansas – species of concern (CWCS).
- Oklahoma – species of concern (CWCS).
- USFS R2 – sensitive species.





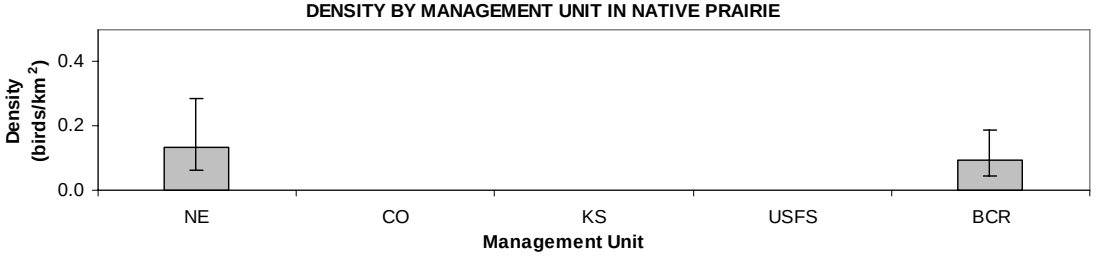


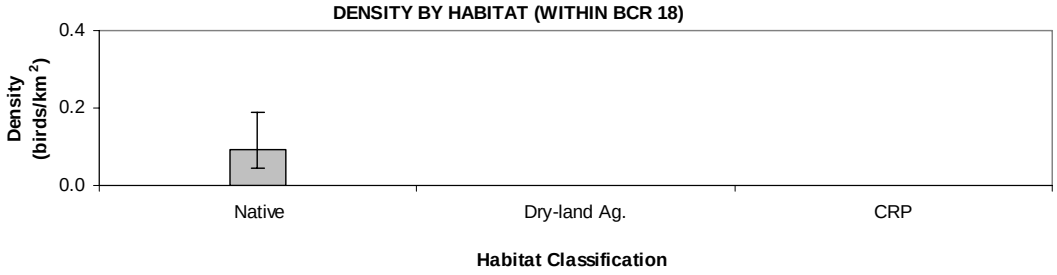
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

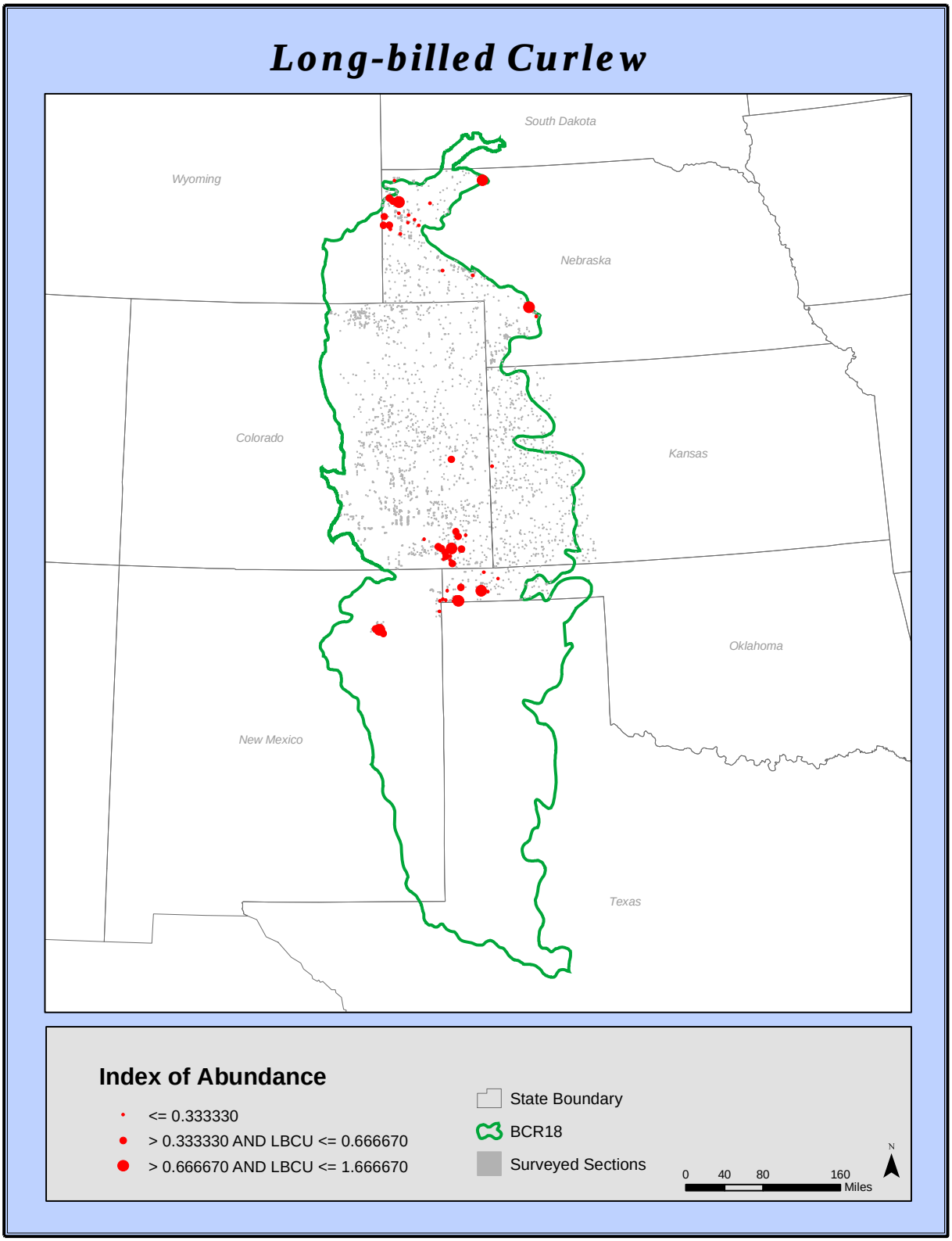
Long-billed Curlew
(Numenius americanus)

In 2005, we observed 98 Long-billed Curlews on 62 (2.63%) of the surveyed sections. This species was concentrated in the northern and southern parts of the study area with highest abundances occurring in western Oklahoma, southeast Colorado, and Nebraska. Density in BCR 18 in native habitat was estimated at 0.09 birds/km^2 (CV = 36%, n = 22). Density was estimated in Nebraska at 0.13 birds/km^2 (CV = 41%, n = 13). Long-billed Curlew is a species of concern as follows:

- Nebraska – species of concern (CWCS).
- Colorado – species of concern (CWCS).
- Kansas – species of concern (CWCS).
- Oklahoma – species of concern (CWCS).
- USFS R2 – sensitive species.



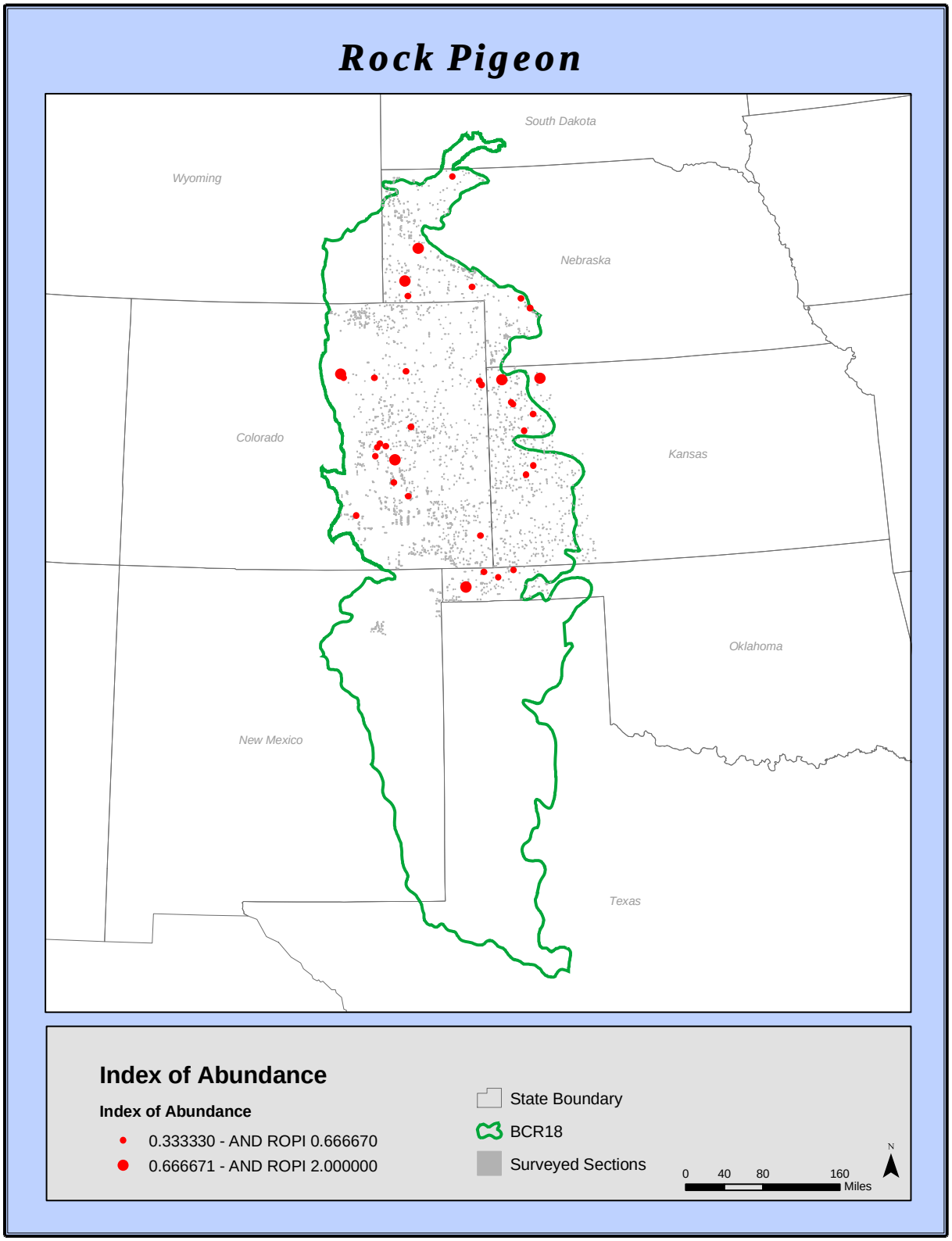




Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Rock Pigeon
(Columbia livia)

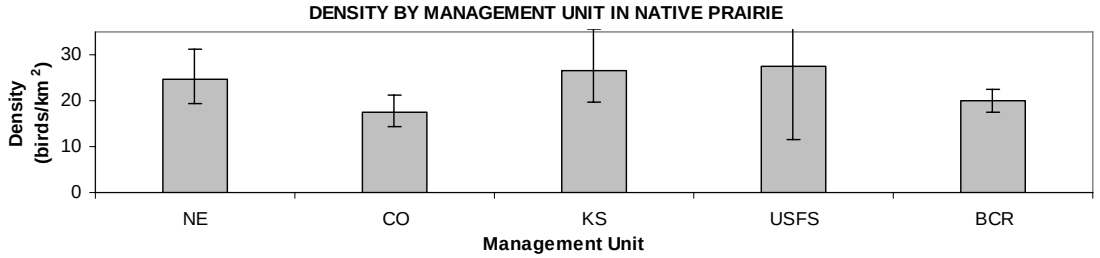
In 2005, we detected 66 individuals on 36 (1.53%) of the sections surveyed. This exotic species, formerly known as Rock Dove, is largely associated with anthropogenic features throughout the Shortgrass Prairie BCR landscape.

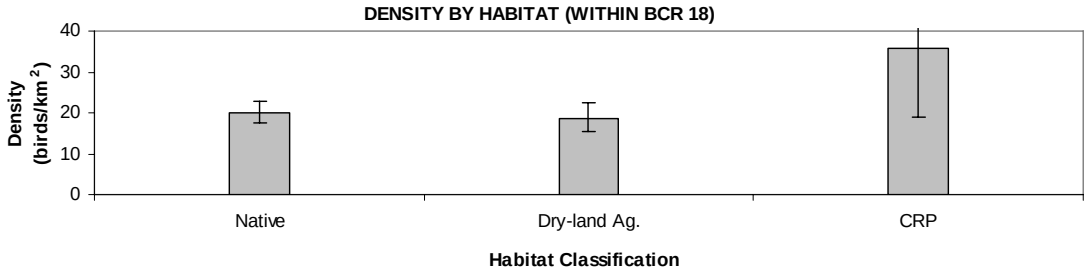


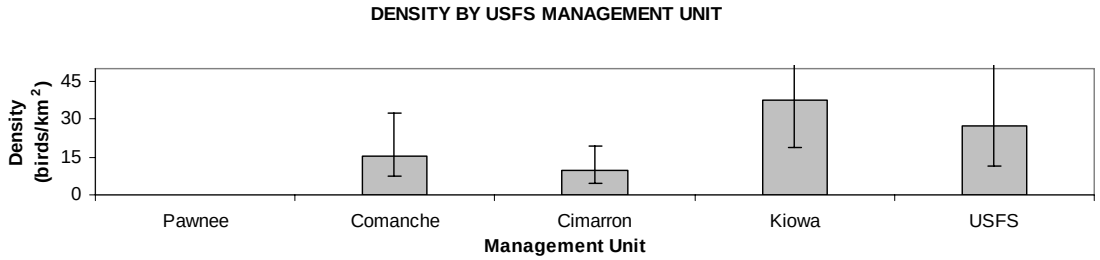
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

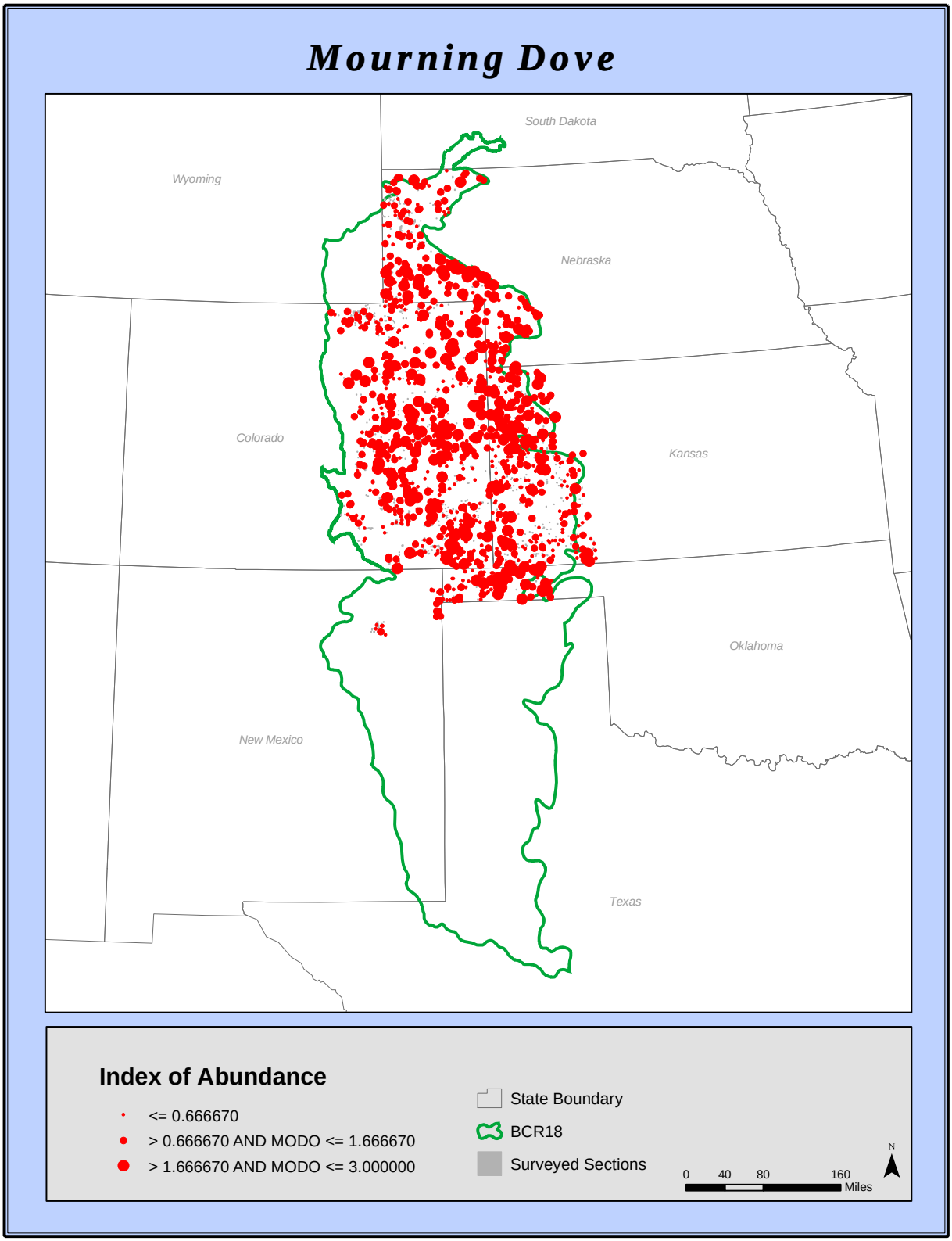
Mourning Dove
(Zenaida macroura)

In 2005, we detected 4,719 individuals on 1,473 (62.42%) of the sections surveyed. The Mourning Dove is common throughout the Shortgrass Prairie BCR. Density of this species appears to be higher, although not significantly so, in CRP habitat within BCR 18 (D = 21.00 birds/km^2, CV = 44%, *n* = 19). No significant differences in density were found to exist among any of the management units.







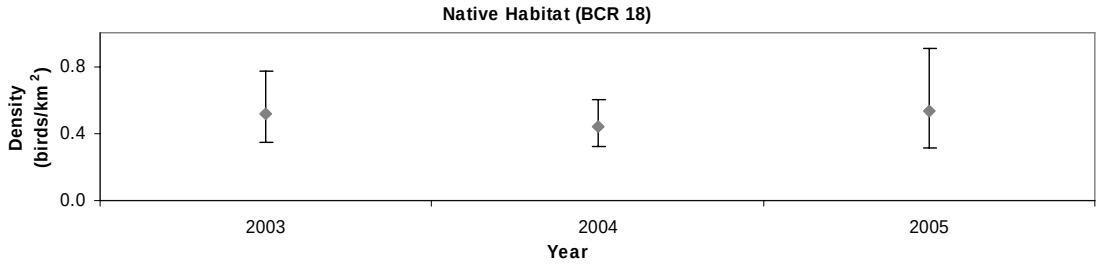


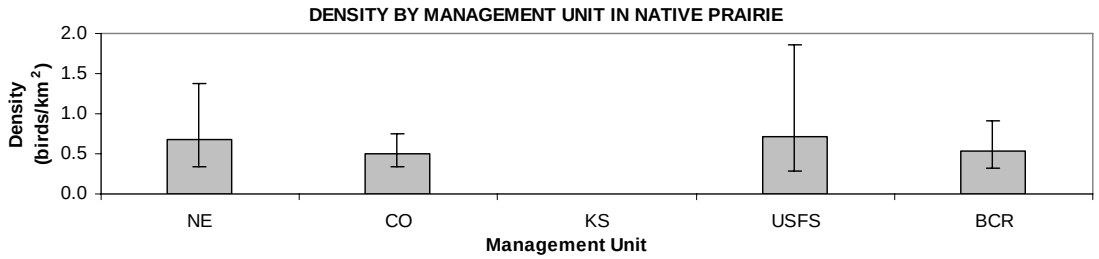
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

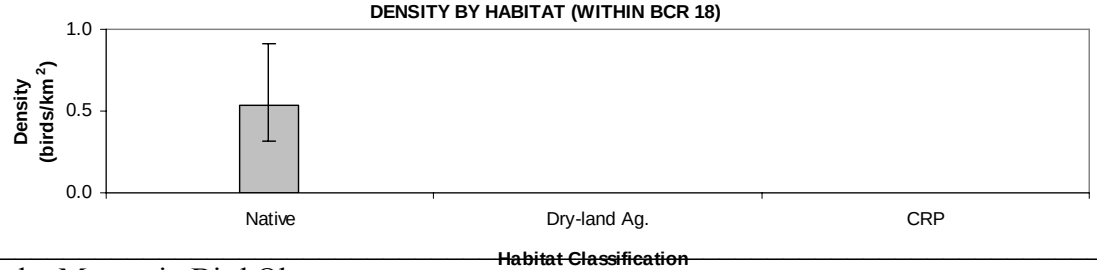
Burrowing Owl
(Athene cunicularia)

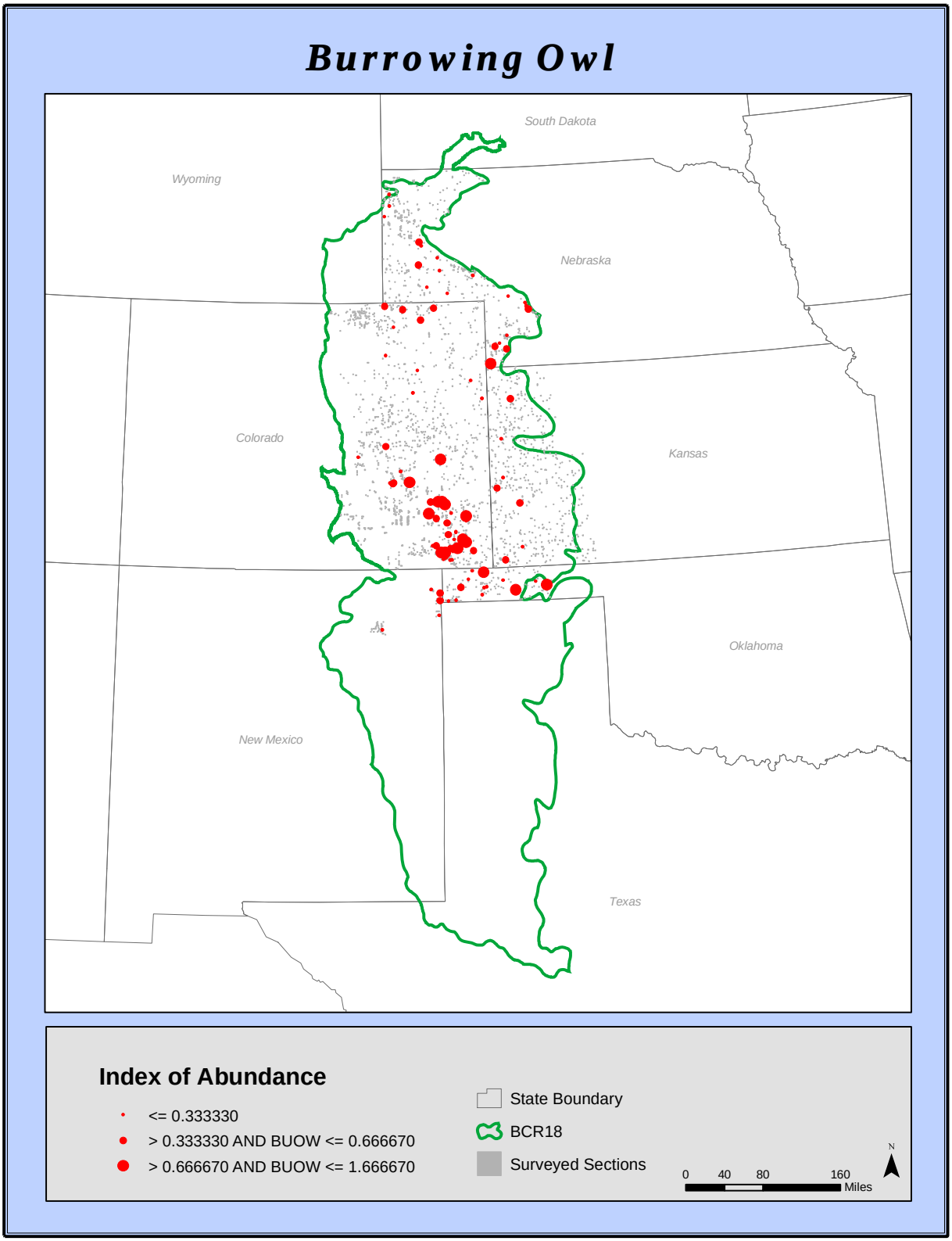
In 2005, we detected 168 Burrowing Owls on 102 (4.32%) of the surveyed sections. This species was widely distributed and strongly associated with prairie dog colonies. Sixty-four percent of Burrowing Owl observations occurred on sections with Black-tailed Prairie Dog colonies. Densities (D = 0.72 birds/km^2, CV = 49%, n = 14) of Burrowing Owls were slightly higher on National Grasslands, although this difference was not significant. Average density within native prairie habitat across the study area was 0.53 birds/km^2 (CV = 28%, n = 102), although because of its colonial nature, local densities where the species occurs are likely considerably higher than this. Burrowing Owl is a species of concern as follows:

- Partners in Flight – Regional Importance and Stewardship species.
- Nebraska – species of concern (CWCS).
- Kansas – species of concern (CWCS).
- Colorado – species of concern (CWCS).
- Oklahoma – species of concern (CWCS).
- USFS R2 – sensitive species.







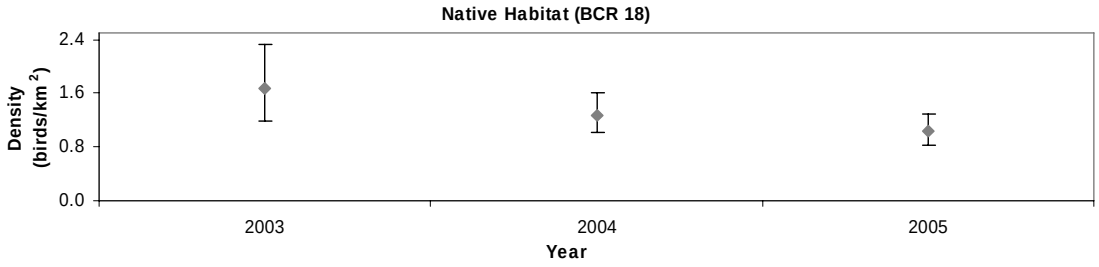


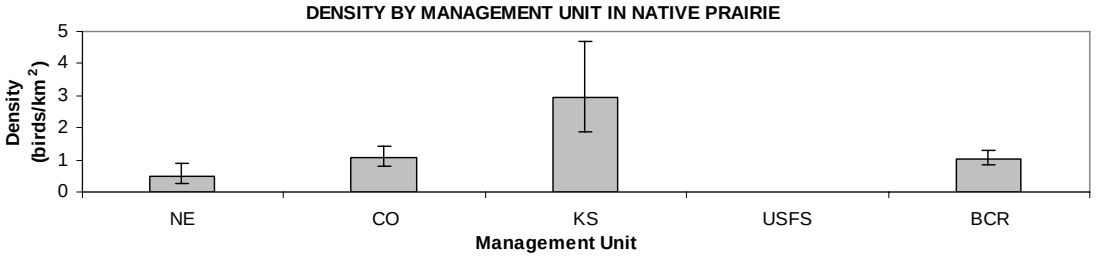
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

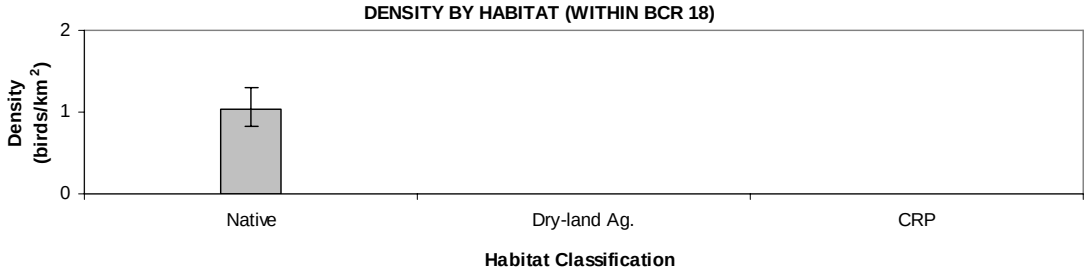
Common Nighthawk
(Chordeilis minor)

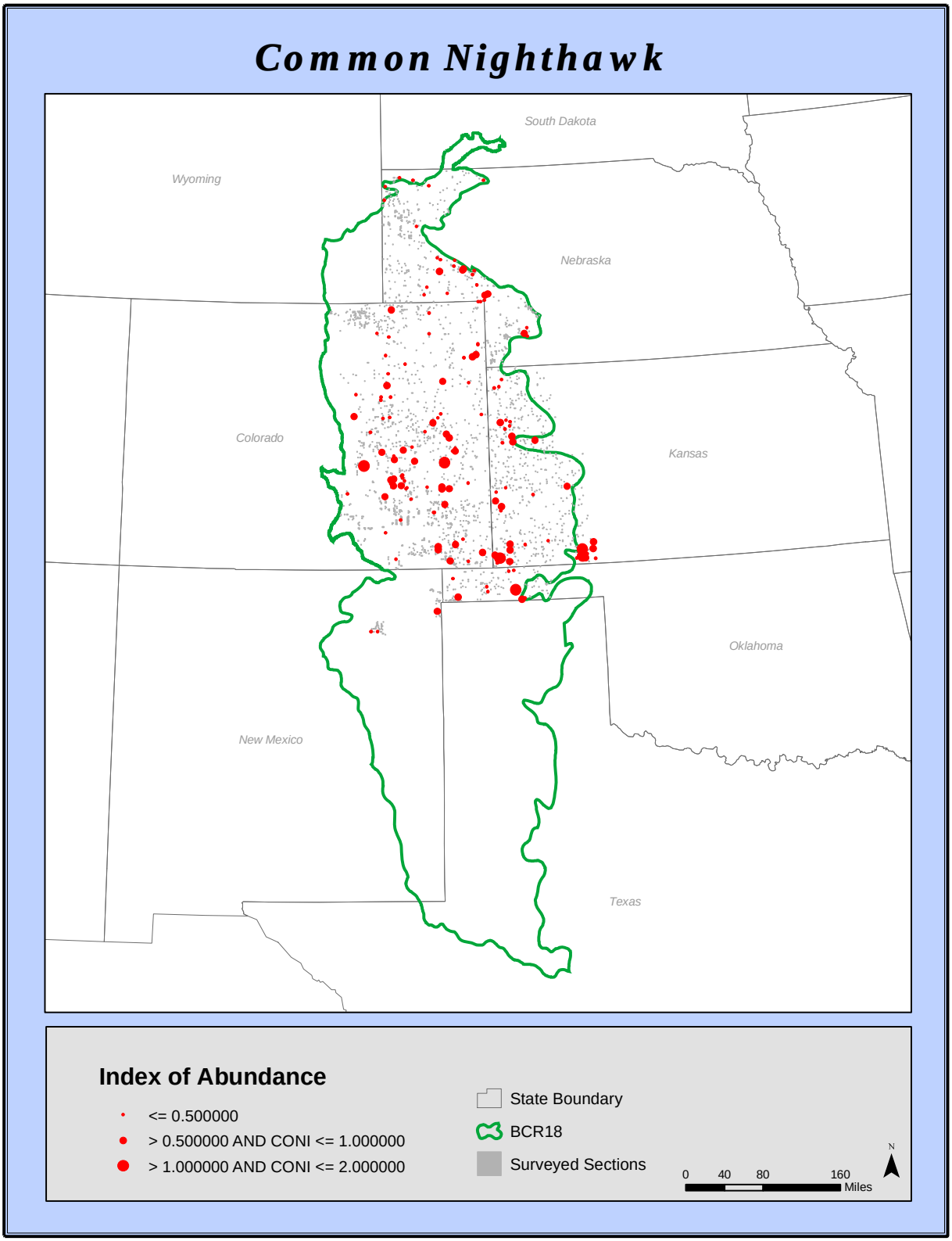
In 2005, we detected 248 individuals on 162 (6.9%) of the sections surveyed. Common Nighthawk occurs throughout the shortgrass prairie BCR. Highest densities occurred in Kansas (D = 2.96 birds/km^2, CV = 24%, *n* = 44). At the BCR level, native prairie supported 1.03 birds/km^2 (CV = 12%, n=184) on average. Visual inspection of BCR-wide densities in native prairie between 2003 (1.67 birds/km^2) and 2005 (1.03 birds/km^2) suggest a steady decline in Common Nighthawks. This species is listed as a species of concern as follows:

- Partners in Flight – Regional Concern.
- Kansas – species of concern (CWCS).







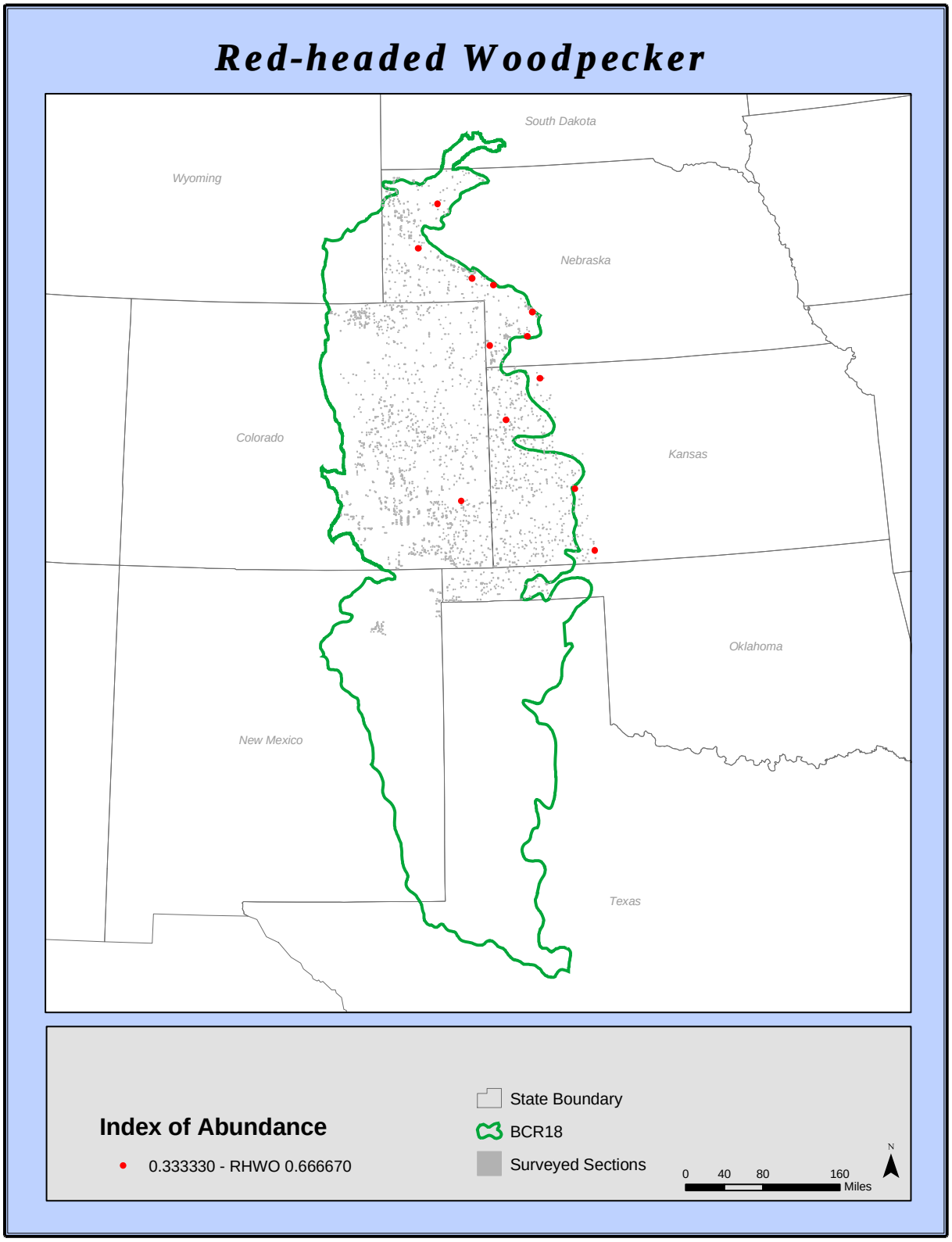


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Red-headed Woodpecker
(Melanerpes erythrocephalus)

In 2005, we detected 15 individuals on 13 (<1%) of the sections surveyed. This species was distributed on the eastern periphery of the Shortgrass Prairie BCR, mainly in scattered woodlands (i.e. shelter belts).

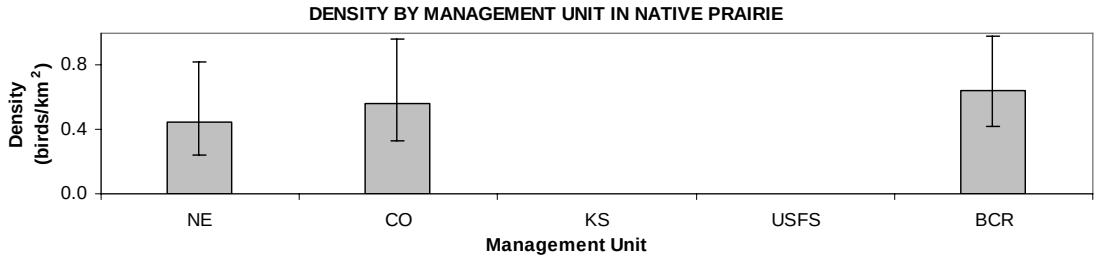
- Partners in Flight – Continental Concern and Regional Importance.
- Kansas – species of concern (CWCS).
- Oklahoma – species of concern (CWCS).

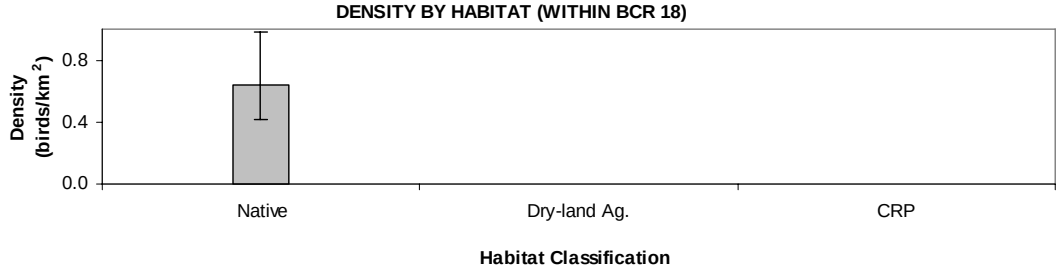


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

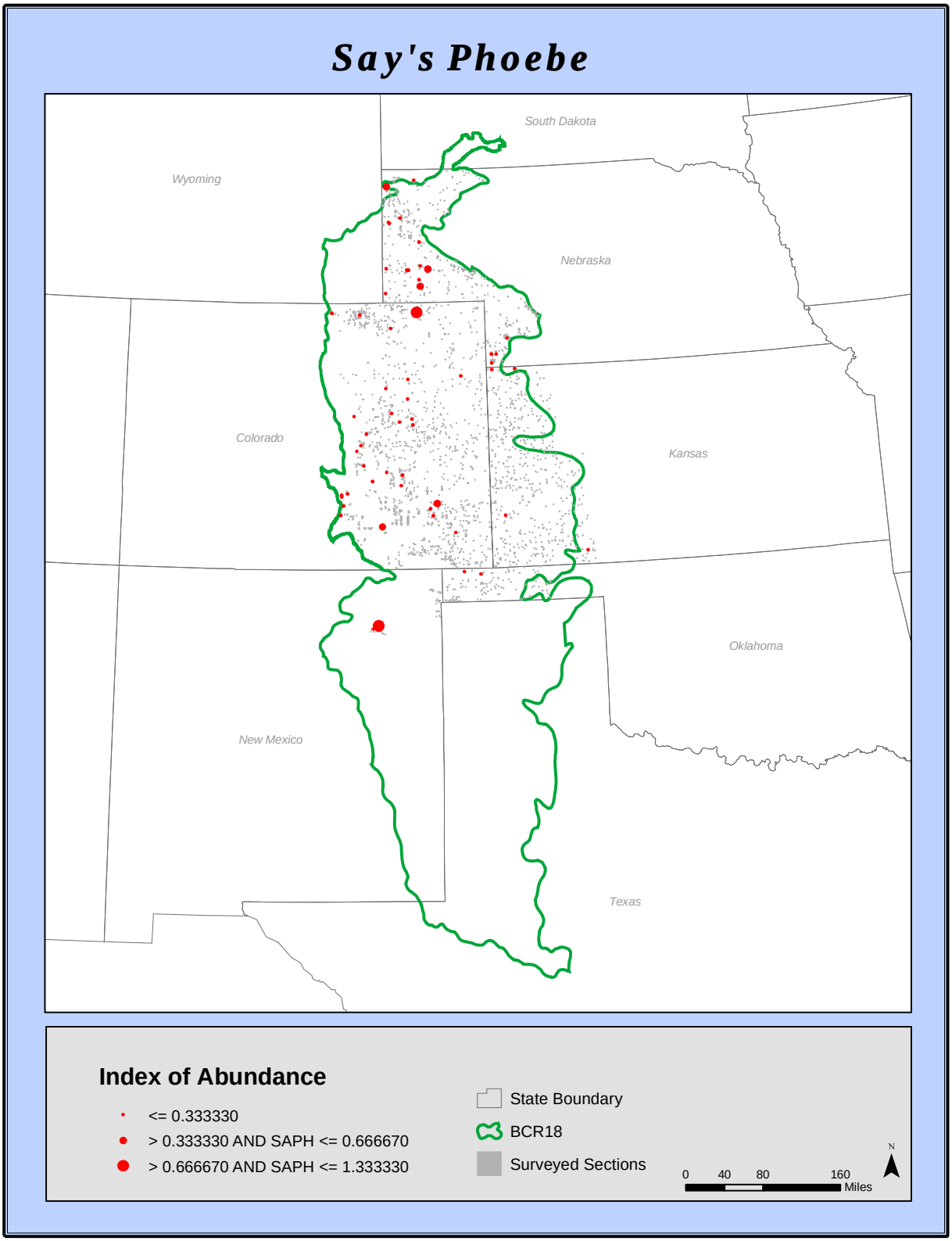
Say's Phoebe
(Sayornis saya)

In 2005, we detected 70 Say's Phoebes on 60 (2.5%) of the surveyed sections. This species is sparsely distributed in the Shortgrass Prairie BCR. Highest density (D = 0.64 birds/km^2, CV = 22%, n = 49) is in native prairie habitat. Too few birds were detected to estimate density in Kansas or on National Grasslands, and density does not appear to differ significantly between Colorado and Nebraska. Say's Phoebe is a Partners in Flight Stewardship species for BCR 18. This species inhabits open expanses with some sort of anthropogenic or vegetative structure for nest building.





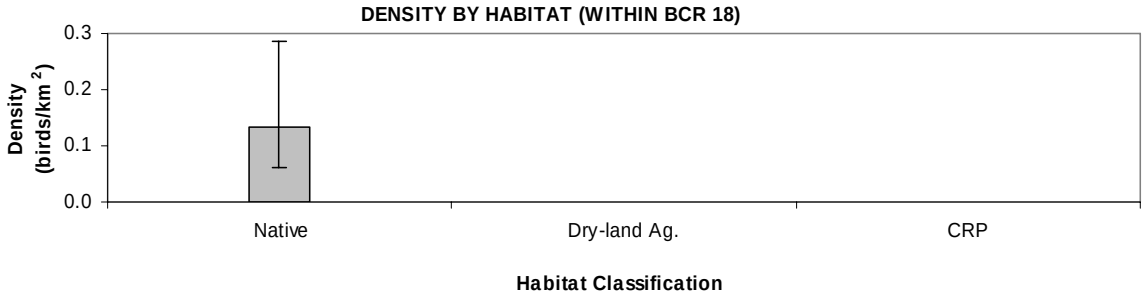
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 3 July 2005.



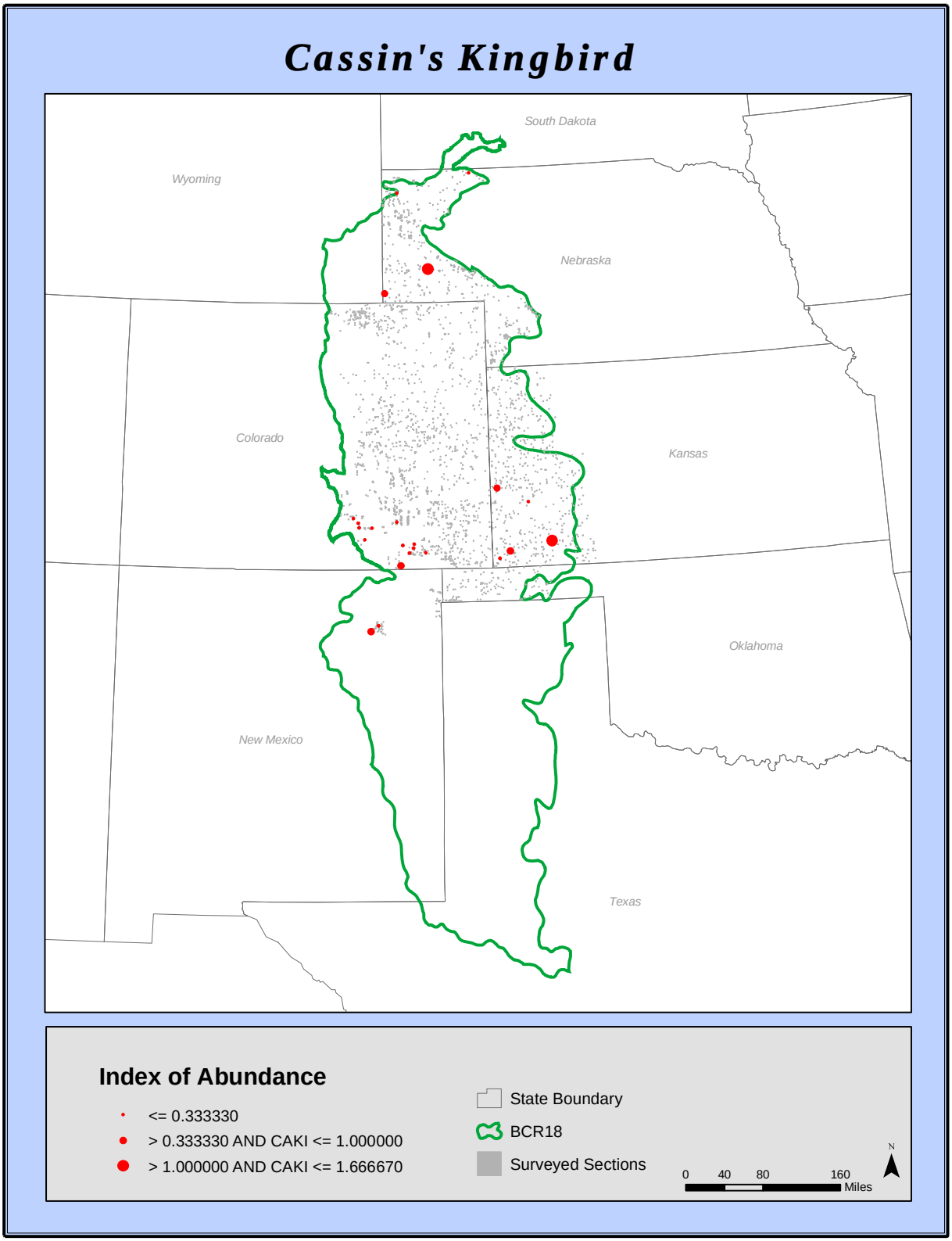
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Cassin's Kingbird
(Tyrannus vociferans)

In 2005, we detected 38 individuals on 24 (1%) of the sections surveyed. Cassin's Kingbird was recorded mainly in the southern portion of the Shortgrass Prairie BCR, although its does occur throughout. The greatest density for this species is in native prairie habitat (D = 0.13 birds/km^2, CV = 40%, *n* = 16). Cassin's Kingbird is a species of concern listed in Nebraska's CWCS.



Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 3 July 2004.

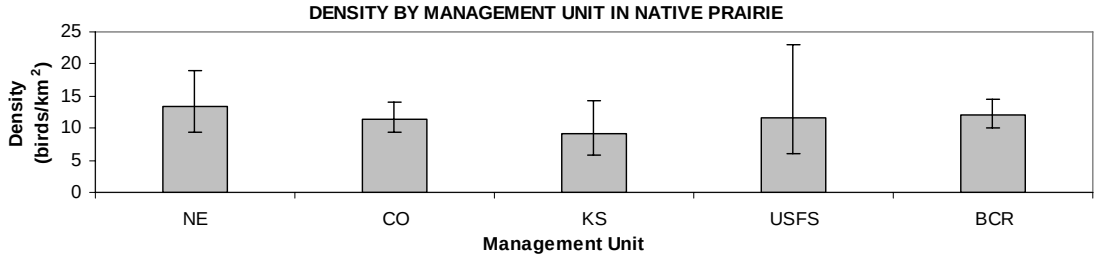


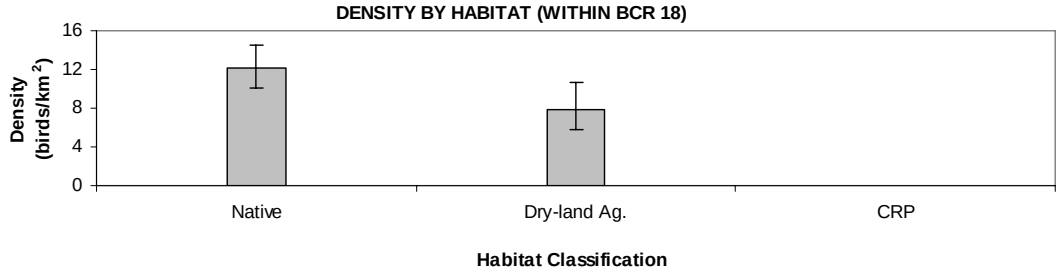
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

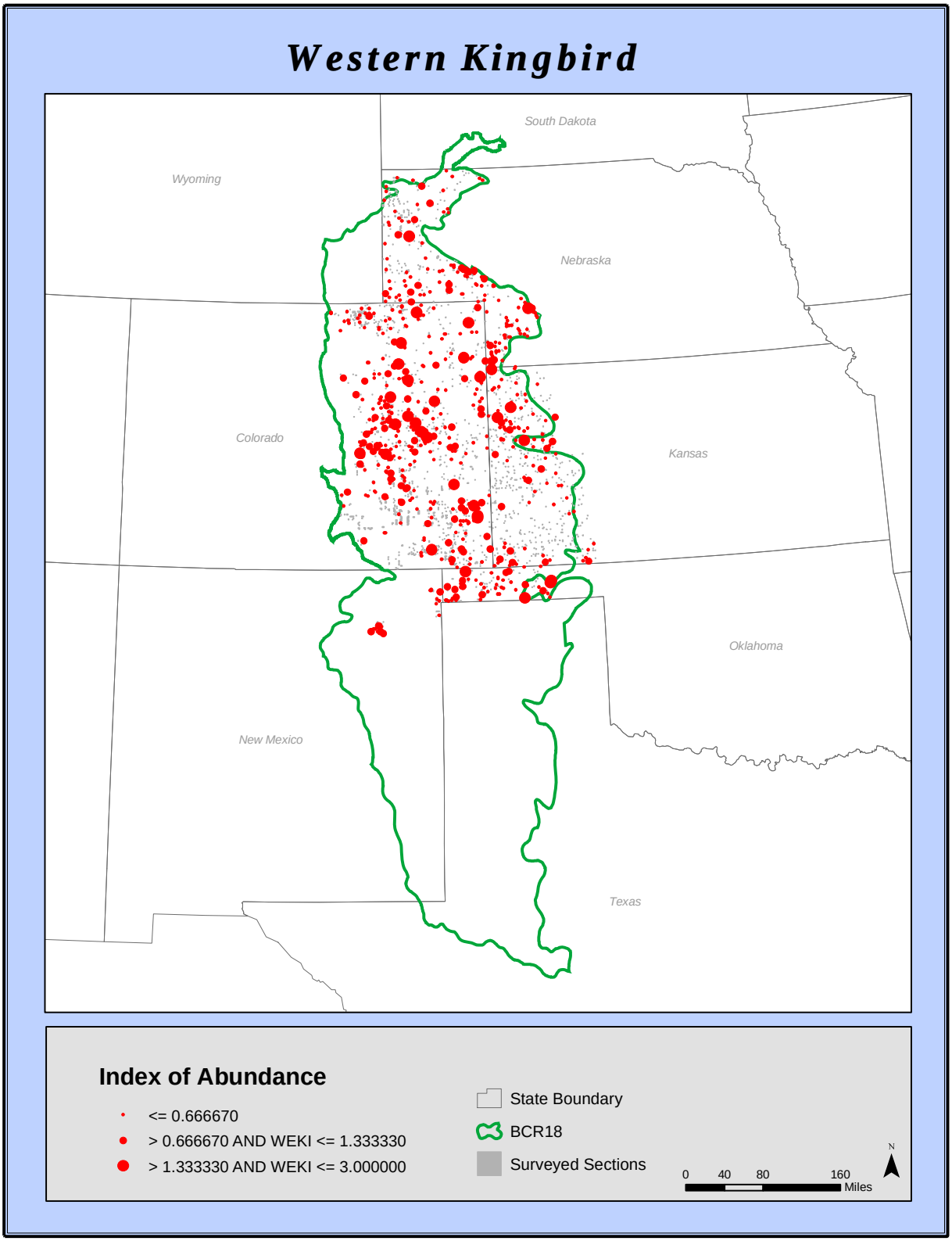
Western Kingbird

(Tyrannus verticalis)

In 2005, we detected 1,201 individuals on 625 (26.48%) of the sections surveyed. Western Kingbird is distributed throughout the Shortgrass Prairie BCR. Density does not appear to vary significantly among management units, although a higher estimated density in native prairie vs. dry-land agriculture approached significance. Western Kingbird is a species of concern in Kansas's CWCS.





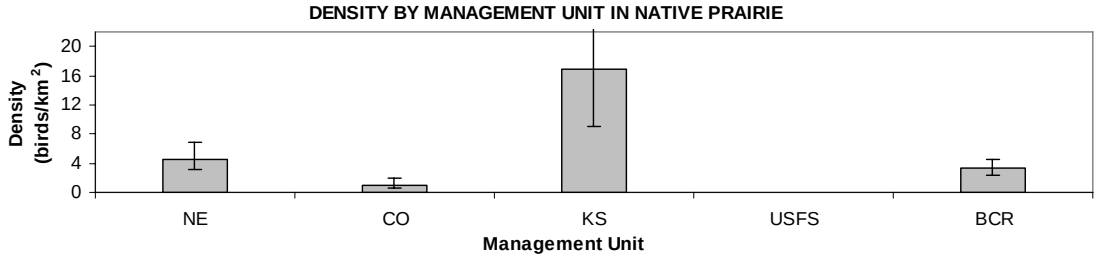


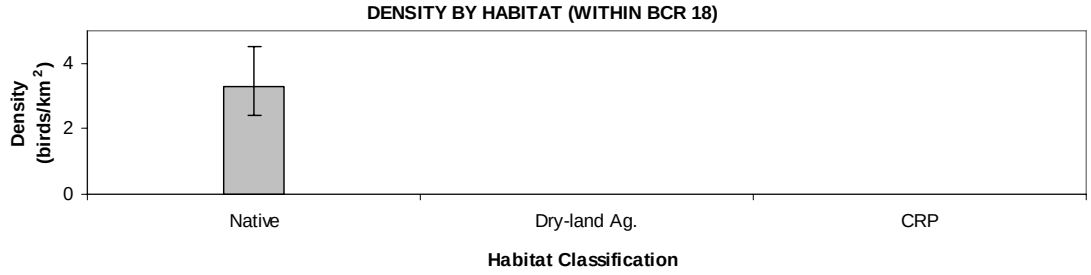
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

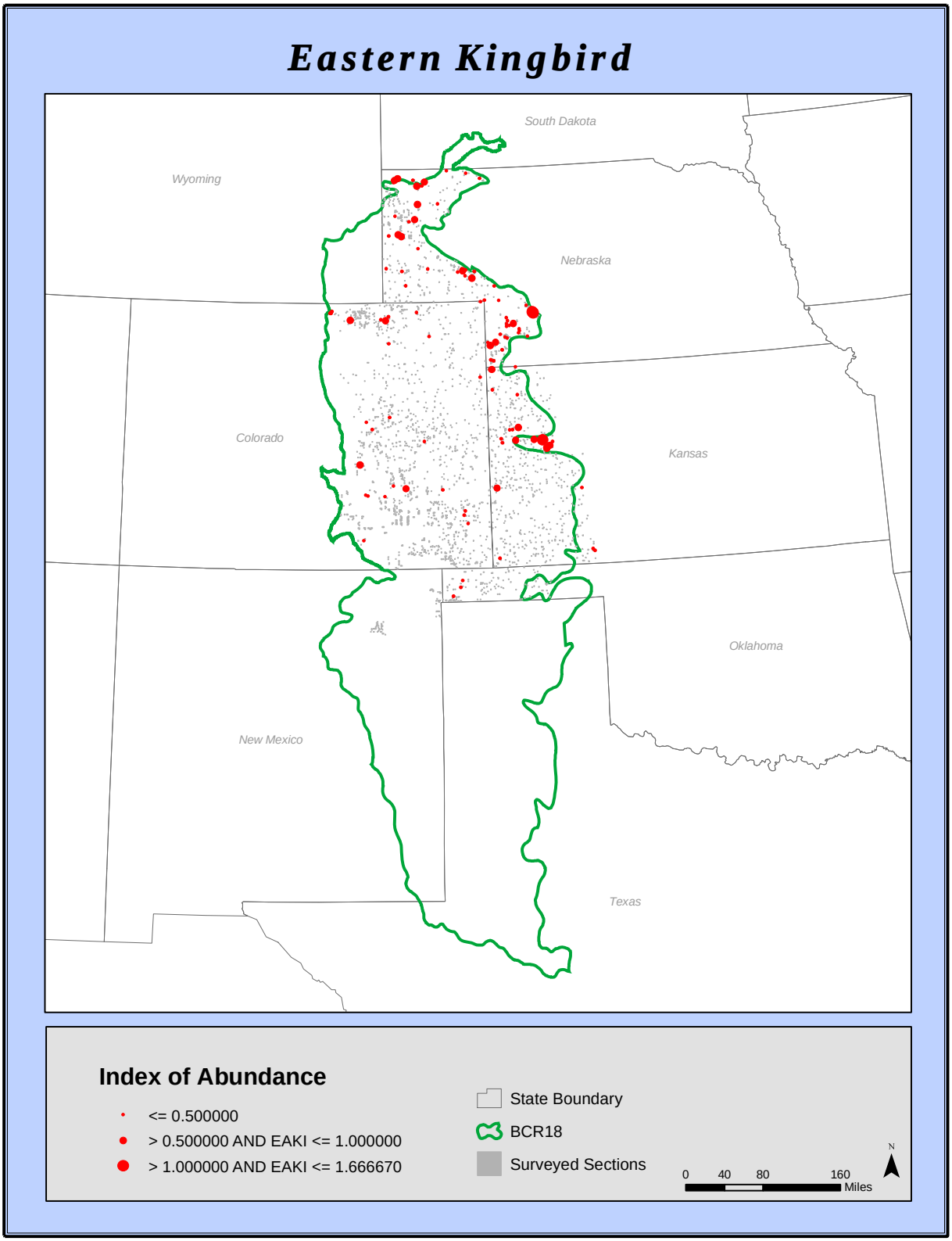
Eastern Kingbird

(Tyrannus tyrannus)

In 2005, we detected 145 individuals on 109 (4.6%) of the sections surveyed. Eastern Kingbird occurs throughout the Shortgrass Prairie BCR, but greatest densities were measured in Kansas (D = 16.92 birds/km^2, CV = 33%, *n* = 22) and in native habitat within BCR 18 (D = 3.30 birds/km^2, CV =161%, *n* = 94). Eastern Kingbird is a species of concern in Kansas's CWCS.





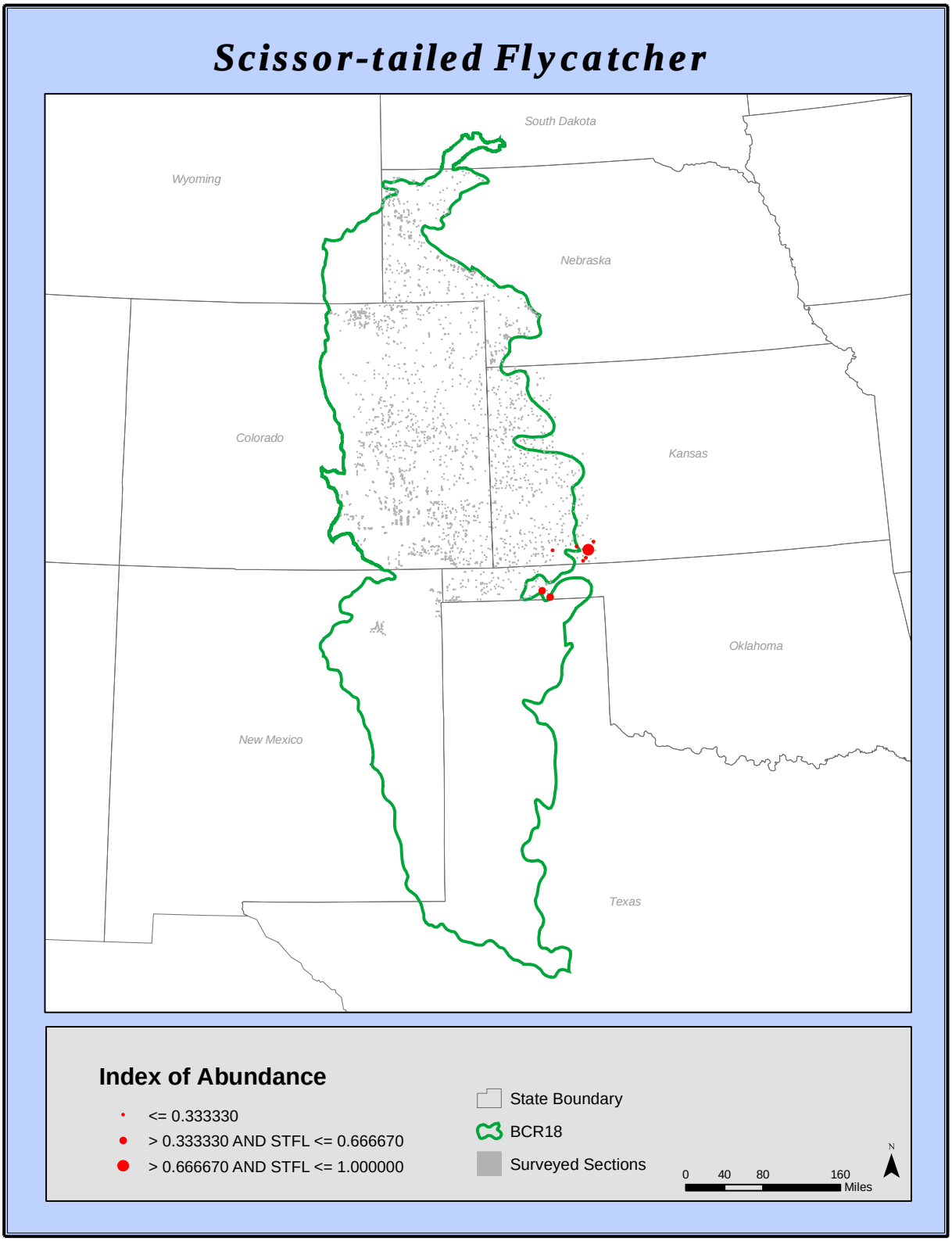


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Scissor-tailed Flycatcher

(Tyrannus forticatus)

In 2005, we detected 12 Scissor-tailed Flycatchers on eight (<1%) of the surveyed sections. This species was observed only in southwest Kansas and the panhandle of Oklahoma. Scissor-tailed Flycatcher is a species of concern in Nebraska and Kansas.

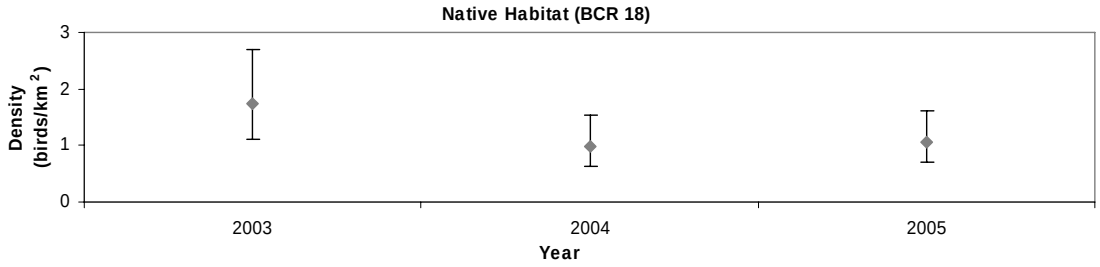


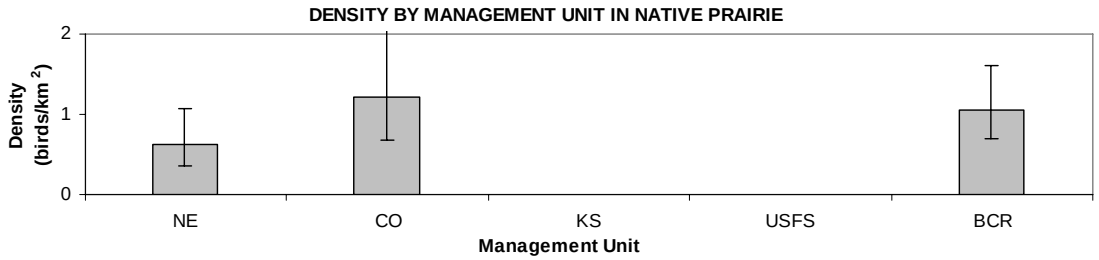
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

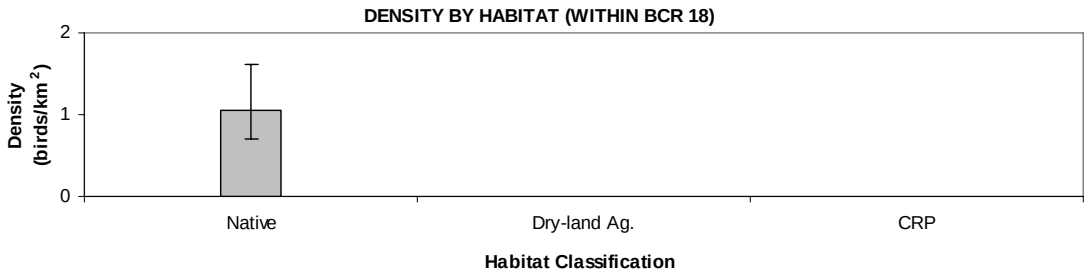
Loggerhead Shrike
(Lanius ludovicianus)

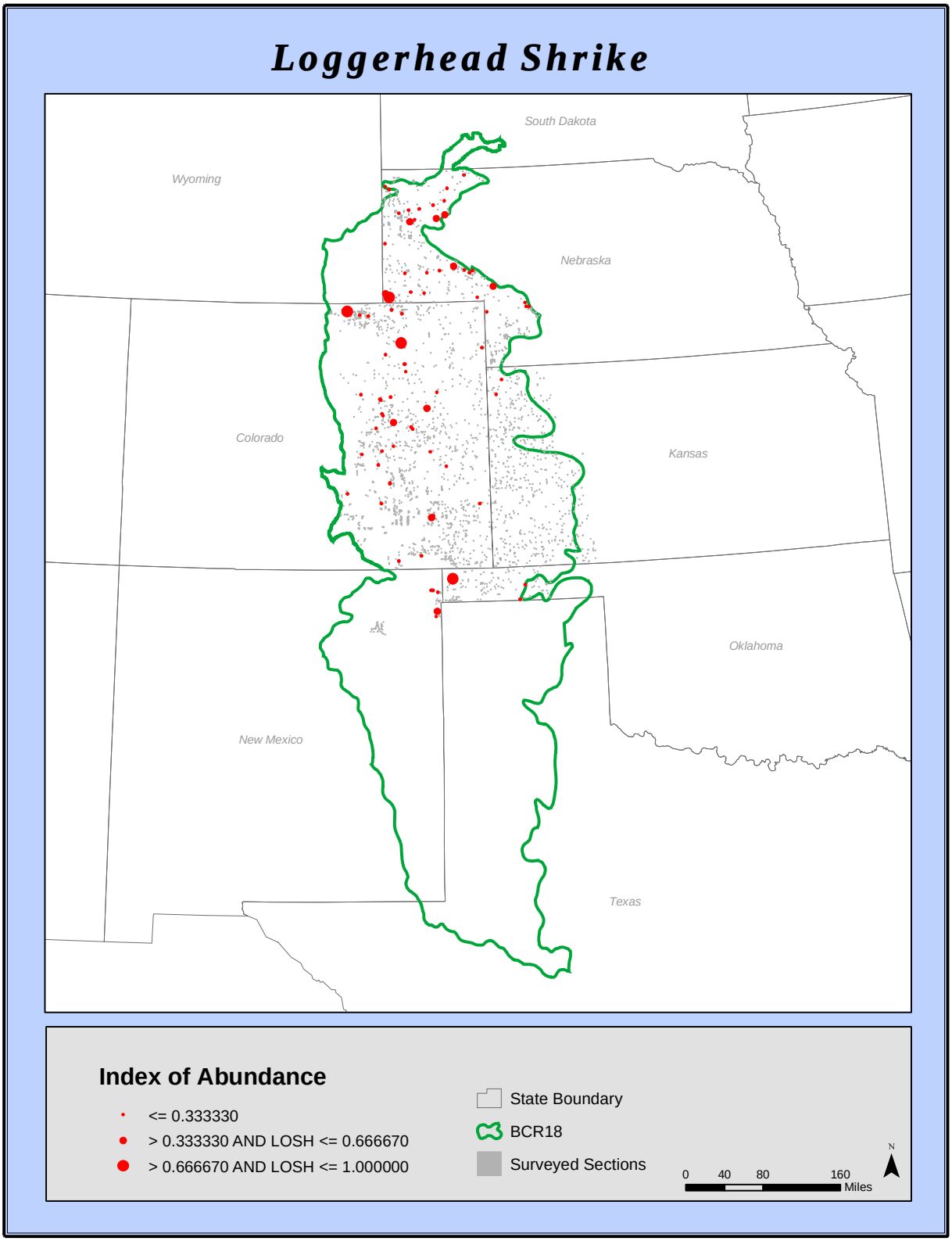
In 2005, we detected 102 Loggerhead Shrikes on 84 (3.6%) of the surveyed sections. This species occurred in highest densities in Colorado and Nebraska. Within the study area, density in native prairie habitat was 1.06 birds/km^2 (CV = 21%, n = 69). Too few were detected to estimate density in any other habitat type, indicating this species' dependence on native grasslands in this region. Density in native prairie was slightly higher, although not significantly so, in Colorado (D = 1.21 birds/km^2, CV = 29%, n = 39) vs. Nebraska. Visual inspection of density estimates and associated confidence intervals suggest a moderate, but non-significant, population decrease between 2003 and 2005. Loggerhead Shrike is a species of concern as follows:

- Partners in Flight – Regional Concern
- Colorado – species of concern (CWCS).
- Kansas – species of concern (CWCS).
- Oklahoma – species of concern (CWCS).
- USFS R2 – sensitive species.







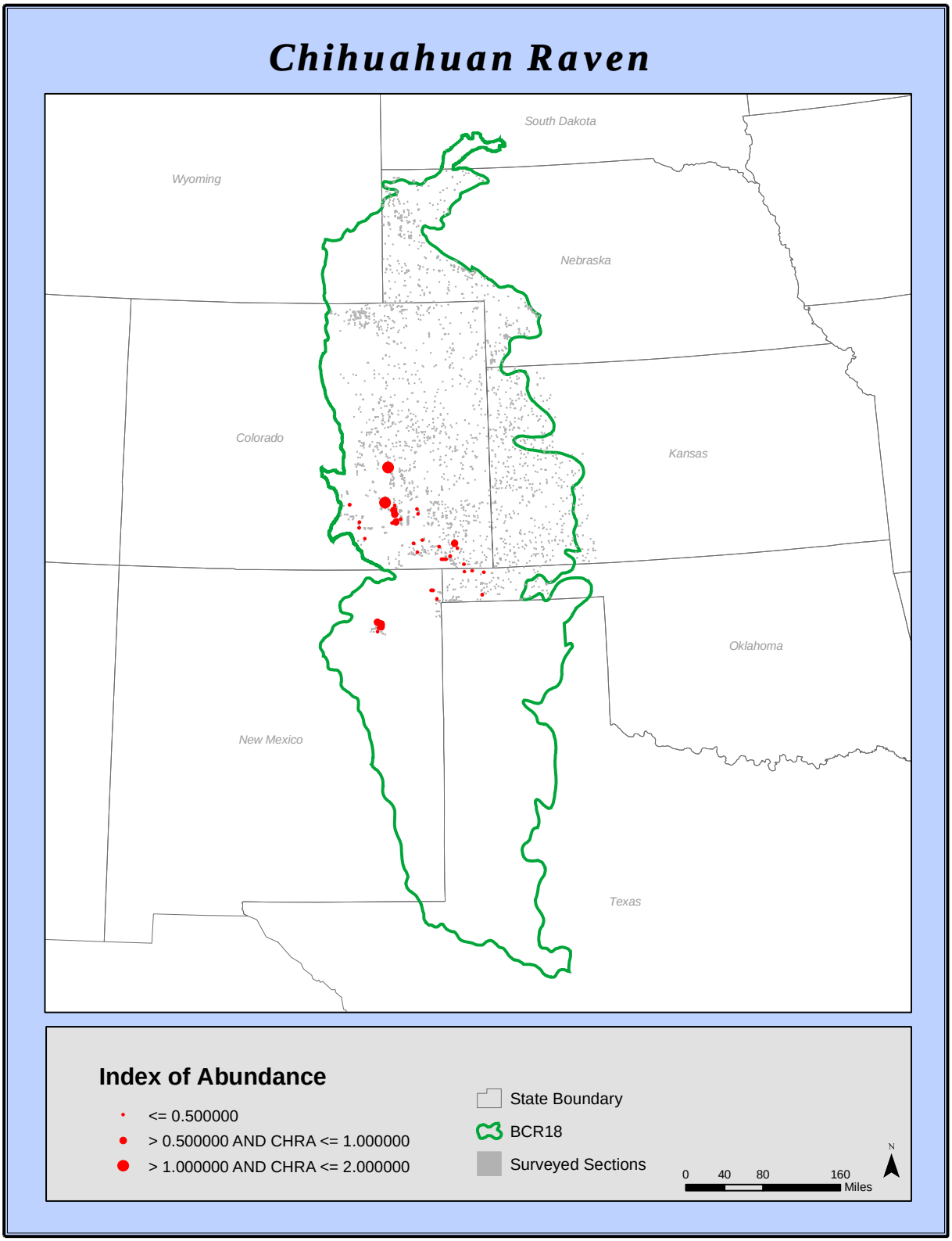


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Chihuahuan Raven

(Corvus cryptoleucus)

In 2005, we detected 59 individuals on 42 (1.8%) of the sections surveyed. Chihuahuan Raven was recorded primarily in native grassland habitats in the southern portion of BCR 18. We did not detect sufficient numbers of this species to estimate density since most of the detections were fly overs. Chihuahuan Raven is a Partners in Flight Regional Stewardship species in BCR18. Kansas's CWCS lists this species as a species of concern.

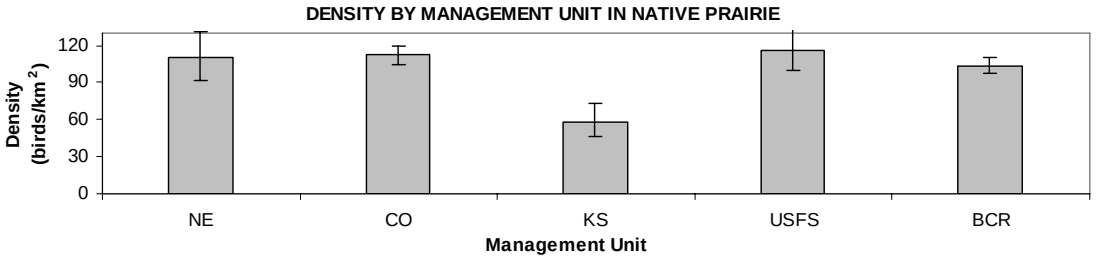


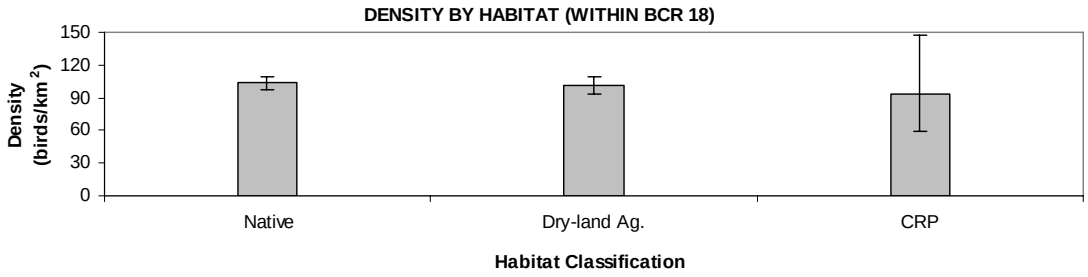
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

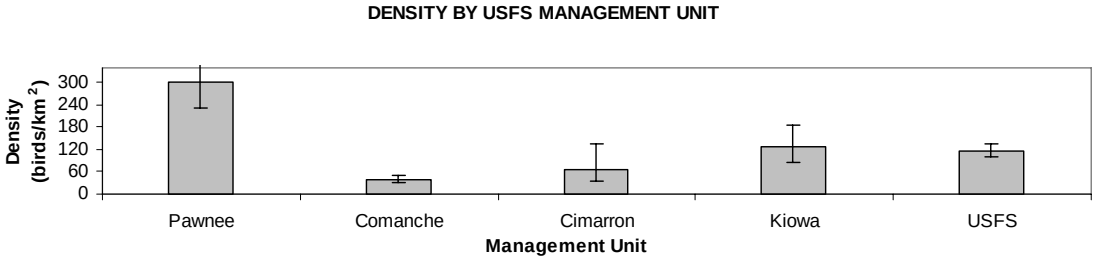
Horned Lark

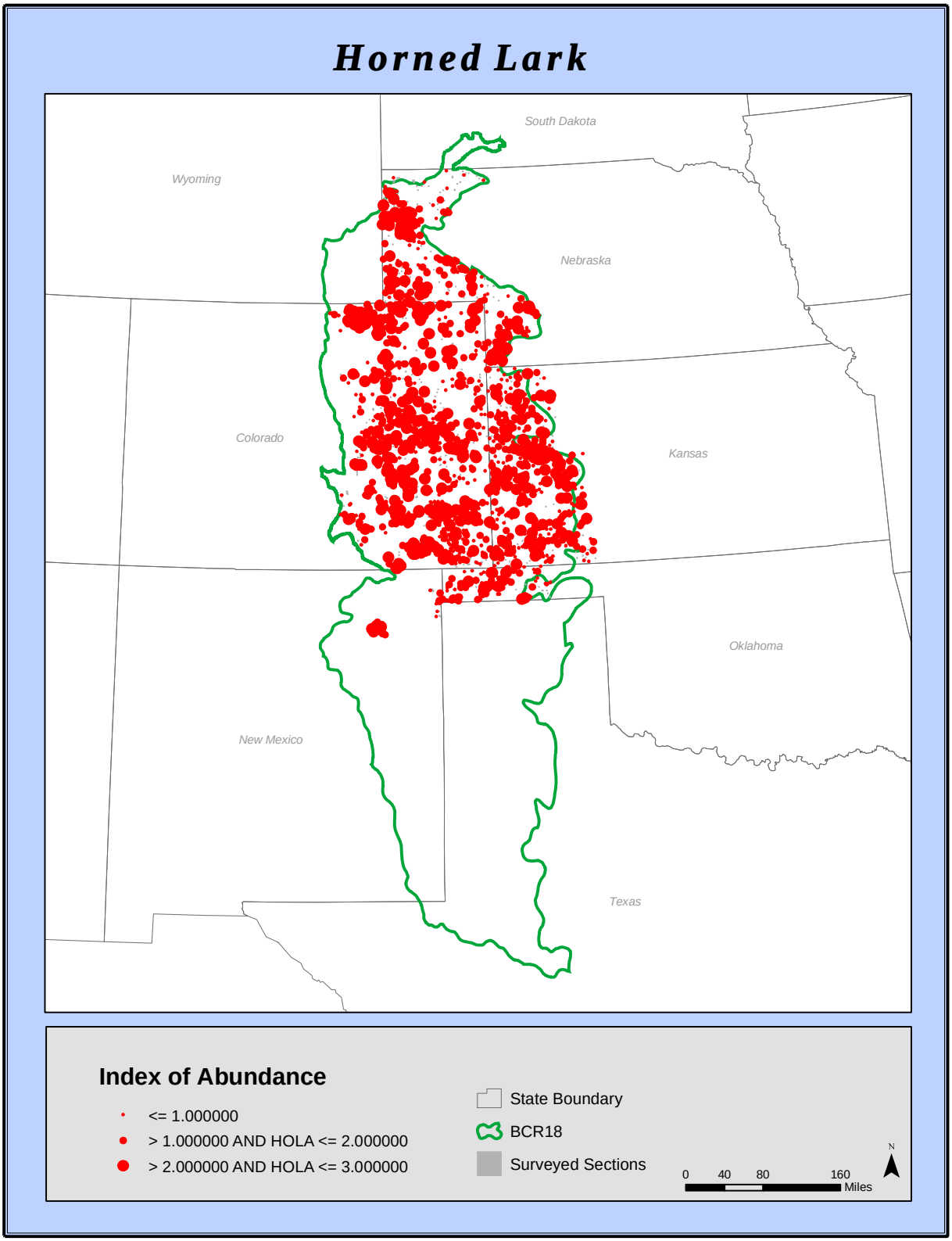
(Eremophila alpestris)

In 2005, we detected 11,620 Horned Larks on 2,013 (85%) of the surveyed sections. We observed more Horned Larks than any other species. This species was widely distributed over the study area with observations occurring in every state. Across the BCR 18 portion of the study area, density was highest in Pawnee National Grassland (D = 303.17 birds/km^2, CV = 14%, *n* = 227). At the BCR scale, Horned Lark density estimates were nearly identical in native prairie (D = 103.4 birds/km^2, CV = 3%, *n* = 5467) and dry-land agriculture habitat (D =100.99 birds/km^2, CV = 4%, *n* = 2070).





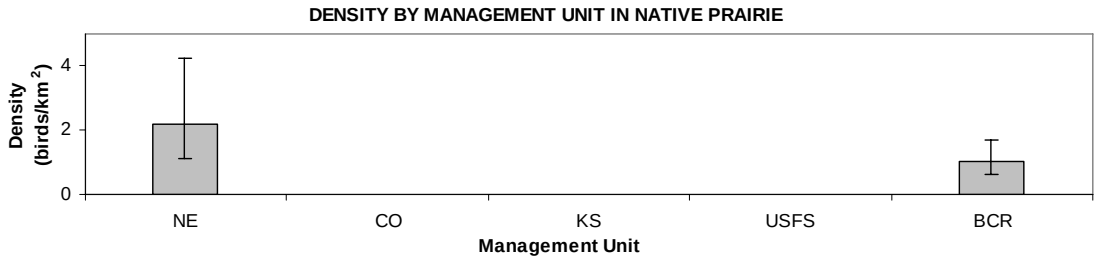


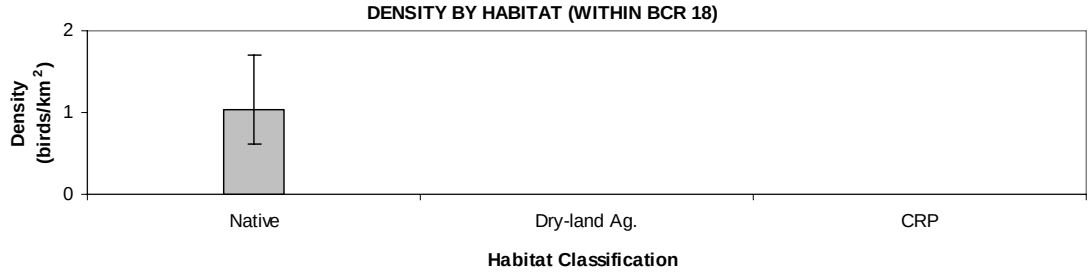


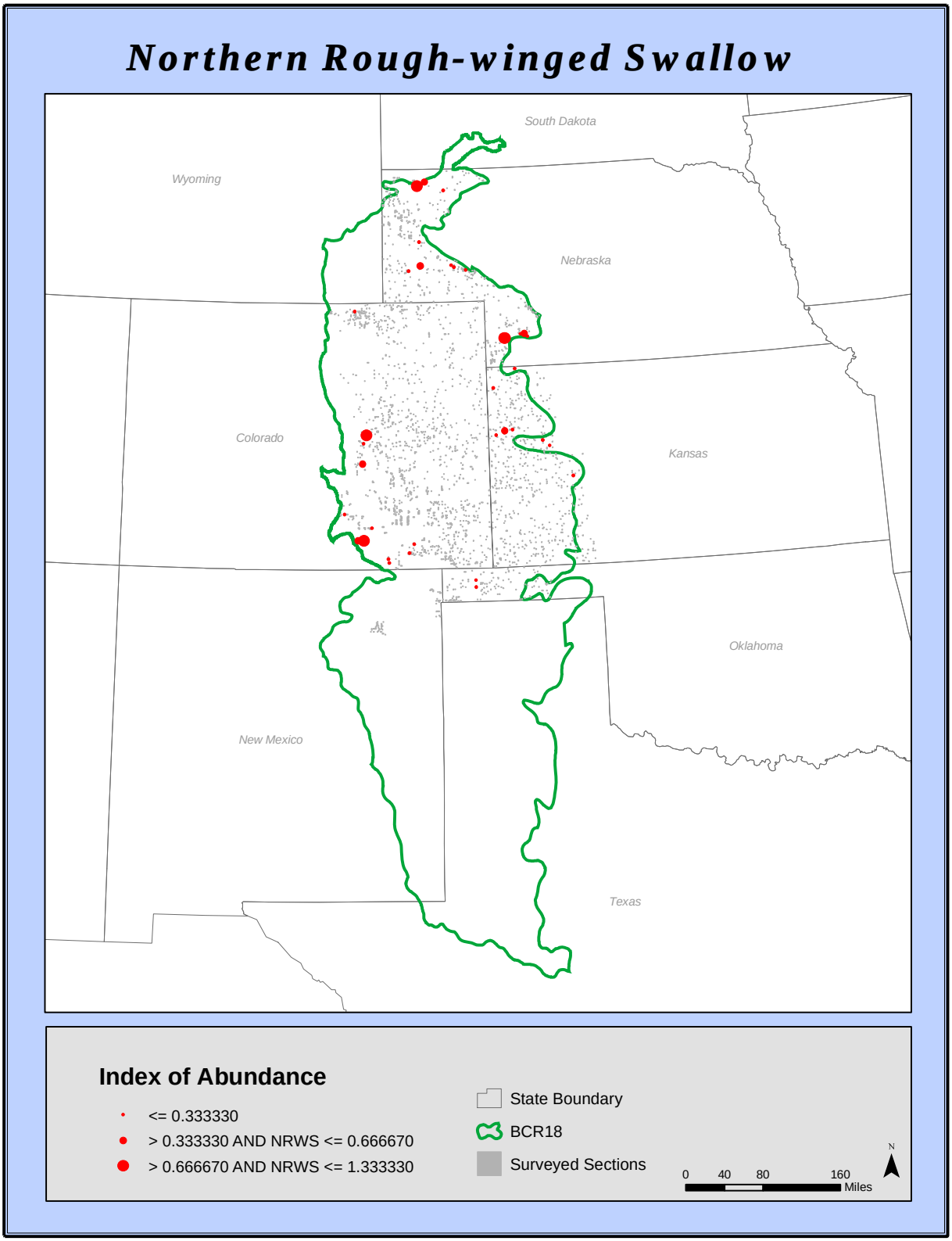
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Northern Rough-winged Swallow
(Stelgidopteryx serripennis)

In 2005, we detected 54 individuals on 37 (1.6%) of the sections surveyed. This species' is locally distributed throughout the BCR. The BCR-wide density estimate in native prairie habitat was 1.03 birds/km^2 (CV = 26%, *n* = 33). We estimated density in Nebraska at 2.17 birds/km^2 (CV = 35%, n= 17).



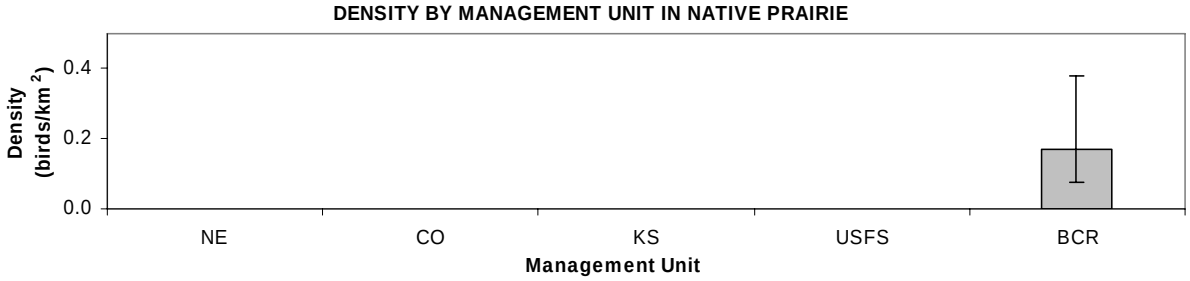


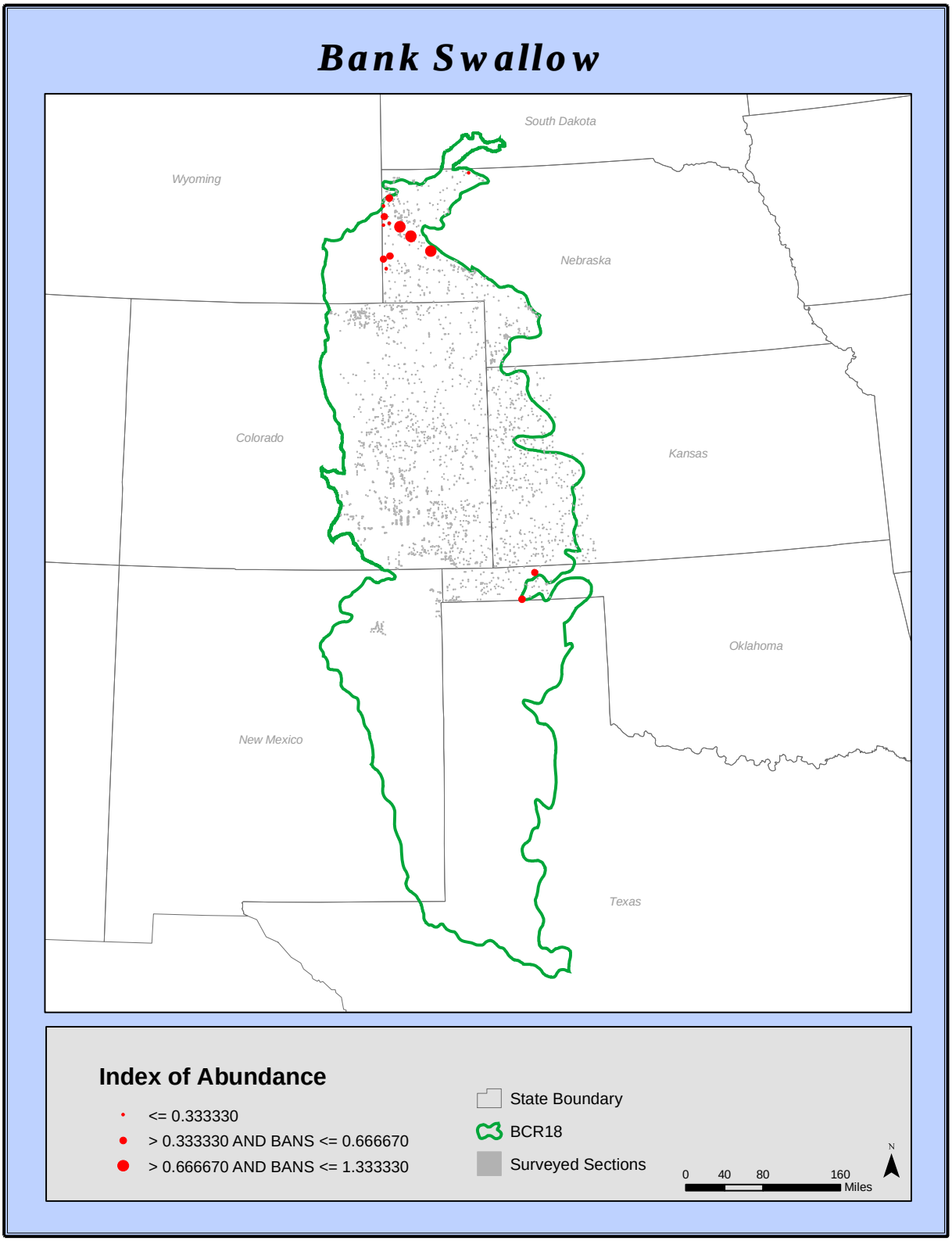


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Bank Swallow
(Riparia riparia)

In 2005, we detected 29 individuals on 15 (<1%) of the sections surveyed, mostly in Nebraska. Shortgrass Prairie BCR density estimate in native prairie habitat was 0.17 birds/km^2 (CV = 42%, *n* = 19). This species depends on escarpments and water for nesting.

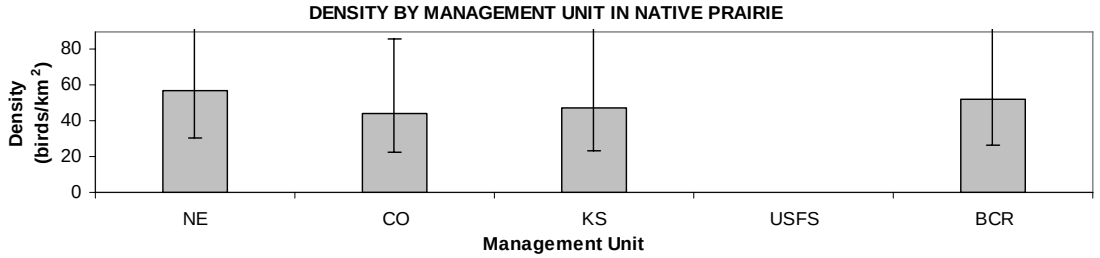


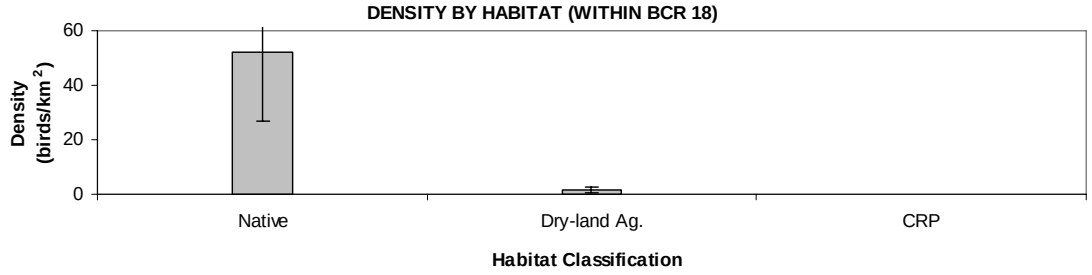


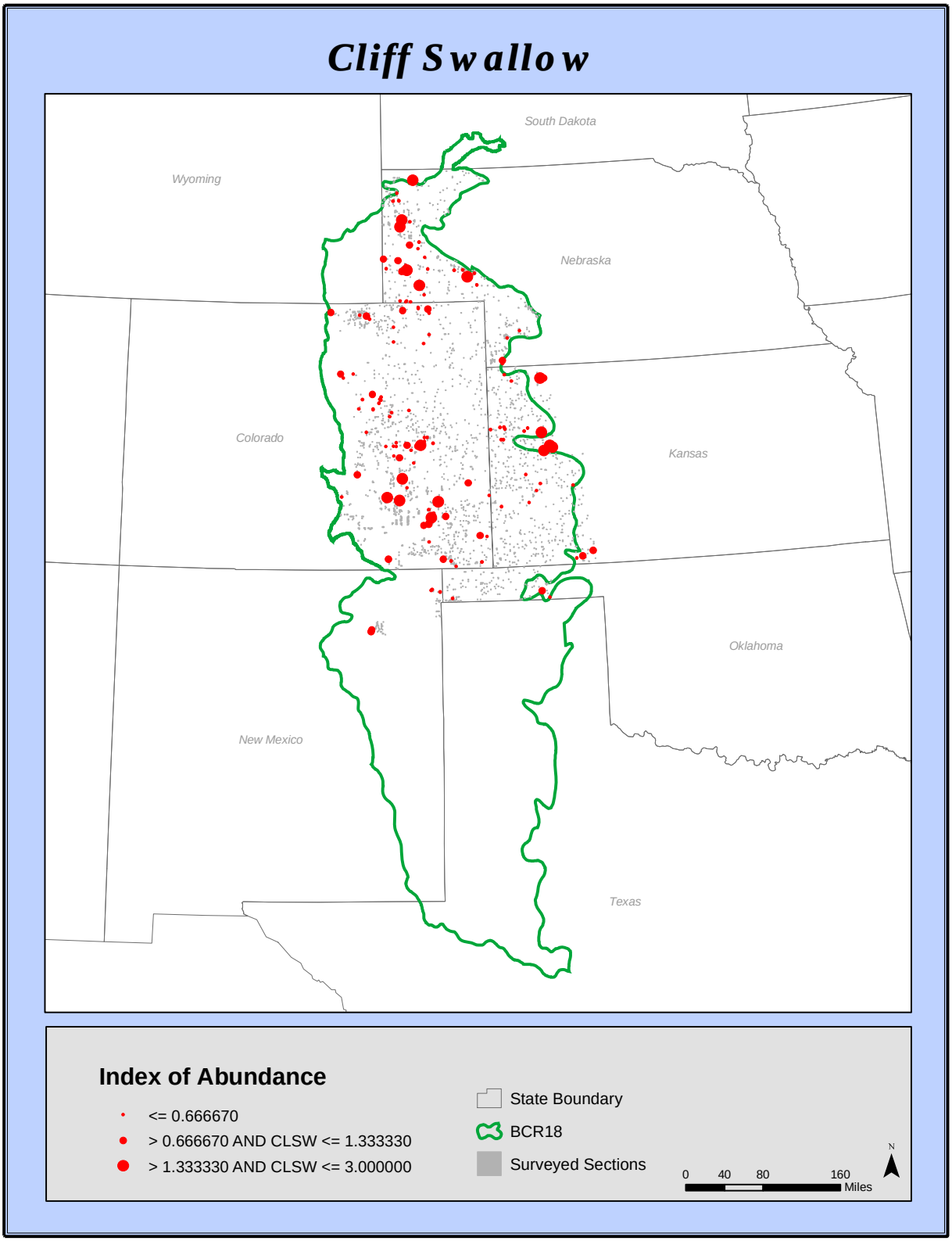
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Cliff Swallow
(Petrochelidon pyrrhonota)

In 2005, we detected 412 individuals on 166 (7.03%) of the sections surveyed. Cliff Swallow occurs throughout the Shortgrass Prairie BCR. The density of this species in Nebraska (D = 57.28 birds/km^2, CV = 32%, *n* = 65) was slightly higher, but not significantly so, than in other management units.



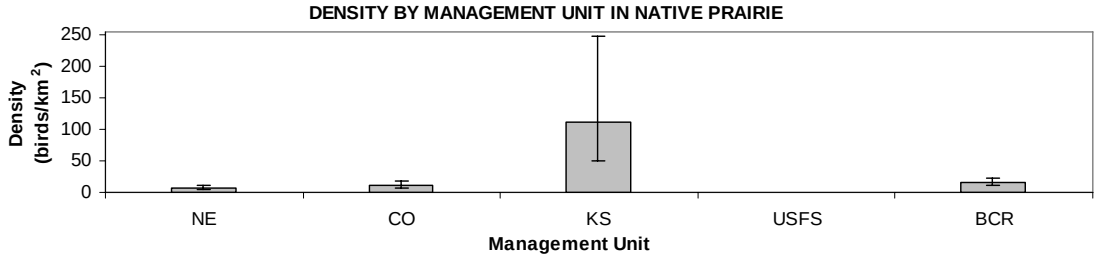


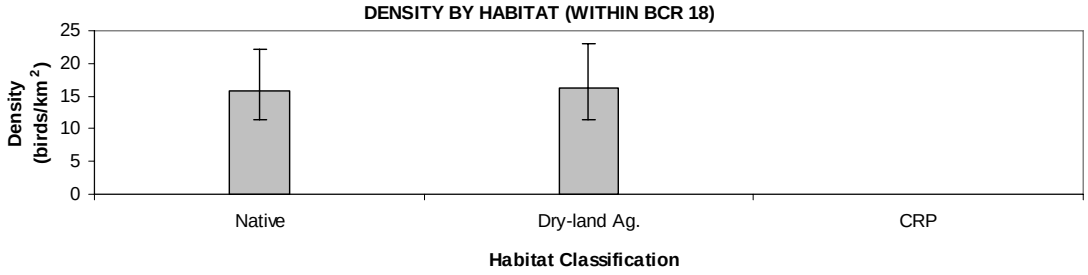


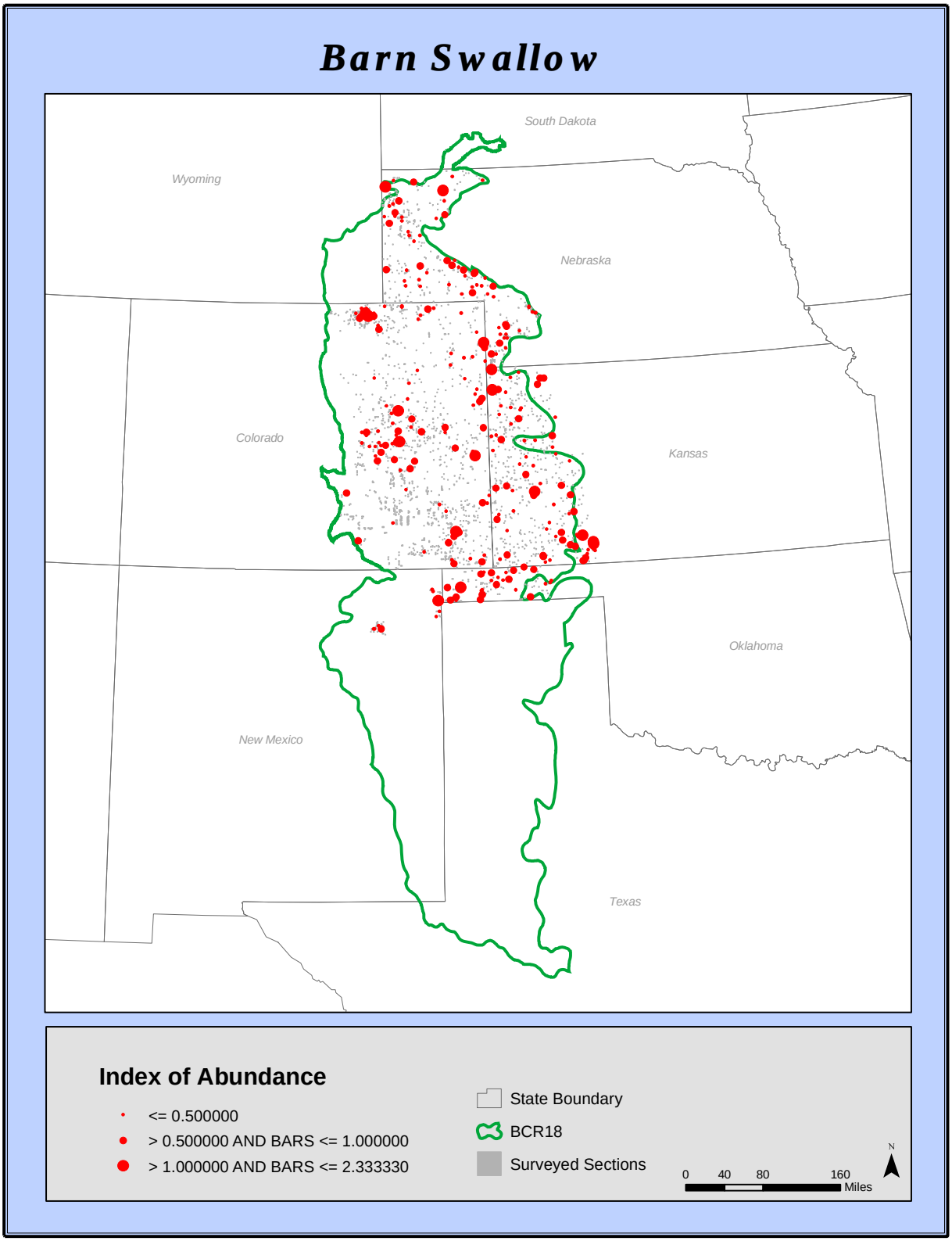
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Barn Swallow
(Hirundo rustica)

In 2005, we detected 456 individuals on 285 (11.95%) of the sections surveyed. Barn Swallow was distributed throughout the Shortgrass Prairie BCR. The highest densities for this species occurred in native prairie in Kansas (D = 111.12 birds/km^2, CV = 42%, *n* = 20). This species is associated with anthropogenic structures and feeds in open areas.



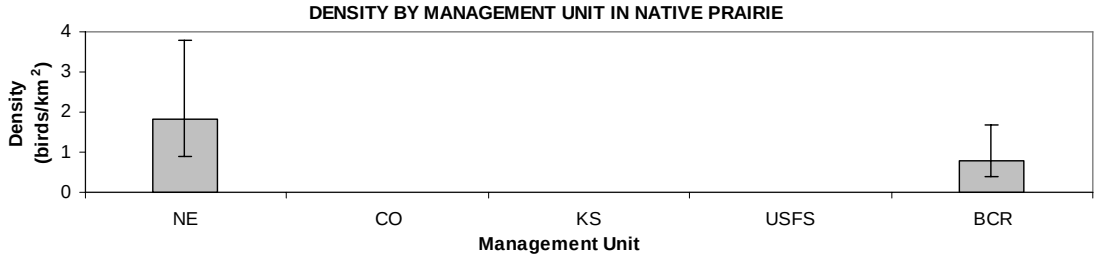


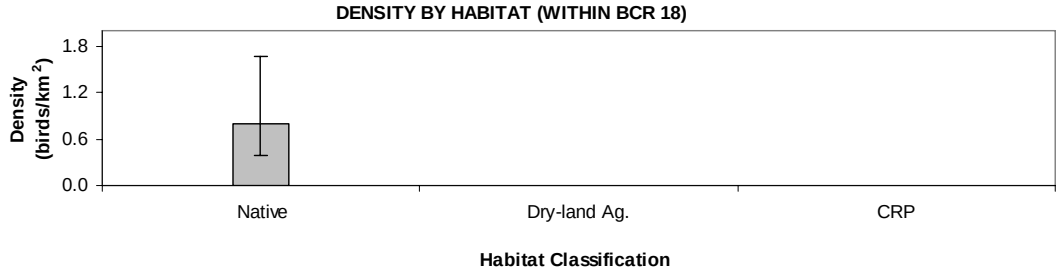


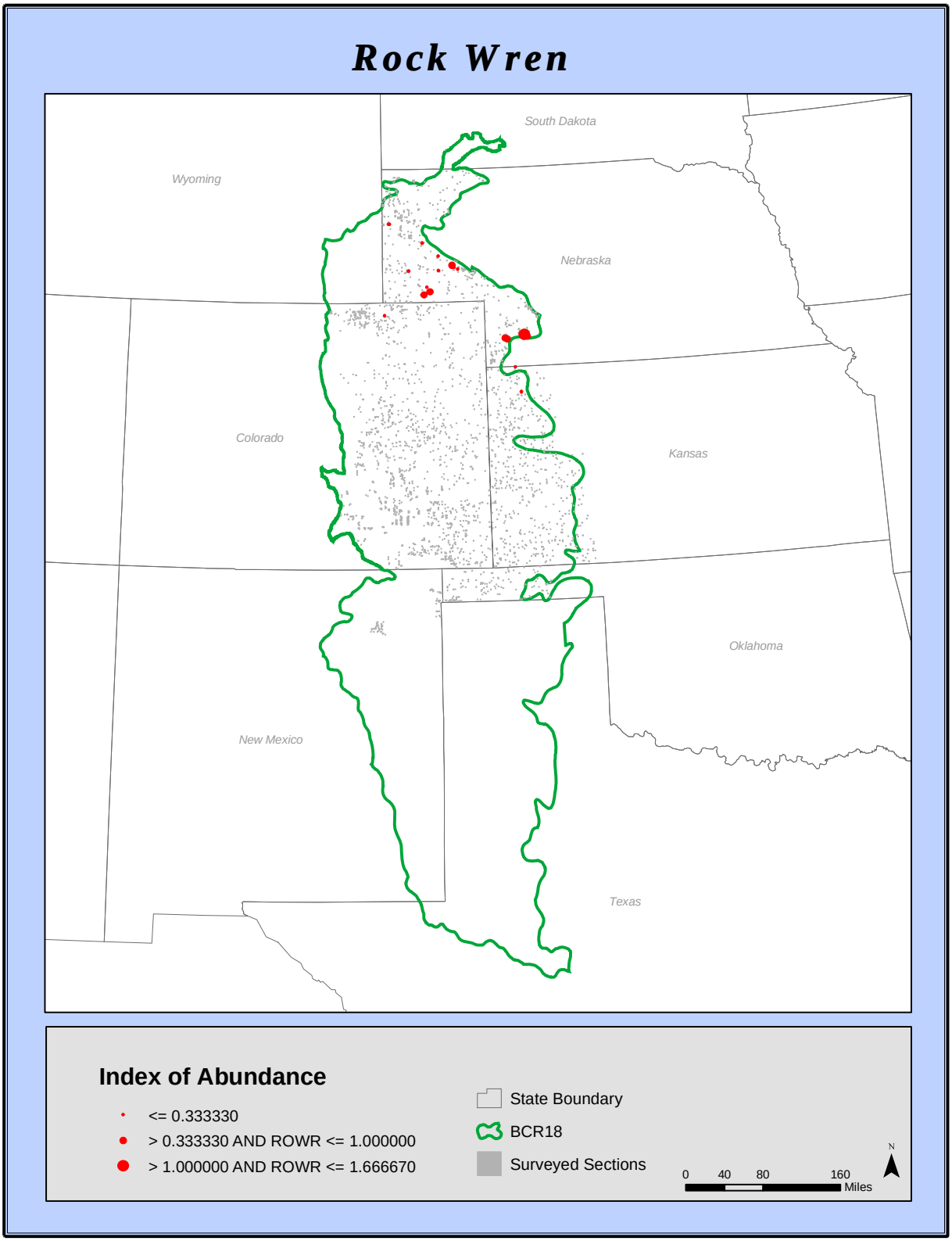
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Rock Wren
(Salinctes obsoletus)

In 2005, we detected 32 individuals on 21 (0.89%) of the sections surveyed. Rock Wren occurred mainly in Nebraska. The Rock Wren density estimate in native prairie for the BCR was (D = 0.8 birds/km^2, CV = 39%, *n* = 23). Density estimate in Nebraska was 1.84 birds/km^2 (CV = 38%, *n* = 22). This species occurs primarily in association with rocky out crops, buttes, or steep slopes, features that occur locally within the BCR.





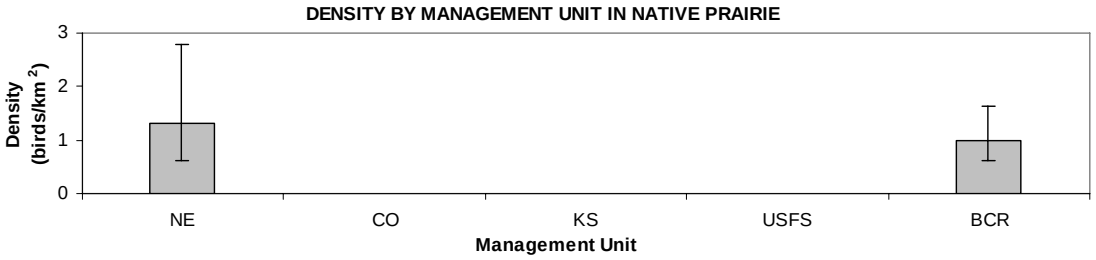


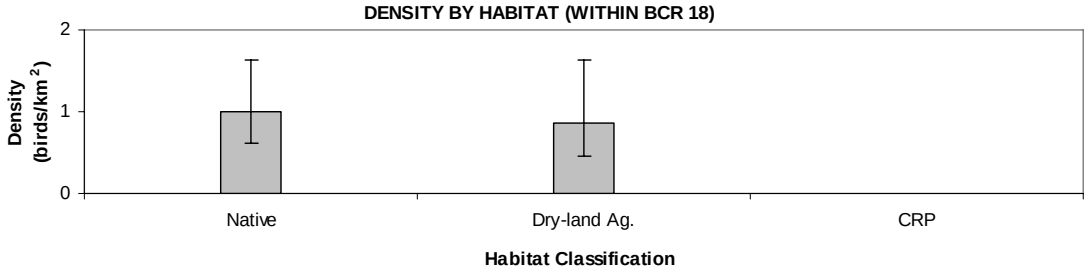
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

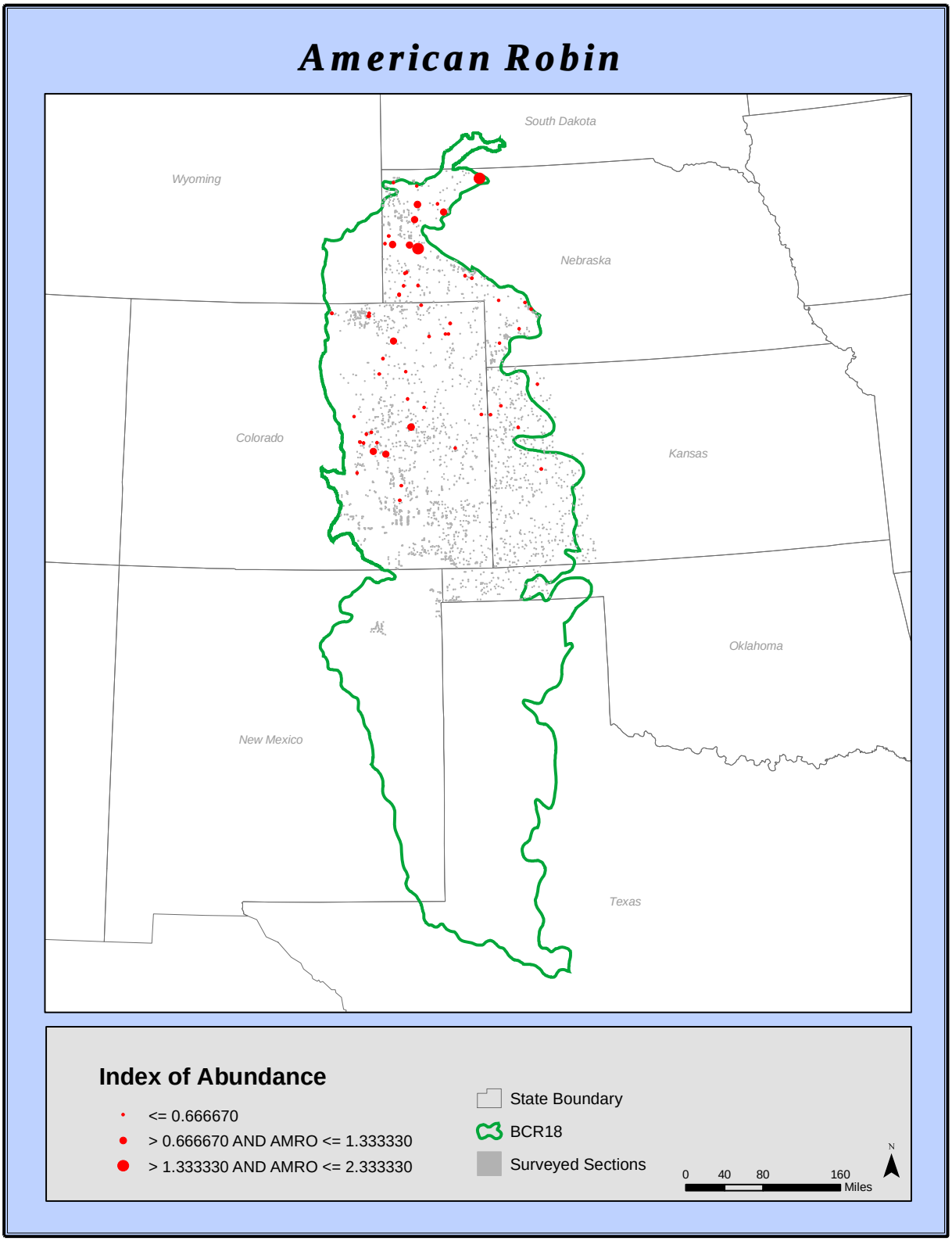
American Robin

(Turdus migratorius)

In 2005, we detected 93 individuals on 59 (2.5%) of the sections surveyed. American Robin occurred mainly in the northern part of the Shortgrass Prairie BCR. Across the BCR, we estimated density of this species at 1 bird/km^2 (CV = 25%, n = 30). We also estimated density in native prairie in Nebraska (D = 1.31 birds/km^2, CV = 40%, *n* = 21).



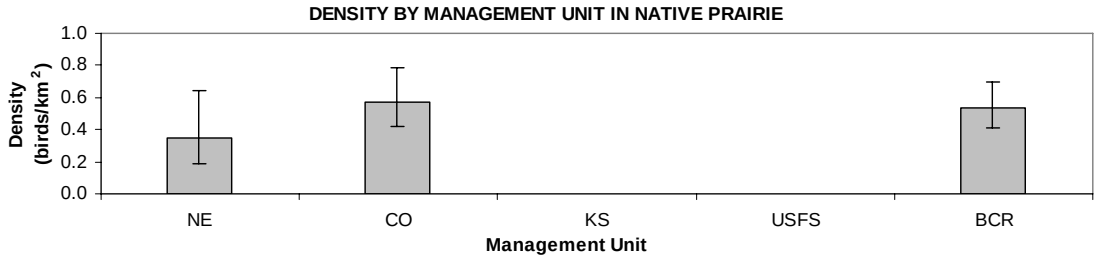


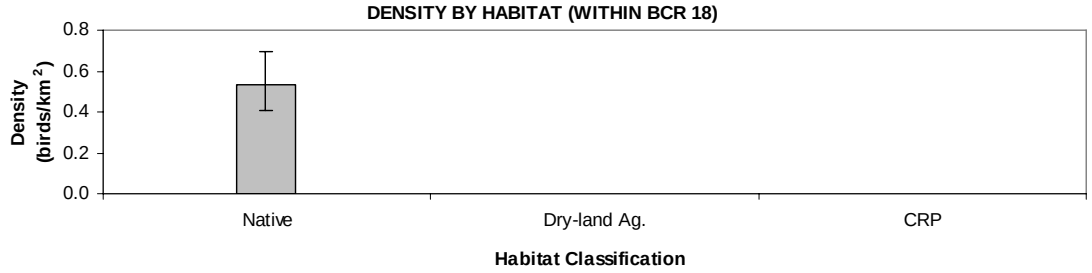


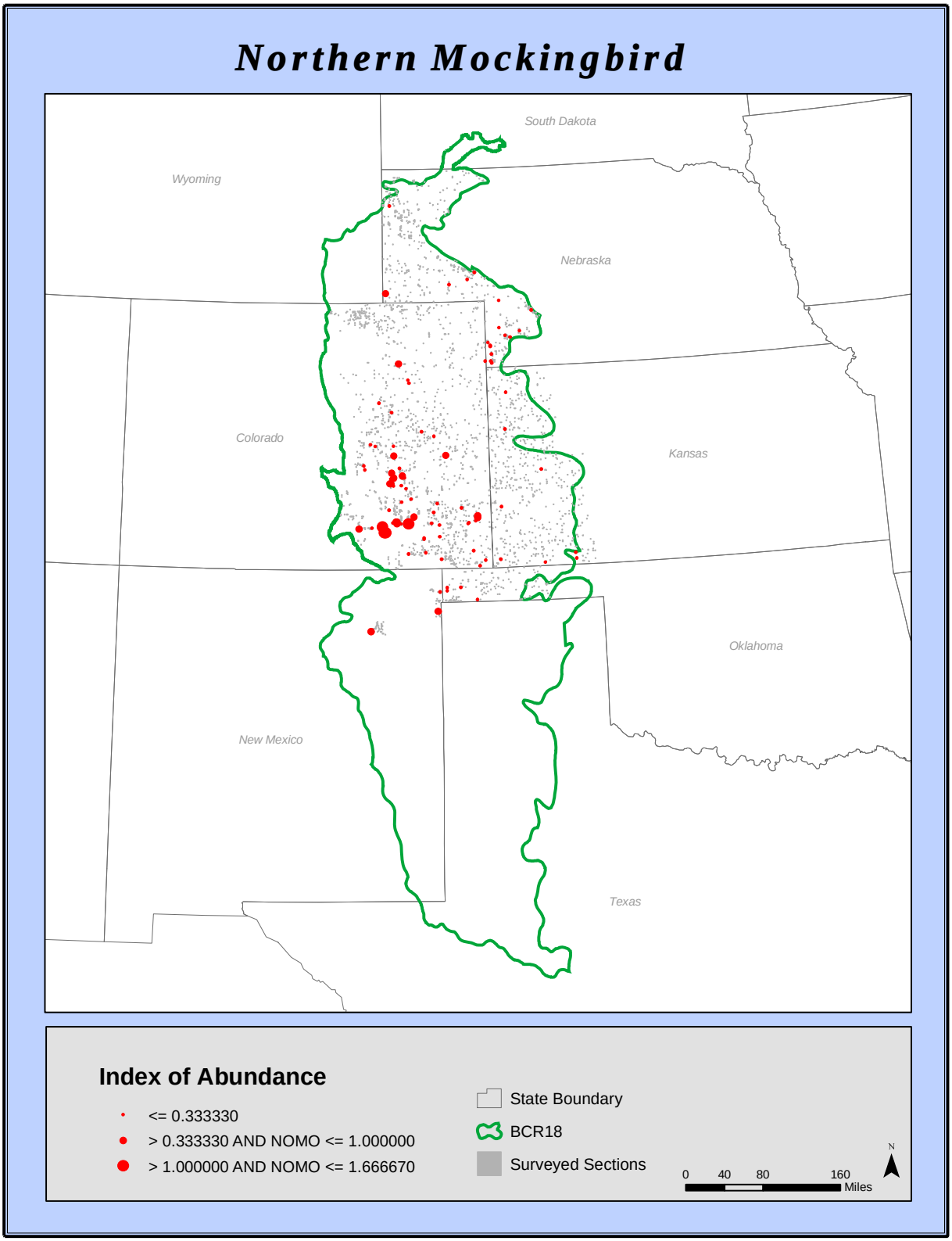
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Northern Mockingbird
(Mimus polyglottos)

In 2005, we detected 139 individuals on 102 (4.32%) of the sections surveyed. We found Northern Mockingbird mainly in the southern portion of Colorado. Northern Mockingbird had highest densities in native prairie habitat (D = .53 birds/km^2, CV = 14%, *n* = 101).



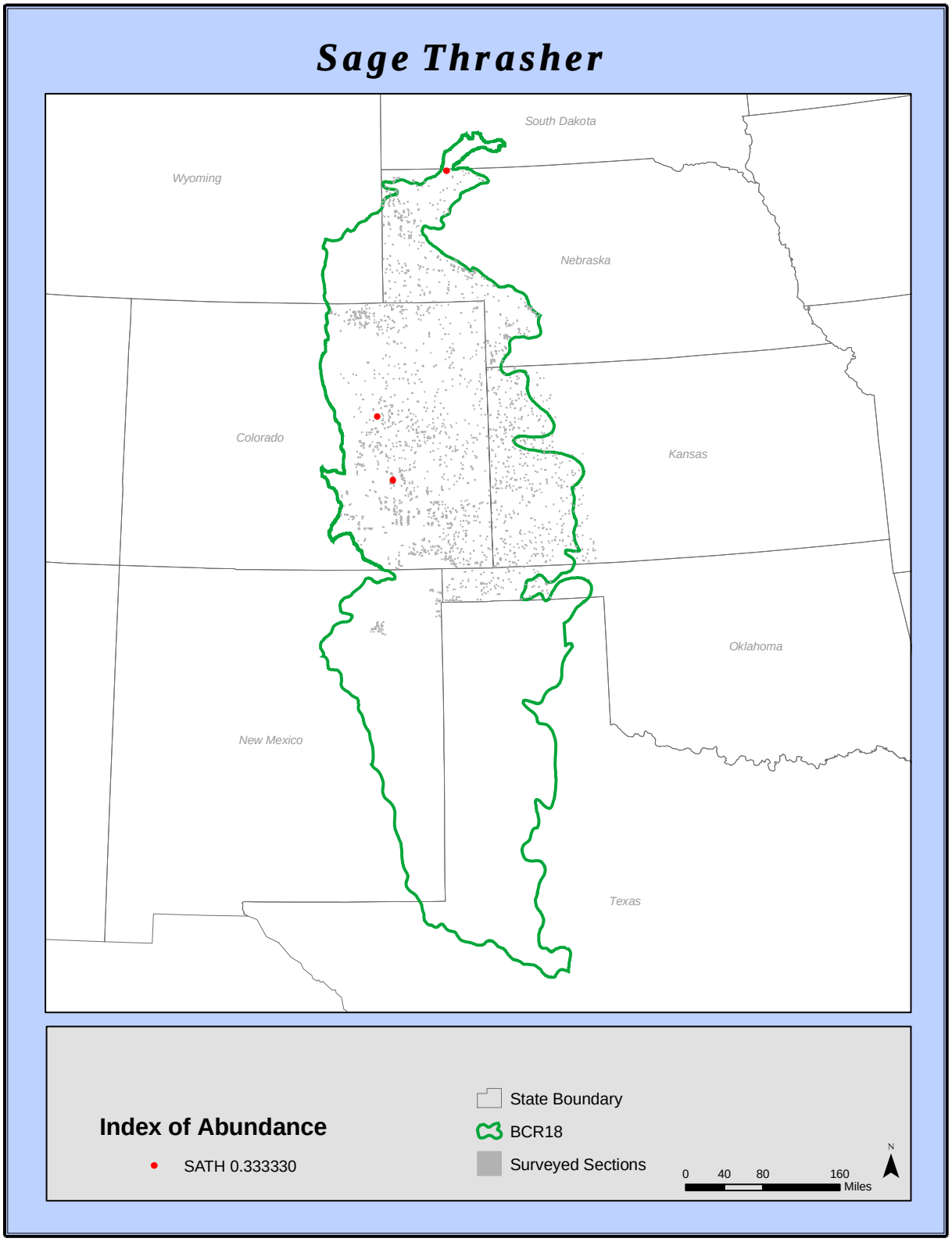




Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Sage Thrasher
(Oreoscoptes montanus)

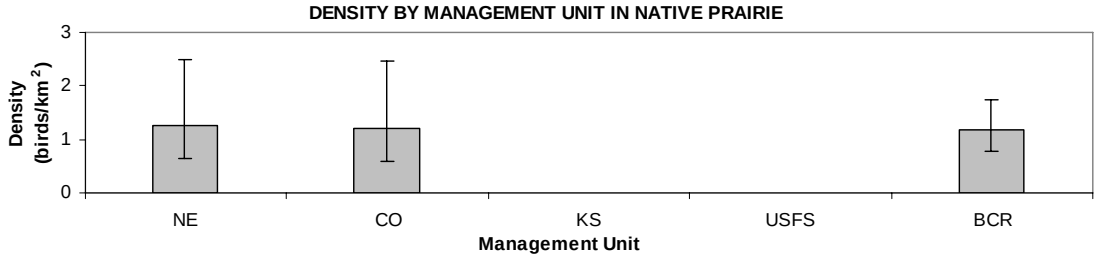
In 2005, we detected three individuals on three (<1%) of the sections surveyed. Sage Thrasher is rare in the Shortgrass Prairie BCR. We detected two in Colorado and one in Nebraska. This species is a shrub habitat obligate. We found this species occurring in cholla sp., yucca sp. and sage sp. shrubs with two of the three observations in 1-3% shrub cover and one observation in <1% shrub cover. Sage Thrasher is listed in Nebraska's CWCS as a species of concern.

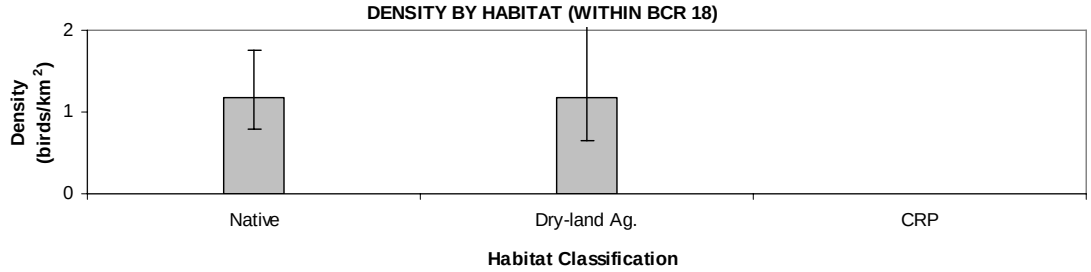


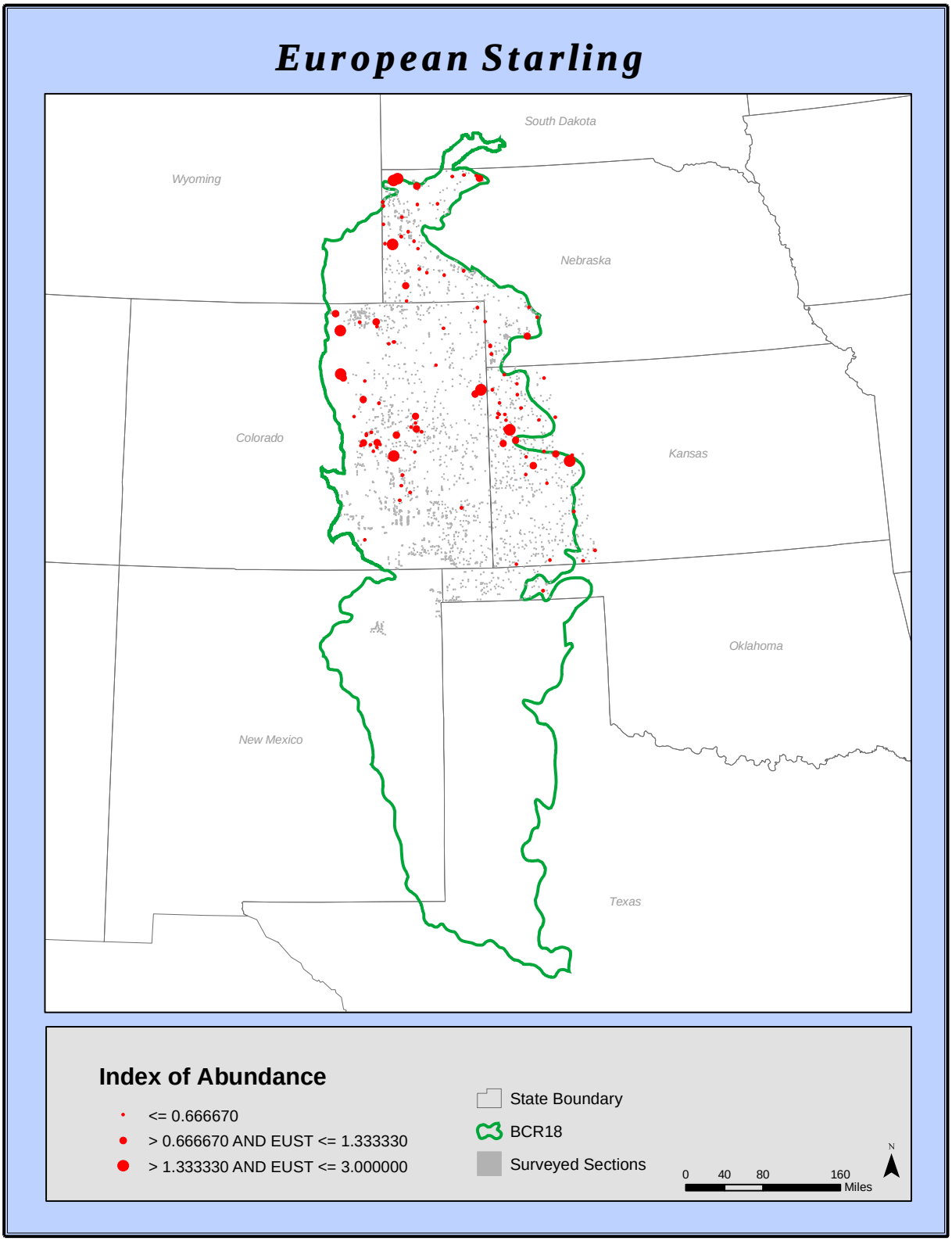
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

European Starling
(Sturnus vulgaris)

In 2005, we detected 233 individuals on 111 (4.7%) of the sections surveyed. We found European Starling throughout the study area. Density estimates were similar across management units. Native prairie habitat contained 1.17 birds/km^2 (CV = 21%, n = 62).



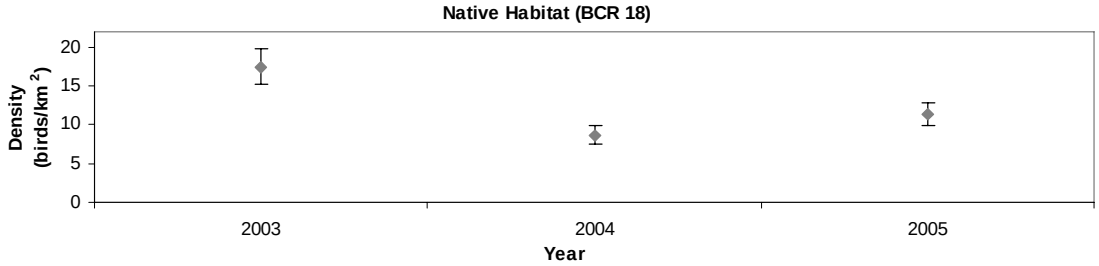


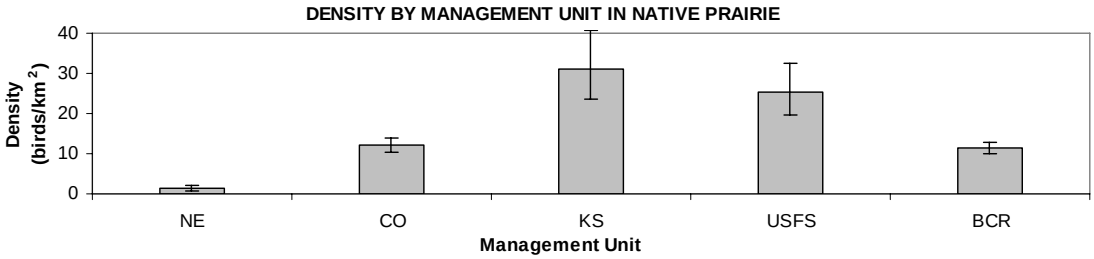


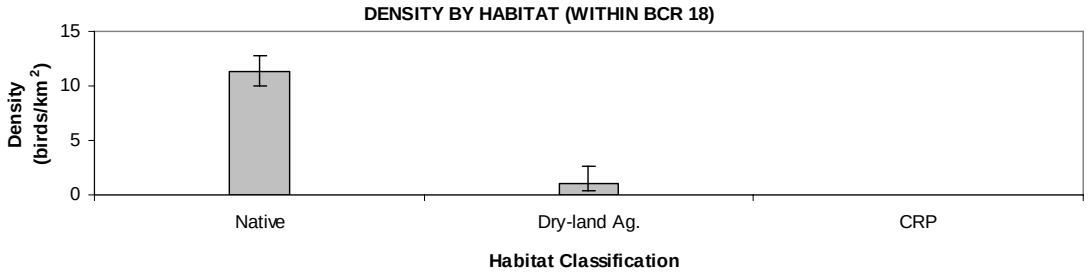
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

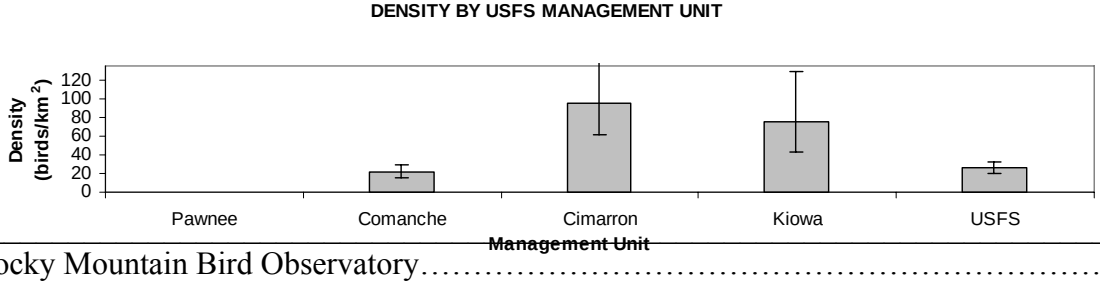
Cassin's Sparrow
(Aimophila cassinii)

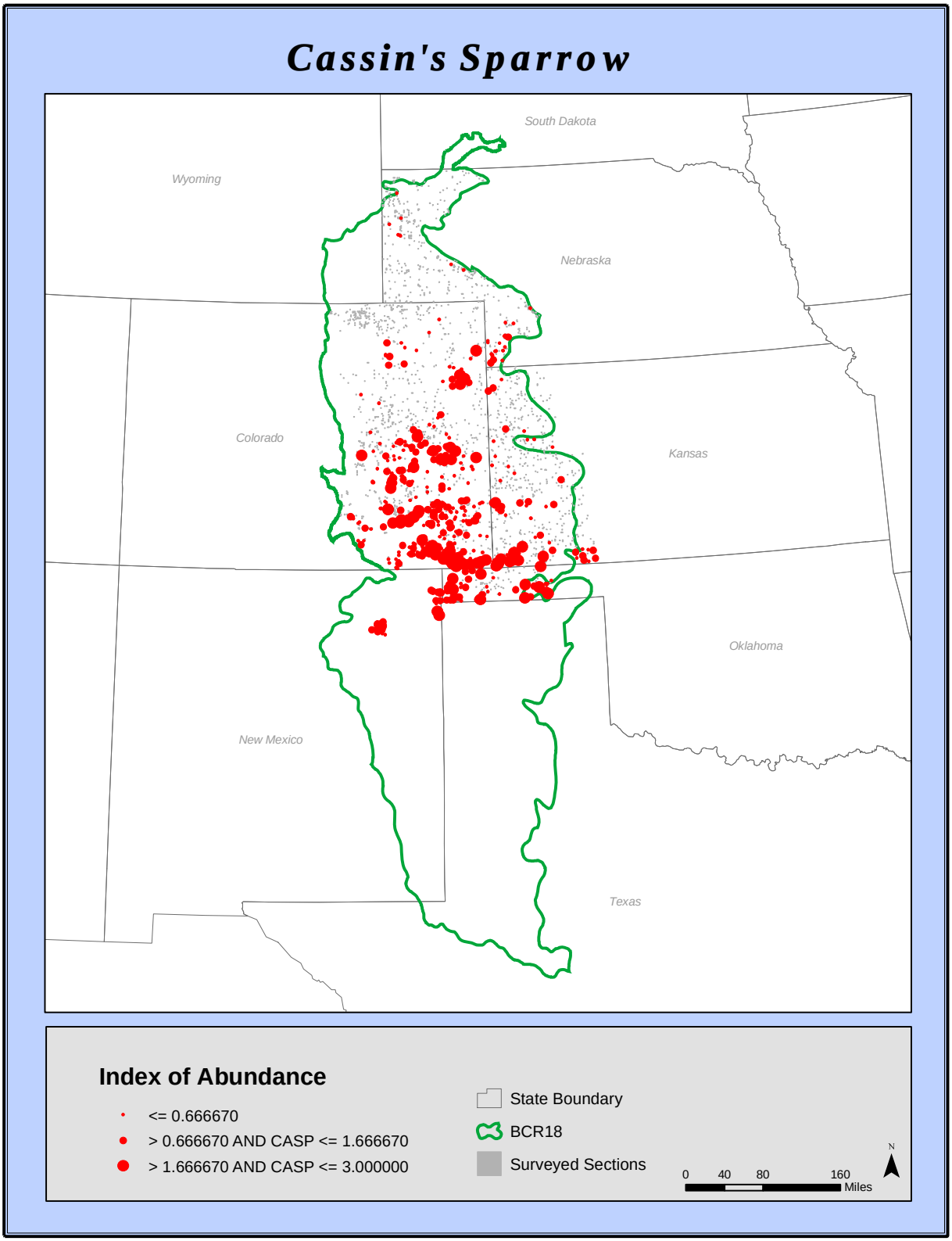
In 2005, we detected 1,876 Cassin's Sparrows on 618 (26.2%) of the surveyed sections. This species was the sixth most abundant bird detected. Cassin's Sparrows tend to occur in areas with shrub cover, and they are more common in the southern portion of the BCR. Density was highest in native prairie habitat (D = 11.31 birds/km^2, CV = 6%, *n* = 1226). Among states, density was highest in Kansas D = 30.99 birds/km^2, CV = 14%, *n* = 185). BCR-wide, Cassin's Sparrow declined significantly from 2003 (17.38 birds/km^2) to 2004 (8.41 birds/km^2). In 2005, density increased to 11.31 birds/km^2, but was still significantly less than in 2003. Cassin's Sparrow is a Partners in Flight Species of Regional Concern and a Regional Stewardship species in BCR18. This species also is listed in Colorado, Kansas and Oklahoma as a species of concern. USFS Region 2 lists this as a sensitive species.







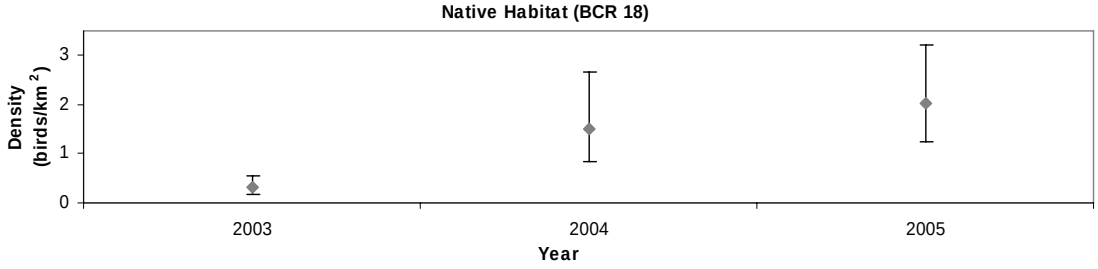


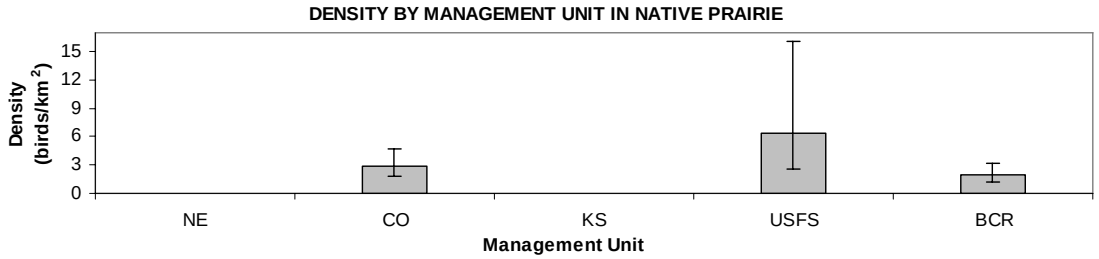


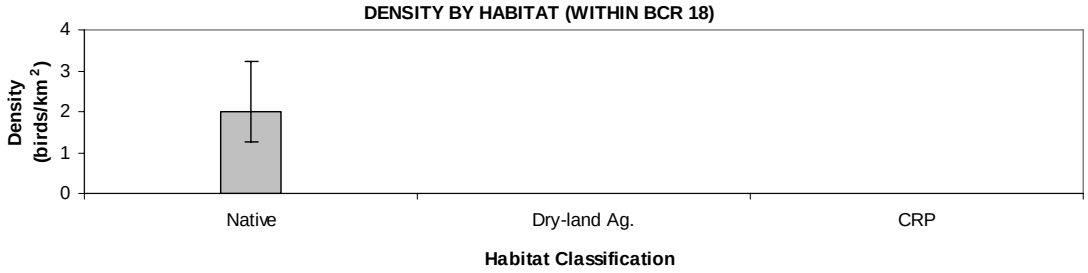
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

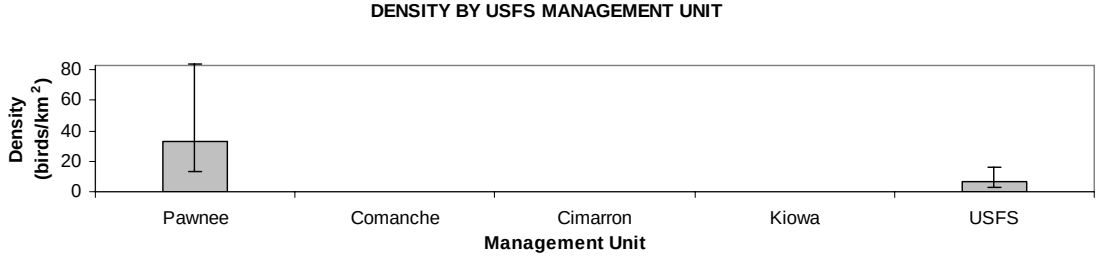
Brewer's Sparrow
(Spizella breweri)

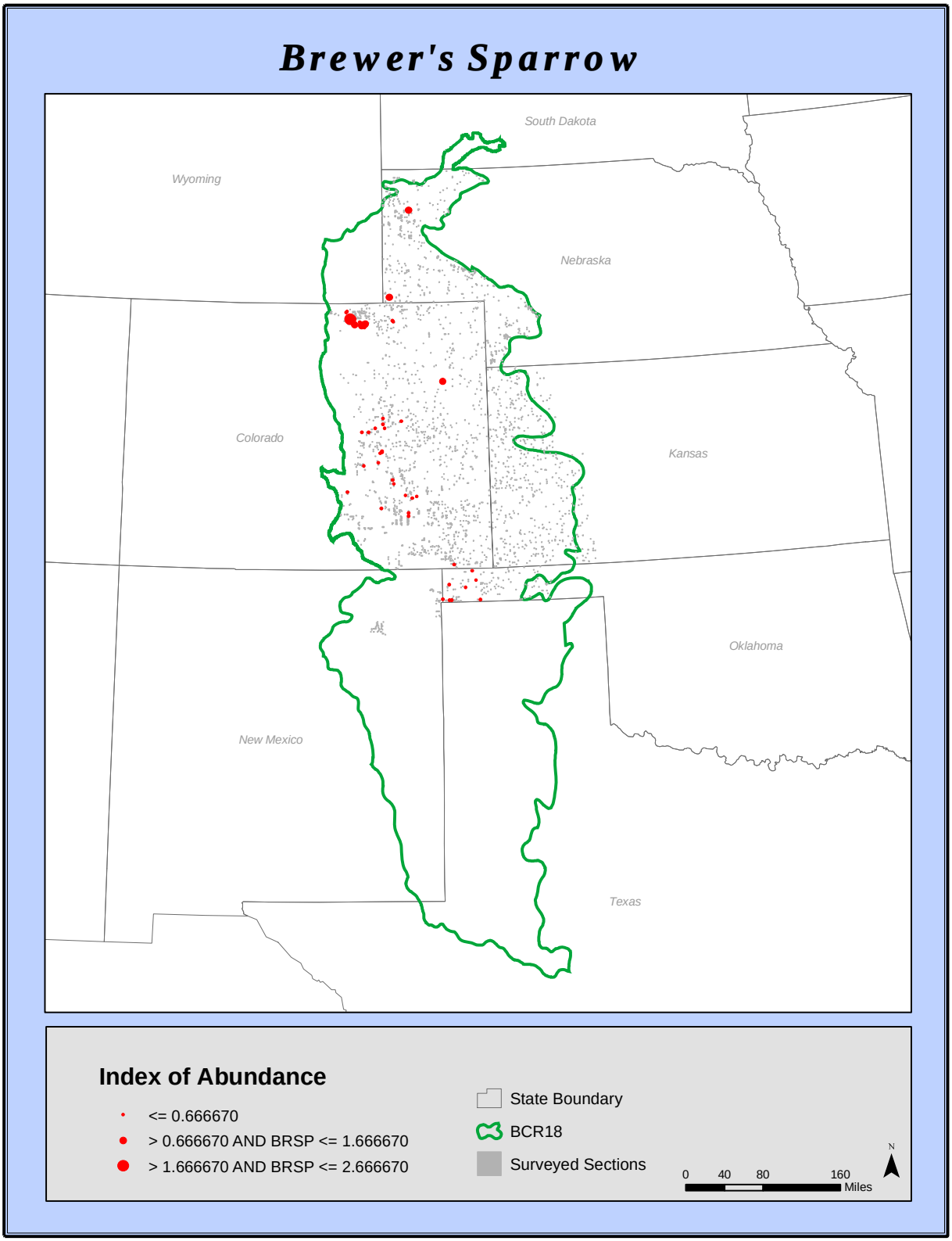
In 2005, we detected 90 Brewer's Sparrows on 50 (2.1%) of the surveyed sections. This species occurs mostly in Colorado and the panhandle of Oklahoma. Density in native prairie habitat across the study area was 2.01 birds/km^2 (CV = 24%, n = 68). This species prefers some shrub cover when breeding. Partners in Flight lists Brewer's Sparrow as a species of Continental Concern and Regional Concern for BCR18. Nebraska and Colorado list it as a species of concern in their CWCS. USFS Region 2 lists this as a sensitive species.







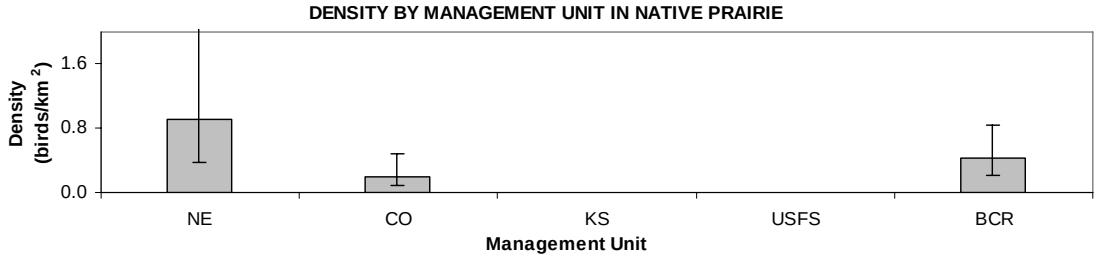


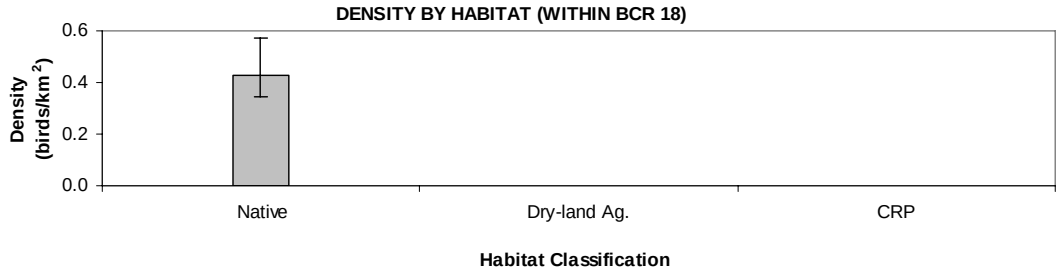


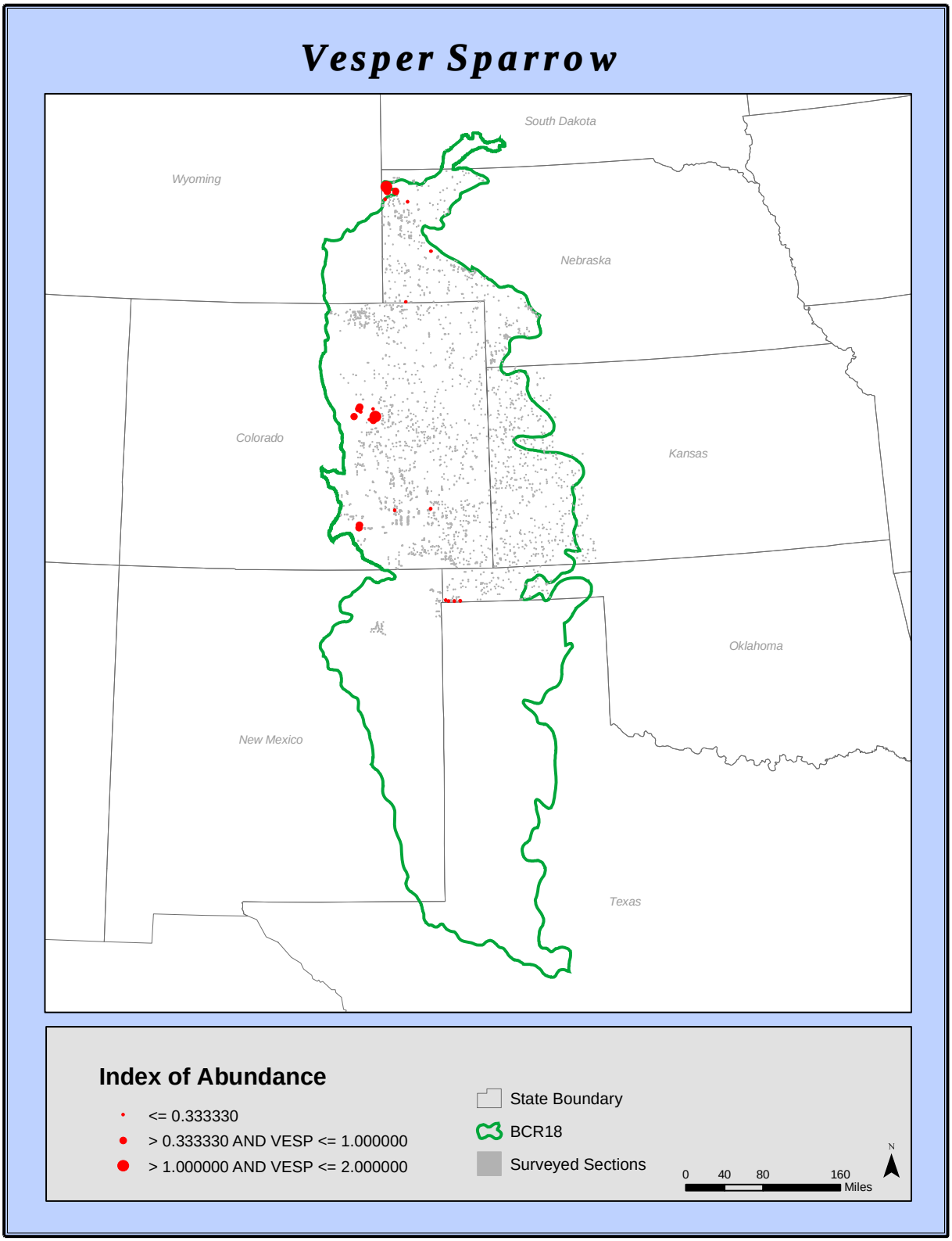
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Vesper Sparrow
(Pooecetes gramineus)

In 2005, we detected 50 Vesper Sparrows on 28 (1.19%) of the surveyed sections. This species occurs locally within the BCR, mainly in north and west. Density in native prairie habitat was 0.43 birds/km^2 (CV = 35%, n = 27). This species prefers some shrub or tree cover for breeding. Colorado's CWCS lists this species as a species of concern.



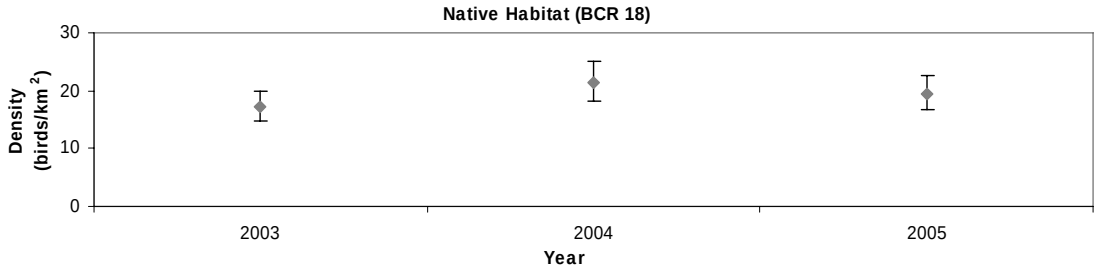


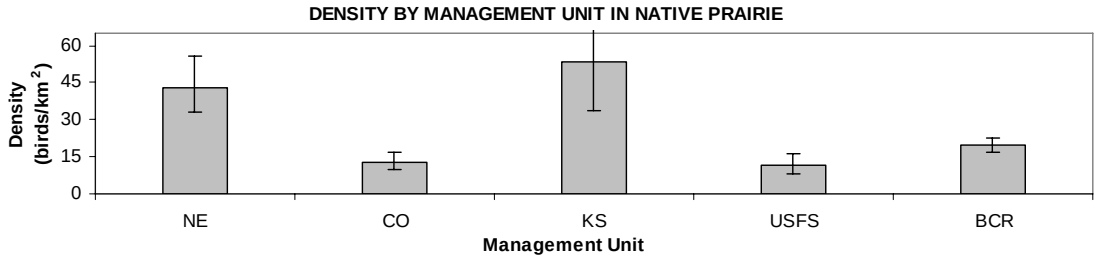


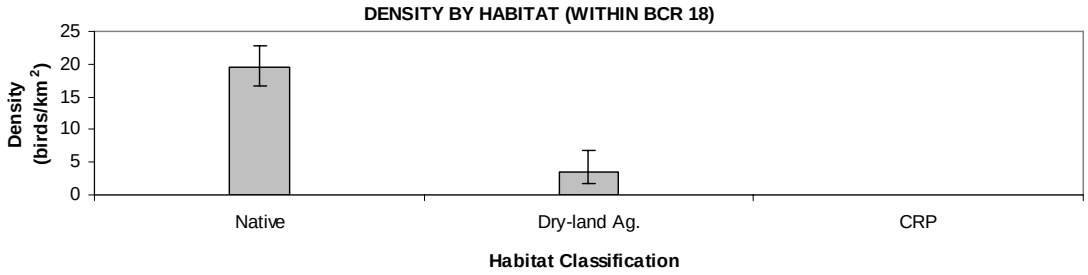
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

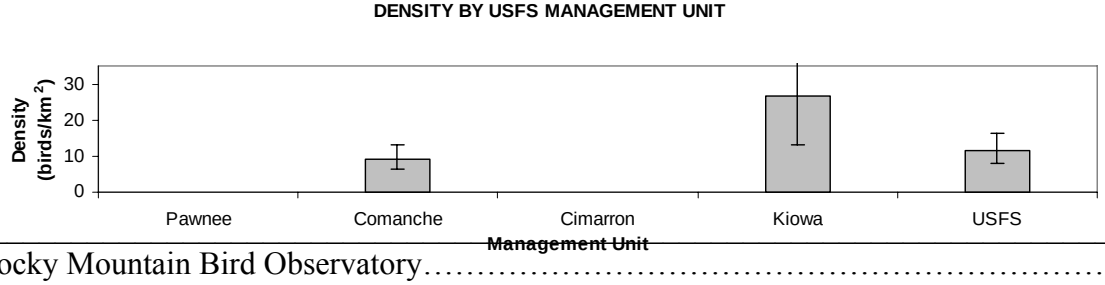
Lark Sparrow
(Chondestes grammacus)

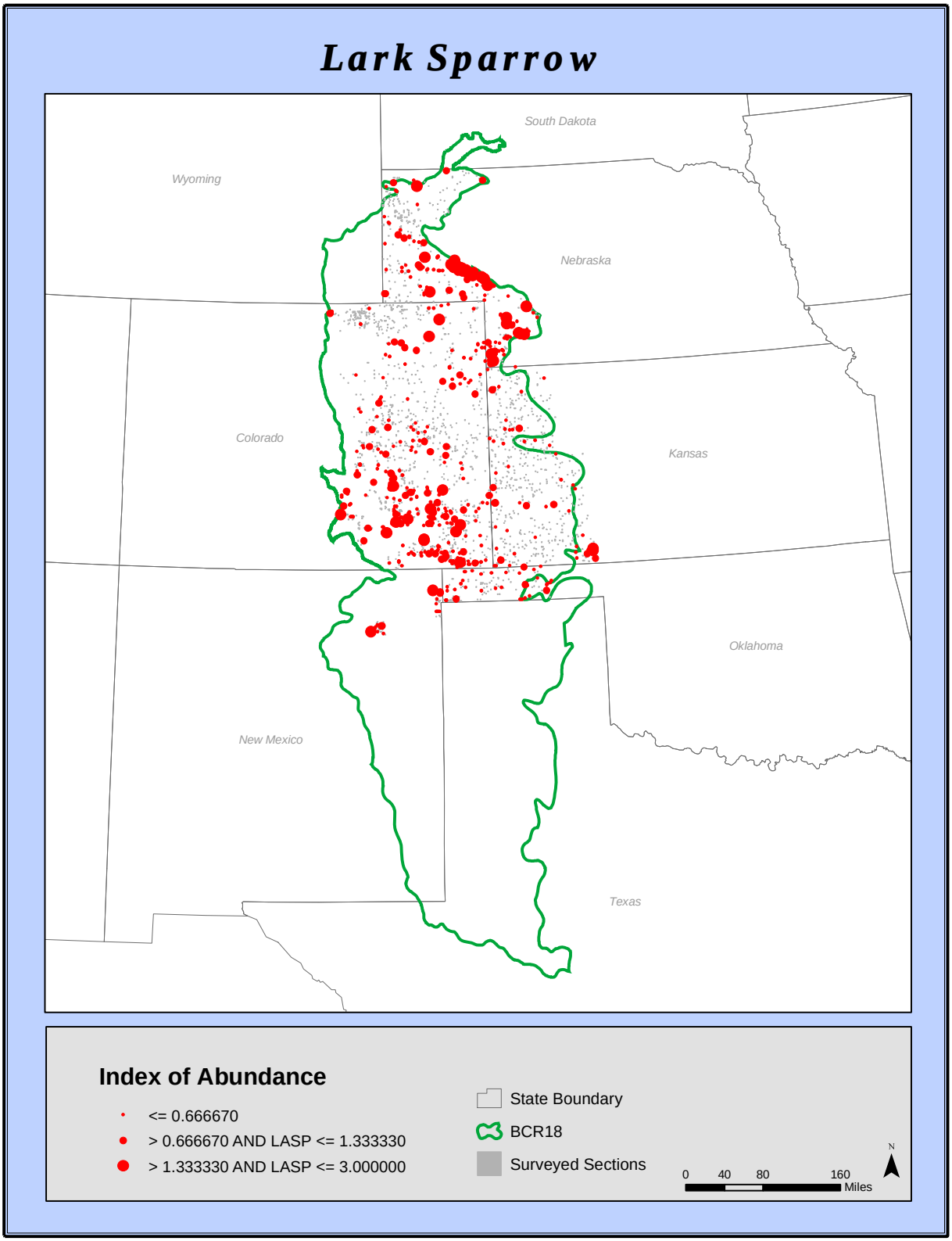
In 2005, we detected 1,215 Lark Sparrows on 572 (24.4%) of the surveyed sections. This species occurs throughout the BCR in varying density. Density was significantly higher in native prairie (D = 19.45 birds/km^2, CV = 8%, *n* = 844) than in dry-land agriculture (D = 3.44 birds/km^2, CV = 35%, *n* = 21). Among states in native prairie, density was higher in Kansas (D = 53.61 birds/km^2, CV = 24%, *n* =45) and Nebraska (D = 43.18 birds/km^2, CV = 13%, *n* =335) than in Colorado (D = 12.9 birds/km^2, CV = 13%, *n* =404). Lark Sparrows prefer grasslands with shrub cover. Lark Sparrow is a Partners in Flight species of Regional Concern. Kansas also lists this species as a species of concern in their CWCS.









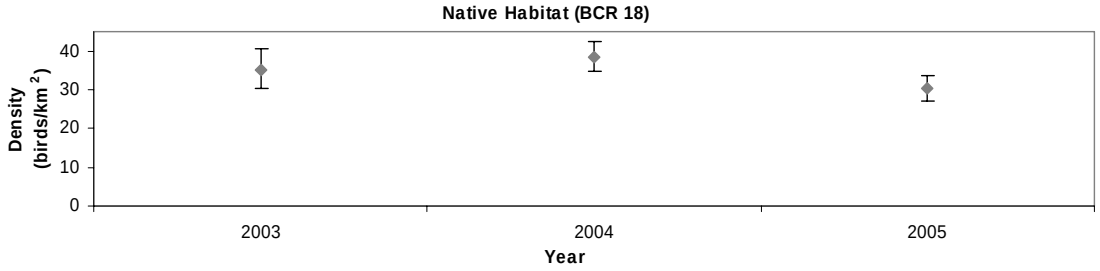


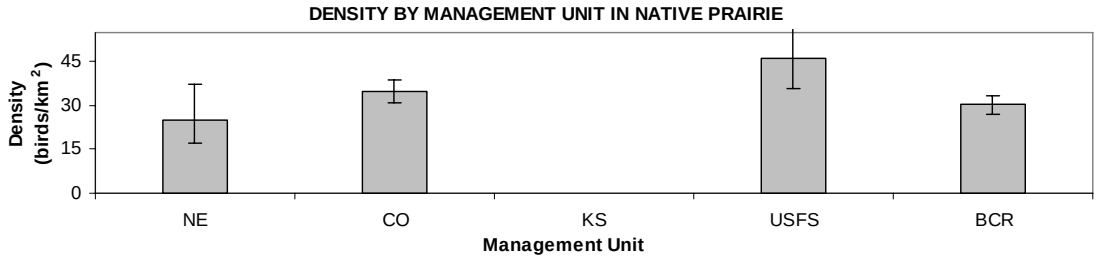
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

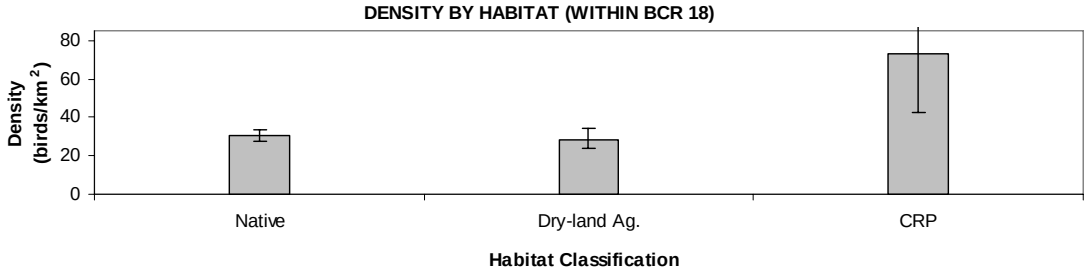
Lark Bunting

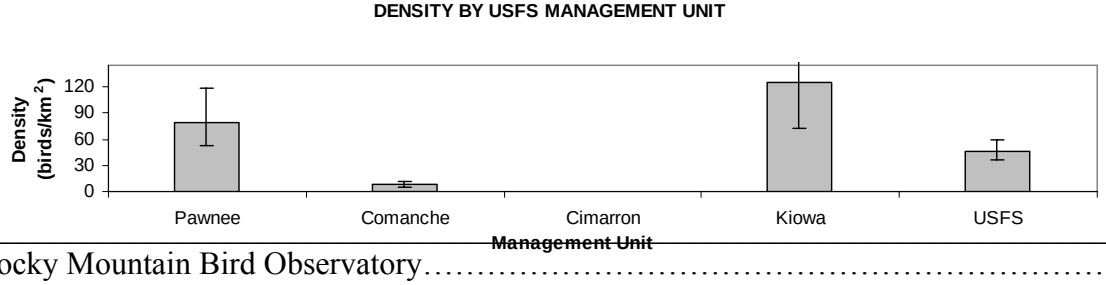
(Calamospiza melanocorys)

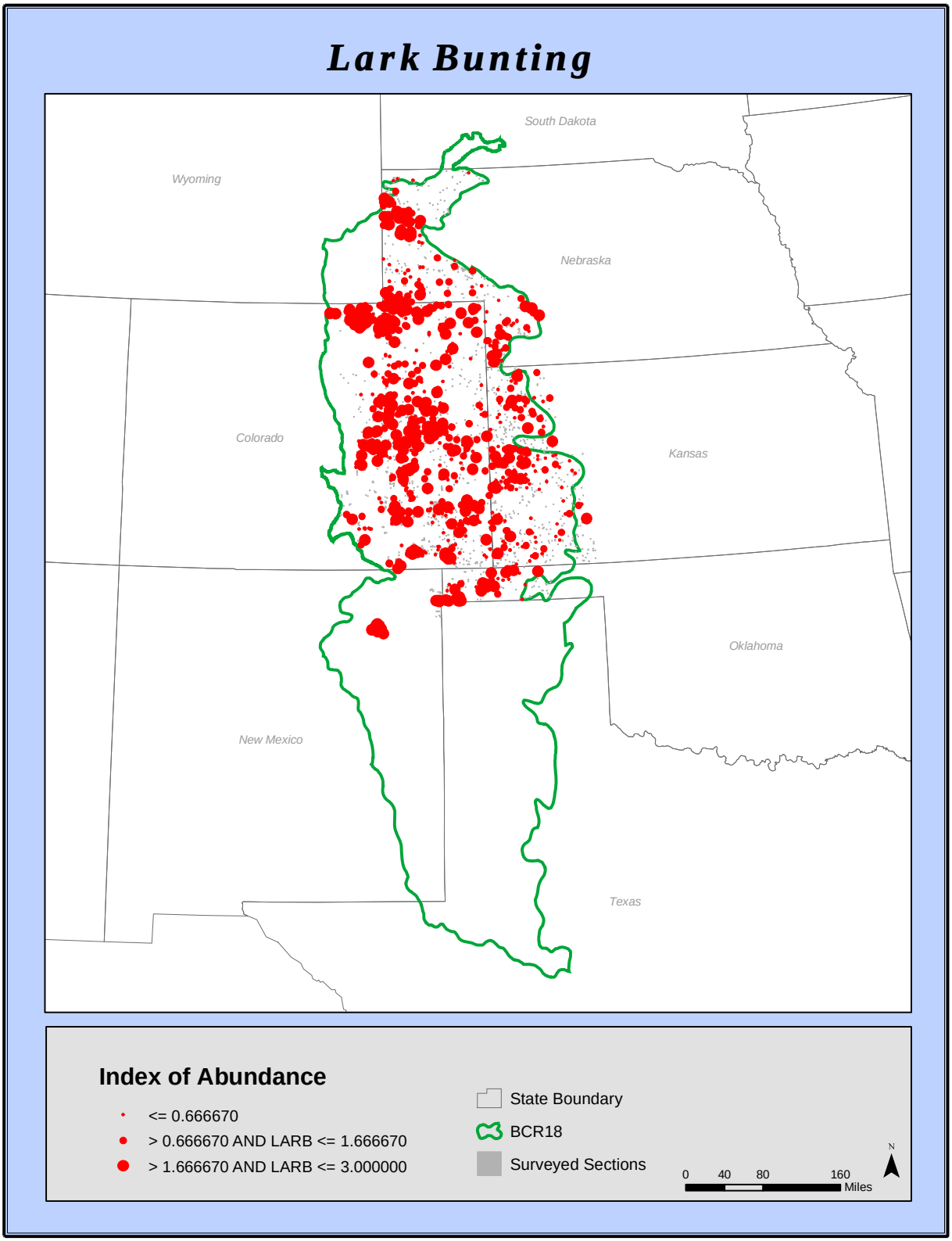
In 2005, we detected 6,149 Lark Buntings on 1,173 (49.7%) of the surveyed sections. This was the third most abundant species we detected and it occurs across the BCR. Density was higher in CRP habitat (D = 72.95 birds/km^2, CV = 27%, *n* = 98) than in dry-land agriculture (D = 28.39 birds/km^2, CV = 9%, *n* = 791) and native habitat (D = 30.25 birds/km^2, CV = 5%, *n* = 2954). Kiowa National Grassland contained the highest density estimate for this species (D = 125.88 birds/km^2, CV = 28%, *n* = 98). Lark Bunting is a Partners in Flight species of Regional Concern and a Stewardship Species in BCR18. This species also is a species of concern in the CWCS of Colorado and Kansas .









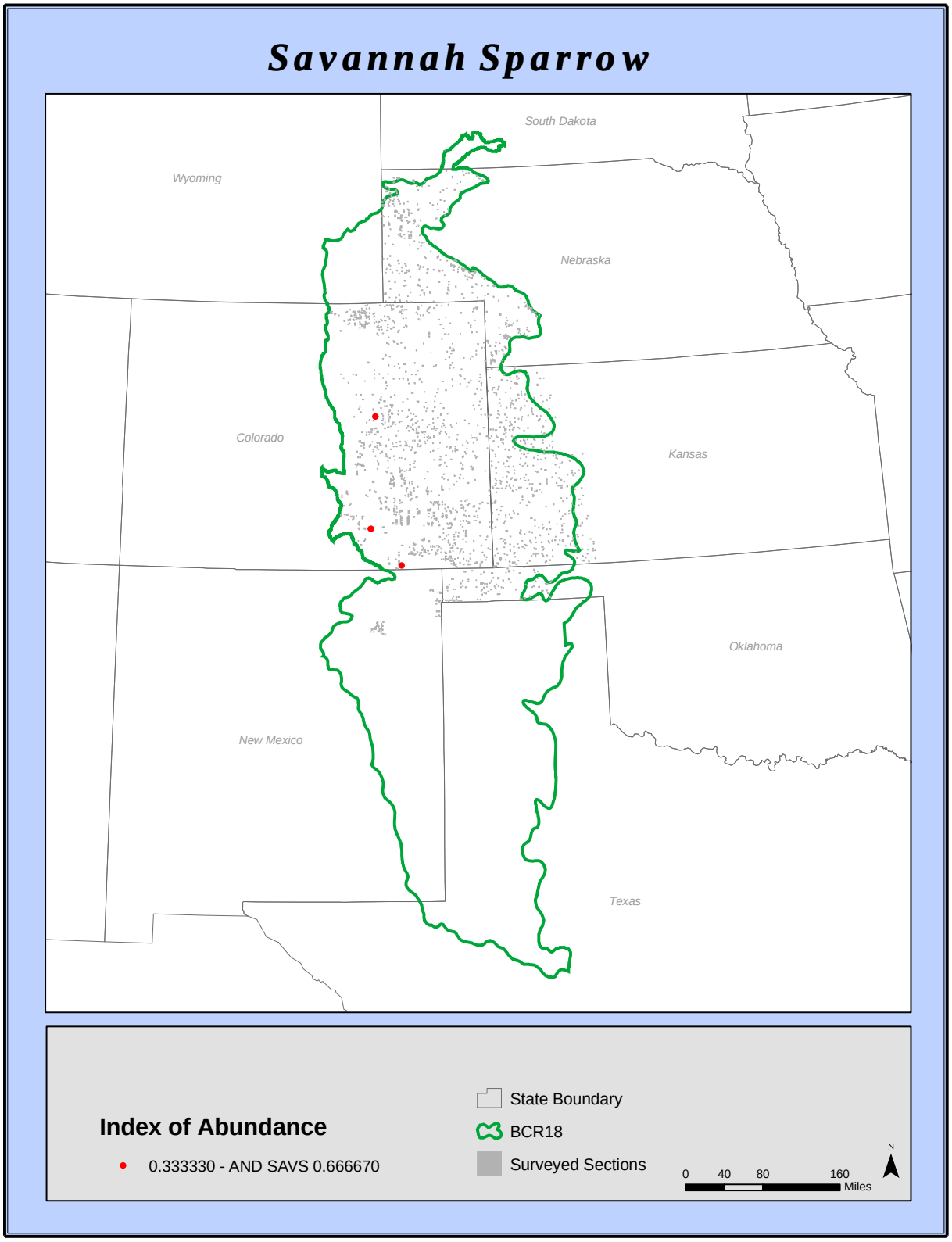


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Savannah Sparrow

(Passerculus sandwichensis)

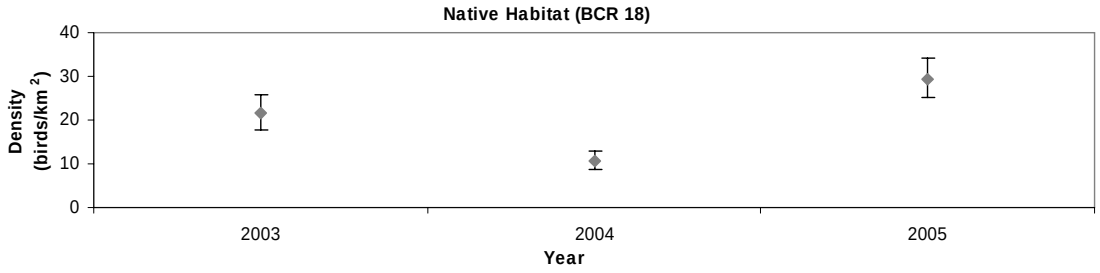
In 2005, we detected four individuals on three (<1%) of the sections surveyed, all in Colorado. Savannah Sparrow is rare in the Shortgrass Prairie BCR. In arid portions of their range, this species prefers irrigated areas or edges of free water bodies. Nebraska lists this species as a species of concern in their CWCS.

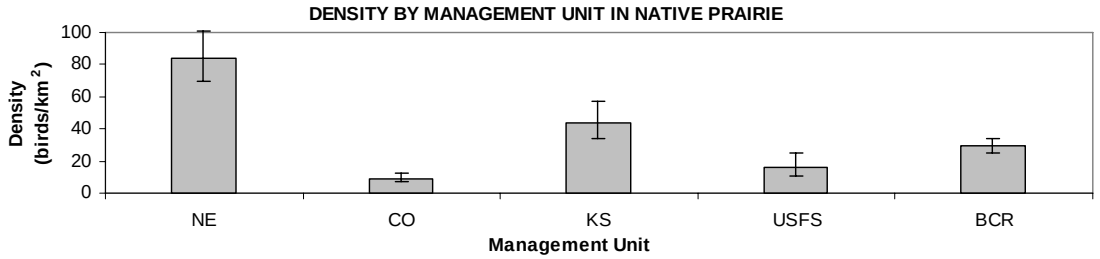


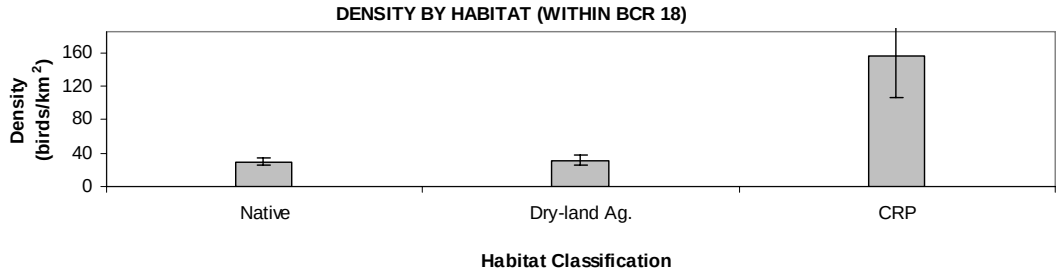
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

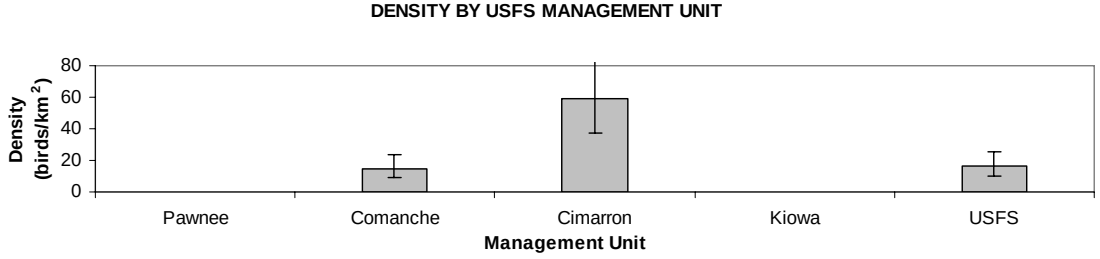
Grasshopper Sparrow
(Ammodramus savannarum)

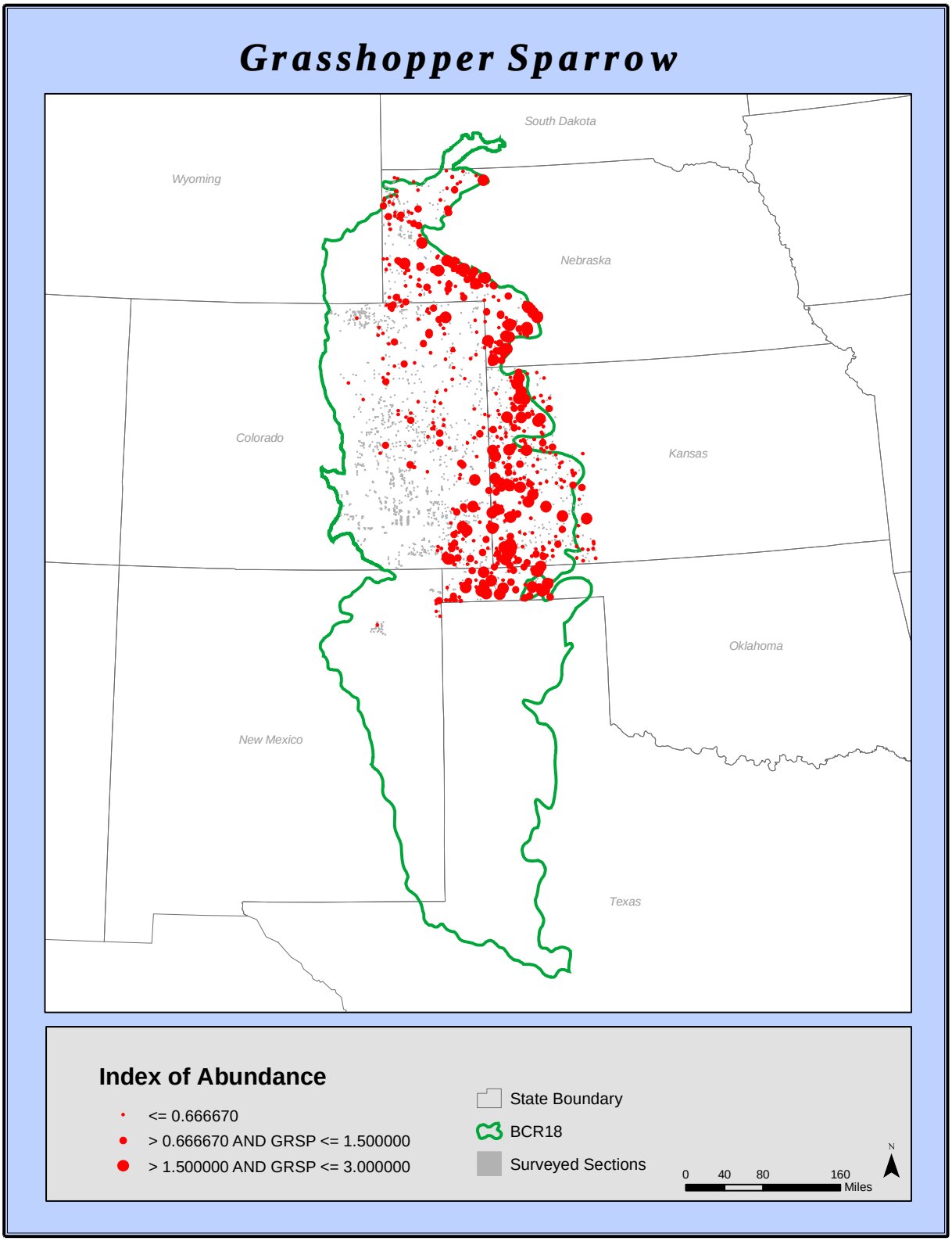
In 2005, we detected 1,823 individuals on 711 (30.13%) of the sections surveyed. Grasshopper Sparrow more common in the eastern portion of the Shortgrass Prairie BCR. This species has higher densities in CRP habitat (D = 155.4 birds/km^2, CV = 19%, *n* = 75) than dry-land agriculture (D = 31.48 birds/km^2, CV = 10%, *n* = 291) and native prairie habitat (D = 29.25 birds/km^2, CV = 8%, *n* = 879). Partners in Flight lists this species as a species of Regional Importance and Stewardship species. Kansas CWCS lists this species as a species of concern. USFS Region 2 lists this as a sensitive species.









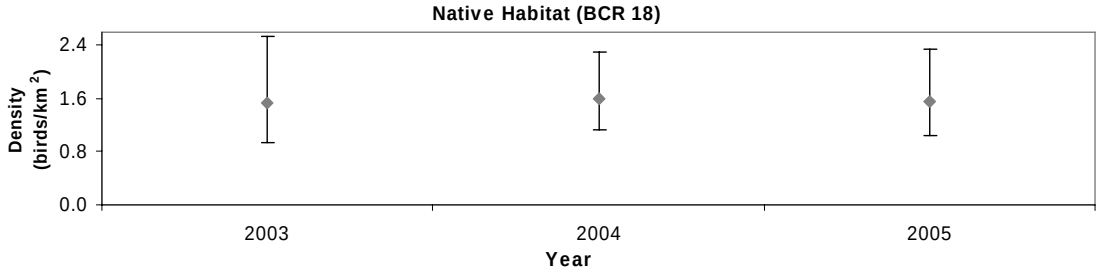


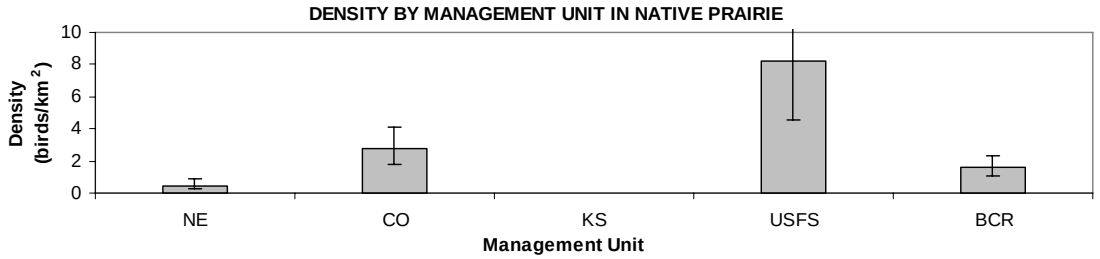
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

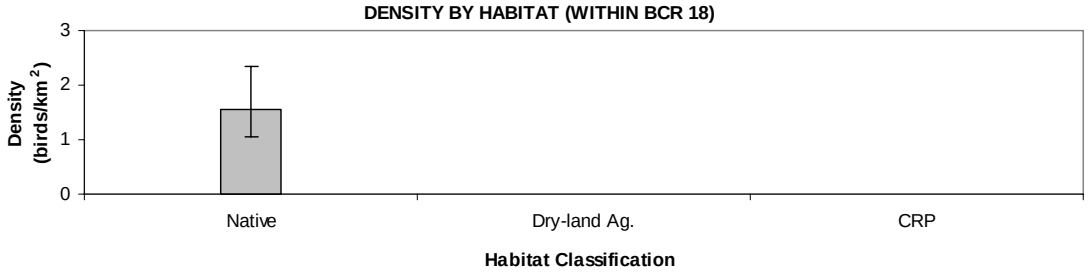
McCown's Longspur
(Calcarius mccownii)

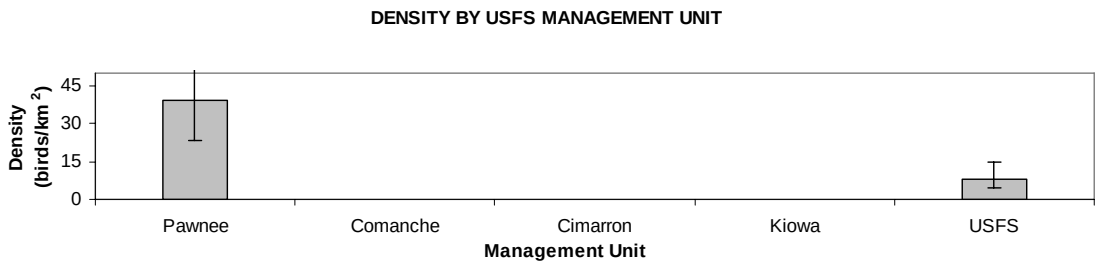
In 2005, we detected 211 individuals on 57 (2.42%) of the sections surveyed. McCown's Longspur occurs only in the northern portion of the Shortgrass Prairie BCR. This species occurred in highest density on Pawnee National Grassland (D = 39.18 birds/km^2, CV = 27%, *n* = 50). McCown's Longspur is a species of concern as follows:

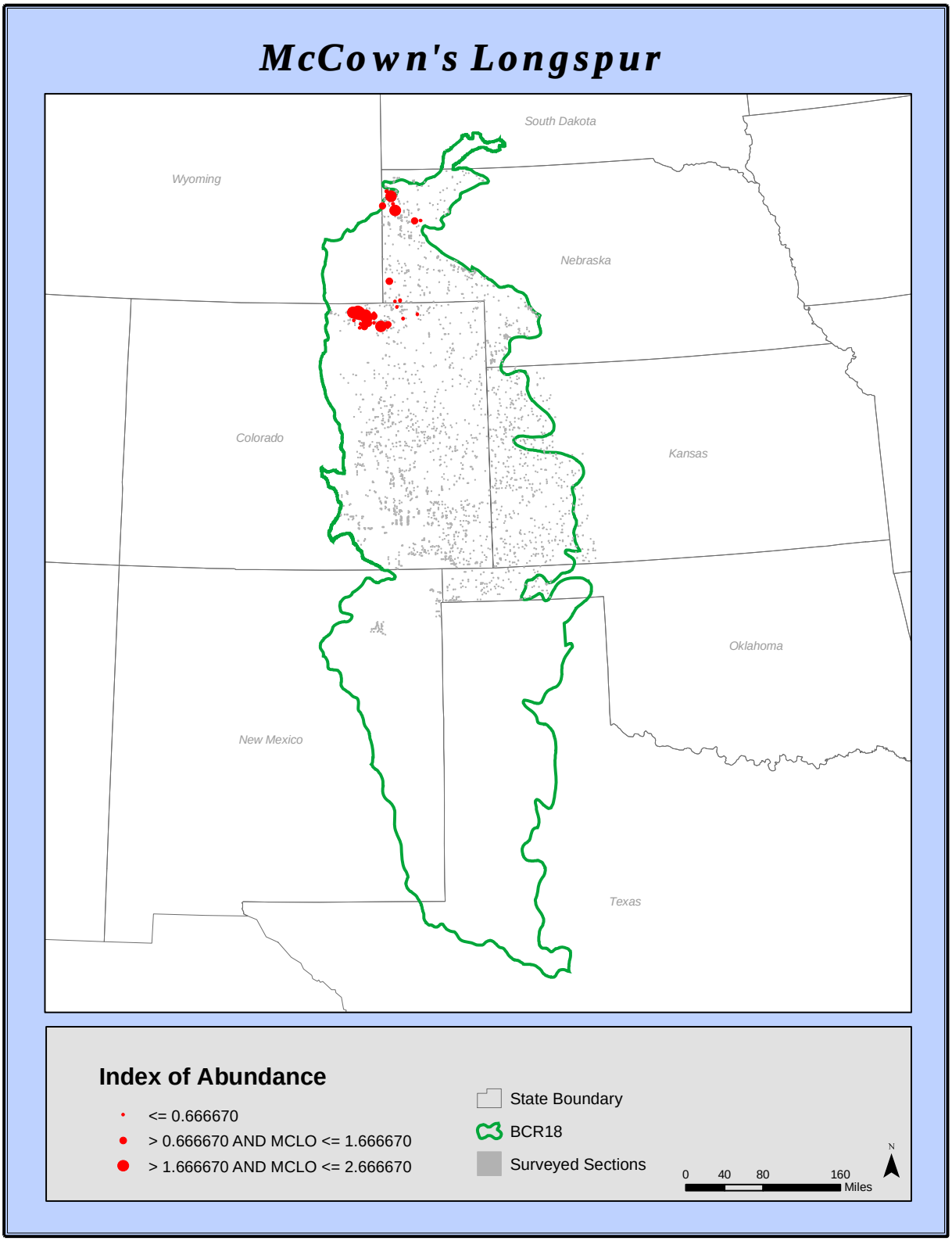
- Partners in Flight – Continental Concern and Regional and Continental Stewardship species.
- Nebraska, Colorado, Kansas, Oklahoma – species of concern (CWCS).
- USFS R2 – sensitive species.











Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

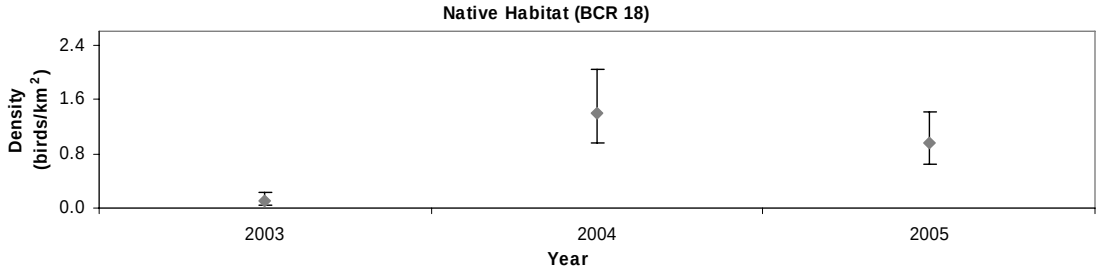
Chestnut-collared Longspur

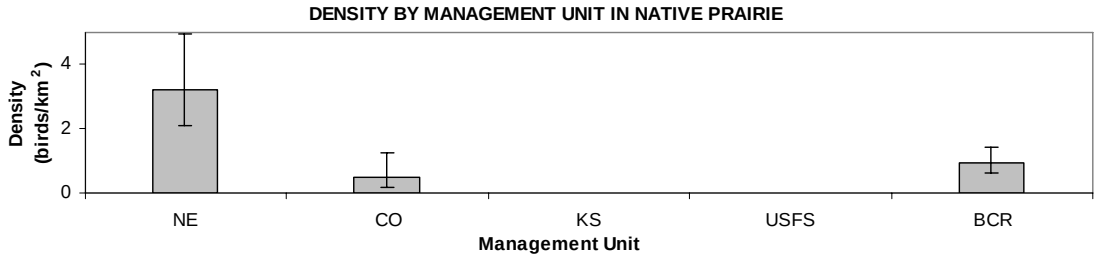
(Calcarius ornatus)

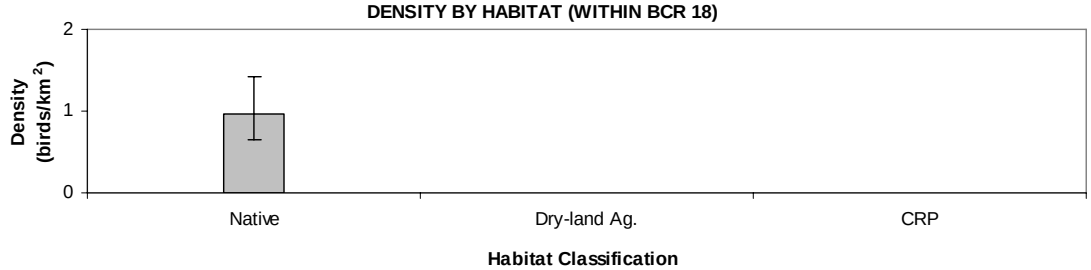
In 2005, we detected 176 individuals on 46 (2%) of the sections surveyed. Chestnut-collared Longspur occurs only in the northern portion of the Shortgrass Prairie BCR, with a higher concentration in Nebraska. Density of Chestnut-collared Longspurs in native prairie habitat was 0.96 birds/km^2 (CV = 20%, *n* = 128). Nebraska had sufficient detections to obtain density estimates within native prairie habitat (D = 3.23 birds/km^2, CV = 22%, *n* = 111). This species prefers short grass structure with little or no shrub cover.

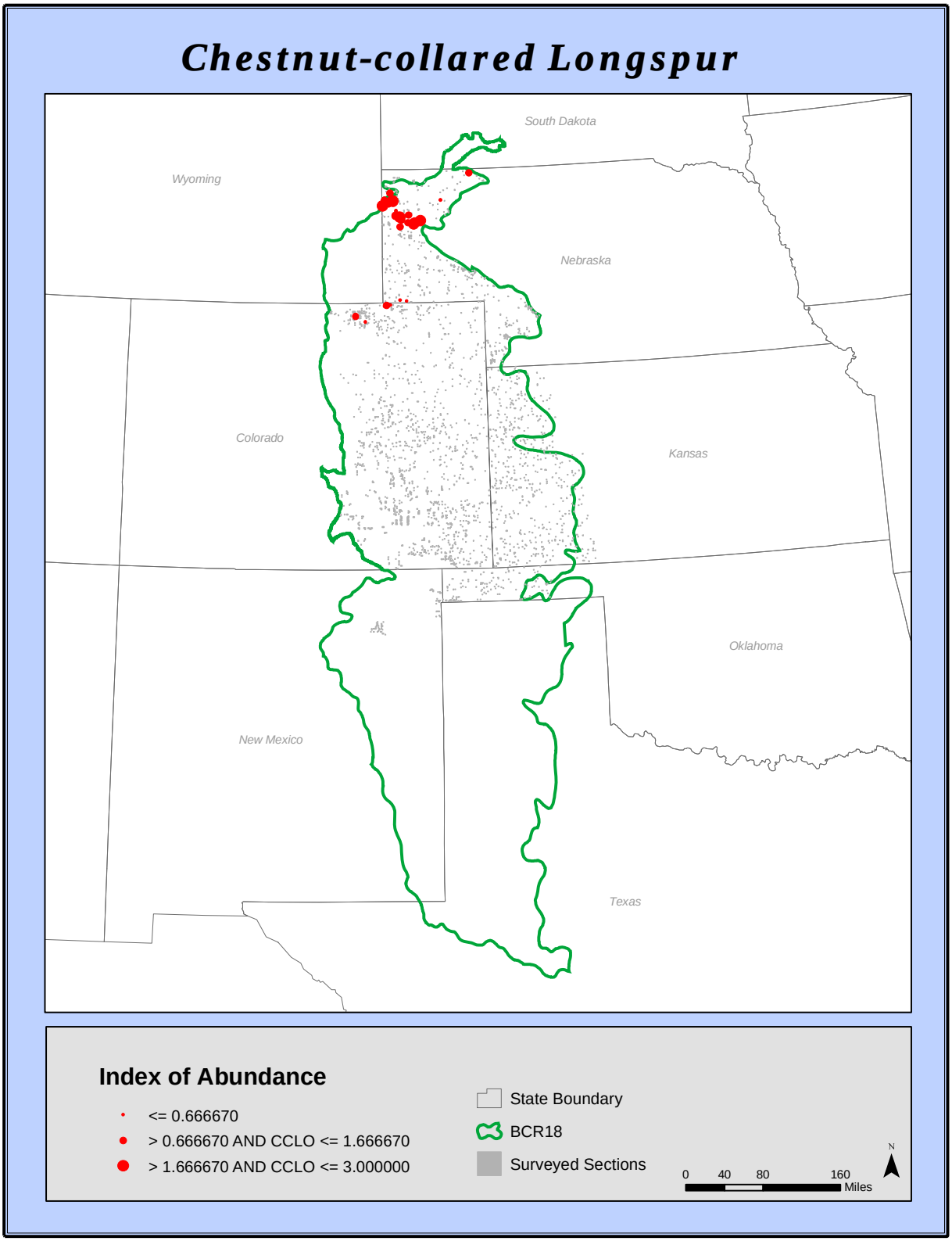
Chestnut-collared Longspur is a species of concern as follows:

- Partners in Flight – Regional Importance.
- Nebraska – species of concern (CWCS).
- Colorado – species of concern (CWCS).
- Kansas – species of concern (CWCS).
- Oklahoma – species of concern (CWCS).
- USFS R2 – sensitive species.







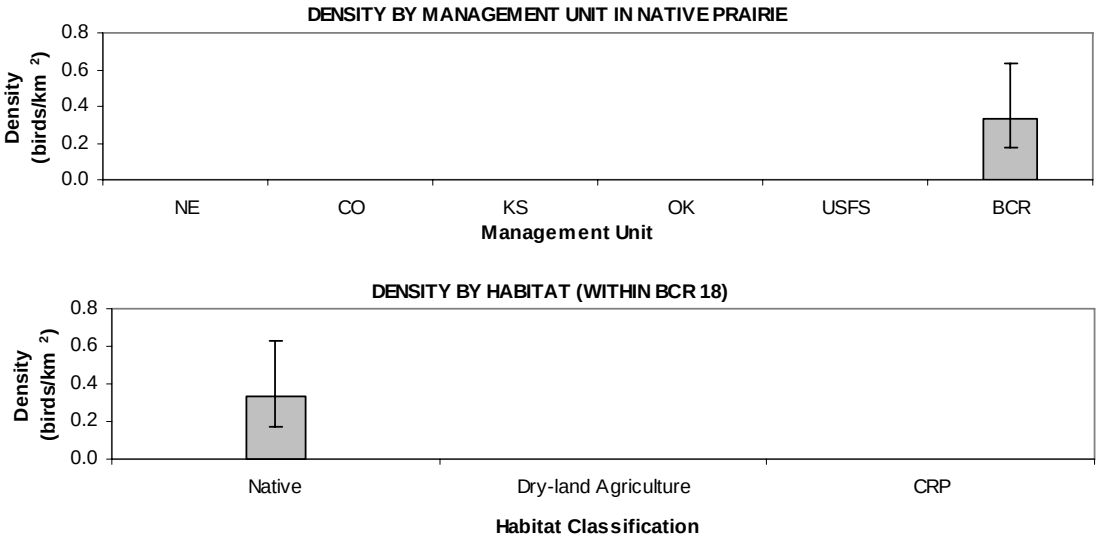


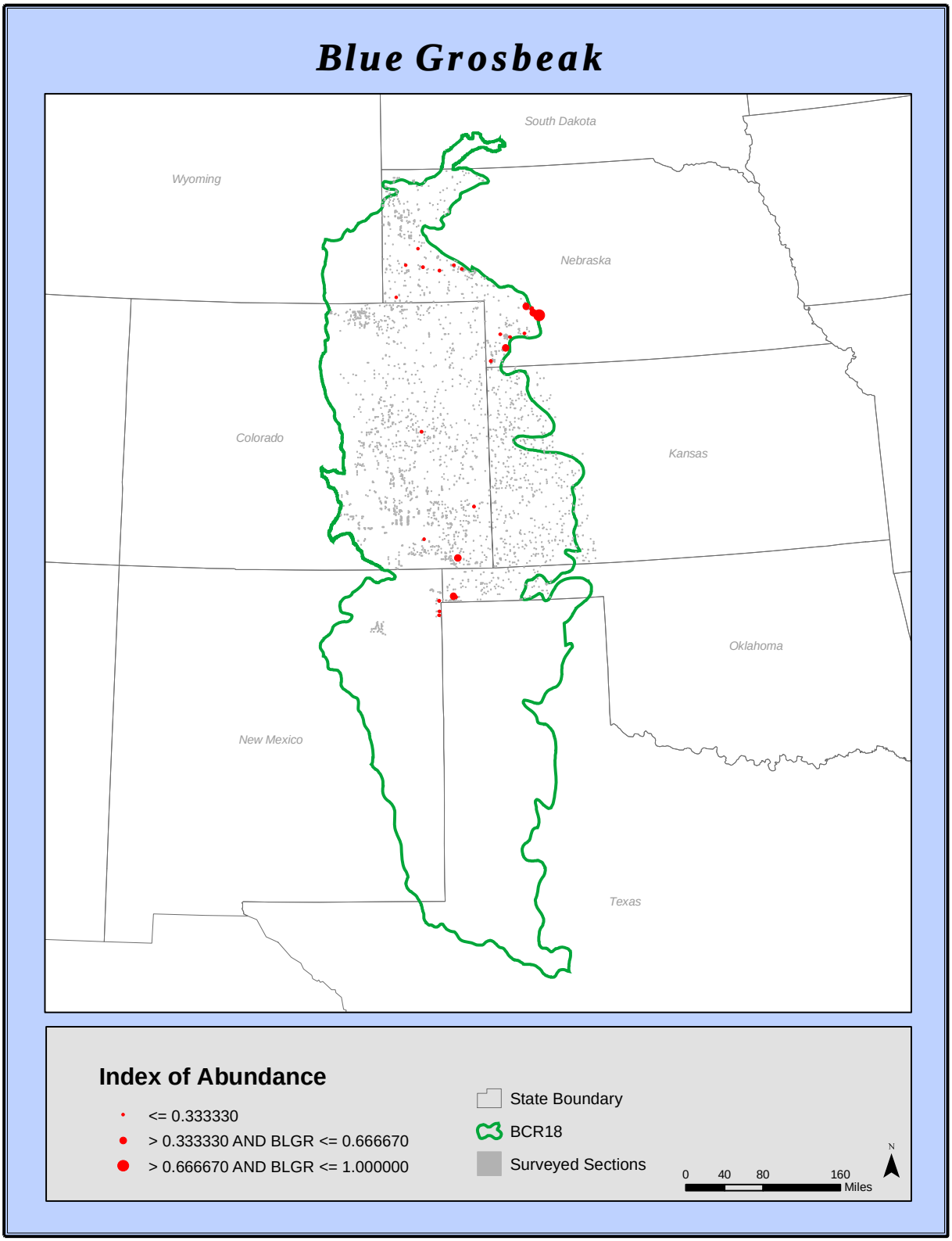
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Blue Grosbeak

(Passerina caerulea)

In 2005, we detected 34 individuals on 27 (1%) of the sections surveyed. Blue Grosbeak occurs sparsely throughout the Shortgrass Prairie BCR, primarily in riparian habitats and other areas with dense shrubs. The highest density of this species occurs in native habitats (D = 0.83 birds/km^2, CV = 36%, *n* = 17). This species requires woody vegetation structure for nesting.



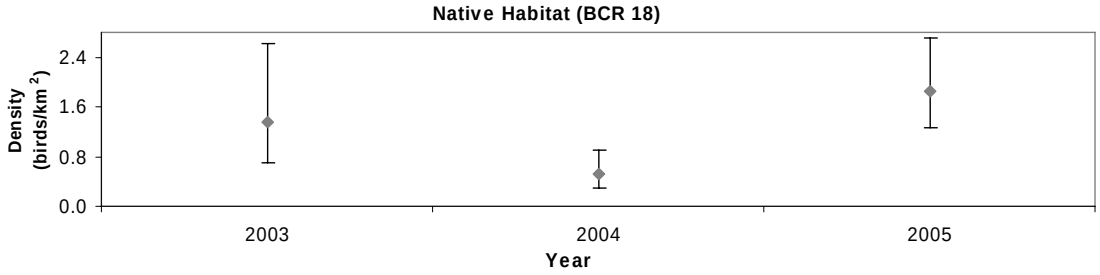


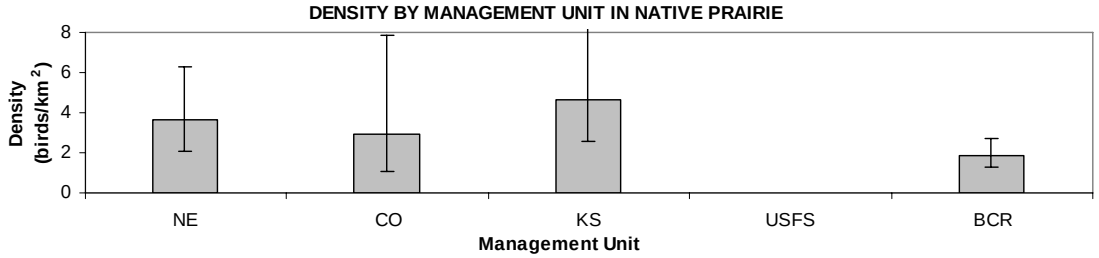
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

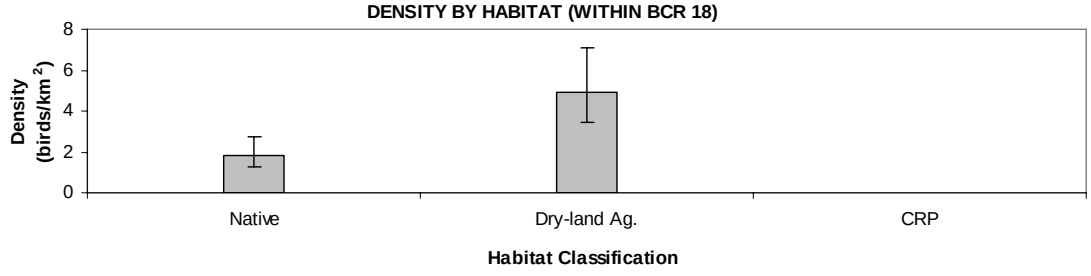
Dickcissel

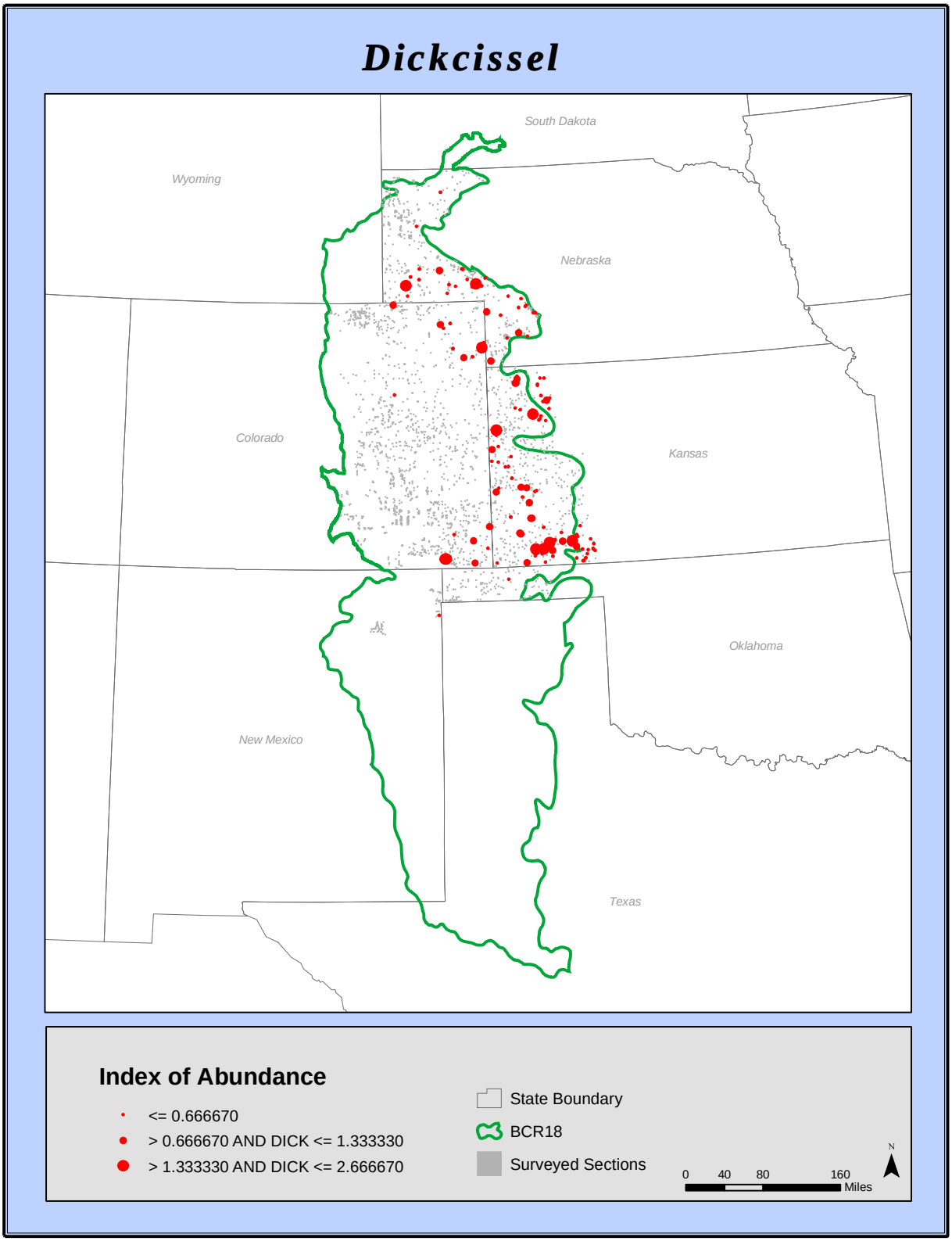
(Spiza americana)

In 2005, we detected 287 individuals on 133 (5.64%) of the sections surveyed. Dickcissel occurs mainly in the eastern portion of the Shortgrass Prairie BCR, wrapping around the southern and northern boundaries. Highest densities of this species occurred in dry-land agriculture in Kansas (D = 6.57 birds/km^2, CV =22%, *n* = 69). BCR-wide, higher density occurred in dry-land agriculture (4.94 birds/km^2) than in native habitat. According to the BBS, this species occurs in highest relative density in the adjacent Central Mixed Grass Prairie BCR (PIF species assessment database 2005) and seems to have population expansion into the Shortgrass Prairie BCR when breeding conditions are limited in the former region or favorable in the latter region. Dickcissel is a Partners in Flight species of Continental Concern. Kansas CWCS lists this species as a species of concern.







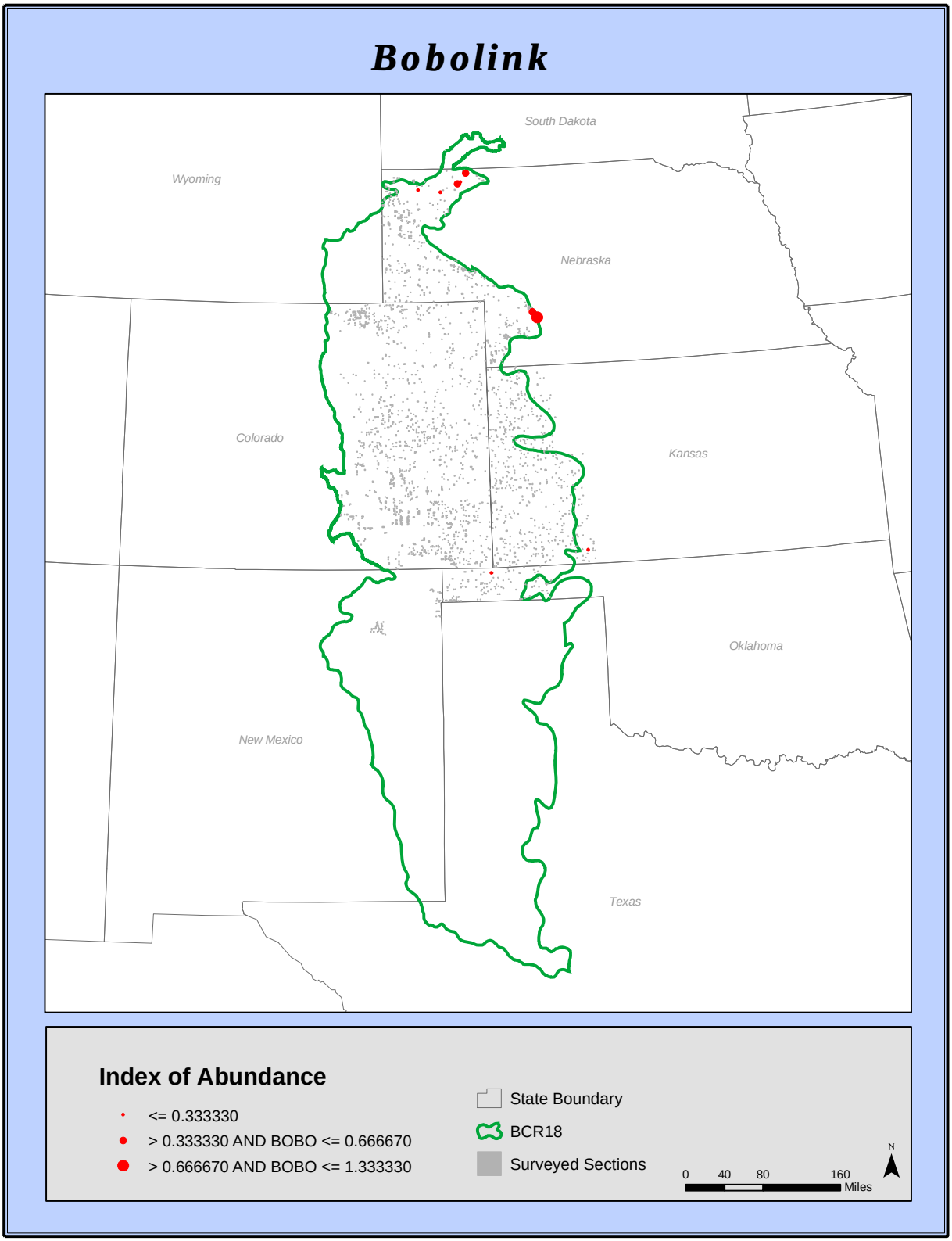


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Bobolink

(Dolichonyx oryzivorus)

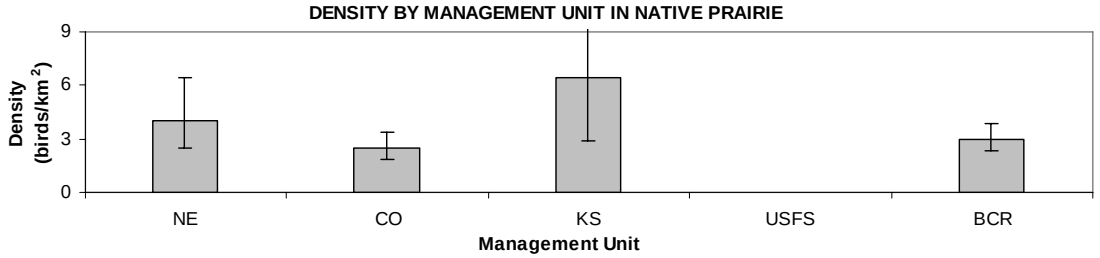
Bobolink rarely occurs within the Shortgrass Prairie BCR. Nebraska contained all15 detections. Three individuals were observed in dry-land agriculture and 13 in native prairie habitat. The range of this species includes the northern most region of Short Grass prairie BCR. Bobolink is a species of concern in Kansas in their CWCS. There were insufficient detections to obtain density estimates.

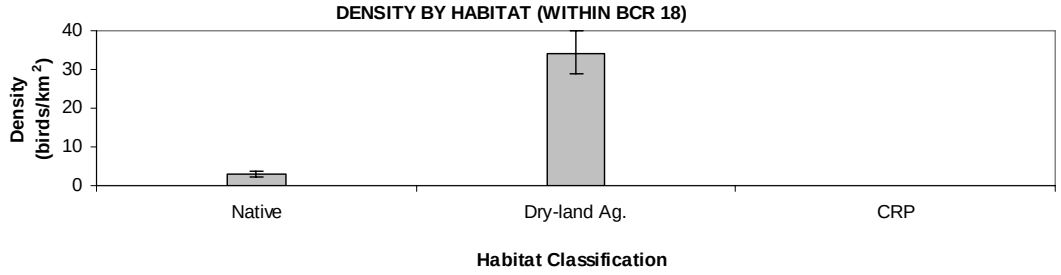


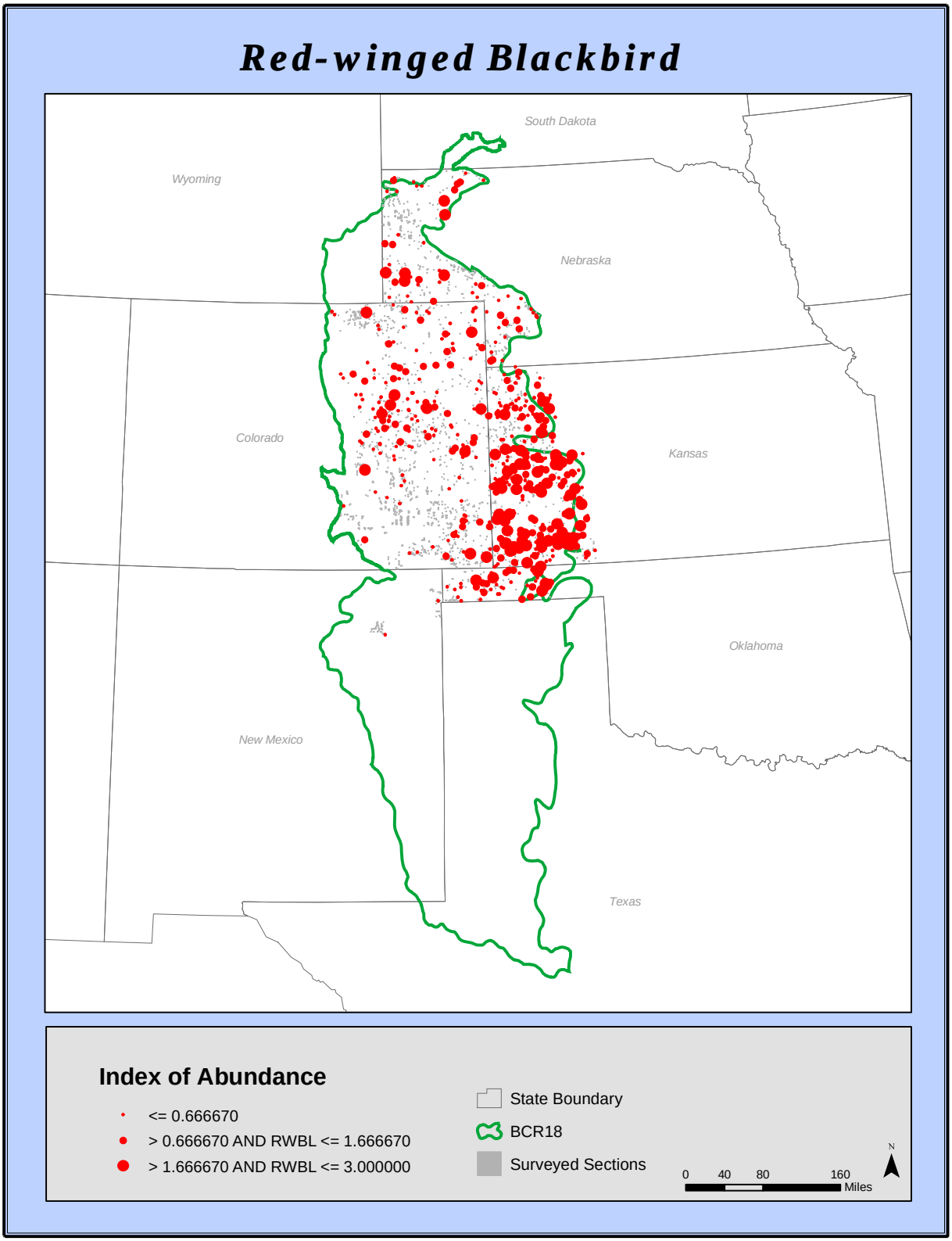
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Red-winged Blackbird
(Agelaius phoeniceus)

In 2005, we detected 2,075 individuals on 572 (24%) of the sections surveyed. Red-winged Blackbird occurs mainly in agricultural or wetland habitat types throughout the Shortgrass Prairie BCR. This species occurred in highest density in dry-land agriculture in Kansas (D = 63.84 birds/km^2, CV = 10%, *n* = 583). Across the BCR, densities also were higher in dry-land agriculture (D = 34.03 birds/km^2, CV = 8%, *n* = 768).





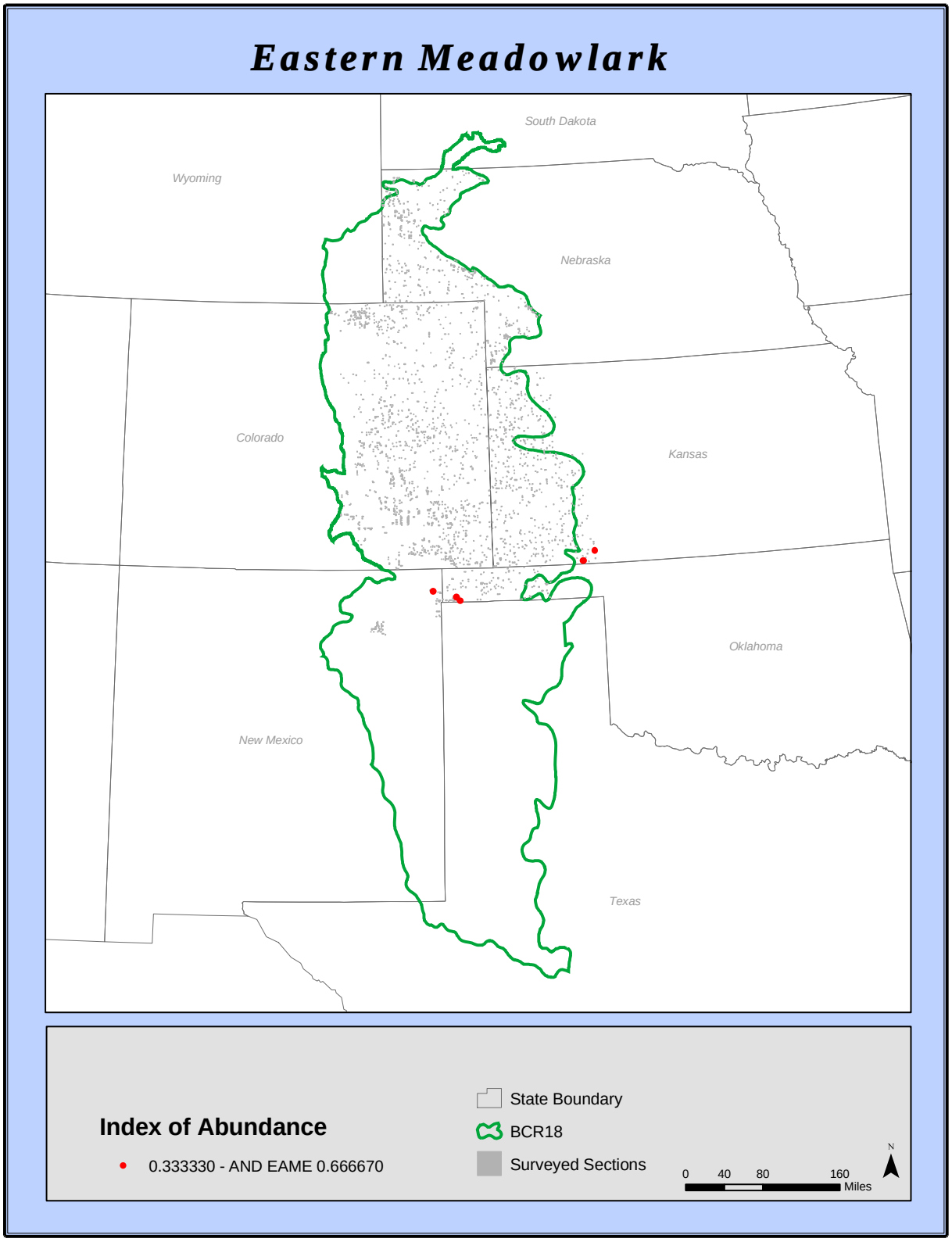


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Eastern Meadowlark

(Sturnella magna)

In 2005, we detected eight individuals on six (<1%) of the sections surveyed. The few detections of Eastern Meadowlark were in the southern portion of the study area. There were not enough detections to generate a density estimate for this species. Eastern Meadowlark is a species of concern in Nebraska's and Kansas's CWCS.

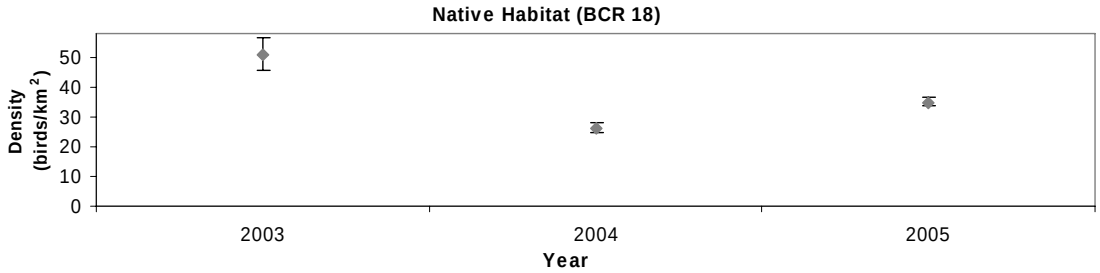


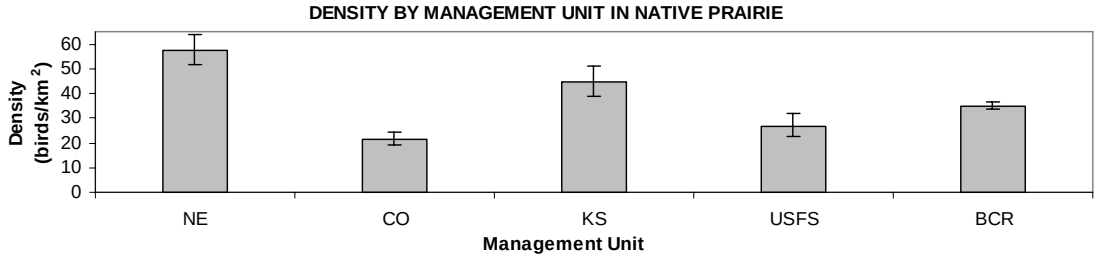
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

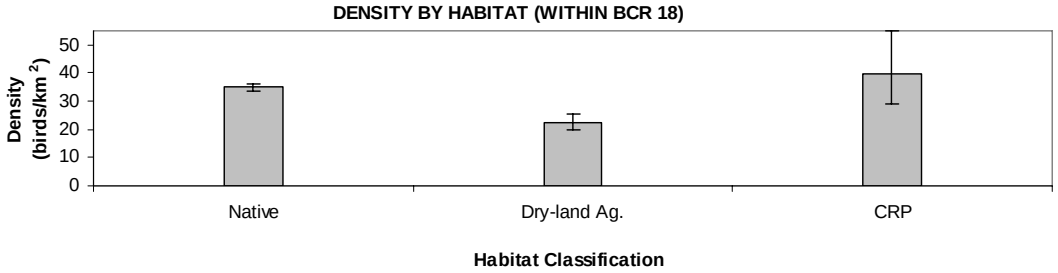
Western Meadowlark

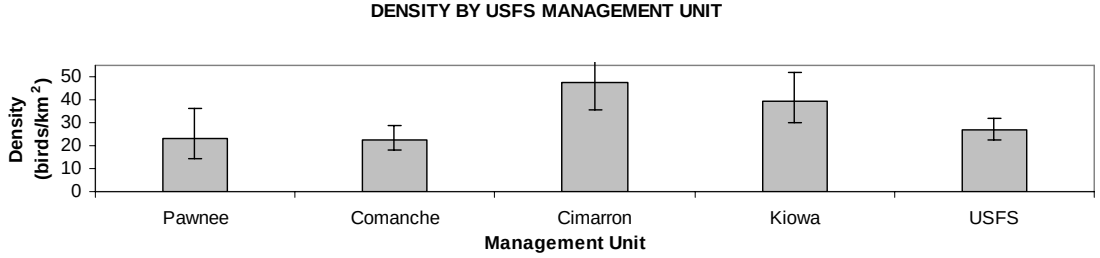
(Sturnella neglecta)

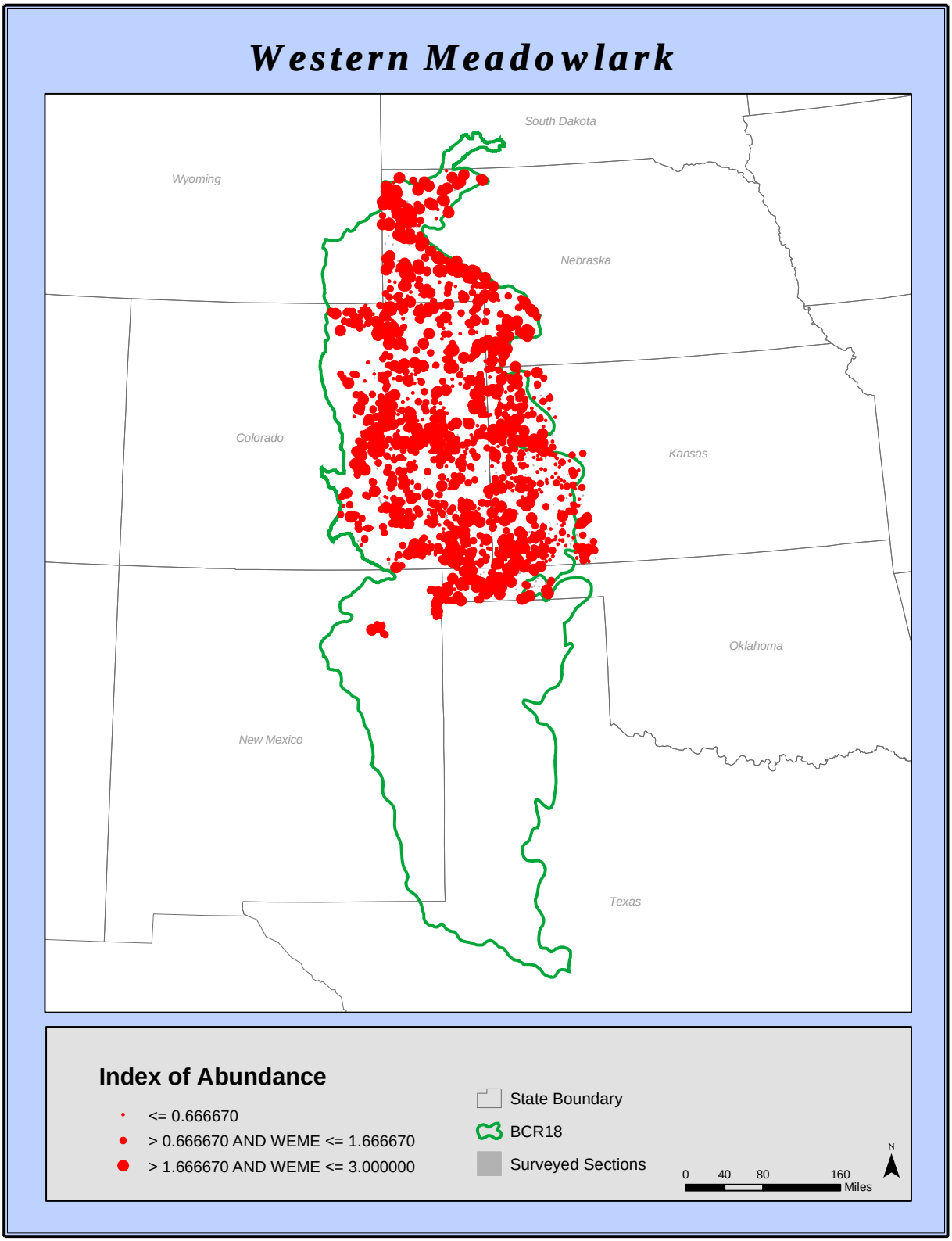
In 2005, we detected 8,601 individuals on 2,082 (88.2%) of the sections surveyed. Western Meadowlark ranked second in total number of individuals detected and it occurs throughout the Shortgrass Prairie BCR. This species was found in highest densities in native prairie of Nebraska (D = 57.35 birds/km^2, CV = 5%, *n* = 1793). Western Meadowlark had higher densities in Native and CRP habitat than dry-land agriculture. Western Meadowlark is a Partners in Flight Stewardship species for BCR 18.







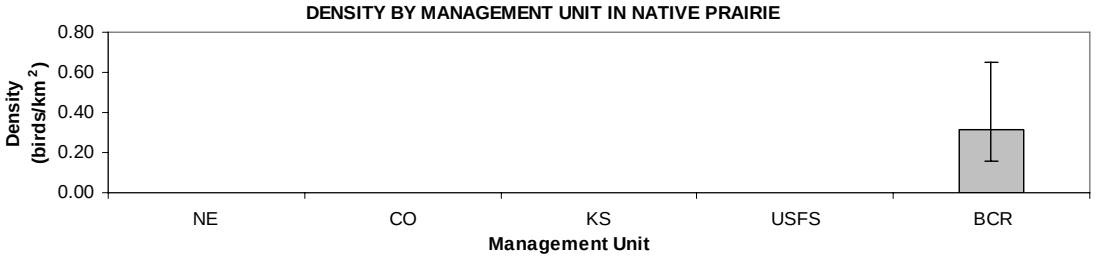


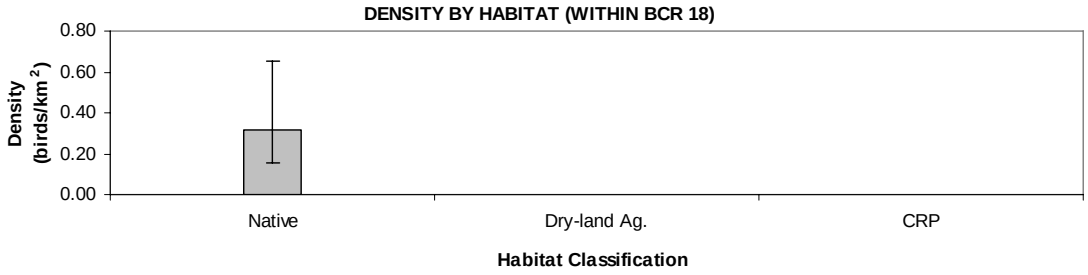


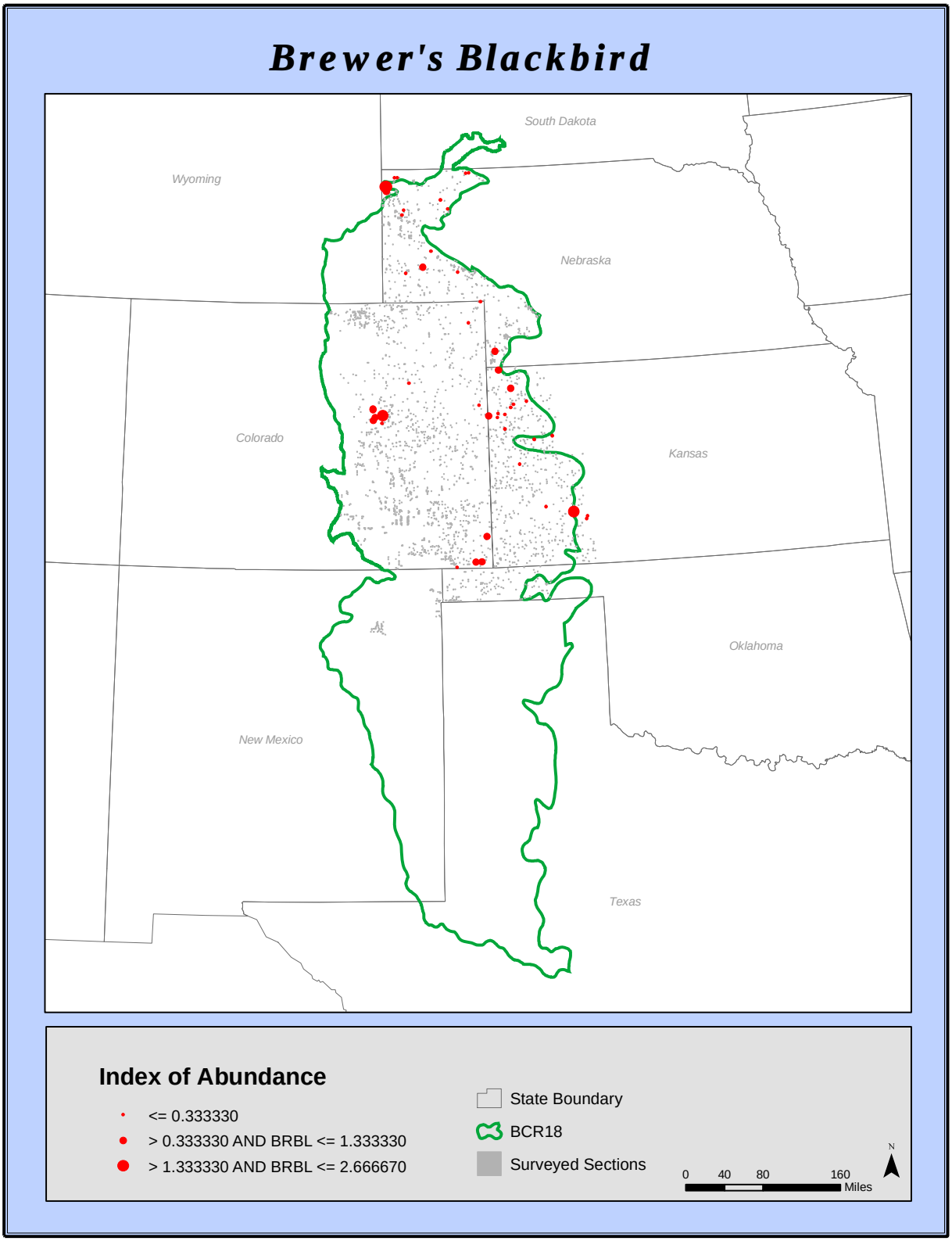
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Brewer's Blackbird
(Euphagus cyancephalus)

In 2005, we detected 89 individuals on 48 (2%) of the sections surveyed. The Brewer's Blackbird appears to occur only locally throughout the Shortgrass Prairie BCR. We found this species mainly in native prairie (D = 0.32 birds/km^2, CV = 38%, *n* = 24). Habitat preferences of this species is open areas with some vegetation structure for nesting. Nebraska and Kansas listed this species as a species of concern in their CWCS.



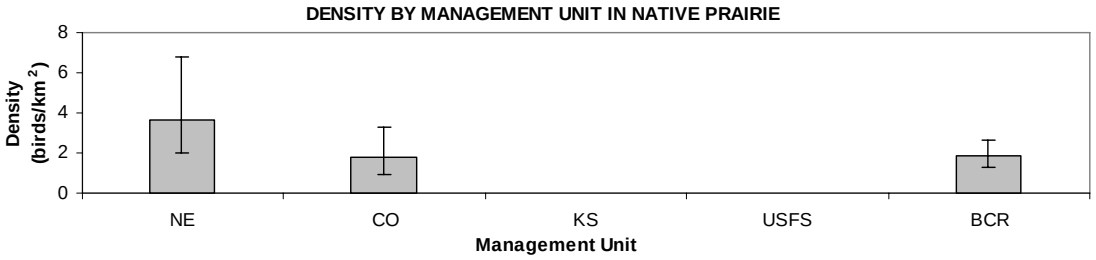


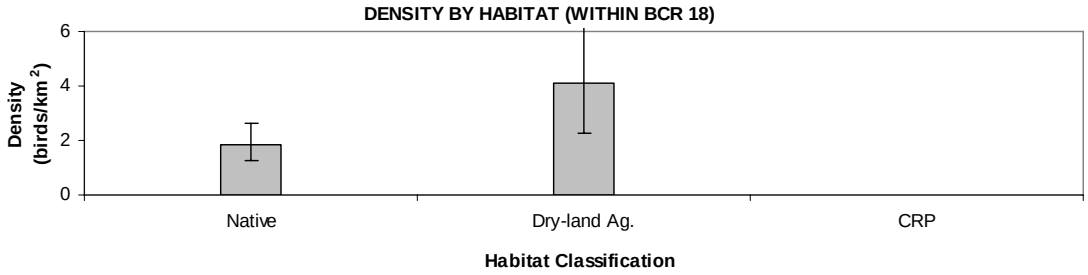


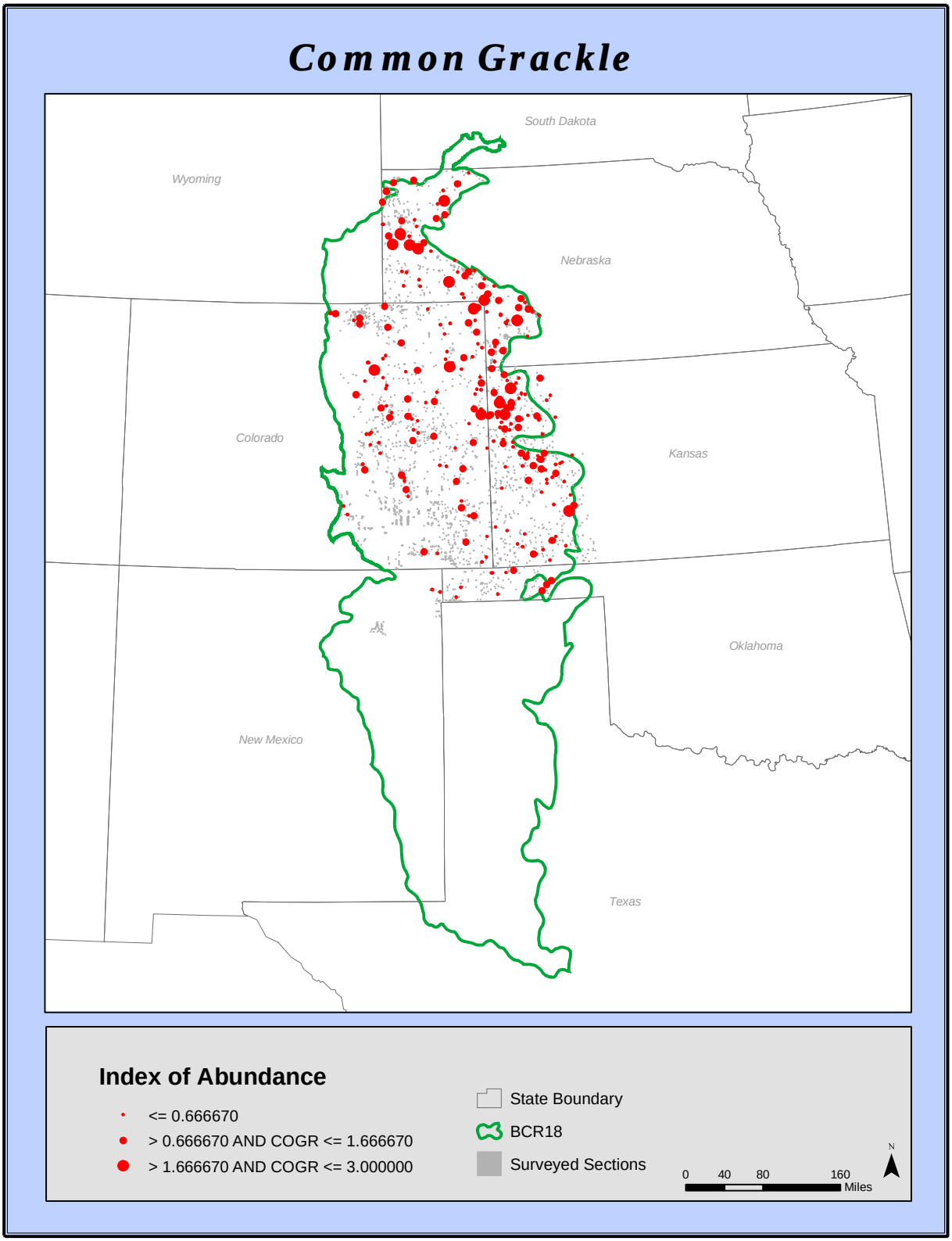
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Common Grackle
(Quiscalus quiscula)

In 2005, we detected 686 individuals on 275 (11.7%) of the sections surveyed. Common Grackle occured throughout the Shortgrass Prairie BCR. We found this species to be most abundant in agricultural habitats. Common Grackle occurred in higher density (4.09 birds/km^2 CV = 31%, *n* = 85) in dry-land agriculture than in native prairie (1.82 birds/km^2 CV = 19%, *n* = 104) with overlapping CI in density estimates. This species shows a propensity for aggregating around human-altered habitats that provide foraging opportunities.





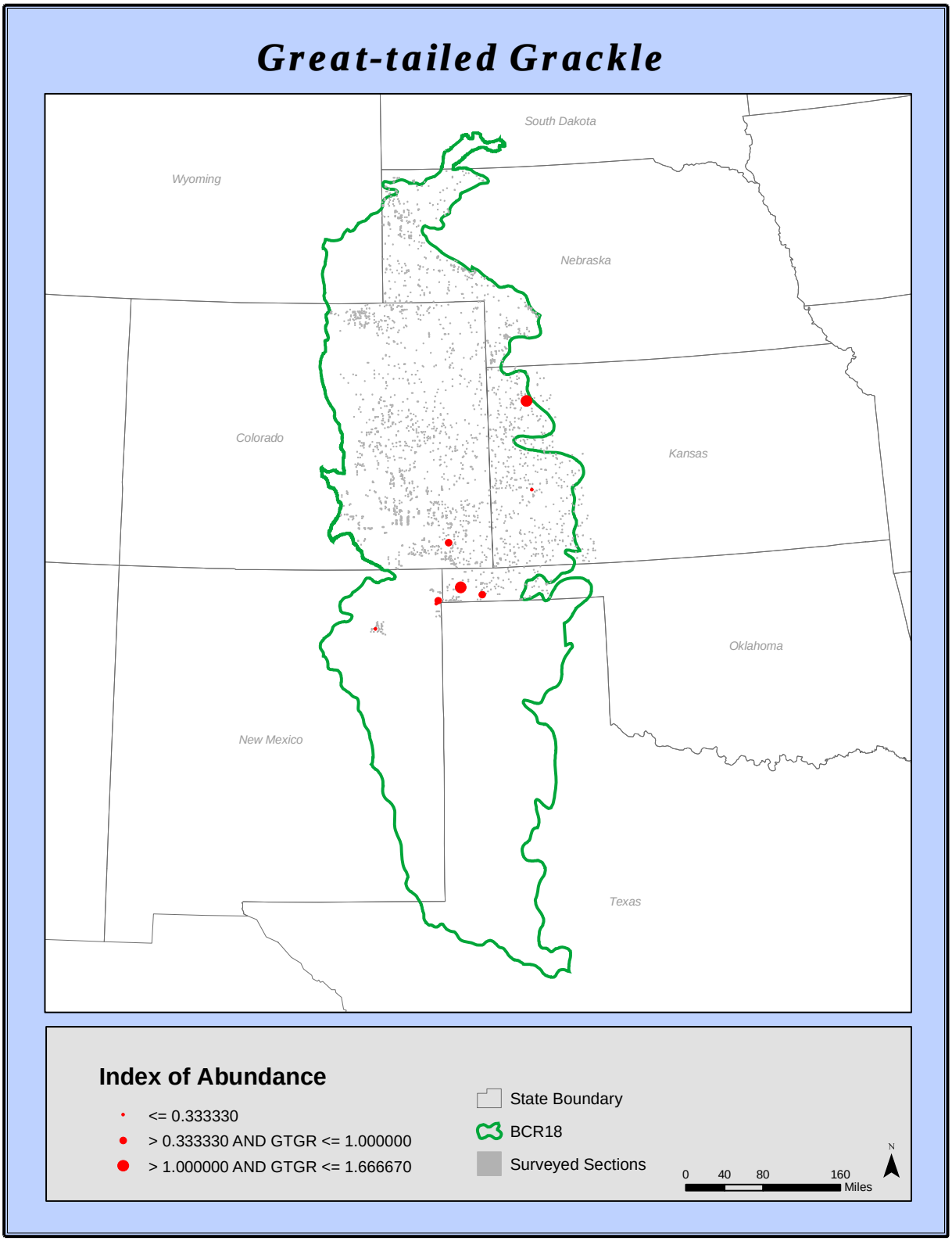


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Great-tailed Grackle

(Quiscalus mexicanus)

In 2005, we detected 19 individuals on eight (<1%) of the sections surveyed, mainly in the southern and eastern portion of the study area. There were inadequate detections to yield a density estimate for this species. This formerly rare species appears to be expanding its range northward into the BCR.

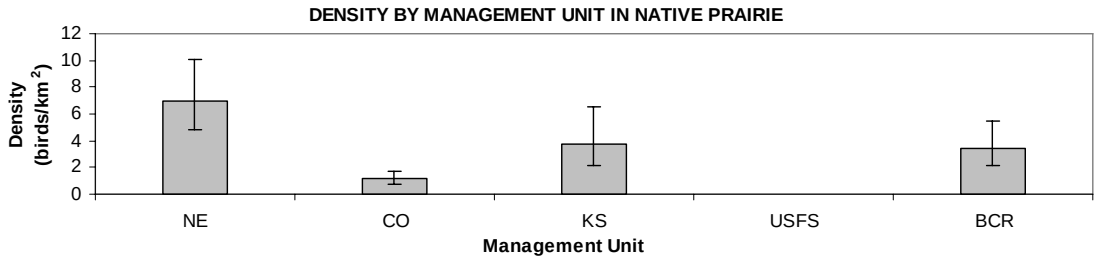


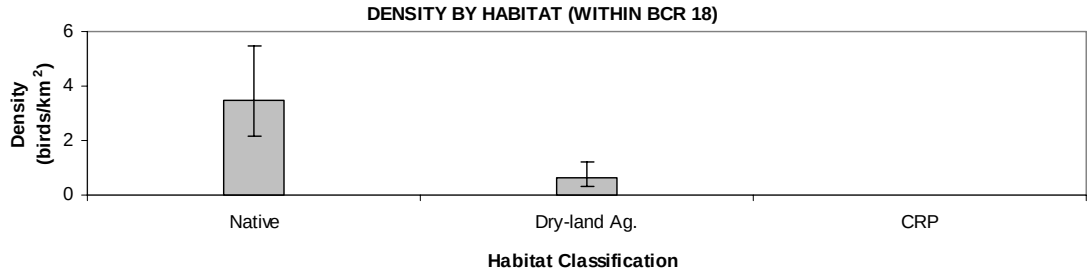
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

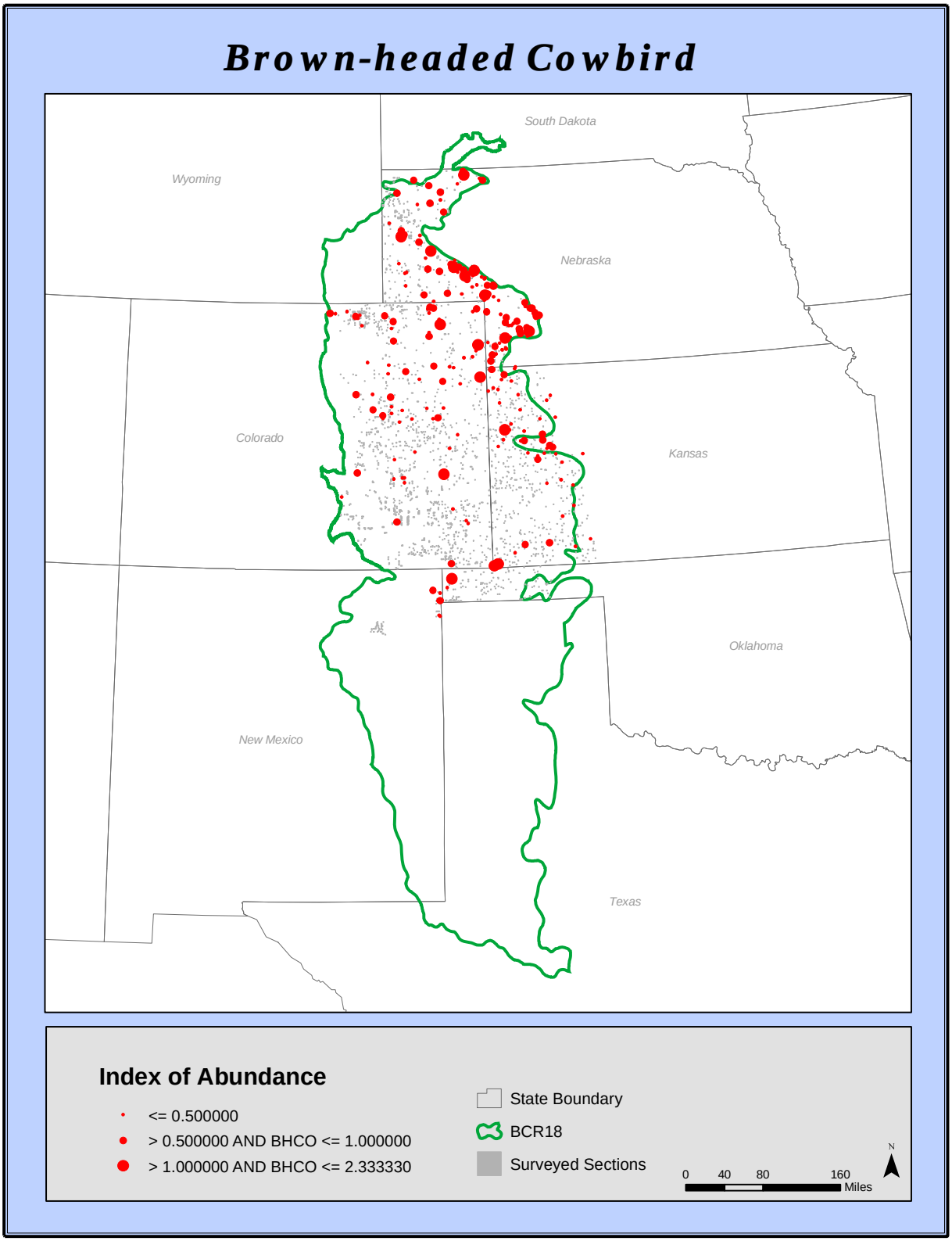
Brown-headed Cowbird

(Molothrus ater)

In 2005, we detected 436 individuals on 254 (10.8%) of the sections surveyed. This species occurs throughout the Shortgrass Prairie BCR. Brown-headed Cowbird, a brood parasite, is a habitat generalist. It is associated mainly with scattered vegetation and anthropogenic habitat types, such as edges. Highest densities for this species were found in native habitats in Nebraska (D = 6.99 birds/km^2, CV = 19%, *n* = 87). BCR-wide, density is higher in native prairie than in dry-land agriculture. Among states, the lowest density estimate was in Colorado.



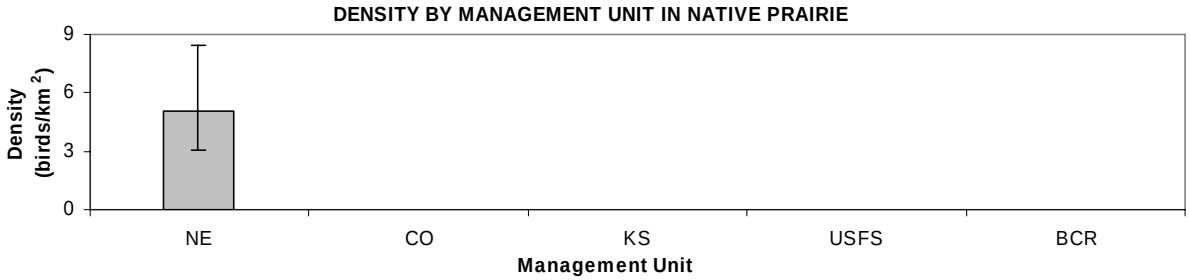


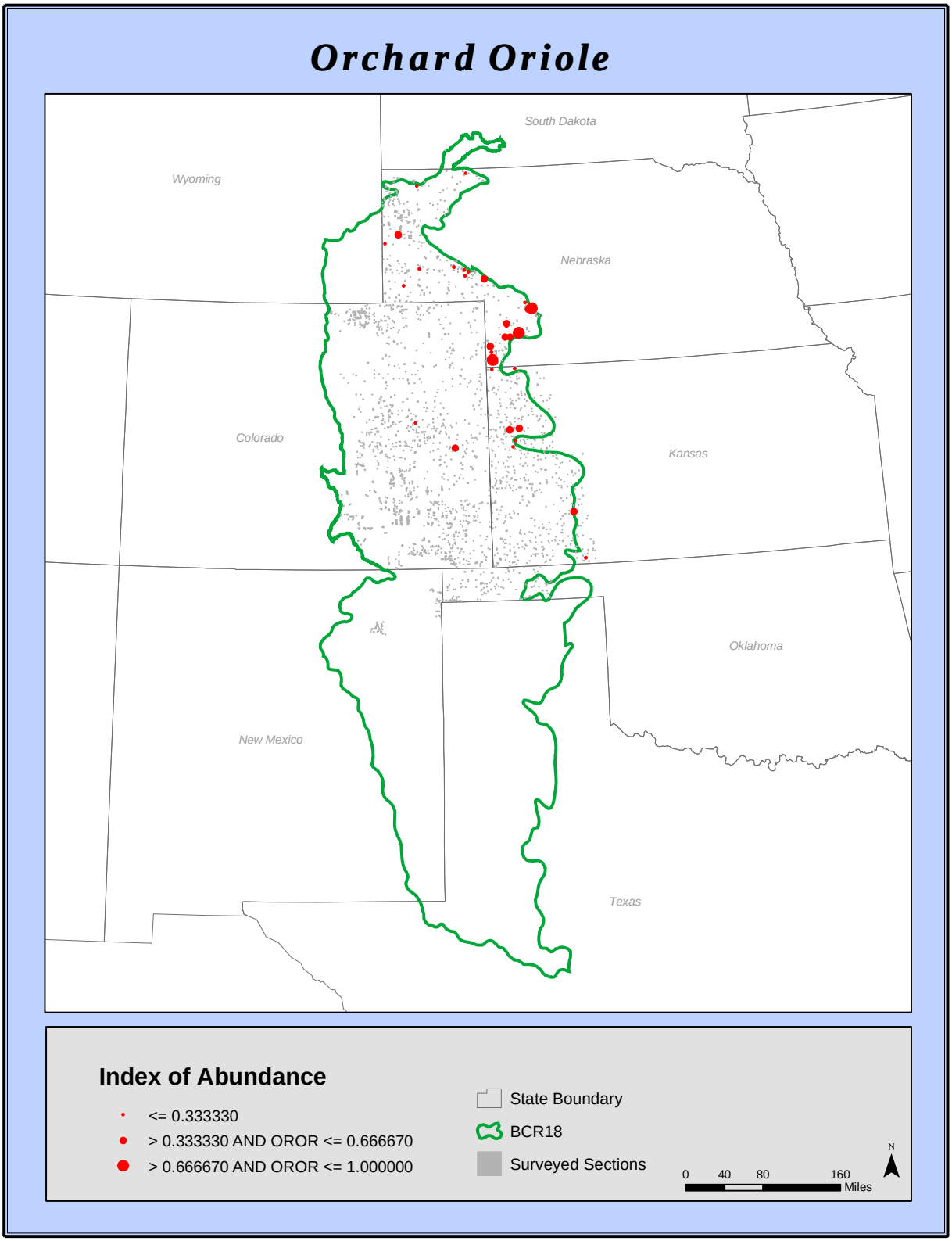


Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Orchard Oriole
(Icterus spurius)

In 2005, we detected 58 individuals on 38 (1.6%) of the sections surveyed. We detected Orchard Oriolein higher numbers in Nebraska than in other states. This species is associated mainly with anthropogenic habitat types, such as shelterbelts and riparian woodlands. Highest densities for this species were found in native habitats in Nebraska (D = 5.07 birds/km^2, CV = 26%, n = 25).



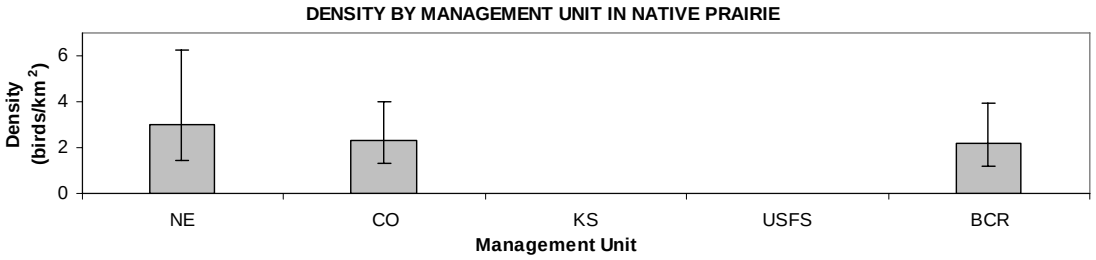


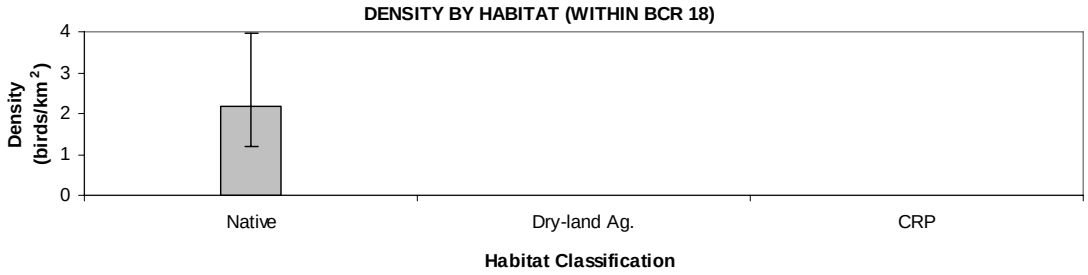
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

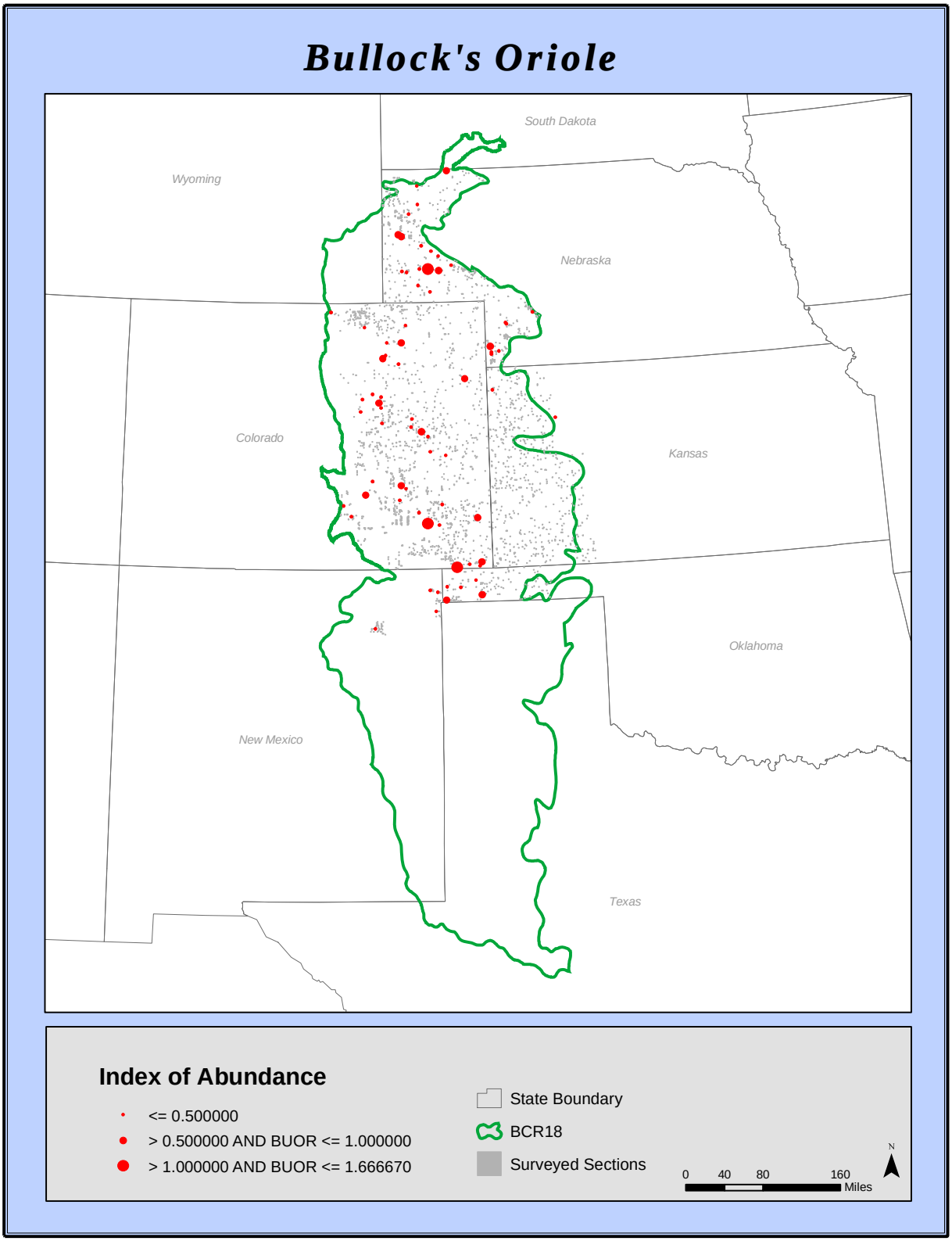
Bullock's Oriole

(Icterus bullockii)

In 2005, we detected 108 individuals on 77 (3.3%) of the sections surveyed. Bullock's Oriole occurs throughout the Shortgrass Prairie BCR, but is generally rare in Kansas. This species is associated mainly with scattered shelterbelts and riparian areas with cottonwoods. Densities were similar in native habitats in Nebraska (D = 2.99 birds/km^2, CV = 38%, n = 25) and Colorado (D = 2.29 birds/km^2, CV = 29%, n = 30).



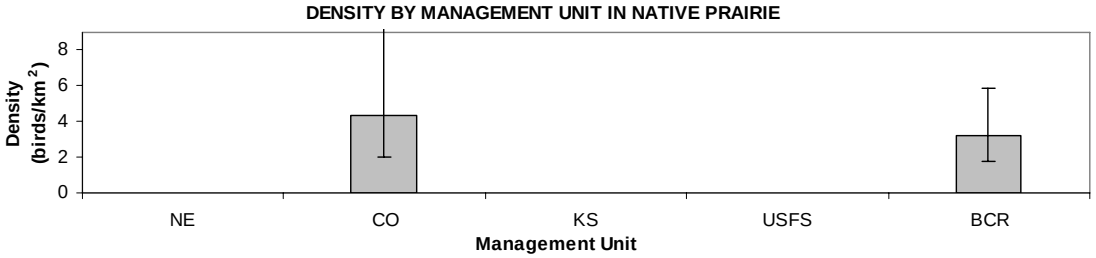


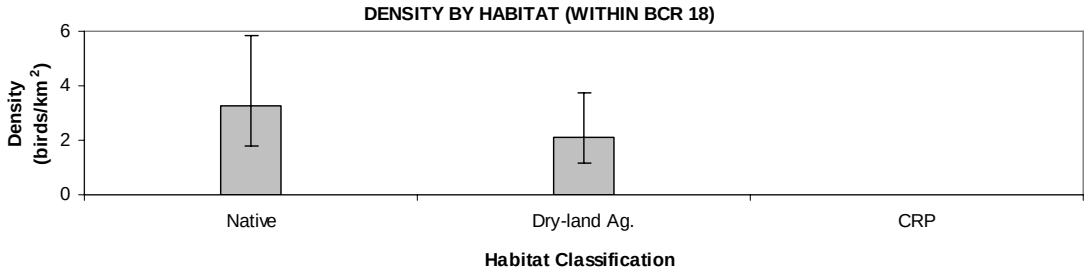


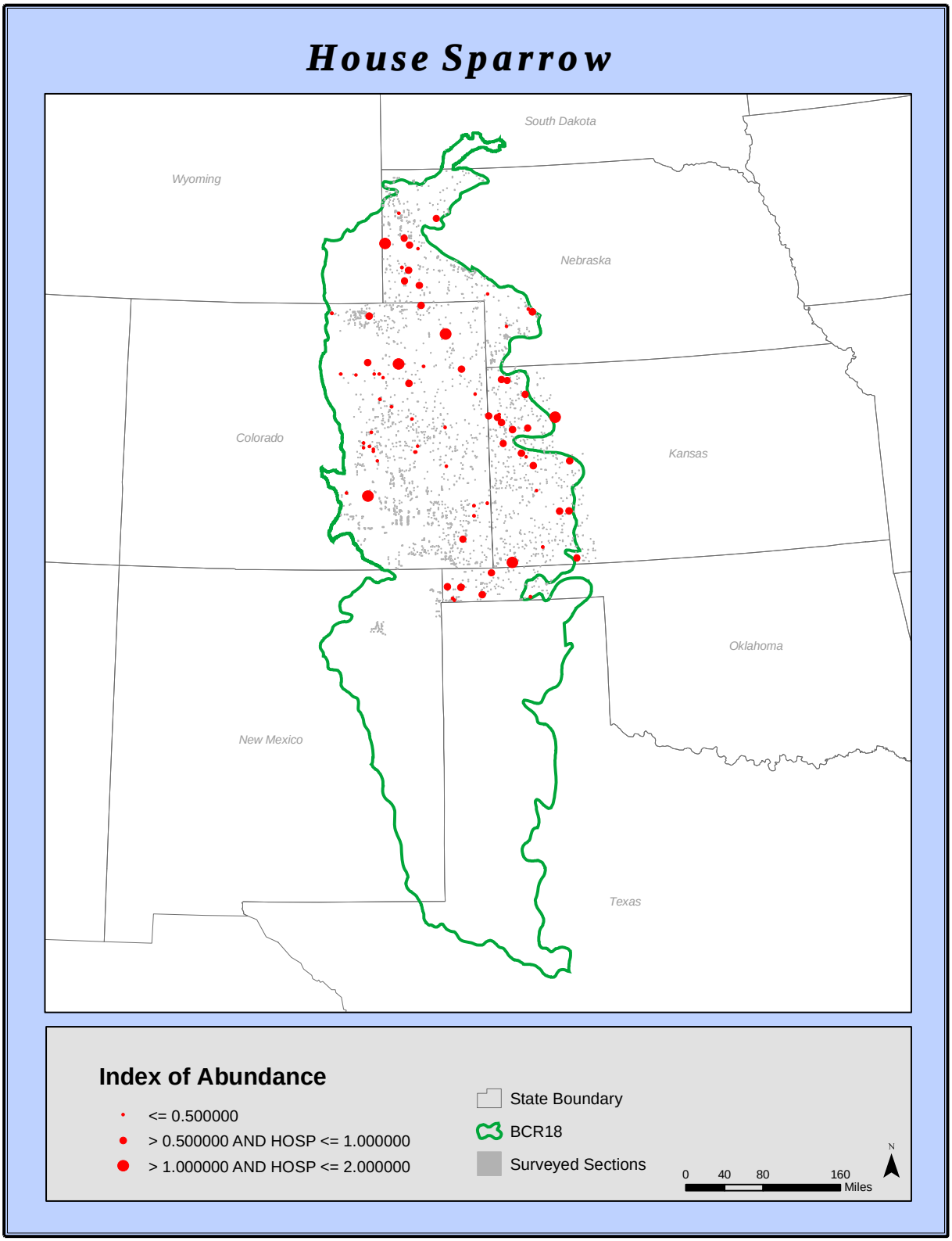
Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

House Sparrow
(Passer domesticus)

In 2005, we detected 151 individuals on 81 (3.4%) of the sections surveyed. House Sparrow occurs throughout the Shortgrass Prairie BCR. It is associated mainly with anthropogenic habitats such as homesteads and farmlands. Across the BCR, House Sparrow density was similar among native habitat (D = 3.24 birds/km^2, CV = 31%, n = 41) and dry-land agriculture (D = 2.09 birds/km^2, CV = 30%, n = 32). This species in the past has had higher densities in dry-land agriculture.







Distribution and index of abundance of the indicated species throughout the study area. Section-based surveys were conducted 15 May – 4 July 2005.

Appendix C Combined 2005 density estimates for all management units.

This appendix presents density estimates for all management units and habitat types for 2005. Species are listed in taxonomic order.

Common Name	Management Unit	Habitat	D	D LCL	D UCL	D CV	n	Sections Surveyed
Ring-necked Pheasant	BCR 18	Native	0.45	0.27	0.73	25%	131	1694
Ring-necked Pheasant	BCR 18	Dry-Ag	2.72	2.10	3.51	13%	224	496
Ring-necked Pheasant	NE	Native	1.12	0.76	1.67	20%	70	403
Ring-necked Pheasant	CO	Native	0.17	0.10	0.29	28%	30	1075
Ring-necked Pheasant	CO	Dry-Ag	2.08	1.09	3.97	33%	33	157
Ring-necked Pheasant	KS	Native	1.27	0.64	2.52	35%	30	158
Ring-necked Pheasant	KS	Dry-Ag	2.56	2.04	3.23	12%	161	295
Scaled Quail	BCR 18	Native	0.37	0.23	0.59	24%	52	1694
Scaled Quail	CO	Native	0.49	0.30	0.82	26%	48	1075
Northern Bobwhite	BCR 18	Native	0.25	0.16	0.39	23%	46	1694
Northern Bobwhite	KS	Native	2.06	1.17	3.64	29%	24	158
Turkey Vulture	BCR 18	Native	0.10	0.07	0.16	23%	35	1694
Northern Harrier	BCR 18	Native	0.08	0.04	0.13	29%	28	1694
Swainson's Hawk	BCR 18	Native	0.94	0.60	1.48	23%	117	1694
Swainson's Hawk	BCR 18	Dry-Ag	0.47	0.24	0.93	35%	31	496
Swainson's Hawk	CO	Native	0.86	0.56	1.33	22%	84	1075
Swainson's Hawk	CO	Dry-Ag	0.73	0.37	1.45	35%	23	157
Swainson's Hawk	USFS	NA	0.52	0.24	1.12	40%	20	267
Red-tailed Hawk	BCR 18	Native	0.14	0.10	0.20	18%	57	1694
Red-tailed Hawk	NE	Native	0.25	0.15	0.43	27%	23	403
Red-tailed Hawk	CO	Native	0.10	0.06	0.16	24%	36	1075
Ferruginous Hawk	BCR 18	Native	0.04	0.02	0.08	37%	20	1694
American Kestrel	BCR 18	Native	0.29	0.20	0.43	20%	80	1694
American Kestrel	NE	Native	0.38	0.26	0.56	20%	38	403
American Kestrel	CO	Native	0.34	0.19	0.60	30%	26	1075
Killdeer	BCR 18	Native	1.75	1.32	2.31	14%	124	1694
Killdeer	BCR 18	Dry-Ag	11.46	6.64	19.79	28%	23	496
Killdeer	NE	Native	0.67	0.39	1.17	29%	26	403
Killdeer	CO	Native	2.04	1.12	3.73	31%	89	1075
Upland Sandpiper	BCR 18	Native	0.19	0.10	0.33	30%	18	1694
Upland Sandpiper	NE	Native	0.90	0.49	1.67	32%	15	403
Long-billed Curlew	BCR 18	Native	0.09	0.05	0.19	36%	22	1694
Long-billed Curlew	NE	Native	0.13	0.06	0.29	41%	13	403
Mourning Dove	BCR 18	Native	19.90	17.49	22.64	7%	1271	1694
Mourning Dove	BCR 18	Dry-Ag	18.63	15.46	22.46	10%	512	496
Mourning Dove	BCR 18	CRP	35.94	19.01	67.94	33%	31	33
Mourning Dove	NE	Native	24.62	19.34	31.33	12%	422	403
Mourning Dove	NE	Dry-Ag	14.65	9.56	22.44	22%	46	44
Mourning Dove	CO	Native	17.44	14.39	21.12	10%	701	1075
Mourning Dove	CO	Dry-Ag	26.29	20.90	33.07	12%	181	157
Mourning Dove	CO	CRP	21.00	8.98	49.11	44%	19	19
Mourning Dove	KS	Native	26.43	19.59	35.66	15%	137	158

Common Name	Management Unit	Habitat	D	D LCL	D UCL	D CV	n	Sections Surveyed
Mourning Dove	KS	Dry-Ag	24.80	17.62	34.90	18%	191	295
Mourning Dove	USFS	NA	27.49	11.62	65.03	45%	73	267
Mourning Dove	Comanche	NA	15.27	7.23	32.28	39%	26	133
Mourning Dove	Cimarron	NA	9.45	4.66	19.14	36%	19	29
Mourning Dove	Kiowa	NA	37.76	18.71	76.22	36%	19	58
Burrowing Owl	BCR 18	Native	0.53	0.31	0.91	28%	102	1694
Burrowing Owl	NE	Native	0.68	0.33	1.38	37%	25	403
Burrowing Owl	CO	Native	0.51	0.34	0.76	21%	65	1075
Burrowing Owl	USFS	NA	0.72	0.28	1.85	49%	14	267
Common Nighthawk	BCR 18	Native	1.03	0.83	1.29	11%	184	1694
Common Nighthawk	NE	Native	0.51	0.29	0.89	29%	34	403
Common Nighthawk	CO	Native	1.06	0.78	1.43	15%	111	1075
Common Nighthawk	KS	Native	2.96	1.87	4.69	24%	44	158
Say's Phoebe	BCR 18	Native	0.64	0.42	0.98	22%	49	1694
Say's Phoebe	NE	Native	0.45	0.24	0.82	32%	18	403
Say's Phoebe	CO	Native	0.56	0.33	0.96	28%	27	1075
Cassin's Kingbird	BCR 18	Native	0.13	0.06	0.29	40%	16	1694
Western Kingbird	BCR 18	Native	12.09	10.08	14.50	9%	614	1694
Western Kingbird	BCR 18	Dry-Ag	7.89	5.84	10.64	15%	127	496
Western Kingbird	NE	Native	13.38	9.48	18.88	18%	157	403
Western Kingbird	NE	Dry-Ag	8.39	4.16	16.94	36%	15	44
Western Kingbird	CO	Native	11.47	9.31	14.13	11%	384	1075
Western Kingbird	CO	Dry-Ag	8.38	5.12	13.71	25%	75	157
Western Kingbird	KS	Native	9.08	5.81	14.19	23%	51	158
Western Kingbird	KS	Dry-Ag	10.05	5.80	17.43	28%	39	295
Western Kingbird	USFS	NA	11.68	5.93	23.02	35%	23	267
Eastern Kingbird	BCR 18	Native	3.30	2.41	4.53	16%	94	1694
Eastern Kingbird	NE	Native	4.62	3.07	6.93	21%	51	403
Eastern Kingbird	CO	Native	1.02	0.51	2.03	36%	26	1075
Eastern Kingbird	KS	Native	16.92	8.99	31.85	33%	22	158
Loggerhead Shrike	BCR 18	Native	1.06	0.70	1.61	21%	69	1694
Loggerhead Shrike	NE	Native	0.63	0.36	1.08	28%	26	403
Loggerhead Shrike	CO	Native	1.21	0.69	2.14	29%	39	1075
Horned Lark	BCR 18	Native	103.40	97.37	109.80	3%	5467	1694
Horned Lark	BCR 18	Dry-Ag	100.99	93.25	109.37	4%	2070	496
Horned Lark	BCR 18	CRP	93.62	59.45	147.44	23%	54	33
Horned Lark	NE	Native	109.75	92.02	130.90	9%	1314	403
Horned Lark	NE	Dry-Ag	103.00	79.09	134.15	13%	189	44
Horned Lark	CO	Native	112.05	104.75	119.86	3%	3723	1075
Horned Lark	CO	Dry-Ag	147.16	128.55	168.46	7%	740	157
Horned Lark	CO	CRP	37.58	21.46	65.80	28%	23	19
Horned Lark	KS	Native	58.46	46.61	73.32	12%	272	158
Horned Lark	KS	Dry-Ag	126.04	113.11	140.43	6%	1139	295
Horned Lark	KS	CRP	120.83	64.83	225.23	30%	27	14
Horned Lark	USFS	NA	115.95	99.86	134.63	8%	592	267
Horned Lark	Pawnee	NA	303.17	231.45	397.11	14%	227	47

Common Name	Management Unit	Habitat	D	D LCL	D UCL	D CV	n	Sections Surveyed
Horned Lark	Comanche	NA	39.95	32.12	49.70	11%	226	133
Horned Lark	Cimarron	NA	66.84	33.31	134.11	36%	32	29
Horned Lark	Kiowa	NA	126.67	86.54	185.41	19%	118	58
Northern Rough-winged Swallow	BCR 18	Native	1.03	0.62	1.71	26%	33	1694
Northern Rough-winged Swallow	NE	Native	2.17	1.11	4.25	35%	17	403
Bank Swallow	BCR 18	Native	0.17	0.08	0.38	42%	19	1694
Cliff Swallow	BCR 18	Native	52.17	26.69	101.94	35%	191	1694
Cliff Swallow	BCR 18	Dry-Ag	1.35	0.69	2.63	35%	20	496
Cliff Swallow	NE	Native	57.28	30.78	106.59	32%	65	403
Cliff Swallow	CO	Native	44.00	22.60	85.68	35%	39	1075
Cliff Swallow	KS	Native	47.38	23.70	94.72	36%	26	158
Barn Swallow	BCR 18	Native	15.88	11.43	22.07	17%	184	1694
Barn Swallow	BCR 18	Dry-Ag	16.25	11.45	23.06	18%	45	496
Barn Swallow	NE	Native	7.42	5.09	10.83	19%	62	403
Barn Swallow	CO	Native	11.75	7.47	18.49	23%	80	1075
Barn Swallow	CO	Dry-Ag	6.71	3.23	13.94	38%	19	157
Barn Swallow	KS	Native	111.16	49.71	248.58	42%	20	158
Barn Swallow	KS	Dry-Ag	43.93	25.18	76.63	29%	29	295
Rock Wren	BCR 18	Native	0.80	0.38	1.67	39%	23	1694
Rock Wren	NE	Native	1.84	0.90	3.77	38%	22	403
American Robin	BCR 18	Native	1.00	0.61	1.62	25%	30	1694
American Robin	BCR 18	Dry-Ag	0.87	0.46	1.63	33%	21	496
American Robin	NE	Native	1.31	0.62	2.79	40%	21	403
Northern Mockingbird	BCR 18	Native	0.53	0.41	0.70	14%	101	1694
Northern Mockingbird	NE	Native	0.34	0.18	0.65	33%	19	403
Northern Mockingbird	CO	Native	0.57	0.42	0.78	16%	81	1075
European Starling	BCR 18	Native	1.17	0.78	1.75	21%	62	1694
European Starling	BCR 18	Dry-Ag	1.18	0.66	2.11	30%	26	496
European Starling	NE	Native	1.26	0.63	2.49	36%	22	403
European Starling	CO	Native	1.20	0.58	2.47	38%	29	1075
Cassin's Sparrow	BCR 18	Native	11.31	9.99	12.80	6%	1226	1694
Cassin's Sparrow	BCR 18	Dry-Ag	1.07	0.43	2.62	48%	21	496
Cassin's Sparrow	NE	Native	1.27	0.82	1.98	23%	34	403
Cassin's Sparrow	CO	Native	11.97	10.37	13.81	7%	904	1075
Cassin's Sparrow	KS	Native	30.99	23.62	40.66	14%	185	158
Cassin's Sparrow	USFS	NA	25.33	19.81	32.40	13%	272	267
Cassin's Sparrow	Comanche	NA	21.10	15.61	28.52	15%	208	133
Cassin's Sparrow	Cimarron	NA	94.60	62.08	144.15	21%	81	29
Cassin's Sparrow	Kiowa	NA	75.10	43.59	129.40	28%	63	58
Brewer's Sparrow	BCR 18	Native	2.01	1.26	3.22	24%	68	1694
Brewer's Sparrow	CO	Native	2.93	1.82	4.73	25%	66	1075
Brewer's Sparrow	USFS	NA	6.34	2.51	16.03	50%	25	267
Brewer's Sparrow	Pawnee	NA	32.98	12.89	84.41	50%	24	47
Vesper Sparrow	BCR 18	Native	0.43	0.22	0.84	35%	27	1694

Common Name	Management Unit	Habitat	D	D LCL	D UCL	D CV	n	Sections Surveyed
Vesper Sparrow	NE	Native	0.90	0.37	2.19	47%	19	403
Vesper Sparrow	CO	Native	0.20	0.09	0.48	45%	25	1075
Lark Sparrow	BCR 18	Native	19.45	16.67	22.70	8%	844	1694
Lark Sparrow	BCR 18	Dry-Ag	3.44	1.75	6.74	35%	21	496
Lark Sparrow	NE	Native	43.18	33.34	55.91	13%	335	403
Lark Sparrow	CO	Native	12.90	10.01	16.61	13%	404	1075
Lark Sparrow	KS	Native	53.61	33.79	85.04	24%	45	158
Lark Sparrow	USFS	NA	11.53	8.07	16.47	18%	85	267
Lark Sparrow	Comanche	NA	9.26	6.49	13.20	18%	60	133
Lark Sparrow	Kiowa	NA	26.51	13.24	53.11	36%	28	58
Lark Bunting	BCR 18	Native	30.25	27.23	33.61	5%	2954	1694
Lark Bunting	BCR 18	Dry-Ag	28.39	23.70	34.01	9%	791	496
Lark Bunting	BCR 18	CRP	72.95	42.86	124.14	27%	98	33
Lark Bunting	NE	Native	25.22	17.07	37.26	20%	513	403
Lark Bunting	NE	Dry-Ag	8.74	4.53	16.84	34%	28	44
Lark Bunting	CO	Native	34.84	31.13	39.00	6%	2311	1075
Lark Bunting	CO	Dry-Ag	56.26	43.81	72.26	13%	364	157
Lark Bunting	CO	CRP	111.11	62.64	197.07	28%	83	19
Lark Bunting	KS	Dry-Ag	32.43	24.57	42.81	14%	388	295
Lark Bunting	USFS	NA	46.12	35.94	59.19	13%	364	267
Lark Bunting	Pawnee	NA	79.14	52.79	118.63	21%	187	47
Lark Bunting	Comanche	NA	7.73	5.44	10.98	18%	84	133
Lark Bunting	Kiowa	NA	125.88	72.68	218.04	28%	98	58
Grasshopper Sparrow	BCR 18	Native	29.25	25.10	34.09	8%	879	1694
Grasshopper Sparrow	BCR 18	Dry-Ag	31.48	25.84	38.35	10%	291	496
Grasshopper Sparrow	BCR 18	CRP	155.40	106.02	227.77	19%	75	33
Grasshopper Sparrow	NE	Native	83.90	69.61	101.12	10%	506	403
Grasshopper Sparrow	NE	Dry-Ag	54.57	28.56	104.29	33%	23	44
Grasshopper Sparrow	CO	Native	9.23	6.96	12.24	14%	154	1075
Grasshopper Sparrow	CO	Dry-Ag	12.15	7.68	19.22	24%	44	157
Grasshopper Sparrow	CO	CRP	77.40	43.05	139.15	29%	31	19
Grasshopper Sparrow	KS	Native	43.64	33.57	56.74	13%	167	158
Grasshopper Sparrow	KS	Dry-Ag	45.79	35.70	58.74	13%	249	295
Grasshopper Sparrow	KS	CRP	160.32	92.06	279.18	28%	45	14
Grasshopper Sparrow	USFS	NA	16.25	10.43	25.30	23%	64	267
Grasshopper Sparrow	Comanche	NA	14.92	9.31	23.89	24%	47	133
Grasshopper Sparrow	Cimarron	NA	58.64	37.40	91.95	23%	39	29
McCown's Longspur	BCR 18	Native	1.56	1.04	2.34	21%	153	1694
McCown's Longspur	NE	Native	0.46	0.23	0.92	37%	22	403
McCown's Longspur	CO	Native	2.72	1.79	4.14	22%	123	1075
McCown's Longspur	USFS	NA	8.17	4.56	14.64	30%	51	267
McCown's Longspur	Pawnee	NA	39.18	23.08	66.49	27%	50	47
Chestnut-collared Longspur	BCR 18	Native	0.96	0.64	1.42	20%	128	1694
Chestnut-collared Longspur	NE	Native	3.23	2.10	4.97	22%	111	403

Common Name	Management Unit	Habitat	D	D LCL	D UCL	D CV	n	Sections Surveyed
Chestnut-collared Longspur	CO	Native	0.49	0.19	1.26	51%	16	1075
Blue Grosbeak	BCR 18	Native	0.83	0.42	1.66	36%	17	1694
Dickcissel	BCR 18	Native	1.85	1.26	2.71	20%	117	1694
Dickcissel	BCR 18	Dry-Ag	4.94	3.45	7.08	18%	86	496
Dickcissel	NE	Native	3.61	2.08	6.27	29%	43	403
Dickcissel	CO	Native	2.91	1.08	7.83	53%	23	1075
Dickcissel	KS	Native	4.63	2.54	8.44	31%	33	158
Dickcissel	KS	Dry-Ag	6.57	4.29	10.05	22%	69	295
Dickcissel	Comanche	NA	3.02	1.04	8.74	58%	16	133
Red-winged Blackbird	BCR 18	Native	3.01	2.35	3.85	13%	247	1694
Red-winged Blackbird	BCR 18	Dry-Ag	34.03	28.99	39.96	8%	768	496
Red-winged Blackbird	NE	Native	4.01	2.51	6.42	24%	63	403
Red-winged Blackbird	NE	Dry-Ag	37.22	21.00	65.96	29%	51	44
Red-winged Blackbird	CO	Native	2.48	1.81	3.40	16%	148	1075
Red-winged Blackbird	CO	Dry-Ag	13.00	9.38	18.02	17%	122	157
Red-winged Blackbird	KS	Native	6.42	2.87	14.33	42%	26	158
Red-winged Blackbird	KS	Dry-Ag	63.84	52.75	77.25	10%	583	295
Western Meadowlark	BCR 18	Native	34.94	33.56	36.38	2%	5398	1694
Western Meadowlark	BCR 18	Dry-Ag	22.52	20.07	25.27	6%	1042	496
Western Meadowlark	BCR 18	CRP	39.74	28.84	54.75	16%	128	33
Western Meadowlark	NE	Native	57.35	51.52	63.84	5%	1793	403
Western Meadowlark	NE	Dry-Ag	24.50	17.35	34.61	18%	83	44
Western Meadowlark	CO	Native	21.68	19.31	24.34	6%	2797	1075
Western Meadowlark	CO	Dry-Ag	22.22	17.80	27.74	11%	405	157
Western Meadowlark	CO	CRP	36.76	21.63	62.45	27%	69	19
Western Meadowlark	KS	Native	44.48	38.75	51.06	7%	666	158
Western Meadowlark	KS	Dry-Ag	25.52	22.24	29.29	7%	542	295
Western Meadowlark	KS	CRP	52.75	33.77	82.40	23%	58	14
Western Meadowlark	USFS	NA	26.85	22.46	32.10	9%	561	267
Western Meadowlark	Pawnee	NA	22.82	14.45	36.04	23%	63	47
Western Meadowlark	Comanche	NA	22.64	17.91	28.61	12%	201	133
Western Meadowlark	Cimarron	NA	47.53	35.79	63.11	14%	115	29
Western Meadowlark	Kiowa	NA	39.53	30.03	52.04	14%	129	58
Brewer's Blackbird	BCR 18	Native	0.32	0.15	0.65	38%	24	1694
Common Grackle	BCR 18	Native	1.82	1.25	2.66	19%	104	1694
Common Grackle	BCR 18	Dry-Ag	4.09	2.27	7.39	31%	85	496
Common Grackle	NE	Native	3.67	1.99	6.77	32%	37	403
Common Grackle	CO	Native	1.77	0.95	3.32	33%	48	1075
Common Grackle	CO	Dry-Ag	6.84	2.92	16.04	45%	27	157
Common Grackle	KS	Dry-Ag	2.80	1.61	4.88	29%	38	295
Brown-headed Cowbird	BCR 18	Native	3.45	2.18	5.45	24%	144	1694
Brown-headed Cowbird	BCR 18	Dry-Ag	0.61	0.31	1.22	35%	19	496
Brown-headed Cowbird	NE	Native	6.99	4.86	10.07	19%	87	403
Brown-headed Cowbird	CO	Native	1.16	0.76	1.76	22%	54	1075
Brown-headed Cowbird	KS	Native	3.73	2.13	6.53	29%	20	158

Common Name	Management Unit	Habitat	D	D LCL	D UCL	D CV	n	Sections Surveyed
Orchard Oriole	BCR 18	Native	1.79	1.03	3.11	29%	34	1694
Orchard Oriole	NE	Native	5.07	3.06	8.41	26%	25	403
Bullock's Oriole	BCR 18	Native	2.19	1.21	3.97	31%	47	1694
Bullock's Oriole	NE	Native	2.99	1.44	6.22	38%	25	403
Bullock's Oriole	CO	Native	2.29	1.31	4.00	29%	30	1075
House Sparrow	BCR 18	Native	3.24	1.79	5.85	31%	41	1694
House Sparrow	BCR 18	Dry-Ag	2.09	1.17	3.72	30%	32	496
House Sparrow	CO	Native	4.32	1.99	9.40	41%	23	1075