Density and Distribution of Breeding Birds on Meadow Springs Ranch and Soapstone Prairie Natural Area in northern Colorado

Annual REPORT

2011

Rocky Mountain Bird Observatory
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ROCKY MOUNTAIN BIRD OBSERVATORY

***Mission**: To conserve birds and their habitats*

***Vision**: Native bird populations are sustained in healthy ecosystems*

***Core Values**: (Our goals for achieving our mission)*

1. ***Science** provides the foundation for effective bird conservation.*
2. ***Education** is critical to the success of bird conservation.*
3. ***Stewardship** of birds and their habitats is a shared responsibility.*

RMBO accomplishes its mission by:

***Monitoring** long-term bird population trends to provide a scientific foundation for conservation action.*

***Researching** bird ecology and population response to anthropogenic and natural processes to evaluate and adjust management and conservation strategies using the best available science.*

***Educating** people of all ages through active, experiential programs that create an awareness and appreciation for birds.*

***Fostering** good stewardship on private and public lands through voluntary, cooperative partnerships that create win-win situations for wildlife and people.*

***Partnering** with state and federal natural resource agencies, private citizens, schools, universities, and other non-governmental organizations to build synergy and consensus for bird conservation.*

***Sharing** the latest information on bird populations, land management and conservation practices to create informed publics.*

***Delivering** bird conservation at biologically relevant scales by working across political and jurisdictional boundaries in western North America.*

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***Cover Photo**:* Meadow Springs Ranch by Mike Forsberg

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EXECUTIVE SUMMARY

Grassland bird populations have declined more than any other guild of North American birds and are among the highest of conservation priorities for state, federal and non-governmental natural resource conservation organizations. In effort to aid conservation and management of grasslands in Colorado, the Rocky Mountain Bird Observatory has partnered with the City of Fort Collins to inventory and monitor grassland birds on city-owned properties in Larimer and Weld counties. This project began in 2006 and 2007 on Soapstone Prairie Natural Area (SPNA) and has since expanded significantly with the incorporation of Meadow Springs Ranch (MSR), and other adjacent city-owned properties.

We conducted avian point count surveys at 531 stations across roughly 9,049 acres on SPNA and MSR between 20 April and 6 July, 2011, including a prescribed burn site on SPNA (399 acres), prairie dog colonies on both properties (~991 acres), and a mile-wide corridor on both the east and west side of I-25 in MSR with high potential for oil and gas development (~7660 acres). We also surveyed vegetation at each station and recorded observations of other wildlife. During 42 survey days in 2011, we observed 12,043 individual birds of 82 species. We estimated densities of all common breeding bird species across the study area, and post-stratified estimates by prairie dog colony habitat, burn area, and oil & gas.

The most common birds within the study areas were Horned Lark, Western Meadowlark, McCown's Longspur and Lark Bunting, which together accounted for 78% of all individual birds observed. We also observed active nests of Ferruginous hawk, Prairie Falcon, Dickcissel, Lark Sparrow, Western Kingbird, Killdeer, Cliff Swallow and American Kestrel. We observed 9 mammalian and reptilian species including Striped skunk, White-tailed deer, Horned lizard, and active dens of Red fox and Coyote.

The acres of these properties include some of the most significant grasslands in northern Colorado, and present an excellent opportunity to conserve vulnerable wildlife and many other valuable ecosystem services. These properties support nearly all of the breeding and migratory grassland bird species expected for this region, including 21 high-priority grassland-dependent species, in addition to other prairie wildlife. Of special note, in 2008 & 2009 these properties supported a breeding population of approximately 56 Mountain Plovers, a species of high conservation concern. In 2011, we estimated the Mountain Plover population on these properties at 12 individuals. In order to sustain populations of this and other shortgrass prairie species, including Ferruginous Hawk, Burrowing Owl, and Long-billed Curlew, management should strive to conserve and augment prairie dog populations, protect and restore wetlands, and maintain a low-level of human presence.

ACKNOWLEDGEMENTS

This project was funded by the Neotropical Migratory Bird Conservation Act (NMBCA #4846). The City of Fort Collins Natural Resources Department also provided valuable in-kind assistance and matching support for this project. We thank our field crew Erin Youngberg and Lucas Caldwell, as well as field assistance from Greg Levandoski, Arvind Panjabi, and Matthew Webb.

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INTRODUCTION

North American short grass prairies are the most endangered and anthropogenically altered ecosystems on the continent (Samson et al. 2004; Brennan et al. 2005). The primary threat to existing prairies is conversion to crop agriculture and development (Samson et al. 2004). Birds are the most abundant vertebrates in grasslands (Kennedy et al. 2008), and grassland birds have shown more significant declines in the last three decades than any other guild of birds (Smith and Lomolino 2004). Breeding grassland birds act as environmental indicators, as individual bird species are associated with specific habitat components within the larger grassland ecosystem (Browder et al. 2002). Monitoring avian populations in remaining North American prairies is important to understanding the overall health of grassland ecosystems and directly contributes to the conservation management of these habitats and the species that depend on them.

The goal of this project is to help managers conserve grassland bird species and their habitats on City of Fort Collins properties in northern Colorado by helping them better understand the abundance, distribution and habitat requirements of breeding birds on the properties. The objectives are to document migratory and breeding bird use of the project area, and provide locations of sensitive bird species and habitats. These properties support breeding populations of more than 21 high-priority bird species, primarily grassland species, recognized by the Colorado Division of Wildlife, the U.S. Fish and Wildlife Service (USFWS), Partners in Flight (PIF), the U.S. Shorebird Conservation Plan, The Nature Conservancy, and other conservation groups. These properties comprise the southern end of the largest remaining contiguous prairie in North America, stretching from north-eastern Colorado to Alberta and Saskatchewan and east into Nebraska and the Dakotas, and thus present an incredible opportunity for grassland conservation. This is the final report for the 2011 monitoring activities.

METHODS

Study Area

We conducted this study on two City of Fort Collins (CFC) properties in Larimer and Weld counties of northern Colorado that comprise roughly 44,000 acres of short grass prairie and rolling foothills: Soapstone Prairie Natural Area (SPNA) and Meadow Springs Ranch (MSR). The properties have a diverse landscape; Soapstone is dominated by native shortgrass prairie with hills, wide shallow washes, and large rocky outcroppings. Meadow Springs Ranch has several small riparian areas and a few steep cliff areas bordered by Plains Cottonwood (*Populus deltoides*) in the northern Lonetree pastures, rolling hills spotted with Saltbush (*Atriplex sp*) in the Lewis and Benson pastures, tall grass ranchland in the Meadow pasture, and an extensive gently sloping prairie dog colony in the southern Bulger pastures.

We used spatial data provided by CFC Natural Resources Department to delineate approximately 991 acres of active prairie dog colony habitat (PDCH). An episode of sylvatic plague wiped out 70% or more of the prairie dogs in SPNA and MSR between 2007 and 2008. We discovered several small but active prairie dog colonies outside of the PDCH layer, suggesting that some colonies could be slowly recovering and re-colonizing (Appendix A). However, prairie dogs are still absent from 69% of their pre-plague range.

The SPNA and MSR properties also sit above the Niobrara shale formation and therefore have high potential for surface disruption due to development of oil and gas resources. An area of particularly high potential for oil and gas development on the Meadow Springs Ranch is along the Interstate 25 corridor.

On November 2nd, 2010 the City of Fort Collins, along with the Nature Conservancy and help from the Larimer County hotshots, performed a prescribed burn on 399 acres in Jack Springs pasture on Soapstone Prairie Natural Area. The burn was designed to encourage the re-establishment of Mountain Plovers that were historically present before the sylvatic plague epidemic that decimated the prairie dog colony in that pasture.

Avian Point Count Surveys

We utilized the same grid of point count stations used to survey the properties since 2006 and used Arc Map 9.1 to identify 531 stations within the 2011 study areas, each separated by 250 meters. For our point counts we limited our surveys to areas of PDCH on MSR (93 points) and SPNA (10 points) and on a small prescribed burn site in former active PDCH in Jack Springs pasture of SPNA (19 points). Each PDCH and burn point count station was surveyed four times between April 20th and May 23rd.

In addition to surveys on PDCH and the burn area, we surveyed 441 points on MSR in a mile-wide corridor on either side of I-25 (7,660 acres) that is being explored for potential oil and gas development. The point count stations in the corridor were surveyed twice between May 24th and July 6th. Points in the corridor that overlapped PDCH points on MSR were visited twice in addition to the four previous PDCH visits (Fig 1).

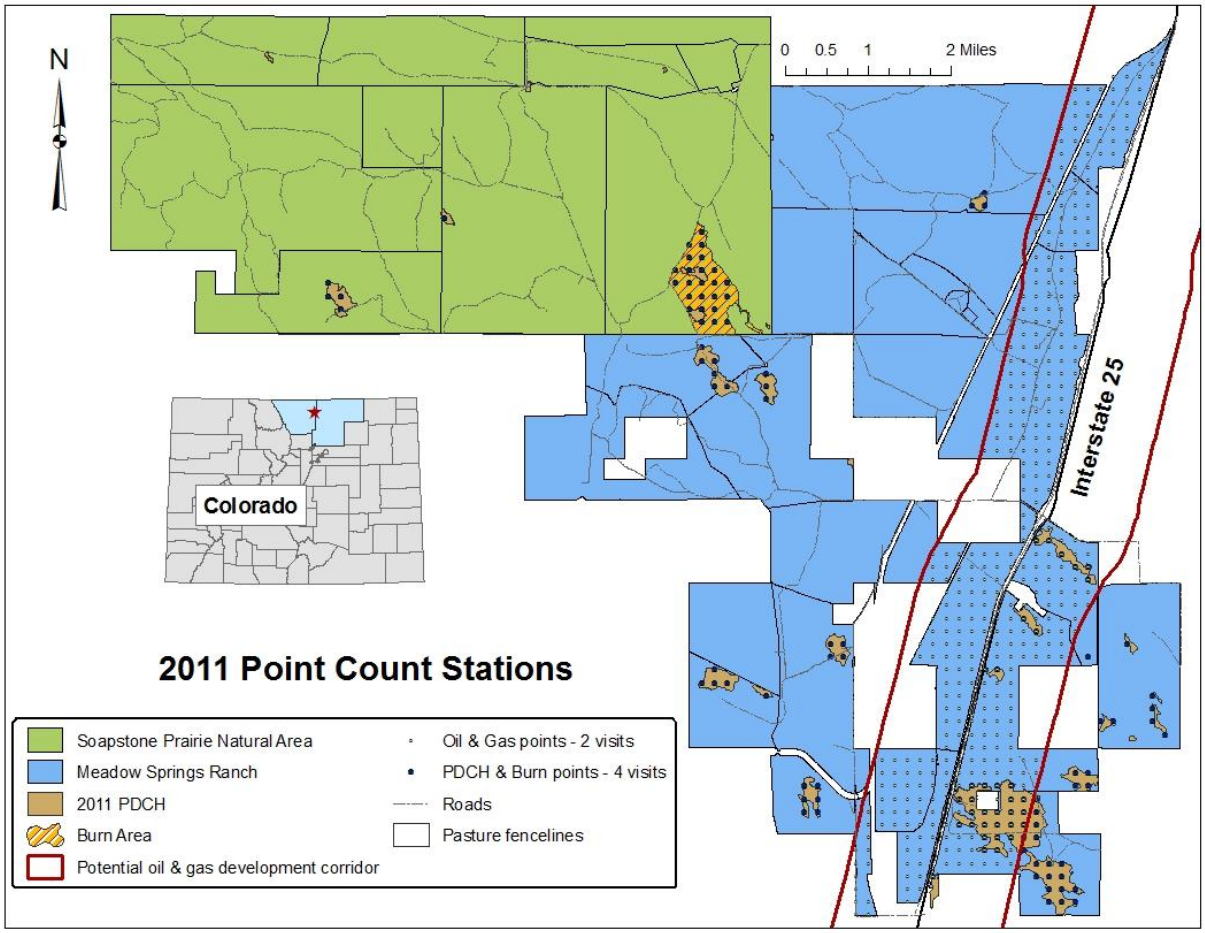

Figure 1: Study area and point-count stations in 2011 on Soapstone Prairie Natural Area and Meadow Springs Ranch in Larimer and Weld counties, Colorado.

All point count surveys started no earlier than one half-hour before sunrise and ended no later than 11 a.m., often earlier. We navigated on foot to each point count station using a handheld GPS unit. We recorded atmospheric data (temperature, cloud cover, precipitation, and wind speed) and time of day at the start and end of each day's point counts. We logged all GPS data in Universal Transverse Mercator (UTM) North American Datum 1927. At each station, we conducted a 5-minute point count survey consisting of five consecutive 1-minute intervals. This protocol, which is described more fully by Hanni et al. (2009), uses Distance sampling (Buckland et al. 2001) with removal (Farnsworth et al. 2002). For each bird detected, observers recorded species, sex, how it was detected (call, song, visual, wing beat, other), distance from observer, and the 1-minute interval in which it was detected. Whenever possible, we measured distances using laser rangefinders. When it was not possible to directly measure the distance to a bird, we measured distance to a nearby object and then gauged our estimate to the bird.

Between point count surveys, we recorded the presence of high-priority and other rare or unusual bird species, but we did not use these observations in our analyses. We also noted presence of cattle and wildlife species including mammals and reptiles.

Habitat Surveys

After completing each point count survey (including each repeat visit) we performed a rapid habitat survey at each point by estimating several vegetation parameters. Within 25 m of each point we visually estimated percent cover of grasses, forbs, bare ground, exotic plants, and 'other cover' to the nearest 1%. 'Other cover' included cactus, low woody plants, rock, and other minor ground cover types. A comparison of visual and quantitative sampling methods for estimating grassland vegetation structure suggests that with proper training, the two methods can yield very comparable results (RMBO, unpubl. data). Also within this radius we estimated average grass height by assigning it to one of five categories: (1) ≤ shoe sole height, (2) ankle height, (3) mid-calf height, (4) knee height, and (5) mid-thigh height or above. Within 100 m of each station we documented shrub and over story tree species and estimated percent cover (to nearest 1%) and average height of each. We also documented the presence of roads, fence lines, or other structures such as pipeline posts and stock tanks. We recorded whether prairie dog colonies at point survey stations were 'active' or 'inactive' based on the detection of at least one prairie dog within 100 m.

Analyses

We estimated bird species density using Program Distance 6.0 release 2 (Thomas et al. in press). We used Half-normal cosine, Hazard-rate cosine, Uniform cosine, and Hazard-rate Simple Polynomial detection function models to determine the best fit model for each species. We then used Goodness-of-fit tests to determine truncation points in each species dataset to eliminate outliers (generally the furthest 5-15% of observations) and improve model performance, as recommended by Buckland et al. (2001). We used Akaike's Information Criterion (AICc) to select among competing models of detectability of each species (across all strata), and post-stratified estimates by habitat strata (PDCH, burn area and oil & gas area). In this report, (n) denotes the total number of detections observed in the field and (n_t) represents the truncated number of detections used to estimate density.

For bird densities we pooled all point count data to generate species-specific detection functions, and post-stratified estimates by PDCH, burn, and oil & gas. Although species' density estimates calculated with less than 75 observations may be unreliable representations of true populations (Buckland et al. 2001), we present estimates for all species with n ≥ 20, and for high-priority species with fewer observations. These estimates should be interpreted with caution. Many species with

relatively few observations are low-density species of high conservation interest, and having even rough estimates of density in a comparable format to other species, along with associated measures of error, can aid in the conservation and management of these species. Nonetheless, we urge that caution be used in interpreting estimates derived from relatively few observations, and that special attention be paid to %CV and confidence limits.

RESULTS

Avian Surveys

We detected 12,043 birds during 1,373 point count visits at 531 stations. We observed 82 species within the study area in 2011 (Appendix B), and estimated density for 25 species (Table 1). We detected 78 bird species in the potential oil and gas development corridor including 21 priority species at 883 point visits (35 points/ 70 point visits were in PDCH). There were 44 bird species detected in PDCH including 12 priority species at 414 point visits. The burn area had 76 point visits with 19 bird species detected, including 9 priority species. Five additional species were detected within the study area outside of our point count survey efforts, including Brown Thrasher, Spotted Towhee, Merlin, and California Gull. We also confirmed breeding of a Dickcissel pair in the North Lonetree pasture of MSR.

Table 1: Average densities (birds/km^2) of twenty-five bird species on SPNA and MSR in 2011. (n_t = number of detections used to obtain density estimates, %CV = percent coefficient of variation, LCL & UCL = 95% lower and upper confidence limits of the density estimate).

		Estimate	%CV	LCI	UCI	n_t
Swainson's Hawk*	Burn	0.0000				0
	OG	0.0492	29.570	0.027	0.090	14
	PDC	0.0450	29.570	0.025	0.082	6
	Pooled	0.0452	29.570	0.025	0.083	20
Ferruginous Hawk*	Burn	0.0000				0
	OG	0.6072	27.010	0.349	1.056	12
	PDC	0.2252	24.120	0.135	0.375	3
	Pooled	0.4584	26.240	0.267	0.787	15
American Kestrel	Burn	0.6465	14.880	0.481	0.870	4
	OG	0.4264	16.330	0.309	0.589	32
	PDC	0.6741	15.240	0.498	0.913	22
	Pooled	0.5133	15.340	0.379	0.696	58
Killdeer	Burn	0.0000				0
	OG	5.9253	64.560	1.821	19.286	53
	PDC	3.0866	65.240	0.939	10.144	10
	Pooled	4.7414	64.550	1.457	15.429	63
Mountain Plover*	Burn	0.8630	34.590	0.412	1.807	4
	OG	0.0666	39.790	0.029	0.153	4
	PDC	0.8342	73.470	0.112	6.194	4
	Pooled	0.3422	58.900	0.080	1.471	12
Long-billed Curlew*	Burn	0.3159	20.810	0.207	0.482	4
	OG	0.0068	20.720	0.004	0.010	1

		Estimate	%CV	LCI	UCI	n_t
	PDC	1.0162	25.450	0.614	1.683	23
	Pooled	0.3283	24.890	0.200	0.538	28
Wilson's Snipe	Burn	0.0000				0
	OG	0.5677	30.490	0.308	1.047	28
	PDC	0.0000				0
	Pooled	0.3651	30.490	0.198	0.673	28
Mourning Dove	Burn	17.3180	31.580	7.140	42.006	2
	OG	3.1012	22.410	1.995	4.820	66
	PDC	0.1445	21.890	0.094	0.223	2
	Pooled	2.9966	23.290	1.888	4.757	70
Burrowing Owl*	Burn	0.0000				0
	OG	0.0844	14.620	0.063	0.113	6
	PDC	1.3537	14.920	1.005	1.824	42
	Pooled	0.4625	14.850	0.344	0.622	48
Say's Phoebe	Burn	0.0000				0
	OG	0.2798	22.820	0.176	0.444	15
	PDC	0.6881	23.370	0.430	1.101	15
	Pooled	0.3874	22.980	0.244	0.616	30
Western Kingbird	Burn	0.0000				0
	OG	0.6016	20.420	0.399	0.907	20
	PDC	0.5823	22.110	0.374	0.907	9
	Pooled	0.5625	20.070	0.375	0.843	29
Loggerhead Shrike*	Burn	0.3159	20.810	0.207	0.482	1
	OG	0.0068	20.720	0.004	0.010	15
	PDC	1.0162	25.450	0.614	1.683	8
	Pooled	0.3283	24.890	0.200	0.538	24
Horned Lark	Burn	135.2600	11.520	107.710	169.850	140
	OG	105.7200	7.910	90.541	123.430	1459
	PDC	164.1600	8.140	139.990	192.500	975
	Pooled	124.9700	7.940	106.970	146.000	2574
Cliff Swallow	Burn	1.0024	13.640	0.764	1.315	1
	OG	7.7582	17.360	5.514	10.916	57
	PDC	0.1840	13.570	0.140	0.241	1
	Pooled	5.1004	17.210	3.635	7.156	59
Barn Swallow	Burn	9.9713	19.330	6.706	14.826	7
	OG	15.9130	15.210	11.796	21.467	77
	PDC	3.5602	15.720	2.611	4.855	12
	Pooled	11.8600	14.980	8.828	15.931	96
Cassin's Sparrow*	Burn	0.0000				0
	OG	1.7955	19.110	1.229	2.623	58
	PDC	0.0000				0
	Pooled	1.1547	19.110	0.790	1.687	58

		Estimate	%CV	LCI	UCI	n_t
Brewer's Sparrow*	Burn	2.2686	19.690	1.529	3.366	1
	OG	3.2618	20.760	2.158	4.931	21
	PDC	20.6190	35.560	10.198	41.689	18
	Pooled	8.4406	29.420	4.719	15.099	40
Vesper Sparrow*	Burn	1.5216	15.450	1.118	2.071	1
	OG	4.7822	16.990	3.416	6.695	27
	PDC	24.3540	26.200	14.506	40.888	25
	Pooled	10.5030	21.470	6.875	16.046	53
Lark Sparrow*	Burn	0.0000				0
	OG	5.9276	14.450	4.453	7.891	64
	PDC	11.4790	55.750	3.548	37.139	10
	Pooled	7.2734	29.350	3.919	13.499	74
Lark Bunting*	Burn	0.0000				0
	OG	8.5090	9.670	7.040	10.285	214
	PDC	77.4710	43.700	33.015	181.790	31
	Pooled	28.8320	35.680	14.240	58.379	245
Grasshopper Sparrow*	Burn	0.0000				0
	OG	11.0030	10.910	8.879	13.635	212
	PDC	0.0000				0
	Pooled	7.0764	10.910	5.710	8.769	212
McCown's Longspur*	Burn	169.9500	10.300	138.270	208.890	139
	OG	44.7540	4.570	40.915	48.953	608
	PDC	76.8590	5.100	69.548	84.939	451
	Pooled	61.3650	4.810	55.843	67.432	1198
Chestnut-collared Longspur*	Burn	0.0000				0
	OG	0.4555	18.440	0.312	0.664	22
	PDC	0.1284	18.110	0.088	0.186	1
	Pooled	0.3316	18.370	0.228	0.483	23
Red-winged Blackbird	Burn	0.0000				0
	OG	10.4390	13.530	8.005	13.613	187
	PDC	5.4998	17.260	3.857	7.842	6
	Pooled	8.3718	13.600	6.410	10.934	193
Western Meadowlark	Burn	6.9075	10.900	5.579	8.553	60
	OG	16.8300	9.820	13.888	20.395	1645
	PDC	19.8520	9.920	16.350	24.105	925
	Pooled	17.1920	9.830	14.184	20.838	2630

*** Indicates priority grassland species as determined by CO Division of Wildlife, Partners in Flight and/or US Fish & Wildlife Services**

Burrowing Owl, Loggerhead Shrike, Lark Bunting, Western Meadowlark, and Brewer's Sparrow had significantly higher densities in the PDCH than in other strata. Lark Buntings arrived in mid-May (first observation on 5/16) at the end of the third PDCH & burn point visit. Most of those detections were migrating flocks passing through PDCH areas in the last point visit effort. Horned Lark and American

Kestrel had similar densities in both PDCH and the burn area. No Swainson's Hawks were observed in the burn area but there were no significant differences in density estimates across other strata. Ferruginous Hawk had a higher density outside PDCH, but all detections in O&G strata except one were at points within 500m of an active nest that was located inside PDCH in the South Bulger pasture (Fig 2).

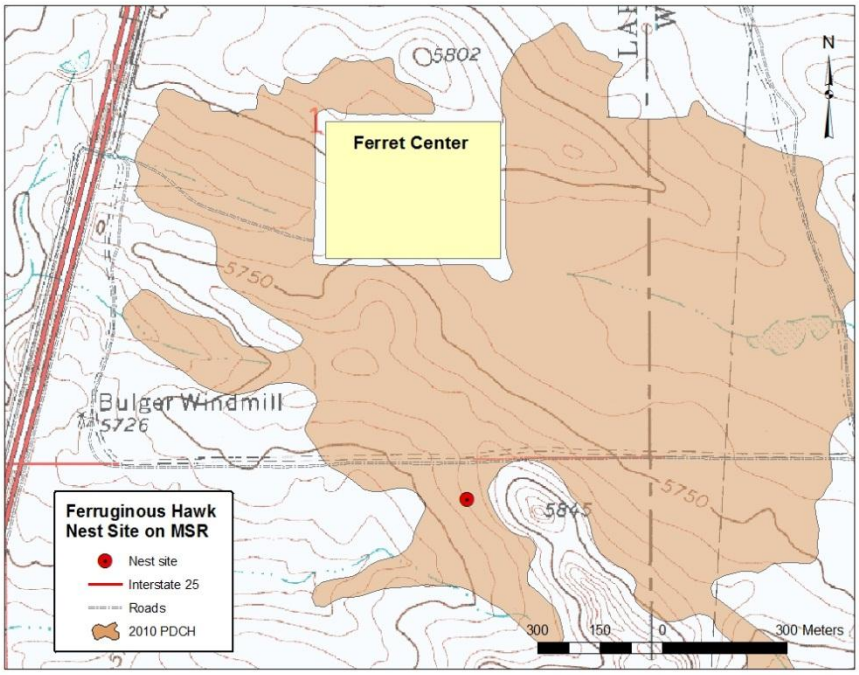

Figure 2: Ferruginous hawk nesting site in the South Bulger pasture of Meadow Springs Ranch, Colorado

Species observed in PDCH that were documented early in the season, such as Vesper Sparrow, Brewer's Sparrow, Long-billed Curlews and Lark sparrows, were mainly using the study area during migration, although some of these may also breed locally or regionally. Prairie dog colonies are important stop-over foraging areas for curlews on these properties. The peak detections of Long-billed Curlew were on 21 April, 2011 (Fig 3).

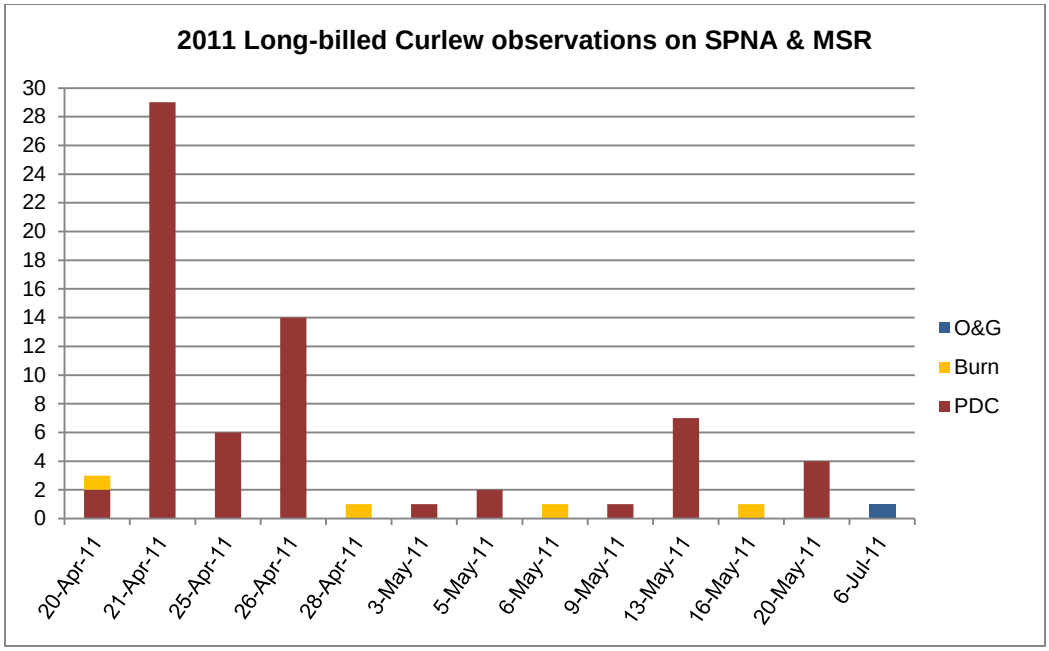

Figure 3: LBCU observations on Soapstone Prairie Natural Area and Meadow Springs Ranch in 2011 by date and point type.

Mountain Plover, McCown's Longspur, and Mourning Dove were the only 3 species found to have higher densities within the burn area than any other strata. The burn area in the Jack Springs pasture on SPNA successfully attracted Plovers back to that area this year, as a pair was observed on two separate visits to the burn site on SPNA on 4/28/11 and 5/5/11 (Fig 5). There were no Mountain Plovers detected in SPNA in 2010.

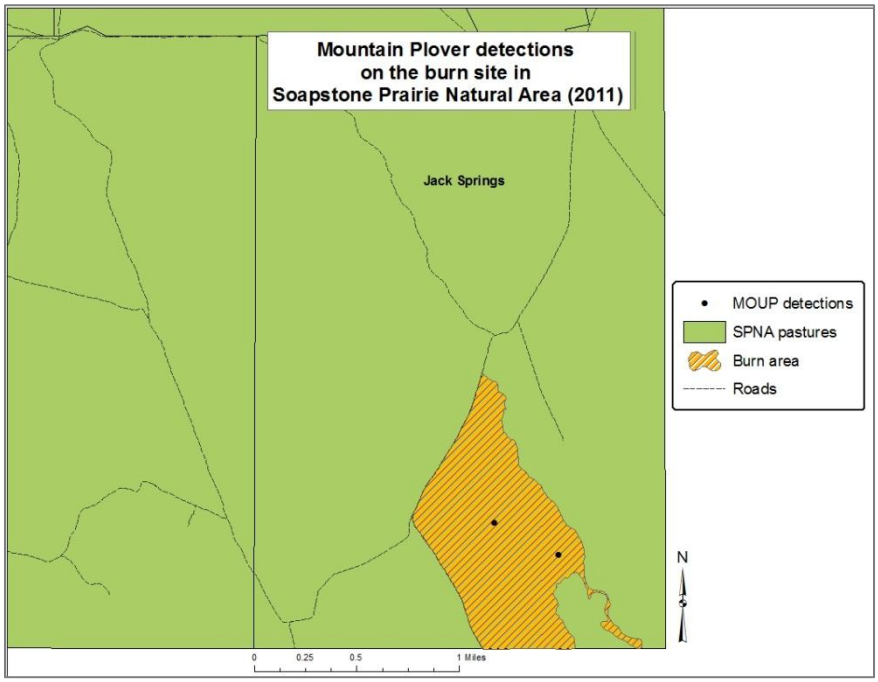

Figure 4: Mountain Plover (MOUP) detection locations on the burn area in Jack Springs pasture on Soapstone Prairie Natural Area, 2011.

Grasshopper and Cassin's Sparrows were only detected in the oil & gas corridor. Killdeer, Wilson's Snipe, and Red-winged Blackbirds were all found in or near water features within the corridor on Meadow Springs Ranch. Swallow spp. were observed near bridges, structures, and cliffs. Chestnut-collared Longspur had higher density in the oil and gas corridor, specifically in the north eastern portion of Meadow Pasture at the edges of PDCH where there is a mix of shorter and taller grasses. Mountain Plover and Burrowing Owls have density estimates in the oil and gas strata because of the overlapping PDCH within the corridor and those species were always detected in or near a prairie dog colony.

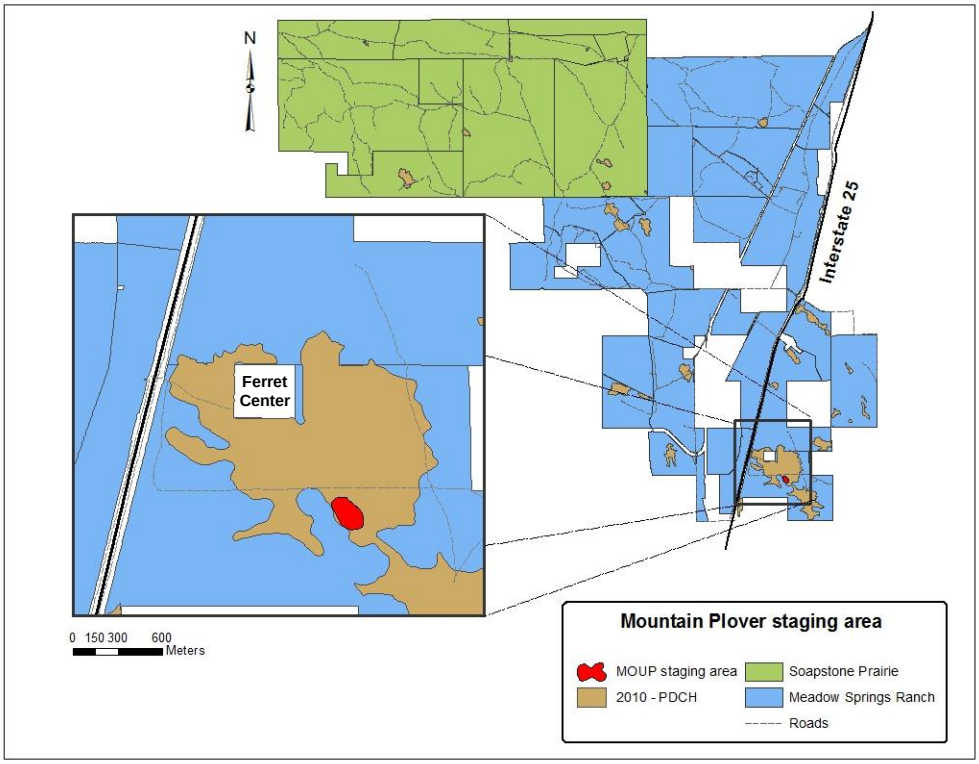

Figure 5: Location of pre-migration staging area of Mountain Plover observed in August, 2011 on Meadow Springs Ranch, Colorado.

Of special interest, a group of 6 Plovers was observed gathering for pre-migration inside PDCH in the South Bulger pasture near the Ferret Center on MSR on July 25th (Fig 4).

Vegetation

Grass was the dominant ground cover type in the 2011 point count study area, followed by bare ground (Fig 6).

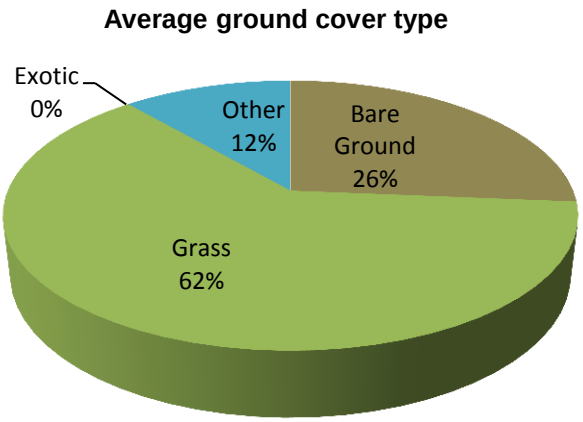

Figure 6: Average % ground cover type for the 2011 study area on Soapstone Prairie Natural Area and Meadow Springs Ranch

There was significantly more bare ground in the burned area on SPNA (39%) than any other area. The only area to have exotic ground cover was in the potential oil & gas development area (1.0%) (Fig 7).

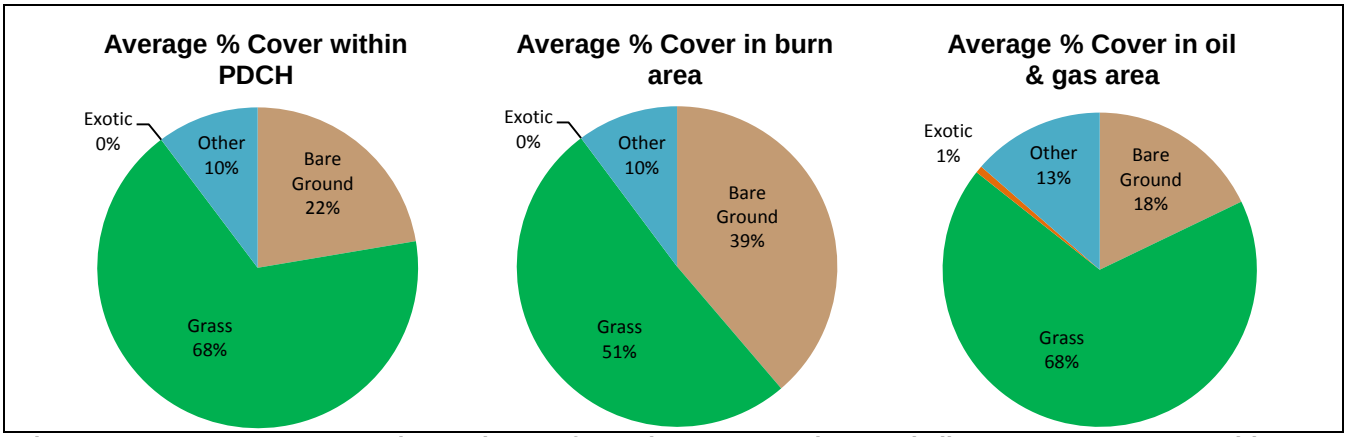

Figure 7: Average percent ground cover in 2011 for each area: PDCH, burn and oil & gas on Soapstone Prairie Natural Area and Meadow Springs Ranch

Grass heights were recorded with a minimum of 1 and a maximum of 5, category 1 (shoe sole height) was the most frequent category recorded, and grass height category 5 was not recorded anywhere in the study area (Fig. 8).

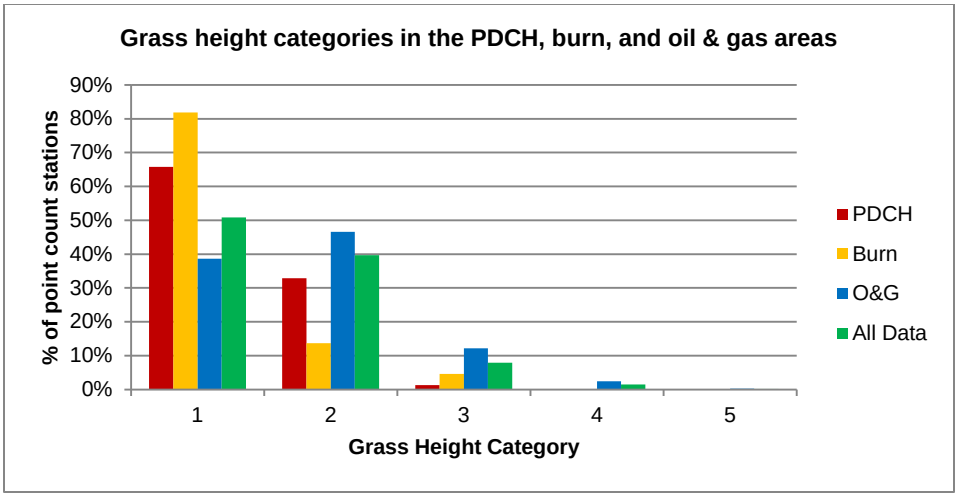

Figure 8: Grass height category percentage at point count stations in 2011 study areas.

The average percent cover of overstory trees in the study area was .21%, the dominant species was Plains cottonwood (*Populus deltoides*) and average height was 9.91m. Average percent shrub cover was .61%, the dominant species were Saltbush (*Atriplex sp*) and Skunkbush sumac (*Rhus trilobata*), and the average shrub height was .40m.

Other Wildlife

We observed several mammal and reptile species in SPNA and MSR. Pronghorn antelope (*Atilocapra americana*) were the most common native ungulate and were observed daily. Through most of June, pronghorn fawns hiding in the grass could be found almost daily on MSR. A pair of White-tailed deer (*Odocoileus virginianus*) was observed in Middle Lewis pasture on Meadow Springs Ranch on one occasion. A striped skunk (*Mephitis mephitis*) was observed in an enclosure in North Bulger pasture on Meadow Springs Ranch. We documented an active Coyote (*Canus latrans*) den with 3 pups in the South Benson c-100 pasture of MSR as well as the active den of a Red fox (*Vulpes vulpes*) in the South Lonetree pasture of MSR next to the frontage road. We regularly encountered Black-tailed jackrabbits (*Lepus californicus*) and a few White-tailed jackrabbits (*L. townsendii*). Horned lizards (*Phrynosoma sp.*) were common throughout MSR (Fig 9). Interestingly, we did not encounter any snakes on either property during the 2011 survey period.

Figure 9: Horned lizard (*Phrynosoma sp)* on Meadow Springs Ranch, Colorado (photo by E. Youngberg, 2011)

DISCUSSION

Soapstone Prairie Natural Area and Meadow Springs Ranch support a rich and diverse shortgrass prairie avifauna, complete with many grassland bird species that are declining or extirpated in much of their range. This includes more than 21 bird species that have been identified as high concerns for conservation by state and federal wildlife agencies and major bird conservation initiatives such as Partners in Flight. Due to the unique geographical location in the transition zone between the

southern Rocky Mountains and the Western Great Plains, the properties surveyed provide not only high-quality breeding habitat for these species, but also migratory stopover habitat for these species and many more (Sparks et al 2007). Appropriate conservation and management of these areas can play an important role in sustaining regional populations of grassland birds and other wildlife.

Figure 10: Mountain plover and chick on SPNA, 2009. Photo by M. Forsberg

Prairie dogs are a keystone species in prairie ecosystems, meaning their presence and activity is essential to sustaining other species. Prairie dogs are an important food source to predatory birds such as Ferruginous Hawk and Golden Eagle (Giovanni et al. 2007). Long-term prairie dog colony stability leads to significant changes in plant community composition with elevated levels of bare soil, forbs and reduced cover (Augustine, et al 2007). These are preferred nesting habitat conditions for several shortgrass obligate species such as Burrowing Owl, Mountain Plover, McCown's Longspur and others (Tipton et al. 2008; Kennedy et al. 2008). These conditions are also preferred as foraging areas by migrants such as Long-billed Curlew, Vesper Sparrow, and Chestnut-collared Longspur. The percent ground cover in PDCH did not vary significantly from the percent ground cover type in non-PDCH, likely due in part to recent reductions in prairie dog numbers and heavy spring rain fall in consecutive years, but 66% of the grass covering PDCH was < 1inch tall, compared to 39% in non-PDCH. The areas of PDCH had higher densities of Horned Lark, McCown's Longspur, Lark Bunting, and Burrowing Owl than areas of non-PDCH. Our calculations show that Mountain Plover (Fig. 10) numbers decreased from around 50 individuals in 2008 & 2009, to around 12 individuals in this year's survey effort (LCI = 2.91, UCI = 53.87, CV = 58.9%). The Mountain Plover was removed as a candidate from the Endangered Species List on May 11, 2011 after thorough review by the USFWS. (USFWS press release, May 11, 2011), but is still a species of high concern, especially in Colorado which supports the vast majority of the species' global breeding population. Given the vulnerability of the prairie dog ecosystem to plague and its importance to several high-priority species, annual monitoring of prairie dog colonies and dependent bird species is needed to allow managers to identify and respond to conservation concerns and guide management actions in a time-sensitive manner, and thereby increase their probability of success in conserving these species.

The habitat in the potential for oil and gas corridor on Meadow Springs Ranch offers habitat for a variety of bird species. Pastures with taller grasses are preferred habitat for Grasshopper and Savannah Sparrow (Beadle, et al 2002), both of which were detected within the corridor. Areas with scattered saltbush and other shrubs provide nesting habitat for Brewer's and Cassin's Sparrows, as well as Lark Buntings. The wetland and riparian habitats attract American Avocet, Great Blue Heron, Red-winged Blackbirds and a variety of ducks for nesting and foraging, as well as other migratory shorebirds.

We confirmed breeding of a Dickcissel pair at the south end of North Lonetree pasture on Meadow Springs Ranch Aug. 3rd, 2011. The species has never been previously documented as a breeding species in Larimer County, Colorado (Kingery, 1998). We confirmed breeding during the nest-finding project in advance of seismic exploration by Tidelands Geophysical Company. While rope-

dragging a transect we flushed a pair of Dickcissel out of an area of dense thistle, tall grass, and shrubs. We then witnessed the female Dickcissel return and feed a fledgling perched in the middle of the dense vegetation. There were 4-5 more birds in the vicinity perched on the fence and in the cottonwood trees directly to the east, indicating that area was heavily used by the species. Dickcissel populations are declining and it is a US Fish and Wildlife Service species of conservation concern and a PIF species of regional concern in the shortgrass prairie Bird Conservation Region. Eastern Colorado is on the westernmost edge of their breeding range, and is only occupied by the species in some years. This documentation is an exciting indicator that they can breed in the pastures of MSR if they find suitable habitat.

The heterogeneity of habitats including the various wetlands, shrublands, different grassland types, and woodlands, supports a wide diversity of bird life found in the study area. Although prairie dog towns are important for some of the most vulnerable and sensitive bird species in the region, conservation and management of these properties should also consider these other unique ecological elements and strive to maintain a mosaic of grasslands with a range of grass cover and heights, and shrub cover.

Management Recommendations

The shortgrass prairie habitats of Meadow Springs Ranch and Soapstone Prairie Natural Area were historically maintained by a combination of ungulate grazing (e.g. bison), small herbivore activity (e.g. prairie dogs), drought and fire. These ecological conditions resulted in a mosaic of vegetation structures, composition, and ecosystem dynamics (Winter et al 2002; Smith and Lomolino 2004).

Moderate to intense grazing contributes to creating ideal nesting habitat for the Mountain Plover (Augustine et al. 2008), and may also help prairie dog colonies expand. We recommend cattle grazing in winter or early spring to maintain plover breeding habitat, especially in areas with no prairie dogs (Wershler & Wallis, 2002). Studies in Colorado have shown that plovers need 25-50 acres to forage and at least 70 acres of suitable habitat to raise their young (May, 2001). Due to Mountain Plover's sensitivity to human disturbance, we recommend avoiding oil and gas exploration near breeding areas by at least 400m. That buffer also applies to nesting areas for Chestnut-collared Longspur, Burrowing Owls, and the Ferruginous Hawk nest in the South Bulger pasture (Fig 2).

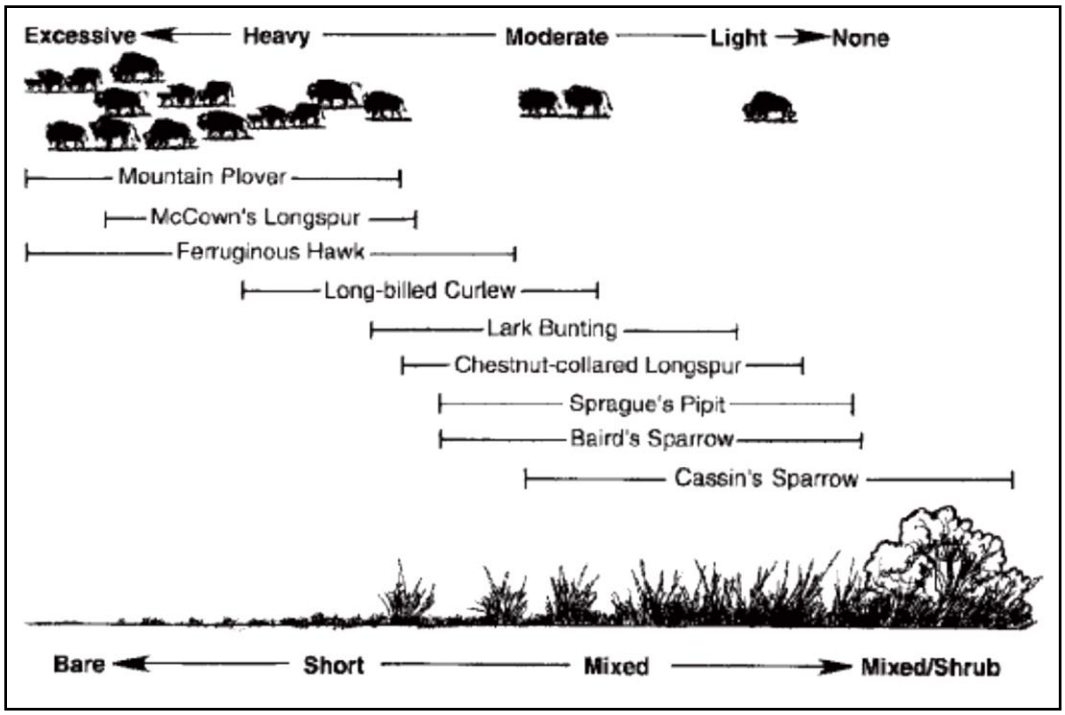

Figure 11: Grassland bird species habitat use in response to a vegetation structure gradient from grazing methods (modified from Knopf, 1996).

In general, the grassland bird community requires a gradient of vegetation structures varying from taller relatively undisturbed vegetation, to very short vegetation and even bare soil achieved with fire or heavy grazing by large ungulates or black-tailed prairie dogs (Knopf, 1996) (Fig 11). Management actions would be well-served to create conditions mimicking those created by natural disturbance regimes and maintain variation within native short grass prairies.

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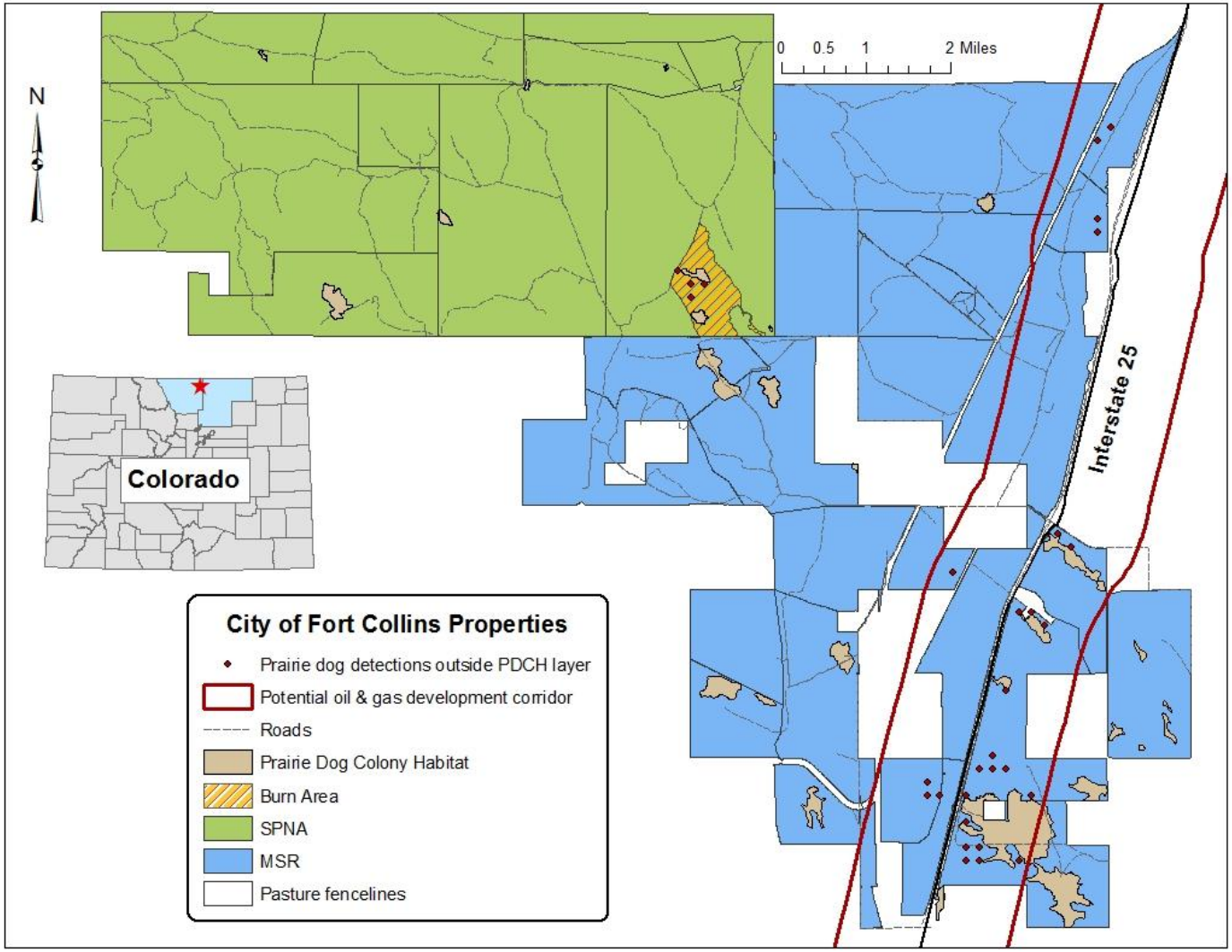
Appendix (A): Map of non-delineated prairie dog activity

Detections of active prairie dog activity outside of the 2010 prairie dog colony habitat delineation.



Appendix (B): Species Detections

Total number of individuals of all species detected in prairie dog colony habitat (PDCH) during point counts on SPNA and MSR in 2011, the prescribed burn area on SPNA, and in the area potential oil & gas development corridor on MSR in 2011.

Common name	Scientific name	PDCH	Burn	Oil & Gas	Total
Canada Goose	*Branta canadensis*	13			13
Gadwall	*Anas strepera*			2	2
Mallard	*Anas platyrhynchos*			38	38
Blue-winged Teal	*Anas discors*			2	2
Green-winged Teal	*Anas crecca*			1	1
American White Pelican*	*Pelecanus erythrorhynchos*			6	6
Double-crested Cormorant	*Phalacrocorax auritus*			9	9
Great Blue Heron	*Ardea herodias*	2		8	10
Turkey Vulture	*Cathartes aura*			3	3
Northern Harrier*	*Circus cyaneus*		2	4	6
Sharp-shinned Hawk	*Accipiter striatus*	1	1		2
Swainson's Hawk*	*Buteo swainsoni*	6		16	22
Red-tailed Hawk	*Buteo jamaicensis*	3	3	4	10
Ferruginous Hawk*	*Buteo regalis*	11		21	32
Golden Eagle*	*Aquila chrysaetos*	2		3	5
American Kestrel	*Falco sparverius*	24	4	40	68
Merlin	*Falco columbarius*			1	1
Prairie Falcon*	*Falco mexicanus*	5	3	1	9
Killdeer	*Charadrius vociferus*	12		67	79
Mountain Plover*	*Charadrius montanus*	7	4	5	16
American Avocet	*Recurvirostra americana*			7	7
Upland Sandpiper*	*Bartramia longicauda*	2		1	3
Long-billed Curlew*	*Numenius americanus*	67	4	1	72
Wilson's Snipe	*Gallinago delicata*			30	30
Wilson's Phalarope*	*Phalaropus tricolor*			2	2
California Gull	*Larus californicus*			1	1

Common name	Scientific name	PDCH	Burn	Oil & Gas	Total
Rock Pigeon	*Columba livia*	3		40	43
Eurasian Collared-Dove	*Streptopelia decaocto*			1	1
Mourning Dove	*Zenaida macroura*	3	44	90	137
Burrowing Owl*	*Athene cunicularia*	47	1	6	54
Common Nighthawk	*Chordeiles minor*			20	20
Red-headed Woodpecker	*Melanerpes erythrocephalus*			1	1
Northern Flicker	*Colaptes auratus*			11	11
Say's Phoebe	*Sayornis saya*	16		15	31
Western Kingbird	*Tyrannus verticalis*	10		25	35
Eastern Kingbird	*Tyrannus tyrannus*			13	13
Loggerhead Shrike*	*Lanius ludovicianus*	11	1	15	27
Common Raven	*Corvus corax*	10		22	32
Horned Lark	*Eremophila alpestris*	1373	245	1941	3559
Tree Swallow	*Tachycineta bicolor*	1		2	3
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*			1	1
Bank Swallow	*Riparia riparia*			4	4
Cliff Swallow	*Petrochelidon pyrrhonota*	1	1	173	175
Barn Swallow	*Hirundo rustica*	20	8	132	160
Black-capped Chickadee	*Poecile atricapillus*			1	1
Rock Wren	*Salpinctes obsoletus*	8	1	2	11
House Wren	*Troglodytes aedon*			1	1
Blue-gray Gnatcatcher	*Polioptila caerulea*			1	1
Swainson's Thrush	*Catharus ustulatus*	2			2
American Robin	*Turdus migratorius*			40	40
Northern Mockingbird	*Mimus polyglottos*			7	7
Sage Thrasher	*Oreoscoptes montanus*		1		1
European Starling	*Sturnus vulgaris*	3		113	116
Yellow Warbler	*Setophaga petechia*			7	7
Yellow-rumped Warbler	*Setophaga coronata*			2	2
Yellow-breasted Chat	*Icteria virens*			1	1

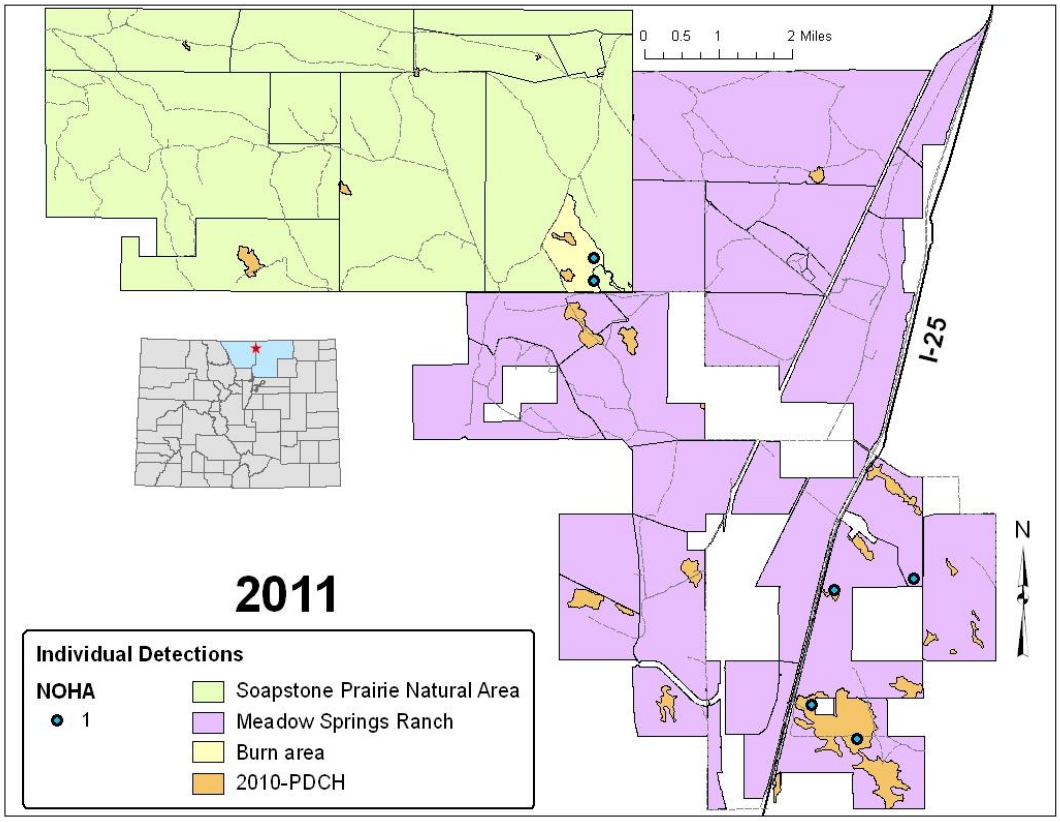
Common name	Scientific name	PDCH	Burn	Oil & Gas	Total
Western Tanager	*Piranga ludoviciana*			2	2
Cassin's Sparrow*	*Peucaea cassinii*			63	63
Chipping Sparrow	*Spizella passerina*	21		26	47
Clay-colored Sparrow	*Spizella pallida*	1		22	23
Brewer's Sparrow*	*Spizella breweri*	63	2	30	95
Vesper Sparrow*	*Pooecetes gramineus*	80	1	41	122
Lark Sparrow*	*Chondestes grammacus*	42		96	138
Lark Bunting*	*Calamospiza melanocorys*	555		657	1212
Savannah Sparrow	*Passerculus sandwichensis*			7	7
Grasshopper Sparrow*	*Ammodramus savannarum*			220	220
Song Sparrow	*Melospiza melodia*			1	1
White-crowned Sparrow	*Zonotrichia leucophrys*	1		1	2
McCown's Longspur*	*Rhyncophanes mccownii*	654	271	847	1772
Chestnut-collared Longspur*	*Calcarius ornatus*	3		23	26
Lazuli Bunting*	*Passerina amoena*			1	1
Red-winged Blackbird	*Agelaius phoeniceus*	21		290	311
Eastern Meadowlark	*Sturnella magna*			2	2
Western Meadowlark	*Sturnella neglecta*	1009	68	1765	2842
Brewer's Blackbird	*Euphagus cyanocephalus*	5		57	62
Common Grackle	*Quiscalus quiscula*	3		29	32
Great-tailed Grackle	*Quiscalus mexicanus*	45		3	48
Brown-headed Cowbird	*Molothrus ater*	2		19	21
Bullock's Oriole	*Icterus bullockii*			6	6
Lesser Goldfinch	*Spinus psaltria*			9	9
American Goldfinch	*Spinus tristis*	1		3	4
House Sparrow	*Passer domesticus*	1		28	29
TOTAL		**4170**	**665**	**7208**	**12043**

Bold face type indicates high regional or continental conservation priority status as determined by Partners In Flight and/or US Fish and Wildlife Service.
* indicates species of special state concern/ threatened determined by the Colorado Division of Wildlife.

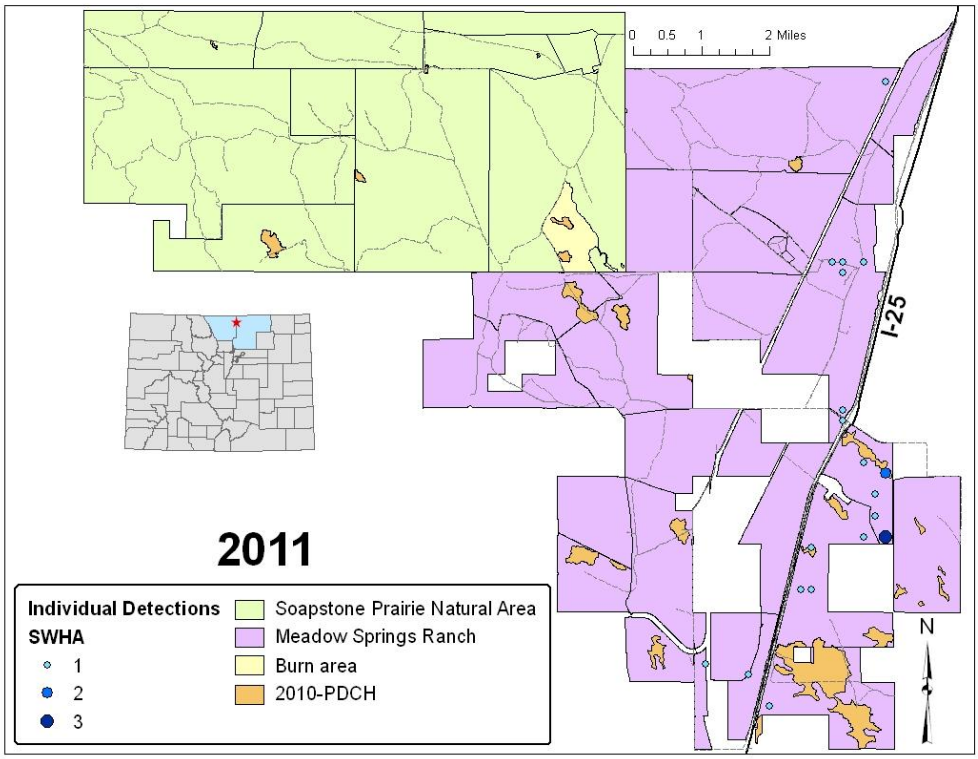
Appendix (C): High Priority Grassland Species Accounts

This section presents distribution maps for grassland species of high priority conservation concern in the Mountains to Plains Area. The map for each species indicates location and number of individual observations recorded during the point count surveys for 2011.

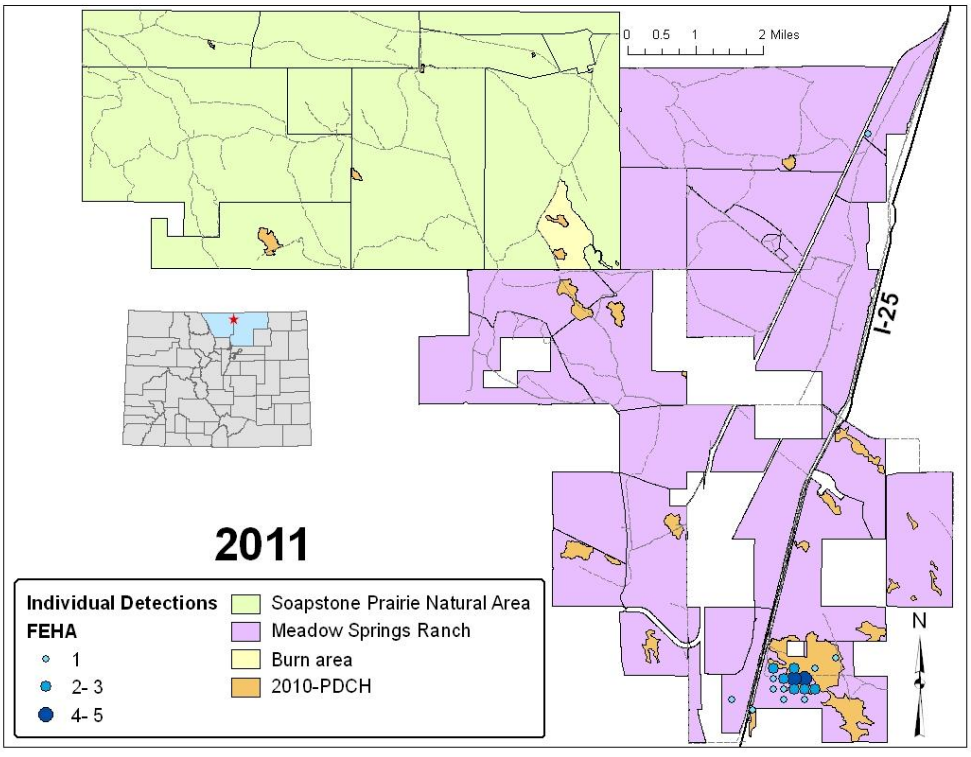
Northern Harrier (*Circus cyaneus)* (n = 6)



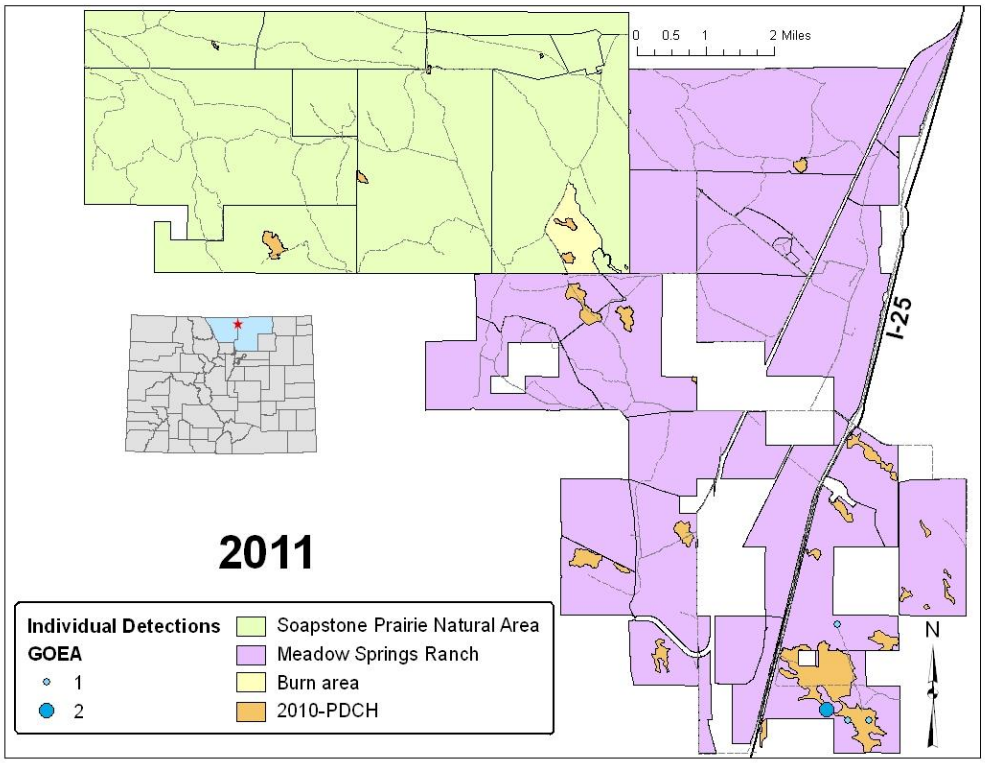
Swainson's Hawk (*Buteo swainsoni)* (n = 22)



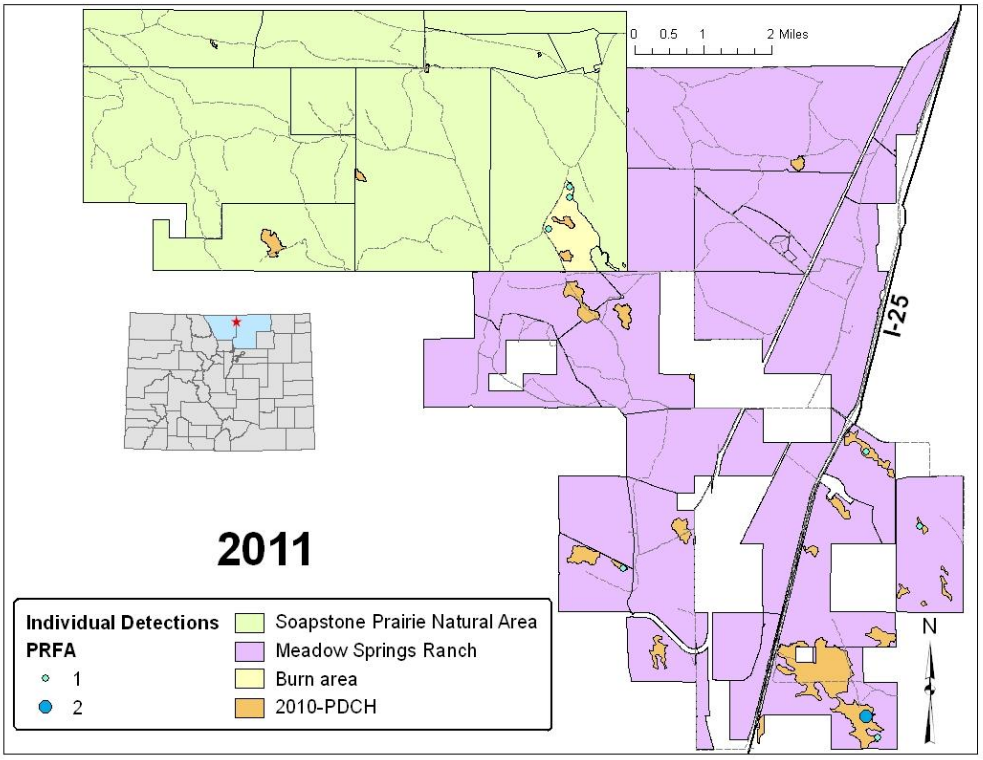
Ferruginous Hawk *(Buteo regalis)* (n = 32)



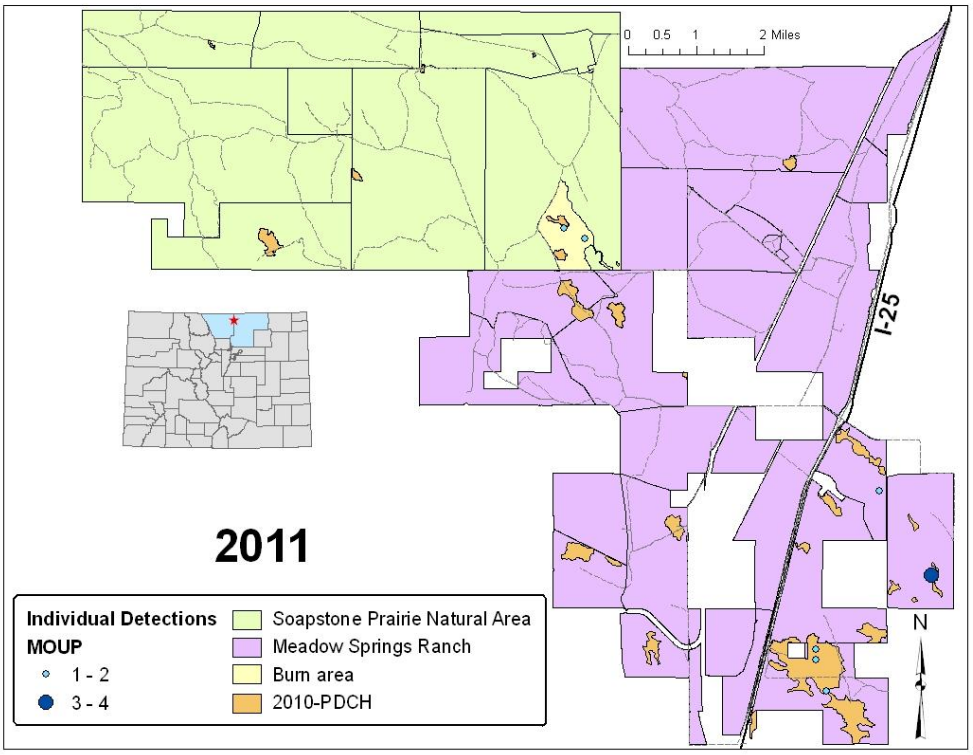
Golden Eagle *(Aquila chrysaetos)* (n = 5)



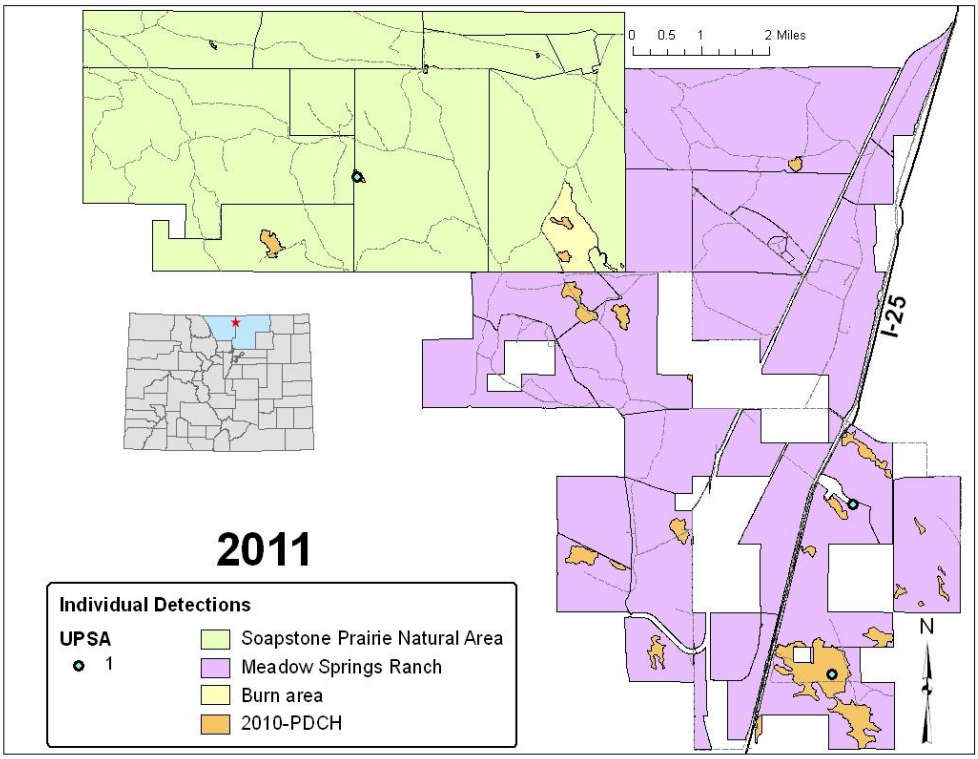
Prairie Falcon *(Falco mexicanus)* (n = 9)



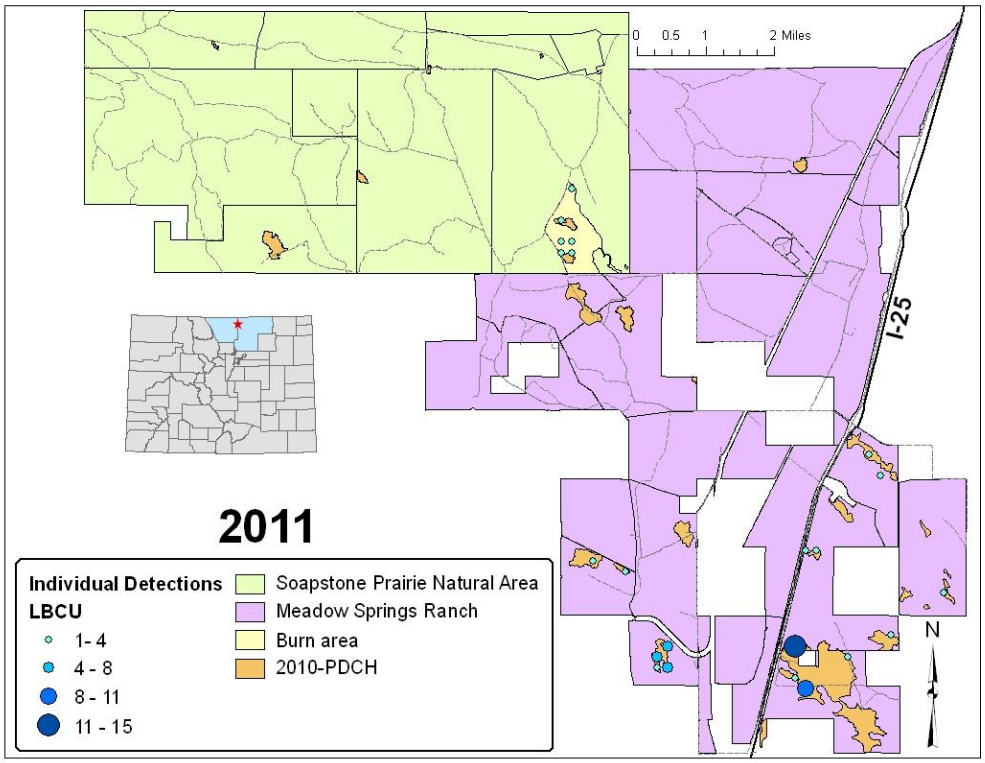
Mountain Plover (*Charadrius montanus)* (n=16)



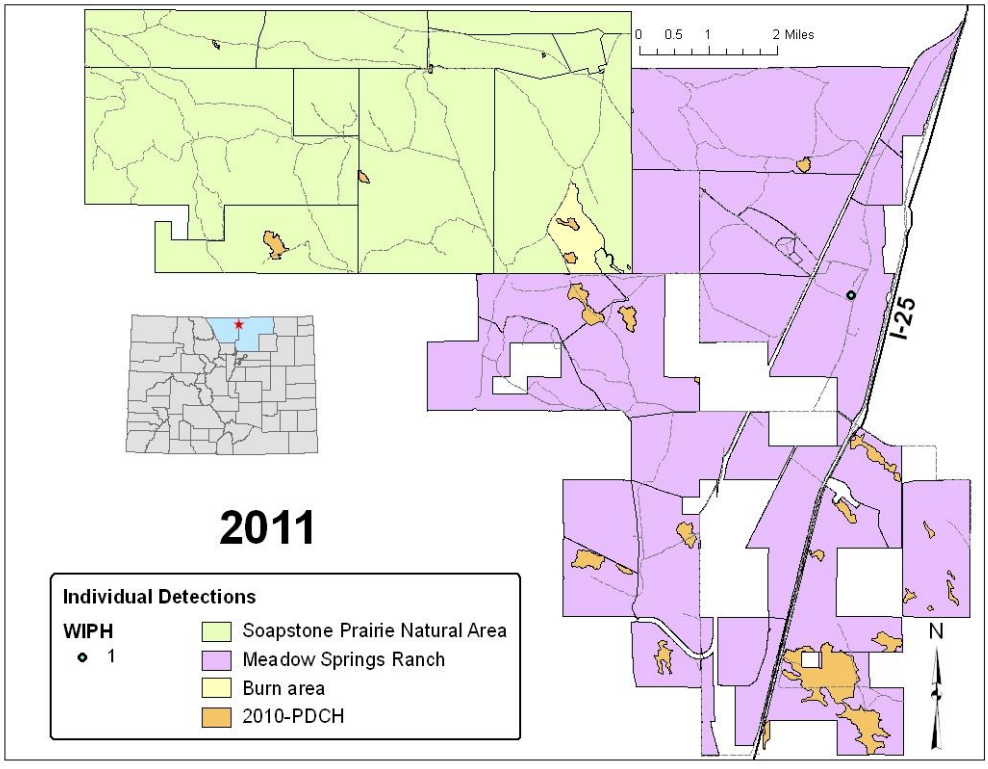
Upland Sandpiper *(Bartramia longicauda)* (n = 3)



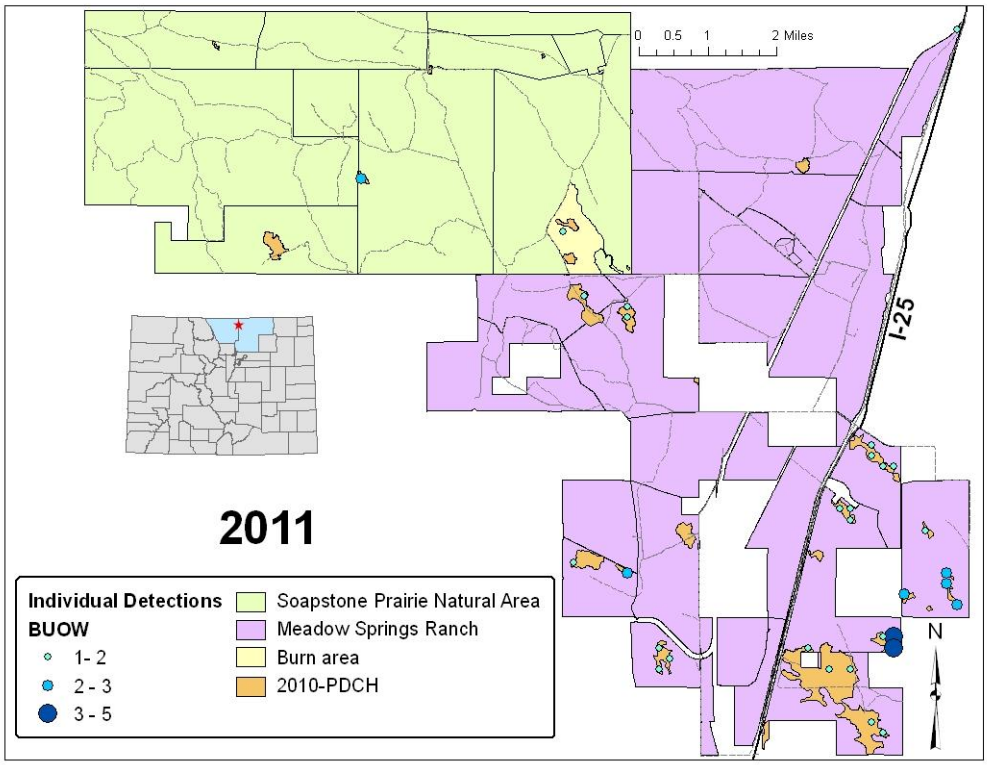
Long-billed Curlew *(Numenius americanus)* (n = 72)



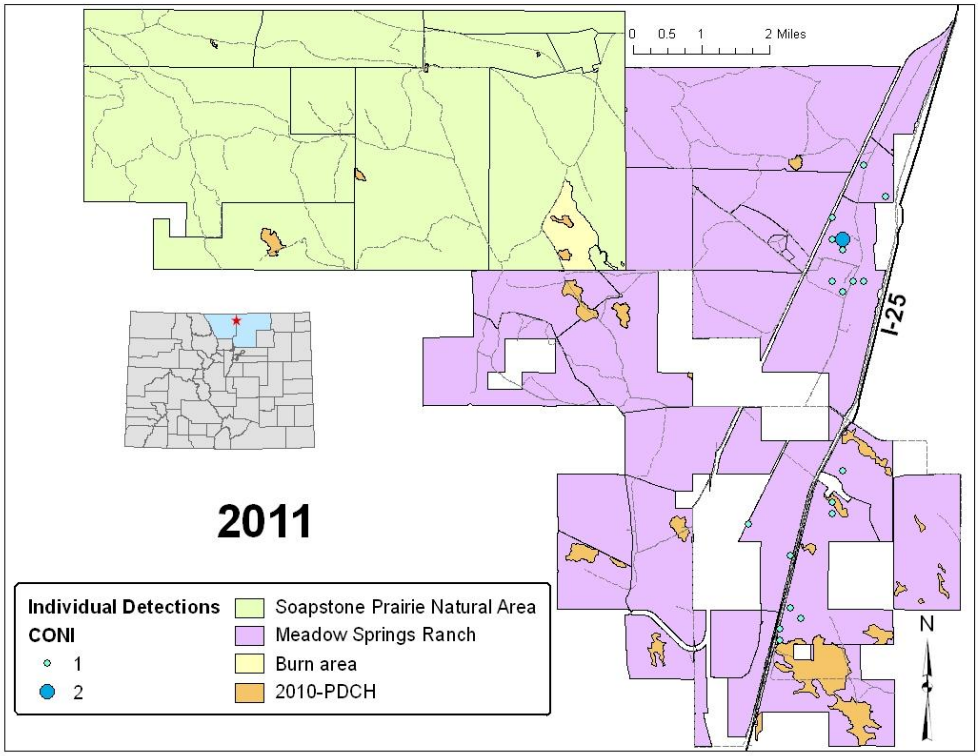
Wilson's Phalarope *(Phalaropus tricolor)* (n = 2)



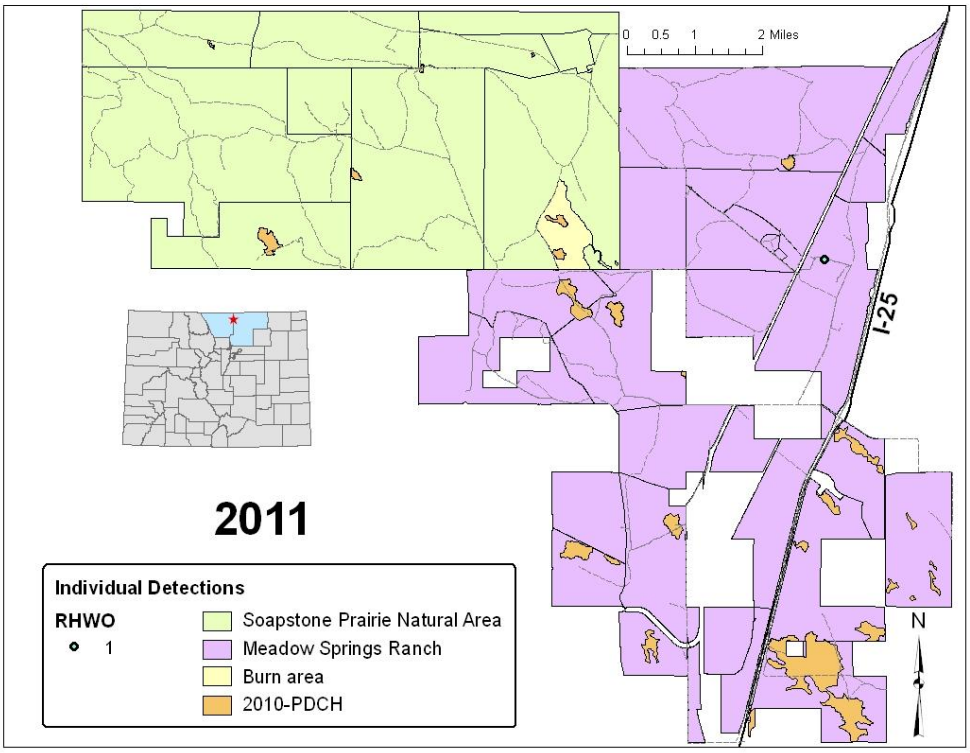
Burrowing Owl *(Athene cunicularia)* (n = 54)



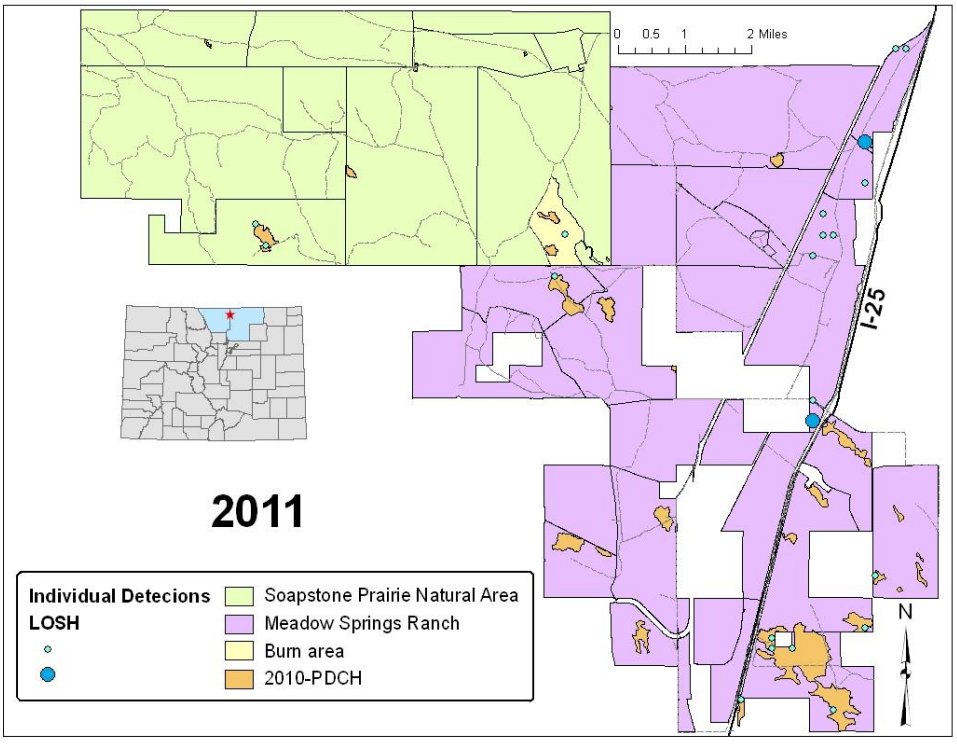
Common Nighthawk *(Chordeiles minor)* (n = 20)



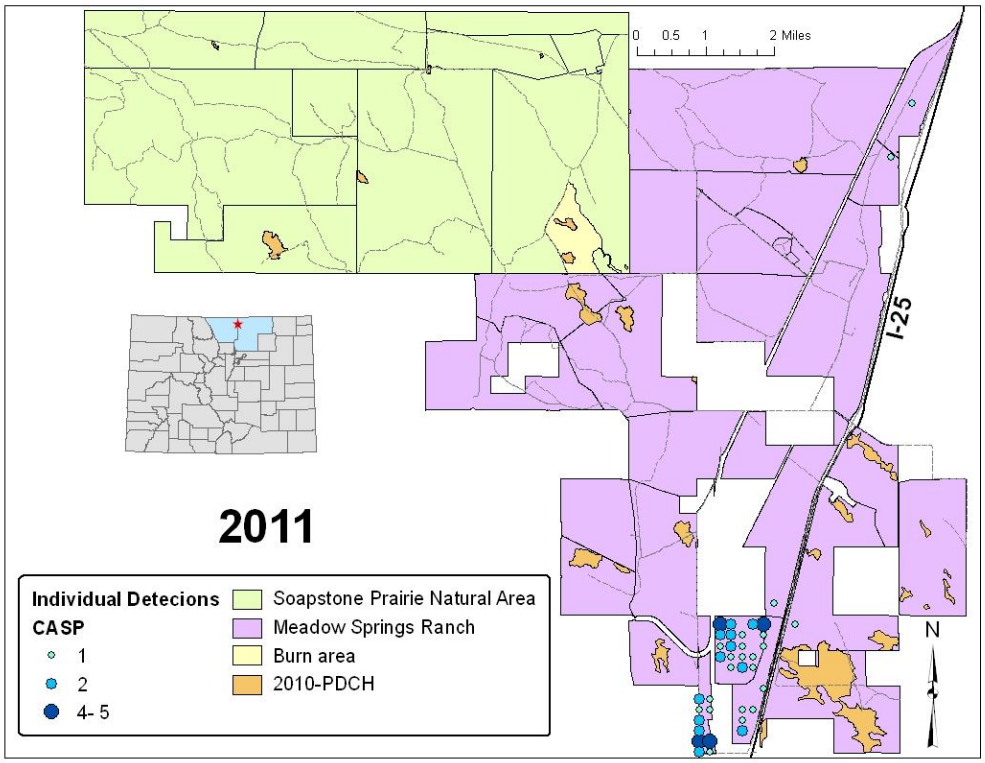
Red-headed Woodpecker *(Melanerpes erythrocephalus)* (n = 1)



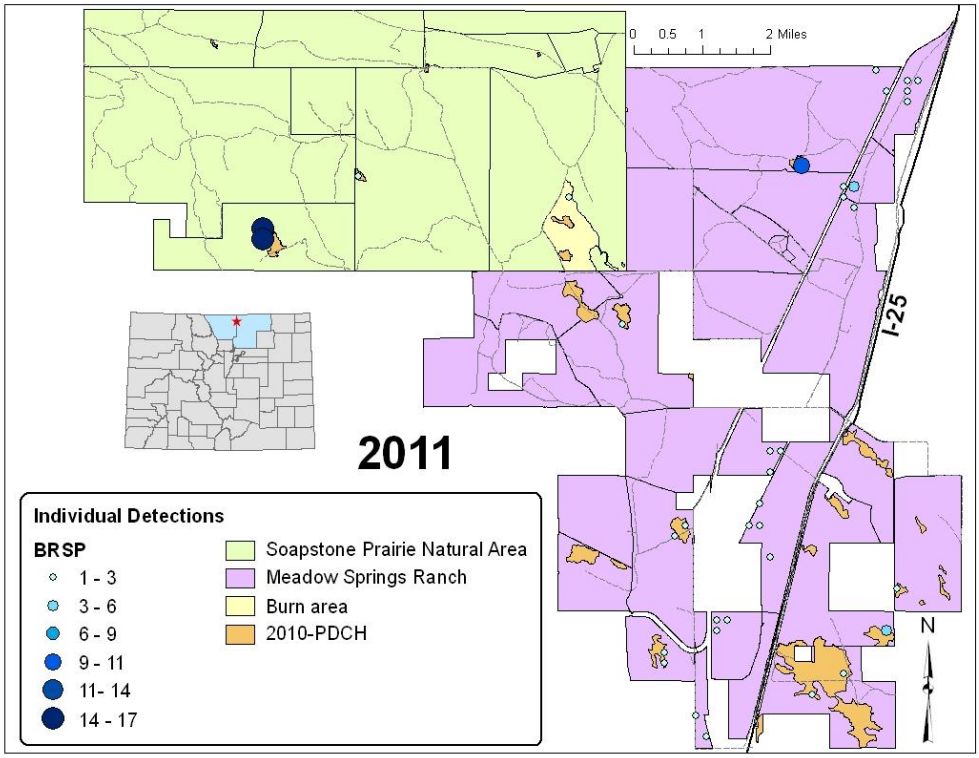
Loggerhead Shrike *(Lanius ludovicianus)* (n = 28)



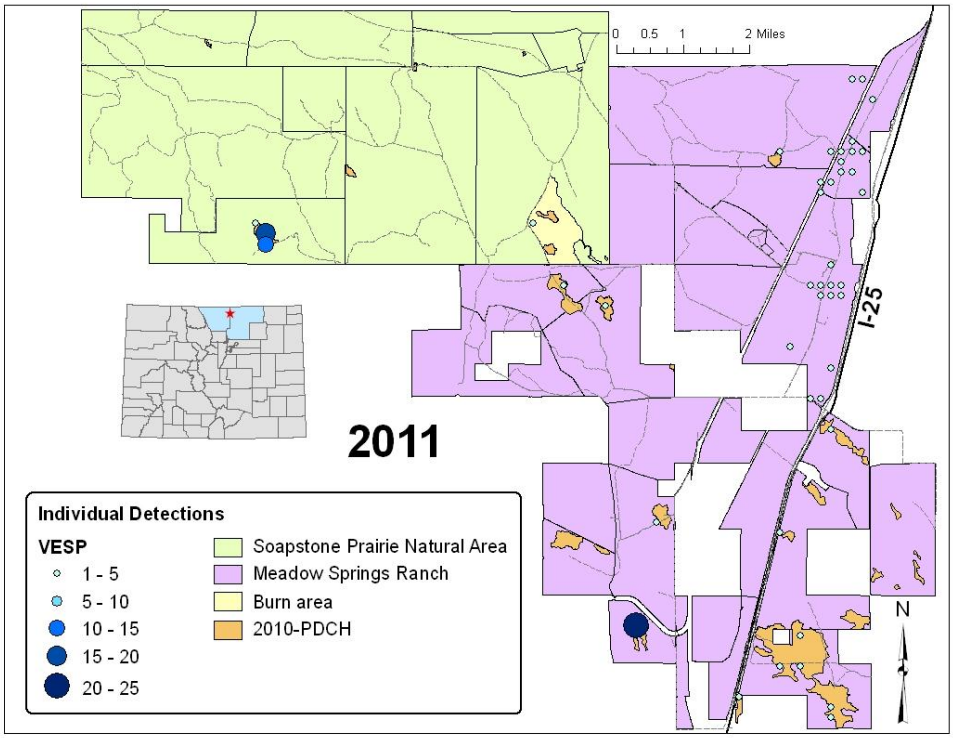
Cassin's Sparrow *(Peucaea cassinii)* (n = 63)



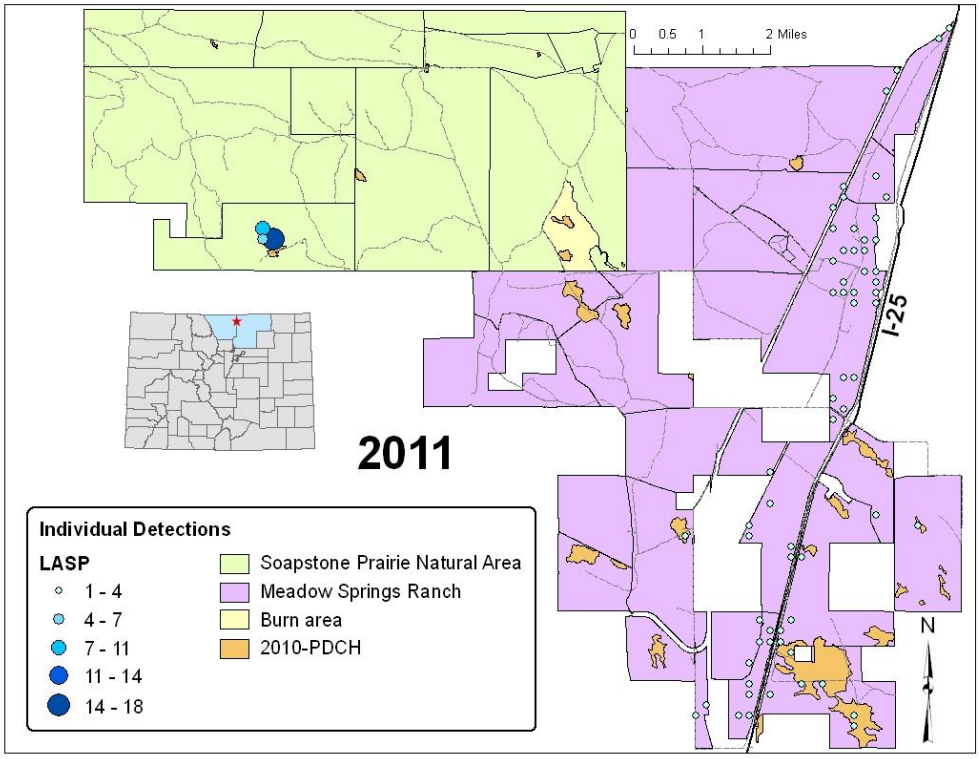
Brewer's Sparrow *(Spizella breweri)* (n = 95)



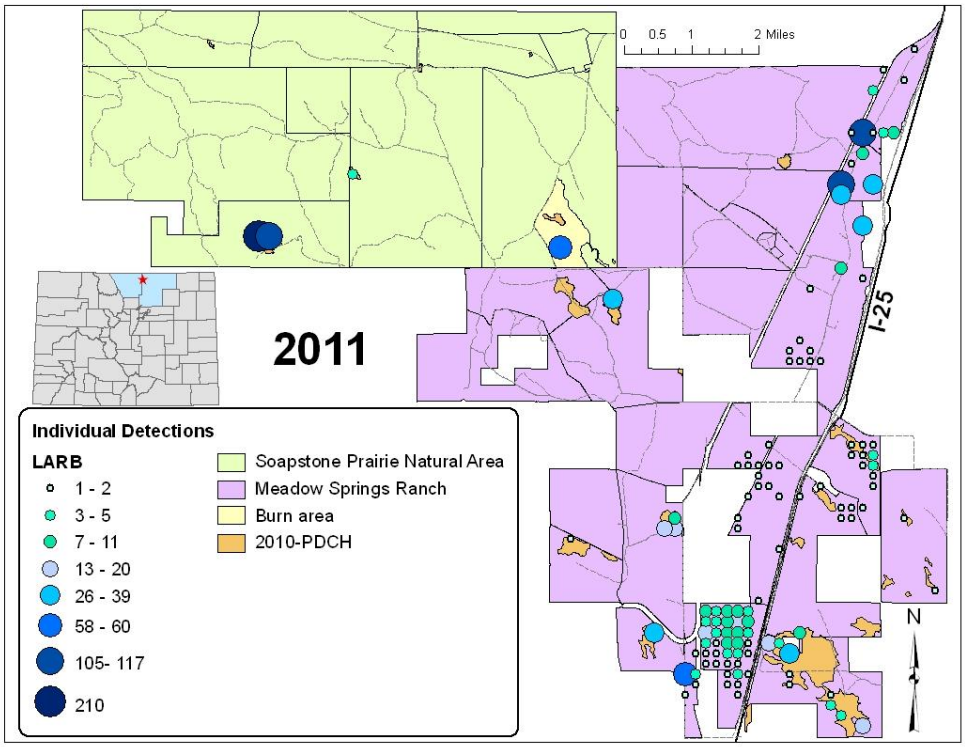
Vesper Sparrow *(Pooecetes gramineus)* (n = 122)



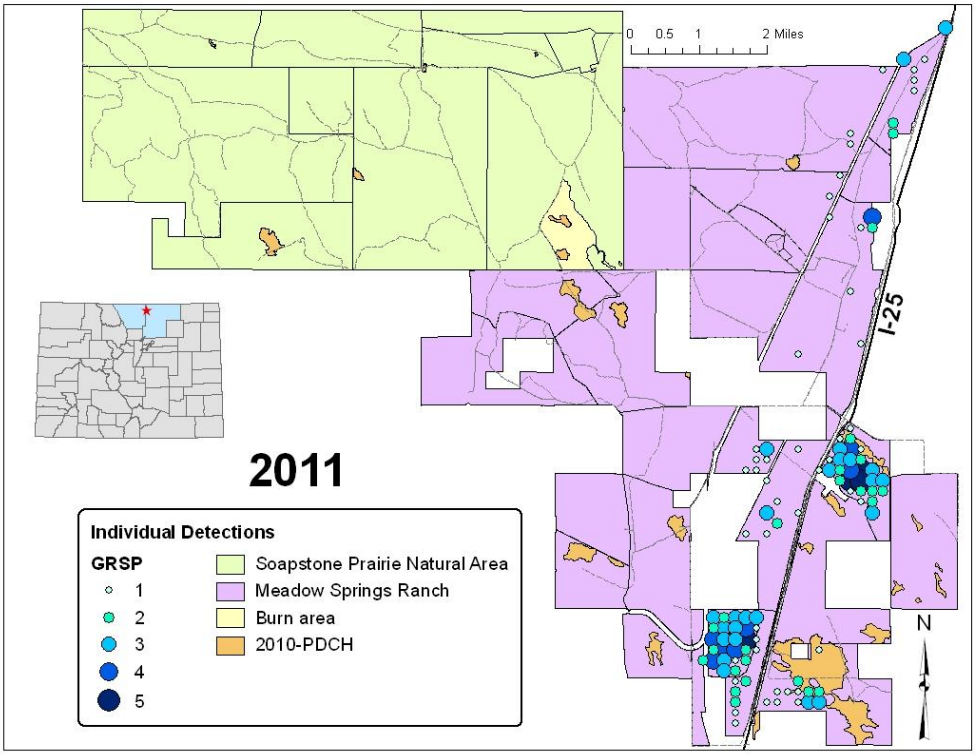
Lark Sparrow *(Chondestes grammacus)* (n = 138)



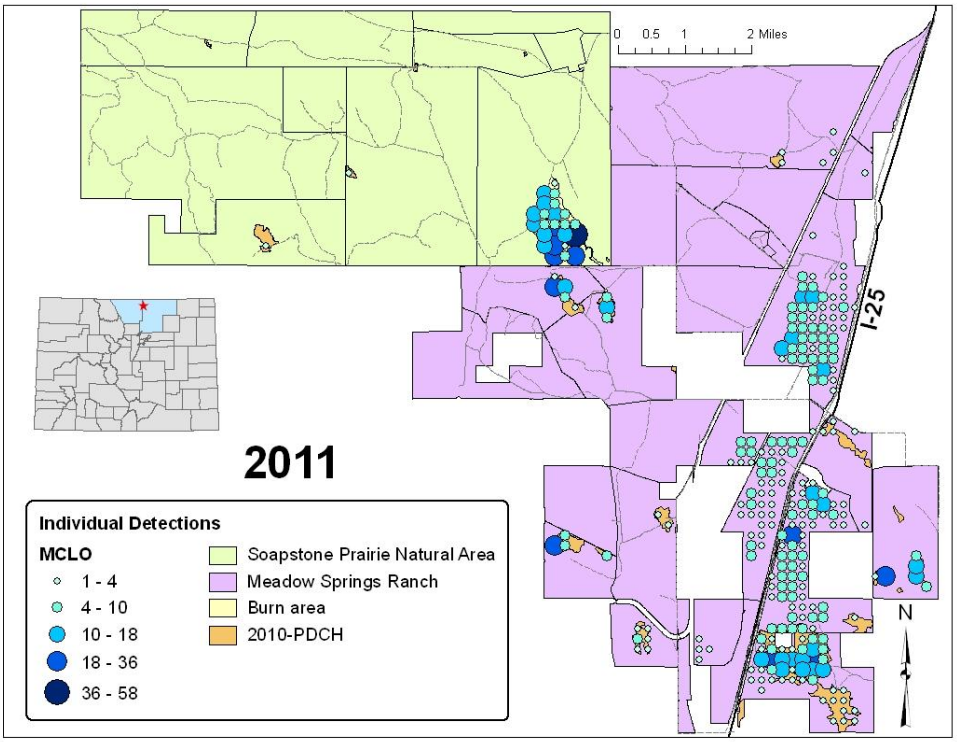
Lark Bunting *(Calamospiza melanocorys)* (n = 1212)



Grasshopper Sparrow *(Ammodramus savannarum)* (n = 220)



McCown's Longspur *(Rhyncophanes mccownii)* (n = 1781)



Chestnut-collared Longspur *(Calcarius ornatus)* (n = 26)