Monitoring Wyoming's Birds: 2009 Field Season Report

January 2010

ROCKY MOUNTAIN BIRD OBSERVATORY

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

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

***Core Values**:*
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**:* Mountain Bluebird, Brewer's Sparrow, Green-tailed Towhee; By Nancy Bell. Used with permission.

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EXECUTIVE SUMMARY

Rocky Mountain Bird Observatory (RMBO), in conjunction with the USDA Forest Service (USFS), USDI Bureau of Land Management and Wyoming Game and Fish Department, conducted its eighth season of landbird monitoring in Wyoming (Monitoring Wyoming's Birds; MWB). In 2008, Rocky Mountain Bird Observatory implemented a new spatially balanced sampling design based upon Bird Conservation Regions (BCRs) and management boundaries in the state of Colorado. The success of this sampling design led to its expansion into Wyoming in 2009. RMBO's new "Integrated Landbird Monitoring" (ILM) design features our historical field and statistical methods of point transect stations and distance sampling, allowing new ILM data to be compared to our historical bird monitoring data. The ILM design also allows for comparison of density estimates across public and private lands and to the results of other long-term monitoring projects throughout the country.

RMBO completed 168 of 174 (97%) planned transect surveys throughout Wyoming in 2009, the highest completion rate we have had since the inception of MWB. We conducted 1,933 point counts and detected 15,258 birds of 155 species across Wyoming's five BCR's. We calculated BCR and stratum-wide density and population estimates for 43 landbird species. Strata include management entities, geographic areas and landscape features. We could not determine statewide density estimates for 2009 because of insufficient sample effort in three strata in BCR 10. Observers recorded 77 bird species that hold special conservation and management designations in Wyoming. We recorded 18 of these species in sufficient numbers to calculate density estimates. This is the first year we used occupancy modeling to provide estimates for low density species. We calculated occupancy estimates for 15 species of concern.

We obtained robust density estimates with low coefficients of variation (<50%) in at least one stratum for 33 species in BCRs 9 and 10 combined, 24 species in BCR 16, 14 species in BCR 17 and eight species in BCR 18. We will be able to detect population trends for these species within our targeted timeframe of 30 years or less, given similar sampling effort and avian population dynamics in future years.

The use of occupancy modeling allows us to monitor populations of avian species that are rare or difficult to detect and therefore result in detection rates too low for density estimation. This additional analytical method greatly increases our effectiveness at monitoring Wyoming's species of concern.

The spatially-balanced sampling design in Wyoming, which contributes to our regional, BCR-wide monitoring, serves as a model for other long-term monitoring efforts because of its ability to address the conservation and management needs of a wide range of stakeholders, landowners and governmental entities at both local and regional scales. Our ILM design represents one method for achieving effective collaboration and coordinated bird monitoring efforts in North America and could be applied to other BCRs and regions across the continent.

ACKNOWLEDGEMENTS

Stratification and allocation of survey effort for MWB were determined in collaboration with partner agencies and organizations, each of which contributed funding to this project in 2009: Wyoming Game and Fish Department, USDI Bureau of Land Management, Shoshone, Bighorn, Medicine Bow, and Wasatch National Forests, Grand Teton and Yellowstone National Parks and Wyoming Audubon. Many individuals helped make the 2009 field season a success. Doug Smith, Stacey Gunther and Christie Hendrix of Yellowstone NP were of great help to executing surveys within Yellowstone NP; Megan Ruehmann conducted surveys within Grand Teton NP. The Wyoming Natural Diversity Database (WYNDD) conducted surveys in Thunder Basin National Grassland and Medicine Bow National Forest, which was a substantial contribution to this year's data. The 2009 RMBO field crew faced many challenges locating new survey locations. Field technicians Mike Blaalid, Thomas Riecke, Eric Ripma, and Walt Wilson helped make this field season a success. Chandman Sambuu managed and updated the RMBO database and produced a new online mapping tool allowing for easier navigation and planning to survey sites. Fort Collins office staff Paul Franco and Sarah Kormos researched and contacted county assessors and private landowners, granting the field crew access and establishing the relationships that enable multi-ownership monitoring to be sustainable. Rob Sparks, GIS specialist, produced sample allocation maps for this report. We thank Gary White, professor emeritus of Colorado State University who wrote the initial SAS code for running the multi-scale occupancy models and Paul Lukacs of the Colorado Division of Wildlife who wrote code in program R for generating density estimates from detection probabilities.

Finally, this report benefited greatly from review by RMBO staff.

This report fulfills requirements in RMBO's contracts with the USDA Forest Service (M-MWB09-01), USDI Bureau of Land Management (SC-BLM09-01), Wyoming Department of Game and Fish (M-WYGF09-01) and Wyoming Audubon (SC-AUD09-01).

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INTRODUCTION

Many bird species serve as indicators of habitat quality, with changes in their populations linked to changes in ecological health (Morrison 1986; Hutto 1998; Rich et al 2004). Understanding bird population dynamics is critical to conservation efforts. Reported declines of North America's breeding birds (Rich et al. 2004) has led to the widespread use of landbird monitoring to identify the severity of declines and their causes. Effective population monitoring identifies species at particular risk, tracks population trends over time and assesses the effects of land management decisions on breeding bird habitat. Many breeding birds in Wyoming are identified as priorities for conservation in Wyoming state plans (WGFD 2005; Nicholoff 2003), National Forest Plans (Management Indicator Species and Sensitive Species), and the Partners in Flight North American Landbird Conservation Plan (PIF Species Assessment Database, Wyoming Partners in Flight) (Rich et al. 2004). Population monitoring also helps to achieve the intent of legislation such as the Migratory Bird Treaty Act (1918), National Environmental Policy Act (1969), Endangered Species Act (1973) and the National Forest Management Act (1976). Despite the widespread use of monitoring to address these issues, there is an ongoing need to coordinate bird monitoring among organizations and integrate them across regional and international boundaries (NABCI 2000). Within the state of Wyoming there is little information about many landbird populations because of the vast, undeveloped areas of the state and the relatively small human population (~515,000). Some areas which support large numbers of migratory or breeding bird populations receive very few human visitors from year to year (Faulkner*, in press*).This makes long-term and systematic population monitoring in these areas all the more important.

Rocky Mountain Bird Observatory began landbird monitoring in Wyoming in 2002. From 2002-2008 we stratified bird surveys by habitat, in relation to vegetation characteristics. We now recognize several limitations to a habitat-based sampling design. First, vegetation changes occur over time because of natural events, land use and management changes. As these changes occur, habitat-based transects need to be re-located. Such relocations do not allow us to relate changes in bird population density to changes in landscape conditions. Second, fluctuating budgets and financial constraints occasionally mean we have to omit some habitats from sampling. Third, habitats often overlap and efforts to place sampling transects within homogeneous stands resulted in excluding certain micro-habitats from sampling. Finally, our original design required that sampling locations be within 1.6 km of a road, which may introduce road-bias to the survey design. Overall, these factors made it difficult to combine data across strata to estimate species' densities on the larger geographic scale needed for regional long-term monitoring. To address these challenges RMBO and its partners developed the Integrated Landbird Monitoring (ILM) design to meet the following monitoring objectives:

- Integrate existing bird monitoring efforts in the region to provide better information on distribution and abundance of all breeding birds, especially for high priority species;
- Provide basic habitat association data for most bird species to address habitat management issues;
- Provide long-term status and trend data for all regularly occurring breeding species throughout Wyoming, with a target of detecting a minimum rate of population change of 3.0% per year within 30 years;

- Maintain a high-quality database that is accessible to all of our collaborators as well as to the public over the internet, in the form of raw and summarized data and;

- Generate decision support tools that help guide conservation efforts and provide a better measure of conservation success.

To achieve these objectives and overcome the disadvantages of habitat-stratified sampling, RMBO and its partners implemented the new ILM sampling design in Colorado in 2008. The success of this sampling design led to its expansion into Wyoming in 2009. The primary level of stratification in the ILM design is Bird Conservation Regions (BCRs). In 1999 The North American Bird Conservation Initiative (NABCI) delineated BCRs in North America based upon eco-regions with similar bird communities, resource management issues, and biotic and abiotic characteristics (NABCI 2007). We stratified within BCRs based on fixed attributes, without regard to existing vegetation conditions. In contrast to the historic, vegetation-stratified sampling, built into our new sampling design is the ability to combine data across strata (and across monitoring programs) in order to estimate bird population status and trends across large areas.

Within each stratum, we used generalized random-tesselation stratification (GRTS), a spatially balanced sampling algorithm, to select sample units (Stevens and Olsen 2004). The GRTS design has several appealing properties with respect to long-term monitoring of birds at large spatial scales:

- Spatially-balanced designs are statistically more efficient than simple random samples;
- Strata based on fixed attributes such as soil type, landscape features and congressional management designations, allow for relating changes in bird population to changes on the landscape through time;
- Each BCR within a state can be stratified differently, depending upon local needs and areas to which one wants to make inferences;
- All vegetation types are available for sampling;
- The design can incorporate weighting by factors that influence species' distributions;
- Aggregation of strata-wide estimates to BCR- or state-wide estimates is built into the design;
- Because each stratum has its own spatially-balanced, ordered sample, sampling effort can vary among strata and among years and still provide statistically valid estimates;
- Local population trends can be directly compared to regional trends;
- Incorporating spatial information in data analysis can increase precision;
- Data from the previous sampling design can be used to calculate and compare densities with the new, BCR-based data (Blakesley and Hanni 2009).

METHODS

Study Area

Wyoming is comprised of five Bird Conservation Regions (Figure 1). We stratified within each of the BCRs based on fixed attributes such as landscape features and management entities (Figures 2-3). In contrast to our historic, habitat-based sampling, we can now combine data across strata and across monitoring programs which will allow us to estimate bird population status and trends across larger areas.

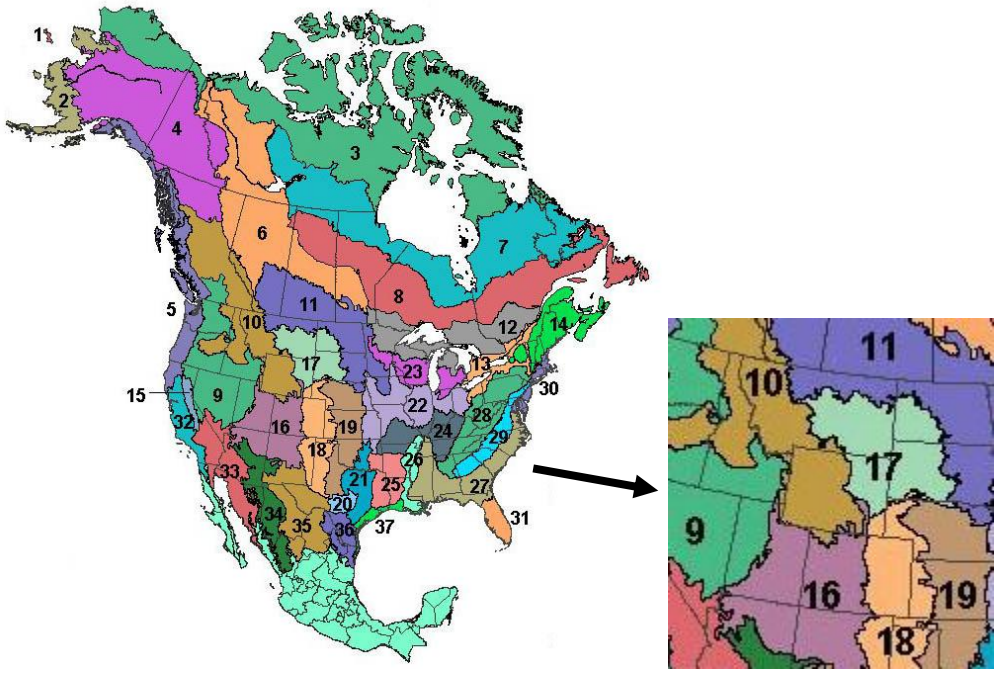

Figure 1. Bird Conservation Regions throughout North America, excluding Hawaii and Mexico. Inset shows geographic boundaries of BCRs 9, 10, 16, 17 and 18 within Wyoming (Source: http://www.nabci-us.org/map.html).

BCR 9- Great Basin

The Great Basin is a complex region covering the eastern slopes of several mountain ranges through Washington, Oregon, Idaho, California, Nevada, Utah and Wyoming. The region is characterized by grassland and sagebrush in the lowlands, pinyon/juniper and ponderosa pine forests in the mid elevations and pine/fir/spruce forests in the higher elevations (NABCI 2000). This is the smallest BCR in Wyoming and therefore was sampled at a small number of transects. For 2009 data analyses, we pooled BCR 9 data with BCR 10 data, which covers a larger percentage of the state and had a larger sample size.

BCR 10- Northern Rockies

The Northern Rockies BCR comprises more than half the state of Wyoming and is dominated by a coniferous forest at higher elevations and shrub steppe/grassland throughout the Wyoming basin (NABCI 2000). This BCR includes several national parks and a large amount of other public land and open space. Many high priority bird species, such as Brewer's Sparrow and Clark's Nutcracker breed in this region and RMBO extensively samples this BCR.

BCR 16- Southern Rockies/Colorado Plateau

This region comprises portions of seven states with a small band entering Wyoming in the southeast corner of the state. At lower elevations this area is characterized by shortgrass prairie, and at higher elevations, stands of pine, fir and spruce interspersed with large aspen stands and montane shrubland. This region provides critical habitat for species such as Grasshopper Sparrow and Mountain Bluebird (NABCI 2000).

BCR 17- Badlands and Prairies

This BCR covers the northeast corner of Wyoming and consists of extensive tracts of dry, mixed grass prairie, providing nesting habitat for many high priority grassland species that are in severe decline. The low density of wetlands and small, water augmented farmlands means these areas receive concentrated and intense use by waterfowl. BCR 17 in Wyoming also covers the Bear Lodge Mountains in Black Hills National Forest, which is the western-most range of a variety of high priority neotropical migrants (NABCI 2000).

BCR 18- Shortgrass Prairie

The shortgrass prairie BCR covers the eastern half of Colorado, and substantial portions of New Mexico, Texas, Nebraska, Kansas and the far southeast corner of Wyoming. McCown's Longspur and Lark Bunting are some high priority breeders of the highly endangered shortgrass prairie ecosystem (NABCI 2000).

Important Bird Areas (IBAs)

Through our sampling design, we survey three Important Bird Areas (IBAs) in Wyoming. These included two transects in each of the national parks of Yellowstone and Grand Teton as well as one transect on the Pathfinder Wildlife Refuge.

Sampling Design

Within each BCR, we defined strata based on land ownership or management entity. Within each stratum we selected a target number of transects to survey (2009 effort is shown in parentheses). In BCR 10 we created 18 strata. National Forest strata were Shoshone easy-access (23), Shoshone roadless (2), Bighorn (10), Region 2 Forests (2) and Medicine Bow (2). We created one stratum for each of the three National Parks within the Greater Yellowstone Inventory and Monitoring Network; Yellowstone (2), Grand Teton (2) and Bighorn National Recreation Area (2). We created one stratum on the Wind River Indian Reservation; however, we were not granted permission to survey these two samples in 2009. We allocated the remaining 9 strata across BCR 10 based on BLM field offices. They included Casper, Cody, Kemmerer, Lander, Pinedale, Rawlins, Rocksprings, and Worland. The final stratum sampled all other lands (2) to include privately owned land.

In BCR 16 we created 4 strata consisting of Medicine Bow (24) and Wasatch (2) National Forests, all BCR 16 BLM lands (2) and all other lands (10). In BCR 17 we created 6 strata consisting of the Wyoming portion of the Black Hills National Forest (10), Thunder Basin National Grassland (10), BLM field offices of Buffalo (2), Casper (2) and Newcastle (2), and all other lands (10). In BCR 18 we created 3 strata consisting of BLM (2), Department of Defense (2) and all other lands (10). We allocated samples among strata in consideration of the interests of our partners.

We used Generalized Random Tesselation Stratification (GRTS), a spatially balanced sampling algorithm, to select sample units in each stratum (Stevens and Olsen 2004). The GRTS design allows sample units to be weighted by any variable of interest in order to increase the probability that certain sample units will be selected (Stevens and Olsen 2004). All sample units in the sampling frame are ordered, such that any set of consecutively numbered units are spatially balanced. In the case of fluctuating budgets, we can adjust the sampling effort among years within each stratum while still preserving a random, spatially-balanced sampling design.

To meet the requirements of the GRTS design all portions of the sampling frame (all strata) were available for sampling. We selected a minimum of two samples within each stratum in

order to provide stratum-level density estimates. Our sampling units were 1-km^2 cells superimposed on a uniform grid over the entire state of Wyoming. Within each cell there were 16 points, placed in a four by four grid, spaced 250 meters apart. All spatial data were compiled using ARCGIS 9.2 (ESRI).

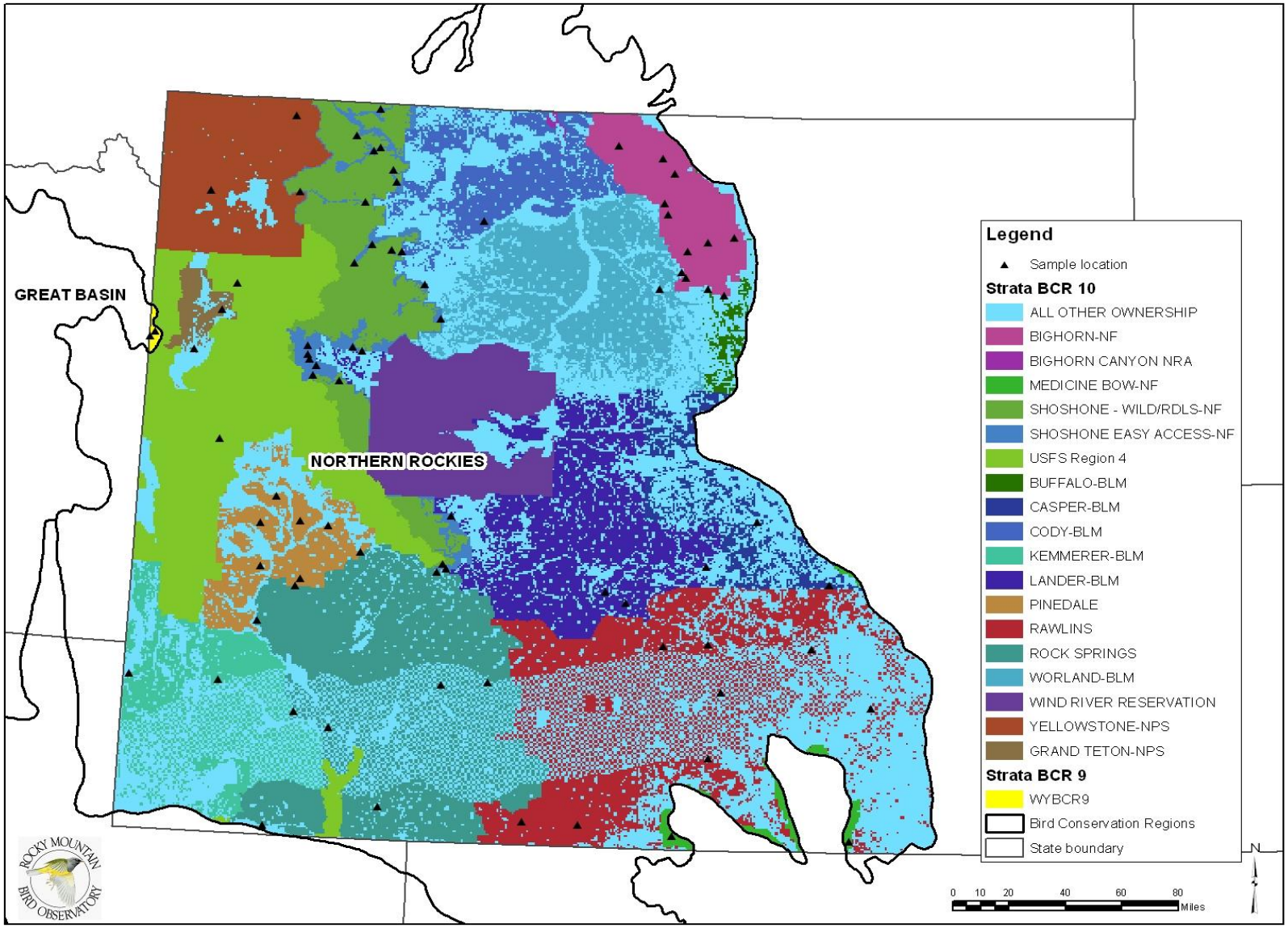

Figure 2. Stratification and sample locations in The Great Basin (9) and Northern Rockies (10) Bird Conservation Regions, Wyoming.

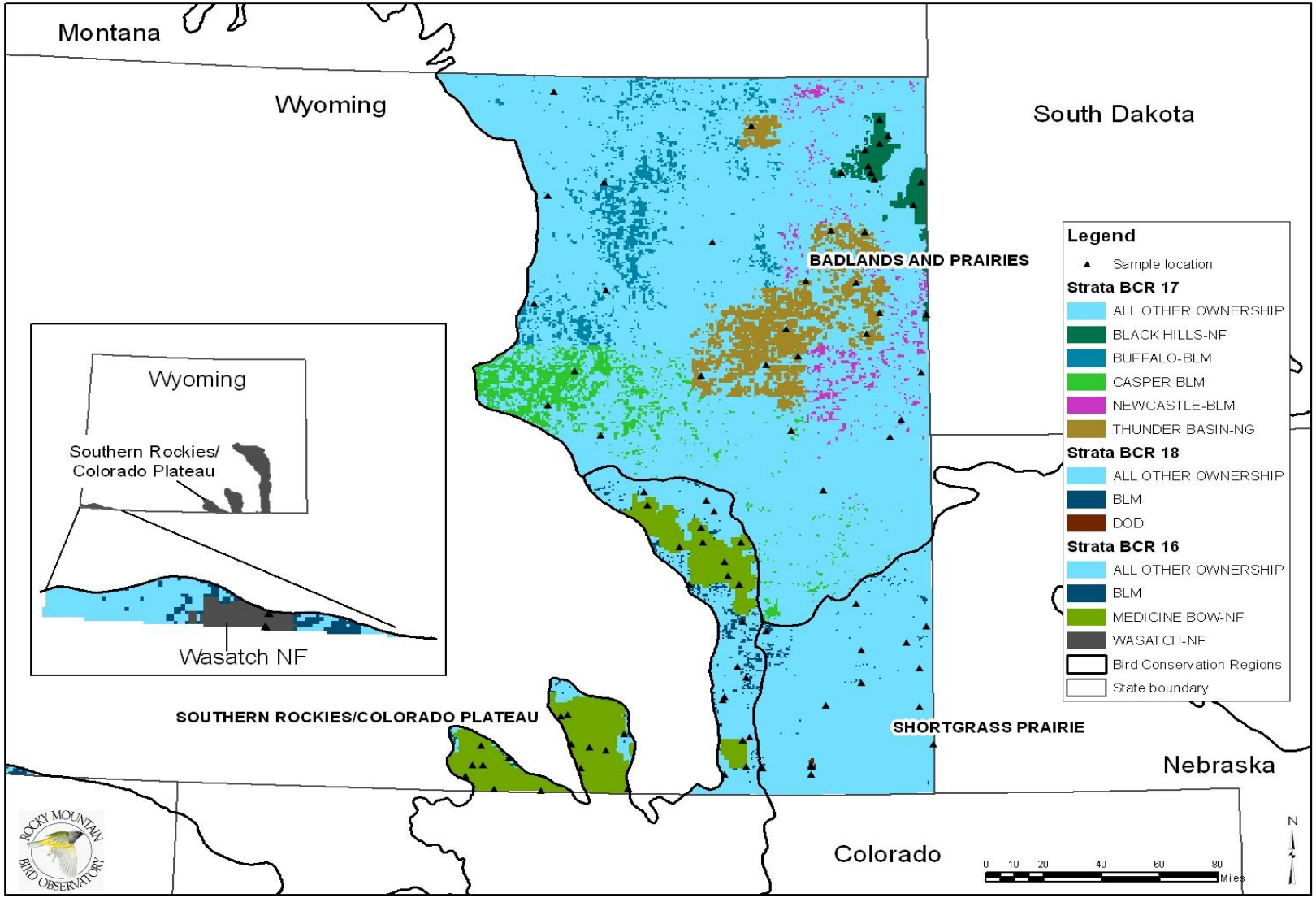

Figure 3. Stratification and sample locations in the Southern Rockies/Colorado Plateau (16), Badlands and Prairies (17) and Shortgrass Prairie (18) Bird Conservation Regions, Wyoming.

Sampling methods

Buckland et al. (2001) developed the concepts and methods of distance analysis. Distance sampling was developed to account for the decreasing probability of detecting an object of interest (e.g., a bird) with increasing distance from the observer to the object (Buckland et al. 2001). Distance analysis relies on three assumptions: 1) all birds at and near the sampling point (distance = 0) are detected; 2) distances of birds are measured accurately; and 3) birds do not move in response to the observer's presence. Our sampling protocol met these assumptions reasonably well.

Occupancy estimation is commonly used to quantify the proportion of sample units occupied by an organism (MacKenzie et al. 2002). Occupancy estimation theory uses a detection probability to adjust the proportion of sites occupied to account for species that were present but undetected (MacKenzie et al. 2002). We used our data to estimate the site occupancy of species of special concern for which we had too few detections to estimate population density. Occupancy estimation requires multiple surveys to the sample unit in time or space (MacKenzie and Royle 2005). Under our sampling framework, we used a removal model to estimate a detection probability from the sequential 1-2 minute sampling intervals. The 16 grid points served as spatial replicates for estimating the proportion of points occupied within the 1-km^2 sampling cells. The assumptions of occupancy estimation are 1) the probabilities of detection and occupancy are constant across the sample units, 2) each point is closed to changes in occupancy over the sampling season, 3) the detection of species at each point are independent and 4) the target species are never falsely detected (MacKenzie et al. 2006).

Observers conducted point counts (Buckland et al. 2001) following protocol established by Leukering (2000) and modified by Hanni et al. (2009). Observers conducted surveys in the morning, from ½-hour before sunrise to 11 AM. At each transect observers established an access point (AP) which they recorded with a GPS unit, allowing future technicians to locate the transect as quickly as possible. From the AP, the observer navigated to the nearest point within the 16-point grid and determined the most efficient route to survey all points. Observers attempted to survey all 16 points.

At each point, observers conducted a five-minute survey. For every bird detected during the five minute period, we recorded species, sex, horizontal distance from the observer, minute the bird was detected, and type of detection (e.g. call, song or visual). Observers measured distances using high quality laser rangefinders. When it was not possible to measure distance to a bird, observers estimated distance by measuring to some nearby object. Observers recorded the presence of all low density species heard and seen when traveling the 250 meters between points. We also recorded all Red Squirrels (*Tamiasciurus hudsonicus*) detected. Observers did not include individual birds detected on a previous point. Observers also recorded birds flying over but not using the immediate surrounding landscape. Low density species are those rare or difficult to detect species (i.e. woodpeckers, owls, raptors, etc.) which historically we are not able to generate density estimates for. This data is collected for distribution mapping purposes.

We considered all non-independent detections of birds, i.e. flocks or pairs of conspecific birds together in close proximity, as part of a 'cluster' rather than as separate independent observations. Observers recorded clusters by recording the number of birds detected within the cluster along with a letter code to keep track of each distinct cluster.

At the start and end of each 16-point transect, observers recorded time and atmospheric data (i.e., temperature in degrees Fahrenheit, cloud cover, precipitation, and wind speed). We navigated to each point using hand-held Garmin® Global Positioning System (GPS) units. Observers logged all GPS data in Universal Transverse Mercator (UTM) North American Datum 83. Before beginning each 5 minute survey, observers recorded vegetation data, within a 50-m radius of the point, including structural stage, forest canopy closure, mean canopy height, types and relative proportions of overstory trees, sub-canopy tree species composition, percent coverage and types of shrubs, and types and relative proportions of ground cover. We recorded vegetation data quietly to allow birds, potentially disturbed by our approach, time to return to their normal habits prior to the beginning of the point transect survey.

Field Personnel

RMBO staff, consisting of five experienced biological technicians, three WYNDD employees and one park employee, conducted field work in 2009. All technicians had excellent aural and visual bird-identification skills. Technicians completed an intensive five-day training program at the beginning of the field season to ensure full understanding of field protocols, to practice bird identification, and to practice distance estimation in a variety of habitats.

Data Analyses

Distance Analyses

We used the analysis software Distance 6.0 to generate detection probabilities using our point transect data (Thomas et al. *in press*). We generated density estimates for species for which we had at least 60 independent detections (n). We excluded flyovers and low density detections from analyses. We pooled our two samples in BCR 9 with our 78 samples in BCR 10 because of BCR 9's small sample size and the similar management and vegetation characteristics within these areas. We used Akaike's Information Criterion (AIC) corrected for small sample size (AICc) and model selection theory to select the most parsimonious detection function for each species (Burnham and Anderson 2002). After we calculated detection probabilities in Distance, we used the SPSURVEY package (Kincaid 2008) in Program R (R Development Core Team 2008) to estimate density and its variance for each bird species.

Occupancy Analyses

We used a multi-scale occupancy model (Nichols et al. 2008) to estimate 1) the proportion of 1-km^2 sampling units occupied by a species (Psi), 2) the proportion of points occupied by a species given presence within the1-km^2 sampling units (Theta) and 3) the probability of detecting a species given presence (p). We constrained Theta and p by holding these parameters constant. Our application of the multi-scale model is analogous to a within-season robust design (Pollock 1982) where the points are the primary samples for estimating Theta and the sampling intervals at each point are the secondary samples for estimating p (Nichols et al. 2008). We considered both Theta and p to be nuisance variables that were important for generating unbiased estimates of Psi. Theta can be considered an availability parameter or the probability that a species was present and available for sampling at the points (Nichols et al. 2008). We estimated the detection probabilities (p) using a removal model with 3 intervals. Using the five 1-minute intervals recorded during sampling, we binned minutes 1 and 2, and minutes 3 and 4 to meet the assumption of a monotonic decline in the detection rates. After the target species was detected at a point, we set all subsequent sample intervals at that point to missing data. We truncated the data, using only detections within 125 m of the sample points. We used program SAS (PROC NLMIXED, SAS Institute 2008) to estimate the model parameters and account for unequal interval length.

Unless otherwise specified, all birds are reported by common name, in taxonomic order, under the American Ornithological Union guidelines, 7th edition (http://www.aou.org/checklist/north/full.php).

RESULTS

RMBO completed 168 of 174 (97%) planned transect surveys throughout Wyoming in 2009. We completed 100% of 2 planned surveys in BCR 9, 92% of 85 planned surveys in BCR 10, 100% of 39 planned surveys in BCR 16, 94% of 36 planned surveys in BCR 17, and 100% of 16 planned surveys in BCR 18 (Table 1). The most common reason for surveys not being conducted was an inability to survey the transect within the sampling time frame (Table 2). These transects were at lower elevations primarily in grassland and shrub steppe, where birds breed early in the season.

RMBO conducted 1,933 point counts among the 168 transects between 17 May and 27 July 2009. We detected 15,258 birds of 155 species across Wyoming's five BCR's (Appendices B-F). We estimated BCR and stratum-level densities (Tables 3-9) and population sizes (Tables 10-14) of 43 landbird species. We obtained robust density estimates with low coefficients of variation (<50%) in at least one stratum for 33 species in BCRs 9 and 10 combined, 24 species in BCR 16, 14 species in BCR 17 and eight species in BCR 18. A minimum of two samples in each stratum are required to calculate statewide density estimates. Because we did not complete two surveys within three strata in BCR 10 (Table 1), we were unable to estimate statewide density in 2009.

In 2009, RMBO recorded 77 bird species that hold conservation and management designations in Wyoming (Appendix A). We recorded 18 of these species in sufficient numbers to calculate density estimates. We estimated species occupancy rates for strata that had at least eight sampling units surveyed (n = 11 strata). We present estimates of the proportion of sample units occupied for 15 species of concern for which we were not able to generate density estimates (Tables 15-17).

Detailed species accounts including maps, density estimate graphs and tables are available at www.rmbo.org/PUBLIC/MONITORING/speciesAccounts.aspx.

Table 1. Surveys planned and completed for Monitoring Wyoming's Birds, 2009.

BCR	Agency /FS Region*	Stratum	Planned Samples	# of samples completed
9	FS-4	WY BCR 9	2	2
10	FS-2	Shoshone (non-roadless)	23	23
10	FS-2	Shoshone (roadless)	2	2
10	FS-2	Medicine Bow	2	2
10	FS-2	Bighorn	10	10
10	FS-4	USFS R4	2	2
10	BLM	Buffalo	2	1
10	BLM	Cody	2	1
10	BLM	Worland	2	2
10	BLM	Lander	2	2
10	BLM	Casper	2	2
10	BLM	Kemmerer	2	2
10	BLM	Pinedale	8	8
10	BLM	Rocksprings	8	8
10	BLM	Rawlins	8	8
10	Tribal	Wind River	2	0
10	NPS	Grand Teton	2	2
10	NPS	Bighorn	2	0
10	NPS	Yellowstone	2	2
10	Other	All Other	2	1
16	FS-4	Wasatch	2	2
16	FS-2	Medicine Bow	23	24
16	BLM	BLM All	2	2
16	Other	All Other	10	10
17	FS-2	Black Hills	10	10
17	NG	Thunder Basin	10	11
17	BLM	Buffalo	2	2
17	BLM	Newcastle	2	2
17	BLM	Casper	2	3
17	Other	All Other	10	8
18	BLM	BLM All	2	2
18	DOD	DOD	2	2
18	Other	All Other	10	10

*FS4- Forest Service Region 4
FS2- Forest Service Region 2
BLM- Bureau of Land Management
NPS- National Park Service
NG-National Grassland
Other- State and Private lands and Federal lands not included in other strata
DOD- Department of Defense

Table 2. Reasons that planned surveys were not completed in Wyoming, 2009

Reason transect was not surveyed	*BCR 9*	*BCR 10*	*BCR16*	*BCR 17*	*BCR 18*
Inaccessible	0	1	0	0	0
Ran out of time	0	2	0	2	0
Denied access	0	2	0	0	0
Unable to contact landowner	0	2	0	0	0
Total	0	7	0	2	0

Table 3. Estimated density and percent Coefficient of Variation for 41 landbird species in the Great Basin and Northern Rockies Bird Conservation Regions (9 and 10) within National Forests, Wyoming, 2009.*

	Medicine Bow			Bighorn			Shoshone			Shoshone-Roadless			USFS Region 4			Targhee (BCR 9)		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**
Mourning Dove	1	0.95	101	0	---	---	38	2.26	38	0	---	---	0	---	---	4	2.54	32
Northern Flicker	7	15.09	100	6	1.77	43	31	4.18	23	0	---	---	2	3.63	37	3	4.31	54
Western Wood-Pewee	0	---	---	1	0.40	83	7	1.29	40	0	---	---	0	---	---	18	35.46	101
Dusky Flycatcher	0	---	---	7	5.33	48	15	5.22	41	3	10.68	101	0	---	---	1	3.71	101
Warbling Vireo	6	26.77	100	5	3.05	63	30	8.37	28	8	22.84	100	2	7.51	100	22	65.44	49
Clark's Nutcracker	2	3.87	101	12	3.18	41	42	5.26	33	3	3.72	101	3	4.89	101	6	7.74	101
Black-billed Magpie	0	---	---	1	0.07	87	24	0.77	37	0	---	---	0	---	---	0	---	---
Common Raven	4	2.14	101	19	1.39	36	65	2.17	25	0	---	---	0	---	---	2	0.71	101
Horned Lark	0	---	---	2	1.09	88	53	13.08	54	0	---	---	0	---	---	0	---	---
Black-capped Chickadee	0	---	---	0	---	---	8	0.00	0	0	---	---	0	---	---	12	0.00	0
Mountain Chickadee	3	24.83	101	61	69.04	22	80	44.93	21	20	105.94	101	25	190.60	56	13	158.49	77
Red-breasted Nuthatch	2	9.30	100	7	4.45	52	24	6.98	26	6	17.86	100	11	38.59	65	30	93.03	26
Rock Wren	9	10.48	101	6	0.96	56	25	1.82	36	5	3.73	101	0	---	---	0	---	---
House Wren	10	35.71	100	13	6.35	43	24	5.36	26	2	4.57	100	0	---	---	21	49.99	94
Ruby-crowned Kinglet	6	25.13	100	66	37.80	21	109	28.53	21	9	24.12	100	9	31.74	100	34	94.93	40
Mountain Bluebird	6	29.86	104	4	7.71	79	24	4.29	36	0	---	---	0	---	---	3	5.37	60
Swainson's Thrush	0	---	---	0	---	---	35	9.25	46	1	2.71	103	4	14.24	103	21	59.20	49
Hermit Thrush	0	---	---	54	15.47	32	70	9.16	21	18	24.13	100	12	21.16	5	0		
American Robin	7	33.26	55	63	42.07	26	114	30.14	22	11	31.93	102	5	21.01	65	24	66.52	37
Sage Thrasher	0	---	---	0	---	---	3	0.31	64	0	---	---	0	---	---	0	---	---
Yellow Warbler	0	---	---	1	0.20	86	15	1.38	44	1	0.94	101	0			0	---	---
Yellow-rumped Warbler	2	9.11	101	73	45.45	21	104	29.59	23	4	11.66	35	11	42.18	15	17	51.60	49
Ovenbird	0	---	---	0	---	---	1	0.25	83	0	---	---	0	---	---	0	---	---
Western Tanager	4	13.27	103	4	1.82	46	20	4.15	38	6	12.74	103	20	55.89	65	30	66.37	73
Green-tailed Towhee	17	48.26	76	10	3.88	70	27	4.79	46	0	---	---	0	---	---	5	9.46	100
Spotted Towhee	0	---	---	2	0.59	84	30	4.05	42	1	1.38	100	2	3.64	100	7	10.08	100
Chipping Sparrow	0	---	---	22	16.64	26	55	19.01	26	11	38.94	101	2	9.32	101	24	88.49	14
Brewer's Sparrow	0	---	---	0	---	---	78	23.21	38	0	---	---	0	---	---	0	---	---
Vesper Sparrow	1	1.99	101	0	---	---	71	8.84	41	0	---	---	0	---	---	0	---	---
Lark Sparrow	5	12.53	100	0	---	---	5	0.78	90	0	---	---	0	---	---	0	---	---

	Medicine Bow			Bighorn			Shoshone			Shoshone-Roadless			USFS Region 4			Targhee (BCR 9)		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**
Sage Sparrow	0	---	---	1	0.47	85	2	0.43	90	0	---	---	0	---	---	0	---	---
Lark Bunting	0	---	---	0	---	---	7	0.79	84	0	---	---	0	---	---	0	---	---
Savannah Sparrow	0	---	---	0	---	---	1	0.95	94	0	---	---	0	---	---	0	---	---
Lincoln's Sparrow	0	---	---	7	8.13	72	15	7.96	58	3	16.30	113	1	7.15	113	5	28.30	113
White-crowned Sparrow	10	42.90	101	5	2.93	89	43	11.53	39	2	5.49	23	6	21.67	101	25	71.49	80
Dark-eyed Junco	7	44.49	100	109	94.73	15	102	40.51	25	13	52.87	78	45	240.82	24	33	139.81	24
Western Meadowlark	0	---	---	0	---	---	52	4.26	41	0	---	---	0	---	---	0	---	---
Brewer's Blackbird	5	31.93	102	0	---	---	16	6.39	55	0	---	---	0	---	---	0	---	---
Brown-headed Cowbird	0	---	---	3	0.84	94	1	0.33	90	0	---	---	0	---	---	4	14.03	30
Pine Siskin	1	13.12	102	17	28.29	30	29	32.55	42	5	204.38	121	9	249.17	67	22	367.12	28
Red Squirrel	6	56.39	100	61	78.41	33	56	32.90	31	0	---	---	6	47.49	38	0	---	---

***n** = number of observations used to estimate D; **D** = density estimate in birds/km^2; **CV** = % coefficient of variation of *D*

Table 4. Estimated density and percent Coefficient of Variation for 32 landbird species in the Great Basin and Northern Rockies Bird Conservation Regions (9 and 10) within National Parks, Wyoming, 2009.*

	Yellowstone			Grand Teton		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**
Mourning Dove	1	0.48	101	0	---	---
Northern Flicker	0	---	---	4	7.66	100
Western Wood-Pewee	3	4.43	101	8	21.01	101
Dusky Flycatcher	2	5.56	12	1	4.95	101
Warbling Vireo	2	4.46	100	1	3.97	100
Clark's Nutcracker	8	7.74	53	2	3.44	101
Common Raven	2	0.54	101	2	0.95	101
Black-capped Chickadee	0	---	---	10	---	---
Mountain Chickadee	19	80.28	13	1	7.36	101
Red-breasted Nuthatch	12	27.91	7	4	16.54	100
House Wren	1	1.79	100	9	28.57	100
Ruby-crowned Kinglet	18	37.69	13	4	14.89	100
Mountain Bluebird	1	1.34	103	1	2.39	103
Swainson's Thrush	14	29.60	103	0	---	---
Hermit Thrush	12	12.57	33	1	1.86	100
American Robin	18	37.42	69	1	7.39	102
Sage Thrasher	0	---	---	9	13.09	101
Yellow-rumped Warbler	20	45.53	61	1	4.05	101
Western Tanager	6	9.96	23	2	5.90	103
Green-tailed Towhee	0	---	---	2	5.05	100
Spotted Towhee	3	3.24	33	0	---	---
Chipping Sparrow	13	35.95	40	0	---	---
Brewer's Sparrow	0	---	---	26	112.13	102
Vesper Sparrow	0	---	---	10	17.70	101
Savannah Sparrow	63	477.64	104	0	---	---
Lincoln's Sparrow	7	29.71	113	2	15.09	113
White-crowned Sparrow	1	2.14	101	1	3.81	101
Dark-eyed Junco	19	60.37	37	11	62.14	100
Western Meadowlark	0	---	---	7	8.15	100
Brown-headed Cowbird	0	---	---	1	4.68	100
Pine Siskin	13	213.60	47	3	366.31	259
Red Squirrel	4	18.80	51	0	---	---

***n** = number of observations used to estimate D; **D** = density estimate in birds/km^2; **CV** = % coefficient of variation of *D*

Table 5. Estimated density and percent Coefficient of Variation for 34 landbird species in the Great Basin and Northern Rockies Bird Conservation Regions (9 and 10) within Bureau of Land Management lands, Wyoming, 2009.*

	Casper			Kemmerer			Lander			Pinedale		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**
Mourning Dove	0	---	---	0	---	---	7	3.44	23	4	0.48	51
Northern Flicker	0	---	---	0	---	---	8	8.90	100	0	---	---
Western Wood-Pewee	0	---	---	0	---	---	2	3.05	11	0	---	---
Dusky Flycatcher	0	---	---	1	3.18	101	18	51.70	59	0	---	---
Warbling Vireo	0	---	---	0	---	---	3	6.91	100	0	---	---
Black-billed Magpie	0	---	---	0	---	---	0	0.00	0	1	0.06	87
Common Raven	0	---	---	1	0.31	101	5	1.38	101	5	0.33	54
Horned Lark	22	85.80	28	11	25.12	6	0	0.00	0	176	87.91	17
Mountain Chickadee	0	---	---	0	---	---	7	29.90	101	0	---	---
Red-breasted Nuthatch	0	---	---	0	---	---	3	7.20	37	0	---	---
Rock Wren	0	---	---	2	1.33	101	37	22.23	101	5	0.73	85
House Wren	0	---	---	0	---	---	4	7.37	100	0	---	---
Ruby-crowned Kinglet	0	---	---	0	---	---	13	28.10	100	0	---	---
Mountain Bluebird	0	---	---	0	---	---	12	18.29	46	8	2.71	79
American Robin	0	---	---	0	---	---	16	38.62	91	0	---	---
Sage Thrasher	0	---	---	25	23.37	16	1	0.84	101	68	13.91	27
Yellow Warbler	0	---	---	0	---	---	3	2.28	40	0	---	---
Yellow-rumped Warbler	0	---	---	0	---	---	6	14.10	69	0	---	---
Western Tanager	0	---	---	0	---	---	1	1.71	103	0	---	---
Green-tailed Towhee	0	---	---	6	9.73	100	36	52.75	31	1	0.35	84
Spotted Towhee	0	---	---	0	---	---	1	1.11	100	0	---	---
Chipping Sparrow	0	---	---	0	---	---	26	74.22	15	0	---	---
Brewer's Sparrow	17	82.48	34	34	94.27	23	8	20.03	76	185	112.20	26
Vesper Sparrow	14	27.88	101	6	6.83	101	18	18.50	56	50	12.45	28
Lark Sparrow	0	---	---	0	---	---	2	2.59	100	0	---	---
Sage Sparrow	0	---	---	18	35.27	66	6	10.62	101	156	70.48	21
Lark Bunting	21	38.09	101	0	---	---	0	---	---	0	---	---
Lincoln's Sparrow	0	---	---	0	---	---	9	39.43	95	0	---	---
White-crowned Sparrow	0	---	---	0	---	---	3	6.64	101	0	---	---
Dark-eyed Junco	0	---	---	0	---	---	8	26.24	100	0	---	---
Western Meadowlark	16	20.97	75	3	2.25	100	3	2.03	100	2	0.33	88
Brewer's Blackbird	0	---	---	1	3.65	102	2	6.59	102	0	---	---
Brown-headed Cowbird	0	---	---	0	---	---	3	8.15	38	0	---	---
Pine Siskin	0	---	---	0	---	---	4	81.30	20	0	---	---

Table 5 continued

	Rawlins			Rock Springs			Worland		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**
Mourning Dove	6	0.84	48	7	0.97	32	0	---	---
Northern Flicker	1	0.32	83	0	---	---	0	---	---
Western Kingbird	2	0.47	89	0	---	---	1	1.28	101
Black-billed Magpie	2	0.15	86	6	0.45	77	0	---	---
Common Raven	29	2.21	21	8	0.62	33	6	2.57	101
Horned Lark	229	134.33	19	79	45.49	13	5	15.98	100
Rock Wren	6	1.03	52	16	2.71	33	2	1.86	101
Mountain Bluebird	5	1.97	50	1	0.39	88	3	6.44	103
American Robin	1	0.61	89	3	1.81	62	0	---	---
Sage Thrasher	36	8.65	39	31	7.38	30	5	6.54	101
Yellow Warbler	0	---	---	3	0.64	86	0	---	---
Green-tailed Towhee	10	4.17	52	6	2.48	44	16	36.34	100
Chipping Sparrow	0	---	---	1	0.80	85	1	4.42	101
Brewer's Sparrow	138	98.29	27	84	59.28	31	34	131.97	102
Vesper Sparrow	31	9.06	27	40	11.59	53	23	36.65	53
Lark Sparrow	0	---	---	0	---	---	5	10.03	100
Sage Sparrow	49	24.67	33	50	26.61	33	0	---	---
Lark Bunting	2	0.53	46	0	---	---	0	---	---
Lincoln's Sparrow	0	---	---	2	2.47	99	0	---	---
White-crowned Sparrow	0	---	---	0	---	---	15	51.48	101
Western Meadowlark	48	9.23	32	3	0.57	44	20	20.97	75
Brewer's Blackbird	7	6.56	65	9	8.36	82	1	5.11	102
Brown-headed Cowbird	2	1.54	61	0	---	---	0	---	---
Pine Siskin	0	---	---	1	1.91	85	0	---	---

***n** = number of observations used to estimate D; **D** = density estimate in birds/km^2; **CV** = % coefficient of variation of *D*

Table 6. Estimated density and percent Coefficient of Variation for 37 landbird species in the Badlands and Prairies Bird Conservation Region (17) within Black Hills National Forest, Other Lands and Thunder Basin National Grassland, Wyoming, 2009.*

	Black Hills National Forest			Other Lands			Thunder Basin National Grassland		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**
Mourning Dove	1	0.13	93	11	2.29	44	27	3.02	29
Northern Flicker	11	3.30	54	3	1.42	72	0	---	---
Western Wood-Pewee	21	8.63	33	0	0.00	0	0	---	---
Dusky Flycatcher	18	13.94	25	4	4.88	58	0	---	---
Western Kingbird	0	---	---	9	3.15	58	3	0.56	90
Warbling Vireo	87	54.01	25	0	---	---	0	---	---
Black-billed Magpie	0	---	---	5	0.57	84	0	---	---
Common Raven	0	---	---	5	0.59	36	0	---	---
Horned Lark	0	---	---	71	62.19	57	80	37.61	27
Black-capped Chickadee	27	---	---	10	---	---	0	---	---
Mountain Chickadee	0	---	---	0	---	---	3	2.92	88
Red-breasted Nuthatch	70	45.30	17	1	1.02	87	0	---	---
Rock Wren	7	1.13	83	3	0.77	60	15	2.05	37
House Wren	13	6.46	57	8	6.26	82	0	---	---
Ruby-crowned Kinglet	18	10.49	32	0	---	---	0	---	---
Mountain Bluebird	21	8.19	56	5	2.94	57	0	---	---
Swainson's Thrush	9	5.29	56	1	0.93	93	0	---	---
American Robin	114	68.25	25	21	21.87	39	0	---	---
Yellow Warbler	5	1.03	43	4	1.29	80	0	---	---
Yellow-rumped Warbler	40	25.34	23	15	14.97	60	0	---	---
Ovenbird	142	79.72	17	0	---	---	0	---	---
Western Tanager	37	17.08	34	3	2.18	61	0	---	---
Green-tailed Towhee	0	---	---	4	2.49	82	0	---	---
Spotted Towhee	15	4.51	53	0	---	---	12	3.05	88
Chipping Sparrow	92	70.80	25	15	18.18	50	9	5.86	88
Brewer's Sparrow	0	---	---	52	53.66	61	51	29.11	48

	Black Hills National Forest			Other Lands			Thunder Basin National Grassland		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**
Vesper Sparrow	17	4.71	56	24	10.48	80	26	6.09	44
Lark Sparrow	5	1.74	61	11	6.04	56	4	1.18	52
Sage Sparrow	0	---	---	1	0.75	93	0	---	---
Lark Bunting	0	---	---	102	40.55	55	578	123.32	19
Grasshopper Sparrow	0	---	---	6	5.28	94	17	8.02	68
Dark-eyed Junco	50	44.21	28	8	11.14	62	0	---	---
Western Meadowlark	2	0.36	82	113	32.46	24	381	58.74	10
Brewer's Blackbird	0	---	---	4	5.60	92	10	7.51	46
Brown-headed Cowbird	50	36.60	20	13	14.99	56	20	12.38	49
Pine Siskin	11	113.83	68	0	---	---	0	---	---
Red Squirrel	21	27.46	41	0	---	---	0	---	---

***n** = number of observations used to estimate D; **D** = density estimate in birds/km^2; **CV** = % coefficient of variation of *D*

Table 7. Estimated density and percent Coefficient of Variation for 20 landbird species in the Badlands and Prairies Bird Conservation Region (17) within Bureau of Land Management lands, Wyoming, 2009.*

	Buffalo			Casper			Newcastle		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**
Mourning Dove	3	2.08	101	5	3.14	68	1	1.27	101
Western Wood-Pewee	0	---	---	3	3.94	101	0	---	---
Western Kingbird	0	---	---	14	9.94	53	0	---	---
Black-billed Magpie	0	---	---	4	0.68	71	0	---	---
Common Raven	6	2.33	101	2	0.48	52	0	---	---
Horned Lark	25	62.02	54	26	46.18	89	1	5.33	100
Mountain Bluebird	2	3.91	103	0	---	---	0	---	---
American Robin	3	9.07	102	0	---	---	0	---	---
Sage Thrasher	7	8.33	101	2	1.45	101	0	---	---
Yellow Warbler	0	---	---	1	0.66	101	0	---	---
Green-tailed Towhee	6	12.39	100	2	2.52	100	0	---	---
Chipping Sparrow	2	8.04	101	3	7.37	101	0	---	---
Brewer's Sparrow	39	137.62	45	32	69.01	88	0	---	---
Vesper Sparrow	7	10.14	101	0	---	---	0	---	---
Lark Sparrow	0	---	---	5	5.57	100	0	---	---
Sage Sparrow	4	9.98	101	0	---	---	0	---	---
Lark Bunting	38	50.12	64	0	---	---	63	152.34	10
Grasshopper Sparrow	0	---	---	7	12.48	107	6	32.09	107
Western Meadowlark	26	24.78	31	81	47.18	10	17	29.71	17
Brewer's Blackbird	3	13.93	102	0	---	---	0	---	---

***n** = number of observations used to estimate D; **D** = density estimate in birds/km^2; **CV** = % coefficient of variation of *D*

Table 8. Estimated density and percent Coefficient of Variation for 41 landbird species in the Southern Rockies/Colorado Plateau Bird Conservation Region (16) within Wyoming, 2009.*

	Other Lands			BLM			Medicine Bow NF			Wasatch NF		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**
Mourning Dove	8	1.08	39	8	5.80	101	23	1.48	46	0	---	---
Northern Flicker	6	1.83	81	0	---	---	36	5.24	28	0	---	---
Western Wood-Pewee	0	---	---	0	---	---	45	8.98	33	0	---	---
Dusky Flycatcher	11	8.67	81	1	4.24	101	5	1.88	56	0	---	---
Western Kingbird	12	3.16	47	0	---	---	0	---	---	0	---	---
Warbling Vireo	21	13.27	81	0	---	---	41	12.35	38	6	13.39	100
Clark's Nutcracker	0	---	---	0	---	---	11	1.44	33	0	---	---
Black-billed Magpie	8	0.63	53	0	---	---	2	0.07	86	0	---	---
Common Raven	14	1.16	30	1	0.41	101	18	0.65	31	4	1.07	52
Horned Lark	55	31.12	32	28	88.36	100	8	2.16	78	0	---	---
Black-capped Chickadee	0	---	---	0	---	---	7	---	---	0	---	---
Mountain Chickadee	14	26.54	82	0	---	---	111	62.02	20	10	41.38	41
Red-breasted Nuthatch	5	3.29	81	0	---	---	22	6.91	26	6	13.95	34
Rock Wren	7	1.15	38	1	0.89	101	55	4.32	31	0	---	---
House Wren	33	16.69	77	0	---	---	61	14.71	27	0	---	---
Ruby-crowned Kinglet	0	---	---	0	---	---	86	24.32	27	5	10.47	100
Mountain Bluebird	36	13.71	46	3	6.14	103	25	5.32	50	2	2.68	26
Swainson's Thrush	0	---	---	0	---	---	8	2.28	55	0	---	---
Hermit Thrush	2	0.59	81	0	---	---	113	15.98	21	6	6.28	33
American Robin	16	9.42	64	0	---	---	111	33.68	25	3	6.24	102
Sage Thrasher	7	1.62	63	0	---	---	0	---	---	0	---	---
Yellow Warbler	0	---	---	6	6.74	101	16	1.59	32	0	---	---
Yellow-rumped Warbler	20	12.89	81	0	---	---	134	41.19	25	10	22.77	23
Ovenbird	0	---	---	0	---	---	0	---	---	0	---	---
Western Tanager	2	0.94	84	0	---	---	44	9.86	37	0	---	---
Green-tailed Towhee	21	8.44	51	6	13.11	101	83	15.91	29	0	---	---
Spotted Towhee	2	0.61	66	11	18.10	100	17	2.48	53	0	---	---
Chipping Sparrow	30	23.49	82	0			23	8.59	40	0	---	---
Brewer's Sparrow	51	35.04	44	3	11.09	102	1	0.33	84	0	---	---
Vesper Sparrow	9	2.54	77	0	---	---	5	0.67	73	0	---	---
Lark Sparrow	12	4.26	42	0	---	---	12	2.03	66	0	---	---
Sage Sparrow	5	1.70	62	0	---	---	0	---	---	0	---	---
Lark Bunting	59	15.15	81	0	---	---	0	---	---	0	---	---
Lincoln's Sparrow	0	---	---	0	---	---	10	5.73	59	0	---	---
White-crowned Sparrow	0	---	---	0	---	---	9	2.61	90	0	---	---
Dark-eyed Junco	1	0.90	81	0	---	---	141	60.49	17	15	47.66	9
Western Meadowlark	104	19.30	20	24	23.96	92	18	1.59	71	0	---	---
Brewer's Blackbird	7	6.33	65	0	---	---	14	6.04	46	0	---	---

	Other Lands			BLM			Medicine Bow NF			Wasatch NF		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**
Brown-headed Cowbird	13	9.68	50	0	---	---	11	3.91	43	0	---	---
Pine Siskin	0	---	---	0	---	---	52	81.11	31	1	6.56	102
Red Squirrel	0	---	---	0	---	---	58	36.80	25	1	4.70	100

***n** = number of observations used to estimate D; **D** = density estimate in birds/km^2; **CV** = % coefficient of variation of *D*

Table 9. Estimated density and percent Coefficient of Variation for 25 landbird species in the Shortgrass Prairie Bird Conservation Region (18) within Wyoming, 2009.*

	Other Lands			BLM			Department of Defense		
Species	**n**	**D**	**CV**	**n**	**D**	**CV**	**n**	**D**	**CV**
Mourning Dove	15	1.99	48	0	---	---	14	9.68	73
Northern Flicker	1	0.30	83	0	---	---	2	3.14	100
Western Wood-Pewee	0	---	---	0	---	---	0	---	---
Dusky Flycatcher	0	---	---	0	---	---	0	---	---
Western Kingbird	33	7.34	37	7	9.42	101	1	1.16	101
Black-billed Magpie	8	0.57	35	3	0.70	38	0	---	---
Common Raven	2	0.15	63	1	0.45	101	0	---	---
Horned Lark	81	45.03	28	38	127.87	11	9	26.16	100
Rock Wren	1	0.16	83	0	---	---	0	---	---
House Wren	2	0.99	83	0	---	---	0	---	---
Ruby-crowned Kinglet	0	---	---	0	---	---	0	---	---
Mountain Bluebird	2	0.75	87	2	4.52	103	0	---	---
American Robin	0	0.58	85	0	---	---	36	111.87	102
Sage Thrasher	1	0.23	84	0	---	---	0	---	---
Yellow Warbler	8	1.64	64	0	---	---	1	1.07	101
Western Tanager	0	---	---	0	---	---	1	2.41	103
Green-tailed Towhee	6	2.37	69	0	---	---	0	---	---
Chipping Sparrow	0	---	---	0	---	---	1	4.02	101
Brewer's Sparrow	13	8.78	85	0	---	---	2	7.06	102
Vesper Sparrow	4	1.11	50	0	---	---	0	---	---
Lark Sparrow	17	5.93	44	4	8.44	100	0	---	---
Lark Bunting	92	23.21	38	2	3.05	101	0	---	---
Grasshopper Sparrow	29	16.18	64	0	---	---	0	---	---
Western Meadowlark	256	46.68	9	19	20.97	4	34	32.41	85
Brewer's Blackbird	8	7.11	85	1	5.38	102	0	---	---

***n** = number of observations used to estimate D; **D** = density estimate in birds/km^2; **CV** = % coefficient of variation of *D*

Table 10. Estimated population sizes (N) of 35 landbird species in Medicine Bow National Forest, Wyoming 2009.*

Species	N	CV	LCL	UCL
Mourning Dove	12,939	49	6,065	27,602
Northern Flicker	108,325	75	36,213	324,038
Western Wood-Pewee	47,839	33	28,243	81,032
Dusky Flycatcher	10,009	56	4,213	23,780
Warbling Vireo	208,472	69	74,246	585,363
Clark's Nutcracker	28,293	74	9,487	84,382
Black-billed Magpie	371	86	109	1,260
Common Raven	14,870	78	4,793	46,131
Horned Lark	11,501	78	3,705	35,699
Mountain Chickadee	462,815	32	276,771	773,916
Red-breasted Nuthatch	86,391	59	35,347	211,146
Rock Wren	78,873	72	27,290	227,957
House Wren	268,658	71	93,513	771,838
Ruby-crowned Kinglet	263,482	53	116,827	594,237
Mountain Bluebird	130,618	70	46,154	369,656
Swainson's Thrush	12,170	55	5,246	28,232
Hermit Thrush	85,138	21	60,337	120,133
American Robin	356,717	30	219,325	580,176
Yellow Warbler	8,489	32	5,063	14,232
Yellow-rumped Warbler	268,021	27	172,563	416,285
Western Tanager	123,268	61	48,890	310,797
Green-tailed Towhee	341,956	58	141,533	826,197
Spotted Towhee	13,209	53	5,859	29,779
Chipping Sparrow	45,766	40	24,177	86,633
Brewer's Sparrow	1,746	84	524	5,822
Vesper Sparrow	14,196	78	4,569	44,104
Lark Sparrow	77,609	87	22,635	266,100
Lincoln's Sparrow	30,539	59	12,422	75,078
White-crowned Sparrow	242,482	95	64,785	907,585
Dark-eyed Junco	559,437	44	281,932	1,110,089
Western Meadowlark	8,487	71	2,975	24,214
Brewer's Blackbird	202,296	86	59,499	687,804
Brown-headed Cowbird	20,822	43	10,508	41,258
Pine Siskin	315,300	32	187,687	529,679
Red Squirrel	496,647	62	195,535	1,261,456

***N**= number of individuals derived from density estimates, **CV** = % coefficient of variation of N, **LCL**= 90% lower confidence limit of N, **UCL**= 90% upper confidence limit of N.

Table 11. Estimated population sizes (N) of 40 landbird species in Shoshone National Forest, Wyoming 2009.*

Species	N	CV	LCL	UCL
Mourning Dove	18,775	38	10,195	34,575
Northern Flicker	34,709	23	23,920	50,364
Western Wood-Pewee	10,744	40	5,675	20,340
Dusky Flycatcher	132,148	69	47,372	368,637
Warbling Vireo	259,386	74	87,872	765,673
Clark's Nutcracker	73,123	47	35,167	152,045
Black-billed Magpie	6,432	37	3,559	11,624
Common Raven	18,065	25	12,105	26,960
Horned Lark	107,373	55	46,330	248,845
Mountain Chickadee	1,224,356	73	420,110	3,568,225
Red-breasted Nuthatch	206,436	72	70,901	601,063
Rock Wren	46,081	69	16,576	128,106
House Wren	82,504	48	38,894	175,010
Ruby-crowned Kinglet	437,604	47	208,976	916,359
Mountain Bluebird	33,472	36	18,880	59,343
Swainson's Thrush	99,364	43	50,711	194,697
Hermit Thrush	276,656	73	94,717	808,074
American Robin	515,859	53	226,505	1,174,854
Sage Thrasher	2,549	64	970	6,697
Yellow Warbler	19,334	49	9,063	41,247
Yellow-rumped Warbler	342,833	19	250,662	468,896
Ovenbird	2,096	83	634	6,933
Western Tanager	140,383	78	45,165	436,344
Green-tailed Towhee	39,815	46	19,421	81,627
Spotted Towhee	45,144	40	23,833	85,512
Chipping Sparrow	481,623	68	174,416	1,329,930
Brewer's Sparrow	196,583	38	107,063	360,955
Vesper Sparrow	73,450	41	38,149	141,415
Lark Sparrow	6,510	90	1,837	23,070
Sage Sparrow	3,563	90	1,007	12,604
Lark Bunting	6,594	84	1,980	21,962
Savannah Sparrow	7,876	94	2,137	29,034
Lincoln's Sparrow	201,597	78	64,665	628,494
White-crowned Sparrow	141,445	27	90,719	220,536
Dark-eyed Junco	776,148	46	379,972	1,585,395
Western Meadowlark	35,398	41	18,565	67,494
Brewer's Blackbird	53,068	55	22,657	124,298
Brown-headed Cowbird	2,733	90	774	9,654
Pine Siskin	546,459	67	201,504	1,481,940
Red Squirrel	273,403	31	165,036	452,926

***N**= number of individuals derived from density estimates, **CV** = % coefficient of variation of N, **LCL**= 90% lower confidence limit of N, **UCL**= 90% upper confidence limit of N.

Table 12. Estimated population sizes (N) of 39 landbird species in the Southern Rockies/ Colorado Plateau Bird Conservation Region (16), Wyoming 2009.*

Species	N	CV	LCL	UCL
Mourning Dove	1,503	71	526	4,293
Northern Flicker	1,273	29	793	2,043
Western Wood-Pewee	1,616	33	954	2,737
Dusky Flycatcher	2,661	56	1,123	6,307
Western Kingbird	489	45	241	994
Warbling Vireo	7,020	46	3,437	14,337
Clark's Nutcracker	259	33	153	437
Black-billed Magpie	119	46	58	246
Common Raven	585	24	395	867
Horned Lark	21,201	73	7,241	62,073
Mountain Chickadee	28,458	19	20,721	39,083
Red-breasted Nuthatch	4,348	24	2,956	6,395
Rock Wren	1,145	26	747	1,756
House Wren	5,650	43	2,868	11,131
Ruby-crowned Kinglet	6,261	36	3,552	11,037
Mountain Bluebird	5,812	42	2,984	11,319
Swainson's Thrush	411	55	177	954
Hermit Thrush	4,113	18	3,089	5,477
American Robin	8,880	25	5,950	13,252
Sage Thrasher	292	63	113	755
Yellow Warbler	1,500	82	460	4,893
Yellow-rumped Warbler	13,833	20	9,955	19,221
Western Tanager	1,944	34	1,120	3,374
Green-tailed Towhee	6,719	39	3,631	12,434
Spotted Towhee	3,814	86	1,125	12,928
Chipping Sparrow	5,775	61	2,286	14,592
Brewer's Sparrow	8,362	41	4,373	15,989
Vesper Sparrow	578	62	225	1,485
Lark Sparrow	1,132	35	643	1,992
Sage Sparrow	437	61	174	1,097
Lark Bunting	2,727	81	852	8,727
Lincoln's Sparrow	1,032	59	420	2,536
White-crowned Sparrow	469	90	133	1,658
Dark-eyed Junco	19,630	10	16,632	23,168
Western Meadowlark	8,074	50	3,700	17,618
Brewer's Blackbird	2,225	40	1,175	4,214
Brown-headed Cowbird	2,447	38	1,340	4,469
Pine Siskin	9,469	29	5,935	15,107
Red Squirrel	7,470	25	4,962	11,245

N= number of individuals derived from density estimates, **CV** = % coefficient of variation of N, **LCL**= 90% lower confidence limit of N, **UCL**= 90% upper confidence limit of N.

Table 13. Estimated population sizes (N) of 37 landbird species in the Badlands and Prairies Bird Conservation Region (17), Wyoming 2009.*

Species	N	CV	LCL	UCL
Mourning Dove	49,287	28	31,201	77,857
Northern Flicker	21,317	44	10,743	42,297
Western Wood-Pewee	56,833	39	30,771	104,967
Dusky Flycatcher	85,038	24	57,598	125,551
Western Kingbird	69,183	43	35,112	136,316
Warbling Vireo	244,110	25	163,893	363,589
Black-billed Magpie	7,056	55	3,019	16,493
Common Raven	15,549	69	5,549	43,572
Horned Lark	1,005,536	30	617,048	1,638,614
Mountain Chickadee	13,203	88	3,782	46,088
Red-breasted Nuthatch	209,370	17	158,129	277,215
Rock Wren	17,871	33	10,564	30,231
House Wren	57,494	50	26,595	124,293
Ruby-crowned Kinglet	47,407	32	28,453	78,988
Mountain Bluebird	81,483	49	37,841	175,455
Swainson's Thrush	28,121	50	12,956	61,037
American Robin	448,350	21	317,079	633,967
Sage Thrasher	44,219	87	12,860	152,045
Yellow Warbler	13,443	44	6,743	26,802
Yellow-rumped Warbler	182,190	26	118,830	279,332
Ovenbird	360,334	17	272,136	477,116
Western Tanager	87,078	31	52,715	143,841
Green-tailed Towhee	78,650	74	26,595	232,593
Spotted Towhee	34,155	48	16,232	71,866
Chipping Sparrow	498,354	21	354,099	701,376
Brewer's Sparrow	1,311,584	32	780,471	2,204,120
Vesper Sparrow	142,009	44	71,141	283,473
Lark Sparrow	65,706	46	32,084	134,561
Sage Sparrow	48,489	94	13,123	179,159
Lark Bunting	1,655,830	13	1,334,238	2,054,935
Grasshopper Sparrow	261,566	65	98,929	691,578
Dark-eyed Junco	250,193	26	165,120	379,097
Western Meadowlark	873,403	7	773,824	985,797
Brewer's Blackbird	122,228	57	50,880	293,628
Brown-headed Cowbird	289,158	20	209,648	398,822
Pine Siskin	90,741	60	36,553	225,258
Red Squirrel	124,126	41	65,051	236,847

N= number of individuals derived from density estimates, **CV** = % coefficient of variation of N, **LCL**= 90% lower confidence limit of N, **UCL**= 90% upper confidence limit of N.

Table 14. Estimated population sizes (N) of 22 landbird species in the Shortgrass Prairie Bird Conservation Region (18), Wyoming 2009.*

Species	N	CV	LCL	UCL
Mourning Dove	268	61	106	680
Northern Flicker	79	92	22	286
Western Kingbird	417	55	179	972
Black-billed Magpie	43	28	27	68
Common Raven	14	76	5	43
Horned Lark	4,554	16	3,491	5,941
Rock Wren	4	78	1	12
House Wren	23	83	7	75
Mountain Bluebird	210	96	56	792
American Robin	2,586	101	650	10,285
Sage Thrasher	5	88	1	17
Yellow Warbler	62	56	26	147
Western Tanager	56	102	14	224
Green-tailed Towhee	55	68	20	152
Chipping Sparrow	93	100	24	366
Brewer's Sparrow	364	65	136	971
Vesper Sparrow	25	52	11	56
Lark Sparrow	331	62	130	841
Lark Bunting	604	36	343	1,065
Grasshopper Sparrow	372	64	141	978
Western Meadowlark	2,301	28	1,466	3,611
Brewer's Blackbird	287	65	108	765

N= number of individuals derived from density estimates, **CV** = % coefficient of variation of N, **LCL**= 90% lower confidence limit of N, **UCL**= 90% upper confidence limit of N.

Table 15. Estimated site occupancy for species of concern detected in BCR 10, by strata, Wyoming 2009.*

	Bighorn National Forest					Shoshone National Forest					Rawlins BLM					Rocksprings BLM				
Species	**Psi**	**CV**	**LCL**	**UCL**	**T**	**Psi**	**CV**	**LCL**	**UCL**	**T**	**Psi**	**CV**	**LCL**	**UCL**	**T**	**Psi**	**CV**	**LCL**	**UCL**	**T**
White-throated Swift	0.11	95	0.00	0.38	1	0.09	68	0.01	0.25	2	0.00	---	---	---	---	0.00	---	---	---	---
Broad-tailed Hummingbird	0.13	95	0.00	0.46	1	0.12	68	0.01	0.33	2	0.00	---	---	---	---	0.00	---	---	---	---
Red-naped Sapsucker	0.16	96	0.00	0.53	1	0.29	48	0.07	0.58	4	0.00	---	---	---	---	0.00	---	---	---	---
American Three-toed Woodpecker	0.00	---	---	---	2	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---
Olive-sided Flycatcher	0.00	---	---	---	---	0.05	98	0.00	0.17	1	0.00	---	---	---	---	0.00	---	---	---	---
Cordilleran Flycatcher	0.72	33	0.22	1.00	5	0.06	99	0.00	0.23	1	0.00	---	---	---	---	0.00	---	---	---	---
Loggerhead Shrike	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---
Plumbeous Vireo	0.15	96	0.00	0.50	1	0.13	69	0.01	0.36	2	0.00	---	---	---	---	0.00	---	---	---	---
Brown Creeper	0.76	33	0.22	1.00	5	0.46	33	0.18	0.76	7	0.00	---	---	---	---	0.00	---	---	---	---
Golden-crowned Kinglet	0.13	96	0.00	0.45	1	0.06	99	0.00	0.21	1	0.00	---	---	---	---	0.00	---	---	---	---
Townsend's Solitaire	0.84	32	0.19	0.92	5	0.51	33	0.20	0.82	7	0.00	---	---	---	---	0.00	---	---	---	---
MacGillivray's Warbler	0.00	---	---	---	---	0.12	68	0.01	0.31	2	0.00	---	---	---	---	0.00	---	---	---	---
McCown's Longspur	0.00	---	---	---	---	0.00	---	---	---	---	0.27	61	0.03	0.62	2	0.13	94	0.00	0.45	1
Cassin's Finch	0.27	64	0.03	0.64	2	0.41	33	0.17	0.67	7	0.00	---	---	---		0.00	---	---	---	---
Red Crossbill	0.24	63	0.03	0.57	2	0.26	40	0.09	0.48	4	0.00	---	---	---		0.00	---	---	---	---

***Psi**= The proportion of 1-km^2 sampling units occupied by a species, **CV** = coefficient of variation of Psi, **LCL**= 95% lower confidence limit of Psi, **UCL**= 95% upper confidence limit of Psi, **T**=The number of transects on which the species was detected.

Table 16. Estimated site occupancy for species of concern detected in BCR 16, by strata, Wyoming 2009.*

	All Other Lands					Medicine Bow				
Species	**Psi**	**CV**	**LCL**	**UCL**	**T**	**Psi**	**CV**	**LCL**	**UCL**	**T**
White-throated Swift	0.00	---	---	---	---	0.00	---	---	---	---
Broad-tailed Hummingbird	0.15	95	0.00	0.49	1	0.42	34	0.16	0.69	7
Red-naped Sapsucker	0.17	96	0.00	0.56	1	0.50	35	0.18	0.82	7
American Three-toed Woodpecker	0.00	---	---	---	---	0.71	56	0.02	0.91	6
Olive-sided Flycatcher	0.00	---	---	---	---	0.18	46	0.00	0.37	4
Cordilleran Flycatcher	0.00	---	---	---	---	0.00	---	---	---	---
Loggerhead Shrike	0.65	73	0.00	0.92	2	0.00	---	---	---	---
Plumbeous Vireo	0.16	96	0.00	0.53	1	0.27	49	0.06	0.54	4
Brown Creeper	0.00	---	---	---	---	0.06	99	0.00	0.24	1
Golden-crowned Kinglet	0.00	---	---	---	---	0.17	56	0.03	0.39	3
Townsend's Solitaire	0.17	95	0.00	0.58	1	0.22	56	0.04	0.50	3
MacGillivray's Warbler	0.00	---	---	---	---	0.66	24	0.34	0.91	11
McCown's Longspur	0.12	95	0.00	0.40	1	0.00	---	---	---	---
Cassin's Finch	0.00	---	---	---	---	0.00	---	---	---	---
Red Crossbill	0.12	95	0.00	0.42	1	0.20	46	0.06	0.41	4

***Psi**= The proportion of 1-km^2 sampling units occupied by a species, **CV** = coefficient of variation of Psi, **LCL**= 95% lower confidence limit of Psi, **UCL**= 95% upper confidence limit of Psi, **T**=The number of transects on which the species was detected.

Table 17. Estimated site occupancy for species of concern detected in BCRs 17 and 18, by strata, Wyoming 2009.*

	All Other Lands BCR 17					Black Hills NF					Thunder Basin NG					All Other Lands BCR 18				
Species	**Psi**	**CV**	**LCL**	**UCL**	**T**	**Psi**	**CV**	**LCL**	**UCL**	**T**	**Psi**	**CV**	**LCL**	**UCL**	**T**	**Psi**	**CV**	**LCL**	**UCL**	**T**
White-throated Swift	0.00	---	---	---	---	0.11	95	0.00	0.38	1	0.00	---	---	---	---	0.00	---	---	---	---
Broad-tailed Hummingbird	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---
Red-naped Sapsucker	0.00	---	---	---	---	0.78	34	0.20	0.98	5	0.00	---	---	---	---	0.00	---	---	---	---
American Three-toed Woodpecker	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---
Olive-sided Flycatcher	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---
Cordilleran Flycatcher	0.00	---	---	---	---	0.58	40	0.15	0.94	4	0.00	---	---	---	---	0.00	---	---	---	---
Loggerhead Shrike	0.00	---	---	---	---	0.00	---	---	---	---	0.51	74	0.00	0.92	2	0.60	74	0.00	0.92	2
Plumbeous Vireo	0.00	---	---	---	---	0.59	40	0.15	0.95	4	0.00	---	---	---	---	0.00	---	---	---	---
Brown Creeper	0.21	94	0.00	0.66	1	0.28	64	0.03	0.66	2	0.00	---	---	---	---	0.00	---	---	---	---
Golden-crowned Kinglet	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---
Townsend's Solitaire	0.24	94	0.00	0.74	1	0.85	32	0.17	0.89	5	0.00	---	---	---	---	0.00	---	---	---	---
MacGillivray's Warbler	0.00	---	---	---	---	0.43	49	0.09	0.81	3	0.00	---	---	---	---	0.00	---	---	---	---
McCown's Longspur	0.16	94	0.00	0.52	1	0.00	---	---	---	---	0.00	---	---	---	---	0.11	95	0.00	0.39	---
Cassin's Finch	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---	0.00	---	---	---	---
Red Crossbill	0.00	---	---	---	---	0.81	21	0.41	1.00	7	0.00	---	---	---	---	0.00	---	---	---	---

***Psi**= The proportion of 1-km^2 sampling units occupied by a species, **CV** = coefficient of variation of Psi, **LCL**= 95% lower confidence limit of Psi, **UCL**= 95% upper confidence limit of Psi, **T**=The number of transects on which the species was detected.

DISCUSSION

This report provides BCR-wide density and population estimates for 43 landbird species in Wyoming using Distance sampling theory. It also provides occupancy estimates for an additional 15 species. Habitat-based monitoring in Wyoming yielded density estimates for 71 species in 2008 (Hanni et al. 2009) and 77 species in 2007 (White and Sparks 2008). These numbers are notably higher than those in this report because the density estimates comprised seven and six years, respectively, of pooled data for many of the habitats surveyed. This year, we were unable to estimate densities for 12 species with 40-60 detections each. We will likely be able to estimate density for these species in 2010, when we will be able to pool two years of data. Overall, we were able to determine densities for 28% of the species we detected during surveys. We expect this percentage to increase through additional sampling in the future.

We were able to estimate density and population size precisely (CV < 50%) for many species at the BCR-level. In addition, we obtained precise density estimates of many species for strata in which at least eight grids were sampled. Note the overall more precise estimates for the non-roadless portion of the Shoshone NF (n = 23 samples) and BCR 16 portion of the Medicine Bow NF (n = 24 samples) compared to other strata. Although we could not estimate statewide density using 2009 data, the ILM design will produce statewide density and population estimates in future years, given at least two samples are surveyed in each stratum within Wyoming.

For the first time, we used occupancy modeling to provide estimates for 15 Species of Concern with insufficient data to estimate density. The use of occupancy modeling as an additional analysis method greatly increases our effectiveness in monitoring Wyoming's species of concern. Although the confidence limits are wide for most of these 15 species, they provide an example of the types of species we have never been able to effectively monitor in the past. This new method for monitoring rarer and more difficult to detect species requires substantial planning and preparation of data and analysis techniques. As we further develop our methods for occupancy modeling we hope to increase the number of species we can generate occupancy estimates for and decrease the variation in our estimates. We believe additional analysis techniques, such as modeling approaches, can expand the coverage of bird species we are able to effectively monitor, thus providing a clearer picture of the health of bird populations on the whole.

Understanding species' population trends on multiple scales requires 10 to 30 years of density estimates (D). Eventually we will post-stratify 2009 samples by vegetation cover types, calculate density estimates for species with large enough sample sizes, and compare resulting estimates with historical estimates from the MWB (2002-2008) habitat-stratified samples.

We were able to complete 97% of our planned surveys this year, which is the highest completion rate we have had since the inception of MWB. Furthermore, unlike our current sampling design, the previous MWB monitoring design did not include private land. Bird monitoring programs in general have avoided private lands, citing increased workload to obtain permission and an overall lower completion rate. Our successful survey effort on private lands this year demonstrates that accessing private lands is possible and can be accomplished efficiently. We are actively improving our ability to contact landowners in a timely manner by hiring a landowner liaison and effectively managing a landowner database.

We considered 2009 to be a pilot year for the BCR design in Wyoming. In Wyoming we adequately sampled many breeding landbird species occurring in the state. We did, however, under-sample several Pinyon-Juniper woodland specialists previously detected under the original MWB sampling design. Some of these species (Juniper Titmouse, Ash-throated Flycatcher, Black-throated Gray Warbler and Scott's Oriole) are species of concern within Wyoming. We could better sample this habitat by increasing the sampling effort within strata where Pinyon-Juniper is most common (such as Kemmerer, Rock Springs and Worland BLM stratum). Alternatively, we could substratify strata based on a static physical attribute associated with Pinyon-Juniper.

The spatially-balanced sampling design in Wyoming, which contributes to regional, BCR-wide monitoring, serves as a model for other long-term monitoring efforts because of its ability to address the conservation and management needs of a wide range of stakeholders, landowners and governmental entities at both local and regional scales. Our ILM design represents one method for achieving effective collaboration and coordinated bird monitoring efforts in North America (NABCI 2007) and could be applied to other BCRs and regions across the continent.

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APPENDIX A

Species of concern detected in Wyoming by management designation: USDI Fish and Wildlife Service (USFWS), USDA Forest Service (USFS), USDI Bureau of Land Management (BLM), Partners in Flight (PIF) and Wyoming Game and Fish Department (WGFD).

	USFWS					USFS		PIF					
Species	**BCR10**	**BCR16**	**BCR17**	**BCR18**	**Region 6**	**Black Hills NF**	**Region 2**	**PIF-BCR10**	**PIF-BCR16**	**PIF-BCR17**	**PIF-BCR18**	**WY-PIF**	**WGFD**
Northern Pintail													SGCN
Ruffed Grouse						MIS		RS					
Greater Sage-Grouse							R2SS	CC,RC,CS,RS	CC,RC	CC,RC,CS,RS		WY-I	SGCN
Dusky Grouse								CC,RC	CC			WY-III	
American White Pelican												WY-II	SGCN
Great Blue Heron													SGCN
Bald Eagle												WY-I	SGCN, T
Northern Harrier		BCC		BCC	BCC		R2SS	RC		RC	RC	WY-III	
Sharp-shinned Hawk						SOLC							
Cooper's Hawk						SOLC							
Northern Goshawk							R2SS	RC,RS		RC		WY-I	SGCN
Swainson's Hawk	BCC	BCC			BCC			CC,RC	CC,RC	CC	CC,RS	WY-I	SGCN
Ferruginous Hawk	BCC	BCC	BCC	BCC	BCC		R2SS	RC	RC	RC,RS	RC,RS	WY-I	SGCN
Golden Eagle	BCC	BCC	BCC		BCC				RC	RC		WY-III	
Peregrine Falcon	BCC	BCC	BCC	BCC	BCC		R2SS					WY-I	SGCN
Prairie Falcon	BCC	BCC	BCC	BCC	BCC				RC		RC	WY-III	
Sandhill Crane													SGCN
Mountain Plover	BCC	BCC	BCC	BCC	BCC		R2SS					WY-I	SGCN
American Avocet												WY-III	
Willet												WY-III	
Upland Sandpiper	BCC		BCC		BCC							WY-I	SGCN
Wilson's Phalarope	BCC	BCC	BCC		BCC							WY-I	
Burrowing Owl		BCC	BCC	BCC	BCC		R2SS			RC	RC,RS	WY-I	SGCN
Short-eared Owl		BCC	BCC		BCC		R2SS	CC		CC,RC	CC	WY-I	SGCN
Common Nighthawk									RC		RC		
Common Poorwill												WY-III	
White-throated Swift								CC	CC,RS	CC	CC	WY-II	
Broad-tailed Hummingbird									RS			WY-II	
Lewis's Woodpecker	BCC	BCC	BCC	BCC	BCC		R2SS	CC,RC	CC,RC,CS,RS	CC,RC	CC,RC	WY-II	SGCN

	USFWS					USFS		PIF					
Species	**BCR10**	**BCR16**	**BCR17**	**BCR18**	**Region 6**	**Black Hills NF**	**Region 2**	**PIF-BCR10**	**PIF-BCR16**	**PIF-BCR17**	**PIF-BCR18**	**WY-PIF**	**WGFD**
Red-headed Woodpecker					BCC					CC,RC	CC,RC	WY-III	
Williamson's Sapsucker	BCC	BCC			BCC			CS,RS	CS,RS			WY-II	
Red-naped Sapsucker	BCC		BCC		BCC			CS,RS				WY-II	
American Three-toed Woodpecker							R2SS					WY-II	SGCN
Black-backed Woodpecker						MIS	R2SS			RC		WY-II	SGCN
Olive-sided Flycatcher							R2SS	CC,RC	CC			WY-II	
Dusky Flycatcher								CS,RS				WY-II	
Cordilleran Flycatcher									RS			WY-II	
Say's Phoebe									RS	RS	RS	WY-III	
Loggerhead Shrike	BCC				BCC		R2SS	RC	RC	RC	RC	WY-II	
Plumbeous Vireo									RS			WY-II	
Warbling Vireo									RS				
Pinyon Jay		BCC						CC	CC,RC,CS,RS	CC,RC	CC		
Clark's Nutcracker								CS,RS	CS,RS			WY-III	
Black-billed Magpie									RS	RC			
Violet-green Swallow									RS				
Northern Rough-winged Swallow										RC		WY-III	
Pygmy Nuthatch	BCC					SOLC			RC			WY-II	SGCN
Brown Creeper						MIS						WY-II	
Rock Wren									RS			WY-III	
Canyon Wren									RC			WY-III	
Marsh Wren												WY-II	
Golden-crowned Kinglet						MIS		RS				WY-II	
Western Bluebird									RS			WY-II	
Mountain Bluebird									RC,CS,RS	RC			
Townsend's Solitaire								RS				WY-II	
Veery												WY-III	
Sage Thrasher										RC		WY-II	SGCN
Yellow Warbler											RC		
Ovenbird												WY-III	
MacGillivray's Warbler												WY-II	
Wilson's Warbler												WY-II	
Green-tailed Towhee									CS,RS				
Brewer's Sparrow	BCC		BCC		BCC		R2SS	CC,RC	CC,RC	CC,RC	CC,RC	WY-I	SGCN
Vesper Sparrow										RC		WY-II	

	USFWS					USFS		PIF					
Species	**BCR10**	**BCR16**	**BCR17**	**BCR18**	**Region 6**	**Black Hills NF**	**Region 2**	**PIF-BCR10**	**PIF-BCR16**	**PIF-BCR17**	**PIF-BCR18**	**WY-PIF**	**WGFD**
Lark Sparrow											RC	WY-II	
Sage Sparrow		BCC					R2SS		RC			WY-I	SGCN
Lark Bunting				BCC				RC		RC,CS,RS	RC,CS,RS	WY-II	SGCN
Grasshopper Sparrow			BCC		BCC	MIS	R2SS			RC,CS,RS	RC,CS,RS	WY-II	SGCN
Song Sparrow						MIS							
McCown's Longspur	BCC			BCC	BCC		R2SS	CC,RC		CC,RC,CS,RS	CC,CS,RS	WY-I	SGCN
Lazuli Bunting								RS				WY-III	
Western Meadowlark										RS	RS		
Bullock's Oriole												WY-III	
Black Rosy-Finch								CC,CS,RS	CC			WY-III	SGCN
Cassin's Finch								RC,CS,RS	RC				
Red Crossbill								RS					
Pine Siskin									RC,RS				

Management	**Code**	**Definition**
US Fish and Wildlife Service (BCR X)	BCC	Birds of Conservation Concern for BCR X
US Fish and Wildlife Service (Region 6)	BCC	Birds of Conservation Concern for Region 6 (Mountain-Prairie)
US Forest Service (Region 2)	R2SS	US Forest Service Region 2 Sensitive Species
Bureau of Land Management (BLM)	SS	BLM Sensitive Species
PIF Species Assessment Database 2005: BCR X (PIF-BCRX)	CC	Continental Concern
PIF Species Assessment Database 2005: BCR X (PIF-BCRX)	CS	Continental Stewardship
PIF Species Assessment Database 2005: BCR X (PIF-BCRX)	RC	Regional Concern
PIF Species Assessment Database 2005: BCR X (PIF-BCRX)	RS	Regional Stewardship
Wyoming Partners in Flight (WY PIF)	WY-I	Wyoming Partners in Flight Level I Priority (Conservation Action)
Wyoming Partners in Flight (WY PIF)	WY-II	Wyoming Partners in Flight Level II Priority (Monitoring)
Wyoming Partners in Flight (WY PIF)	WY-III	Wyoming Partners in Flight Level III Priority (Local Interest)
Wyoming Game and Fish Dept. (WGFD)	SGCN	Species of Greatest Conservation Need (Wyoming Comprehensive Wildlife Conservation Plan 2005)

APPENDIX B

Number of birds detected in the Great Basin Bird Conservation Region (9), Wyoming, 2009.

Species	BCR 9
Ruffed Grouse	1
Dusky Grouse	3
Red-tailed Hawk	1
Mourning Dove	4
Red-naped Sapsucker	2
Downy Woodpecker	1
Hairy Woodpecker	6
Northern Flicker	3
Western Wood-Pewee	18
Dusky Flycatcher	2
Warbling Vireo	22
Clark's Nutcracker	7
Common Raven	2
Tree Swallow	6
Black-capped Chickadee	12
Mountain Chickadee	19
Red-breasted Nuthatch	32
White-breasted Nuthatch	1
House Wren	22
Ruby-crowned kinglet	34
Mountain Bluebird	3
Townsend's Solitaire	1
Swainson's Thrush	22
American Robin	29
Yellow-rumped Warbler	18
MacGillivray's Warbler	8

Species	BCR 9
Wilson's Warbler	5
Western Tanager	33
Green-tailed Towhee	5
Spotted Towhee	7
Chipping Sparrow	25
Fox Sparrow	1
Song Sparrow	3
Lincoln's Sparrow	5
White-crowned Sparrow	25
Dark-eyed Junco	38
Black-headed Grosbeak	4
Blue Grosbeak	1
Brown-headed Cowbird	5
Cassin's Finch	3
Pine Siskin	41
Points Surveyed*	**24**

*The sampling unit was a grid of 16 points; however, because not all points were completed within each grid, the number of points are provided here.

APPENDIX C

Number of birds detected in Wyoming by stratum in the Northern Rockies Bird Conservation Region (10), 2009.

	Other Lands	BLM								
Species	**ALL OTHER**	**BUFFALO**	**CASPER**	**CODY**	**KEMMERER**	**LANDER**	**PINEDALE**	**RAWLINS**	**WORLAND**	**ROCK SPRINGS**
Canada Goose								6		
Mallard	1									
Blue-winged Teal										
Cinnamon Teal	1									
Northern Shoveler	1									
Northern Pintail	1									
Green Winged Teal							1			
Chukar				1						
Ring-necked Pheasant									2	
Ruffed Grouse										
Greater Sage Grouse										
Dusky Grouse										
Great Blue Heron										
Turkey Vulture						1		2		
Northern Harrier								1		
Sharp-shinned Hawk										
Cooper's Hawk		1								
Swainsons Hawk								1		
Red-tailed Hawk										
Ferruginous Hawk										
Golden Eagle			1					4		1
American Kestrel										
Prairie Falcon						1				

	Other Lands	BLM								
Species	**ALL OTHER**	**BUFFALO**	**CASPER**	**CODY**	**KEMMERER**	**LANDER**	**PINEDALE**	**RAWLINS**	**WORLAND**	**ROCK SPRINGS**
Sandhill Crane							3			
Killdeer	1		2							
Mountain Plover								9		
American Avocet	9						1			
Spotted Sandpiper										
Willet	16				3		7	1		
Wilson's Snipe										
Wilson's Phalarope	1									
California Gull								1		
Eurasian Collared-Dove										
Mourning Dove					1	8	4	7		9
Great Horned Owl										
Common Nighthawk					1					1
White-throated Swift										
Broad-tailed Hummingbird		1								
Red-headed Woodpecker										
William's Sapsucker						1				
Red-naped Sapsucker		1				1				
Downy Woodpecker										
Hairy Woodpecker		2				1				
American Three-toed Woodpecker										
Northern Flicker						12		3		
Olive-sided Flycatcher						1				
Western Wood-Pewee						2				
Least Flycatcher										
Dusky Flycatcher					1	20				
Cordilleran Flycatcher										
Say's Phoebe				1		1				1
Western Kingbird								2	1	

	Other Lands	BLM								
Species	**ALL OTHER**	**BUFFALO**	**CASPER**	**CODY**	**KEMMERER**	**LANDER**	**PINEDALE**	**RAWLINS**	**WORLAND**	**ROCK SPRINGS**
Eastern Kingbird									1	
Loggerhead Shrike					1					
Plumbeous Vireo						2				
Warbling Vireo						4				1
Red-eyed Vireo										
Gray Jay										
Stellar's Jay		1								
Clark's Nutcracker										
Black-billed Magpie							1	2		6
American Crow										
Common Raven		5		11	2	5	11	33	6	10
Horned Lark	52		22	4	13		185	233	5	86
Tree Swallow								1		1
Violet-green Swallow								6		
Cliff Swallow										1
Barn Swallow										
Black-capped Chickadee										
Mountain Chickadee		1				8				
Red-breasted Nuthatch		3				3				
White-breasted Nuthatch						1				
Brown Creeper		1								
Rock Wren				15	2	38	6	7	2	19
Canyon Wren										
House Wren						4				1
Golden-crowned Kinglet										
Ruby-crowned Kinglet		12				15				
Mountain Bluebird						15	8	5	4	2
Townsend's Solitaire		2				1				
Swainson's Thrush										

	Other Lands	BLM								
Species	**ALL OTHER**	**BUFFALO**	**CASPER**	**CODY**	**KEMMERER**	**LANDER**	**PINEDALE**	**RAWLINS**	**WORLAND**	**ROCK SPRINGS**
Hermit Thrush		8								
American Robin		5				27		1		3
Sage Thrasher	5			1	34	1	108	36	5	43
Brown Thrasher										
European Starling								1		
American Pipit										
Cedar Waxwing		1								
Orange-crowned Warbler						2				
Yellow Warbler						3				3
Yellow-rumped Warbler		9				8				
Ovenbird										
MacGillivray's Warbler						4				
Common Yellowthroat										
Wilson's Warbler										
Western Tanager						1				
Green-tailed Towhee					6	43	2	12	17	10
Spotted Towhee						1				
Chipping Sparrow		1				27			1	1
Brewer's Sparrow	30		19	26	41	9	235	154	38	106
Vesper Sparrow	5		14	17	6	20	67	31	23	52
Lark Sparrow	1					3			7	
Sage Sparrow				4	18	6	177	50		61
Lark Bunting	2		22	9				2		
Savannah Sparrow								1		
Fox Sparrow										
Song Sparrow						4				1
Lincoln's Sparrow						9				3
White-crowned Sparrow						3			15	
Dark-eyed Junco		3				8				

	Other Lands	BLM								
Species	**ALL OTHER**	**BUFFALO**	**CASPER**	**CODY**	**KEMMERER**	**LANDER**	**PINEDALE**	**RAWLINS**	**WORLAND**	**ROCK SPRINGS**
McCown's Longspur								22		1
Lazuli Bunting						1				
Red-winged Blackbird	1									
Western Meadowlark	27		16	22	6	6	9	67	21	6
Brewer's Blackbird	2				1	3		8	1	10
Common Grackle									1	
Brown-headed Cowbird				1		3		2		
Black Rosy Finch										
Pine Grosbeak										
Cassin's Finch		1				6				
House Finch						1				
Red Crossbill										
Pine Siskin		2				5				1
American Goldfinch										
Points Surveyed*	**12**	**6**	**16**	**13**	**28**	**31**	**128**	**109**	**20**	**110**

*The sampling unit was a grid of 16 points; however, because not all points were completed within each grid, the number of points are provided here.

Number of birds detected in Wyoming by stratum in the Northern Rockies Bird Conservation Region (10), 2009 continued.

	National Forest					National Park	
Species	**MEDBOW[1]**	**BIGHORN**	**SHOSHONE**	**SHOS-RDLESS[2]**	**USFSR4[3]**	**TETON**	**YELLOWSTONE**
Canada Goose			1				
Mallard			5				
Blue-winged Teal							3
Cinnamon Teal							
Northern Shoveler							
Northern Pintail							
Green Winged Teal							
Chukar							
Ring-necked Pheasant							
Ruffed Grouse			1	2			
Greater Sage Grouse	1						
Dusky Grouse	2		1				
Great Blue Heron			2				
Turkey Vulture			3				
Northern Harrier		2					
Sharp-shinned Hawk		1	2				
Cooper's Hawk		1	2				
Swainsons Hawk							
Red-tailed Hawk		2	6	1	1	1	
Ferruginous Hawk			1				
Golden Eagle			1				
American Kestrel	1	1	4				
Prairie Falcon			1				

[1] MEDBOW= Medicine Bow NF
[2] SHOS-RDLESS= Shoshone Roadless
[3] USFSR4= US Forest Service Region 4

	National Forest					National Park	
Species	**MEDBOW[1]**	**BIGHORN**	**SHOSHONE**	**SHOS-RDLESS[2]**	**USFSR4[3]**	**TETON**	**YELLOWSTONE**
Sandhill Crane						1	
Killdeer							
Mountain Plover							
American Avocet							
Spotted Sandpiper							5
Willet							
Wilson's Snipe							3
Wilson's Phalarope							
California Gull							
Eurasian Collared-Dove		1					
Mourning Dove	1		38				1
Great Horned Owl			1				
Common Nighthawk			2				
White-throated Swift		3	14				
Broad-tailed Hummingbird	1	1	2	1			
Red-headed Woodpecker			1				
William's Sapsucker		2	1				
Red-naped Sapsucker	1	2	5				
Downy Woodpecker		2	5	1			
Hairy Woodpecker	4	7	20	2	2		1
American Three-toed Woodpecker	2	2					
Northern Flicker	8	7	39		3	6	
Olive-sided Flycatcher			3				1
Western Wood-Pewee		3	8		1	10	3
Least Flycatcher			3				
Dusky Flycatcher		12	22	3		1	2
Cordilleran Flycatcher		14	2				
Say's Phoebe							
Western Kingbird							

	National Forest					National Park	
Species	**MEDBOW[1]**	**BIGHORN**	**SHOSHONE**	**SHOS-RDLESS[2]**	**USFSR4[3]**	**TETON**	**YELLOWSTONE**
Eastern Kingbird			1				
Loggerhead Shrike							
Plumbeous Vireo		1	2				
Warbling Vireo	6	5	39	9	2	1	3
Red-eyed Vireo			1				
Gray Jay		7	8		1		3
Stellar's Jay			1		7		
Clark's Nutcracker	2	12	47	6	3	3	10
Black-billed Magpie		1	24				
American Crow			15				
Common Raven	4	20	67			2	2
Horned Lark		2	53				
Tree Swallow		2	6			2	
Violet-green Swallow		3	6				
Cliff Swallow			2			1	7
Barn Swallow			23				
Black-capped Chickadee			11			10	
Mountain Chickadee	3	64	86	20	27	1	19
Red-breasted Nuthatch	2	7	24	6	11	4	12
White-breasted Nuthatch		1	3	1			
Brown Creeper		17	12		1		
Rock Wren	9	6	36	7			
Canyon Wren			1				
House Wren	10	14	28	2		9	1
Golden-crowned Kinglet		1	1		3		
Ruby-crowned Kinglet	6	79	122	9	9	6	21
Mountain Bluebird	6	5	30			2	1
Townsend's Solitaire		9	14	2	2		4
Swainson's Thrush			38	1	4		16

			National Forest			National Park	
Species	**MEDBOW[1]**	**BIGHORN**	**SHOSHONE**	**SHOS-RDLESS[2]**	**USFSR4[3]**	**TETON**	**YELLOWSTONE**
Hermit Thrush		62	76	20	12	1	12
American Robin	11	84	138	13	7	2	39
Sage Thrasher			3			9	
Brown Thrasher			1				
European Starling							
American Pipit		1	44	1			
Cedar Waxwing							
Orange-crowned Warbler							
Yellow Warbler		1	16	1			
Yellow-rumped Warbler	2	78	113	6	11	2	20
Ovenbird			2				
MacGillivray's Warbler			2	1	3		1
Common Yellowthroat	3		2				
Wilson's Warbler		1	1	1			1
Western Tanager	4	6	23	9	22	4	6
Green-tailed Towhee	23	11	38			3	
Spotted Towhee		2	35	1	2		5
Chipping Sparrow		22	57	11	2		16
Brewer's Sparrow			84			26	
Vesper Sparrow	1		75			10	
Lark Sparrow	7		5				
Sage Sparrow		1	2				
Lark Bunting			7				
Savannah Sparrow			1				71
Fox Sparrow					1		
Song Sparrow	1		6		1		5
Lincoln's Sparrow		8	20	3	1	2	7
White-crowned Sparrow	13	5	56	2	7	1	1
Dark-eyed Junco	8	111	104	13	45	13	19

	National Forest					National Park	
Species	**MEDBOW[1]**	**BIGHORN**	**SHOSHONE**	**SHOS-RDLESS[2]**	**USFSR4[3]**	**TETON**	**YELLOWSTONE**
McCown's Longspur							
Lazuli Bunting		1					
Red-winged Blackbird			4				
Western Meadowlark			60			7	
Brewer's Blackbird	5		17				
Common Grackle							
Brown-headed Cowbird		3	1			1	
Black Rosy Finch			6	5			
Pine Grosbeak		3			3		
Cassin's Finch		4	11	3			2
House Finch			1				
Red Crossbill		2	7		1		
Pine Siskin	2	29	41	5	10	3	22
American Goldfinch	1	1	9				
Points Surveyed*	**16**	**117**	**256**	**25**	**19**	**18**	**32**

*The sampling unit was a grid of 16 points; however, because not all points were completed within each grid, the number of points are provided here.

APPENDIX D

Number of birds detected in Wyoming by stratum in the Southern Rockies/Colorado Plateau Bird Conservation Region (16), 2009.

	BLM	Other Lands	National Forest	
Species	**ALLBLM**	**ALLOTHER**	**MEDBOW**	**WASATCH**
Blue-winged Teal	1			
Wild Turkey			2	
Great Blue Heron		2		
Turkey Vulture		3		
Bald Eagle	1			
Cooper's Hawk	1			
Red-tailed Hawk	2	6	1	
Ferruginous Hawk		2		
Golden Eagle	3	5		
American Kestrel	1	6	5	
Peregrine Falcon			1	
Prairie Falcon		1		
American Coot	1			
Killdeer	2	6		
Spotted Sandpiper			1	
Willet			1	
Wilson's Snipe				1
Wilson's Phalarope	1			
Mourning Dove	8	8	25	
Common Nighthawk	1	6		
Common Poorwill			1	
White-throated Swift	1			
Broad-tailed Hummingbird	1	2	19	2
Belted Kingfisher			1	
William's Sapsucker			3	
Red-naped Sapsucker		1	15	
Downy Woodpecker			7	
Hairy Woodpecker			69	5
American Three-toed Woodpecker			14	
Northern Flicker		6	46	
Olive-sided Flycatcher			23	
Western Wood-Pewee			57	
Dusky Flycatcher	5	13	6	
Say's Phoebe	3	1		
Western Kingbird		15	1	

	BLM	Other Lands	National Forest	
Species	**ALLBLM**	**ALLOTHER**	**MEDBOW**	**WASATCH**
Eastern Kingbird			1	
Loggerhead Shrike		5		
Plumbeous Vireo	2	1	15	
Warbling Vireo		21	44	6
Red-eyed Vireo		1	3	
Gray Jay				2
Stellar's Jay		1	2	
Pinyon Jay		2	1	
Clark's Nutcracker			11	
Black-billed Magpie		8	2	
American Crow			3	
Common Raven	1	14	18	6
Horned Lark	28	65	8	
Tree Swallow			1	
Violet-green Swallow		4	3	
Black-capped Chickadee			16	
Mountain Chickadee		14	147	13
Red-breasted Nuthatch		5	26	6
White-breasted Nuthatch		3	6	
Pygmy Nuthatch			4	
Brown Creeper			1	
Rock Wren	1	11	62	
Canyon Wren			1	
House Wren		33	65	
Golden-crowned Kinglet			10	
Ruby-crowned Kinglet			92	10
Blue-gray Gnatcatcher	13			
Western Bluebird		1	1	
Mountain Bluebird	4	38	25	2
Townsend's Solitaire		2	6	
Veery			1	
Swainson's Thrush			11	
Hermit Thrush		2	130	17
American Robin		16	140	6
Sage Thrasher		7		
Cedar Waxwing			2	
Yellow Warbler	6		18	
Yellow-rumped Warbler		20	155	14
Ovenbird			1	
MacGillivray's Warbler			30	
Common Yellowthroat			56	

	BLM	Other Lands	National Forest	
Species	**ALLBLM**	**ALLOTHER**	**MEDBOW**	**WASATCH**
Wilson's Warbler			15	
Yellow-breasted Chat	13			
Western Tanager		2	57	
Green-tailed Towhee	6	24	109	
Spotted Towhee	13	3	24	
Chipping Sparrow		33	28	
Clay-colored Sparrow		2		
Brewer's Sparrow	4	55	3	
Vesper Sparrow		9	5	
Lark Sparrow		15	14	
Sage Sparrow		5		
Lark Bunting		63		
Song Sparrow		1	12	
Lincoln's Sparrow			10	
White-crowned Sparrow			11	
Dark-eyed Junco		1	160	17
McCown's Longspur		1		
Black-headed Grosbeak			2	
Lazuli Bunting			1	
Red-winged Blackbird	4		13	
Western Meadowlark	28	178	21	
Brewer's Blackbird		8	19	
Brown-headed Cowbird		13	13	
Pine Grosbeak			7	
Red Crossbill		7	12	17
Pine Siskin			63	3
American Goldfinch		2	4	
Evening Grosbeak			1	
Points Surveyed*	**21**	**113**	**237**	**32**

*The sampling unit was a grid of 16 points; however, because not all points were completed within each grid, the number of points are provided here.

APPENDIX E

Number of birds detected in the Badlands and Prairies Bird Conservation Region (17), Wyoming, 2009.

Species	All Other Lands ALLOTHER	BUFFALO	BLM CASPER	NEWCASTLE	National Forest BLACKHILLS	National Grassland THUNDERBASIN
Canada Goose	5					
Mallard		1				
Green-winged Teal						1
Ruffed Grouse					1	
Wild Turkey					5	
Turkey Vulture	2	1	2		1	1
Northern Harrier						3
Northern Goshawk					2	
Swainson's Hawk	1	1	3			
Red-tailed Hawk	2			1	5	3
Ferruginous Hawk	2		2			
Golden Eagle	1		3			
American Kestrel	2	1	6		3	
Prairie Falcon			1			
Killdeer	2					7
Upland Sandpiper				1		
California Gull			1			
Mourning Dove	11	3	5	1	1	30
Great-horned Owl	2					
Common Nighthawk		3			2	
White-throated Swift					1	
Lewis' Woodpecker					2	
Red-naped Sapsucker					12	
Downy Woodpecker					4	
Hairy Woodpecker	2				10	
Black-backed Woodpecker					1	
Northern Flicker	3				13	1
Western Wood-Pewee			4		21	
Dusky Flycatcher	4				19	
Cordilleran Flycatcher					9	
Say's Phoebe						3
Western Kingbird	9		14	1		6

Species	All Other Lands ALLOTHER	BUFFALO	BLM CASPER	NEWCASTLE	National Forest BLACKHILLS	National Grassland THUNDERBASIN
Eastern Kingbird	1				3	3
Loggerhead Shrike	1		1	1		2
Plumbeous Vireo					12	
Warbling Vireo					89	
Red-eyed Vireo					7	
Gray Jay					4	
Blue Jay					5	
Pinyon Jay	1					
Black-billed Magpie	5		4			
American Crow					12	
Common Raven	5	6	2			
Horned Lark	73	25	26	1		80
Tree Swallow	1					
Violet-green Swallow		2	3		3	
Cliff Swallow	4					
Barn Swallow	1	1			1	
Black-capped Chickadee	10				28	
Mountain Chickadee						5
Red-breasted Nuthatch	2				70	
White-breasted Nuthatch	6				9	
Brown Creeper	1				5	
Rock Wren	3				7	15
House Wren	9				13	
Ruby-crowned Kinglet					18	
Blue-gray Gnatcatcher	2					
Eastern Bluebird					1	
Mountain Bluebird	5	2	1		22	
Townsend's Solitaire	1				6	
Swainson's Thrush	1				9	
American Robin	25	3			119	1
Gray Catbird	1					
Sage Thrasher		7	2			
European Starling	2					
Cedar Waxwing	3				3	
Yellow Warbler	4		1		5	
Chestnut-sided Warbler					1	
Yellow-rumped Warbler	15				42	
American Redstart					56	

Species	All Other Lands ALLOTHER	BUFFALO	BLM CASPER	NEWCASTLE	National Forest BLACKHILLS	National Grassland THUNDERBASIN
Ovenbird					145	
MacGillivray's Warbler					9	
Common Yellowthroat	3				2	
Western Tanager	3				40	1
Green-tailed Towhee	4	6	2			
Spotted Towhee					15	13
Chipping Sparrow	15	2	3		93	11
Brewer's Sparrow	57	39	36			64
Vesper's Sparrow	24	7			17	30
Lark Sparrow	11		6		5	5
Sage Sparrow	1	4				
Lark Bunting	111	38	1	64		626
Grasshopper Sparrow	6		7	6		18
Song Sparrow					1	
Dark-eyed Junco	8				50	
McCown's Longspur	1					
Black-headed Grosbeak					14	
Red-winged Blackbird	9					5
Western Meadowlark	134	32	103	19	3	419
Brewer's Blackbird	8	3				13
Brown-headed Cowbird	16				50	24
Bullock's Oriole			1			
Red Crossbill					19	
Pine Siskin					11	
American Goldfinch	2	2			1	
points surveyed*	**73**	**22**	**36**	**12**	**115**	**136**

*The sampling unit was a grid of 16 points; however, because not all points were completed within each grid, the number of points are provided here.

APPENDIX F

Number of birds detected in the Shortgrass Prairie Bird Conservation Region (18), Wyoming, 2009.

Species	BLM	All Other Lands	Department of Defense
Canada Goose		1	1
Great Blue Heron		1	
Turkey Vulture	2	5	3
Swainson's Hawk		2	4
Red-tailed Hawk	1	4	
Ferruginous Hawk	1	7	
Golden Eagle	2	3	
American Kestrel		10	1
Prairie Falcon		1	
Killdeer	4	2	2
Mountain Plover	3		
California Gull		1	
Rock Pigeon			4
Eurasian Collared-Dove			1
Mourning Dove		15	14
Downy Woodpecker			1
Northern Flicker		2	3
Say's Phoebe		1	
Western Kingbird	7	35	1
Eastern Kingbird	1	6	
Loggerhead Shrike	1	5	
Black-billed Magpie	3	8	
American Crow		2	3
Common Raven	1	2	
Horned Lark	38	82	9
Violet-green Swallow	1	2	
Rock Wren		1	
House Wren		2	
Blue-gray Gnatcatcher		1	
Western Bluebird		1	
Mountain Bluebird	2	3	
American Robin		1	37
Sage Thrasher		1	
European Starling		2	31
Yellow Warbler		8	1

Species	BLM	All Other Lands	Department of Defense
Western Tanager			1
Green-tailed Towhee		7	
Chipping Sparrow			1
Brewer's Sparrow		18	2
Vesper's Sparrow		4	
Lark Sparrow	4	19	
Lark Bunting	2	97	
Grasshopper Sparrow		29	
McCown's Longspur		3	
Red-winged Blackbird		2	2
Western Meadowlark	49	327	37
Brewer's Sparrow	1	8	
Common Grackle			4
Bullock's Oriole		4	
House Finch			8
American Goldfinch			2
House Sparrow			4
Points Surveyed*	**19**	**115**	**22**

*The sampling unit was a grid of 16 points; however, because not all points were completed within each grid, the number of points are provided here.