Integrated Monitoring in Bird Conservation Regions (IMBCR):

2018 Field Season Report

July 2019

Bird Conservancy of the Rockies
Connecting People, Birds and Land

Bird Conservancy of the Rockies
14500 Lark Bunting Lane
Brighton, CO 80603
303-659-4348
www.birdconservancy.org
Tech. Report # SC-IMBCR-09

Bird Conservancy of the Rockies

Connecting people, birds and land

Mission: Conserving birds and their habitats through science, education and land stewardship

Vision: Native bird populations are sustained in healthy ecosystems

Bird Conservancy of the Rockies conserves birds and their habitats through an integrated approach of science, education, and land stewardship. Our work radiates from the Rockies to the Great Plains, Mexico and beyond. Our mission is advanced through sound science, achieved through empowering people, realized through stewardship, and sustained through partnerships. Together, we are improving native bird populations, the land, and the lives of people.

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.

Goals:

1. Guide conservation action where it is needed most by conducting scientifically rigorous monitoring and research on birds and their habitats within the context of their full annual cycle.
2. Inspire conservation action in people by developing relationships through community outreach and science-based, experiential education programs.
3. Contribute to bird population viability and help sustain working lands by partnering with landowners and managers to enhance wildlife habitat.
4. Promote conservation and inform land management decisions by disseminating scientific knowledge and developing tools and recommendations.

Suggested Citation:
Drilling, N. E., J. M. Timmer, A.W. Green, M. F. McLaren, B. J. Woiderski, C. M. White, N. J. Van Lanen, D.C. Pavlacky Jr., and R. A. Sparks. 2019. Integrated Monitoring in Bird Conservation Regions (IMBCR): 2018 Field Season Report. Bird Conservancy of the Rockies. Brighton, Colorado, USA.

Cover Photo:
Lark Bunting by Bill Schmoker

Contact Information:
Matthew McLaren
matthew.mclaren@birdconservancy.org
Bird Conservancy of the Rockies
14500 Lark Bunting Lane
Brighton, CO 80603
970-482-1707

Executive Summary

Bird Conservancy of the Rockies (Bird Conservancy), in conjunction with its partners, conducted the eleventh consecutive year of landbird monitoring for the Integrated Monitoring in Bird Conservation Regions (IMBCR) program. IMBCR uses a spatially balanced sampling design which allows inferences to avian species occurrence and population sizes at various scales, from local management units to entire BCRs or states, facilitating conservation at local and national levels. The sampling design allows analysts to estimate species densities, population sizes, occupancy rates, and trends for individual strata or biologically meaningful combinations of strata. The IMBCR design provides a spatially consistent and flexible framework for understanding the status and annual changes of bird populations. Collaboration across organizations and spatial scales increases sample sizes and improves the accuracy and precision of population estimates. Analyzing the data collectively allows us to estimate detection probabilities for species that would otherwise have insufficient numbers of detections at local scales.

In 2018, the IMBCR program's area of inference encompassed four entire states (Colorado, Montana, Utah, and Wyoming) and portions of 10 additional states (California, Idaho, Kansas, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, South Dakota, and Texas). We surveyed across US Forest Service (USFS) Regions 1, 2, and 4 and in portions of Region 3; all of the Badlands and Prairies Bird Conservation Region (BCR 17), all of the Shortgrass Prairie Bird Conservation Region (BCR 18), and portions of seven other BCRs: Great Basin (9), Northern Rockies (10), Prairie Potholes (11), Sierra Nevada (15), Southern Rockies/Colorado Plateau (16), Central Mixed Grass Prairie (19), and Sonoran and Mojave Deserts (33). Observers conducted 18,111 point counts within the 1,628 surveyed sampling units between April 22 and July 19, 2018. They detected 237,046 individual birds representing 336 species.

This report summarizes the results of the 2018 field season. To view interactive maps illustrating survey and detection locations, species counts and density, population and occupancy results, please visit Bird Conservancy's Rocky Mountain Avian Data Center at http://rmbo/v3/avian/ExploretheData.aspx. Instructions for using the Avian Data Center are included in Appendix A of this report and are available on the Avian Data Center itself. Each stratum or combination of strata presented in this report's Results section contains a web link that leads directly to the Avian Data Center with the appropriate queries already populated. Please note that not every stratum or conceivable combination of strata are summarized in this report. All individual strata and all biologically meaningful combinations of strata, or "superstrata", can be found on the Avian Data Center.

To demonstrate the use of IMBCR monitoring data for bird conservation, we focus on population trends from 2009-2018 for five priority grassland species in the Badlands and Prairies Bird Conservation Region (BCR 17) of the Northern Great Plains. Occupancy rates appear relatively stable for all five species across the region with more annual fluctuation in density estimates. A comparison of regional and local estimates highlights discrepancies and allows managers and biologists to form hypotheses about potential drivers of change in local populations (e.g., National Grassland or National Park). Based on population trend estimates, Chestnut-collared Longspur and Sprague's Pipit are declining with confidence across BCR 17. Conservation practitioners need this information to know if efforts conducted on the ground are effective at reducing annual population declines.

The IMBCR program is well-positioned to address conservation and management needs for a wide range of stakeholders at various spatial scales. By focusing on relevant scales from local management units to state-wide, IMBCR can easily be integrated within an interdisciplinary approach to bird conservation that combines monitoring, research, and management.

Acknowledgements

Many individuals helped make the 2018 field season a success. Stratification and allocation of survey efforts were determined in collaboration with partner agencies and organizations, each of which provided funding or in-kind assistance: Collaborative Forest Landscape Restoration Program; Colorado Parks and Wildlife; Department of Defense; Montana Fish, Wildlife and Parks; National Fish and Wildlife Foundation; US Bureau of Land Management; US Forest Service; US National Park Service; and Wyoming Game and Fish Department. We thank Playa Lakes Joint Venture for building a collaborative partnership and acquiring funding across the states within their boundary to allow for the addition of IMBCR for PLJV. Funding for surveys in the PLJV region was provided by Colorado Parks & Wildlife; Kansas Department of Wildlife, Parks & Tourism; Nebraska Game & Parks Commission; New Mexico Department of Game & Fish; Oklahoma Department of Wildlife Conservation; Texas Parks & Wildlife Department; Farm Service Agency (USDA); US Forest Service; Great Plains Landscape Conservation Cooperative (USFWS); and The Migratory Bird Program (USFWS Southwest Region). We thank Department of Defense, Great Basin Bird Observatory, Intermountain Bird Observatory, Utah Division of Wildlife Resources, and Wyoming Natural Diversity Database for planning and implementing field work in their study areas. Bird Conservancy of the Rockies' landowner liaison, Jenny Berven, with help from Tiffany Peeken, contacted county assessors to determine land ownership of survey locations. We thank Mevin Hooten at Colorado State University and Elise Zipkin at Michigan State University for input during model development. We thank Ryan Wermager of The Nature Conservancy for providing excellent training facilities at the Whitney Preserve for the Northern Great Plains and Wyoming monitoring efforts. We also thank the many field observers who collected avian and vegetation point count data and contacted private landowners to obtain access to survey locations and establish working relationships for the future. Without the efforts of these observers and the cooperation of numerous private landowners, IMBCR partners would have been unable to conduct avian monitoring on private lands. Finally, this report benefited greatly from review by Bird Conservancy staff and IMBCR partners.

Table of Contents

Table of Figures

Table of Tables

Introduction

Monitoring is an essential component of wildlife management and conservation science (Marsh & Trenham, 2008; Witmer, 2005). Common goals of population monitoring are to estimate the population status of target species and to detect changes in populations over time (Sauer & Knutson, 2008; Thompson, White, & Gowan, 1998). In addition to providing basic information on species distributions, effective monitoring programs can identify species that are at-risk because of small or declining populations (Dreitz, Lukacs, & Knopf, 2006); provide an understanding of how management actions affect populations (Alexander, Stevens, Geupel, & Will, 2008; Lyons, Runge, Laskowski, & Kendall, 2008); and evaluate population responses to landscape alteration and climate change (Baron et al., 2008; Lindenmayer & Likens, 2009).

While monitoring at local scales remains critical, there is an increasing need to monitor the consequences of environmental change over large spatial and temporal scales and address questions much larger than those that can be answered within individual management units (Dreitz, Stinson, Hahn, Tack, & Lukacs, 2017; Lindenmayer & Likens, 2009). Reconciling disparities between the geographic scale of management actions and the scale of ecological and species-specific responses is a persistent challenge for natural resource management agencies (Ruggiero, Hayward, & Squires, 1994). Population monitoring of eco-regional landscapes provides an important context for evaluating population change at local and regional scales, with the potential to identify causal factors and management actions for species recovery (Manley, Schlesinger, Roth, & Van Horne, 2005; Sauer & Knutson, 2008).

Before monitoring can be used by land managers to guide conservation efforts, sound program designs and analytical methods are necessary to produce unbiased population estimates (Sauer & Knutson, 2008). At the most fundamental level, reliable knowledge about the status of avian populations requires accounting for spatial variation and incomplete detection of the target species (Pollock et al., 2002; Rosenstock, Anderson, Giesen, Leukering, & Carter, 2002; Thompson, 2002). Addressing spatial variation entails the use of probabilistic sampling designs, which allow population estimates to be extended over the entire area of interest (Thompson et al., 1998). Accounting for incomplete detection involves the use of appropriate sampling and analytical methods to address the fact that few, if any, species are so conspicuous that they are detected with certainty when present during a survey. Accounting for these two sources of variation ensures observed trends reflect true population changes rather than artifacts of the sampling and observation processes (Pollock et al., 2002; Thompson, 2002).

The apparent large-scale declines of avian populations and the loss, fragmentation and degradation of native habitats highlight the need for extensive and rigorous landbird monitoring programs (Rich et al., 2004; US North American Bird Conservation Initiative Monitoring Subcommittee, 2007). The US North American Bird Conservation Initiative's (NABCI) "Opportunities for Improving Avian Monitoring" (NABCI Monitoring Subcommittee, 2007) provided goals for avian monitoring programs, including:

Goal 1: Fully integrate monitoring into bird management and conservation practices and ensure that monitoring is aligned with management and conservation priorities.

Goal 2: Coordinate monitoring programs among organizations and integrate them across spatial scales to solve conservation or management problems effectively.

Goal 3: Increase the value of monitoring information by improving statistical design.

Goal 4: Maintain bird population monitoring data in modern data management systems. Recognize legal, institutional, proprietary, and other constraints while still providing greater availability of raw data, associated metadata, and summary data for bird monitoring programs.

With the NABCI Monitoring Subcommittee (2007) guidelines in mind, Bird Conservancy of the Rockies and partners initiated a broad-scale bird monitoring program in 2008, entitled "Integrated Monitoring in Bird Conservation Regions" (IMBCR) (Blakesley & Hanni, 2009). See Appendix B: IMBCR Program and Stratification History for a complete history of this program. The monitoring objectives of the IMBCR partnership are to:

1. Provide robust density, population and occupancy estimates that account for incomplete detection and are comparable at different geographic extents;
2. Provide long-term status and trend data for all regularly occurring breeding landbird species throughout the study area;
3. Provide a design framework to spatially integrate existing bird monitoring efforts in the region to provide better information on distribution and abundance of breeding landbirds, especially for high priority species;
4. Provide basic habitat association data for most bird species to address habitat management issues;
5. 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
6. Generate decision support tools that help guide conservation efforts and provide a better measure of conservation success.

The IMBCR design uses Bird Conservation Regions (BCRs) as sampling frames (Figure 1), stratified by land ownership inside each BCR (NABCI Monitoring Subcommittee, 2007). BCRs provide a spatially consistent framework for bird conservation in North America. Each BCR represents a distinct ecological region with similar bird communities, vegetation types, and resource management interests (NABCI, 2000). Population monitoring within BCRs can be implemented with a flexible hierarchical framework of nested units, where information on status of bird populations can be partitioned into smaller units for small-scale conservation planning, or aggregated to support large-scale conservation efforts throughout a species' geographic range. By focusing on scales relevant to management and conservation, information obtained from monitoring in BCRs can be integrated into research and management at various scales applicable to land managers (Pavlacky et al., 2017; Ruth et al., 2003).

Important properties of the IMBCR design are:

- All areas are available for sampling, including all vegetation types;
- Strata are based on fixed attributes, which allows us to relate changes in bird populations to changes on the landscape through time;
- Each state's portion of a BCR can be stratified differently depending upon local needs and areas to which one wants to make inferences;
- Aggregation of strata-wide estimates to BCR- or state-wide estimates is built into the design;
- Local population trends are directly comparable to regional trends; and
- Coordination among partners reduces the costs and increases efficiencies of monitoring per partner.

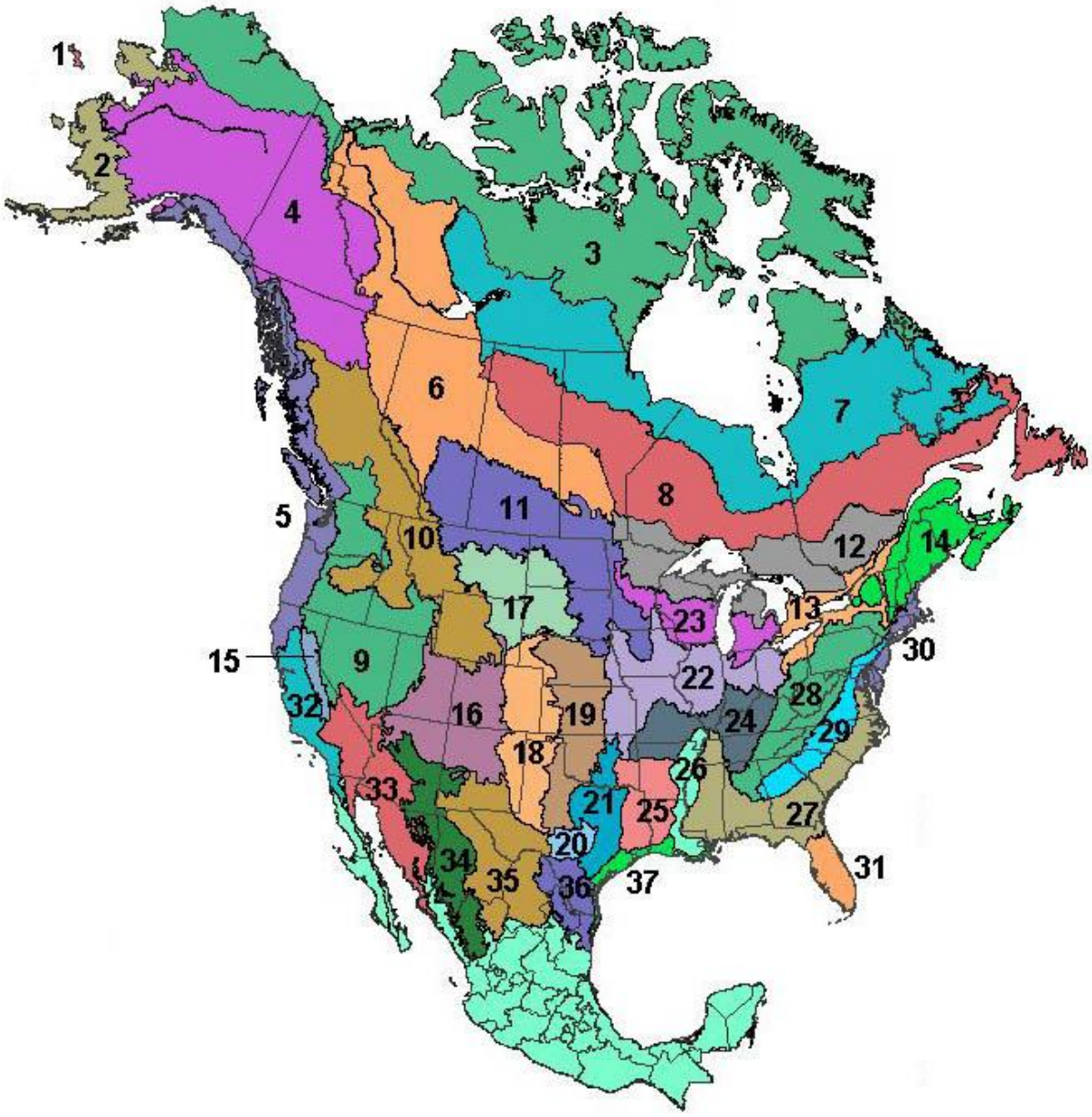


Figure 1. Bird Conservation Regions throughout North America, excluding Hawaii and Mexico (Source: http://nabci-us.org/resources/bird-conservation-regions-map/).

Methods

Study Area

In 2018, the IMBCR program's area of inference encompassed four entire states (Colorado, Montana, Utah, and Wyoming) and portions of 11 additional states (California, Idaho, Kansas, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, South Dakota, and Texas). We surveyed across US Forest Service (USFS) Regions 1, 2, and 4 and in portions of Region 3; all of the Badlands and Prairies Bird Conservation Region (BCR 17), all of the Shortgrass Prairie Bird Conservation Region (BCR 18), and portions of seven other BCRs: Great Basin (9), Northern Rockies (10), Prairie Potholes (11), Sierra Nevada (15), Southern Rockies/Colorado Plateau (16), Central Mixed Grass Prairie (19), and Sonoran and Mojave Deserts (33) (Figure 2). For a map and complete descriptions of the Bird Conservation Regions, see the NABCI website: http://nabci-us.org/resources/bird-conservation-regions-map/.

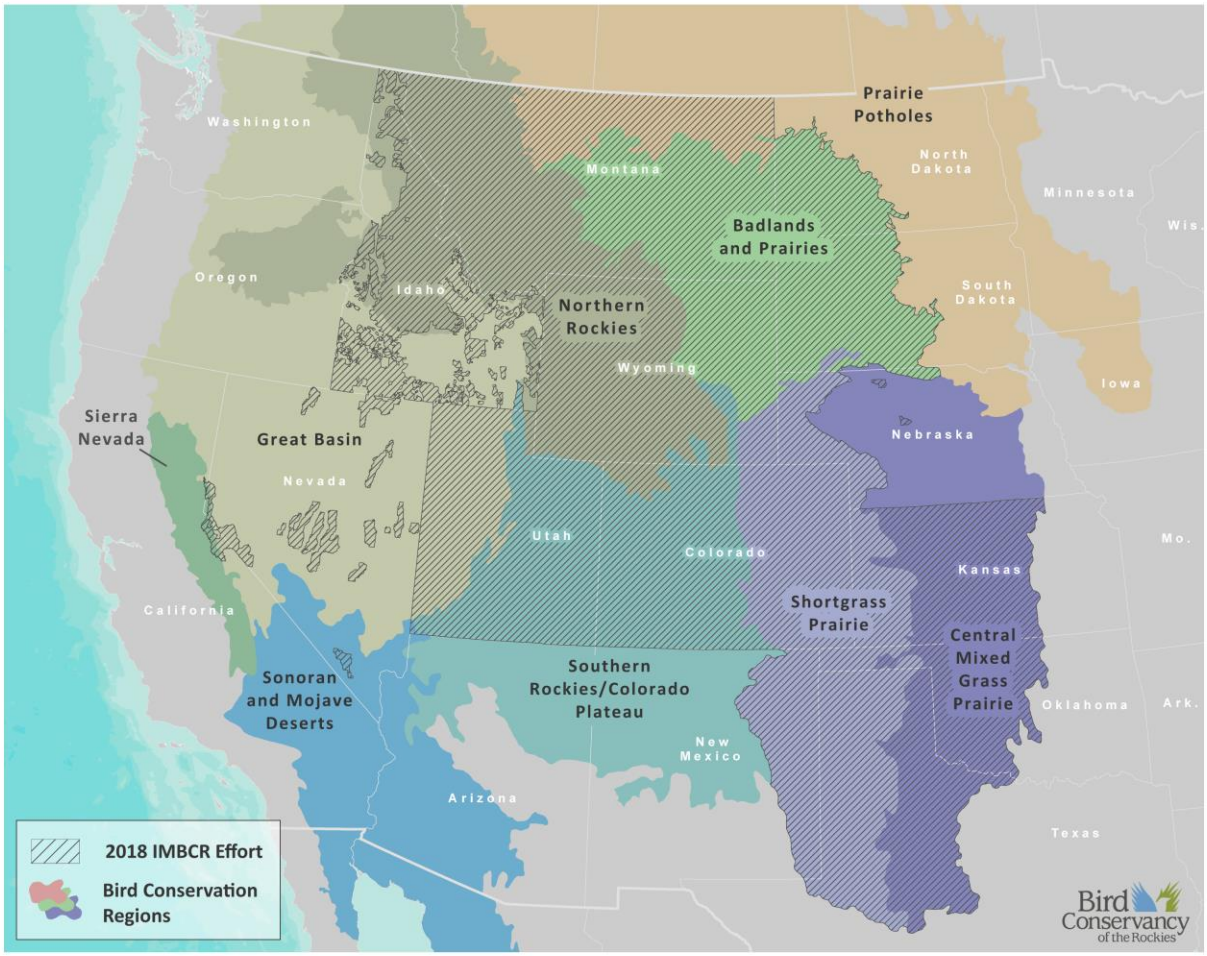


Figure 2. Spatial extent of sampled Bird Conservation Regions using the IMBCR design, 2018.

Sampling Design

Sampling Frame and Stratification

A key component of the IMBCR design is the ability to infer across spatial scales, from small management units, such as individual national forests or BLM field offices, to entire states and BCRs. This is accomplished through hierarchical (nested) stratification, which allows data from smaller-order strata to be combined to make inferences about higher-order strata. For example, data from each individual national forest stratum in USFS Region 2 are combined to produce Region-wide avian population estimates; data from each individual stratum in Montana are combined to produce statewide estimates; data from each individual stratum in BCR 17 are combined to produce BCR-wide estimates.

We defined strata based on areas to which IMBCR partners wanted to make inferences. We defined the largest sampling frame by the intersection of state and BCR boundaries (e.g., Wyoming BCR 10). We based the strata within the state/BCR frames on fixed attributes, such as land ownership boundaries, elevation zones, major river systems and wilderness/roadless designations.

Sampling Units

The IMBCR design defines sampling units as 1 km² cells, each containing 16 evenly spaced sample points, 250 meters apart (Figure 3). We define potential sampling units by superimposing a uniform grid of cells over each state in the study area. We then assign each cell to a stratum using ArcGIS version 10.X and higher (Environmental Systems Research Institute, 2017). For all stratifications developed after 2012, we used the United States National Grid (USNG), a nonproprietary alphanumeric referencing system derived from the Military Grid Reference System that was created by the Federal Geographic Data Committee.

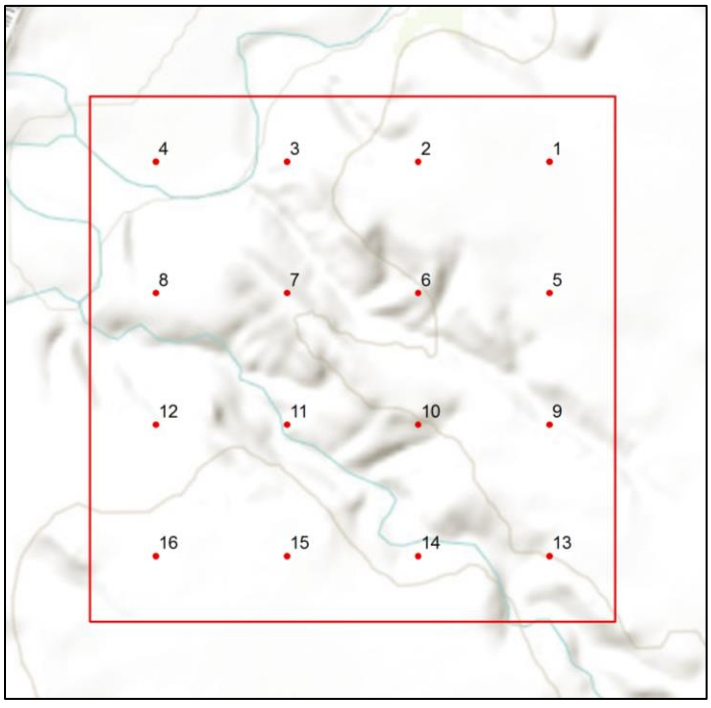


Figure 3. Example 1 km² sampling unit using the IMBCR design.

Sample Selection

Within each stratum, the IMBCR design used generalized random-tessellation stratification (GRTS), a spatially balanced sampling algorithm, to select sampling units (Stevens Jr. & Olsen, 2004). The GRTS design has some appealing properties with respect to long-term monitoring of birds at large spatial scales:

- Spatially balanced sampling is generally more efficient than simple random sampling of natural resources (Stevens Jr. & Olsen, 2004). Incorporating information about spatial autocorrelation in the data can increase precision in density estimates;
- All sampling units in the sampling frame are ordered, such that any set of consecutively numbered units is a spatially well-balanced sample (Stevens Jr. & Olsen, 2004). In the case of fluctuating budgets, IMBCR partners can adjust the sampling effort among years within each stratum while still preserving a random, spatially balanced sampling design.

A minimum of two sampling units within each stratum are required to estimate the variances of population parameters. However, reliable stratum-level occupancy estimates require larger samples sizes, with a minimum of approximately 10 samples per stratum. Furthermore, additional samples may be required for strata comprising large geographic areas. Because we estimate regional density and occupancy using an area weighted mean, adding more samples to a particular stratum does not bias the overall estimate, it simply increases the precision. After the initial two sampling units were selected, the remaining allocation of sampling effort among strata was based on the priorities of the funding partners.

Sampling Methods

IMBCR observers with excellent aural and visual bird-identification skills conducted field work in 2018. Prior to conducting surveys, observers completed an intensive training program to ensure full understanding of the field protocol; review bird and plant identification; and practice distance estimation in a variety of habitats. Many observers attended a second, shorter mid-season training to review protocol and practice bird and plant identification at high-elevation sites that were inaccessible earlier in the season.

Observers conducted point counts (Buckland et al., 2001) following protocols established by IMBCR partners (Hanni, White, Birek, Van Lanen, & McLaren, 2012). Observers conducted surveys in the morning, beginning one-half hour before sunrise and concluding no later than five hours after sunrise. Observers recorded the start time for every point count conducted. For every bird detected during the six-minute period, observers recorded species; sex; horizontal distance from the observer; minute; type of detection (e.g., call, song, visual); whether the bird was thought to be a migrant; and whether the observer was able to visually identify each record.

Observers measured distances to each bird using laser rangefinders, when possible. When it was not possible, observers estimated the distance by measuring to some object near the bird using a laser rangefinder. In addition to recording all bird species detected in the area during point counts, observers recorded birds flying over but not using the immediate surrounding landscape. Observers also recorded Abert's squirrel (*Sciurus aberti*), American red squirrel (*Tamiasciurus hudsonicus*), and American pika (*Ochotona princeps*). While observers traveled between points within a sampling unit, they recorded the presence of any species not recorded during a point count. The opportunistic detections of these species are used for distribution mapping purposes only.

Observers 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 independent observations. Observers recorded the number of birds detected within each cluster along with a letter code to distinguish between multiple clusters.

At the start and end of each survey, observers recorded time, ambient temperature, cloud cover, precipitation, and wind speed. Observers navigated to each point using hand-held Global Positioning System units. Before beginning each six-minute count, surveyors recorded vegetation data within a 50 m radius of the point via ocular estimation. Vegetation data included the dominant habitat type and relative abundance; percent cover and mean height of trees and shrubs by species; as well as grass height and ground cover types. Observers recorded vegetation data quietly to allow birds time to return to their normal habits prior to beginning each count.

For more detailed information about survey methods and vegetation data collection protocols, refer to Bird Conservancy's Field Protocol for Spatially Balanced Sampling of Landbird Populations on our Avian Data Center website at http://rmbo.org/v3/avian/DataCollection.aspx. There you will find links to past and current protocols and data sheets.

Data Analysis

Distance Analysis Assumptions

Distance sampling theory 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). The detection probability is used to adjust the count of birds to account for birds that were present but undetected. Application of distance theory requires that five critical assumptions be met: 1) all birds at and near the sampling location (distance = 0) are detected; 2) distances to birds are measured accurately; 3) birds do not move in response to the observer's presence (Buckland et al., 2001; Thomas et al., 2010); 4) cluster sizes are recorded without error; and 5) the sampling units are representative of the entire survey region (Buckland, Marsden, & Green, 2008).

Density Estimation

We developed a Bayesian, zero-inflated N-mixture model (Royle 2004, Sillett et al. 2011) to estimate density and abundance for all strata and superstrata across all species with sufficient data. We used distance sampling to estimate detection probabilities and adjust counts accordingly. For a detailed description of statistical analyses performed, see (Appendix D).

Bayesian approaches to density estimation provide several benefits over traditional distance sampling analyses, while providing similar and unbiased estimates of density and abundance. First, with the nested design of IMBCR, point count locations within a 1-km^2 grid are not independent. Therefore, with traditional methods, it is necessary to treat each point as a spatial replicate within the grid (i.e., average counts across points). However, it is unlikely that bird densities are uniform within a grid, and a better solution would be to estimate density at the point count location. Bayesian models provide the flexibility to do this, while correctly accounting for the lack of independence among points. The second benefit, also provided by this flexibility, is the ability to include covariates to explain changes in density. This allows us to explicitly estimate the response of bird density to variables, such as habitat variables, management actions, or time (i.e., trend). Finally, Bayesian approaches allow for sharing of information

across parameters. This can assist in obtaining estimates at sites with little data or provide measures of uncertainty when no birds were detected, such as at low densities and/or small sample sizes.

We fit a series of models to the data from each species that had the same model structure describing density estimation but varied in detection structure (see *Observation process* section below). We used zero-inflation to account for excess zeros in the data, where abundance at a point count location (*N*) is conditional on the point's true occupancy state (*z*) of a species at the point count location, and the mean abundance within a 1-km^2 grid cell was modeled as a function of year to estimate stratum-specific trends.

All points within a grid cell shared a mean abundance to account for the lack of independence of those points, but abundance was allowed to vary spatially within a grid cell (i.e., by point) through Poisson variation. To avoid predicting species occurrence outside of observed ranges, we fixed occupancy probabilities to 0 for all strata in which the species was never observed and used a prior informed by the observed proportion of grid-year combinations in a stratum in which the species was detected.

We derived density at the point count location by dividing the estimated abundance by the area of the point count circle (see *Observation process* section below) and multiplying by cluster size. We derived stratum-level density estimates by averaging all point-level density estimates within each stratum, and we took the area-weighted average of strata estimates to obtain superstratum estimates.

Observation process

We estimated the probability of detecting an independent cluster of individuals by fitting distance functions to the distance data collected during surveys (Buckland et al. 2001). We fit 4 detection models including: 1) half-normal constant (HN(.)), 2) hazard rate constant (Haz(.)), 3) half-normal year (HN(t)), and 4) hazard rate year (Haz(t)).

We removed the furthest 10% of observed detection distances from the data set and binned the remaining detections into 10 evenly-spaced distance classes. The furthest remaining detection distance became the radius of the point count circle with which we estimated density.

Detection model selection

To minimize computing time but find the most parsimonious detection function, we fit detection-only models to the distance data, using the four model structures described above. We used the Watanabe-Akaike Information Criterion (WAIC; Watanabe 2010, Hooten and Hobbs 2015) to select the most parsimonious detection structure and then used that structure for detection probabilities in the full model to estimate density and abundance.

Superstratum trends

We developed a post-hoc approach to estimate trends for superstrata. Using the rolled-up estimates of density for a superstratum, we fit a general linear model (GLM) to the samples from each Bayesian iteration.

Fitting a GLM across iterations allowed us to incorporate uncertainty in trends due to uncertainty around density estimates, but it did not account for temporal variation. To incorporate this second form of variation, we sampled a random intercept and slope for each iteration using the mean and standard error estimated using the GLM and made inference on the distribution of the resampled values

Occupancy Analysis

Occupancy estimation is most commonly used to quantify the proportion of sample units (i.e., 1 km² cells) occupied by an organism (MacKenzie et al., 2002). The application of occupancy modeling requires multiple surveys of the sample unit in space or time to estimate a detection probability (MacKenzie et al., 2006). The detection probability adjusts the proportion of sites occupied to account for species that were present but undetected (MacKenzie et al., 2002). We used a removal design (MacKenzie et al., 2006), to estimate a detection probability for each species, in which we binned minutes one and two, minutes three and four and minutes five and six to meet the assumption of a monotonic decline in the detection rates through time. After the target species was detected at a point, we set all subsequent sampling intervals at that point to "missing data" (MacKenzie et al., 2006).

The 16 points in each sampling unit served as spatial replicates for estimating the proportion of points occupied within the sampled sampling units. We used a Bayesian, multi-scale occupancy model (Nichols et al. 2008, Mordecai et al. 2011, Green et al. 2019) to estimate 1) the probability of detecting a species given presence (p), 2) the proportion of points occupied by a species given presence within sampled sampling units (θ, Theta) and 3) the proportion of sampling units occupied by a species (ψ, Psi).

We truncated the data, using only detections <125 m from the sample points, except for species in Accipitriformes, Anseriformes, Falconiformes, Galliformes, Gruiformes, Pelecaniformes, Podicepidiformes, and Suliformes for which we used the maximum observed distance for each species. Truncating the data allowed us to use bird detections over a consistent plot size and ensured that the points were independent (points were spread 250 m apart), which in turn allowed us to estimate θ (the proportion of points occupied within each sampling unit) (Pavlacky Jr., Blakesley, White, Hanni, & Lukacs, 2012). The interpretation of θ for species for which we used maximum distances changes from occupancy to use because point count buffers overlap, but we chose this approach to provide estimates for a larger number of species.

We expected regional differences in the behavior, habitat use, and local abundance of species would correspond to regional variation in detection and the fraction of occupied points. Therefore, we estimated the proportion of sampling units occupied (ψ) for each stratum by estimating BCR-by-year specific estimates of detection (p) and point-level occupancy (θ). We fixed p and θ to 0 for BCRs in which a particular species was never detected.

We fixed ψ to 0 for all strata in which the species was never detected. As with density, we took an area-weighted mean of stratum-level occupancy estimates (i.e., ψ) to estimate superstratum-level occupancy probabilities. The true point-level occupancy state was conditional on the grid-cell-level occupancy state (i.e., occupied or unoccupied), such that a point could only be occupied if the grid cell was occupied.

Finally, we modeled the observation process conditional on the point being occupied using removal modeling.

Our application of the multi-scale model was analogous to a within-season robust design (Pollock, 1982) where the two-minute intervals at each point were the secondary samples for estimating *p* and the points were the primary samples for estimating θ (Nichols et al., 2008; Pavlacky Jr. et al., 2012). We considered both *p* and θ to be nuisance variables that were important for generating unbiased estimates of ψ. θ can be considered an availability parameter or the probability a species was present and available for sampling at the points (Nichols et al., 2008; Pavlacky Jr. et al., 2012).

Automated Analysis

We recently updated our analytical methods and are using Bayesian hierarchical models specifically designed for analysis of IMBCR data. We perform all data and output manipulation in R (R Core Team, 2019) and model fitting in JAGS (Plummer 2003, 2017) using the R package jagsUI (Kellner 2018). The R code called the raw data from the IMBCR Structured Query Language (SQL) server database and reformatted the data into a form usable with the JAGS code. We allowed the input of all data collected in a manner consistent with the IMBCR design to increase the number of detections available for estimating global detection rates for population density and site occupancy. The R code provided an automated framework for combining strata-level estimates of population density and site occupancy at multiple spatial scales, as well as estimating the standard deviations and credible intervals for the combined estimates.

We fit initial models to all species with at least 30 detections for density estimation and 10 detections for occupancy estimation. For density estimation, we fit the full model after determining whether there were enough detections based on results from the detection-only model fits. In some cases for both density and occupancy estimation, it was necessary to use a less parsimonious detection structure or simplified model structure to facilitate model convergence. We currently maintain version control of the automated analysis code in the Bird Conservancy repository (Atlassian Stash, version 3.6.1).

Results

I. Summary

In 2018, field observers completed 1,628 of 1,635 (99.6%) planned surveys throughout all or portions of BCRs 9, 10, 11, 15, 16, 17, 18, 19, and 33 using the IMBCR design (Table 1, Figure 2). Reasons surveys were not completed are summarized in Table 2. Observers conducted 18,111 point counts within the 1,628 surveyed sampling units between April 22 and July 19, 2018. They detected 237,046 individual birds representing 336 species.

Please note that not every stratum or superstratum is summarized in this report. We include details of specific strata or superstrata for which our partners are most interested. Results from all strata and all biologically meaningful superstrata can be found on the Rocky Mountain Avian Data Center (http://rmbo.org/v3/avian/ExploretheData.aspx). This online database contains interactive maps showing survey and detection locations, as well as species counts and density, population, and occupancy results using the IMBCR study design. Instructions for using the Avian Data Center are

included in Appendix A of this report and are available on the Avian Data Center website. Each stratum or superstratum presented in the Results section contains a web link that leads directly to the Avian Data Center with the appropriate queries already populated.

Unless otherwise specified, all bird species names listed in this report are from the 58th supplement to the American Ornithologists' Union Check-list of North and Middle American Birds (Chesser et al., 2017).

II. Trend Estimates

We estimated species population trends for data collected through 2018. Results can be found here. Individual strata estimates are compiled by state. To find superstratum estimates, select a spreadsheet for any state included in the superstratum. For example, to find estimates for the Badlands and Prairies Bird Conservation Region (BCR 17), select the spreadsheet for Montana, Wyoming, Nebraska, North Dakota, or South Dakota. We do not include trend estimates for species with zero detections in a given stratum. Be cautious when interpreting trends for low-density species at the superstratum (regional) level when there were zero detections in a given year. In these cases, we add a very small number to the estimate (i.e., half the minimum non-zero estimate) in order to take the log of the estimate. This increases uncertainty around the trend estimates.

Explanation of trend estimates spreadsheet column are as follows:

Stratum: the abbreviated code for a stratum or superstratum

Stratum Name: full name for a stratum or superstratum

Species: full name of bird species. Note that we record a few mammals detected on surveys, such as red and Abert's squirrels and pika

BirdCode: 4-letter bird code

Mean: mean trend estimate based on all years a stratum was surveyed. A value of 1 indicates the population is stable, <1 indicates the population is declining and >1 is an increasing population

SD: standard deviation or amount of variation in the data

CV: coefficient of variation or ratio of the standard deviation to the mean (lower is better!)

LCI 95 and UCI 95: 95% credible interval; the true estimate falls within this interval with 95% probability

LCI 90 and UCI 90: same interpretation as above but with 90% probability

Median: value that represents the midpoint of the distribution. We recommend reporting the median rather than the mean because some credible intervals have long tails so the means can be quite a bit higher than the medians, especially for estimates near zero. Medians are also more representative of the distributions

f: the probability the trend is in the direction of the mean. This is our confidence in the direction of the trend (not necessarily the magnitude). As 'f' approaches 1, our confidence increases (e.g., if the trend estimate is 1.16 and 'f' is .88, then we are 88% sure the population is increasing

N. Detect: the number of detections used to estimate trend for each species-stratum combination

N.Strata.Det: the number of strata with a detection used to estimate regional (superstrata) trends. This column will contain an "NA" for individual strata.

N.Strata: the number of strata contained in a superstratum (minimum number of strata within a superstratum is 2). This column will contain an "NA" for individual strata.

III. Number of Species with Estimates

The way we present density and occupancy estimates in the 2018 report has changed from previous years. In the past, if a species had been detected in a stratum in a previous year, but was not detected in the current year, we did not provide density or occupancy estimates for that species in that stratum. This year we have included estimates for these species. In these cases the estimate is zero or very close to zero. We consider these to be legitimate estimates of zero occupancy or density because the species occurs in the area of interest, but was not detected in a particular year.

This change means that the number of species with either density or occupancy estimates for a given stratum or superstratum in a given year is not comparable to the number of species with estimates for that stratum or superstratum and year in previous reports. The number of species in the current report will include species with zero, or near zero estimates if that species has been detected in previous years, whereas past reports will not. Therefore, there may be more species with estimates for a given stratum in this year's report than in previous reports.

Table 1. Planned and completed surveys by stratum, 2018.
BCR = Bird Conservancy of the Rockies; DoD = Department of Defense; GBBO = Great Basin Bird Observatory; IBO = Intermountain Bird Observatory; UDWR = Utah Division of Wildlife Resources; WYNDD = Wyoming Natural Diversity Database.

State	BCR	Stratum	Stratum Description	Collected By	Area (km^2)	Planned	Completed	Percent Completed
CA	15	CA-BCR15-HT	Humboldt-Toiyabe National Forest	GBBO	1,635	4	4	100%
CA	9	CA-BCR9-HT	Humboldt-Toiyabe National Forest	GBBO	1,174	4	4	100%
CO	10	CO-BCR10-AO	All Other Lands	BCR	9,251	6	5	83%
CO	10	CO-BCR10-BL	Bureau of Land Management	BCR	4,288	10	10	100%
CO	16	CO-BCR16-AO	All Other Lands	BCR	51,214	18	17	94%
CO	16	CO-BCR16-BL	Bureau of Land Management	BCR	27,825	28	28	100%
CO	16	CO-BCR16-GM	Grand Mesa; Uncompahgre and Gunnison National Forests	BCR	13,630	7	7	100%
CO	16	CO-BCR16-MA	Manti-La Sal National Forest	BCR	131	2	2	100%
CO	16	CO-BCR16-NC	National Park Service - Northern Colorado Plateau Network	BCR	692	2	2	100%
CO	16	CO-BCR16-PC	Pike and San Isabel National Forests Control	BCR	1,300	26	26	100%
CO	16	CO-BCR16-PO	Pike and San Isabel National Forests All Other	BCR	9,650	5	5	100%
CO	16	CO-BCR16-RA	Rio Grande National Forest - High Elevation	BCR	866	6	6	100%
CO	16	CO-BCR16-RC	Arapaho and Roosevelt National Forests Control	BCR	780	26	26	100%
CO	16	CO-BCR16-RM	National Park Service - Rocky Mountain Network	BCR	1,743	2	2	100%
CO	16	CO-BCR16-RO	Routt National Forest	BCR	5,123	15	15	100%
CO	16	CO-BCR16-RP	Rio Grande National Forest - Middle Elevation	BCR	5,410	4	4	100%
CO	16	CO-BCR16-RS	Rio Grande National Forest - Low Elevation	BCR	1,896	4	4	100%
CO	16	CO-BCR16-SA	San Juan National Forest	BCR	8,794	6	6	100%
CO	16	CO-BCR16-SC	National Park Service - Southern Colorado Plateau Network	BCR	214	2	2	100%
CO	16	CO-BCR16-VO	Arapaho and Roosevelt National Forests All Other	BCR	6,152	4	4	100%
CO	16	CO-BCR16-WA	White River National Forest - High Elevation	BCR	2,138	6	6	100%
CO	16	CO-BCR16-WF	USFS - Williams Fork Management Unit	BCR	551	6	6	100%
CO	16	CO-BCR16-WP	White River National Forest - Middle Elevation	BCR	5,443	4	4	100%
CO	16	CO-BCR16-WS	White River National Forest - Low Elevation	BCR	2,786	4	4	100%
CO	18	CO-BCR18-AR	Arkansas River and Tributaries	BCR	1,127	7	7	100%
CO	18	CO-BCR18-CO	Comanche National Grassland	BCR	4,836	6	6	100%

State	BCR	Stratum	Stratum Description	Collected By	Area (km²)	Planned	Completed	Percent Completed
CO	18	CO-BCR18-DO	Department of Defense	BCR	1,647	2	2	100%
CO	18	CO-BCR18-IA	Area between I-70 and the Arkansas River	BCR	34,755	9	9	100%
CO	18	CO-BCR18-NP	Area North of the Platte River	BCR	11,457	7	7	100%
CO	18	CO-BCR18-PC	Pawnee National Grassland - Private Lands	BCR	2,458	2	2	100%
CO	18	CO-BCR18-PG	Pawnee National Grassland - Public Lands	BCR	810	5	5	100%
CO	18	CO-BCR18-PI	Area between the Platte River and I-70	BCR	30,365	9	9	100%
CO	18	CO-BCR18-PT	Platte River and Tributaries	BCR	970	7	7	100%
CO	18	CO-BCR18-SA	Area South of the Arkansas River	BCR	24,985	9	9	100%
ID	10	ID-BCR10-BI	Bitterroot National Forest	IBO	1,916	2	2	100%
ID	10	ID-BCR10-BO	Boise National Forest	IBO	8,778	8	8	100%
ID	10	ID-BCR10-CH	Bureau of Land Management - Challis Field Office	IBO	1,350	2	2	100%
ID	10	ID-BCR10-CL	Clearwater National Forest - Roaded/Managed	IBO	1,946	17	17	100%
ID	10	ID-BCR10-CR	Clearwater National Forest - Roadless/Wilderness	IBO	5,036	5	5	100%
ID	10	ID-BCR10-CT	Caribou-Targhee National Forest	BCR	7,752	8	8	100%
ID	10	ID-BCR10-FR	Bureau of Land Management - Four Rivers Field Office	IBO	1,269	3	3	100%
ID	10	ID-BCR10-IP	Idaho Panhandle National Forest - Roaded/Managed	IBO	8,660	24	24	100%
ID	10	ID-BCR10-IR	Idaho Panhandle National Forest - Roadless/Wilderness	IBO	3,155	6	6	100%
ID	10	ID-BCR10-KO	Kootenai National Forest	IBO	169	2	2	100%
ID	10	ID-BCR10-NP	Nez Perce National Forest - Roaded/Managed	IBO	2,864	17	17	100%
ID	10	ID-BCR10-NR	Nez Perce National Forest - Roadless/Wilderness	IBO	6,370	5	5	100%
ID	10	ID-BCR10-PA	Payette National Forest	IBO	9,857	10	10	100%
ID	10	ID-BCR10-SA	Salmon-Challis National Forest	IBO	13,563	11	11	100%
ID	10	ID-BCR10-SM	Bureau of Land Management - Salmon Field Office	IBO	637	2	2	100%
ID	10	ID-BCR10-SW	Sawtooth National Forest	IBO	6,302	5	5	100%
ID	10	ID-BCR10-US	Bureau of Land Management - Upper Snake Field Office	IBO	652	2	2	100%
ID	16	ID-BCR16-CT	Caribou-Targhee National Forest	BCR	909	2	2	100%
ID	9	ID-BCR9-BO	Boise National Forest	IBO	1,710	2	2	100%
ID	9	ID-BCR9-BR	Bureau of Land Management - Bruneau Field Office	IBO	5,953	10	10	100%
ID	9	ID-BCR9-BU	Bureau of Land Management - Burley Field Office	IBO	3,334	8	8	100%
ID	9	ID-BCR9-CH	Bureau of Land Management - Challis Field Office	IBO	1,862	2	2	100%

State	BCR	Stratum	Stratum Description	Collected By	Area (km²)	Planned	Completed	Percent Completed
ID	9	ID-BCR9-CT	Caribou-Targhee National Forest	BCR	1,940	3	3	100%
ID	9	ID-BCR9-CU	Curlew National Grassland	BCR	300	10	10	100%
ID	9	ID-BCR9-FO	Bureau of Land Management - Four Rivers Field Office	IBO	1,720	3	3	100%
ID	9	ID-BCR9-JA	Bureau of Land Management - Jarbidge Field Office	IBO	5,386	6	6	100%
ID	9	ID-BCR9-MN	Morley Nelson Birds of Prey National Conservation Area	IBO	1,904	2	2	100%
ID	9	ID-BCR9-OW	Bureau of Land Management - Owyhee Field Office	IBO	5,066	10	10	100%
ID	9	ID-BCR9-SA	Salmon-Challis National Forest	IBO	3,857	4	4	100%
ID	9	ID-BCR9-SM	Bureau of Land Management - Salmon Field Office	IBO	1,340	3	3	100%
ID	9	ID-BCR9-SW	Sawtooth National Forest	IBO	2,175	3	3	100%
ID	9	ID-BCR9-US	Bureau of Land Management - Upper Snake Field Office	IBO	6,473	3	3	100%
KS	18	KS-BCR18-AO	All Other Lands	BCR	34,794	11	11	100%
KS	18	KS-BCR18-CM	Cimarron National Grassland	BCR	430	4	4	100%
KS	18	KS-BCR18-PL	Playas	BCR	370	11	11	100%
KS	18	KS-BCR18-RV	Rivers	BCR	1,409	11	11	100%
KS	19	KS-BCR19-AO	All Other Lands	BCR	98,649	11	11	100%
KS	19	KS-BCR19-PL	Playas	BCR	176	11	11	100%
KS	19	KS-BCR19-RV	Rivers	BCR	10,523	11	11	100%
NE/SD	11	MR-NGPIM-FM	Missouri National Recreational River - 59 Mile District	BCR	243	8	8	100%
NE/SD	11	MR-NGPIM-TM	Missouri National Recreational River - 39 Mile District	BCR	248	8	8	100%
MT	10	MT-BCR10-BE	Beaverhead-Deerlodge National Forest - Roaded/Managed	IBO	7,697	10	10	100%
MT	10	MT-BCR10-BI	Bitterroot National Forest - Roaded/Managed	IBO	2,324	8	8	100%
MT	10	MT-BCR10-BM	Bureau of Land Management - Missoula/Butte	IBO	1,356	3	3	100%
MT	10	MT-BCR10-BR	Beaverhead-Deerlodge National Forest - Roadless/Wilderness	IBO	8,236	3	3	100%
MT	10	MT-BCR10-BS	Bureau of Land Management - southwestern Montana	IBO	3,447	3	3	100%
MT	10	MT-BCR10-BW	Bitterroot National Forest - Roadless/Wilderness	IBO	2,763	2	2	100%
MT	10	MT-BCR10-CR	Custer National Forest - Roadless/Wilderness	IBO	1,783	2	2	100%
MT	10	MT-BCR10-CU	Custer National Forest - Roaded/Managed	IBO	779	3	3	100%
MT	10	MT-BCR10-FL	Flathead National Forest - Roaded/Managed	IBO	4,945	9	9	100%
MT	10	MT-BCR10-FR	Flathead National Forest - Roadless/Wilderness	IBO	6,410	3	3	100%
MT	10	MT-BCR10-GA	Gallatin National Forest - Roaded/Managed	IBO	3,479	9	9	100%

State	BCR	Stratum	Stratum Description	Collected By	Area (km²)	Planned	Completed	Percent Completed
MT	10	MT-BCR10-GR	Gallatin National Forest - Roadless/Wilderness	IBO	5,787	2	2	100%
MT	10	MT-BCR10-HE	Helena National Forest - Roaded/Managed	IBO	3,024	9	9	100%
MT	10	MT-BCR10-HR	Helena National Forest - Roadless/Wilderness	IBO	2,248	3	3	100%
MT	10	MT-BCR10-KO	Kootenai National Forest - Roaded/Managed	IBO	7,239	27	27	100%
MT	10	MT-BCR10-KR	Kootenai National Forest - Roadless/Wilderness	IBO	1,887	7	7	100%
MT	10	MT-BCR10-LC	Lewis and Clark National Forest - Roaded/Managed	IBO	2,778	6	6	100%
MT	10	MT-BCR10-LO	Lolo National Forest - Roaded/Managed	IBO	7,742	9	9	100%
MT	10	MT-BCR10-LR	Lewis and Clark National Forest - Roadless/Wilderness	IBO	5,007	3	3	100%
MT	10	MT-BCR10-LW	Lolo National Forest - Roadless/Wilderness	IBO	3,859	3	2	67%
MT	11	MT-BCR10-ON	All Other Lands	IBO	75,417	2	2	100%
MT	11	MT-BCR11-AO	All Other Lands	IBO	62,631	10	10	100%
MT	11	MT-BCR11-BN	Bureau of Land Management - North Valley	IBO	1,588	10	10	100%
MT	11	MT-BCR11-BO	Bureau of Land Management - Other	IBO	6,826	10	10	100%
MT	11	MT-BCR11-FT	USFWS and Tribal Lands	IBO	12370	2	2	100%
MT	17	MT-BCR17-AO	All Other Lands	IBO	102,779	10	10	100%
MT	17	MT-BCR17-BL	Bureau of Land Management	IBO	25,013	10	10	100%
MT	17	MT-BCR17-CU	Custer National Forest	IBO	2,649	4	4	100%
MT	17	MT-BCR17-LC	Lewis and Clark National Forest	IBO	867	3	3	100%
MT	17	MT-BCR17-RF	USFWS and River Lands	IBO	8,610	2	2	100%
ND	17	ND-BCR17-BM	Bureau of Land Management	BCR	165	7	7	100%
ND	17	ND-BCR17-KR	Knife River Indian Villages National Historic Site	BCR	5	2	2	100%
ND	17	ND-BCR17-MG	Little Missouri National Grassland	BCR	4,133	5	5	100%
ND	17	ND-BCR17-ON	All Other Lands	BCR	45,456	8	8	100%
ND	17	ND-BCR17-RG	Cedar River National Grassland	BCR	20	5	5	100%
ND	17	ND-BCR17-TI	Tribal Lands	BCR	4,780	4	2	50%
ND	17	ND-BCR17-TN	Theodore Roosevelt National Park - North Unit	BCR	100	6	6	100%
ND	17	ND-BCR17-TS	Theodore Roosevelt National Park - South Unit	BCR	193	8	8	100%
NE	17	NE-BCR17-LG	Oglala National Grassland	BCR	350	4	4	100%
NE	17	NE-BCR17-ON	All Other Lands	BCR	4,553	2	2	100%
NE	18	NE-BCR18-AO	All Other Lands	BCR	28,452	8	8	100%

State	BCR	Stratum	Stratum Description	Collected By	Area (km²)	Planned	Completed	Percent Completed
NE	18	NE-BCR18-GG	Oglala National Grassland	BCR	31	4	4	100%
NE	18	NE-BCR18-NP	National Park Service Lands	BCR	25	2	2	100%
NE	18	NE-BCR18-PR	Pineridge Biologically Unique Landscape	BCR	1,885	8	8	100%
NE	18	NE-BCR18-RD	Nebraska National Forest - Pine Ridge	BCR	200	4	4	100%
NE	18	NE-BCR18-SA	Sandsage Prairie Biologically Unique Landscape	BCR	2,894	8	8	100%
NE	18	NE-BCR18-WH	Wildcat Hills Biologically Unique Landscape	BCR	1,665	8	8	100%
NE	19	NE-BCR19-BE	Nebraska National Forest - Bessey District	BCR	361	4	4	100%
NE	19	NE-BCR19-SG	Samuel R. McKelvie National Forest	BCR	468	4	4	100%
NE	17	NE-NGPIM-NI	Niobrara National Scenic River	BCR	64	14	14	100%
NM	18	NM-BCR18-AO	All Other Lands	BCR	65,011	18	18	100%
NM	18	NM-BCR18-KW	Kiowa National Grassland	BCR	553	2	2	100%
NM	18	NM-BCR18-PL	Playas	BCR	244	17	17	100%
NM	18	NM-BCR18-RV	Rivers	BCR	2,206	15	15	100%
NV	15	NV-BCR15-HT	Humboldt-Toiyabe National Forest	GBBO	616	4	4	100%
NV	33	NV-BCR33-HT	Humboldt-Toiyabe National Forest	GBBO	1,313	5	5	100%
NV	9	NV-BCR9-HT	Humboldt-Toiyabe National Forest	GBBO	22,324	13	13	100%
OK	18	OK-BCR18-AO	All Other Lands	BCR	10,556	8	8	100%
OK	18	OK-BCR18-PL	Playas	BCR	105	5	5	100%
OK	18	OK-BCR18-RB	Rita Blanca National Grassland	BCR	57	2	2	100%
OK	18	OK-BCR18-RV	Rivers	BCR	533	8	8	100%
OK	19	OK-BCR19-AO	All Other Lands	BCR	68,616	8	8	100%
OK	19	OK-BCR19-PL	Playas	BCR	14	2	2	100%
OK	19	OK-BCR19-RV	Rivers	BCR	6,531	8	8	100%
SD	17	SD-BCR17-BF	Black Hills National Forest - All other Watersheds	BCR	5,009	13	13	100%
SD	17	SD-BCR17-BM	Bureau of Land Management	BCR	831	7	7	100%
SD	17	SD-BCR17-BN	Badlands National Park - North Unit	BCR	399	16	16	100%
SD	17	SD-BCR17-GG	Buffalo Gap National Grassland	BCR	2,346	4	4	100%
SD	17	SD-BCR17-HU	Black Hills National Forest - Hydrologic Code 7 Watersheds	BCR	376	9	9	100%
SD	17	SD-BCR17-NO	Other National Park Service Lands	BCR	11	2	2	100%
SD	17	SD-BCR17-ON	All Other Lands	BCR	64,642	8	8	100%

State	BCR	Stratum	Stratum Description	Collected By	Area (km²)	Planned	Completed	Percent Completed
SD	17	SD-BCR17-PG	Fort Pierre National Grassland	BCR	482	4	4	100%
SD	17	SD-BCR17-RG	Grand River National Grassland	BCR	613	5	5	100%
SD	17	SD-BCR17-TR	Tribal Lands	BCR	28,128	4	3	75%
SD	17	SD-BCR17-UF	Custer National Forest	BCR	326	4	4	100%
SD	17	SD-BCR17-WC	Wind Cave National Park	BCR	136	14	14	100%
SD	18	SD-BCR18-AO	All Other Lands	BCR	2,415	2	2	100%
TX	18	TX-BCR18-AO	All Other Lands	BCR	98,186	16	16	100%
TX	18	TX-BCR18-PL	Playas	BCR	4,507	16	16	100%
TX	18	TX-BCR18-RB	Rita Blanca National Grassland	BCR	305	2	2	100%
TX	18	TX-BCR18-RV	Rivers	BCR	1,200	16	16	100%
TX	19	TX-BCR19-AO	All Other Lands	BCR	84,131	16	16	100%
TX	19	TX-BCR19-PL	Playas	BCR	327	9	9	100%
TX	19	TX-BCR19-RV	Rivers	BCR	4,787	16	16	100%
UT	10	UT-BCR10-AO	All Other Lands	UDWR	1,968	12	12	100%
UT	10	UT-BCR10-AS	Ashley National Forest	BCR	96	3	3	100%
UT	10	UT-BCR10-SL	Bureau of Land Management - Salt Lake Field Office	BCR	642	2	2	100%
UT	10	UT-BCR10-VE	Bureau of Land Management - Vernal Field Office	BCR	268	2	2	100%
UT	10	UT-BCR10-WA	Uinta-Wasatch-Cache National Forest	BCR	49	3	3	100%
UT	16	UT-BCR16-AH	Ashley National Forest	BCR	5,166	17	17	100%
UT	16	UT-BCR16-AO	All Other Lands	UDWR	48,838	44	44	100%
UT	16	UT-BCR16-CC	Bureau of Land Management - Cedar City Field Office	IBO	450	2	2	100%
UT	16	UT-BCR16-DI	Dixie National Forest	IBO	5,934	8	8	100%
UT	16	UT-BCR16-FI	Bureau of Land Management - Fillmore Field Office	IBO	40	2	2	100%
UT	16	UT-BCR16-FL	Fishlake National Forest	IBO	6,670	8	8	100%
UT	16	UT-BCR16-GS	Bureau of Land Management - Grand Staircase-Escalante Nat'l Mon.	IBO	7,564	4	4	100%
UT	16	UT-BCR16-KA	Bureau of Land Management - Kanab Field Office	IBO	2,267	4	4	100%
UT	16	UT-BCR16-MA	Manti-La Sal National Forest	IBO	5,280	25	25	100%
UT	16	UT-BCR16-MN	Bureau of Land Management - Monticello Field Office	BCR	7,321	3	3	100%
UT	16	UT-BCR16-MO	Bureau of Land Management - Moab Field Office	BCR	7,725	3	3	100%
UT	16	UT-BCR16-PR	Bureau of Land Management - Price Field Office	IBO	10,216	6	6	100%

State	BCR	Stratum	Stratum Description	Collected By	Area (km^2)	Planned	Completed	Percent Completed
UT	16	UT-BCR16-RI	Bureau of Land Management - Richfield Field Office	IBO	8,068	4	4	100%
UT	16	UT-BCR16-SA	Manti-La Sal National Forest - Sanpitch	IBO	307	3	3	100%
UT	16	UT-BCR16-SG	Bureau of Land Management - Saint George Field Office	IBO	1,904	3	3	100%
UT	16	UT-BCR16-SL	Bureau of Land Management - Salt Lake Field Office	IBO	87	2	2	100%
UT	16	UT-BCR16-VE	Bureau of Land Management - Vernal Field Office	BCR	6,704	3	3	100%
UT	16	UT-BCR16-WA	Uinta-Wasatch-Cache National Forest	BCR	9,913	3	3	100%
UT	33	UT-BCR33-AO	All Other Lands	UDWR	65	15	15	100%
UT	33	UT-BCR33-SG	Bureau of Land Management - Saint George Field Office	IBO	388	2	2	100%
UT	9	UT-BCR9-AO	All Other Lands	UDWR	34,636	39	39	100%
UT	9	UT-BCR9-AP	Department of Defense - APG Impact Area	DOD	70	6	6	100%
UT	9	UT-BCR9-CC	Bureau of Land Management - Cedar City Field Office	IBO	8,046	4	4	100%
UT	9	UT-BCR9-CT	Caribou-Targhee National Forest	BCR	54	2	2	100%
UT	9	UT-BCR9-DD	Department of Defense - Other Lands	DOD	1986	6	6	100%
UT	9	UT-BCR9-DI	Dixie National Forest	IBO	1,008	2	2	100%
UT	9	UT-BCR9-FI	Bureau of Land Management - Fillmore Field Office	BCR	18,326	8	8	100%
UT	9	UT-BCR9-FL	Fishlake National Forest	IBO	590	2	2	100%
UT	9	UT-BCR9-MU	Department of Defense - Mudflats	DOD	1162	3	3	100%
UT	9	UT-BCR9-RI	Bureau of Land Management - Richfield Field Office	IBO	617	2	2	100%
UT	9	UT-BCR9-SG	Bureau of Land Management - Saint George Field Office	IBO	232	2	2	100%
UT	9	UT-BCR9-SL	Bureau of Land Management - Salt Lake Field Office	BCR	12,340	4	4	100%
UT	9	UT-BCR9-SW	Sawtooth National Forest	IBO	364	2	2	100%
UT	9	UT-BCR9-TS	Department of Defense - Target S Impact Area	DOD	128	6	6	100%
UT	9	UT-BCR9-UR	Department of Defense - UTG Impact Area	DOD	126	5	5	100%
UT	9	UT-BCR9-UT	Department of Defense - UTTR Impact Areas	DOD	522	5	5	100%
UT	9	UT-BCR9-WA	Uinta-Wasatch-Cache National Forest	BCR	1,648	3	3	100%
WY	10	WY-BCR10-AO	All Other Lands	BCR	52,161	15	15	100%
WY	10	WY-BCR10-AS	Ashley National Forest	BCR	540	2	2	100%
WY	10	WY-BCR10-BE	Bridger-Teton National Forest - Roaded/Managed	BCR	3,034	17	17	100%
WY	10	WY-BCR10-BH	Bighorn Canyon National Recreation Area	BCR	57	2	2	100%
WY	10	WY-BCR10-BI	Bighorn National Forest	WYNDD	4,712	9	9	100%

State	BCR	Stratum	Stratum Description	Collected By	Area (km^2)	Planned	Completed	Percent Completed
WY	10	WY-BCR10-BR	Bridger-Teton National Forest - Roadless/Wilderness	BCR	11,364	3	3	100%
WY	10	WY-BCR10-BU	Bureau of Land Management - Buffalo Field Office	BCR	547	2	2	100%
WY	10	WY-BCR10-CA	Bureau of Land Management - Casper Field Office	BCR	2,509	2	2	100%
WY	10	WY-BCR10-CO	Bureau of Land Management - Cody Field Office	BCR	4,704	2	2	100%
WY	10	WY-BCR10-CT	Caribou-Targhee National Forest	BCR	1,397	3	3	100%
WY	10	WY-BCR10-GR	Grand Teton National Park	BCR	856	2	2	100%
WY	10	WY-BCR10-KE	Bureau of Land Management - Kemmerer Field Office	BCR	5,733	2	2	100%
WY	10	WY-BCR10-LA	Bureau of Land Management - Lander Field Office	BCR	9,829	6	6	100%
WY	10	WY-BCR10-MB	Medicine Bow National Forest	WYNDD	773	3	3	100%
WY	10	WY-BCR10-PI	Bureau of Land Management - Pinedale Field Office	BCR	3,687	8	8	100%
WY	10	WY-BCR10-RA	Bureau of Land Management - Rawlins Field Office	BCR	13,954	8	7	88%
WY	10	WY-BCR10-RO	Bureau of Land Management - Rock Springs Field Office	BCR	15,152	8	8	100%
WY	10	WY-BCR10-SE	Shoshone National Forest - Roaded/Managed	BCR	2,101	7	7	100%
WY	10	WY-BCR10-SR	Shoshone National Forest - Roadless/Wilderness	BCR	8,311	7	7	100%
WY	10	WY-BCR10-WA	Wasatch National Forest	BCR	33	3	3	100%
WY	10	WY-BCR10-WO	Bureau of Land Management - Worland Field Office	BCR	8,467	6	6	100%
WY	10	WY-BCR10-WR	Wind River Reservation	BCR	7,819	4	4	100%
WY	10	WY-BCR10-YE	Yellowstone National Park	BCR	7,592	4	4	100%
WY	16	WY-BCR16-AO	All Other Lands	BCR	5,438	5	5	100%
WY	16	WY-BCR16-BL	Bureau of Land Management	BCR	647	2	2	100%
WY	16	WY-BCR16-MB	Medicine Bow National Forest	WYNDD	5,329	14	14	100%
WY	16	WY-BCR16-WA	Wasatch National Forest	BCR	180	3	3	100%
WY	17	WY-BCR17-AO	All Other Lands	BCR	52,186	12	12	100%
WY	17	WY-BCR17-BH	Black Hills National Forest	BCR	1,085	6	6	100%
WY	17	WY-BCR17-BU	Bureau of Land Management - Buffalo Field Office	BCR	2,653	2	2	100%
WY	17	WY-BCR17-CA	Bureau of Land Management - Casper Field Office	BCR	2,695	2	2	100%
WY	17	WY-BCR17-NE	Bureau of Land Management - Newcastle Field Office	BCR	1,025	2	2	100%
WY	17	WY-BCR17-TB	Thunder Basin National Grassland	WYNDD	4,520	10	10	100%
WY	18	WY-BCR18-AO	All Other Lands	BCR	12,064	12	12	100%
WY	18	WY-BCR18-BL	Bureau of Land Management	BCR	171	2	2	100%

State	BCR	Stratum	Stratum Description	Collected By	Area (km^2)	Planned	Completed	Percent Completed
WY	18	WY-BCR18-DO	Department of Defense	BCR	23	2	2	100%
WY	9	WY-BCR9-WY	Caribou-Targhee National Forest	BCR	119	2	2	100%

Table 2. Reasons planned surveys were not completed, 2018.

Stratum	# Not Completed	Reason
WY-BCR10-RA	1	Accessibility determined too late to survey
CO-BCR16-AO	1	Active Wildfire
MT-BCR10-LW	1	Active Wildfire
CO-BCR10-AO	1	Miscommunication with landowner
ND-BCR17-TI	2	Unable to secure permission to survey
SD-BCR17-TR	1	Unable to secure permission to survey

IV. Land Ownership

A. US Forest Service

Jump to:
Region 1 Region 2 Region 3 Region 4

1. Region 1

a. Region 1 National Forests

Within this sampling design each national forest in Region 1 was stratified separately. In this section of the report, we summarize results for all Region 1 Forests combined, followed by summaries for each individual national forest.

(1) Region 1 National Forests: Total

We obtained results for USFS-Region 1 National Forests by compiling and jointly analyzing data from 29 strata in three states.

Field observers completed 206 of 207 planned surveys (99.5%) in 2018. Observers conducted 2,227 point counts within the 206 surveyed grid cells between May 26 and July 13. They detected 176 bird species, including six priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 188 species that have been detected in any year, nine of which are priority species. The data yielded robust density estimates (CV < 50%) for 87 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout USFS-Region 1 National Forests for 190 species that have been detected in any year, eight of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 128 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within USFS-Region 1 National Forests across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

USFS-Region 1 National Forests Results

(2) Beaverhead-Deerlodge National Forest

We obtained results for Beaverhead-Deerlodge National Forest by compiling and jointly analyzing data from two strata: front-country/managed areas and designated roadless/wilderness areas. This forest-level stratification distinction was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 161 point counts within the 13 surveyed grid cells between June 15 and July 8. They detected 64 bird species, including one priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 109 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 32 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Beaverhead-Deerlodge National Forest for 107 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 39 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Beaverhead-Deerlodge National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Beaverhead-Deerlodge National Forest Results

(3) Bitterroot National Forest

We obtained results for Bitterroot National Forest by compiling and jointly analyzing data from three strata in two states: Montana front-country/managed areas, Montana designated roadless/wilderness areas, and Idaho. This forest-level stratification distinction in Montana was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit. The stratification distinction between states is made to allow for the summation of the data for individual states involved.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 153 point counts within the 12 surveyed grid cells between June 20 and July 2. They detected 64 bird species, including two priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 96 species that have been detected in any year, two of which are priority species. The data yielded robust density estimates (CV < 50%) for 31 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Bitterroot National Forest for 111 species that have been detected in any year, two of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 49 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Bitterroot National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Bitterroot National Forest Results

(4) Clearwater National Forest

We obtained results for Clearwater National Forest by compiling and jointly analyzing data from two strata: front-country/managed areas and designated roadless/wilderness areas. This forest-level stratification distinction was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 214 point counts within the 22 surveyed grid cells between June 3 and July 2. They detected 70 bird species, including two priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 102 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 37 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Clearwater National Forest for 101 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 50 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Clearwater National Forest across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

Clearwater National Forest Results

(5) Custer National Forest

We obtained results for Custer National Forest by compiling and jointly analyzing data from four strata across two states (Montana and South Dakota) and two BCRs (10 and 17). Within Montana BCR 10, Custer National Forest is further split into front-country/managed areas and designated roadless/wilderness areas. This forest-level stratification distinction was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit. The state-level stratification distinction is made for the benefit of the state partners to allow for the summation of the data for individual states. Likewise, the BCR-level stratification distinction is made to allow for the summation of the data for individual BCRs.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 157 point counts within the 13 surveyed grid cells between June 13 and July 6. They detected 100 bird species, including ten priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 140 species that have been detected in any year, 13 of which are priority species. The data yielded robust density estimates (CV < 50%) for 42 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Custer National Forest for 139 species that have been detected in any year,

12 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 54 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Custer National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Custer National Forest Results

(6) Flathead National Forest

We obtained results for Flathead National Forest by compiling and jointly analyzing data from two strata: front-country/managed areas and designated roadless/wilderness areas. This forest-level stratification distinction was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 129 point counts within the 12 surveyed grid cells between May 30 and July 10. They detected 84 bird species, including one priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 107 species that have been detected in any year, two of which are priority species. The data yielded robust density estimates (CV < 50%) for 38 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Flathead National Forest for 106 species that have been detected in any year, two of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 49 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Flathead National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Flathead National Forest Results

(7) Gallatin National Forest

We obtained results for Gallatin National Forest by compiling and jointly analyzing data from two strata: front-country/managed areas and designated roadless/wilderness areas. This forest-level stratification distinction was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 121 point counts within the 11 surveyed grid cells between May 28 and July 9. They detected 64 bird species, including zero priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 116 species that have been detected in any year, three of which are priority species. The data yielded robust density estimates (CV < 50%) for 31 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Gallatin National Forest for 113 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 38 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Gallatin National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Gallatin National Forest Results

(8) Helena National Forest

We obtained results for Helena National Forest by compiling and jointly analyzing data from two strata: front-country/managed areas and designated roadless/wilderness areas. This forest-level stratification distinction was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 138 point counts within the 12 surveyed grid cells between June 2 and July 7. They detected 78 bird species, including two priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 121 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 42 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Helena National Forest for 118 species that have been detected in any year, four of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 47 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Helena National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Helena National Forest Results

(9) Idaho Panhandle National Forest

We obtained results for Idaho Panhandle National Forest by compiling and jointly analyzing data from two strata: front-country/managed areas and designated roadless/wilderness areas. This forest-level stratification distinction was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 322 point counts within the 30 surveyed grid cells between May 26 and July 4. They detected 81 bird species, including five priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 113 species that have been detected in any year, eight of which are priority species. The data yielded robust density estimates (CV < 50%) for 45 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Idaho Panhandle National Forest for 112 species that have been detected in any year, eight of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 55 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Idaho Panhandle National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Idaho Panhandle National Forest Results

(10) Kootenai National Forest

We obtained results for Kootenai National Forest by compiling and jointly analyzing data from three strata: Montana front-country/managed areas, Montana designated roadless/wilderness areas and Idaho. This forest-level stratification distinction in Montana was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit. The stratification distinction between states is made to allow for the summation of the data for individual states involved.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 377 point counts within the 36 surveyed grid cells between May 28 and July 11. They detected 110 bird species, including seven priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 117 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 46 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Kootenai National Forest for 126 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 62 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Kootenai National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Kootenai National Forest Results

(11) Lewis and Clark National Forest

We obtained results for Lewis and Clark National Forest by compiling and jointly analyzing data from three strata: one in BCR 17 and two in BCR 10. Within BCR 10, the Forest is split into front-country/managed areas and designated roadless/wilderness areas because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit. The BCR-level stratification distinction is made to allow for the summation of the data for individual BCRs.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 114 point counts within the 12 surveyed grid cells between June 8 and July 8. They detected 70 bird species, including two priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 119 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 26 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Lewis and Clark National Forest for 119 species that have been detected in any year, four of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 38 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Lewis and Clark National Forest across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

Lewis and Clark National Forest Results

(12) Lolo National Forest

We obtained results for Lolo National Forest by compiling and jointly analyzing data from two strata: front-country/managed areas and designated roadless/wilderness areas. This forest-level stratification distinction was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit.

Field observers completed 11 of 12 planned surveys (91.7%) in 2018. Observers conducted 123 point counts within the 11 surveyed grid cells between May 29 and July 13. They detected 81 bird species, including two priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 125 species that have been detected in any year, three of which are priority species. The data yielded robust density estimates (CV < 50%) for 43 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Lolo National Forest for 124 species that have been detected in any year, four of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 51 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Lolo National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Lolo National Forest Results

(13) Nez Perce National Forest

We obtained results for Nez Perce National Forest by compiling and jointly analyzing data from two strata: front-country/managed areas and designated roadless/wilderness areas. This forest-level stratification distinction was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 218 point counts within the 22 surveyed grid cells between June 3 and July 13. They detected 73 bird species, including five priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 108 species that have been detected in any year, five of which are priority species. The data yielded robust density estimates (CV < 50%) for 36 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Nez Perce National Forest for 107 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 46 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Nez Perce National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Nez Perce National Forest Results

b. Region 1 National Grasslands

We obtained results for Region 1 National Grasslands by compiling and jointly analyzing data from three strata in two states: Cedar River, Grand River and Little Missouri National Grasslands. This grassland-level stratification is made so we can produce results for each grassland individually as well as for all three of them as a whole. All of the national grasslands in USFS Region 1 fall within the Dakota Prairie National Grasslands. We did not survey one national grassland within Region 1 – Sheyenne National Grassland. We have collected data from this grassland using a different study design in the past. For more information on this, refer to the 'Monitoring of Grassland Birds on Little Missouri, Sheyenne and Grand River National Grasslands' report (Sparks & Hanni, 2013).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 172 point counts within the 15 surveyed grid cells between June 6 and July 4. They detected 79 bird species, including three priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 117 species that have been detected in any year, five of which are priority species. The data yielded robust density estimates (CV < 50%) for 42 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout USFS-Region 1 National Grasslands for 113 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 46 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within USFS-Region 1 National Grasslands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

USFS-Region 1 National Grasslands Results

(1) Little Missouri National Grassland

We obtained results for Little Missouri National Grassland from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 49 point counts within the five surveyed grid cells between June 6 and July 2. They detected 52 bird species, including 20 priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 84 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 25 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Little Missouri National Grassland for 77 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 29 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Little Missouri National Grassland across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Little Missouri National Grassland Results

(2) Cedar River National Grassland

We obtained results for Cedar River National Grassland from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 51 point counts within the five surveyed grid cells between June 29 and July 4. They detected 30 bird species, including 12 priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 61 species that have been detected in any year, two of which are priority species. The data yielded robust density estimates (CV < 50%) for ten species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Cedar River National Grassland for 61 species that have been detected in any year, two of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 22 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Cedar River National Grassland across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Cedar River National Grassland Results

(3) Grand River National Grassland

We obtained results for Grand River National Grassland from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 72 point counts within the five surveyed grid cells between June 14 and June 29. They detected 47 bird species, including 19 priority species (Appendix G).

Bird Conservancy estimated densities and population sizes for 63 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 11 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Grand River National Grassland for 57 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 16 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Grand River National Grassland across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Grand River National Grassland Results

2. Region 2

a) Region 2 National Forests

Within this sampling design each national forest in Region 2 is stratified separately. In this section of the report, we summarize results for all Region 2 Forests combined, followed by summaries for each individual Forest.

(1) Region 2 National Forests: Total

We obtained results for Region 2 National Forests by compiling and jointly analyzing data from 25 strata in four states. This forest-level stratification distinction is made to allow for the summation of the data for individual Forests, BCRs and States.

Field observers completed 203 of 205 planned surveys (99%) in 2018. Observers conducted 2,216 point counts within the 203 surveyed grid cells between May 21 and July 16. They detected 174 bird species, including 13 priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 205 species that have been detected in any year, 19 of which are priority species. The data yielded robust density estimates (CV < 50%) for 88 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout USFS-Region 2 National Forests for 208 species that have been detected in any year, 21 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 126 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within USFS-Region 2 National Forests across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

USFS-Region 2 National Forests Results

(2) Arapaho and Roosevelt National Forests

We obtained results for Arapaho and Roosevelt National Forests by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 306 point counts within the 30 surveyed grid cells between June 2 and July 7. They detected 89 bird species, including five priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 116 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 40 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Arapaho and Roosevelt National Forests for 116 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 42 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Arapaho and Roosevelt National Forests across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Arapaho and Roosevelt National Forests Results

(3) Bighorn National Forest

We obtained results for Bighorn National Forest by analyzing data from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 116 point counts within the nine surveyed grid cells between June 26 and July 5. They detected 61 bird species, including ten priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 96 species that have been detected in any year, five of which are priority species. The data yielded robust density estimates (CV < 50%) for 25 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Bighorn National Forest for 94 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 29 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Bighorn National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Bighorn National Forest Results

(4) Black Hills National Forest

We obtained results for the Black Hills National Forest by compiling and jointly analyzing data from three strata spanning two states. This forest-level stratification distinction is made to allow for the summation of the data for individual states. In 2011, the South Dakota Black Hills National Forest stratum was split into two strata based on watersheds in the Forest: Hydrologic Code 7 Watersheds and all other watersheds. This stratification by watershed allows for adjusting sampling intensity to target Management Indicator Species on the Forest.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 326 point counts within the 28 surveyed grid cells between May 21 and July 12. They detected 97 bird species, including ten priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 138 species that have been detected in any year, ten of which are priority species. The data yielded robust density estimates (CV < 50%) for 59 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Black Hills National Forest for 133 species that have been detected in any year, ten of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 65 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Black Hills National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on

the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Black Hills National Forest Results

(5) Grand Mesa, Uncompaghre and Gunnison National Forests
We obtained results for Grand Mesa, Uncompaghre and Gunnison National Forests by analyzing data from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 62 point counts within the seven surveyed grid cells between June 10 and July 13. They detected 49 bird species, including three priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 102 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 33 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Grand Mesa, Uncompaghre and Gunnison National Forests for 102 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 36 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Grand Mesa, Uncompaghre and Gunnison National Forests across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Grand Mesa, Uncompaghre and Gunnison National Forests Results

(6) Medicine Bow National Forest
We obtained results for Medicine Bow National Forest by compiling and jointly analyzing data from two strata. This forest-level stratification distinction is made to allow for the summation of the data for individual BCRs.

Field observers completed 17 of 19 planned surveys (89.5%) in 2018. Observers conducted 174 point counts within the 17 surveyed grid cells between June 26 and July 15. They detected 88 bird species, including five priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 131 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 48 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Medicine Bow National Forest for 132 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 63 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Medicine Bow National Forest across all years of the project, follow the web link

below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, after you click on the link below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Medicine Bow National Forest Results

(7) Nebraska National Forests

We obtained results for Nebraska National Forests by compiling and jointly analyzing data from three strata: Nebraska National Forest Pine Ridge and Bessey Ranger Districts and Samuel R. McKelvie National Forest. This district-level stratification distinction is made to allow for the summation of the data for individual BCRs and Ranger Districts.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 126 point counts within the 12 surveyed grid cells between May 31 and July 4. They detected 80 bird species, including two priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 116 species that have been detected in any year, three of which are priority species. The data yielded robust density estimates (CV < 50%) for 41 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Nebraska National Forests for 111 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 59 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Nebraska National Forests across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Nebraska National Forests Results

(8) Pike and San Isabel National Forests

We obtained results for Pike and San Isabel National Forests by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 336 point counts within the 31 surveyed grid cells between May 31 and July 13. They detected 83 bird species.

Bird Conservancy estimated densities and population sizes for 129 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 47 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Pike and San Isabel National Forests for 127 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 44 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Pike and San Isabel National Forests across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Pike and San Isabel National Forests Results

(9) Rio Grande National Forest

We obtained results for Rio Grande National Forest by compiling and jointly analyzing data from three strata: low, medium and high elevations. From 2008-2010, the Rio Grande National Forest was contained within one forest-wide stratum. The stratum was split into three strata based on elevation prior to the 2011 field season. The new stratification by elevation allows for adjusting sampling intensity to target Management Indicator Species on the Forest. There was a land acquisition within Great Sand Dunes National Monument so during the restratification some samples were removed from Rio Grande National Forest and added to the RMNW stratum; 16 km² were added to the area of the RMNW strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 146 point counts within the 14 surveyed grid cells between June 17 and July 12. They detected 74 bird species, including five priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 127 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 52 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Rio Grande National Forest for 114 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 55 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Rio Grande National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Rio Grande National Forest Results

(10) Routt National Forest

We obtained results for Routt National Forest by compiling and jointly analyzing data from two strata: Routt National Forest and the Williams Fork Management Unit. In 2011, the Routt National Forest and Arapaho and Roosevelt National Forests strata were reorganized and a third stratum, the Williams Fork Area, was created from the two. The Williams Fork Area is a portion of the Arapaho and Roosevelt National Forests that is included in the Routt National Forest land management plan but administered by the Arapaho and Roosevelt National Forests. This stratum allows data to be rolled-up to meet multiple needs of these two units.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 234 point counts within the 21 surveyed grid cells between June 14 and July 14. They detected 82 bird species, including three priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 115 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 42 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Routt National Forest for 112 species that have been detected in any year, four of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 46 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Routt National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Routt National Forest Results

(11) San Juan National Forest

We obtained results for San Juan National Forest by analyzing data from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 82 point counts within the six surveyed grid cells between June 7 and July 1. They detected 62 bird species, including four priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 121 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 41 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout San Juan National Forest for 119 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 43 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within San Juan National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

San Juan National Forest Results

(12) Shoshone National Forest

We obtained results for Shoshone National Forest by analyzing data from two strata; front-country/managed areas and designated roadless/wilderness areas. This forest-level stratification distinction was made because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 165 point counts within the 14 surveyed grid cells between May 30 and July 16. They detected 76 bird species, including four priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 138 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 41 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Shoshone National Forest for 139 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 36 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Shoshone National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Shoshone National Forest Results

(13) White River National Forest

We obtained results for White River National Forest by compiling and jointly analyzing data from three strata: low, medium and high elevations. From 2008-2010, the White River National Forest was contained within one forest-wide stratum. The stratum was split into three strata based on elevation prior to the 2011 field season. The new stratification by elevation allows us to adjust sampling intensity to target Management Indicator Species on the Forest.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 143 point counts within the 14 surveyed grid cells between June 15 and July 14. They detected 65 bird species, including two priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 119 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 40 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout White River National Forest for 114 species that have been detected in any year, four of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 55 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within White River National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

White River National Forest Results

b) Region 2 National Grasslands

Within this sampling design, each national grassland in Region 2 is stratified separately. This grassland-level stratification distinction is made so we can analyze the data separately for each grassland, or together as a whole. In this section of the report, we summarize results for all Region 2 grasslands combined, followed by summaries for each individual grassland.

(1) Region 2 National Grasslands: Total

We obtained results for Region 2 National Grasslands by compiling and jointly analyzing data from eight strata in five states. This grassland-level stratification distinction is made to allow for the summation of the data for individual Grasslands, BCRs, and States.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 530 point counts within the 41 surveyed grid cells between May 7 and June 28. They detected 119 bird species, including 12 priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 164 species that have been detected in any year, 18 of which are priority species. The data yielded robust density estimates (CV < 50%) for 49 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout USFS-Region 2 National Grasslands for 168 species that have been detected in any year, 20 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 62 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within USFS-Region 2 National Grasslands across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

USFS-Region 2 National Grasslands Results

(2) Nebraska National Grasslands (Buffalo Gap, Fort Pierre and Oglala)

We obtained results for Nebraska National Grasslands by analyzing data from four strata in two states; Buffalo Gap National Grassland, Fort Pierre National Grassland, Oglala National Grassland in BCR 17 and Oglala National Grassland in BCR 18. This grassland-level stratification distinction is made so we can analyze the data separately for each grassland, or together as a whole. The BCR-level stratification distinction in Oglala National Grassland is made to allow for the summation of the data for individual BCRs.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 210 point counts within the 16 surveyed grid cells between May 28 and June 28. They detected 95 bird species, including nine priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 128 species that have been detected in any year, 13 of which are priority species. The data yielded robust density estimates (CV < 50%) for 33 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Nebraska National Grasslands for 123 species that have been detected in

any year, 14 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 46 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Nebraska National Grasslands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Nebraska National Grasslands Results

(3) Cimarron National Grassland

We obtained results for Cimarron National Grassland from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 51 point counts within the four surveyed grid cells between May 7 and June 1. They detected 28 bird species, including 17 priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 33 species that have been detected in any year, one of which are priority species. The data yielded robust density estimates (CV < 50%) for 12 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Cimarron National Grassland for 32 species that have been detected in any year, one of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 11 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Cimarron National Grassland across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Cimarron National Grassland Results

(4) Comanche National Grassland

We obtained results for Comanche National Grassland from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 65 point counts within the six surveyed grid cells between May 20 and May 24. They detected 34 bird species, including 13 priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 93 species that have been detected in any year, two of which are priority species. The data yielded robust density estimates (CV < 50%) for 16 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Comanche National Grassland for 90 species that have been detected in any year, two of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 12 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Comanche National Grassland across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Comanche National Grassland Results

(5) Public Lands on Pawnee National Grassland

We obtained results for Public Lands on Pawnee National Grassland by analyzing data from one stratum. In 2013, Pawnee National Grasslands was split into two strata – public lands and private lands – because Pawnee National Grasslands contains a large amount of private land within its borders. This allowed the USFS to concentrate more survey effort on public lands. We only present estimates for the public lands portion of Pawnee National Grasslands in this report.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 70 point counts within the five surveyed grid cells between May 16 and June 4. They detected 20 bird species, including two priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 34 species that have been detected in any year, two of which are priority species. The data yielded robust density estimates (CV < 50%) for eight species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Pawnee National Grassland for 17 species that have been detected in any year, one of which is a priority species. The data yielded robust occupancy estimates (CV < 50%) for nine species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Pawnee National Grassland across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Pawnee National Grassland Results

(6) Thunder Basin National Grassland

We obtained results for Thunder Basin National Grassland from one stratum.

Field observers completed ten of ten planned surveys (100%) in 2018. Observers conducted 134 point counts within the ten surveyed grid cells between May 30 and June 4. They detected 63 bird species, including 23 priority species (Appendix H).

Bird Conservancy estimated densities and population sizes for 93 species that have been detected in any year, two of which are priority species. The data yielded robust density estimates (CV < 50%) for 18 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Thunder Basin National Grassland for 94 species that have been detected in

any year, two of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 20 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Thunder Basin National Grassland across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Thunder Basin National Grassland Results

3. Region 3

In this section, we summarize results for two national grasslands in Region 3: Kiowa National Grassland and Rita Blanca National Grassland.

a) Kiowa National Grassland

We obtained results for Kiowa National Grassland from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 32 point counts within the two surveyed grid cells between May 31 and June 28. They detected 15 bird species, including ten priority species (Appendix I).

Bird Conservancy estimated densities and population sizes for 29 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for four species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Kiowa National Grassland for 29 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for eight species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Kiowa National Grassland across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Kiowa National Grassland Results

b) Rita Blanca National Grassland

We obtained results for Rita Blanca National Grassland by analyzing data from two strata corresponding to the portions of the Rita Blanca National Grassland that lie within Texas and Oklahoma. This state-level stratification distinction is made is made to allow for the summation of the data for individual states.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 34 point counts within the four surveyed grid cells between May 22 and June 27. They detected 26 bird species, with no priority species (Appendix I).

Bird Conservancy estimated densities and population sizes for 52 species that have been detected in any year, one of which are priority species. The data yielded robust density estimates (CV < 50%) for 11 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Rita Blanca National Grassland for 50 species that have been detected in any year, one of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 43 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Rita Blanca National Grassland across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Rita Blanca National Grassland Results

4. Region 4

In this section, we summarize results for all 12 national forests and Curlew National Grassland in Region 4. In 2010, the USFS Region 4 stratum in Wyoming BCR 10 was restratified into three separate strata: Bridger-Teton National Forest front-country/managed areas, Bridger-Teton National Forest designated roadless/wilderness areas and the remainder of USFS Region 4 lands in Wyoming BCR 10. This restratification was done to allow for density and occupancy estimation at the national forest level for the Bridger-Teton National Forest. Similarly, in 2013 the remaining USFS Region 4 stratum was restratified by forest (Caribou-Targhee, Ashley, and Wasatch National Forests), allowing for forest-wide estimates within Caribou-Targhee National Forest. There were some significant stratification changes made to the BCR 10 portion of Idaho between the 2013 and 2014 field seasons. The boundary between USFS Regions 1 and 4 runs through Idaho and was taken into account when restratifying so that estimates could be generated at the USFS Region level. The new USFS Region 4 strata created in Idaho BCR 10 included Boise National Forest, Payette National Forest, Salmon-Challis National Forest, and Sawtooth National Forest. The Utah portion of Manti-La Sal National Forest was stratified in 2015 to provide forest-wide estimates and the BCR 16 portion of Ashley National Forest in Utah was added to the sampling frame in 2016. In 2017,we obtained region-wide estimates by completely stratifying Ashley, Boise, Dixie, Fishlake, Humboldt-Toiyabe, Salmon-Challis, Sawtooth, and Uinta-Wasatch-Cache National Forests.

a. Region 4 National Forests: Total

We obtained results for USFS-Region 4 National Forests by compiling and jointly analyzing data from 36 strata in six states.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 2,333 point counts within the 202 surveyed grid cells between May 8 and July 19. They detected 177 bird species, including ten priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 174 species, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 95 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout USFS-Region 4 National Forests for 191 species, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 135 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within USFS-Region 4 National Forests across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

USFS-Region 4 National Forests Results

b. Ashley National Forest

We obtained results for Ashley National Forest from three strata in two states. The state-level stratification distinction is made to allow for the summation of the data for individual states. Likewise, the BCR-level stratification distinction is made to allow for the summation of the data for individual BCRs. In 2017, the BCR 16 portion of Ashley National Forest in Utah was restratified to include private inholdings and maintain consistency with other forests in the state.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 281 point counts within the 22 surveyed grid cells between May 28 and July 9. They detected 90 bird species, including five priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 93 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 44 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Ashley National Forest for 102 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 47 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Ashley National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Ashley National Forest Results

c. Boise National Forest

We obtained results for Boise National Forest by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 101 point counts within the ten surveyed grid cells between June 5 and June 26. They detected 78 bird species, including six priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 90 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 37 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Boise National Forest for 88 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 52 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Boise National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Boise National Forest Results

d. Bridger-Teton National Forest

In 2010, the USFS Region 4 stratum in Wyoming was restratified into three separate strata: Bridger-Teton National Forest front-country/managed areas, Bridger-Teton National Forest designated roadless/wilderness areas and the remainder of USFS Region 4 lands in Wyoming BCR 10. We separated this forest from the rest of the Region 4 USFS lands to estimate density and occupancy at the National Forest level for the Bridger-Teton National Forest. We obtained results for Bridger-Teton National Forest by analyzing data from the front-country/managed stratum and the designated roadless/wilderness stratum. We stratified at the forest-level because of field implementation cost considerations and the desire to focus monitoring on the more highly managed areas while maintaining inference to the entire management unit.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 269 point counts within the 20 surveyed grid cells between May 31 and July 19. They detected 86 bird species, including two priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 122 species that have been detected in any year, three of which are priority species. The data yielded robust density estimates (CV < 50%) for 36 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Bridger-Teton National Forest for 120 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 44 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Bridger-Teton National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Bridger-Teton National Forest Results

e. Caribou-Targhee National Forest

We obtained results for Caribou-Targhee National Forest by compiling and jointly analyzing data from six strata in three states. The state-level stratification distinction is made to allow for the summation of the data for individual states. Likewise, the BCR-level stratification distinction is made to allow for the summation of the data for individual BCRs.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 249 point counts within the 20 surveyed grid cells between May 25 and July 17. They detected 94 bird species, with no priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 146 species that have been detected in any year, three of which are priority species. The data yielded robust density estimates (CV < 50%) for 42 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Caribou-Targhee National Forest for 146 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 65 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Caribou-Targhee National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Caribou-Targhee National Forest Results

f. Dixie National Forest

We obtained results for Dixie National Forest by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 113 point counts within the ten surveyed grid cells between May 8 and June 24. They detected 78 bird species, with no priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 84 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 42 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Dixie National Forest for 82 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 45 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Dixie National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Dixie National Forest Results

g. Fishlake National Forest

We obtained results for Fishlake National Forest by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 120 point counts within the ten surveyed grid cells between May 12 and June 29. They detected 68 bird species, with no priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 75 speciesthat have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 32 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Fishlake National Forest for 73 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 32 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Fishlake National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Fishlake National Forest Results

h. Humboldt-Toiyabe National Forest

We obtained results for Humboldt-Toiyabe National Forest by compiling and jointly analyzing data from five strata in two states.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 350 point counts within the 30 surveyed grid cells between May 10 and July 7. They detected 117 bird species, with no priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 113 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 59 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Humboldt-Toiyabe National Forest for 114 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 60 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Humboldt-Toiyabe National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Humboldt-Toiyabe National Forest Results

i. Manti-La Sal National Forest

We obtained results for Manti-La Sal National Forest by compiling and jointly analyzing data from three strata across two states. In 2014, a new stratum was created for Manti-La Sal National Forest in Utah. Previously, only the Colorado portion of Manti-La Sal was stratified and surveyed. In 2015, Sanpitch Recreation Area was added as an additional stratum and incorporated into forest-wide estimates for Manti-La Sal National Forest. This area is part of Uinta National Forest but administered by Manti-La Sal National Forest. The additional Utah strata allow for the generation of forest-wide estimates for Manti-La Sal National Forest. The state-level stratification distinction is made to allow for the summation of the data for individual states.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 301 point counts within the 30 surveyed grid cells between May 21 and July 4. They detected 93 bird species, including three priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 132 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 50 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Manti-La Sal National Forest for 133 species that have been detected in any year, four of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 57 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Manti-La Sal National Forest across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, below select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

Manti-La Sal National Forest Results

j. Payette National Forest

We obtained results for Payette National Forest from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 87 point counts within the ten surveyed grid cells between May 31 and July 5. They detected 76 bird species, including seven priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 90 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 31 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Payette National Forest for 85 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 38 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Payette National Forest across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit

results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Payette National Forest Results

k. Salmon-Challis National Forest

We obtained results for Salmon-Challis National Forest by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 174 point counts within the 15 surveyed grid cells between June 3 and July 8. They detected 77 bird species, including five priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 97 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 32 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Salmon-Challis National Forest for 93 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 39 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Salmon-Challis National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Salmon-Challis National Forest Results

l. Sawtooth National Forest

We obtained results for Sawtooth National Forest by compiling and jointly analyzing data from three strata in two states.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 111 point counts within the ten surveyed grid cells between May 27 and July 2. They detected 60 bird species, including two priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 88 species that have been detected in any year, two of which are priority species. The data yielded robust density estimates (CV < 50%) for 31 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Sawtooth National Forest for 89 species that have been detected in any year, two of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 37 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Sawtooth National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to

limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Sawtooth National Forest Results

m. Uinta-Wasatch-Cache National Forest

We obtained results for Wasatch National Forest from five strata in two states. The state-level stratification distinction is made to allow for the summation of the data for individual states. Likewise, the BCR-level stratification distinction is made to allow for the summation of the data for individual BCRs.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 177 point counts within the 15 surveyed grid cells between May 22 and July 14. They detected 84 bird species, including one priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 94 species that have been detected in any year, one of which are priority species. The data yielded robust density estimates (CV < 50%) for 27 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Uinta-Wasatch-Cache National Forest for 97 species that have been detected in any year, two of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 40 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Uinta-Wasatch-Cache National Forest across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Uinta-Wasatch-Cache National Forest Results

n. Curlew National Grassland

We obtained results for Curlew National Grassland from one stratum

Field observers completed all planned surveys (100%) in 2018. Observers conducted 132 point counts within the ten surveyed grid cells between May 31 and June 6. They detected 55 bird species, including ten priority species (Appendix J).

Bird Conservancy estimated densities and population sizes for 65 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 20 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Curlew National Grassland for 60 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 20 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Curlew National Grassland across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to

limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Curlew National Grassland Results

B. Bureau of Land Management

Jump to:

BLM in Colorado BLM in Idaho BLM in Montana
BLM in Utah BLM in Wyoming

1. BLM in Colorado

a) BLM in Colorado: Total

We obtained results for all BLM lands in Colorado by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 448 point counts within the 38 surveyed grid cells between May 16 and July 10. They detected 106 bird species, including two priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 146 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 57 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all BLM lands in Colorado for 159 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 68 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all BLM lands in Colorado across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in Colorado Results

b) BLM in Colorado BCR 10

We obtained results for BLM lands in Colorado BCR 10 from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 128 point counts within the ten surveyed grid cells between May 22 and June 7. They detected 49 bird species, including nine priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 100 species that have been detected in any year, five of which are priority species. The data yielded robust density estimates (CV < 50%) for 22 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Colorado BCR 10 for 96 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 27 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Colorado BCR 10 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in Colorado BCR 10 Results

c) BLM in Colorado BCR 16

We obtained results for BLM lands in Colorado BCR 16 from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 320 point counts within the 28 surveyed grid cells between May 16 and July 10. They detected 100 bird species, including 11 priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 154 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 56 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Colorado BCR 16 for 151 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 64 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Colorado BCR 16 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in Colorado BCR 16 Results

2. BLM in Idaho

a) Challis Field Office

We obtained results for the BLM Challis Field Office lands by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 50 point counts within the four surveyed grid cells between June 1 and June 28. They detected 45 bird species, including two priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 65 that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 17 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout the BLM Challis Field Office lands for 61 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 24 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within the BLM Challis Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

ID-BLM - Challis Field Office Results

b) Four Rivers Field Office

We obtained results for BLM Four Rivers Field Office lands by compiling and jointly analyzing data from three strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 112 point counts within the eight surveyed grid cells between May 20 and June 22. They detected 47 bird species, including six priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 69 species that have been detected in any year, eight of which are priority species. The data yielded robust density estimates (CV < 50%) for 15 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Four Rivers Field Office lands for 69 species that have been detected in any year, eight of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 30 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Four Rivers Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

ID-BLM - Four Rivers Field Office Results

c) Salmon Field Office

We obtained results for BLM Salmon Field Office lands by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 51 point counts within the five surveyed grid cells between May 29 and June 5. They detected 56 bird species, including four priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 69 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 23 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Salmon Field Office lands for 66 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 38 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Salmon Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

ID-BLM - Salmon Field Office Results

d) Upper Snake Field Office

We obtained results for BLM Upper Snake Field Office lands by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 65 point counts within the five surveyed grid cells between May 22 and May 28. They detected 41 bird species, including eight priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 49 species that have been detected in any year, ten of which are priority species. The data yielded robust density estimates (CV < 50%) for 13 species for which we estimated density.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Upper Snake Field Office lands for 48 species that have been detected in any year, ten of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 19 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Upper Snake Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

ID-BLM - Upper Snake Field Office Results

e) Bruneau Field Office

We obtained results for BLM Bruneau Field Office (ID-BCR9-BR) by compiling and analyzing data from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 142 point counts within the ten surveyed grid cells between May 20 and June 8. They detected 56 bird species, including eight priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 63 species, eight of which are priority species. The data yielded robust density estimates (CV < 50%) for 15 of the species for which we estimated density.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Bruneau Field Office for 61 species, eight of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 11 of the species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results and species counts within BLM Bruneau Field Office across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, after you click on the link below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2017, hit "Add Filter", then "Run Query".

ID-BCR9-BR Results

f) Burley Field Office

We obtained results for BLM Burley Field Office (ID-BCR9-BU) by compiling and analyzing data from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 126 point counts within the eight surveyed grid cells between May 23 and June 15. They detected 30 bird species, including nine priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 50 species, 11 of which are priority species. The data yielded robust density estimates (CV < 50%) for 14 of the species for which we estimated density.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Burley Field Office for 49 species, 11 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 14 of the species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results and species counts within BLM Burley Field Office across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, after you click on the link below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

ID-BCR9-BU Results

g) Jarbidge Field Office

We obtained results for BLM Jarbidge Field Office (ID-BCR9-JA) by compiling and analyzing data from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 96 point counts within the six surveyed grid cells between May 22 and June 16. They detected 19 bird species, including seven priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 27 species, eight of which are priority species. The data yielded robust density estimates (CV < 50%) for ten of the species for which we estimated density.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Jarbidge Field Office for 27 species, eight of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for eight of the species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results and species counts within BLM Jarbidge Field Office across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, after you click on the link below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

ID-BCR9-JA Results

h) Owyhee Field Office

We obtained results for BLM Owyhee Field Office (ID-BCR9-OW) by compiling and analyzing data from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 117 point counts within the ten surveyed grid cells between May 20 and June 7. They detected 55 bird species, including nine priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 68 species, ten of which are priority species. The data yielded robust density estimates (CV < 50%) for 20 of the species for which we estimated density.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Owyhee Field Office for 64 species, ten of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 15 of the species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results and species counts within BLM Owyhee Field Office across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, after you click on the link below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

ID-BCR9-OW Results

3. BLM in Montana

a) BLM in Montana: Total

We obtained results for all BLM lands in Montana by compiling and jointly analyzing data from five strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 480 point counts within the 36 surveyed grid cells between May 23 and July 1. They detected 126 bird species, including 12 priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 167 species that have been detected in any year, 15 of which are priority species. The data yielded robust density estimates (CV < 50%) for 47 species for which we estimated density.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all BLM lands in Montana for 170 species that have been detected in any year, 15 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 77 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all BLM lands in Montana across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

BLM in Montana Results

b) BLM in Montana BCR 10

We obtained results for BLM lands in Montana BCR 10 by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 88 point counts within the six surveyed grid cells between June 8 and July 1. They detected 65 bird species, including four priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 120 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 27 species for which we estimated density.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Montana BCR 10 for 117 species that have been detected in any year, four of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 35 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Montana BCR 10 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want

to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in Montana BCR 10 Results

c) BLM in Montana BCR 11

We obtained results for BLM lands in Montana BCR 11 by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 280 point counts within the 20 surveyed grid cells between May 24 and June 23. They detected 79 bird species, including 11 priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 97 species that have been detected in any year, 12 of which are priority species. The data yielded robust density estimates (CV < 50%) for 23 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Montana BCR 11 for 100 species that have been detected in any year, 13 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 35 of these species.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Montana BCR 11 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in Montana BCR 11 Results

d) BLM in Montana BCR 17

We obtained results for BLM lands in Montana BCR 17 from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 112 point counts within the ten surveyed grid cells between May 23 and June 24. They detected 60 bird species, including 23 priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 97 species that have been detected in any year, 12 of which are priority species. The data yielded robust density estimates (CV < 50%) for 17 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Montana BCR 17 for 94 species that have been detected in any year, 11 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 19 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Montana BCR 17 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in Montana BCR 17 Results

4. **BLM in North Dakota BCR 17**

We obtained results for BLM lands in North Dakota BCR 17 from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 96 point counts within the seven surveyed grid cells between June 17 and July 7. They detected 76 bird species, including 26 priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 97 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 29 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in North Dakota BCR 17 for 90 species that have been detected in any year, four of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 24 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in North Dakota BCR 17 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in North Dakota BCR 17 Results

5. **BLM in South Dakota BCR 17**

We obtained results for BLM lands in South Dakota BCR 17 from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 92 point counts within the seven surveyed grid cells between June 12 and June 27. They detected 52 bird species, including 19 priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 120 species that have been detected in any year, 12 of which are priority species. The data yielded robust density estimates (CV < 50%) for 13 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in South Dakota BCR 17 for 115 species that have been detected in any year, 12 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 18 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in South Dakota BCR 17 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in South Dakota BCR 17 Results

6. BLM in Utah

a) BLM in Utah: Total

We obtained results for all BLM lands in Utah by compiling and jointly analyzing data from 19 strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 739 point counts within the 63 surveyed grid cells between May 7 and June 20. They detected 108 bird species, including 16 priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 127 species that have been detected in any year, 18 of which are priority species. The data yielded robust density estimates (CV < 50%) for 45 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all BLM lands in Utah for 139 species that have been detected in any year, 22 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 76 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all BLM lands in Utah across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM in Utah Results

b) BLM in Utah BCR 9

We obtained results for BLM lands in Utah BCR 9 by compiling and jointly analyzing data from five strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 271 point counts within the 20 surveyed grid cells between May 7 and May 30. They detected 61 bird species, including 13 priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 115 species that have been detected in any year, 21 of which are priority species. The data yielded robust density estimates (CV < 50%) for 25 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Utah BCR 9 for 109 species that have been detected in any year, 20 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 26 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Utah BCR 9 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in Utah BCR 9 Results

c) BLM in Utah BCR 10

We obtained results for BLM lands in Utah BCR 10 by compiling and jointly analyzing data from two strata .

Field observers completed all planned surveys (100%) in 2018. Observers conducted 52 point counts within the four surveyed grid cells between May 29 and June 20. They detected 38 bird species, including seven priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 43 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 13 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Utah BCR 10 for 64 species that have been detected in any year, ten of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 26 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Utah BCR 10 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

BLM lands in Utah BCR 10 Results

d) BLM in Utah BCR 16

We obtained results for BLM lands in Utah BCR 16 by compiling and jointly analyzing data from 11 strata.

Field observers completed 37 of 36 planned surveys (102.8%) in 2018. Observers conducted 392 point counts within the 37 surveyed grid cells between May 7 and June 14. They detected 90 bird species, including 11 priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 106 species that have been detected in any year, 13 of which are priority species. The data yielded robust density estimates (CV < 50%) for 38 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Utah BCR 16 for 108 species that have been detected in any year, 14 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 58 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Utah BCR 16 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

BLM lands in Utah BCR 16 Results

e) Cedar City Field Office

We obtained results for BLM Cedar City Field Office lands by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 82 point counts within the six surveyed grid cells between May 9 and May 30. They detected 48 bird species, including seven priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 57 species that have been detected in any year, eight of which are priority species. The data yielded robust density estimates (CV < 50%) for 19 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Cedar City Field Office lands for 74 species that have been detected in any year, 11 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 16 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Cedar City Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BLM - Cedar City Field Office Results

f) Fillmore Field Office

We obtained results for BLM Fillmore Field Office lands by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 138 point counts within the ten surveyed grid cells between May 7 and May 17. They detected 52 bird species, including 11 priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 57 species that have been detected in any year, 11 of which are priority species. The data yielded robust density estimates (CV < 50%) for 15 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Fillmore Field Office lands for 60 species that have been detected in any year, 11 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 18 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Fillmore Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BLM - Fillmore Field Office Results

g) Kanab Field Office

We obtained results for BLM Kanab Field Office lands from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 42 point counts within the four surveyed grid cells between May 8 and May 25. They detected 37 bird species, including seven priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 49 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 17 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Kanab Field Office lands for 46 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 17 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Kanab Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BLM - Kanab Field Office Results

h) Moab Field Office

We obtained results for BLM Moab Field Office lands from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 30 point counts within the three surveyed grid cells between May 23 and May 26. They detected 30 bird species, including four priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 46 species that have been detected in any year, five of which are priority species. The data yielded robust density estimates (CV < 50%) for 11 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Moab Field Office lands for 43 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 13 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Moab Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BLM - Moab Field Office Results

i) Monticello Field Office

We obtained results for BLM Monticello Field Office lands from one stratum.

Field observers completed three of three planned surveys (100%) in 2018. Observers conducted 21 point counts within the four surveyed grid cells between May 22 and May 31. They detected 25 bird species, including four priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 33 species that have been detected in any year, three of which are priority species. The data yielded robust density estimates (CV < 50%) for eight species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Monticello Field Office lands for 33 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 12 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Monticello Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BLM - Monticello Field Office Results

j) Price Field Office

We obtained results for BLM Price Field Office lands from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 64 point counts within the six surveyed grid cells between May 13 and June 5. They detected 39 bird species, including four priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 55 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 12 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Price Field Office lands for 53 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for seven species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Price Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BLM - Price Field Office Results

k) Richfield Field Office

We obtained results for BLM Richfield Field Office lands by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 71 point counts within the six surveyed grid cells between May 12 and May 23. They detected 30 bird species, including five priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 41 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 14 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Richfield Field Office lands for 64 species that have been detected in any year, nine of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 19 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Richfield Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BLM - Richfield Field Office Results

l) Saint George Field Office

We obtained results for BLM Saint George Field Office lands by compiling and jointly analyzing data from three strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 82 point counts within the seven surveyed grid cells between May 7 and May 26. They detected 55 bird species, including eight priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 65 species that have been detected in any year, nine of which are priority species. The data yielded robust density estimates (CV < 50%) for 16 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Saint George Field Office lands for 71 species that have been detected in any year, ten of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 27 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Saint George Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BLM - Saint George Field Office Results

m) Salt Lake Field Office

We obtained results for BLM Salt Lake Field Office lands by compiling and jointly analyzing data from three strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 99 point counts within the eight surveyed grid cells between May 15 and June 2. They detected 44 bird species, including nine priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 96 species that have been detected in any year, 19 of which are priority species. The data yielded robust density estimates (CV < 50%) for 11 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Salt Lake Field Office lands for 92 species that have been detected in any year, 18 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for seven species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Salt Lake Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BLM - Salt Lake Field Office Results

n) Vernal Field Office

We obtained results for BLM Vernal Field Office lands by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 67 point counts within the five surveyed grid cells between May 25 and June 20. They detected 47 bird species, including five priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 76 species that have been detected in any year, 11 of which are priority species. The data yielded robust density estimates (CV < 50%) for 12 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Vernal Field Office lands for 73 species that have been detected in any year, 11 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 16 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Vernal Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BLM - Vernal Field Office Results

7. BLM in Wyoming

a) BLM in Wyoming: Total

We obtained results for BLM lands in Wyoming by compiling and jointly analyzing data from 14 strata.

Field observers completed 53 of 54 planned surveys (98.1%) in 2018. Observers conducted 698 point counts within the 53 surveyed grid cells between May 21 and July 15. They detected 121 bird species, including nine priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 166 species that have been detected in any year, 13 of which are priority species. The data yielded robust density estimates (CV < 50%) for 46 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Wyoming for 162 species that have been detected in any year, 13 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 67 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Wyoming across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in Wyoming Results

b) BLM in Wyoming BCR 16

We obtained results for BLM lands in Wyoming BCR 16 from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 29 point counts within the two surveyed grid cells between June 4 and June 5. They detected 35 bird species, including four priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 77 species that have been detected in any year, two of which are priority species. The data yielded robust density estimates (CV < 50%) for 12 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Wyoming BCR 16 for 77 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 21 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Wyoming BCR 16 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in Wyoming BCR 16 Results

c) BLM in Wyoming BCR 18

We obtained results for BLM lands in Wyoming BCR 18 from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 27 point counts within the two surveyed grid cells between May 28 and June 3. They detected 17 bird species, including six priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 47 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for four species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM lands in Wyoming BCR 18 for 41 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 11 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM lands in Wyoming BCR 18 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BLM lands in Wyoming BCR 18 Results

d) Buffalo Field Office

We obtained results for BLM Buffalo Field Office lands by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 48 point counts within the four surveyed grid cells between June 6 and July 15. They detected 44 bird species, including three priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 99 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 15 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Buffalo Field Office lands for 91 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 24 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Buffalo Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BLM - Buffalo Field Office Results

e) Casper Field Office

We obtained results for BLM Casper Field Office lands by compiling and jointly analyzing data from two strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 54 point counts within the four surveyed grid cells between June 1 and June 15. They detected 42 bird species, including two priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 85 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 15 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Casper Field Office lands for 81 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 21 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Casper Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BLM - Casper Field Office Results

f) Cody Field Office

We obtained results for BLM Cody Field Office lands from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 19 point counts within the two surveyed grid cells between May 22 and June 1. They detected 17 bird species, including two priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 49 species that have been detected in any year, three of which are priority species. The data yielded robust density estimates (CV < 50%) for seven species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Cody Field Office lands for 48 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 12 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Cody Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BLM - Cody Field Office Results

g) Kemmerer Field Office

We obtained results for BLM Kemmerer Field Office lands from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 24 point counts within the two surveyed grid cells between May 29 and June 10. They detected 14 bird species, including three priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 31 species that have been detected in any year, five of which are priority species. The data yielded robust density estimates (CV < 50%) for six species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Kemmerer Field Office lands for 27 species that have been detected in any year, five of

which are priority species. The data yielded robust occupancy estimates (CV < 50%) for nine species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Kemmerer Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BLM - Kemmerer Field Office Results

h) Lander Field Office

We obtained results for BLM Lander Field Office lands from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 83 point counts within the six surveyed grid cells between May 30 and June 21. They detected 43 bird species, including ten priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 81 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 18 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout WY-BLM Lander Field Office lands for 79 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 19 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Lander Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BLM - Lander Field Office Results

i) Newcastle Field Office

We obtained results for BLM Newcastle Field Office lands from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 22 point counts within the two surveyed grid cells between May 21 and May 22. They detected 24 bird species, including ten priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 90 species that have been detected in any year, ten of which are priority species. The data yielded robust density estimates (CV < 50%) for five species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Newcastle Field Office lands for 89 species that have been detected in any year, ten of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 13 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Newcastle Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BLM - Newcastle Field Office Results

j) Pinedale Field Office

We obtained results for BLM Pinedale Field Office lands from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 96 point counts within the eight surveyed grid cells between May 30 and June 30. They detected 46 bird species, including nine priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 76 species that have been detected in any year, five of which are priority species. The data yielded robust density estimates (CV < 50%) for 13 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Pinedale Field Office lands for 75 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for nine species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Pinedale Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BLM - Pinedale Field Office Results

k) Rawlins Field Office

We obtained results for BLM Rawlins Field Office lands from one stratum.

Field observers completed seven of eight planned surveys (87.5%) in 2018. Observers conducted 105 point counts within the seven surveyed grid cells between May 31 and June 6. They detected 35 bird species, including eight priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 59 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 13 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Rawlins Field Office lands for 53 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for ten species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BLM Rawlins Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want

to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BLM Rawlins Field Office Results

l) Rock Springs Field Office

We obtained results for BLM Rock Springs Field Office lands from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 112 point counts within the eight surveyed grid cells between May 28 and July 4. They detected 53 bird species, including ten priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 78 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 14 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Rock Springs Field Office lands for 77 species, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 13 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results and that have been detected in any year species counts within BLM Rock Springs Field Office lands across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BLM - Rock Springs Field Office Results

m) Worland Field Office

We obtained results for BLM Worland Field Office by analyzing data from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 79 point counts within the six surveyed grid cells between May 27 and June 29. They detected 43 bird species, including five priority species (Appendix F).

Bird Conservancy estimated densities and population sizes for 59 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 13 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BLM Worland Field Office for 57 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 16 of these species.

To view a map of survey locations, density and occupancy results, and species counts within BLM Worland Field Office across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BLM - Worland Field Office Results

C. Department of Defense

Jump to:

DOD Lands in Colorado BCR 18
DOD Lands in Utah BCR 9
DOD Lands in Wyoming BCR 18

1. DOD Lands in Colorado BCR 18

We obtained results for DOD lands in Colorado BCR 18 from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 29 point counts within the two surveyed grid cells between May 20 and June 2. They detected 51 bird species, including 14 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 97 species that have been detected in any year, 12 of which are priority species. The data yielded robust density estimates (CV < 50%) for 14 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout DOD lands in Colorado BCR 18 for 94 species that have been detected in any year, 11 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 36 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within DOD lands in Colorado BCR 18 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

CO-BCR 18 Department of Defense lands Results

2. DOD Lands in Utah BCR 9

We obtained results for DOD lands in Utah BCR 9 by compiling and jointly analyzing data from six strata.

Field observers completed 31 of 31 planned surveys (100%) in 2018. Observers conducted 429 point counts within the 31 surveyed grid cells between May 10 and June 7. They detected 41 bird species, none were priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 34 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 12 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout DOD lands in Utah BCR 9 for 65 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 47 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within DOD lands in Utah BCR 9 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, after you click on the link below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR9 Department of Defense lands Results

3. All Other DOD Lands in Utah BCR 9

We obtained results for all other DOD lands in Utah BCR 9 from one stratum.

Field observers completed six of six planned surveys (100%) in 2018. Observers conducted 79 point counts within the six surveyed grid cells between May 10 and June 5. They detected 35 bird species, with no priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 28 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 11 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all other DOD lands in Utah BCR 9 for 27 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for seven species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all other DOD lands in Utah BCR 9 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR9 All Other DOD lands Results

4. DOD Lands in Utah BCR 9 - Mudflats

We obtained results for mudflats in DOD lands of Utah BCR 9 from one stratum.

Field observers completed three of three planned surveys (100%) in 2018. Observers conducted 39 point counts within the three surveyed grid cells between June 5 and June 7. They detected two bird species, with no priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for two species that have been detected in any year, neither of which are priority species. The data yielded robust density estimates (CV < 50%) for one species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout mudflats in DOD lands of Utah BCR 9 for one species that have been detected in any year,. The data yielded robust occupancy estimates (CV < 50%) for no species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within mudflats in DOD lands of Utah BCR 9 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want

to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR9 - DOD mudflats Results

5. DOD Lands in Utah BCR 9 – APG Impact Areas

We obtained results for AGP Impact Areas in DOD lands of Utah BCR 9 from one stratum.

Field observers completed six of five planned surveys (120%) in 2018. Observers conducted 88 point counts within the six surveyed grid cells between May 21 and May 23. They detected 12 bird species, including zero priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for ten species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for six species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout AGP Impact Areas in DOD lands of Utah BCR 9 for eight species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for six species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within AGP Impact Areas in DOD lands of Utah BCR 9 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR9 - DOD AGP Impact Areas Results

6. DOD Lands in Utah BCR 9 – Target S Impact Areas

We obtained results for Target S Impact Areas in DOD lands of Utah BCR 9 from one stratum.

Field observers completed six of six planned surveys (100%) in 2018. Observers conducted 96 point counts within the six surveyed grid cells between May 16 and May 24. They detected 15 bird species, including zero priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 11 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for seven species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Target S Impact Areas in DOD lands of Utah BCR 9 for ten species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for six species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Target S Impact Areas in DOD lands of Utah BCR 9 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR9 - DOD Target S Impact Areas Results

7. DOD Lands in Utah BCR 9 – UTG Impact Areas

We obtained results for UTG Impact Areas in DOD lands of Utah BCR 9 from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 62 point counts within the five surveyed grid cells between May 30 and June 6. They detected four bird species, including zero priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for three species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for one species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout UTG Impact Areas in DOD lands of Utah BCR 9 for two species that have been detected in any year, neither of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within UTG Impact Areas in DOD lands of Utah BCR 9 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

UT-BCR9 - DOD UTG Impact Areas Results

8. DOD Lands in Utah BCR 9 – UTTR Impact Areas

We obtained results for UTTR Impact Areas in DOD lands of Utah BCR 9 from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 65 point counts within the five surveyed grid cells between May 10 and June 5. They detected 16 bird species, including zero priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 14 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for seven species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout UTTR Impact Areas in DOD lands of Utah BCR 9 for 13 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for six species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within UTTR Impact Areas in DOD lands of Utah BCR 9 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

UT-BCR9 - DOD UTTR Impact Areas Results

9. DOD Lands in Wyoming BCR 18

We obtained results for DOD lands in Wyoming BCR 18 from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 22 point counts within the two surveyed grid cells between May 23 and May 24. They detected 25 bird species, including eight priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 54 species that have been detected in any year, 13 of which are priority species. The data yielded robust density estimates (CV < 50%) for five species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout DOD lands in Wyoming BCR 18 for 54 species that have been detected in any year, 13 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 13 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within DOD lands in Wyoming BCR 18 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BCR18 - Department of Defense Results

D. National Park Service

Jump to:

Greater Yellowstone Network
Northern Colorado Plateau Network in Colorado
Northern Great Plains Network
Rocky Mountain Network in Colorado
Southern Colorado Plateau Network in Colorado

1. Greater Yellowstone Network

a) Greater Yellowstone Network: Total

We obtained results for the Greater Yellowstone Network by compiling and jointly analyzing data from three strata.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 120 point counts within the eight surveyed grid cells between May 27 and July 6. They detected 76 bird species.

Bird Conservancy estimated densities and population sizes for 122 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 30 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout the Greater Yellowstone Network for 122 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 38 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within the Greater Yellowstone Network across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

NPS-Greater Yellowstone Network Results

b) Bighorn Canyon National Recreation Area

We obtained results for Bighorn Canyon National Recreation Area from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 26 point counts within the two surveyed grid cells between May 27 and May 30. They detected 31 bird species.

Bird Conservancy estimated densities and population sizes for 56 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for six species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Bighorn Canyon National Recreation Area for 56 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 18 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Bighorn Canyon National Recreation Area across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Bighorn Canyon National Recreation Area Results

c) Grand Teton National Park

We obtained results for Grand Teton National Park from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 32 point counts within the two surveyed grid cells between May 29 and June 26. They detected 36 bird species.

Bird Conservancy estimated densities and population sizes for 79 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 15 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Grand Teton National Park for 76 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 22 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Grand Teton National Park across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to

limit results to 2018, after you click on the link below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Grand Teton National Park Results

d) Yellowstone National Park

We obtained results for Yellowstone National Park from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 62 point counts within the four surveyed grid cells between June 28 and July 6. They detected 45 bird species.

Bird Conservancy estimated densities and population sizes for 82 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 21 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Yellowstone National Park for 81 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 24 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Yellowstone National Park across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Yellowstone National Park Results

2. Northern Colorado Plateau Network in Colorado

We obtained results for the Northern Colorado Plateau Network by analyzing data from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 18 point counts within the two surveyed grid cells between May 15 and June 9. They detected 32 bird species.

Bird Conservancy estimated densities and population sizes for 70 species that have been detected in any year, nine of which are priority species. The data yielded robust density estimates (CV < 50%) for nine species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout the Northern Colorado Plateau Network for 70 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 20 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within the Northern Colorado Plateau Network across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want

to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Northern Colorado Plateau Network Results

3. Northern Great Plains Network

a) Badlands National Park - North Unit

We obtained results for the North Unit of Badlands National Park from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 195 point counts within the 16 surveyed grid cells between May 21 and June 13. They detected 65 bird species.

Bird Conservancy estimated densities and population sizes for 91 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 18 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout the North Unit of Badlands National Park for 89 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 21 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within the North Unit of Badlands National Park across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Badlands National Park - North Unit Results

b) Knife River Indian Villages National Historic Site

We obtained results for Knife River Indian Villages National Historic Site from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 23 point counts within the two surveyed grid cells between June 25 and June 25. They detected 64 bird species.

Bird Conservancy estimated densities and population sizes for 101 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 23 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Knife River Indian Villages National Historic Site for 96 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 52 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Knife River Indian Villages National Historic Site across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on

the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Knife River Indian Villages National Historic Site Results

c) Missouri National Recreational River

We obtained results for Missouri National Recreational River by compiling and jointly analyzing data from two strata in two states.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 116 point counts within the 16 surveyed grid cells between June 6 and June 19. They detected 99 bird species.

Bird Conservancy estimated densities and population sizes for 107 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 49 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Missouri National Recreational River for 105 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 69 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Missouri National Recreational River across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Missouri National Recreational River Results

(1) Missouri National Recreational River - 59 Mile District

We obtained results for Missouri National Recreational River - 59 Mile District by analyzing data from one stratum in two states.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 55 point counts within the eight surveyed grid cells between June 8 and June 15. They detected 80 bird species.

Bird Conservancy estimated densities and population sizes for 91 species. The data yielded robust density estimates (CV < 50%) for 42 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Missouri National Recreational River-59 Mile District for 88 species. The data yielded robust occupancy estimates (CV < 50%) for 58 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Missouri National Recreational River-59 Mile District across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from

the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Missouri National Recreational River-59 Mile District Results

(2) Missouri National Recreational River - 39 Mile District

We obtained results for Missouri National Recreational River - 39 Mile District by analyzing data from one stratum in two states.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 61 point counts within the eight surveyed grid cells between June 6 and June 19. They detected 92 bird species.

Bird Conservancy estimated densities and population sizes for 103 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 39 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Missouri National Recreational River-39 Mile District for 101 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 59 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Missouri National Recreational River-39 Mile District across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Missouri National Recreational River-39 Mile District Results

d) Niobrara National Scenic River

We obtained results for Niobrara National Scenic River from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 135 point counts within the 14 surveyed grid cells between June 3 and June 6. They detected 95 bird species.

Bird Conservancy estimated densities and population sizes for 102 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 51 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Niobrara National Scenic River for 97 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 58 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Niobrara National Scenic River across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want

to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Niobrara National Scenic River Results

e) NPS lands in Nebraska BCR 18

We obtained results for NPS lands in Nebraska BCR 18 by compiling and analyzing data from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 24 point counts within the two surveyed grid cells between June 16 and June 16. They detected 44 bird species, including 12 priority species.

Bird Conservancy estimated densities and population sizes for 34 species that have been detected in any year, eight of which are priority species. The data yielded robust density estimates (CV < 50%) for nine species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all NPS lands in Nebraska BCR 18 for 25 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 23 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all NPS lands in Nebraska BCR 18 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

National Park Service lands in Nebraska BCR 18 Results

f) All Other NPS lands in South Dakota

We obtained results for all other NPS lands in South Dakota from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 22 point counts within the two surveyed grid cells between July 1 and July 10. They detected 41 bird species, including five priority species.

Bird Conservancy estimated densities and population sizes for 37 species that have been detected in any year, three of which are priority species. The data yielded robust density estimates (CV < 50%) for 20 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all other NPS lands in South Dakota for 36 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 31 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all other NPS lands in South Dakota across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

All other National Park Service lands in South Dakota Results

g) Theodore Roosevelt National Park

We obtained results for Theodore Roosevelt National Park by compiling and jointly analyzing data from two strata: the North Unit and the South Unit.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 124 point counts within the 14 surveyed grid cells between June 15 and July 2. They detected 74 bird species.

Bird Conservancy estimated densities and population sizes for 109 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 36 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Theodore Roosevelt National Park for 104 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 39 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Theodore Roosevelt National Park across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Theodore Roosevelt National Park Results

h) Wind Cave National Park

We obtained results for Wind Cave National Park by compiling and analyzing data from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 167 point counts within the 14 surveyed grid cells between June 15 and July 7. They detected 79 bird species.

Bird Conservancy estimated densities and population sizes for 114 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 40 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Wind Cave National Park for 111 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 42 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Wind Cave National Park across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Wind Cave National Park Results

4. Rocky Mountain Network in Colorado

We obtained results for the Rocky Mountain Network in Colorado from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 29 point counts within the two surveyed grid cells between July 3 and July 4. They detected 35 bird species.

Bird Conservancy estimated densities and population sizes for 84 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 20 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout the Rocky Mountain Network in Colorado for 81 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 27 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within the Rocky Mountain Network in Colorado across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Rocky Mountain Network in Colorado Results

5. Southern Colorado Plateau Network in Colorado

We obtained results for the Southern Colorado Plateau Network by analyzing data from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 24 point counts within the two surveyed grid cells between June 5 and June 6. They detected 29 bird species.

Bird Conservancy estimated densities and population sizes for 70 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 16 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout the Southern Colorado Plateau Network for 71 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 26 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within the Southern Colorado Plateau Network across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Southern Colorado Plateau Network Results

E. Tribal Lands

Jump to:

Tribal Lands in North Dakota BCR 17
Tribal Lands in South Dakota BCR 17
Wind River Tribal Lands in Wyoming BCR 10

1. Tribal Lands in North Dakota BCR 17

We obtained results for Tribal Lands in North Dakota BCR 17 by compiling and analyzing data from one stratum.

Field observers completed two of four planned surveys (50%) in 2018. Observers conducted 18 point counts within the two surveyed grid cells between July 17 and July 18. They detected 46 bird species, including 14 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 63 species that have been detected in any year, 13 of which are priority species. The data yielded robust density estimates (CV < 50%) for 18 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Tribal Lands in North Dakota BCR 17 for 58 species that have been detected in any year, 12 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 21 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Tribal Lands in North Dakota BCR 17 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

Tribal Lands in North Dakota BCR 17 Results

2. Tribal Lands in South Dakota BCR 17

We obtained results for Tribal Lands in South Dakota BCR 17 from one stratum.

Field observers completed three of four planned surveys (75%) in 2018. Observers conducted 35 point counts within the three surveyed grid cells between July 2 and July 5. They detected 40 bird species, including 15 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 30 species that have been detected in any year, 12 of which are priority species. The data yielded robust density estimates (CV < 50%) for seven species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Tribal Lands in South Dakota BCR 17 for 22 species that have been detected in any year, eight of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 13 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Tribal Lands in South Dakota BCR 17 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want

to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Tribal Lands in South Dakota BCR 17 Results

3. Wind River Tribal Lands in Wyoming BCR 10

We obtained results for Wind River Tribal Lands In Wyoming BCR 10 from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 44 point counts within the four surveyed grid cells between May 31 and June 5. They detected 52 bird species, including 11 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 79 species that have been detected in any year, 13 of which are priority species. The data yielded robust density estimates (CV < 50%) for 23 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Wind River Tribal Lands In Wyoming BCR 10 for 73 species that have been detected in any year, 13 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 27 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Wind River Tribal Lands In Wyoming BCR 10 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Wind River Tribal Lands In Wyoming BCR 10 Results

F. All Other Lands

This section contains results for All Other Lands sampled in states that do not have full IMBCR coverage across the entire state. Results for All Other Lands strata within Colorado, Montana, and Wyoming are reported in Section II: States.

Jump to:

All Other Lands in Nebraska BCR 17
All Other Lands in Nebraska BCR 18
All Other Lands in North Dakota BCR 17
All Other Lands in South Dakota BCR 17
All Other Lands in South Dakota BCR 18

1. All Other Lands in Nebraska BCR 17

We obtained results for all other lands in Nebraska BCR 17 from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 31 point counts within the two surveyed grid cells between June 5 and June 6. They detected 42 bird species, including three priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 48 species that have been detected in any year, three of which are priority species. The data yielded robust density estimates (CV < 50%) for 12 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all other lands in Nebraska BCR 17 for 44 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 21 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all other lands in Nebraska BCR 17 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

All Other Lands in Nebraska BCR 17Results

2. All Other Lands in Nebraska BCR 18

We obtained results for all other lands in Nebraska BCR 18 from one stratum.

Field observers completed all planned surveys (100%) in 2018. Observers conducted 88 point counts within the eight surveyed grid cells between June 11 and June 25. They detected 53 bird species, including 18 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 57 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 12 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all other lands in Nebraska BCR 18 for 51 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 11 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all other lands in Nebraska BCR 18 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

All Other Lands in Nebraska BCR 18 Results

3. All Other Lands in North Dakota BCR 17

We obtained results for all other lands in North Dakota BCR 17 by compiling and jointly analyzing data from two strata.

Field observers completed 10 of 12 planned surveys (83.3%) in 2018. Observers conducted 81 point counts within the ten surveyed grid cells between June 24 and July 18. They detected 87 bird species, including 18 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 111 species that have been detected in any year, 24 of which are priority species. The data yielded robust density estimates (CV < 50%) for 34 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all other lands in North Dakota BCR 17 for 102 species that have been detected in any year, 20 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 59 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all other lands in North Dakota BCR 17 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

All Other Lands in North Dakota BCR 17 Results

4. All Other Lands in South Dakota BCR 17

We obtained results for all other lands in South Dakota BCR 17 by compiling and jointly analyzing data from two strata.

Field observers completed 11 of 12 planned surveys (91.7%) in 2018. Observers conducted 98 point counts within the 11 surveyed grid cells between May 30 and July 5. They detected 73 bird species, including eight priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 119 species that have been detected in any year, 11 of which are priority species. The data yielded robust density estimates (CV < 50%) for 15 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all other lands in South Dakota BCR 17 for 107 species that have been detected in any year, 11 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 57 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all other lands in South Dakota BCR 17 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

All Other Lands in South Dakota BCR 17 Results

5. All Other Lands in South Dakota BCR 18

We obtained results for all other lands in South Dakota BCR 18 from one stratum.

Field observers completed both planned surveys (100%) in 2018. Observers conducted 22 point counts within the two surveyed grid cells between June 30 and July 1. They detected 45 bird species.

Bird Conservancy estimated densities and population sizes for 53 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 18 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout all other lands in South Dakota BCR 18 for 46 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 37 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within all other lands in South Dakota BCR 18 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

All Other Lands in South Dakota BCR 18 Results

V. Joint Ventures

Playa Lakes Joint Venture

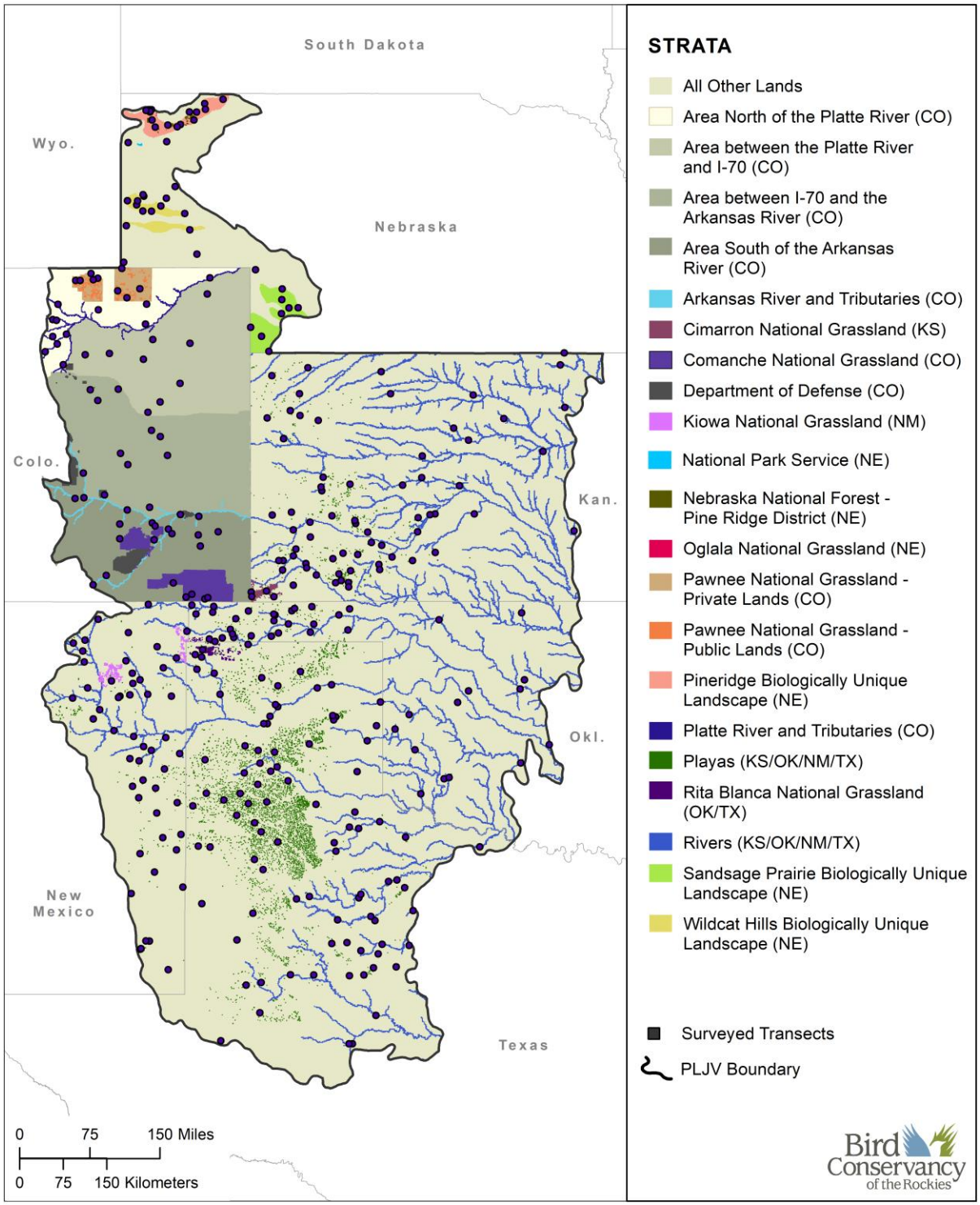


Figure 4. Survey locations in the Playa Lakes Joint Venture area in 2018.

1. Playa Lakes Joint Venture Total

We obtained results for the Playa Lakes Joint Venture area by compiling and jointly analyzing data from 42 Strata in six states (Figure 4).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 3296 point counts within the 359 surveyed grid cells between April 23 and July 4. They detected 236 bird species.

Bird Conservancy estimated densities and population sizes for 200 species that have been detected in any year. The data yielded robust density estimates (CV < 50%) for 90 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout the Playa Lakes Joint Venture area for 229 species that have been detected in any year. The data yielded robust occupancy estimates (CV < 50%) for 125 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within the Playa Lakes Joint Venture area across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Playa Lakes Joint Venture Results

2. Playas

a) Playas in BCR 18

We obtained results for playas in BCR 18 by compiling and jointly analyzing data from four strata in four states (Figure 4).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 462 point counts within the 49 surveyed grid cells between April 23 and June 26. They detected 91 bird species, including 22 priority species.

Bird Conservancy estimated densities and population sizes for 93 species that have been detected in any year, 25 of which are priority species. The data yielded robust density estimates (CV < 50%) for 28 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout playas in BCR 18 for 90 species that have been detected in any year, 24 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 30 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within playas in BCR 18 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

PLJV BCR18-Playas Results

b) Playas in BCR 19

We obtained results for playas in BCR 19 by compiling and jointly analyzing data from three strata in three states (Figure 4).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 134 point counts within the 22 surveyed grid cells between April 25 and June 12. They detected 76 bird species, including 20 priority species.

Bird Conservancy estimated densities and population sizes for 69 species that have been detected in any year, 20 of which are priority species. The data yielded robust density estimates (CV < 50%) for 17 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout playas in BCR 19 for 64 species that have been detected in any year, 18 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 27 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within playas in BCR 19 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

PLJV BCR19-Playas Results

3. Rivers

a) Rivers in BCR 18

We obtained results for Rivers in BCR 18 by compiling and jointly analyzing data from six strata in five states (Figure 4).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 571 point counts within the 64 surveyed grid cells between April 23 and June 29. They detected 172 bird species, including 27 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 159 species that have been detected in any year, 28 of which are priority species. The data yielded robust density estimates (CV < 50%) for 70 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Rivers in BCR 18 for 188 species that have been detected in any year, 30 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 103 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Rivers in BCR 18 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

PLJV BCR18-Rivers Results

b) Rivers in BCR 19

We obtained results for Rivers in BCR 19 by compiling and jointly analyzing data from three strata in three states (Figure 4).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 244 point counts within the 35 surveyed grid cells between April 23 and June 17. They detected 141 bird species, including 29 priority species.

Bird Conservancy estimated densities and population sizes for 112 species that have been detected in any year, 29 of which are priority species. The data yielded robust density estimates (CV < 50%) for 59 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Rivers in BCR 19 for 114 species that have been detected in any year, 29 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 77 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Rivers in BCR 19 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

PLJV BCR19-Rivers Results

4. All Other Lands

a) All Other Lands in BCR 18

We obtained results for All Other Lands in BCR 18 by compiling and jointly analyzing data from four strata in four states (Figure 4).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 508 point counts within the 53 surveyed grid cells between April 23 and June 25. They detected 119 bird species, including 28 priority species.

Bird Conservancy estimated densities and population sizes for 107 species that have been detected in any year, 25 of which are priority species. The data yielded robust density estimates (CV < 50%) for 38 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in BCR 18 for 102 species that have been detected in any year, 24 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 46 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in BCR 18 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

PLJV BCR18-All Other Lands Results

b) Pineridge Biologically Unique Landscape in Nebraska BCR 18

We obtained results for the Pineridge Biologically Unique Landscape from one stratum (Figure 4).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 74 point counts within the eight surveyed grid cells between June 17 and June 26. They detected 72 bird species, including 20 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 89 species that have been detected in any year, 11 of which are priority species. The data yielded robust density estimates (CV < 50%) for 30 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout the Pineridge Biologically Unique Landscape for 84 species that have been detected in any year, nine of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 32 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within the Pineridge Biologically Unique Landscape across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Pineridge Biologically Unique Landscape Results

c) Sandsage Prairie Biologically Unique Landscape in Nebraska BCR 18

We obtained results for the Sandsage Prairie Biologically Unique Landscape from one stratum (Figure 4).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 93 point counts within the eight surveyed grid cells between June 10 and June 23. They detected 58 bird species, including 17 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 73 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 22 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout the Sandsage Prairie Biologically Unique Landscape for 71 species that have been detected in any year, six of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 21 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within the Sandsage Prairie Biologically Unique Landscape across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Sandsage Prairie Biologically Unique Landscape Results

d) Wildcat Hills Biologically Unique Landscape in Nebraska BCR 18

We obtained results for the Wildcat Hills Biologically Unique Landscape from one stratum (Figure 4).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 70 point counts within the eight surveyed grid cells between June 12 and June 24. They detected 65 bird species, including 18 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 78 species that have been detected in any year, eight of which are priority species. The data yielded robust density estimates (CV < 50%) for 23 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout the Wildcat Hills Biologically Unique Landscape for 71 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 24 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within the Wildcat Hills Biologically Unique Landscape across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Wildcat Hills Biologically Unique Landscape Results

e) All Other Lands in BCR 19

We obtained results for PLJV All Other Lands in BCR 19 by compiling and jointly analyzing data from three strata in three states (Figure 4).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 213 point counts within the 35 surveyed grid cells between April 27 and June 22. They detected 115 bird species, including 28 priority species.

Bird Conservancy estimated densities and population sizes for 102 species that have been detected in any year, 30 of which are priority species. The data yielded robust density estimates (CV < 50%) for 47 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout PLJV All Other Lands in BCR 19 for 99 species that have been detected in any year, 30 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 56 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in BCR 19 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

PLJV BCR19-All Other Lands Results

VI. States

Jump to: Colorado Montana Utah Wyoming

A. Colorado

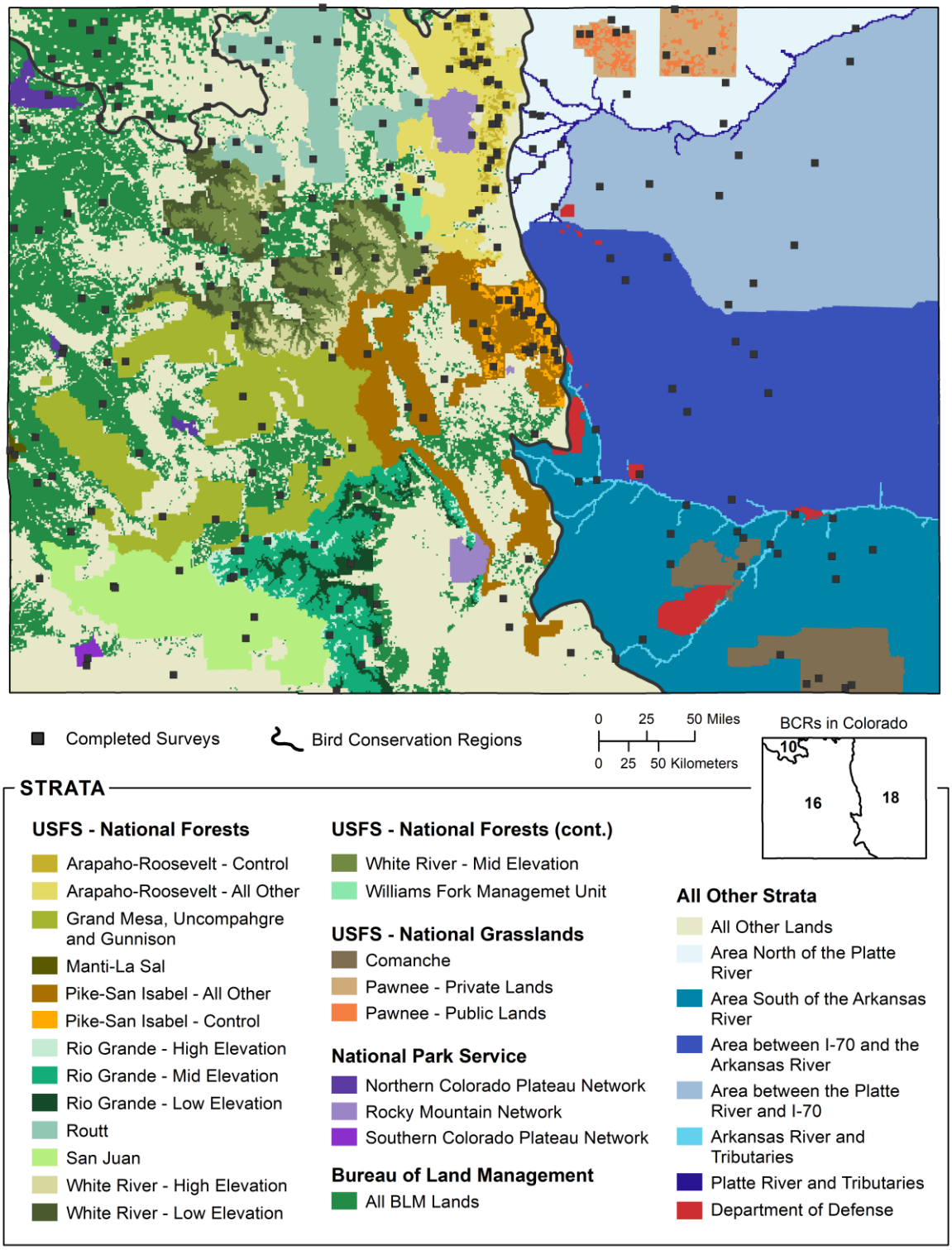


Figure 5. Survey locations in Colorado, 2018.

1. Colorado Statewide

a) Colorado Statewide: Total

We obtained results for Colorado by compiling and jointly analyzing data from 32 strata (Figure 5). For results on specific lands within Colorado, refer to section IV: Land Ownership.

Field observers completed 254 of 256 planned surveys (99.2%) in 2018. Observers conducted 2805 point counts within the 254 surveyed grid cells between May 14 and July 14. They detected 210 bird species, including 41 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 229 species that have been detected in any year, 46 of which are priority species. The data yielded robust density estimates (CV < 50%) for 99 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Colorado for 234 species that have been detected in any year, 46 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 145 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Colorado across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Statewide Colorado Results

b) All Other Lands in Colorado

We obtained results for All Other Lands in Colorado by compiling and jointly analyzing data from seven strata (Figure 5).

Field observers completed 58 of 60 planned surveys (96.7%) in 2018. Observers conducted 649 point counts within the 58 surveyed grid cells between May 14 and July 9. They detected 149 bird species, including 24 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 193 species that have been detected in any year, 39 of which are priority species. The data yielded robust density estimates (CV < 50%) for 78 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Colorado for 197 species that have been detected in any year, 43 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 101 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Colorado across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

CO-All Other Lands Results

2. Colorado BCR 10

a) Colorado BCR 10: Total

We obtained results for Colorado BCR 10 by compiling and jointly analyzing data from two strata (Figure 5).

Field observers completed 15 of 16 planned surveys (93.8%) in 2018. Observers conducted 179 point counts within the 15 surveyed grid cells between May 22 and June 7. They detected 71 bird species, including 13 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 119 species that have been detected in any year, 23 of which are priority species. The data yielded robust density estimates (CV < 50%) for 30 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Colorado BCR 10 for 119 species that have been detected in any year, 22 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 44 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Colorado BCR 10 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

CO-BCR10 Results

b) All Other Lands in Colorado BCR 10

We obtained results for All Other Lands in Colorado BCR 10 from one stratum (Figure 5).

Field observers completed five of six planned surveys (83.3%) in 2018. Observers conducted 51 point counts within the five surveyed grid cells between May 25 and June 6. They detected 60 bird species, including ten priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 97 species that have been detected in any year, 17 of which are priority species. The data yielded robust density estimates (CV < 50%) for 24 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Colorado BCR 10 for 100 species that have been detected in any year, 17 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 31 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Colorado BCR 10 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

CO-BCR10 All Other Lands Results

3. Colorado BCR 16

a) Colorado BCR 16: Total

We obtained results for Colorado BCR 16 by compiling and jointly analyzing data from 20 strata (Figure 5).

Field observers completed 176 of 177 planned surveys (99.4%) in 2018. Observers conducted 1869 point counts within the 176 surveyed grid cells between May 14 and July 14. They detected 153 bird species, including 25 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 190 species that have been detected in any year, 35 of which are priority species. The data yielded robust density estimates (CV < 50%) for 79 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Colorado BCR 16 for 192 species that have been detected in any year, 34 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 117 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Colorado BCR 16 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

CO-BCR16 Results

b) All Other Lands in Colorado BCR 16

We obtained results for All Other Lands in Colorado BCR 16 from one stratum (Figure 5).

Field observers completed 17 of 18 planned surveys (94.4%) in 2018. Observers conducted 150 point counts within the 17 surveyed grid cells between May 14 and July 9. They detected 114 bird species, including 12 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 173 species that have been detected in any year, 33 of which are priority species. The data yielded robust density estimates (CV < 50%) for 63 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Colorado BCR 16 for 171 species that have been detected in any year, 32 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 71 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Colorado BCR 16 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

CO-BCR16 - All Other Lands Results

4. Colorado BCR 18

a) Colorado BCR 18: Total

We obtained results for Colorado BCR 18 by compiling and jointly analyzing data from 10 strata (Figure 5).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 757 point counts within the 63 surveyed grid cells between May 14 and June 6. They detected 135 bird species, including 18 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 194 species that have been detected in any year, 34 of which are priority species. The data yielded robust density estimates (CV < 50%) for 43 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Colorado BCR 18 for 198 species that have been detected in any year, 35 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 77 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Colorado BCR 18 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

CO-BCR18 Results

b) Colorado BCR 18 Rivers

We obtained results for Colorado BCR 18 Rivers by compiling and jointly analyzing data from two strata (Figure 5).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 145 point counts within the 14 surveyed grid cells between May 15 and June 1. They detected 110 bird species, including ten priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 163 species that have been detected in any year, 22 of which are priority species. The data yielded robust density estimates (CV < 50%) for 43 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Colorado BCR 18 Rivers for 166 species that have been detected in any year, 23 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 61 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Colorado BCR 18 Rivers across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

CO-BCR18 - Rivers Results

c) Non-river Lands in Colorado BCR 18

We obtained results for Non-river Lands in Colorado BCR 18 by compiling and jointly analyzing data from eight strata (Figure 5).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 612 point counts within the 49 surveyed grid cells between May 14 and June 6. They detected 97 bird species, including 13 priority species (Appendix E).

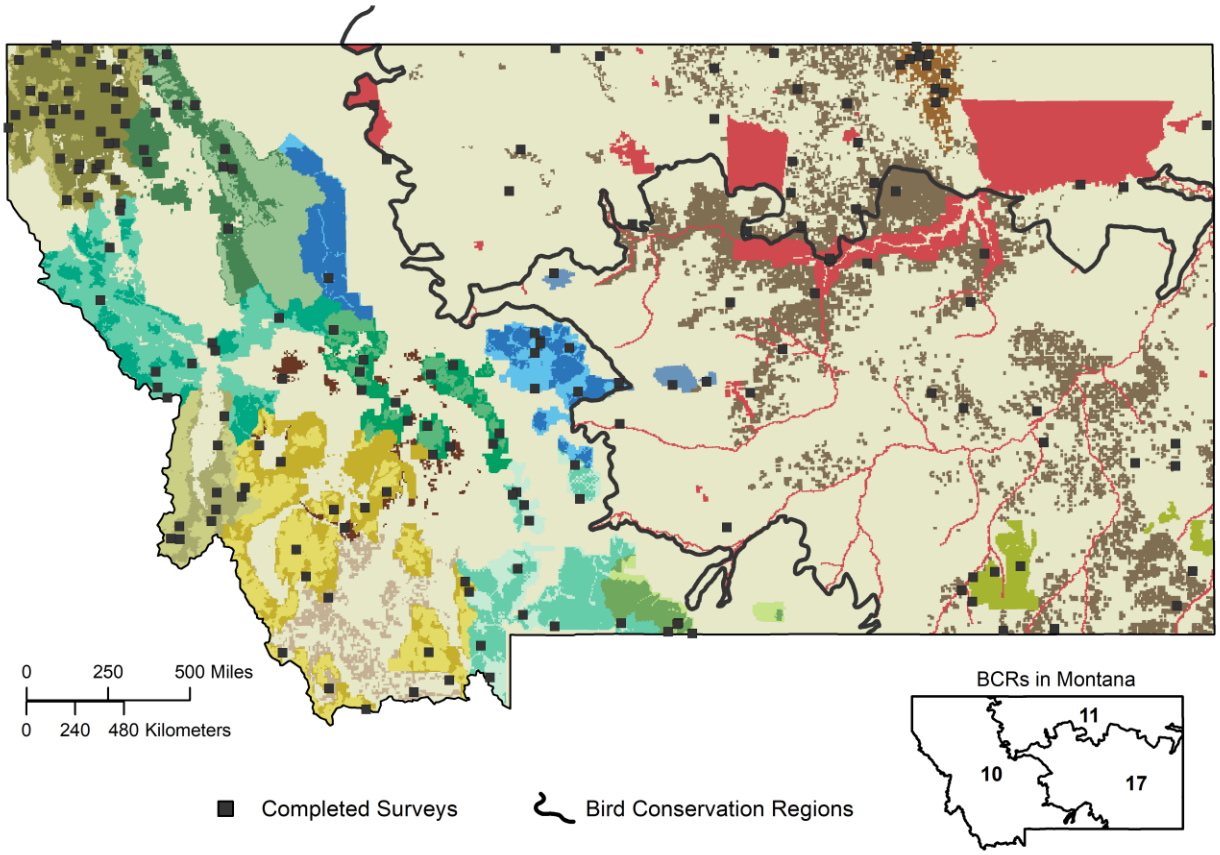
Bird Conservancy estimated densities and population sizes for 159 species that have been detected in any year, 28 of which are priority species. The data yielded robust density estimates (CV < 50%) for 39 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Non-river Lands in Colorado BCR 18 for 157 species that have been detected in any year, 27 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 52 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Non-river Lands in Colorado BCR 18 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

CO-BCR18 - Nonrivers Results

B. Montana



STRATA

USFS - National Forests
- Beaverhead-Deerlodge - Roaded/Managed
- Beaverhead-Deerlodge - Roadless/Wilderness
- Bitterroot - Roaded/Managed
- Bitterroot - Roadless/Wilderness
- Custer (BCR17)
- Custer - Roaded/Managed
- Custer - Roadless/Wilderness
- Flathead - Roaded/Managed
- Flathead - Roadless/Wilderness
- Gallatin - Roaded/Managed
- Gallatin - Roadless/Wilderness
- Helena - Roaded/Managed
- Helena - Roadless/Wilderness

USFS - National Forests (cont.)
- Kootenai - Roaded/Managed
- Kootenai - Roadless/Wilderness
- Lewis and Clark - Roaded/Managed
- Lewis and Clark - Roadless/Wilderness
- Lewis and Clark (BCR 17)
- Lolo - Roaded/Managed
- Lolo - Roadless/Wilderness

Bureau of Land Management
- All Other BLM
- Missoula-Butte
- North Valley
- Southwestern Montana

All Other Strata
- All Other Lands
- US Fish & Wildlife Service Lands, Rivers, & Tribal Lands

Figure 6. Survey locations in Montana, 2018

1. **Montana Statewide**

a) Montana Statewide: Total

We obtained results for Montana by compiling and jointly analyzing data from 30 strata (Figure 6). For results on specific lands within Montana, refer to section IV: Land Ownership.

Field observers completed 186 of 187 planned surveys (99.5%) in 2018. Observers conducted 2203 point counts within the 186 surveyed grid cells between May 23 and July 13. They detected 207 bird species, including 34 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 214 species that have been detected in any year, 39 of which are priority species. The data yielded robust density estimates (CV < 50%) for 90 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Montana for 219 species that have been detected in any year, 40 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 167 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Montana across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Statewide Montana Results

b) All Other Lands in Montana

We obtained results for All Other Lands in Montana by compiling and jointly analyzing data from three strata (Figure 6).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 304 point counts within the 22 surveyed grid cells between May 26 and June 21. They detected 137 bird species, including 18 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 175 species that have been detected in any year, 27 of which are priority species. The data yielded robust density estimates (CV < 50%) for 49 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Montana for 183 species that have been detected in any year, 31 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 115 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Montana Other across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, below select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

MT-All Other Lands Results

2. Montana BCR 10

a) Montana BCR 10: Total

We obtained results for Montana BCR 10 by compiling and jointly analyzing data from 21 strata (Figure 6).

Field observers completed 125 of 126 planned surveys (99.2%) in 2018. Observers conducted 1413 point counts within the 125 surveyed grid cells between May 27 and July 13. They detected 164 bird species, including 22 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 195 species that have been detected in any year, 33 of which are priority species. The data yielded robust density estimates (CV < 50%) for 78 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Montana BCR 10 for 198 species that have been detected in any year, 32 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 143 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Montana BCR 10 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

MT-BCR10 Results

b) All Other Lands in Montana BCR 10

We obtained results for All Other Lands in Montana BCR 10 by compiling and jointly analyzing data from one stratum (Figure 6).

Field observers completed both planned surveys (100%) in 2018. Observers conducted 28 point counts within the two surveyed grid cells between May 27 and June 3. They detected 63 bird species, including five priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 54 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 19 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Montana BCR 10 for 50 species that have been detected in any year, four of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 21 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Montana BCR 10 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

MT-BCR10 - All Other Lands Results

3. Montana BCR 11

a) Montana BCR 11: Total

We obtained results for Montana BCR 11 by compiling and jointly analyzing data from four strata (Figure 6).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 440 point counts within the 32 surveyed grid cells between May 24 and June 23. They detected 104 bird species, including 17 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 135 species that have been detected in any year, 21 of which are priority species. The data yielded robust density estimates (CV < 50%) for 28 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Montana BCR 11 for 138 species that have been detected in any year, 23 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 65 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Montana BCR 11 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

MT-BCR11 Results

b) All Other Lands in Montana BCR 11

We obtained results for All Other Lands in Montana BCR 11 by compiling and jointly analyzing data from one stratum (Figure 6).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 133 point counts within the ten surveyed grid cells between May 29 and June 9. They detected 81 bird species, including 12 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 109 species that have been detected in any year, 15 of which are priority species. The data yielded robust density estimates (CV < 50%) for 24 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Montana BCR 11 for 109 species that have been detected in any year, 17 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 40 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Montana BCR 11 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

MT-BCR11 - All Other Lands Results

4. Montana BCR 17

a) Montana BCR 17: Total

We obtained results for Montana BCR 17 by compiling and jointly analyzing data from five strata (Figure 6).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 350 point counts within the 29 surveyed grid cells between May 23 and June 29. They detected 123 bird species, including 16 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 186 species that have been detected in any year, 31 of which are priority species. The data yielded robust density estimates (CV < 50%) for 45 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Montana BCR 17 for 187 species that have been detected in any year, 29 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 77 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Montana BCR 17 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

MT-BCR17 Results

b) All Other Lands in Montana BCR 17

We obtained results for All Other Lands in Montana BCR 17 by compiling and jointly analyzing data from one stratum (Figure 6).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 143 point counts within the ten surveyed grid cells between May 26 and June 21. They detected 79 bird species, including 22 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 126 species that have been detected in any year, 17 of which are priority species. The data yielded robust density estimates (CV < 50%) for 27 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Montana BCR 17 for 123 species that have been detected in any year, 16 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 38 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Montana BCR 17 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

MT-BCR17 - All Other Lands Results

C. Utah

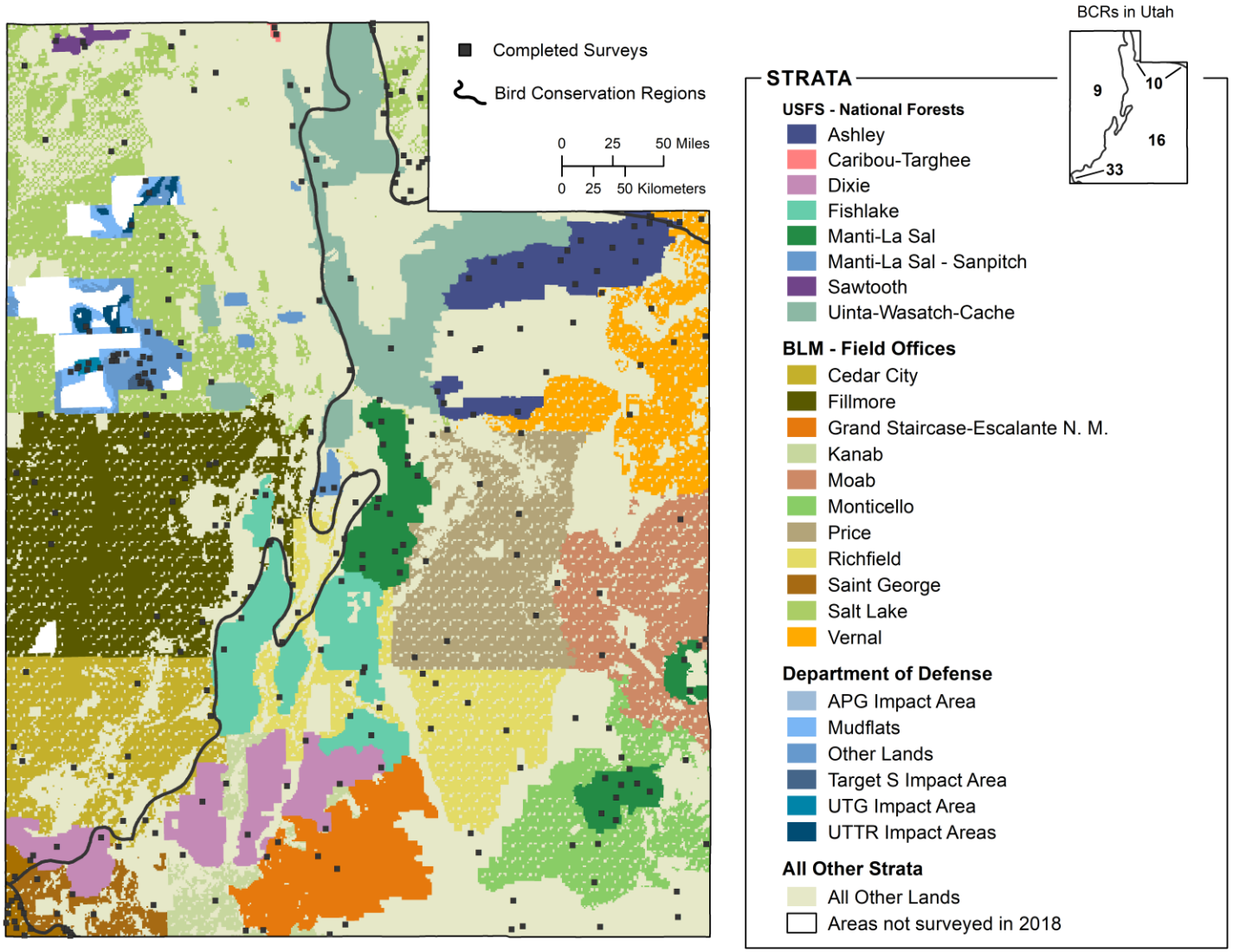


Figure 7. Survey locations in Utah, 2018.

1. **Utah Statewide**

a) Utah Statewide: Total

We obtained results for Utah by compiling and jointly analyzing data from 42 strata (Figure 7). For results on specific lands within Utah, refer to section IV: Land Ownership.

Field observers completed 284 of 284 planned surveys (100%) in 2018. Observers conducted 3424 point counts within the 284 surveyed grid cells between May 7 and July 9. They detected 180 bird species, including eight priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 182 species that have been detected in any year, eight of which are priority species. The data yielded robust density estimates (CV < 50%) for 96 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Utah for 186 species that have been detected in any year, 11 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 129 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Utah across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

Statewide Utah Results

b) All Other Lands in Utah

We obtained results for All Other Lands in Utah by compiling and jointly analyzing data from four strata (Figure 7).

Field observers completed 110 of 110 planned surveys (100%) in 2018. Observers conducted 1,355 point counts within the 110 surveyed grid cells between May 8 and June 27. They detected 161 bird species, including seven priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 165 species that have been detected in any year, seven of which are priority species. The data yielded robust density estimates (CV < 50%) for 77 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Utah for 163 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 89 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Utah across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

UT-All Other Lands Results

2. **Utah BCR 9**

a) Utah BCR 9: Total

We obtained results for Utah BCR 9 by compiling and jointly analyzing data from 17 strata (Figure 7).

Field observers completed 101 of 101 planned surveys (100%) in 2018. Observers conducted 1291 point counts within the 101 surveyed grid cells between May 7 and July 1. They detected 122 bird species, including three priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 130 species that have been detected in any year, five of which are priority species. The data yielded robust density estimates (CV < 50%) for 59 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Utah BCR 9 for 139 species that have been detected in any year, seven of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 77 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Utah BCR 9 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR9 Results

b) All Other Lands in Utah BCR 9

We obtained results for All Other Lands in Utah BCR 9 by compiling and jointly analyzing data from one stratum (Figure 7).

Field observers completed 39 of 40 planned surveys (97.5%) in 2018. Observers conducted 477 point counts within the 39 surveyed grid cells between May 8 and June 21. They detected 98 bird species, including one priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 108 species that have been detected in any year, four of which are priority species. The data yielded robust density estimates (CV < 50%) for 44 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Utah BCR 9 for 103 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 38 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Utah BCR 9 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR9 - All Other Lands Results

3. **Utah BCR 10**

a) Utah BCR 10: Total

We obtained results for Utah BCR 10 by compiling and jointly analyzing data from five strata (Figure 7).

Field observers completed 22 of 22 planned surveys (100%) in 2018. Observers conducted 262 point counts within the 22 surveyed grid cells between May 17 and June 27. They detected 93 bird species, including one priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 92 species that have been detected in any year, one of which is a priority species. The data yielded robust density estimates (CV < 50%) for 36 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Utah BCR 10 for 98 species that have been detected in any year, three of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 53 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Utah BCR 10 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR10 Results

b) All Other Lands in Utah BCR 10

We obtained results for All Other Lands in Utah BCR 10 from one stratum (Figure 7).

Field observers completed 12 of 12 planned surveys (100%) in 2018. Observers conducted 137 point counts within the 12 surveyed grid cells between May 17 and June 27. They detected 55 bird species, including one priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 58 species that have been detected in any year, one of which is a priority species. The data yielded robust density estimates (CV < 50%) for 23 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Utah BCR 10 for 57 species that have been detected in any year, one of which is a priority species. The data yielded robust occupancy estimates (CV < 50%) for 22 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Utah BCR 10 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR10 - All Other Lands Results

4. **Utah BCR 16**

c) Utah BCR 16: Total

We obtained results for Utah BCR 16 by compiling and jointly analyzing data from 18 strata (Figure 7).

Field observers completed 144 of 144 planned surveys (100%) in 2018. Observers conducted 1630 point counts within the 144 surveyed grid cells between May 7 and July 9. They detected 161 bird species, including six priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 163 species that have been detected in any year, six of which are priority species. The data yielded robust density estimates (CV < 50%) for 81 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Utah BCR 16 for 162 species that have been detected in any year, eight of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 113 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Utah BCR 16 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR16 Results

d) All Other Lands in Utah BCR 16

We obtained results for All Other Lands in Utah BCR 16 from one stratum (Figure 7).

Field observers completed 44 of 44 planned surveys (100%) in 2018. Observers conducted 499 point counts within the 44 surveyed grid cells between May 9 and June 27. They detected 136 bird species, including five priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 144 species that have been detected in any year, five of which are priority species. The data yielded robust density estimates (CV < 50%) for 65 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Utah BCR 16 for 138 species that have been detected in any year, five of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 66 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Utah BCR 16 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR16 - All Other Lands Results

5. Utah BCR 33

a) Utah BCR 33: Total

We obtained results for Utah BCR 33 by compiling and jointly analyzing data from two strata (Figure 7).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 232 point counts within the 17 surveyed grid cells between May 8 and May 18. They detected 65 bird species, none of which are priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 77 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 17 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Utah BCR 33 for 76 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 21 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Utah BCR 33 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR33 Results

b) All Other Lands in Utah BCR 33

We obtained results for All Other Lands in Utah BCR 33 from one stratum (Figure 7).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 208 point counts within the 15 surveyed grid cells between May 8 and May 18. They detected 64 bird species, none of which are priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 70 species that have been detected in any year, none of which are priority species. The data yielded robust density estimates (CV < 50%) for 23 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Utah BCR 33 for 68 species that have been detected in any year, none of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 19 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Utah BCR 33 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

UT-BCR33 - All Other Lands Results

D. Wyoming

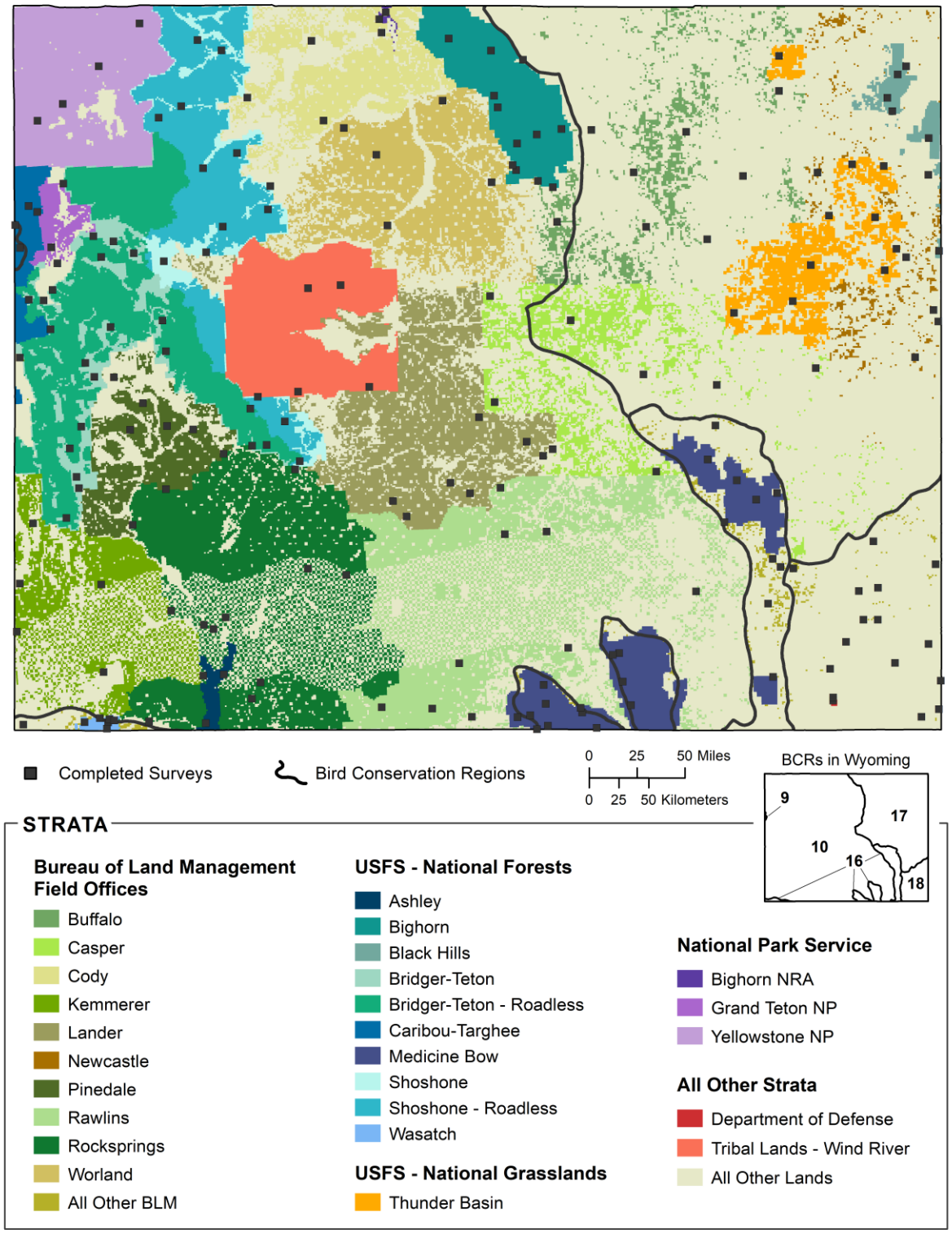


Figure 8. Survey locations in Wyoming, 2018.

1. Wyoming Statewide

a) Wyoming Statewide: Total

We obtained results for Wyoming by compiling and jointly analyzing data from 37 strata (Figure 8). For results on specific lands within Wyoming, see section IV. Land Ownership.

Field observers completed 200 of 201 planned surveys (99.5%) in 2018. Observers conducted 2561 point counts within the 200 surveyed grid cells between May 21 and July 19. They detected 191 bird species, including 46 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 206 species that have been detected in any year, 56 of which are priority species. The data yielded robust density estimates (CV < 50%) for 101 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Wyoming for 212 species that have been detected in any year, 59 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 128 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Wyoming across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

Statewide Wyoming Results

b) All Other Lands in Wyoming

We obtained results for All Other Lands in Wyoming by compiling and jointly analyzing data from four strata (Figure 8).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 559 point counts within the 44 surveyed grid cells between May 21 and June 25. They detected 150 bird species, including 34 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 181 species that have been detected in any year, 46 of which are priority species. The data yielded robust density estimates (CV < 50%) for 61 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Wyoming for 179 species that have been detected in any year, 47 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 77 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Wyoming across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-All Other Lands Results

2. Wyoming BCR 10

a) Wyoming BCR 10: Total

We obtained results for Wyoming BCR 10 by compiling and jointly analyzing data from 23 strata (Figure 8).

Field observers completed 124 of 125 planned surveys (99.2%) in 2018. Observers conducted 1616 point counts within the 124 surveyed grid cells between May 22 and July 19. They detected 167 bird species, including 33 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 190 species that have been detected in any year, 50 of which are priority species. The data yielded robust density estimates (CV < 50%) for 83 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Wyoming BCR 10 for 191 species that have been detected in any year, 53 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 118 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Wyoming BCR 10 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BCR10 Results

b) All Other Lands in Wyoming BCR 10

We obtained results for All Other Lands in Wyoming BCR 10 by analyzing data from one stratum (Figure 8).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 180 point counts within the 15 surveyed grid cells between May 22 and June 25. They detected 113 bird species, including 20 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 152 species that have been detected in any year, 30 of which are priority species. The data yielded robust density estimates (CV < 50%) for 43 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Wyoming BCR 10 for 149 species that have been detected in any year, 32 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 54 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Wyoming BCR 10 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BCR10 - All Other Lands Results

3. Wyoming BCR 16

a) Wyoming BCR 16: Total

We obtained results for Wyoming BCR 16 by compiling and jointly analyzing data from four strata (Figure 8).

Field observers completed 24 of 26 planned surveys (92.3%) in 2018. Observers conducted 264 point counts within the 24 surveyed grid cells between June 1 and July 15. They detected 101 bird species, including 14 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 159 species that have been detected in any year, 35 of which are priority species. The data yielded robust density estimates (CV < 50%) for 53 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Wyoming BCR 16 for 152 species that have been detected in any year, 33 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 68 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Wyoming BCR 16 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BCR16 Results

b) All Other Lands in Wyoming BCR 16

We obtained results for All Other Lands in Wyoming BCR 16 by analyzing data from one stratum (Figure 8).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 48 point counts within the five surveyed grid cells between June 1 and June 8. They detected 45 bird species, including nine priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 107 species that have been detected in any year, 21 of which are priority species. The data yielded robust density estimates (CV < 50%) for 13 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Wyoming BCR 16 for 101 species that have been detected in any year, 19 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 18 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Wyoming BCR 16 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

WY-BCR16 - All Other Lands Results

4. Wyoming BCR 17

a) Wyoming BCR 17: Total

We obtained results for Wyoming BCR 17 by compiling and jointly analyzing data from six strata (Figure 8).

Field observers completed 34 of 34 planned surveys (100%) in 2018. Observers conducted 447 point counts within the 34 surveyed grid cells between May 21 and June 16. They detected 121 bird species, including 25 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 163 species that have been detected in any year, 40 of which are priority species. The data yielded robust density estimates (CV < 50%) for 50 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Wyoming BCR 17 for 162 species that have been detected in any year, 38 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 50 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Wyoming BCR 17 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

WY-BCR17 Results

b) All Other Lands in Wyoming BCR 17

We obtained results for All Other Lands in Wyoming BCR 17 from one stratum (Figure 8).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 173 point counts within the 12 surveyed grid cells between May 21 and June 5. They detected 92 bird species, including 31 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 133 species that have been detected in any year, 29 of which are priority species. The data yielded robust density estimates (CV < 50%) for 31 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout for All Other Lands in Wyoming BCR 17 for 129 species that have been detected in any year, 26 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 37 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within for All Other Lands in Wyoming BCR 17 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

WY-BCR17 - All Other Lands Results

5. Wyoming BCR 18

a) Wyoming BCR 18: Total

We obtained results for Wyoming BCR 18 by compiling and jointly analyzing data from three strata (Figure 8).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 207 point counts within the 16 surveyed grid cells between May 21 and June 3. They detected 69 bird species, including 16 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 99 species that have been detected in any year, 26 of which are priority species. The data yielded robust density estimates (CV < 50%) for 23 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout Wyoming BCR 18 for 92 species that have been detected in any year, 23 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 22 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within Wyoming BCR 18 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

WY-BCR18 Results

b) All Other Lands in Wyoming BCR 18

We obtained results for All Other Lands in Wyoming BCR 18 from one stratum (Figure 8).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 158 point counts within the 12 surveyed grid cells between May 21 and June 3. They detected 65 bird species, including 27 priority species (Appendix E).

Bird Conservancy estimated densities and population sizes for 94 species that have been detected in any year, 24 of which are priority species. The data yielded robust density estimates (CV < 50%) for 23 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout All Other Lands in Wyoming BCR 18 for 85 species that have been detected in any year, 22 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 22 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within All Other Lands in Wyoming BCR 18 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

WY-BCR18 - All Other Lands Results

VII. Bird Conservation Regions

Jump to: Bird Conservation Region 17 Bird Conservation Region 18

A. Bird Conservation Region 17

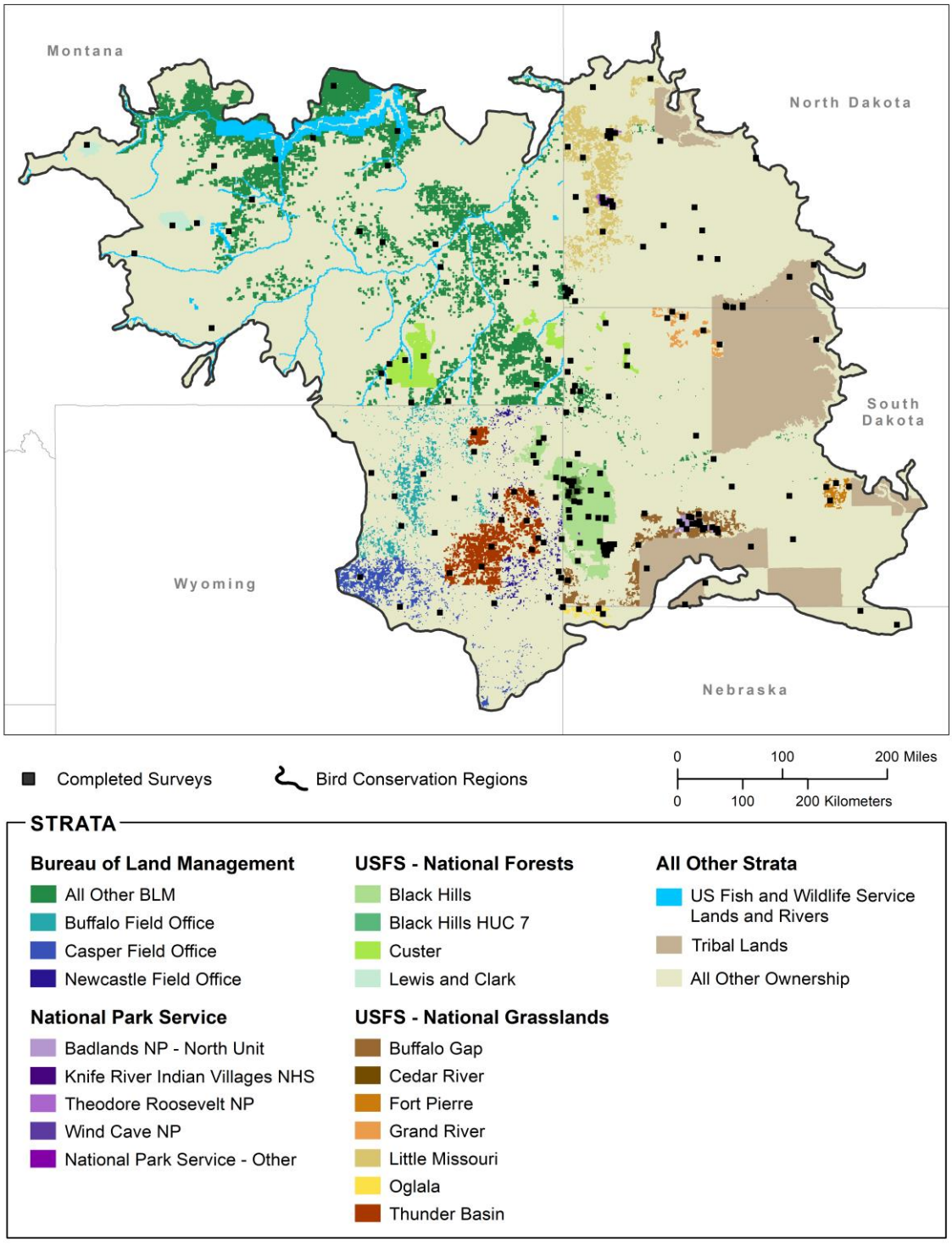


Figure 9. Survey locations in the Badlands and Prairies Bird Conservation Region (BCR 17), 2018.

BCR 17: Total

We obtained results for BCR 17 by compiling and jointly analyzing data from 33 strata in five states (Figure 9).

Field observers completed 201 of 202 planned surveys (99.5%) in 2018. Observers conducted 2379 point counts within the 201 surveyed grid cells between May 21 and July 18. They detected 194 bird species, including 70 priority species (Appendix D).

Bird Conservancy estimated densities and population sizes for 217 species that have been detected in any year, 74 of which are priority species. The data yielded robust density estimates (CV < 50%) for 88 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (Ψ, Psi) throughout BCR 17 for 217 species that have been detected in any year, 77 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 126 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BCR 17 across all years of the project, follow the web link below and hit the “Run Query” button highlighted in red located near the top of the page. If you want to limit results to 2018, select “Year” from the Filter drop down box on the top left of the screen. Hit the “Add” button, select 2018, hit “Add Filter”, then “Run Query”.

BCR 17 Results

B. Bird Conservation Region 18

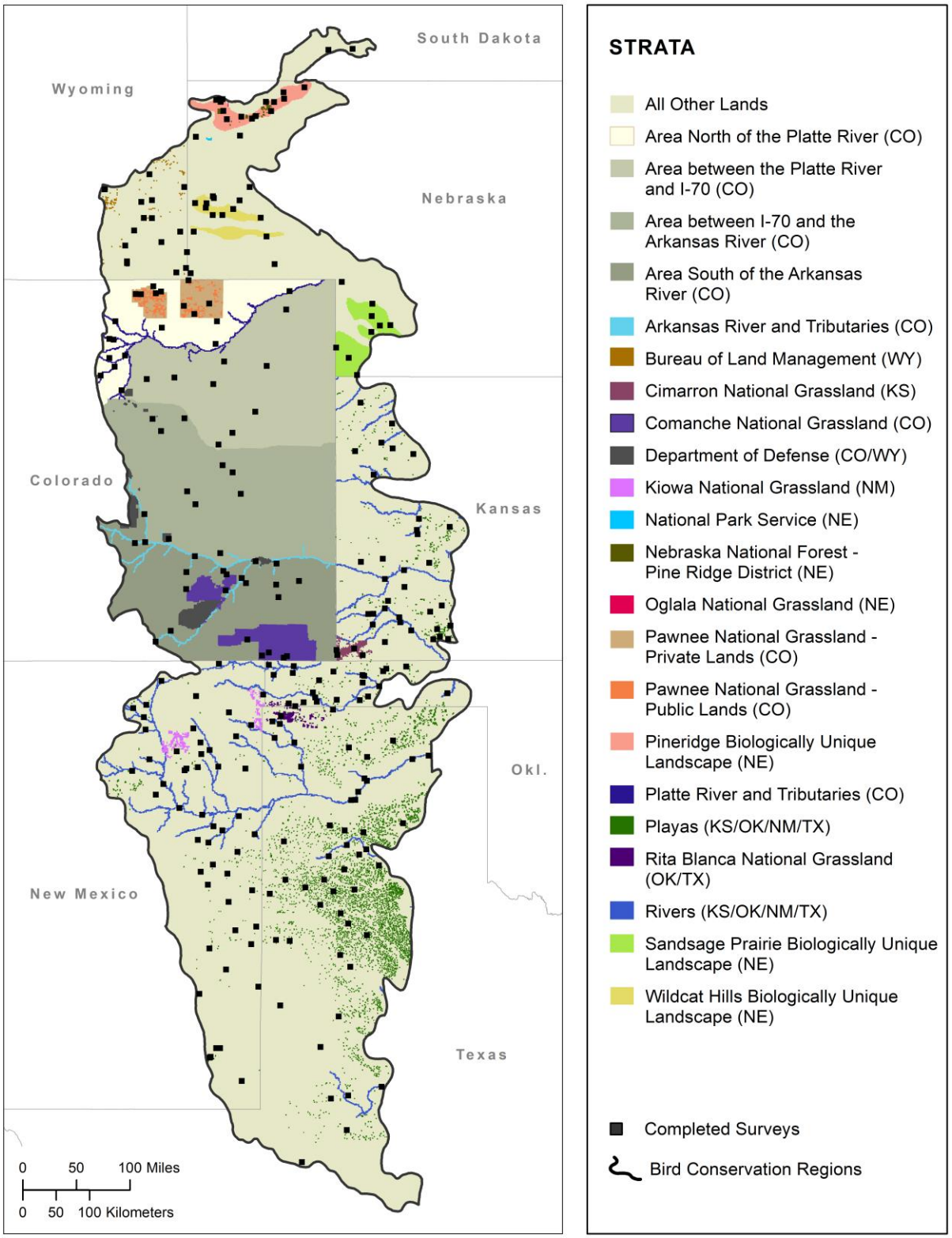


Figure 10. Survey location in the Shortgrass prairie Bird Conservation Region (BCR 18), 2018.

BCR 18 Total

We obtained results for BCR 18 by compiling and jointly analyzing data from 37 strata in eight states (Figure 10).

Field observers completed all planned surveys (100%) in 2018. Observers conducted 2,934 point counts within the 286 surveyed grid cells between April 23 and July 4. They detected 214 bird species, including 44 priority species (Appendix D).

Bird Conservancy estimated densities and population sizes for 186 species that were detected in any year, 41 of which are priority species. The data yielded robust density estimates (CV < 50%) for 87 species for which we estimated densities.

Bird Conservancy estimated the proportion of 1 km² grid cells occupied (ψ, Psi) throughout BCR 18 for 225 species that were detected in any year, 46 of which are priority species. The data yielded robust occupancy estimates (CV < 50%) for 118 species for which we estimated occupancy.

To view a map of survey locations, density and occupancy results, and species counts within BCR 18 across all years of the project, follow the web link below and hit the "Run Query" button highlighted in red located near the top of the page. If you want to limit results to 2018, select "Year" from the Filter drop down box on the top left of the screen. Hit the "Add" button, select 2018, hit "Add Filter", then "Run Query".

BCR 18 Results

Discussion

Applications of IMBCR Data

We collect breeding bird information in the Great Plains, Rocky Mountains, and Intermountain West each year and estimate occupancy, density, abundance, and as of this year, trend, at a variety of spatial scales. This information is used in a variety of ways to inform avian conservation and management decisions:

1. Compare bird population estimates across space. The IMBCR program was designed to provide accurate and contextual information about bird populations from local management units up to BCRs. The hierarchical design of the IMBCR program is critical for understanding bird populations because avian responses to biotic and abiotic features are often scale-dependent (Johnson, 1980; Wiens, Rotenberry, & Van Horne, 1987). The hierarchical framework of nested strata is useful for partitioning bird population estimates according to management units and aggregating bird population estimates at various scales to support both local and landscape-level conservation efforts.

    - At the management unit scale, IMBCR population estimates are used to support local management efforts. Bird population monitoring is necessary to determine if management actions implemented in previous management cycle(s) are achieving conservation objectives. Stratum-level estimates are compared to state and regional estimates to determine whether local populations are above or below regional

estimates. Population estimates within management units are also compared over time and to estimates in the surrounding region to evaluate the effectiveness of management actions.

- The large-scale context provides biological information for conservation planning and landscape prioritization. Population estimates help determine where to focus conservation efforts, such as targeting areas with larger populations for protection and prioritizing areas with lower populations for habitat restoration.

- The large-scale context allows an assessment of conservation responsibility. By comparing stratum and BCR-level abundance estimates, a biologist for a management unit (e.g., National Grassland) can determine what proportion of a species' regional population resides on his or her unit during the breeding season. If a significant proportion of the regional population spends time on the management unit during the breeding season, it might warrant additional conservation or protection measures.

2. Compare bird population estimates across time. Monitoring at regional and BCR scales provides land managers with dependable knowledge about the status and change of bird populations at ecologically relevant scales (NABCI, 2009).

    - Annual estimates of density and occupancy are compared over time to determine if population changes are a result of population growth or decline and/or range expansion or contraction. For example, if population densities of a species declined over time, but the occupancy rates remained constant, then the population change was likely driven by declines in local abundance. In contrast, if both density and occupancy rates of a species decline over time, then population change was likely the result of reduced distribution on the landscape.

    - Land managers and conservation organizations use IMBCR population estimates to better understand annual fluctuations and long-term trends in landbird populations (NABCI, 2009). With new Bayesian analyses, we now provide population trends at multiple scales for over 300 species with a level of confidence in the direction of change. Populations with declining trends inform State Wildlife Action Plans and show which species should be of regional conservation concern. Managers can also set thresholds to trigger management action when populations decline above a certain rate and be informed when populations are increasing.

    - The IMBCR data are also used to investigate population, metapopulation, and community dynamics over time. Sampling units surveyed every year provide information on dynamic processes (e.g., colonization and extinction) that give rise to the patterns of abundance, occupancy, and species richness over time. This information helps generate hypotheses for potential drivers of change on the landscape that could be influencing site occupancy over time.

3. Model habitat relationships to predict species' responses to changes on the landscape. Although IMBCR sampling frames are not stratified based on vegetation, the monitoring data can be post-stratified to estimate density by habitat type (e.g., sagebrush shrubland).

    - Because IMBCR strata are based on fixed attributes rather than existing vegetation types, we can connect changes in bird populations to changes in vegetation (or other

dynamic variables) at multiple scales. The hierarchical stratification scheme is well-suited for linking bird population responses to climate and landscape change at biogeographical scales (Opdam & Wascher, 2004).

- Monitoring data are useful for evaluating competing hypotheses about how bird populations respond to system dynamics. Understanding regional bird population dynamics should help land managers predict species' responses to landscape change and local or large-scale conservation efforts (Jones, 2011; Noon, Bailey, Sisk, & McKelvey, 2012).

- For project planning in specific strata (e.g., National Forest, BLM field office), the monitoring data inform environmental assessments by estimating population-level impacts from proposed activities. If the project is occurring in specific habitat(s) within the stratum, such as ponderosa pine forests, we can use the habitat-specific density estimates to calculate the number of individual birds that could be impacted within the project area.

4. The IMBCR design provides a legitimate way to extend population estimates to un-sampled regions because the models provide population estimates that account for incomplete detection. The population estimation approach to species distribution modeling represents an improvement over opportunistic, index-based approaches (Rota, et al, 2011) especially when the fate of declining species depends on conservation action. The IMBCR data also provide a source for tool development to help land managers and resource professionals address important conservation issues and make more defensible decisions.

    - Species distribution maps based on relationships between the monitoring data and environmental features (e.g., Sparks et al. 2016, Correll et al. 2016) provide an objective means for landscape prioritization to direct conservation efforts (Brooks et al. 2004). Large-scale species distribution maps combined with the local habitat relationships are useful for answering the "where" and "what to do" questions in conservation planning (Wilson et al., 2007).

    - The foundation of decision support tools (DST) are species distribution maps used to prioritize landscapes for conservation and bird-habitat relationships used to evaluate the effectiveness of conservation practices. DST that integrate biological, social, and economic objectives are important for cost-effective conservation outcomes in working landscapes with multiple management objectives. For example, we developed a DST for sagebrush birds, which combined local habitat relationships developed from the bird and vegetation monitoring data, several management actions (e.g., deferred and continuous grazing), and vegetation potential within a structured framework. The tool evaluated the optimal management action to benefit sagebrush birds and forage production for livestock.

5. Auxiliary, or "overlay" projects are a growing component of the IMBCR program. They are designed to address specific management questions. Overlay projects utilize the IMBCR sampling design and field methods but are not integrated into the nested stratification of the IMBCR program. These projects benefit from the IMBCR program by incorporating detection data from relevant IMBCR surveys in their analyses. Utilizing the IMBCR design also allows the resulting project-specific population estimates to be placed in a regional context. In this way, the collaborative efficiency of the IMBCR program is extended to overlay projects by improving

the accuracy and precision of population estimates for infrequently detected species and allowing those estimates to be compared to regional populations. Some example overlay projects include:

a. Monitor in the Atlantic Rim Natural Gas area (south-central Wyoming) to determine impacts on birds; set management triggers to determine when a threshold is met for sagebrush songbird occupancy in the project area compared to surrounding BLM lands

b. Examine community-level effects and bird species relationships with restoration treatments under the Forest Service's Collaborative Forest Landscape Restoration Program implemented across the Front Range in Colorado

c. Evaluate riparian songbird response to tamarisk removal and revegetation efforts along the Dolores River and tributaries in southwestern Colorado and southeastern Utah to inform future restoration efforts

d. Compare population estimates on private ranches in the Great Plains to estimates in the surrounding region to see if participating ranches provide breeding habitat for grassland birds and can market beef on these ranches as bird-friendly

e. Examine livestock grazing impacts on breeding songbirds in high altitude riparian areas in the Bridger-Teton National Forest in grazed and ungrazed allotments to inform grazing management plans

IMBCR as an Adaptive Management Resource and Management Tool

Monitoring is integral to the management and conservation of wildlife populations (Marsh & Trenham, 2008; Sauer & Knutson, 2008). In particular, monitoring is a key part of adaptive management, providing the means for assessing the impacts of management changes and improving system understanding (Lyons et al., 2008; Nichols & Williams, 2006). The IMBCR program accommodates the principles of adaptive monitoring (Lindenmayer & Likens, 2009) because it: 1) addresses well-defined and tractable questions; 2) is underpinned by rigorous science; 3) is based on a conceptual model of how bird populations function; and 4) is relevant to the management of natural resources (Pavlacky et al., 2017). The IMBCR program uses the best available science to support natural resource management by providing bird population estimates that appropriately account for spatial variation and incomplete detection (Pollock et al., 2002; Rosenstock et al., 2002; Thompson, 2002). As a relevant management tool, IMBCR population estimates provide information about species' responses to local management efforts, which can be compared to those at state or BCR-scale to place the population estimates in a regional context.

Under the adaptive monitoring framework, the objectives, sampling design, data collection, analysis, and interpretation are iterative, allowing the program to evolve and develop in response to new information or new management questions. The IMBCR program allows for different stratification schemes and the re-stratification of local management units to better address partner management objectives or new questions. The flexible hierarchical design also accommodates annual fluctuation of sampling intensity without compromising regional population estimates. In addition, overlay (auxiliary) projects can address specific management questions or hypotheses without affecting the integrity of the overall IMBCR framework.

Special Focus: Priority Grassland Bird Species of the Northern Great Plains

Grassland birds are among the fastest declining group of birds in North America, particularly those breeding in the Northern Great Plains (NGP) and wintering in the Chihuahuan Desert grasslands in Mexico (NABCI, 2016). Grassland prairie converted for cropland or residential development threatens these populations on both the breeding and wintering grounds (NABCI 2016). As a result, the National Fish and Wildlife Foundation (NFWF) has made grassland birds a conservation priority for the NGP and selected several focal species to serve as an indicator for conservation practices in the region (NFWF 2016). These species were selected using a structured decision-making process and were intended to represent structural heterogeneity across the grassland (e.g., low herbaceous height and shrub cover) (Green et al. 2018). Focal species include Baird's Sparrow, Chestnut-collared Longspur, Lark Bunting, McCown's Longspur, and Sprague's Pipit. Below we present population estimates for these five species across BCR 17 (Badlands and Prairies) within the NGP for the 10 years in which we have IMBCR coverage of the region (2009 to 2018).

Grassland birds often show low site fidelity year-to-year as they track suitable breeding sites (Cody 1985), which are influenced by local precipitation (Niemuth et al. 2008), management actions, and disturbances (Augustine and Derner 2015). Thus, occupancy at any one site can vary annually, which stresses the importance of regional monitoring; local occupancy rates may decline due to local habitat conditions while conditions at the landscape scale remain suitable for the species (Green et al. 2019). Occupancy rates across BCR 17 for the five focal species appear relatively stable from 2009 to 2018 (Figure 11). Lark Bunting occupancy was highest during this time period and was lowest for McCown's Longspur and Sprague's Pipit (Figure 11). Lark Buntings occupy breeding sites with greater grass and shrub cover in the NGP (Green et al. 2019); therefore higher, relatively stable occupancy rates indicate the presence of suitable breeding sites for this species throughout BCR 17. Conversely, both McCown's Longspurs and Sprague's Pipits typically breed in sites with less herbaceous cover (Knopf 1996). To increase suitable breeding sites for these species, land managers may need to increase disturbance events such as fire and grazing to increase structural heterogeneity in grassland systems (Derner et al. 2009, Augustine and Derner 2015).

Density estimates for the five species across BCR 17 show more annual fluctuation from 2009-2018 compared to occupancy estimates. Although the range for a species (i.e., its occupancy across the landscape) may not change much from year-to-year, the number of individuals using breeding sites could vary due to natural and anthropogenic drivers. Similar to occupancy rates, Lark Buntings were the most abundant focal species and McCown's Longspurs and Sprague's Pipits were the least abundant throughout the region (Figure 12).

To see if local populations in the NGP mirror what is occurring at the regional scale, we can compare density over time for Lark Buntings in BCR 17 to a specific management unit, like Buffalo Gap National Grassland in southwestern South Dakota. While population density might be somewhat stable across a region, populations may decline within a management unit due to local habitat conditions and events. Based on a comparison of density estimates from 2013-2018 (years when we have monitoring coverage in both areas), it appears Lark Bunting populations are relatively stable at the regional scale, but have experienced a decline at the local scale (Figure 13).

The monitoring data serve as a logical place to form hypotheses for observed population fluctuations and predictions about bird response to drivers of change (Pavlacky et al. 2017). Although further analyses would be necessary to identify potential causes of local population declines, we could model habitat features (e.g., higher grass and shrub cover) critical for Lark Bunting breeding site selection (Green et al. 2019). The abundance estimates also allow us to determine conservation responsibility for

breeding birds by comparing the proportion of Lark Buntings residing on Buffalo Gap National Grassland during the breeding season relative to the regional BCR 17 population. Buffalo Gap appears to provide breeding habitat for a small proportion of the regional Lark Bunting population (<1%), but it could provide significant breeding habitat for other grassland species of concern.

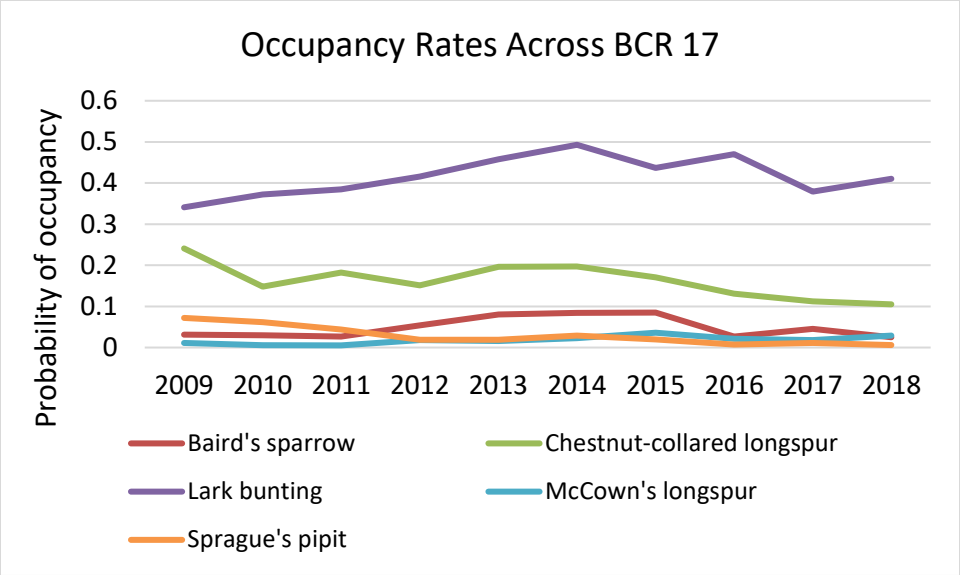


Figure 11. Occupancy rates estimated from IMBCR data for five focal grassland species in BCR 17, 2009-2018.

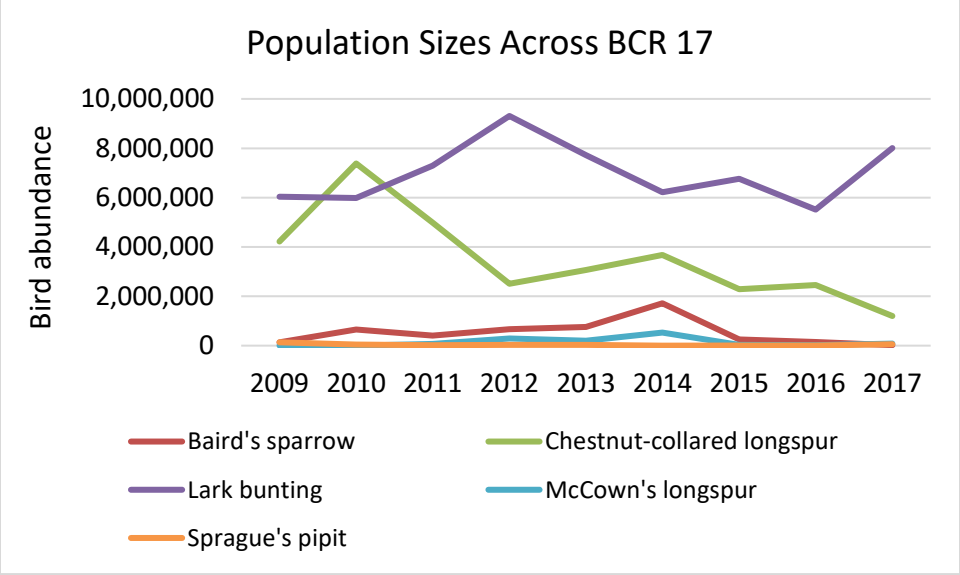


Figure 12. Population abundance estimated from IMBCR data for five focal grassland species in BCR 17, 2009-2018.

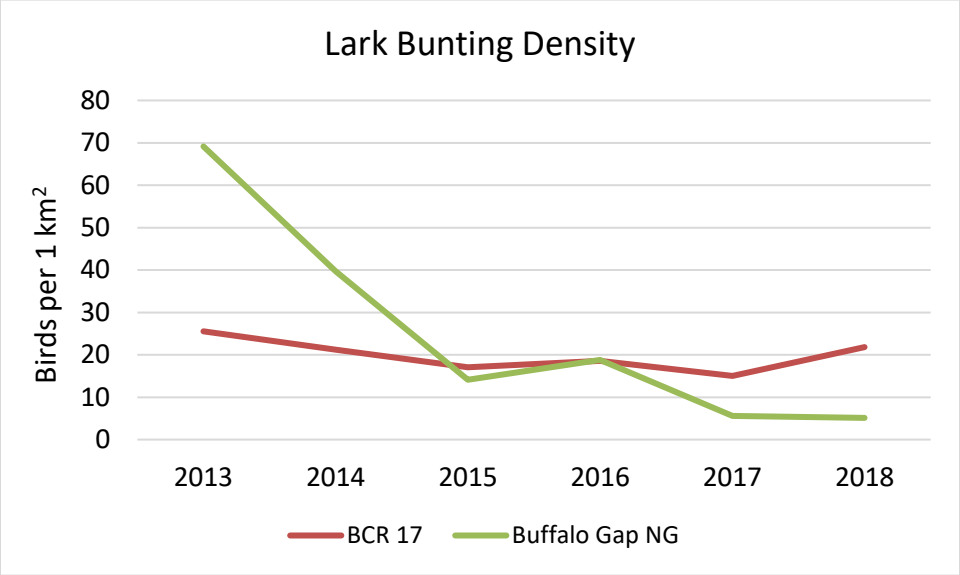


Figure 13. Lark Bunting density in BCR 17 (red line) and Buffalo Gap National Grassland, South Dakota (green line) based on IMBCR data from 2013-2018.

Based on new trend results for the five focal species across BCR 17, two species are declining with confidence, Chestnut-collared Longspur and Sprague's Pipit (Table 3). Chestnut-collared Longspurs are declining approximately 17% annually and Sprague's Pipits are declining roughly 31% annually. The Lark Bunting population in BCR 17 is not significantly increasing or decreasing in the region, whereas we are certain the local Bunting population in Buffalo Gap National Grassland is declining at approximately 37% each year (Table 3).

Table 3. Population trends for five focal grassland species across BCR 17, 2009-2018, and for Lark Bunting in Buffalo National Grassland, 2013-2018. Trend metrics are mean, standard deviation (SD), and 95% lower and upper credible intervals (LCI95, UCI95). A mean >1 indicates an increasing population and a mean <1 indicates a decreasing population. Our confidence in the direction of the trend (i.e., increasing or decreasing) is represented by "Significance," where 1 indicates 100% confidence the population is changing in the direction of the mean and 0.5 indicates an equal probability of an increasing or decreasing population.

Stratum	Species	Mean	SD	LCI95	UCI95	Significance
BCR 17	Baird's Sparrow	0.99	0.20	0.69	1.46	0.57
BCR 17	Chestnut-collared Longspur	0.83	0.03	0.76	0.90	1.00
BCR 17	Lark Bunting	1.00	0.02	0.97	1.04	0.51
BCR 17	McCown's Longspur	1.31	0.34	0.83	2.14	0.85
BCR 17	Sprague's Pipit	0.69	0.14	0.43	0.99	0.98
Buffalo Gap National Grassland	Lark Bunting	0.63	0.03	0.57	0.68	1.00

One of the primary objectives in the NFWF Business Plan for the NGP is to reduce annual population declines for these five focal species where NFWF-funded projects, such as conservation easements, are occurring (NFWF 2016). To help meet this objective, we are conducting an IMBCR overlay project in the NGP to evaluate NFWF-funded conservation easement, restoration, and grazing management projects. We will then compare bird density, occupancy, and species richness on the NFWF projects to the surrounding region to see if the projects are having a positive impact on the focal species. Understanding the effectiveness of these projects for grassland birds will help guide future conservation efforts in the region.

Conclusion

The availability of consistent monitoring data at multiple scales is an important challenge for avian conservation (Ruth et al., 2003). The IMBCR program meets this challenge through its randomized, hierarchical design, which allows for inference to multiple strata of interest, from National Grasslands to states to BCRs (Pavlacky et al., 2017). With this design, we can model habitat relationships to evaluate species' responses to local management actions and predict species' distributions for landscape prioritization. The stratification of the IMBCR sampling frame based on eco-regional boundaries and other fixed attributes is also a critical feature of the program because it allows for the evaluation of long-term avian responses to landscape and climate change (Metzger et al., 2013; Pavlacky et al., 2017).

The importance of long-term population monitoring at larger spatial scales is well known (Jones, 2011; Thompson et al., 1998), but it is expensive and often cost-prohibitive. The IMBCR design reduces expenses through cooperation with multiple partners, one of the stated goals of effective collaboration and coordinated bird monitoring (NABCI Monitoring Subcommittee, 2007). Partners can investigate priority species and management questions with slight modifications to the IMBCR design, further reducing costs associated with developing new studies and monitoring programs. These cost savings allow for an increased sampling effort or for the development of decision support tools to aid land managers and conservation practitioners on the ground. Based on its spatially balanced design, the IMBCR program can also accommodate a shortage of monitoring funds in certain years or strata without reducing the overall rigor of the program (Stevens Jr. & Olsen, 2004).

The IMBCR program is well-positioned to address the conservation and management needs of a wide range of stakeholders due to its rigorous, hierarchical design and the strength of the IMBCR partnership. This partnership is an ongoing collaboration between multiple entities from state and federal agencies to non-governmental organizations, and was created to address management and conservation objectives of larger avian programs like NABCI (NABCI Monitoring Subcommittee, 2007). Through the IMBCR partnership, monitoring resources are pooled among separate management entities, promoting a more efficient use of resources and allowing for inference to larger landscapes (Pavlacky et al., 2017). By providing essential knowledge of bird populations at multiple scales relevant to management and conservation, the IMBCR program helps prioritize management actions and facilitate a collaborative approach to bird conservation (Ruth et al., 2003, Pavlacky et al., 2017).

Literature Cited

Alexander, J. D., Stevens, J. L., Geupel, G. R., & Will, T. C. (2008). Decision support tools: bridging the gap between science and management. In *Proceedings of the Fourth International Partners in Flight Conference: Tundra to Tropics.* (p. Pages 283–291). McAllen, Texas, USA. Retrieved from http://www.partnersinflight.org/pubs/McAllenProc/articles/PIF09_Decision Support Tools/Alexander_PIF09.pdf

Arizona Game and Fish Department. (2012). *Arizona's State Wildlife Action Plan: 2012 - 2022*. Arizona Game and Fish Department, Phoenix, Arizona. Retrieved from http://www.azgfd.gov/pdfs/w_c/cwcs/downloads/CWCS_Final_May2006.pdf

Augustine, D. J., and J. D. Derner. (2015). Patch-burn grazing management, vegetation heterogeneity, and avian responses in a semi-arid grassland. *Journal of Wildlife Management,* 79, 927–936.

Baron, J. S., Julius, S. H., West, J. M., Joyce, L. A., Blate, G., Peterson, C. H., … Griffith, B. (2008). Some guidelines for helping natural resources adapt to climate change. *International Human Dimensions Programme on Global Environmental Change Update*, *2*, 46–52.

Blakesley, J. A., & Hanni, D. J. (2009). *Monitoring Colorado's Birds, 2008* (No. Tech. Rep. M-MCB08-01.). Technical Report M-MCB08-01. Rocky Mountain Bird Observatory, Brighton, Colorado, USA.

Brooks, T. , Da Fonseca, G. A. and Rodrigues, A. S. (2004). Species, Data, and Conservation Planning. *Conservation Biology,* 18, 1682-1688.

Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., & Thomas, L. (2001). *Introduction to distance sampling: estimating abundance of biological populations*. Oxford, UK: Oxford University Press.

Buckland, S. T., Marsden, S. J., & Green, R. E. (2008). Estimating bird abundance: making methods work. *Bird Conservation International*, *18*, S91–S108.

Bureau of Land Management. (2010). Wyoming Sensitive Species Policy and List. Retrieved from http://www.blm.gov/pgdata/etc/medialib/blm/wy/resources/efoia/IMs/2010.Par.41285.File.dat/wy2010-027atch2.pdf

Bureau of Land Management. (2014). 2014 Montana/Dakotas BLM Special Status Species List.

Bureau of Land Management. (2015). Idaho Bureau of Land Management Special Status Species List Update. Idaho State Office Instruction Memorandum 2015-009c1, attachment 1.

Chesser, R. T., Burns, K. J., Cicero, C., Dunn, J. L., Kratter, A. W., Lovette, I. J., … Winker, K. (2017). Fifty-eighth supplement to the American Ornithological Society's Check-list of North American Birds. *The Auk*, *134*(3), 751–773.

Cody, M. L. (1985). *Habitat selection in birds.* New York, NY, USA. Academic Press.

Colorado Parks and Wildlife. (2015). Vertebrate and Mollusk Species of Greatest Conservation Need. Retrieved from http://cpw.state.co.us/Documents/WildlifeSpecies/SWAP/SGCN-Final-Table.pdf

Correll, M.D., N. Drilling, A. Dwyer, T. L. George, A. W. Green, A. O. Panjabi, D. C. Pavlacky Jr, L. Quattrini, A. Shaw, R. A. Sparks, E. H. Strasser, and A. Van Boer. 2016. Recommendations for grassland bird

species conservation in the Northern Great Plains business plan. Final report. Bird Conservancy of the Rockies, Brighton, Colorado, USA.

Derner, J.D.,W. K.Lauenroth, P. Stapp, and D. J. Augustine. (2009). Livestock as ecosystem engineers for grassland bird habitat in theWestern Great Plains of North America. *Rangeland Ecology and Management,* 62, 111–118.

Dreitz, V. J., Lukacs, P. M., & Knopf, F. L. (2006). Monitoring low density avian populations: An example using Mountain Plovers. *Condor*, *108*(3), 700–706.

Dreitz, V. J., Stinson, L. T., Hahn, B. A., Tack, J. D., & Lukacs, P. M. (2017). A large-scale perspective for managing prairie avifauna assemblages across the western US: influences of habitat, land ownership and latitude. *PeerJ*, *5*, e2879. https://doi.org/10.7717/peerj.2879

Dyke, S. R., Johnson, S. K., Isakson, P. T. (2015). *North Dakota State Wildlife Action Plan*. North Dakota Game and Fish Department, Bismarck, ND. 438 pp.

Environmental Systems Research Institute. (2017). *ArcGIS, version 10.X*. Redlands, California, USA: Environmental Systems Research Institute, Incorporated.

Green, A.W., M.D. Correll, T.L. George, I. Davidson, S. Gallagher, C. West, A. Lopata, D. Casey, K. Ellison, D.C. Pavlacky Jr., L. Quattrini, A.E. Shaw, E.H. Strasser, T. VerCauteren, and A.O. Panjabi. (2018). Using Structured Decision Making to prioritize species assemblages for conservation. *Journal for Nature Conservation,* 45, 48-57.

Green, A. W., Pavlacky, D. C., & George, T. L. (2019). A dynamic multi-scale occupancy model to estimate temporal dynamics and hierarchical habitat use for nomadic species. *Ecology and Evolution*, *2019(9),* 793-803.

Hanni, D. J., White, C. M., Birek, J. J., Van Lanen, N. J., & McLaren, M. F. (2012). *Field protocol for spatially-balanced sampling of landbird populations. Unpublished report.* Brighton, Colorado, USA: Rocky Mountain Bird Observatory. Retrieved from http://www.rmbo.org/PUBLIC/MONITORING/protocols/Field_protocol_for_spacially_balanced_sampling_final_2009.pdf

Hobbs, N. T., & Hooten, M. B. (2015). *Bayesian models: a statistical primer for ecologists*. Princeton University Press, Princeton, New Jersey, USA.

Johnson, D. H. (1980). The Comparison of Usage and Availability Measurements for Evaluating Resource Preference. *Ecology*, *61*(1), 65–71. https://doi.org/10.2307/1937156

Jones, J. P. G. (2011). Monitoring species abundance and distribution at the landscape scale. *Journal of Applied Ecology*, *48*(1), 9–13. https://doi.org/10.1111/j.1365-2664.2010.01917.x

Kellner, K. (2018). *Package 'jagsUI'*. https://cran.r-project.org/web/packages/jagsUI/jagsUI.pdf. Accessed 2 Jul 2019.

Knopf, F. (1996). Prairie legacies-birds. Pages 135–148 in F. Samson, and F. L. Knopf, editors. *Prairie conservation: preserving North America's most endangered ecosystem*. Island Press, Washington, D.C., USA.

Lindenmayer, D. B., & Likens, G. E. (2009). Adaptive monitoring: a new paradigm for long-term research and monitoring. *Trends in Ecology and Evolution*, *24*(9), 482–486.

Lindenmayer, D. B., & Likens, G. E. (2010). The science and application of ecological monitoring. *Biological Conservation*, *143*(6), 1317–1328. https://doi.org/10.1016/j.biocon.2010.02.013

Lyons, J. E., Runge, M. C., Laskowski, H. P., & Kendall, W. L. (2008). Monitoring in the context of structured decision-making and adaptive management. *The Journal of Wildlife Management*, *72 (8)*, 1683–1692.

MacKenzie, D. I., Nichols, J. D., Lachman, G. B., Droege, S., Royle, J. A., & Langtimm, C. A. (2002). Estimating site occupancy rates when detection probabilities are less than one. *Ecology*, *83*(8), 2248–2255.

MacKenzie, D. I., Nichols, J. D., Royle, J. A., Pollock, K. H., Bailey, L. L., & Hines, J. E. (2006). *Occupancy estimation and modeling: inferring patterns and dynamics of species occurrence*. Burlington, Massachusetts, USA: Elsevier.

Manley, P. N., Schlesinger, M. D., Roth, J. K., & Van Horne, B. (2005). A field-based evaluation of a presence-absence protocol for monitoring ecoregional-scale biodiversity. *Journal of Wildlife Management*, *69*(3), 950–966.

Marsh, D. M., & Trenham, P. C. (2008). Current trends in plant and animal population monitoring. *Conservation Biology*, *22*(3), 647–655.

Metzger, M. J., Brus, D. J., Bunce, R. G. H., Carey, P. D., Gonçalves, J., Honrado, J. P., … Zomer, R. (2013). Environmental stratifications as the basis for national, European and global ecological monitoring. *Ecological Indicators*, *33*, 26–35. https://doi.org/10.1016/j.ecolind.2012.11.009

Montana Fish Wildlife and Parks. (2015). Montana State Wildlife Action Plan, 1–453. https://doi.org/10.1017/CBO9781107415324.004

Montana Natural Heritage Program. (2015). Animal Species of Concern. Retrieved April 1, 2015, from http://mtnhp.org/SpeciesOfConcern/

Mordecai, R. S., Mattsson, B. J., Tzilkowski, C. J., & Cooper, R. J. (2011). Addressing challenges when studying mobile or episodic species: Hierarchical Bayes estimation of occupancy and use. J*ournal of Applied Ecology* 48: 56–66. https://doi.org/10.1111/j.1365-2664.2010.01921.

National Fish and Wildlife Foundation (NFWF). (2016). Business plan for the Northern Great Plains. NFWF. Washington, D.C., USA. 76 pp.

Niemuth, N. D., Solberg, J. W., & Shaffer, T. L. (2008). Influence of mois- ture on density and distribution of grassland birds in North Dakota. *The Condor* 110: 211–222.

North American Bird Conservation Initiative. (2016). *The State of North America's Birds 2016*. Environment and Climate Change Canada: Ottawa, Ontario. 8 pages. www.stateofthebirds.org

New Mexico Department of Game and Fish. (2016). *State Wildlife Action Plan for New Mexico*. New Mexico Department of Game and Fish. Santa Fe, New Mexico. Retrieved from http://www.wildlife.state.nm.us/download/conservation/swap/New-Mexico-State-Wildlife-Action-Plan-SWAP-Final-2017.pdf

Nichols, J. D., Bailey, L. L., O'Connell, A. F., Talancy, N. W., Grant, E. H. C., Gilbert, A. T., … Hines, J. E. (2008). Multi-scale occupancy estimation and modelling using multiple detection methods. *Journal of Applied Ecology, 45*(5), 1321–1329.

Nichols, J. D., & Williams, B. K. (2006). Monitoring for conservation. *Trends in Ecology and Evolution*, *21*(12), 668–673.

Noon, B. R., Bailey, L. L., Sisk, T. D., & McKelvey, K. S. (2012). Efficient Species-Level Monitoring at the Landscape Scale. *Conservation Biology*, *26*(3), 432–441.

Oklahoma Department of Wildlife Conservation. (2015). *Oklahoma Comprehensive Wildlife Conservation Strategy: A Strategic Conservation Plan for Oklahoma's Rare and Declining Wildlife*. Retrieved from https://www.wildlifedepartment.com/wildlifemgmt/cwcs.pdf

Opdam, P., & Wascher, D. (2004). Climate change meets habitat fragmentation: linking landscape and biogeographical scale levels in research and conservation. *Biological Conservation*, *117*(3), 285–297.

Partners in Flight. (2017). Avian Conservation Assessment Database, version 2017. Retrieved March 7, 2018, from http://pif.birdconservancy.org/ACAD

Pavlacky, D. C., Lukacs, P. M., Blakesley, J. A., Skorkowsky, R. C., Klute, D. S., Hahn, B. A., … Hanni, D. J. (2017). A statistically rigorous sampling design to integrate avian monitoring and management within Bird Conservation Regions. *PLoS ONE*, *12*(10). https://doi.org/10.1371/journal.pone.0185924

Pavlacky Jr., D. C., Blakesley, J. A., White, G. C., Hanni, D. J., & Lukacs, P. M. (2012). Hierarchical multi-scale occupancy estimation for monitoring wildlife populations. *Journal of Wildlife Management*, *76*, 154–162.

Plummer, M. (2003). *JAGS: a program for analysis of Bayesian graphical models using Gibbs sampling*. Proceedings of the 3rd International Workshop on Distributed Statistical Computing DSC 2003, 20–22 March 2003, Vienna, Austria.

Plummer, M. (2017). JAGS version 4.3.0 user manual. https://sourceforge.net/projects/mcmc-jags/files/Manuals/4.x/jags_user_manual.pdf/download. Accessed 2 Jul 2019.

Pollock, K. H. (1982). A capture-recapture design robust to unequal probability of capture. *Journal of Wildlife Management*, *46*(3), 752–757.

Pollock, K. H., Nichols, J. D., Simons, T. R., Farnsworth, G. L., Bailey, L. L., & Sauer, J. R. (2002). Large scale wildlife monitoring studies: statistical methods for design and analysis. *Environmetrics*, *13*(2), 105–119. https://doi.org/10.1002/env.514

R Core Team. (2019). *R: a language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from www.R-project.org/

Rich, T. D., Beardmore, C. J., Berlanga, H., Blancher, P. J., Bradstreet, M. S. W., Butcher, G. S., … Will, T. C. (2004). *Partners in Flight North American landbird conservation plan*. Ithaca, New York, USA: Cornell Lab of Ornithology.

Rosenstock, S. S., Anderson, D. R., Giesen, K. M., Leukering, T., & Carter, M. F. (2002). Landbird counting techniques: current practices and an alternative. *Auk*, *119*(1), 46–53.

Rota, C. T., Fletcher Jr., R. J., Evans, J. M., & Hutto, R. L. (2011). Does accounting for imperfect detection improve species distribution models? *Ecography*, *34*(4), 659–670.

Royle, J. A., Dawson, D. K., & Bates, S. (2004). Modeling abundance effects in distance sampling. *Ecology, 85(6)*, 1591-1597.

Ruggiero, L. F., Hayward, G. D., & Squires, J. R. (1994). Viability analysis in biological evaluations: Concepts of population vability analysis, biological population, and ecological scale. *Conservation Biology*, *8*(2), 364–372.

Ruth, J. M., Petit, D. R., Sauer, J. R., Samuel, M. D., Johnson, F. A., Fornwall, M. D., … Bennett, J. P. (2003). Science for avian conservation: Priorities for the new millennium. *Auk*, *120*(1), 204–211.

Sauer, J. R., & Knutson, M. G. (2008). Objectives and metrics for wildlife monitoring. *Journal of Wildlife Management*, *72*(8), 1663–1664.

Schneider, R., Fritz, M., Jorgensen, J., Schainost, S., Simpson, R., Steinauer, G., & Rothe-Groleau, C.. (2018). *Revision of the Tier 1 and 2 Lists of Species of Greatest Conservation Need: A Supplement to the Nebraska Natural Legacy Project State Wildlife Action Plan*. The Nebraska Game and Parks Commission, Lincoln, NE.

Sillett, T. S., Chandler, R. B., Royle, J. A., Kéry, M., & Morrison, S.A. (2012). HIerarchical distance-sampling models to estimate population size and habitat-specific abundance of an island endemic. *Ecological Applications, 22(7)*, 1997-2006.

Sparks, R. A., & Hanni, D. J. (2013). *Monitoring Birds on Little Missouri, Sheyenne and Grand River National Grasslands. Tech. Report # M-DAKPG-12.* Rocky Mountain Bird Observatory, Brighton, Colorado, USA.

Sparks R.A., N.J. Van Lanen, A. Van Boer, and D.C. Pavlacky Jr. 2016. Monitoring Avian Populations on Colorado and Wyoming Military Installations. Bird Conservancy of the Rockies. Brighton, Colorado, USA.

Stevens Jr., D. L., & Olsen, A. R. (2004). Spatially balanced sampling of natural resources. *Journal of the American Statistical Association*, *99*(465), 262–278.

Texas Parks and Wildlife Department. (2012). *Texas Conservation Action Plan 2012 - 2016*. Austin, TX.

Thomas, L., Buckland, S. T., Rexstad, E. A., Laake, J. L., Strindberg, S., Hedley, S. L., … Burnham., K. P. (2010). Distance software: design and analysis of distance sampling surveys for estimating population size. *Journal of Applied Ecology*, *47*, 5–14.

Thompson, W. L. (2002). Towards reliable bird surveys: accounting for individuals present but not detected. *Auk*, *119*(1), 18–25.

Thompson, W. L., White, G. C., & Gowan, C. (1998). *Monitoring vertebrate populations*. San Diego, California, USA: Academic Press.

US Forest Service. (2008). Region 2 Regional Forester's Sensitive Species. Retrieved from http://www.fs.fed.us/r2/projects/scp/sensitivespecies/index.shtml.

US North American Bird Conservation Initiative. (2000). Bird Conservation Regions descriptions: a supplement to the North American Bird Conservation Initiative: Bird Conservation Regions map.

US North American Bird Conservation Initiative. (2009). *The State of the Birds, United States of America, 2009*. Washington, D.C., USA: U.S. Department of Interior. Retrieved from http://www.stateofthebirds.org/pdf_files/State of the Birds_FINAL.pdf

US North American Bird Conservation Initiative Monitoring Subcommittee. (2007). *Opportunities for improving avian monitoring*. Arlington, Virginia, USA: Division of Migratory Bird Management, U.S. Fish and Wildlife Service. Retrieved from http://www.nabci-us.org/aboutnabci/monitoringreportfinal0307.pdf

Utan Wildlife Action Plan Joint Team. (2015). *Utah Wildlife Action Plan: A plan for managing native wildlife species and their habitats to help prevent listing under the Endangered Species Act*. Salt Lake City, Utah, USA: Utah Division of Wildlife Resources.

Watanabe, S. (2010). Asymptotic equivalence of Bayes cross validation and widely applicable information criterion in singular learning theory. *Journal of Machine Learning Research, 2010(11)*, 3571-3594.

Wiens, J. A., Rotenberry, J. T., & Van Horne, B. (1987). Habitat Occupancy Patterns of North American Shrubsteppe Birds: The Effects of Spatial Scale. *Oikos*, *48*(2), 132. https://doi.org/10.2307/3565849

Wilson, K. A., Underwood, E. C., Morrison, S. A., Klausmeyer, K. R., Murdoch, W. W., Reyers, B., … Possingham, H. P. (2007). Conserving biodiversity efficiently: What to do, where, and when. *PLoS Biology*, *5*(9), 1850–1861. https://doi.org/10.1371/journal.pbio.0050223

Witmer, G. W. (2005). Wildlife population monitoring: some practical considerations. *Wildlife Research*, *32*, 259–263.

Wyoming Game and Fish Department. (2016). 2017 S*pecies of Greatest Conservation Need*. Retrieved from https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/SWAP/Wyoming-SGCN.pdf

Appendix A: Avian Data Center Usage Tips

Overview

All results, including parameter estimates, distribution maps, raw count data and effort, are available online. To view interactive maps showing survey and detection locations, as well as species counts, and density, population and occupancy results using the IMBCR study design please visit the Rocky Mountain Avian Data Center. Click on the "Explore the Data" tab to view IMBCR results.

The Avian Data Center has been designed to provide information for specific questions and therefore works best when users select multiple filters for a query. To run a query, click the arrow for the drop down "Filter" menu (located in the extreme upper left corner of the screen) and select one of the following filter types: Study Design, BCR, State, County, Management Entity, Priority Species List, Species, Year, Superstratum, or Individual Stratum. After selecting the filter type, click the "Add" button immediately to the right of the drop down menu. A box will appear with options for the filter that you may select. Use the drop down menu in the box to select the specific filter and then click "Add filter". The selected filter will appear near the top of the screen. Users may add multiple filter types to view results for a very specific inquiry (e.g., to view IMBCR results for BRSP in CO you would apply the following filters: Study Design = IMBCR, Species = Brewer's Sparrow and State = CO) or to view multiple outputs at once (e.g., to view data and results for Brewer's Sparrow and Vesper Sparrow at the same time select Species = Brewer's Sparrow and Species = Vesper Sparrow). Below is an explanation of the different filter types you may choose from.

Study Design: This filter will allow users to select data and results for IMBCR, GRTS, Migration Phenology, NEON, or NPS study designs.

- Selecting the GRTS filter will display data and results for monitoring efforts which used the IMBCR design but do NOT contribute to statewide and regional estimates (also known as "overlays").
- The IMBCR filter will select data and results collected under the IMBCR protocol that contribute to state and BCR-wide estimates.
- The Migration Phenology filter will select data and results for the Migration Phenology project.
- The NEON study design is a specific study design developed by NEON and Bird Conservancy for surveys conducted at NEON research locations.
- The NPS study designs are a mixture of study designs specifically designed for individual national parks. Please note that we are still working on adding some of the historic data to the Avian Data Center so not all study designs are currently available.

BCR: This filter will allow users to select data and results for a particular Bird Conservation Region. Selecting this filter will provide you with results for all strata and superstrata within a particular BCR.

State: This filter will allow users to select data and results for all study designs for a particular state. Selecting this filter will supply the user with data and results for all strata and superstrata within a particular state.

County: This filter will allow users to select data for a particular county. Please note that only raw count data and survey locations are available at the county level.

Management Entity: This filter will allow users to select data and results for All Other Lands, Colorado State Land Board, The Nature Conservancy (TNC), US Bureau of Indian Affairs (BIA), US Bureau of Land Management (BLM), US Department of Defense (DOD), US Fish and Wildlife Service (USFWS), US Forest Service (USFS), or National Park Service (NPS). Once a management entity is chosen, users may notice that additional filter types are available in the filters drop down list. These additional filter types, listed from most general to most specific, are management regions (e.g., USFS Region 1), management units (e.g., Dakota Prairie Grasslands), management forests (e.g., Shoshone National Forest), or management districts (e.g., North Kaibab district within Kaibab National Forest). Below is the filter hierarchy for the different management entities.

Priority Species List: This filter will allow users to select data and results for multiple species at once. The query will display data and results for all species included on the selected management indicator list, species of conservation concern list, etc.

Species: This filter allows users to select data and results for a particular species.

Year: This filter will allow users to select all data and results for a particular year.

Superstratum: This filter allows users to select IMBCR data and results for multiple strata that were analyzed jointly (e.g., the entire Bridger-Teton National Forest which was broken up into 2 strata or the entire state of Colorado which was broken up into 30 strata).

Individual Stratum: This filter allows users to select data and results for a particular stratum.

Hierarchy for the different management entities

All Other Lands:

Tier One – Management Entity – All Other Lands
Tier Two – Management Region – Not applicable
Tier Three – Management Unit – Not applicable
Tier Four – National Forest or Grassland – Not applicable
Tier Five – Management District – Not applicable

Colorado State Land Board:

Tier One – Management Entity – Colorado State Land Board
Tier Two – Management Region – Lowry Range
Tier Three – Management Unit – Not applicable
Tier Four – National Forest or Grassland – Not applicable
Tier Five – Management District – Not applicable

TNC:

Tier One – Management Entity – The Nature Conservancy
Tier Two – Management Region – Cherry Creek
Tier Three – Management Unit – Not applicable
Tier Four – National Forest or Grassland – Not applicable
Tier Five – Management District – Not applicable

Tribal Lands:

Tier One – Management Entity – US Bureau of Indian Affairs
Tier Two – Management Region – Reservation
Tier Three – Management Unit – Not applicable
Tier Four – National Forest or Grassland – Not applicable
Tier Five – Management District – Not applicable

BLM:

Tier One – Management Entity – Bureau of Land Management
Tier Two – Management Region – BLM Field Office
Tier Three – Management Unit – Not applicable
Tier Four – National Forest or Grassland – Not applicable
Tier Five – Management District – Not applicable

DOD:

Tier One – Management Entity – US Department of Defense
Tier Two – Management Region – US DoD Installation
Tier Three – Management Unit – Not applicable
Tier Four – National Forest or Grassland – Not applicable
Tier Five – Management District – Not applicable

USFWS:

Tier One – Management Entity – US Fish and Wildlife Service
Tier Two – Management Region – USFWS Region
Tier Three – Management Unit – USFWS Management Unit, Refuge, etc.
Tier Four – National Forest or Grassland – Not applicable
Tier Five – Management District – Not applicable

USFS:

Tier One – Management Entity – US Forest Service
Tier Two – Management Region – USFS Regions
Tier Three – Management Unit – National Forest (NF) or National Grassland (NG) management units (used to represent situations where multiple forests are managed jointly)
Tier Four – National Forest or Grassland – NF or NG
Tier Five – Management District – NF or NG Ranger Districts

NPS:

Tier One – Management Entity – National Park Service
Tier Two – Management Region – Inventory and Monitoring Network
Tier Three – Management Unit – Individual NPS Parks, Monuments, Memorials, Recreation Areas, and Historic Sites
Tier Four – Management Forest – Not applicable
Tier Five – Management District – Not applicable

Clearing Filters

Filters can be cleared in one of two ways. You may click on the circled "X" to the left of an individual filter at the top of the screen to remove it or you may click the "clear all filters" button at the top of the screen to start building a new query.

Running Queries

Once you have selected your desired filters, please click on the "Run Query" button located at the top of the screen. The amount of time it takes for the desired data and results to be displayed will depend on how specific your query is.

Comparing Multiple Queries

Users may view results of multiple queries at once. To do this, run the first query as described above and then click the button "New Query Window" (located at the top of the screen). A new window will appear where a separate query can be run. The two windows can then be viewed side by side.

Share a Created Query with a Colleague

It is possible to create a link to the Avian Data Center/ Explore the Data screen with a pre-loaded set of filters for a query. To do this, add the custom set of filters for your query per the instructions above and then click the "Generate URL" button near the top right corner of the screen. A pop-up box will appear with a highlighted URL address. Once you copy the highlighted text, you may paste the URL address into an email or document using conventional means. Please note that whoever receives the URL address will need to run the query after clicking on the link to see the survey locations, results, and raw count statistics for the set of filters of interest.

Viewing Maps (Map Tab)

What is displayed?

By default, the map tab is the initial start-up page. After clicking the "Run Query" button, the ADC will display a map of all survey locations corresponding to your set of filters (surveyed sampling units are represented by blue semi-transparent circles) using Google Maps. If you have filtered by species, blue circles represent survey locations where that species was not detected and blue circles with a pink dot in the center represent survey locations where that species was detected. To see the specific name of a survey location, hover the mouse arrow over the blue circle. After a moment the name of the surveyed sampling unit will appear. You may view the bird detection information for a sampling unit and the survey dates by left clicking your mouse on the blue circle.

By default, the zoom capability of the maps page is restricted to protect the privacy of private landowners. Funding and/or implementation partners wishing for more precise location information to be displayed should request a password from Bird Conservancy IT staff via email. Once a user has a password, click on the "View Options" button at the top of the screen, enter the password in the "Password for Bird Conservancy staff and partners" field, and click "Save". If you have run a query prior to entering the password, you will need to click the "Run Query" button again in order to utilize the enhanced zooming features now available to you.

Adding map layers

You may add the following layers to the map: Bird Conservation Region boundaries, BIA boundaries, DoD boundaries, NPS boundaries, USFS boundaries and BLM Field Office boundaries. To do this, left click on the drop down menu at the top left corner of the map, select the desired layer, and click the "add layer" button. It is possible to add multiple layers to the map by repeating this process. The top-most feature's name will appear if you left click your mouse inside the layer's boundaries.

Viewing Occupancy/Density Results (Occupancy and Density Tabs)

Viewing Tables

You may view an occupancy or density results table and a chart for all appropriate strata (based on the set of filters), for which we have results, by clicking on the tabs labeled "Occupancy" or "Density". These tabs are located just below the drop down filter menu in the upper left corner of the screen. The occupancy tables display species, stratum, year, Psi (proportion of sampling units expected to be occupied), number of sampling units the species was detected on and standard error (SE) of the estimate and the percent coefficient of variation (% CV). The density tables will display species, stratum or habitat type, year, number of birds expected per km^2 (D), total number of individuals expected to reside within the stratum (N), percent coefficient of variation (% CV) and the number of independent detections used in analyses (*n*). You may view a description of the column headings by moving the mouse arrow over the column heading. You may also sort the table by clicking on any of the column headings.

Viewing the Charts

When viewing the occupancy and density charts, the point estimate of Psi or D is indicated with a dot. Additionally, short horizontal dashes above and below the point estimate represent values one standard error away from the point estimate. To view the species, stratum and year that correspond to an estimate on the chart, simply move your mouse arrow over the point estimate or standard error bar. A message will pop up with the appropriate information. If you have queried out multiple years of data, the point estimates for each year will be connected with a solid line. You may remove an individual estimate from the chart by clicking on the corresponding row of the table on the left side of the screen. Estimates that are not displayed on the chart will turn a peach color in the table. You may add the estimate back onto the chart by clicking on the peach colored row in the table.

How to interpret the estimates

The Integrated Monitoring in Bird Conservation Regions Program annually collects breeding bird information in all or portions of 13 states. Each year, we calculate occupancy and density estimates at a variety of spatial scales. This information can be used in the following ways to inform avian conservation:

1. **Bird population estimates can be compared in space and time.** For example, stratum-level estimates can be compared to state and regional estimates to determine whether local populations are above or below estimates for the region;

2. **Population estimates can inform management decisions on where to focus conservation efforts.** For example, strata with large populations can be targeted for protection and strata

with low populations can be prioritized for conservation action; a threshold could be set to trigger a management action when populations reach a predetermined level;

3. **Treatment area population estimates can be compared to regional estimates to evaluate effectiveness of management actions.** For example, if sagebrush areas are being treated to improve habitat for Greater Sage-grouse (GRSG) and estimates for sagebrush-obligate birds increase in these areas in relation to regional estimates where treatment is not occurring, the results would suggest that the GRSG management actions are also beneficial to other sagebrush-obligate bird species;

4. **Annual density and occupancy estimates can be compared over time to determine if population changes are a result of population growth or decline and/or range expansion or contraction**. For example, if population densities of a species declined over time, but the occupancy rates remained constant, then the population change was due to declines in local abundance. In contrast, if both density and occupancy rates of a species declined, then population change was due to range contraction;

5. **Occupancy rates can be multiplied by the land area in a region of interest to estimate the area occupied by a species.** For example, if a stratum comprises 120,000 km² and the occupancy estimate for Western Meadowlark is 0.57, managers can estimate that 68,400 km² (120,000 km² * 0.57) of habitat within that stratum is occupied by Western Meadowlarks.

Knowing which species have estimates

To restrict the species filter to display only those species for which occupancy and/or density estimates have been produced, click on the “View Options” button on the very top of the screen and then check the box next to “Only show species for which occupancy/density results are available”. This will prevent you from querying out numerous species for which occupancy or density estimates are not available.

Saving results of your query

You may easily save the results of your query by clicking the “Copy to clipboard” button and pasting the results into another program such as excel or by clicking the “Save to CSV” button. Similarly, to save a chart click on the “View Image” button below the chart, right click on anywhere on the image and select “Copy image” or “Save image as”.

Functionality

Please keep in mind that queries with very generic filters will result in long wait times and may not function optimally (your browser may end up crashing). For instance, if a user selects only the IMBCR filter, occupancy results will be displayed for every species and strata/superstrata combination for which there are occupancy and/or density results. If your query is not specific enough, the chart on the right side of the screen will not be displayed or a pop-up box will appear asking if you would like to continue. This pop-up box is designed to prevent your web browser from crashing while the ADC attempts to create a chart that would be extremely difficult to interpret. We recommend that you cancel the proposed query and add additional filters to make your query less generic.

What is available?

Currently, occupancy results for 2010 through 2018 and density results for 2008 through 2018 are available via the ADC.

Viewing Raw Count Statistics (Species Counts Tab)

You may view the raw count of detections for each species and the effort (expressed as the number of point count stations surveyed) for your query by clicking on the “Species Counts” tab located just below the drop down filter menu in the upper left corner of the screen. Both the counts (left table) and effort tables (right table) may be sorted by clicking on the row header. Additionally, you may view the counts and effort by BCR, State, County, Stratum, or Management Entity by clicking on the “Count by” drop down menu located above the counts table. If you have filtered using “Superstrata”, viewing counts by Stratum is an excellent way of getting a list of all the strata that comprise a Superstratum. If you would prefer to view effort expressed as the number of sampling units surveyed, click on the “View Options” button located at the top of the screen and check the box labeled “Show effort by number of sampling units instead of by point”.

Appendix B: IMBCR Program and Stratification History

In 1995, Bird Conservancy of the Rockies (Bird Conservancy; formerly Rocky Mountain Bird Observatory), in partnership with Colorado Parks and Wildlife (CPW; formerly Colorado Division of Wildlife), the United States Forest Service (USFS), the Bureau of Land Management (BLM) and the National Park Service (NPS), began efforts to create and conduct a Colorado-wide program to monitor breeding bird populations. This was the first attempt in the nation to develop and implement a statewide landbird monitoring program. After a successful pilot year in 1998, Bird Conservancy implemented the protocol in 13 habitats in Colorado in 1999. Bird Conservancy and its partners used this methodology for 10 years and expanded the effort to include parts of Arizona, New Mexico, North Dakota, South Dakota, Utah, and Wyoming.

In 2007, the NABCI Monitoring Subcommittee published "Opportunities for Improving Avian Monitoring" (NABCI Monitoring Subcommittee, 2007) which offered recommendations for improving the efficiency and effectiveness of avian monitoring in North America. After taking NABCI's recommendations into consideration, IMBCR partners developed a new study design and protocol for statewide bird monitoring in Colorado. The new study design used BCRs as the sampling frame and further stratified by land ownership within each BCR.

2008: IMBCR partners stratified and surveyed the Southern Rockies/Colorado Plateau BCR (BCR 16) and the Shortgrass Prairie BCR (BCR 18) portions of Colorado, as well as the BCR 16 portion of Wyoming. Furthermore, in Colorado BCR 16, we used cell weighting to target high order rivers and streams (based on Strahler stream order) and higher elevation habitats (e.g. alpine tundra), which occur in a small proportion of the landscape (Blakesley & Hanni, 2009).

2009: After the 2008 season, IMBCR partners determined the cell weighting had caused middle-elevations in Colorado to be under-sampled. To correct this, all strata in the Colorado and Wyoming portions of BCR 16 were restratified without cell weighting. Additionally, the All Other Lands stratum in Wyoming BCR 16 was split into two strata: All Other Lands and BLM Lands.

Based on the overall success of the pilot implementation, IMBCR expanded to include the Colorado and Wyoming portions of the Northern Rockies (BCR 10); the Great Basin (BCR 9) and BCR 18 portions of Wyoming; all of the Badlands and Prairies (BCR 17); the USFS National Forests and Grasslands within BCR 18; and Coconino and Prescott National Forests in the Sierra Madre Occidental (BCR 34).

2010: The program expanded to include the BCR 10 and the Prairie Potholes BCR (BCR 11) portions of Montana, three national forests in the Idaho portion of BCR 10 and Kaibab National Forest in BCRs 16 and 34. Additionally, there were several restratifications done in Colorado BCRs 10 and 16 between 2009 and 2010. The Colorado BCR 10 stratum was restratified to include the small easternmost portion of BCR 10 that dips into Colorado so all Colorado BCR 10 lands are represented. The "NPS Rocky Mountain Inventory and Monitoring Network (RMNW)" and "Northern Colorado Plateau Inventory and Monitoring Network (NCPN)" were restratified because some NCPN park units were initially misclassified into the RMNW stratum. In Wyoming, the USFS Region 4 stratum was restratified into three separate strata: "Bridger-Teton National Forest front-country/managed areas", "Bridger-Teton National Forest designated roadless/wilderness areas" and "the remainder of USFS Region 4 lands in Wyoming BCR 10". This restratification was done to allow for density and occupancy estimation specifically for the Bridger-Teton National Forest.

2011: The geographic extent of the IMBCR program expanded to the Nebraska portion of the Central Mixed Grass Prairie (BCR 19) and included all of the national forests and grasslands in Nebraska. Additionally, there were several restratifications done in Colorado. The Colorado BCR 10 stratum was split into two strata: BLM Lands and All Other Lands. This was done to facilitate improved tracking of priority species on BLM lands throughout Colorado. Rio Grande National Forest and White River National Forest strata were each split into three strata: low, medium, and high elevations. This stratification by elevation allowed sampling intensity changes to target Management Indicator Species on the forests. The Routt National Forest and Arapaho and Roosevelt National Forests strata were reorganized and a third stratum, the Williams Fork Area, was created from the two because it had mixed administration between the Routt National Forest and the Arapahoe and Roosevelt National Forests. The RMNW stratum was restratified to accurately reflect land ownership. There was a land acquisition within Great Sand Dunes National Monument and some samples were removed from Rio Grande National Forest and added to the RMNW stratum; 16 km^2 were added to the area of the RMNW strata. In South Dakota, the Black Hills National Forest stratum was split into two strata based on watersheds in the Forest: Hydrologic Code 7 Watersheds and all other watersheds. Stratification by watershed allows for adjusting sampling intensity to target Management Indicator Species on the Forest.

2012: In 2012, we added four strata in Idaho to account for all of BCR10 within the state. We took into account the boundary between USFS Regions 1 and 4, which runs through Idaho, when stratifying so estimates could be generated at the USFS Region level. The new strata include “All Other Lands in the Region 1 portion of Idaho BCR 10” (all lands outside of national forest boundaries), “All Other Lands in the Region 4 portion of Idaho BCR 10” (all lands outside of national forest boundaries), “other USFS lands in the Region 1 portion of Idaho BCR 10” and “USFS designated roadless/wilderness areas within the Region 4 portion of Idaho BCR 10”. In Arizona, Tonto National Forest became a part of the IMBCR survey effort. The forest was stratified into two strata based on elevation to allow sampling intensity changes to target Management Indicator Species on the Forests. Kaibab National Forest was restratified into two strata based on elevation for the same reason. In Montana, several strata were restratified and combined within BCR 17. The three “All Other Lands” strata were combined with the “Tribal Lands” stratum into one “All Other Lands” stratum. The four BLM strata within Montana BCR 17 were combined into one BLM stratum. These strata were collapsed into larger strata to maximize the number of samples conducted within two strata rather than spread them out amongst eight strata.

2013: 2013 brought significant changes to the program’s overall stratification methods. The original IMBCR sampling grids were created at the state scale and as the program expanded, additional sampling grids were created at the BCR scale. In response to a rapidly growing monitoring program, the partnership acknowledged the need for a standard national grid system to promote the coordination and application of monitoring data in conservation. The group proposed the use of the United States National Grid (USNG), a national grid system created by the Federal Geographic Data Committee, as its standard. There are three advantages to using the USNG. First, the use of standard grids allows for the integration of datasets and subsequent identification of areas where sampling should or has not occurred. Second, it provides a means to identify sampled areas in a consistent manner so results of monitoring projects can be evaluated in a spatially comparable way. Lastly, it facilitates regional and national-level avian distribution modeling and the development of broad-scale avian distribution maps. This standard was approved by the NABCI committee. Bird Conservancy started using the USNG for new stratification and restratification schemes in 2013.

We added several USFS strata to the sampling frame for the 2013 field season – Coronado National Forest in southern Arizona, Carson National Forest in north-central New Mexico, and Caribou-Targhee National Forest in southeastern Idaho. Coronado and Carson National Forests were stratified into two

strata based on elevation to allow for adjusting sampling intensity to target Management Indicator Species on the Forests. Because Caribou-Targhee National Forest spans three states and three BCRs, it was necessary to divide the forest into four strata. The state and BCR-level stratification distinctions allowed the summation of the data for individual states or BCRs. The four new strata in Idaho and Utah join a preexisting Caribou-Targhee stratum in west-central Wyoming as a part of Wyoming's statewide effort. In addition, Pawnee National Grassland was split into two strata – public lands and private lands – since Pawnee National Grassland contains a large amount of private land within its administrative boundary. This allowed the USFS to concentrate more survey effort specifically on public lands. In Wyoming, the preexisting stratum in BCR 10 containing all USFS Region 4 lands (other than Bridger-Teton National Forest) was restratified into three separate strata, one for each Forest (Caribou-Targhee, Ashley, and Wasatch). This allows for forest-wide estimates within Caribou-Targhee National Forest. If, in the future, Ashley and Wasatch National Forests are completely sampled, this will also allow for forest-wide estimates in each of those forests.

The North Dakota, South Dakota, and Nebraska portions of BCR 17 underwent a complete restratification to incorporate several NPS Northern Great Plains Inventory and Monitoring Network (NGPN) strata. All of the non-NPS strata in these states were retained, but renamed to avoid confusion. The NPS strata were stratified by NPS unit to allow the NGPN to monitor birds on each of its units separately. New strata included Knife River Indian Villages National Historic Site, Theodore Roosevelt National Park, Badlands National Park, Jewel Cave National Monument, Mount Rushmore National Monument, and Wind Cave National Park.

Nebraska BCR 18 also underwent a complete restratification to allow for the individual stratification of Agate Fossil Beds and Scotts Bluff National Monuments. We also added an additional stratum for Cherry Ranch, a property owned by The Nature Conservancy (TNC).

2014: In Colorado, the Arapaho and Roosevelt and the Pike and San Isabel National Forests were restratified to allow these forests to monitor treatments intended to mitigate fire hazard and improve forest health. We divided each forest into two strata: a control stratum and the remainder of the forest. The control portion of the Arapaho and Roosevelt National Forests consists of lands ranging in elevation from 6,000 ft. (1,829 m) to 9,000 ft. (2,743 m) and excludes treatment areas and areas burned between 1998 and 2013. The Pike and San Isabel control stratum ranges from 6,000 ft. (1,829 m) to 9,500 ft. (2,896 m) and excludes treatment areas and areas burned between 1998 and 2013. We created a single experiment overlay stratum for all of Arapaho and Roosevelt and Pike and San Isabel National Forests consisting of actual treatment areas (areas with >30% treatment). Since this stratum spans multiple forests, it is not considered to be a part of the IMBCR design; however, detections from this stratum do contribute to the number of detections used in analyses.

Significant stratification changes were made to the BCR 10 portion of Idaho. The four strata defined in the 2012 field season were further subdivided into nine strata. The boundary between USFS Regions 1 and 4 runs through Idaho and was taken into account when restratifying so that estimates could be generated at the USFS Region level. The new strata created in Idaho BCR 10 include the "Idaho portion of Bitterroot National Forest", "BLM Lands within Idaho BCR10", "Boise National Forest", "the Idaho portion of Kootenai National Forest", "Payette National Forest", "Salmon-Challis National Forest", "Sawtooth National Forest", "All other Lands within Idaho BCR 10 and USFS Region 1" (all lands outside of national forest and BLM boundaries) and "All Other Lands within Idaho BCR 10 and USFS Region 4" (all lands outside of national forest and BLM boundaries). Since Bitterroot and Kootenai National Forests span Idaho and Montana, 2014 density and occupancy estimates for those forests included strata from

both states. In the past, "forest-wide" estimates have only represented the Montana portion of these forests.

We subdivided the US Fish and Wildlife Service (USFWS) strata in Montana BCRs 11 and 17 to allow density and occupancy estimation specifically within the Charles M. Russell National Wildlife Refuge. Previously, we grouped all USFWS lands together in these BCRs, limiting estimates for individual refuges. In each BCR, we created two new strata – a Charles M. Russel NWR stratum and an "All Other USFWS Lands" stratum.

In addition to restratification, we added a few new strata to the IMBCR program in 2014. In Nebraska, NGPN began monitoring on the Niobrara National Scenic River spanning BCRs 17 and 19. In Utah, we created a new stratum for Manti-La Sal National Forest. Previously, only the Colorado portion of Manti-La Sal was stratified and surveyed. The additional Utah portion allows for the generation of forest-wide estimates for Manti-La Sal.

2015: In 2015, the Department of Defense (DoD) stratum in Colorado BCR 18 was completely restratified as part of a DoD Legacy Resource Management Program Grant to represent six individual military installations: US Air Force Academy, Fort Carson, Pueblo Chemical Depot, Piñon Canyon, and All Other DoD Lands. This DoD installation-level stratification allows for the generation of density and occupancy estimates for each installation. Fort Carson and Piñon Canyon were further stratified by areas within range fans (training zones) and areas outside of range fans to allow the DoD to assess the effects of military training on bird species.

The Rocky Mountain Arsenal National Wildlife Refuge stratum also came out of the 2015 restratification. During WWII, the Rocky Mountain Arsenal, as it was originally known, was a chemical weapons manufacturing facility. At the time of the 2008 IMBCR stratification in the state Colorado, it was still partially owned by the US Army and was included in the DoD stratum. The refuge is now in its own individual stratum.

The IMBCR program expanded to include the Missouri National Recreational River (MNRR), part of the NPS NGPN in Nebraska and South Dakota. There are two strata for MNRR representing the 39 Mile District and the 59 Mile District. In Utah, an additional stratum was added for Sanpitch Recreation Area. This area is part of Uinta National Forest but administered by Manti-La Sal National Forest and will be incorporated into forest-wide estimates for Manti-La Sal National.

2016: In 2016, the Playa Lakes Joint Venture (PLJV) coordinated a partnership between several state wildlife agencies and Bird Conservancy to expand sampling in five of the joint venture's six states: Nebraska, Kansas, New Mexico, Oklahoma, and Texas. PLJV's sixth state, Colorado, was already included in the IMBCR program starting in 2008. This expansion now provides the program with nearly complete coverage of two BCRs that were only sparsely covered in past years: Shortgrass Prairie (BCR 18) and Central Mixed Grass Prairie (BCR 19). The BCR 18 and 19 portions of these 5 states were divided into several strata, including, playas, rivers, biologically unique landscapes in Nebraska, and all other lands.

The IMBCR program also underwent a major expansion into the state of Utah in 2016. The entire state was stratified into BLM, USFS, DoD, and All Other Lands strata. This year was somewhat of a pilot year, with select BLM, USFS, DoD, and all other lands strata sampled across the state. In future years, sampling will be increased to a statewide level.

In addition to new strata, some existing strata were restratified for a variety of reasons. In North and South Dakota, we restratified the Tribal and All Other Lands strata to ensure all tribal lands were only

included in the tribal lands strata. In the past, some tribal lands could still be found within the All Other Lands strata. We also restratified Cimarron, Kiowa, and Rita Blanca National Grasslands in Kansas, Oklahoma, New Mexico, and Texas. With the expansion of IMBCR throughout the PLJV region, these strata needed to be fit to the US National Grid to make them consistent with the rest of the IMBCR program in the region. In addition, we determined that the portion of Rita Blanca National Grassland that fell in New Mexico was actually managed by Kiowa National Grassland, so that portion was moved to the Kiowa National Grasslands stratum. All DoD lands in Colorado BCR18 were combined into one stratum. This was the same stratification used prior to 2015.

2017: In 2017, the IMBCR program expanded to include Humboldt-Toiyabe National Forest in two new states, Nevada and California. This, coupled with an expansion into national forests in Idaho BCR 9 and Utah yielded complete coverage of USFS lands at the regional level for USFS Region 4. Idaho also experienced a significant expansion with statewide coverage of BLM lands. In a concerted effort from several implementation partners, Utah sampling included statewide coverage, including several new BLM Field Offices, All Other Lands in BCR 10, and remaining Region 4 National Forests We also obtained complete coverage of BCR 18 for the first time by expanding into the BCR 18 portion of South Dakota.

USFWS strata in Montana BCR 11 and BCR 17 were re-combined in 2017 and reverted back to their pre-2014 areas. In Idaho, BLM Four Rivers Field Office in BCR 9 was split into two strata, incorporating the boundaries of Morley Nelson Snake River Birds of Prey National Conservation Area into the design. Additionally, we resampled All Other Lands in Nebraska BCR 17 to include eastern areas not included in the sampling frame from 2013-2016.

2018: In 2018, several Montana strata were combined to help produce statewide estimates. In BCR 10, the All Other Lands, Fish and Wildlife Service, National Park Service, Rivers, Blackfeet and Crow Reservations, and Flathead Reservation strata were combined into a single All Other Lands Stratum. In Montana BCR 11, we collapsed the Fish and Wildlife Service and Tribal Lands strata into a single Fish and Wildlife Service and Tribal Lands stratum. Two strata in Montana BCR 17, Fish and Wildlife Service and Rivers, were combined into a single Fish and Wildlife Service and Rivers stratum.

Additionally, Agate Fossil Beds National Monument and Scotts Bluff National Monument in Nebraska BCR 18 were combined into a single National Park Service Lands Stratum. In South Dakota BCR 17, the Badlands National Park - South Unit and Tribal Lands strata were combined into a single, new Tribal stratum, and Jewel Cave National Monument and Mount Rushmore were also collapsed into one National Park Service lands stratum.

Finally, Department of Defense strata in Utah were completely restratified to better assess the effects of military training on bird species.

Appendix C: Protocol Changes Over Time

The original protocol implemented in 2008 has changed and evolved over time to better facilitate analysis and meet partner needs. In 2009, observers began recording the primary habitat type at each sample point from a list of habitat options. We added categorical habitat options to facilitate data proofing, to incorporate habitat in analysis and to link the IMBCR data and results with the older habitat-based monitoring program. Observers also began recording the presence of water and snow within 50 m of each point as a type of ground cover.

Beginning in 2010, the point count duration was increased from five minutes to six minutes to facilitate occupancy estimation, which is easier to analyze using equal time intervals (in this case, two minutes each). Observers began recording juvenile birds detected during point counts. Observers placed a "J" in the sex column for these detections. Previously, juvenile birds were not recorded because this study focuses on recording breeding birds. Juvenile bird detections are used for distribution mapping purposes only and are not factored into data analysis. A minute column was added to the bird datasheet so observers could record the actual minute of each bird detection during a point count. Previously, observers used tick marks to separate minute intervals. We added a "visual" checkbox to the bird datasheet for observers to check if they visually observed and identified any of the species recorded. This reminds observers that they need to look for birds in addition to listening for them and helps crew leaders make decisions regarding unusual or rare bird detections while proofing data. We provided observers with an additional datasheet to record the reasons points were not surveyed (e.g., weather issues, unsafe terrain, denied permission by landowner, etc.). This sheet also provided space to record additional landowner information as needed. Lastly, observers began recording horizontal distance to each flyover detection. In the past, we did not record distances because we do not use flyover detections in analysis. However, observers sometimes incorrectly distinguish flyovers from birds using the surrounding habitat while foraging on the wing (e.g., swallows, swifts, and raptors). Therefore, if we find an incorrectly recorded flyover, we can still use the detection data in analysis.

In 2012, observers began recording the start time for every point count conducted so we could use temporal information as a variable in analyses. Start times for the entire transect and for individual points were all recorded in Mountain Daylight Time for consistency across the region. Prior to 2012, observers were allowed to conduct point counts until 11:00 AM local time each day. In order to account for variability across study areas from Arizona to Montana, crew leaders instructed observers to survey no later than five hours after sunrise in 2012. Observers also began noting migrant detections on surveys. After the field season, we thoroughly review the migrant records; if those records are verified, they are not included in analysis. Previously, crew leaders instructed observers to record a bird as a male if 1) it was a singing warbler or sparrow, or 2) it was singing repeatedly and emphatically. In 2012, we instructed observers to only identify the sex of a visually observed bird of a sexually dimorphic species. We instructed observers to record subspecies only if they visually identified a bird as such. In the past, we used geographic range to assume a bird was of a particular subspecies. Up until the 2012 field season, we provided observers with a list of rare or difficult to detect species to record while traveling between points within a sampling unit. In 2012, in order to simplify the protocol and collect more useful information, we eliminated the list and observers recorded any species they came across while traveling between points they had not documented during a point count. That way all species encountered within the sampling unit would be documented for distribution mapping purposes.

Also in 2012, several changes were made to the vegetation datasheet. First, we removed distance to the nearest road, forest structural stage and human structures from the data sheet. We no longer collect these types of data in the field because they can be obtained through remote sensing. Second, we

modified the datasheet to simply record whether a mid-story was present. In the past, if mid-story vegetation was present, observers would record the species found in that layer. Data analysis found mid-story vegetation data to be extremely variable from year to year. Third, we added a ground cover category for residual grass. Finally, we limited acceptable overstory, understory, and ground cover relative abundance values to 1%, 5%, or increments of 10%. In the past, observers estimated cover to the nearest percent for all categories where percent cover or relative abundance was recorded. We made the change to improve the consistency of cover and relative abundance estimates and to decrease the amount of time observers spend estimating these values.

In 2012, crew leaders provided observers with two additional data sheets to facilitate working on private lands. The first contained specific information about the land ownership of each point located within a given sampling unit. In cases where a point fell on private property, the data sheet contained the name, contact information and any pertinent notes about the landowner. The second data sheet was a contact log where observers recorded all contacts or attempted contacts they had with landowners. This information was later entered into the landowner database when the observer had internet access.

In 2015, we began recording American pika, similarly to the way we record Abert's and American red squirrels. In 2017, we added a checkbox onto the vegetation data sheet to mark the presence/absence of invasive cheatgrass.

In 2018, we made one change to the ground cover section of the vegetation protocol to collect more specific data on ground cover types. We split the bare/litter ground cover category into bare ground and litter cover so that future analyses could treat these categories separately.

Appendix D: Data Analysis

Distance Analysis

Density and Abundance Estimation

State process

We developed a zero-inflated N-mixture model (Royle 2004, Sillett et al. 2011) to estimate density and abundance for all strata and superstrata across all species with sufficient data. For a given species, the true occupancy state of point count location *k* in grid *j*, stratum *i*, and year *t* is distributed

$$z_{ijkt} \sim Bern(\psi_i).$$

The number of independent clusters of individuals, *N*, of a given species at point count location *k* in grid *j*, stratum *i*, and year *t* came from a Poisson distribution

$$N_{ijkt} \sim Poisson(\lambda_{ijt} \times z_{ijkt})$$

with mean λ_{ijt}. Abundances at all points within a grid came from a distribution with the same mean to account for the lack of independence between points, and we modeled λ as a function of time to estimate trend for each stratum:

$$\log(\lambda_{ijt}) = \alpha_i + r_i(t-1) + \varepsilon_j,$$

where α and r are stratum-specific intercepts and trends, respectively, and ε is a grid-specific random effect.

To avoid predicting species occurrence outside of observed ranges, we fixed ψ to 0 for all strata in which the species was never observed and used a prior informed by the observed proportion of grid-year combinations in a stratum in which the species was detected

$$logit(\psi_i) \sim Normal(\mu_{\psi_i}, \sigma_\psi^2),$$

where μ_{ψ_i} is the stratum-specific naïve occupancy and σ_ψ^2 is the annual variation in occupancy probabilities shared across strata. All other parameters had vague priors:

$$\boldsymbol{\alpha} \sim Normal(0,4),$$

$$\exp(\boldsymbol{r}) \sim Uniform(0.25,1.75),$$

$$\boldsymbol{\varepsilon} \sim Normal(0, \sigma_\varepsilon^2),$$

and

$$\sigma_\varepsilon^2 \sim Uniform(0,5).$$

We derived density, *D*, at the point count location as

$$D_{ijkt} = \frac{N_{ijkt} \times s}{A_c},$$

where A_c is the area of the point count circle (see *Observation process* section below) and *s* is the cluster size, which was sampled from the distribution

$$s \sim Gamma(k, \theta) + 1,$$

where *k* and θ were derived from the mean and variance of observed cluster sizes. We subtracted 1 from the mean when calculating *k* and θ and added 1 to the random variable to ensure cluster sizes were $\geq$ 1. We derived stratum-level density estimates by averaging all point-level density estimates within each stratum, and we took the area-weighted average of strata estimates to obtain superstrata estimates.

Observation process

We estimated the probability of detecting an independent cluster of individuals by fitting distance functions to the distance data collected during surveys (Buckland et al. 2001). We fit four detection models including: 1) half-normal constant (HN(.)), 2) hazard rate constant (Haz(.)), 3) half-normal year (HN(t)), and 4) hazard rate year (Haz(t)).

We removed the furthest 10% of observed detection distances from the data set and binned the remaining detections into 10 evenly spaced distance classes. For half-normal functions, we calculated the detection probability, *p*, for each distance class, *l*, as:

$$p_l = \frac{2\pi \int_{c=b_l}^{c=b_{l+1}} \exp\left(-\left(\frac{c^2}{2\theta^2}\right)\right) c \, dc}{A_l},$$

where b_l and b_{l+1} are the cutpoints for *l*, θ is the half-normal shape parameter, and A_l is the area of *l*. Because of the lack of an analytical solution to the integral of the hazard rate function, we calculated *p* at the midpoint, *m*, of each distance class

$$p_l = 1 - \exp\left(-\left(\frac{m_l}{a}\right)^b\right).$$

To allow detection probabilities to vary by year, we sampled year-specific shape parameters from hyperdistributions:

$$\theta_t \sim Normal\left(\mu_\theta, \sigma_\theta^2\right),$$

$$a_t \sim Normal(\mu_a, \sigma_a^2),$$

and

$$b_t \sim Normal\left(\mu_b, \sigma_b^2\right),$$

with priors of

$$\mu_\theta \sim Unif(0{,}1000),$$

$$\mu_a \sim Unif(0,500),$$

$$\sigma_\theta, \sigma_a, \mu_b \sim Unif(0,100),$$

and

$$\sigma_b \sim Unif(0,25).$$

We then multiplied p_l by the proportional area of *l* to account for the probability that a cluster is within distance class *l* and obtain π_l, the probability a cluster is present within distance class *l* and is detected,

$$\pi_{lt} = \frac{p_{lt} A_l}{\sum_{l=1}^{L} A_l}.$$

We calculated the overall capture probability, p_{cap}, as

$$p_{cap} = \sum_{l=1}^{L} \pi_l,$$

and modeled the number of detections in each distance class at each point count location in year *t* as

$$\boldsymbol{y_{ijkt}} \sim Multinom\left(\boldsymbol{\pi}_t, N_{ijkt}\right).$$

Detection model selection

To find the most parsimonious detection function while minimizing computing time, we fit detection-only models to the distance data, using the four model structures described above. We used the Watanabe-Akaike Information Criterion (WAIC; Watanabe 2010, Hooten and Hobbs 2015) to select the most parsimonious detection structure and then used that structure for detection probabilities in the full model to estimate density and abundance.

Superstratum trends

We developed a post-hoc approach to estimate trends for superstrata. Using the rolled-up estimates of density for superstratum, *i*, we fit a general linear model (GLM) to the samples from each Bayesian iteration, *m*,

$$\log\left(\widehat{D}_{itm}\right) \sim \alpha_{im} + r_{im}(t-1).$$

Fitting a GLM across iterations allowed us to incorporate uncertainty in trends due to uncertainty around density estimates, but it did not account for temporal variation. To incorporate this second form of variation, we sampled a random intercept ($\tilde{\alpha}_{im}$) and slope ($\tilde{r}_{im}$) for each iteration using the mean and standard error estimated using the GLM and made inference on the distribution of the resampled values,

$$\tilde{\alpha}_{im} \sim Normal(\mu_{\alpha_{im}}, SE_{\alpha_{im}})$$

and

$$\tilde{r}_{im} \sim Normal(\mu_{r_{im}}, SE_{r_{im}}).$$

Occupancy Estimation

Occupancy estimation is most commonly used to quantify the proportion of sample units (i.e., 1 km² cells) occupied by an organism (MacKenzie et al., 2002). The application of occupancy modeling requires multiple surveys of the sample unit in space or time to estimate a detection probability (MacKenzie et al., 2006). The detection probability adjusts the proportion of sites occupied to account for species that were present but undetected (MacKenzie et al., 2002). We used a removal design (MacKenzie et al., 2006), to estimate a detection probability for each species, in which we binned minutes one and two, minutes three and four, and minutes five and six to meet the assumption of a monotonic decline in the detection rates through time. After the target species was detected at a point, we set all subsequent sampling intervals at that point to "missing data" (MacKenzie et al., 2006).

The 16 points in each sampling unit served as spatial replicates for estimating the proportion of points occupied within the sampled sampling units. We used a Bayesian, multi-scale occupancy model (Nichols et al. 2008, Mordecai et al. 2011, Green et al. 2019) to estimate 1) the probability of detecting a species given presence (p), 2) the proportion of points occupied by a species given presence within sampled sampling units (θ) and 3) the proportion of sampling units occupied by a species (ψ).

We truncated the data, using only detections <125 m from the sample points, except for species in Accipitriformes, Anseriformes, Falconiformes, Galliformes, Gruiformes, Pelecaniformes, Podicepidiformes, and Suliformes for which we used the maximum observed distance for each species. Truncating the data allowed us to use bird detections over a consistent plot size and ensured that the points were independent (points were spread 250 m apart), which in turn allowed us to estimate θ (the proportion of points occupied within each sampling unit) (Pavlacky Jr., Blakesley, White, Hanni, & Lukacs, 2012). The interpretation of θ for species for which we used maximum distances changes from occupancy to use because point count buffers overlap, but we chose this approach to provide estimates for a larger number of species.

We expected regional differences in the behavior, habitat use, and local abundance of species would correspond to regional variation in detection and the fraction of occupied points. Therefore, we estimated the proportion of sampling units occupied (ψ) for each stratum by estimating BCR by year specific estimates of detection (p) and point-level occupancy (θ). We fixed p and θ to 0 for BCRs in which a particular species was never detected. Otherwise these parameters came from hyperdistributions,

$$logit(p_{BCR,t}) \sim Normal(\mu_{p_{BCR}}, \sigma_p^2)$$

and

$$logit(\theta_{BCR,t}) \sim Normal(\mu_{\theta_{BCR}}, \sigma_\theta^2),$$

where μ_p and μ_θ are BCR-specific means for detection and point-level occupancy, respectively, and σ_p^2 and σ_θ^2 are the annual variances shared across BCRs.

We fixed ψ to 0 for all strata in which the species was never detected. Otherwise, the true occupancy state ($z_{i,t}$) of a 1-km² grid cell, j, in a given year, t, in stratum i was modeled as

$$z_{ijt} \sim Bernoulli(\psi_{it})$$

and

$$logit(\psi_{it}) \sim Normal(\mu_{\psi_i}, \sigma_{\psi}^2),$$

where μ_{ψ_i} is the stratum-specific mean occupancy rate on the logit scale and σ_{ψ}^2 is the annual variance shared across all strata. As with density, we took an area-weighted mean of stratum-level occupancy estimates (i.e., ψ) to estimate superstratum-level occupancy probabilities.

The true point-level occupancy state (u) was conditional on the grid-cell-level occupancy state (i.e., *z* = 1, occupied; *z* = 0, unoccupied), such that a point could only be occupied if the grid cell was occupied,

$$u_{ijkt} \sim Bernoulli(\theta_{BCR,t} \times z_{ijt}).$$

Finally, we modeled the observation process conditional on the point being occupied (i.e., *u* = 1) as

$$y_{ijkt} \sim Binomial(p_{BCR,t} \times u_{ijkt}, J_{ijkt}),$$

where y_{ijkt} are the observation data at point *k* in year *t* (*y* =1, observed; *y* = 0, not observed) and J_{ijkt} is the 2-minute interval in which the species was first detected (i.e., *J* = 1, 1-2 minutes, *J* = 2, 3-4 minutes, *J* =3, 5-6 minutes or not detected).

Our application of the multi-scale model was analogous to a within-season robust design (Pollock, 1982) where the two-minute intervals at each point were the secondary samples for estimating *p* and the points were the primary samples for estimating θ (Nichols et al., 2008; Pavlacky Jr. et al., 2012). We considered both *p* and θ to be nuisance variables that were important for generating unbiased estimates of ψ. θ can be considered an availability parameter or the probability a species was present and available for sampling at the points (Nichols et al., 2008; Pavlacky Jr. et al., 2012).

Automated Analysis

We updated our analytical methods and are used Bayesian hierarchical models specifically designed for analysis of IMBCR data. We performed all data and output manipulation in R (R Core Team, 2019) and model fitting in JAGS (Plummer 2003, 2017) using the R package jagsUI (Kellner 2018). The R code called the raw data from the IMBCR Structured Query Language (SQL) server database and reformatted the data into a form usable with the JAGS code. We allowed the input of all data collected in a manner consistent with the IMBCR design to increase the number of detections available for estimating global detection rates for population density and site occupancy. The R code provided an automated framework for combining strata-level estimates of population density and site occupancy at multiple spatial scales, as well as estimating the standard deviations and credible intervals for the combined estimates.

We fit initial models to all species with at least 30 detections for density estimation and 10 detections for occupancy estimation. For density estimation, we fit the full model after determining whether there were enough detections based on results from the detection-only model fits. In some cases for both density and occupancy estimation, it was necessary to use a less parsimonious detection structure or simplified model structure to facilitate model convergence. We currently maintain version control of the automated analysis code in the Bird Conservancy repository (Atlassian Stash, version 3.6.1).

Appendix E: Priority Species Designations by Partners in Flight

Priority species detected in Bird Conservation Regions (BCRs) surveyed in 2018, as designated by Partners in Flight. BCRs include BCR 9 (Great Basin), BCR 10 (Northern Rockies), BCR 11 (Prairie Potholes), BCR 15 (Sierra Nevada) and BCR 16 (Southern Rockies and Colorado Plateau). An "X" in the Occupancy or Density Estimated column indicates that occupancy or density estimates were generated for the priority species at some level in one or more of the BCRs where it holds a priority designation.

Species	Partners in Flight*					Occupancy Estimate	Density Estimate
	BCR 9	BCR 10	BCR 11	BCR 15	BCR 16		
American Dipper		UCS,RS				X	X
American Kestrel	UCS,RC,RS	RC				X	X
Baird's Sparrow			UCC,UCS,RC, RS,TNC			X	X
Band-tailed Pigeon				RC		X	X
Bank Swallow	CBSD	CBSD	RC,CBSD		CBSD	X	X
Barn Swallow	RC					X	X
Bell's Vireo					TNC,RC,UCC	X	X
Belted Kingfisher	RC,CBSD	CBSD	CBSD	CBSD	CBSD	X	X
Black Rosy-Finch	RC,TNC,UCC, UCS,RS	TNC,RS,UCS, UCC,RC			RC,UCC,TNC	X	X
Black-billed Cuckoo			CBSD,UCC,RC			X	X
Black-billed Magpie	UCS		UCS		UCS	X	X
Black-chinned Sparrow	CBSD,UCC				CBSD,UCC	X	X
Black-headed Grosbeak				UCS		X	X
Black-throated Gray Warbler					RC	X	X
Black-throated Sparrow	UCS					X	X

Species	Partners in Flight*					Occupancy Estimate	Density Estimate
	BCR 9	BCR 10	BCR 11	BCR 15	BCR 16		
Bobolink		UCC,CBSD	UCS,UCC,RS, CBSD,RC			X	X
Boreal Chickadee		CBSD				X	X
Brewer's Blackbird	UCS					X	X
Brewer's Sparrow	RC,UCS,RS, CBSD	CBSD,RC	CBSD	CBSD,RC	RC,CBSD	X	X
Broad-tailed Hummingbird					RS,UCS	X	X
Brown Creeper				RC,UCS,RS		X	X
Brown Thrasher			RC			X	X
Brown-capped Rosy-Finch					RS,RC,UCS, UCC,TNC	X	X
Bullock's Oriole				RC		X	X
Burrowing Owl			RC			X	X
California Quail	UCS					X	X
Calliope Hummingbird	RS,UCS	UCS,RS		UCS,RS		X	X
Cassin's Finch	RS,CBSD,UCS, UCC	CBSD,UCS,UCC,RC,RS		RC,CBSD,UCS, RS,UCC	CBSD,RC,UCC	X	X
Cassin's Vireo		RS,UCS		RS,UCS		X	X
Chestnut-collared Longspur			RC,UCS,UCC, TNC,RS			X	X
Chimney Swift			CBSD			X	X
Chipping Sparrow		UCS,RS,RC				X	X
Clark's Nutcracker		RS,UCS			RC,RS,UCS	X	X
Clay-colored Sparrow			RS,UCS			X	X
Common Nighthawk	CBSD	CBSD	CBSD	CBSD	RC,CBSD	X	X
Common Poorwill					RC	X	X
Cooper's Hawk					UCS,RS	X	X
Cordilleran Flycatcher					RS,UCS	X	X

Species	Partners in Flight*					Occupancy Estimate	Density Estimate
	BCR 9	BCR 10	BCR 11	BCR 15	BCR 16		
Dickcissel			RC			X	X
Dusky Flycatcher		UCS				X	X
Dusky Grouse	RS,RC,UCS	UCS,RS			RS,UCS	X	X
Eastern Kingbird			UCS			X	X
Eastern Meadowlark					CBSD	X	X
Evening Grosbeak		RC				X	X
Ferruginous Hawk	UCS,RS,RC	RC	UCS,RC,RS		RC	X	X
Field Sparrow			CBSD			X	X
Golden Eagle	UCS,RS,RC		RC		RC	X	X
Golden-crowned Kinglet		UCS		RC		X	X
Grace's Warbler					RS,UCS	X	X
Grasshopper Sparrow	CBSD	CBSD	RC,CBSD			X	X
Gray Flycatcher	RS,UCS					X	X
Gray Vireo	UCC				RS,UCC,RC, UCS	X	X
Greater Prairie-Chicken			UCC,RC,TNC			X	X
Greater Sage-Grouse	RC,TNC,UCC	UCC,RC,RS, UCS,TNC	UCC,RC,TNC		UCC,TNC,RC	X	X
Green-tailed Towhee	UCS,RS,RC				UCS,RS	X	X
Hammond's Flycatcher		UCS				X	X
Horned Lark	CBSD	CBSD	RC,CBSD	CBSD	CBSD	X	X
Hutton's Vireo				UCS,RS		X	
Juniper Titmouse					RS,UCS	X	X
Lark Bunting		CBSD	RC,CBSD			X	X
Lark Sparrow	RC					X	X
Lazuli Bunting	RS,UCS	UCS			RS,UCS,RC	X	X
Lewis's Woodpecker	UCS,RS,RC	RC		RC	RS,RC,UCS	X	X

Species	Partners in Flight*					Occupancy Estimate	Density Estimate
	BCR 9	BCR 10	BCR 11	BCR 15	BCR 16		
Loggerhead Shrike	CBSD	CBSD	CBSD		RC,CBSD	X	X
MacGillivray's Warbler	RC	UCS				X	X
Marsh Wren			UCS			X	X
McCown's Longspur		RC	UCS,RC,RS			X	X
Mountain Bluebird	UCS	UCS			RS,RC,UCS	X	X
Mountain Chickadee	RC	UCS		UCS,RS		X	X
Mountain Quail	RC			RS,UCS		X	X
Northern Flicker	CBSD,UCS	UCS,CBSD	CBSD	CBSD	UCS,RS,CBSD	X	X
Northern Goshawk	RC	RS,UCS				X	X
Northern Harrier	UCS,RS		RC,UCS,RS			X	X
Northern Pygmy-Owl				RS,UCS		X	X
Olive-sided Flycatcher	UCC,TNC,RC	UCC,TNC,RC		UCC,RC,TNC	RC,UCC,TNC	X	X
Pileated Woodpecker				RC		X	X
Pine Siskin	RC,CBSD	CBSD,UCS,RS	CBSD	CBSD	UCS,RS,CBSD	X	X
Pinyon Jay	TNC,RS,RC, UCS,UCC	UCC,TNC,RC		TNC,RC,UCC	UCS,RS,TNC, UCC,RC	X	X
Plumbeous Vireo					RS,UCS	X	X
Prairie Falcon	RS,UCS		RC		RC	X	X
Pygmy Nuthatch				RC	UCS,RS	X	X
Red-breasted Nuthatch		UCS				X	X
Red-headed Woodpecker			CBSD,RC,UCC			X	X
Red-naped Sapsucker		UCS,RS				X	X
Rock Wren	UCS,RS,CBSD	CBSD		CBSD	CBSD,RS,UCS	X	X
Ruby-crowned Kinglet		UCS				X	X
Ruffed Grouse	CBSD	RS,UCS,CBSD	CBSD			X	X
Rufous Hummingbird	UCC,CBSD	CBSD,UCC				X	X
Sage Thrasher	RC,RS,UCS					X	X

Species	Partners in Flight*					Occupancy Estimate	Density Estimate
	BCR 9	BCR 10	BCR 11	BCR 15	BCR 16		
Sagebrush Sparrow	RC,RS,UCS	RC			RC	X	X
Savannah Sparrow			UCS			X	X
Say's Phoebe					UCS	X	X
Sedge Wren			UCS			X	X
Sharp-tailed Grouse	RC	RC	UCS,RS			X	X
Short-eared Owl	RC,CBSD	CBSD,RC	RC,CBSD			X	X
Sprague's Pipit		UCC,TNC,RC	UCS,RS,UCC, TNC,RC			X	X
Steller's Jay				RS,UCS		X	X
Swainson's Hawk			RC,UCS,RS			X	X
Swainson's Thrush		UCS				X	X
Townsend's Solitaire		UCS,RS				X	X
Townsend's Warbler	RC	UCS,RS				X	X
Tree Swallow		UCS				X	X
Varied Thrush		RC				X	X
Vesper Sparrow		RC	UCS			X	X
Violet-green Swallow					UCS	X	X
Virginia's Warbler	UCC				UCS,UCC,RS	X	X
Warbling Vireo		UCS			UCS	X	X
Western Meadowlark	UCS		UCS			X	X
White-tailed Ptarmigan		RS,RC,UCS			RC	X	X
Williamson's Sapsucker	RC	RS,UCS			UCS,RS	X	X
Willow Flycatcher	RC	UCS,RS				X	X
Wilson's Warbler	CBSD	CBSD		CBSD	CBSD	X	X
Yellow-billed Cuckoo	RC,CBSD					X	X
Yellow-headed Blackbird	UCS		UCS			X	X

*CBSD = Common Bird in Steep Decline; RC = Regional Concern Species; RS = Regional Stewardship Species; TNC = Tri-National Concern Species; UCC = U.S. and Canada Concern Species; UCS = U.S. and Canada Stewardship Species (Partners in Flight, 2017).

Appendix D continued. Priority species detected in Bird Conservation Regions (BCRs) surveyed in 2018, as designated by Partners in Flight (PIF). BCRs include BCR 17 (Badlands and Prairies), BCR 18 (Shortgrass Prairie), BCR 19 (Central Mixed Grass Prairie), BCR 33 (Sonoran and Mojave Deserts), and BCR 34 (Sierra Madre Occidental). An "X" in the Occupancy or Density Estimated column indicates that occupancy or density estimates were generated for the priority species at some level in one or more of the BCRs where it holds a priority designation.

Species	Partners in Flight*				Occupancy Estimate	Density Estimate
	BCR 17	BCR 18	BCR 19	BCR 33		
Abert's Towhee				UCS,RS	X	X
American Dipper	RC				X	X
American Kestrel					X	X
Ash-throated Flycatcher				UCS	X	X
Baird's Sparrow	UCC,RC,TNC				X	X
Baltimore Oriole			RC,UCS,RS		X	X
Bank Swallow	CBSD	CBSD	CBSD		X	X
Bell's Vireo		UCC,TNC,RC	UCC,RC,TNC	TNC,UCC	X	X
Belted Kingfisher	CBSD	CBSD	CBSD		X	X
Black-billed Cuckoo	UCC,RC,CBSD		UCC,CBSD		X	X
Black-billed Magpie	RC				X	X
Black-chinned Sparrow				UCC,CBSD	X	X
Black-tailed Gnatcatcher				RS,UCS	X	X
Black-throated Gray Warbler					X	X
Black-throated Sparrow				RS,RC,UCS	X	X
Bobolink	UCC,CBSD		CBSD,UCC		X	X
Brewer's Sparrow	CBSD,RC	CBSD,RC		CBSD	X	X
Broad-tailed Hummingbird					X	X

Species	Partners in Flight*				Occupancy Estimate	Density Estimate
	BCR 17	BCR 18	BCR 19	BCR 33		
Brown Thrasher			RS,UCS		X	X
Bullock's Oriole		UCS	RC	RC	X	X
Burrowing Owl	RC	UCS,RS,RC	RC	UCS	X	X
Cactus Wren				RC,UCS,RS	X	X
Cassin's Sparrow		UCS,RC,RS	RC		X	X
Chestnut-collared Longspur	RS,RC,UCC, TNC,UCS	RC,UCC,TNC			X	X
Chihuahuan Raven		UCS,RS			X	X
Chimney Swift		CBSD	CBSD		X	X
Common Nighthawk	RC,CBSD	RC,CBSD	CBSD,UCS		X	X
Common Poorwill				UCS	X	X
Cooper's Hawk					X	X
Cordilleran Flycatcher					X	X
Costa's Hummingbird				UCS,RS	X	
Crissal Thrasher				RS,UCS	X	X
Dickcissel	RC		UCS,RC,RS		X	X
Eastern Kingbird	UCS		UCS		X	X
Eastern Meadowlark		CBSD	UCS,RC,RS, CBSD		X	X
Evening Grosbeak					X	X
Ferruginous Hawk	RS,UCS,RC	RS,UCS,RC	RC		X	X
Field Sparrow	CBSD		RC,CBSD		X	X
Gambel's Quail				UCS,RS	X	X
Golden Eagle	RC				X	X
Grace's Warbler					X	X
Grasshopper Sparrow	RS,RC,UCS,	RC,RS,UCS,	CBSD,RC,UCS,		X	X

Species	Partners in Flight*				Occupancy Estimate	Density Estimate
	BCR 17	BCR 18	BCR 19	BCR 33		
	CBSD	CBSD	RS			
Gray Vireo				UCC,RC	X	X
Greater Prairie-Chicken	TNC,UCC,RC	TNC,UCC,RC	TNC,UCC,UCS, RC,RS		X	X
Greater Sage-Grouse	RS,TNC,RC, UCS,UCC				X	X
Horned Lark	CBSD	RS,UCS,CBSD	CBSD	CBSD	X	X
Juniper Titmouse					X	X
Ladder-backed Woodpecker				RC	X	X
Lark Bunting	UCS,RS,CBSD, RC	UCS,CBSD,RC, RS	RC,CBSD		X	X
Lark Sparrow	RC	UCS	RC,UCS,RS		X	X
Lazuli Bunting	UCS,RS				X	X
Lesser Nighthawk				UCS,RS	X	X
Lesser Prairie-Chicken		RC,TNC,UCS, UCC,RS	UCC,RC,UCS, TNC,RS		X	X
Lewis's Woodpecker	RC	RC			X	X
Loggerhead Shrike	CBSD	CBSD	CBSD,RC	CBSD	X	X
Lucy's Warbler				RS,RC,UCS	X	X
McCown's Longspur	RC,UCS,RS	UCS,RS			X	X
Mississippi Kite			UCS,RS		X	X
Northern Bobwhite		CBSD	CBSD,UCS		X	X
Northern Flicker	CBSD	CBSD	CBSD	CBSD	X	X
Northern Goshawk	RC				X	X
Northern Harrier	RC,UCS,RS	RC	RC		X	X
Northern Rough-winged Swallow				RS,UCS	X	X

Species	Partners in Flight*				Occupancy Estimate	Density Estimate
	BCR 17	BCR 18	BCR 19	BCR 33		
Olive-sided Flycatcher					X	X
Pine Siskin	CBSD				X	X
Pinyon Jay	TNC,RC,UCC	TNC,RC,UCC			X	X
Plumbeous Vireo					X	X
Prairie Falcon		RC		RC	X	X
Pygmy Nuthatch					X	X
Red Crossbill	UCS				X	X
Red-headed Woodpecker	UCC,RC,CBSD	CBSD,UCC	UCS,CBSD,RS, UCC		X	X
Ring-necked Pheasant	UCS	UCS,RS			X	X
Rock Wren	CBSD	CBSD		CBSD,RS,UCS	X	X
Ruffed Grouse	CBSD				X	X
Sage Thrasher	RC				X	X
Sagebrush Sparrow	RC			RC	X	X
Say's Phoebe				RS,UCS	X	X
Scaled Quail		RC			X	X
Scissor-tailed Flycatcher			RC		X	X
Sharp-tailed Grouse	RS,UCS	RC			X	X
Short-eared Owl	RC,CBSD	CBSD			X	X
Sprague's Pipit	UCC,TNC,RC				X	X
Swainson's Hawk		UCS,RS	RC		X	X
Verdin			CBSD	CBSD,UCS,RC, RS	X	X
Vesper Sparrow	RS,RC,UCS				X	X
Violet-green Swallow					X	X
Virginia's Warbler	UCC			UCC	X	X

Species	Partners in Flight*				Occupancy Estimate	Density Estimate
	BCR 17	BCR 18	BCR 19	BCR 33		
Western Kingbird		UCS			X	X
Western Meadowlark	UCS	RS,RC,UCS	RC,RS,UCS		X	X
Wild Turkey			UCS		X	X
Williamson's Sapsucker					X	X
Willow Flycatcher				RC	X	X
Yellow-billed Cuckoo		RC,CBSD	RC,CBSD	CBSD	X	X

*CBSD = Common Bird in Steep Decline; RC = Regional Concern Species; RS = Regional Stewardship Species; TNC = Tri-National Concern Species; UCC = U.S and Canada Concern Species; UCS = U.S. and Canada Stewardship Species (Partners in Flight, 2017).

Appendix F: Priority Species Designations by State Agency

Priority species detected in 2018, by state, with management designations by state agencies. Agencies include Arizona Game and Fish Department (AZGF), Colorado Parks and Wildlife (CPW), Idaho Fish and Game Department (IDFG), Kansas Department of Wildlife, Parks and Tourism (KDWPT), Montana Fish, Wildlife and Parks (MTFWP), Nebraska Game and Parks Commission (NGPC), and New Mexico Department of Game and Fish (NMDGF). An "X" in the Occupancy or Density Estimated columns indicates estimates were generated for that species at some level in one or more of the states where it holds a priority designation.

Species	State Agencies*							Occupancy Estimate	Density Estimate
	AZGF	CPW	IDFG	KDWPT	MTFWP	NGPC	NMDGF		
Abert's Towhee	T1B						SGCN,ST	X	X
Acorn Woodpecker	T1C							X	X
American Avocet				T2		T2		X	X
American Bittern	T1B	T2	T2	T2	S3B		SGCN	X	X
American Pipit	T1C							X	X
American Three-toed Woodpecker	T1C							X	X
American White Pelican		T2	T2	T2	S3B			X	X
Arizona Woodpecker	T1B								
Baird's Sparrow	T1C			T2	S3B	T1	SGCN,ST	X	X
Bald Eagle	T1A	SSC,T2		T2		T2	SGCN,ST	X	X
Baltimore Oriole				T2				X	X
Band-tailed Pigeon	T1C	T2						X	X
Barn Owl				T2		T2			
Bell's Vireo	T1B			T2			SGCN,ST	X	X
Bendire's Thrasher	T1C						SGCN	X	
Black Rosy-Finch		T2	T21		S2			X	X
Black Swift		T2	T2		S1B		SGCN		
Black Tern		T2	T2	T2	S3B	T1		X	
Black-and-white Warbler						T2		X	X
Black-backed Woodpecker					S3			X	X
Black-billed Cuckoo				T2	S3B	T1		X	X
Black-billed Magpie	T1B					T1		X	X

Species	State Agencies*							Occupancy Estimate	Density Estimate
	AZGF	CPW	IDFG	KDWPT	MTFWP	NGPC	NMDGF		
Black-chinned Sparrow	T1C						SGCN	X	X
Black-tailed Gnatcatcher	T1C							X	X
Black-throated Gray Warbler	T1C						SGCN	X	X
Blue-gray Gnatcatcher					S2B			X	X
Bobolink		T2	T2	T2	S3B			X	X
Boreal Chickadee					S3			X	X
Boreal Owl		T2					SGCN,ST		
Botteri's Sparrow	T1B						SGCN	X	X
Brewer's Sparrow	T1C	T2			S3B	T1		X	X
Bridled Titmouse	T1C							X	X
Brown Creeper					S3	T2		X	X
Brown-capped Rosy-Finch		T1					SGCN	X	X
Brown-crested Flycatcher	T1C							X	X
Bullock's Oriole	T1C			T2		T3		X	X
Burrowing Owl	T1B	ST,T1	T2	T2	S3B	T1	SGCN	X	X
California Gull			T2					X	X
Canvasback				T2		T2			
Cassin's Finch		T2			S3		SGCN	X	X
Cassin's Kingbird						T2		X	X
Cassin's Sparrow	T1C	T2		T2		T2	SGCN	X	X
Chestnut-collared Longspur	T1C	T2		T2	S2B	T1	SGCN	X	X
Clark's Nutcracker			T21		S3		SGCN	X	X
Common Nighthawk	T1B		T21	T2			SGCN	X	X
Common Poorwill	T1C			T2				X	X
Cordilleran Flycatcher	T1C					T2		X	X
Costa's Hummingbird	T1C						SGCN,ST	X	
Curve-billed Thrasher				T2				X	X
Dark-eyed Junco						T2		X	X
Dickcissel				T2				X	X
Eastern Kingbird				T2				X	X

Species	State Agencies*							Occupancy Estimate	Density Estimate
	AZGF	CPW	IDFG	KDWPT	MTFWP	NGPC	NMDGF		
Eastern Meadowlark	T1C			T2		T2		X	X
Eastern Wood-Pewee				T2				X	X
Evening Grosbeak	T1B				S3		SGCN	X	X
Ferruginous Hawk	T1B	SSC,T2	T2	T2	S3B	T1		X	X
Forster's Tern				T2	S3B	T2			
Franklin's Gull			T21		S3B			X	X
Gila Woodpecker	T1B						SGCN,ST	X	X
Gilded Flicker	T1B								
Golden Eagle	T1B	T1	T2	T2	S3	T2		X	X
Grace's Warbler	T1C	T2					SGCN	X	X
Grasshopper Sparrow	T1B	T2	T21	T2			SGCN,SE	X	X
Gray Flycatcher	T1C							X	X
Gray Vireo	T1C	T2					SGCN,ST	X	X
Great Blue Heron					S3			X	X
Great Gray Owl			T21		S3				
Greater Prairie-Chicken		T2		T2		T2		X	X
Greater Sage-Grouse		SSC,T1	T1		S2			X	X
Green-tailed Towhee					S3B			X	X
Gunnison Sage-Grouse		SSC,T1							
Harris's Hawk	T1C								
Harris's Sparrow				T2					
Henslow's Sparrow				T2		T1			
Hooded Oriole	T1C							X	
Juniper Titmouse	T1C	T2					SGCN	X	X
Kentucky Warbler				T2		T2			
Lark Bunting		T2		T2				X	X
Lark Sparrow				T2				X	X
Lazuli Bunting	T1C	T2						X	X
Least Tern	T1A	SE,T2		SE,T1	S1B	T1	SGCN,SE	X	
Lesser Prairie-Chicken		ST,T1		T1			SGCN	X	X

Species	State Agencies*							Occupancy Estimate	Density Estimate
	AZGF	CPW	IDFG	KDWPT	MTFWP	NGPC	NMDGF		
Lesser Scaup						T2		X	X
Lewis's Woodpecker	T1C	T2	T2		S2B	T2	SGCN	X	X
Loggerhead Shrike		T2		T2	S3B	T1	SGCN	X	X
Long-billed Curlew		SSC,T2	T2	T2	S3B	T1	SGCN	X	X
Louisiana Waterthrush						T2			
Lucy's Warbler	T1C						SGCN	X	X
MacGillivray's Warbler	T1B							X	X
Marbled Godwit				T2				X	X
McCown's Longspur	T1C	T2		T2	S3B	T1	SGCN	X	X
Merlin						T2		X	
Mexican Jay	T1C								
Mississippi Kite	T1B			T2		T2		X	X
Montezuma Quail	T1C							X	X
Mountain Bluebird	T1C						SGCN	X	X
Mountain Plover	T1B	SSC,T1		T2	S2B	T1	SGCN	X	X
Mountain Quail			T2					X	X
Nelson's Sparrow					S3B				
Northern Bobwhite	T1A	T2		T2				X	X
Northern Goshawk	T1B	T2			S3			X	X
Northern Harrier		T2						X	X
Northern Pintail				T2		T2		X	X
Olive Warbler	T1C							X	X
Olive-sided Flycatcher	T1C	T2	T21				SGCN	X	X
Orange-crowned Warbler	T1C							X	X
Pacific Wren	T1B				S3			X	X
Painted Bunting				T2				X	X
Peregrine Falcon	T1A	SSC,T2		T2	S3	T2	SGCN,ST	X	X
Phainopepla	T1C							X	X
Pileated Woodpecker					S3	T2		X	X
Pine Siskin						T2		X	X

Species	State Agencies*							Occupancy Estimate	Density Estimate
	AZGF	CPW	IDFG	KDWPT	MTFWP	NGPC	NMDGF		
Pinyon Jay	T1B	T2	T2		S3	T1	SGCN	X	X
Piping Plover		ST,T2		ST,T1	S2B	T1			
Plumbeous Vireo						T2		X	X
Prairie Falcon	T1C	T2				T2		X	X
Purple Martin	T1B,T1C	T2						X	X
Pygmy Nuthatch						T2	SGCN	X	X
Red Crossbill	T1C							X	X
Red-faced Warbler	T1C						SGCN	X	X
Red-headed Woodpecker				T2	S3B		SGCN	X	X
Red-shouldered Hawk						T2			
Ruby-throated Hummingbird						T2			
Rufous Hummingbird		T2						X	X
Rufous-winged Sparrow	T1B							X	X
Sage Thrasher	T1C		T2		S3B			X	X
Sagebrush Sparrow	T1C	T2	T2		S3B		SGCN	X	X
Sandhill Crane		SSC,T1	T21			T2		X	X
Savannah Sparrow	T1B					T2		X	X
Scaled Quail	T1C			T2				X	X
Scissor-tailed Flycatcher				T2		T2		X	X
Scott's Oriole	T1C							X	X
Sedge Wren					S3B			X	X
Sharp-tailed Grouse		SSC,SE,T1	T2		S1,S4			X	X
Short-eared Owl		T2	T21	T2		T1		X	X
Snowy Egret	T1C								
Spotted Towhee				T2				X	X
Sprague's Pipit	T1A			T2	S3B	T1	SGCN	X	X
Summer Tanager	T1C					T2		X	X
Swainson's Hawk	T1C	T2		T2				X	X
Swamp Sparrow						T2			
Tufted Titmouse						T2			X

Species	State Agencies*							Occupancy Estimate	Density Estimate
	AZGF	CPW	IDFG	KDWPT	MTFWP	NGPC	NMDGF		
Upland Sandpiper		T2		T2				X	X
Varied Bunting	T1C						SGCN,ST	X	X
Varied Thrush					S3B			X	X
Veery		T2			S3B			X	X
Vermilion Flycatcher	T1C							X	X
Vesper Sparrow							SGCN	X	X
Violet-green Swallow						T2		X	X
Virginia Rail	T1C							X	
Virginia's Warbler	T1C	T2					SGCN	X	X
Western Bluebird							SGCN	X	X
Western Kingbird				T2				X	X
White-crowned Sparrow	T1C							X	X
White-faced Ibis		T2	T2		S3B			X	X
White-tailed Ptarmigan		T1			S3		SGCN,SE	X	X
White-throated Swift	T1C					T2		X	X
Wild Turkey	T1B						SGCN,ST	X	X
Williamson's Sapsucker	T1C						SGCN	X	X
Willow Flycatcher	T1A	SE,T1					SGCN,SE	X	X
Wilson's Phalarope				T2				X	X
Wood Thrush						T1		X	X
Woodhouse's Scrub-Jay	T1C							X	X
Yellow Warbler	T1B							X	X
Yellow-billed Cuckoo	T1A	SSC,T1	T1		S3B	T2	SGCN	X	X
Yellow-breasted Chat	T1C							X	X
Yellow-throated Vireo						T2		X	X

*__AZGF:__ T1A = scored 1 for vulnerability and meets one of the following criteria: federally listed species, candidate for federal listing species, species covered under a signed conservation agreement, species recently removed from listing, closed season species; T1B = scored 1 for vulnerability and does not meet any of the criteria for T1A; T1C = unknown status species (Arizona Game and Fish Department, 2012); **CPW:** T1 = species of highest conservation priority in the state; T2 = important in light of forestalling population trends or habitat conditions; SSC = State Special Concern; SE = State Endangered; ST = State Threatened (Colorado Parks and Wildlife, 2015); **IDFG:** T1 = Tier 1 priority species; T2 = Tier 2 priority species; T3 = Tier 3 priority species (J. Halka, personal communication, 2018); **KDWPT:** T1 **=** Tier 1 priority species;

T2 = Tier 2 priority species (C. Berens, personal communication, 2018); **MTFWP:** S1 = at high risk; S1B = at high risk, breeding; S1M = at high risk, migratory; S2 = at risk; S2B = at risk, breeding; S3 = potentially at risk; S3B = potentially at risk, breeding; S4 = apparently secure; S5N = common, nonbreeding (Montana Fish Wildlife and Parks, 2015); **NGPC:** T1 = Tier I: Globally or nationally most at-risk of extinction; T2 = Tier II: State Critically Imperiled, State Imperiled or State Vulnerable (Schneider et al, 2018); **NMDGF:** SGCN = Species of Greatest Conservation Need; ST = State Threatened; SE = State Endangered (New Mexico Department of Game and Fish, 2016).

Appendix E Continued. Priority species detected in 2018, by state, with management designations by state agencies. Agencies include North Dakota Game and Fish (NDGF), Oklahoma Department of Wildlife Conservation (ODWC), South Dakota Game, Fish and Parks (SDGFP), Texas Parks and Wildlife (TPWD), Utah Division of Wildlife Resources (UDWR) and Wyoming Game and Fish Department (WYGF). An "X" in the Occupancy or Density Estimated columns indicates estimates were generated for that species at some level in one or more of the states where it holds a priority designation.

Species	State Agencies*						Occupancy Estimate	Density Estimate
	NDGF	ODWC	SDGFP	TPWD	UDWR	WYGF		
American Avocet	L2						X	X
American Bittern	L1				S3,S3N,S4B	T2	X	X
American Kestrel	L2			S4B		T3	X	X
American Pipit						T3	X	X
American Three-toed Woodpecker			3				X	X
American White Pelican	L2		2b	S2B,S3N	S3B	T2	X	X
Ash-throated Flycatcher						T2	X	X
Baird's Sparrow	L1	T3	2a	S2		T2	X	X
Bald Eagle	L2	T3	1	S3B,S3N	S2B,S4N	T2	X	X
Band-tailed Pigeon					S3B		X	X
Barn Owl		T3						
Bell's Vireo		T2		S3B			X	X
Bendire's Thrasher					SU		X	
Bewick's Wren				S5B		T3	X	X
Black Rosy-Finch					S1	T2	X	X
Black Swift					S2B,S4N			
Black Tern	L1		2a	S3		T2	X	
Black-backed Woodpecker			3			T2	X	X

Species	State Agencies*						Occupancy Estimate	Density Estimate
	NDGF	ODWC	SDGFP	TPWD	UDWR	WYGF		
Black-billed Cuckoo	L1					T2	X	X
Black-chinned Hummingbird						T2	X	X
Black-throated Gray Warbler						T2	X	X
Blue Grosbeak						T3	X	X
Blue-gray Gnatcatcher						T3	X	X
Bobolink	L2					T2	X	X
Boreal Owl					S2	T2		
Botteri's Sparrow				S3B			X	X
Brewer's Sparrow	L3					T2	X	X
Brown-capped Rosy-Finch						T2	X	X
Bullock's Oriole		T3					X	X
Burrowing Owl	L2	T2	3	S3B	S3B	T1	X	X
Canvasback	L2	T3						
Canyon Wren						T3	X	X
Carolina Chickadee				S5B				
Cassin's Sparrow		T2		S4B			X	X
Chestnut-collared Longspur	L1	T2	2a			T2	X	X
Clark's Nutcracker						T2	X	X
Common Nighthawk						T3	X	X
Common Yellowthroat				S5B		T3	X	X
Dickcissel	L2			S4B		T2	X	X
Eastern Meadowlark				S5B			X	X
Ferruginous Hawk	L1	T3	3	S2B,S4N	S3B	T2	X	X
Field Sparrow				S5B			X	X
Forster's Tern				S5		T2		
Franklin's Gull	L1			S2		T2	X	X
Golden Eagle	L2	T3		S3B	S4	T2	X	X
Grasshopper Sparrow	L1			S3B		T2	X	X
Gray Vireo						T2	X	X
Great Blue Heron						T2	X	X

Species	State Agencies*						Occupancy Estimate	Density Estimate
	NDGF	ODWC	SDGFP	TPWD	UDWR	WYGF		
Great Gray Owl						T2		
Greater Prairie-Chicken	L2	T3	2a	S1B			X	X
Greater Sage-Grouse	L1		3		S3	T2	X	X
Green Heron				S5B			X	
Gunnison Sage-Grouse					S2			
Harris's Hawk				S3B				
Harris's Sparrow		T3		S4				
Henslow's Sparrow		T1		S2,S3N,SXB				
Juniper Titmouse		T3				T2	X	X
Kentucky Warbler		T3		S3B				
Lark Bunting	L1		2a				X	X
Lark Sparrow				S4B			X	X
Least Tern	L2	T2	1,SE	S3B			X	
Lesser Prairie-Chicken		T2		S2B			X	X
Lesser Scaup	L2	T3					X	X
Lewis's Woodpecker			3		S3	T2	X	X
Loggerhead Shrike	L2	T1		S4B		T2	X	X
Long-billed Curlew	L1	T2	2a	S3B,S5N		T2	X	X
Louisiana Waterthrush		T3		S3B				
MacGillivray's Warbler						T2	X	X
Marbled Godwit	L1		2a				X	X
McCown's Longspur	L3	T2		S4		T2	X	X
Merlin						T3	X	
Mississippi Kite				S4B			X	X
Montezuma Quail				S3B			X	X
Mountain Plover		T1		S2		T1	X	X
Nelson's Sparrow	L1	T3						
Northern Bobwhite		T3		S4B			X	X
Northern Goshawk			3			T1	X	X
Northern Harrier	L2			S2B,S3N			X	X

Species	State Agencies*						Occupancy Estimate	Density Estimate
	NDGF	ODWC	SDGFP	TPWD	UDWR	WYGF		
Northern Pintail	L2	T3		S3B,S5N			X	X
Olive-sided Flycatcher					S3,S4B		X	X
Orchard Oriole				S4B			X	X
Painted Bunting		T2		S4B			X	X
Peregrine Falcon	L3	T3	1,SE	S3	S3B	T2	X	X
Pileated Woodpecker				S4B			X	X
Pinyon Jay		T3					X	X
Piping Plover	L2	T3	1,ST	S2				
Prairie Falcon	L2	T3					X	X
Purple Martin						T3	X	X
Pygmy Nuthatch						T2	X	X
Red Crossbill						T2	X	X
Red-eyed Vireo						T2	X	X
Red-headed Woodpecker	L1	T2		S3B		T2	X	X
Red-shouldered Hawk				S4B				
Rufous Hummingbird						T2	X	X
Rufous-crowned Sparrow				S4B			X	X
Sage Thrasher						T2	X	X
Sagebrush Sparrow						T2	X	X
Scaled Quail		T3		S4B			X	X
Scissor-tailed Flycatcher				S3B			X	X
Scott's Oriole						T2	X	X
Sedge Wren				S4			X	X
Sharp-tailed Grouse	L2				S2	T2	X	X
Short-eared Owl	L2	T3		S4N		T2	X	X
Snowy Egret		T3		S5B		T2		
Solitary Sandpiper		T3						
Sprague's Pipit	L1	T3	2a	S3N			X	X
Summer Tanager				S5B			X	X
Swainson's Hawk	L1	T2		S4B		T2	X	X

Species	State Agencies*						Occupancy Estimate	Density Estimate
	NDGF	ODWC	SDGFP	TPWD	UDWR	WYGF		
Upland Sandpiper	L2	T3				T2	X	X
Virginia Rail						T3	X	
Virginia's Warbler						T2	X	X
Western Bluebird							X	X
Western Meadowlark	L2						X	X
White-faced Ibis				S4B	S2,S3B	T2	X	X
Wild Turkey				S5B			X	X
Willet	L2		2b				X	X
Williamson's Sapsucker						T2	X	X
Willow Flycatcher		T3			S1B	T3	X	X
Wilson's Phalarope	L1	T3	2b				X	X
Wood Thrush		T2		S4B			X	X
Woodhouse's Scrub-Jay						T2	X	X
Yellow-billed Cuckoo				S4,S5B	S2B	T2	X	X

*__NDGF__: L1 = Level 1: species having a high level of conservation priority because of declining status either here or across their range or a high rate of occurrence in North Dakota constituting the core of the species breeding range (i.e. "responsibility" species) but are at-risk range wide; L2 = Level 2: Species having a moderate level of conservation priority or a high level of conservation priority but a substantial level of non-SWG funding is available to them; L3 = Level 3: species having a moderate level of conservation priority but are believed to be peripheral or non-breeding in North Dakota (Dyke et al, 2015); **ODWC:** Tier 1 = Species receiving a combined score of 13 to 15 on Oklahoma's Species of Greatest Conservation Need Selection and Scoring Criteria; Tier 2 = Species receiving a combined score of 11 or 12 on Oklahoma's Species of Greatest Conservation Need Selection and Scoring Criteria; Tier 3 = Species receiving a combined score of 6 to 10 on Oklahoma's Species of Greatest Conservation Need Selection and Scoring Criteria (Oklahoma Department of Wildlife Conservation, 2015); **SDGFP:** 1 = State or federally listed species for which the state has a mandate for recovery 2A = Species that are regionally or globally imperiled and for which South Dakota represents an important portion of their remaining range; 2B = Species that are regionally or globally secure* and for which South Dakota represents an important portion of their remaining range; 3 = Species with characteristics that make them vulnerable (E. Dowd, personal communication; 2018); **TPWD:** S1 = Critically Imperiled; S1B = Critically Imperiled Breeding; S2 = Imperiled; S2B = Imperiled Breeding; S3 = Vulnerable; S3B = Vulnerable Breeding; S3N = Vulnerable Nonbreeding; S4 = Apparently Secure; S4B = Apparently Secure Breeding; S5 = Secure; S5B = Secure Breeding; SHB = Possibly Extirpated Breeding; SXB = Presumed Extirpated Breeding (Texas Parks and Wildlife Department, 2012); **UDWR:** S1 = Critically Imperiled; S1B = Critically Imperiled Breeding; S2 = Imperiled; S2B = Imperiled Breeding; S3 = Vulnerable; S3B = Vulnerable Breeding; S3N = Vulnerable Nonbreeding; S4 = Apparently secure; S4B = Apparently secure Breeding; S4N = Apparently secure Nonbreeding; SU = Unrankable, due to conflicting or inadequate information; (Utan Wildlife Action Plan Joint Team, 2015); **WYGF:** Tier 1 = Species scoring 37-54 on WYGFD's ranking matrix; Tier 2 = Species scoring 19-36 on WYGFD's ranking matrix; Tier 3 = Species scoring 1-88 on the WYGFD's ranking matrix (Wyoming Game and Fish Department, 2016).

Appendix G: Priority Species Designations for the Bureau of Land Management

Priority species detected on Bureau of Land Management lands in 2018, with management designations by state. An "X" in the Occupancy or Density Estimated columns indicates estimates were generated for that species in at least one BLM stratum in one or more of the states where it holds a priority designation.

Species	Bureau of Land Management*							Occupancy Estimate	Density Estimate
	Colorado	Idaho	Montana	North Dakota	South Dakota	Utah	Wyoming		
Baird's Sparrow	SS		SS	SS	SS		SS	X	X
Bald Eagle	SS	T2	SS	SS	SS	SS	SS	X	X
Black-chinned Sparrow						SS		X	X
Black-throated Gray Warbler						SS		X	X
Black-throated Sparrow		T2						X	X
Brewer's Sparrow	SS	T2	SS		SS	SS	SS	X	X
Burrowing Owl	SS	T2	SS	SS	SS	SS	SS	X	X
Cassin's Finch		T2				SS		X	X
Chestnut-collared Longspur			SS		SS	SS		X	X
Ferruginous Hawk	SS	T2	SS	SS	SS	SS	SS	X	X
Franklin's Gull			SS		SS			X	X
Gambel's Quail						SS		X	X
Golden Eagle	SS	T2	SS	SS	SS	SS		X	X
Grasshopper Sparrow		T2				SS		X	X
Gray Vireo						SS		X	X
Greater Sage-Grouse	SS	T2	SS	SS	SS	SS	SS	X	X
Green-tailed Towhee		T2				SS		X	X
Gunnison Sage-Grouse	FT					SS			
Loggerhead Shrike		T2	SS		SS	SS	SS	X	X
Long-billed Curlew	SS	T2	SS	SS	SS	SS	SS	X	X
Lucy's Warbler						SS		X	X
McCown's Longspur			SS		SS			X	X
Mountain Plover	SS		SS		SS	SS	SS	X	X

Species	Bureau of Land Management*							Occupancy Estimate	Density Estimate
	Colorado	Idaho	Montana	North Dakota	South Dakota	Utah	Wyoming		
Northern Goshawk	SS	T2				SS	SS	X	X
Peregrine Falcon	SS		SS	SS	SS	SS	SS	X	X
Pinyon Jay		T2				SS		X	X
Prairie Falcon						SS		X	X
Red-headed Woodpecker			SS		SS			X	X
Sage Thrasher		T2	SS		SS	SS	SS	X	X
Sagebrush Sparrow		T2	SS		SS	SS	SS	X	X
Short-eared Owl		T2				SS		X	X
Sprague's Pipit			SS	SS	SS			X	X
Vaux's Swift		T2						X	X
Virginia's Warbler		T2				SS		X	X

*FT = Federally Threatened; SS = Sensitive Species; Colorado (R. Sell, personal communication, 2018); Montana (Montana Natural Heritage Program, 2015); North Dakota, South Dakota (Bureau of Land Management, 2014); Utah (G.D. Cook, personal communication, 2018); Wyoming (Bureau of Land Management, 2010); T2 = Tier 2 Sensitive Species; Idaho (Bureau of Land Management, 2015).

Appendix H: Priority Species Designations for USFS Region 1

Priority species detected on US Forest Service lands in Region 1 in 2018, with management designations by region and unit. Codes for Units: Beaverhead-Deerlodge NF (BDNF), Bitterroot NF (BINF), Clearwater NF (CLNF), Custer NF (CUNF), Flathead NF (FLNF), Gallatin NF (GANF), Helena NF (HENF), Idaho Panhandle NF (IPNF). An "X" in the Occupancy or Density Estimated columns indicates estimates were generated for that species in at least one USFS stratum where it holds a priority designation.

Species	USFS Region 1*								Occupancy Estimate	Density Estimate
	BDNF	BINF	CLNF	CUNF	FLNF	HENF	GANF	IDNF		
Baird's Sparrow				SS					X	X
Bald Eagle	SS	SS	MIS,SS	SS	MIS,SS	SS,MIS	MIS,SS	R1SS	X	X
Belted Kingfisher			MIS						X	X
Black Swift								R1SS		
Black-backed Woodpecker	SS	SS	SS	SS	MIS,SS	R1SS	R1SS	R1SS	X	X
Brewer's Sparrow				MIS					X	X
Bullock's Oriole				MIS					X	X
Cassin's Kingbird				MIS					X	X
Chipping Sparrow								FS	X	X
Dusky Flycatcher								FS	X	X
Hairy Woodpecker						FS,MIS		FS	X	X
Hammond's Flycatcher								FS	X	X
Lark Sparrow				MIS					X	X
Long-billed Curlew				SS					X	X
Northern Goshawk			MIS	MIS		MIS	MIS		X	X
Olive-sided Flycatcher								FS	X	X
Ovenbird				MIS					X	X
Pileated Woodpecker		MIS	MIS			MIS			X	X
Pygmy Nuthatch			SS					R1SS	X	X
Ruffed Grouse				MIS					X	X
Sharp-tailed Grouse				MIS					X	X
Spotted Towhee				MIS					X	X
Western Kingbird				MIS					X	X

Species	USFS Region 1*								Occupancy Estimate	Density Estimate
	BDNF	BINF	CLNF	CUNF	FLNF	HENF	GANF	IDNF		
Yellow Warbler				MIS					X	X

*R1SS = Region 1 Sensitive Species; MIS = Management Indicator Species; FS = Focal Species; FT = Federally Threatened; FE = Federally Endangered, SS = Sensitive Species (C. Staab, personal communication, 2018)

Appendix G continued. Priority species detected on US Forest Service lands in Region 1 in 2018, with management designations by region and unit. Codes for Units: Kootenai NF (KONF), Lewis and CLark NF (LCNF), Lolo NF (LONF), Nez Perce NF (NPNF), Dakota Prairie NG (DPNG). An "X" in the Occupancy or Density Estimated columns indicates estimates were generated for that species in at least one USFS stratum where it holds a priority designation.

Species	USFS Region 1*						Occupancy Estimate	Density Estimate
	KONF	LCNF	LONF	NPNF	DPNG	Region-wide		
Amer. Three-toed Woodpecker		MIS					X	X
Baird's Sparrow					SS	R1SS	X	X
Bald Eagle	SS	MIS,SS	SS	MIS,SS	SS	R1SS	X	X
Black Swift				SS		R1SS		
Black-backed Woodpecker	SS	SS	SS	SS		R1SS	X	X
Chipping Sparrow	FS						X	X
Dusky Flycatcher	FS						X	X
Dusky Grouse		MIS					X	X
Golden Eagle		MIS					X	X
Hairy Woodpecker	FS						X	X
Hammond's Flycatcher	FS						X	X
Long-billed Curlew				SS	SS	R1SS	X	X
Mountain Quail				SS		R1SS	X	X
Northern Goshawk		MIS	MIS	MIS			X	X
Olive-sided Flycatcher	FS						X	X

Species	USFS Region 1*						Occupancy Estimate	Density Estimate
	KONF	LCNF	LONF	NPNF	DPNG	Region-wide		
Pileated Woodpecker			MIS	MIS			X	X
Prairie Falcon		MIS					X	X
Pygmy Nuthatch				SS		R1SS	X	X
Sharp-tailed Grouse					MIS		X	X
Sprague's Pipit					SS	R1SS	X	X

* R1SS = Region 1 Sensitive Species; MIS = Management Indicator Species; FS = Focal Species; FT = Federally Threatened; FE = Federally Endangered, SS = Sensitive Species (C. Staab, personal communication, 2018)

Appendix I: Priority Species Designations for USFS Region 2

Priority species detected on US Forest Service lands in Region 2 in 2018, with management designations by region and unit. Codes for Units: Arapaho and Roosevelt NF (ARNF), Bighorn NF (BINF), Black Hills NF (BHNF), Grand Mesa, Uncompaghre and Gunnison NF (GMUG), Medicine Bow NF (MBNF), Nebraska/Samuel R. McKelvie NF (NENF), Rio Grande NF (RGNF), Routt NF (RONF), and San Juan NF (SJNF). An "X" in the Occupancy or Density Estimated columns indicates estimates were generated for that species in at least one USFS stratum where it holds a priority designation.

Species	USFS Region 2*									Occupancy Estimate	Density Estimate
	ARNF	BINF	BHNF	GMUG	MBNF	NENF	RGNF	RONF	SJNF		
American Dipper			SLC							X	X
American Three-toed Woodpecker					MIS					X	X
Bald Eagle				MIS						X	X
Black-and-white Warbler			SLC							X	X
Black-backed Woodpecker			MIS							X	X
Brewer's Sparrow		MIS		MIS						X	X
Broad-winged Hawk			SLC								
Brown Creeper			MIS		SSC		MIS			X	X
Brown-capped Rosy-Finch					SSC					X	X
Burrowing Owl	MIS									X	X
Cooper's Hawk			SLC							X	X
Golden-crowned Kinglet	MIS	SLC	MIS		MIS			MIS		X	X
Grasshopper Sparrow			MIS							X	X
Greater Prairie-Chicken						MIS				X	X
Green-tailed Towhee									MIS	X	X
Hairy Woodpecker	MIS			MIS					MIS	X	X
Hermit Thrush							MIS			X	X
Lark Bunting	MIS									X	X
Lewis's Woodpecker				MIS						X	X
Lincoln's Sparrow					MIS		MIS			X	X
Mallard									MIS	X	X
Mountain Bluebird	MIS								MIS	X	X
Northern Goshawk				MIS	MIS			MIS	MIS	X	X

Species	USFS Region 2*									Occupancy Estimate	Density Estimate
	ARNF	BINF	BHNF	GMUG	MBNF	NENF	RGNF	RONF	SJNF		
Northern Saw-whet Owl			SLC								
Peregrine Falcon				MIS						X	X
Pinyon Jay				MIS						X	X
Pygmy Nuthatch	MIS	SLC	SLC			MIS	MIS			X	X
Red Crossbill				MIS						X	X
Red-breasted Nuthatch		MIS								X	X
Ruffed Grouse			MIS							X	X
Sharp-shinned Hawk			SLC							X	X
Sharp-tailed Grouse						MIS			MIS	X	X
Song Sparrow			MIS							X	X
Swainson's Hawk		SLC								X	X
Vesper Sparrow							MIS	MIS		X	X
Warbling Vireo	MIS									X	X
Wild Turkey									MIS	X	X
Willow Flycatcher									MIS	X	X
Wilson's Warbler	MIS				MIS		MIS	MIS		X	X

*R2SS = Region 2 Sensitive Species; MIS = Management Indicator Species; SI = Species of Interest; SLC = Species of Local Concern; SNI = Species Needing More Inventory; SC = Species of Concern; SVC = Species of Viability Concern; SSC = Species of Special Concern; FT = Federally Threatened; FE = Federally Endangered (US Forest Service, 2008)

Appendix H continued. Priority species detected on US Forest Service lands in Region 2 in 2018, with management designations by region and unit. Codes for Units: Shoshone NF (SHNF), White River NF (WRNF), Buffalo Gap NG (BGNG) Comanche NG (CONG), Fort Pierre NG (FPNG), Oglala NG (OGNG), Pawnee NG (PANG), and Thunder Basin NG (TBNG). An "X" in the Occupancy or Density Estimated columns indicates estimates were generated for that species in at least one USFS stratum where it holds a priority designation.

Species	USFS Region 2*									Occupancy Estimate	Density Estimate
	SHNF	WRNF	BGNG	CONG	FPNG	OGNG	PANG	TBNG	Region-wide		
American Pipit		MIS								X	X
Bald Eagle	MIS									X	X
Black-backed Woodpecker									R2SS	X	X
Boreal Owl									R2SS		
Brewer's Sparrow	MIS	MIS							R2SS	X	X
Bullock's Oriole				MIS						X	X
Burrowing Owl							MIS		R2SS	X	X
Cassin's Sparrow									R2SS	X	X
Chestnut-collared Longspur									R2SS	X	X
Dusky Grouse	MIS									X	X
Golden-crowned Kinglet							MIS			X	X
Grasshopper Sparrow									R2SS	X	X
Greater Prairie-Chicken					MIS				R2SS	X	X
Hairy Woodpecker	MIS						MIS			X	X
Lark Bunting							MIS			X	X
Lewis's Woodpecker									R2SS	X	X
Loggerhead Shrike									R2SS	X	X
Long-billed Curlew				MIS					R2SS	X	X
McCown's Longspur									R2SS	X	X
Mountain Bluebird							MIS			X	X
Northern Goshawk	MIS								R2SS	X	X
Northern Harrier									R2SS	X	X
Olive-sided Flycatcher									R2SS	X	X
Peregrine Falcon	MIS	SC								X	X

Species	USFS Region 2*									Occupancy Estimate	Density Estimate
	SHNF	WRNF	BGNG	CONG	FPNG	OGNG	PANG	TBNG	Region-wide		
Purple Martin									R2SS	X	X
Pygmy Nuthatch		SVC					MIS			X	X
Ruffed Grouse	MIS									X	X
Sharp-tailed Grouse			MIS		MIS	MIS		MIS	R2SS	X	X
Virginia's Warbler		MIS								X	X
Warbling Vireo							MIS			X	X
White-tailed Ptarmigan									R2SS	X	X
Wilson's Warbler							MIS			X	X

*R2SS = Region 2 Sensitive Species; MIS = Management Indicator Species; SI = Species of Interest, SLC = Species of Local Concern; SNI = Species Needing More Inventory; SC = Species of Concern; SVC = Species of Viability Concern; SSC = Species of Special Concern; FT = Federally Threatened; FE = Federally Endangered (US Forest Service, 2008)

Appendix J: Priority Species Designations for USFS Region 3

Priority species detected on US Forest Service lands in Region 3 in 2018, with management designations by region and unit. Codes for Units: Carson NF (CANF), Coconino NF (CCNF), Coronado NF (CRNF) Comanche NG (CONG), Kaibab NF (KANF), Prescott NF (PRNF), Tonto NF (TONF), and Kiowa/Rita Blanca NG (KRNG). An "X" in the Occupancy or Density Estimated columns indicates estimates were generated for that species in at least one USFS stratum where it holds a priority designation.

Species	USFS Region 3*								Occupancy Estimate	Density Estimate
	CANF	CCNF	CRNF	KANF	PRNF	TONF	KRNG	Region-wide		
Acorn Woodpecker			MIS						X	X
American Kestrel			MIS						X	X
Bald Eagle					SC	MIS		R3SS	X	X
Brown Creeper			MIS						X	X
Brown-headed Cowbird					SC				X	X
Cordilleran Flycatcher			MIS		SC				X	X
Grace's Warbler				FS	SC				X	X
Grasshopper Sparrow					SC			R3SS	X	X
Hairy Woodpecker	MIS	MIS	MIS		SC	MIS			X	X
Horned Lark						MIS			X	X
House Wren			MIS						X	X
Northern Flicker			MIS			MIS			X	X
Purple Martin					SC				X	X
Pygmy Nuthatch		MIS	MIS		SC	MIS			X	X
Red-breasted Nuthatch			MIS						X	X
Red-faced Warbler					SC				X	X
Spotted Towhee					SC	MIS			X	X
Swainson's Hawk					SC				X	X
Townsend's Solitaire						MIS			X	X
Violet-green Swallow			MIS			MIS			X	X
Virginia's Warbler					SC				X	X
Western Bluebird				FS		MIS			X	X

Species	USFS Region 3*								Occupancy Estimate	Density Estimate
	CANF	CCNF	CRNF	KANF	PRNF	TONF	KRNG	Region-wide		
Western Wood-Pewee						MIS			X	X
White-breasted Nuthatch			MIS						X	X

*R3SS = USFS Region 3 Sensitive Species; MIS = Management Indicator Species; SC = Species of Concern; FS = Focal Species (S. R. Plunkett and N. Kline, personal communication, 2018).

Appendix K: Priority Species Designations for USFS Region 4

Priority species detected on US Forest Service lands in Region 4 in 2017, with management designations by region and unit. Codes for Units: Ashley NF (ASNF), Boise NF (BONF), Bridger-Teton NF (BTNF), Caribou-Targhee NF (CTNF), Humboldt-Toiyabe NF (HTNF), Manti-La Sal NF (MLNF), Payette NF (PANF), Salmon-Challis National Forest (SCNF), Sawtooth NF (SANF), Uinta-Wasatch-Cache National Forest (UWCNF). An "X" in the Occupancy or Density Estimated columns indicates estimates were generated for that species in at least one USFS stratum where it holds a priority designation.

Species	USFS Region 4*											Occupancy Estimate	Density Estimate
	ASNF	BONF	BTNF	CTNF	HTNF	MLNF	PANF	SCNF	SANF	UWCNF	Region-wide		
American Dipper		FS										X	X
American Three-toed Woodpecker		SS								MIS	R4SS	X	X
Bald Eagle		SS	MIS	MIS							R4SS	X	X
Black-backed Woodpecker		MIS										X	X
Brewer's Sparrow			MIS				MIS		SI			X	X
Brown Creeper								MIS				X	X
Brown-headed Cowbird					MIS							X	X
Burrowing Owl					CAS							X	X
Cooper's Hawk						SS						X	X
Dusky Grouse		FS				MIS						X	X
Flammulated Owl		SS									R4SS		
Golden Eagle	MIS				EPA	MIS,SS						X	X
Great Gray Owl		SS						MIS			R4SS		
Greater Sage-Grouse		SS			MIS,SS		MIS	PMIS	MIS		R4SS	X	X
Lewis's Woodpecker		FS				SS	MIS					X	X
Lincoln's Sparrow	MIS											X	X
Loggerhead Shrike		FS										X	X
Mountain Bluebird								MIS				X	X
Mountain Chickadee							MIS					X	X
Mountain Quail											R4SS	X	X

Species	USFS Region 4*											Occupancy Estimate	Density Estimate
	ASNF	BONF	BTNF	CTNF	HTNF	MLNF	PANF	SCNF	SANF	UWCNF	Region-wide		
Northern Goshawk	MIS	SS		MIS	MIS,CAS			MIS	MIS	MIS	R4SS	X	X
Olive-sided Flycatcher									SI			X	X
Peregrine Falcon		SS	MIS	MIS							R4SS	X	X
Pileated Woodpecker		MIS					MIS	MIS				X	X
Pine Siskin		FS										X	X
Pinyon Jay					NV SC							X	X
Pygmy Nuthatch								MIS				X	X
Red-naped Sapsucker	MIS											X	X
Ruby-crowned Kinglet								MIS				X	X
Song Sparrow	MIS											X	X
Vesper Sparrow							MIS	MIS				X	X
Warbling Vireo	MIS											X	X
Western Meadowlark		FS										X	X
Western Tanager					MIS							X	X
White-headed Woodpecker		MIS					PMIS				R4SS		
Williamson's Sapsucker					MIS		MIS					X	X
Willow Flycatcher											FE	X	X
Wilson's Warbler		FS										X	X
Yellow Warbler							MIS	MIS				X	X
Yellow-rumped Warbler					MIS							X	X

*CAS = Conservation Agreement Species; FE = Federally Endangered Species; FS = Focal Species; EPA = Eagle Protection Act; MIS = Management Indicator Species; NV SC = Nevada Species of Concern; PMIS = Proposed Management Indicator Species; R4SS = Region 4 Sensitive Species; SC = Species of Concern; SI = Species of Interest; SS = Sensitive Species (R. Sadak, personal communication, 2018)