Avian Monitoring On Camp Guernsey:
2013 Report

April 2014

The Rocky Mountain Bird Observatory

Mission: To conserve birds and their habitats

Vision: Native bird populations are sustained in healthy ecosystems

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

RMBO accomplishes its mission by:

- **Monitoring** long-term bird population trends to provide a scientific foundation for conservation action.
- **Researching** bird ecology and population response to anthropogenic and natural processes to evaluate and adjust management and conservation strategies using the best available science.
- **Educating** people of all ages through active, experiential programs that create an awareness and appreciation for birds.
- **Fostering** good stewardship on private and public lands through voluntary, cooperative partnerships that create win-win situations for wildlife and people.
- **Partnering** with state and federal natural resource agencies, private citizens, schools, universities and other non-governmental organizations to build synergy and consensus for bird conservation.
- **Sharing** the latest information on bird populations, land management and conservation practices to create informed publics.
- **Delivering** bird conservation at biologically relevant scales by working across political and jurisdictional boundaries in western North America.

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EXECUTIVE SUMMARY

The Rocky Mountain Bird Observatory (RMBO), in conjunction with Camp Guernsey and the Wyoming Military Department, conducted landbird monitoring throughout the 79,000-acre Camp Guernsey installation located near Guernsey, WY in 2013. This project used a spatially balanced sampling design and a survey protocol implemented in portions of 13 states as part of a program entitled "Integrated Monitoring in Bird Conservation Regions" (IMBCR). The IMBCR design allows inferences to avian species occurrence and population sizes from local to regional scales, including states and Bird Conservation Regions (BCR). By using a design compatible with the IMBCR program, estimates for Camp Guernsey can be compared to nearby regional estimates to determine whether avian populations within Camp Guernsey are similar to regional populations. We used regional population estimates for the Wyoming portion of BCR 17 (Badlands and Prairies) as the region for comparison in this report. In 2013, RMBO completed surveys within 20 1-km^2 grid cells, resulting in 244 point counts conducted. Surveys on Camp Guernsey were conducted between 24 May and 16 June while surveys within the Wyoming portion of BCR 17 were conducted between 19 May and 11 July. Field technicians observed 2,620 individuals of 79 bird species during the surveys within Camp Guernsey. Using the RIMBCR package for Program R designed by Paul Lukacs of the University of Montana, we estimated densities and/or occupancy rates of 99 species occurring in the Wyoming portion of BCR 17 and/or on Camp Guernsey, including 21 species with special designation for BCR 17 as designated by Partners in Flight. Estimated occupancy rates and densities were higher on Camp Guernsey compared to the Wyoming portion of BCR 17 for 30% and 45% of the species for which we produced estimates; respectively. Conversely, occupancy and density estimates were higher within the Wyoming portion of BCR 17 compared to Camp Guernsey for 40% and 52% of the species for which we produced estimates; respectively. Results from the grid-based point count survey effort suggest that Camp Guernsey currently represents important breeding bird habitat, particularly for species inhabiting ponderosa pine, open and/or grassland habitats. We produced a density distribution map for Pygmy Nuthatch within Camp Guernsey based the IMBCR point count survey data, several habitat variables and spatial covariates. This additional analysis was conducted for Pygmy Nuthatch because it represents one of the species detected during point counts within Camp Guernsey that is considered a priority species by the Wyoming Military Department. Pygmy Nuthatch is also considered an indicator species for mature ponderosa pine habitat. Unsurprisingly, ponderosa pine cover was found to be the primary factor influencing Pygmy Nuthatch density within Camp Guernsey. As such, Pygmy Nuthatch densities are predicted to be higher within the north section compared to the south section of Camp Guernsey. In addition to the IMBCR point count surveys, RMBO conducted several days of raptor surveys and riparian area searches in Camp Guernsey. Several species were determined to be nesting, including Ferruginous Hawk, and strong evidence of breeding behavior was observed for Merlin. As expected, avian diversity was found to be relatively high in riparian areas with the majority of the riparian species observed being adequately monitored via the IMBCR program (46 of 54 species or 85%). We recommend that natural resource managers on Camp Guernsey work to maintain and enhance habitats through vegetation restoration efforts, as needed, following training exercises. Additionally, we recommend riparian areas should be fenced to exclude cattle and improve riparian habitat conditions on the property.

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INTRODUCTION

Monitoring is an essential component of wildlife management and conservation science (Witmer 2005, Marsh and Trenham 2008). Common goals of population monitoring are to estimate the population status of target species and to detect changes in populations over time (Thompson et al. 1998, Sauer and Knutson 2008). Effective monitoring programs can identify species that are at-risk due to small or declining populations (Dreitz et al. 2006), provide an understanding of how management actions affect populations (Alexander et al. 2008, Lyons et al. 2008), evaluate population responses to landscape alteration and climate change (Baron et al. 2008, Lindenmayer and Likens 2009) as well as provide basic information on species distributions.

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 Committee 2009). As natural areas are developed due to increasing infrastructure development and anthropogenic use it is imperative for land managers to better understand the impacts subsequent landscape changes have on wildlife communities. Higher road densities may lead to an increase in non-native vegetation along the roads and fragmented habitats. Tall structures provide prominent perches which may aid predators in locating prey and may dissuade prey species from residing in the area. Furthermore, noise associated with increased traffic volume may interfere with aspects of avian communication that are vital to territory advertisement and attracting mates (Ingelfinger and Anderson 2004, Holloran 2005). Operations consistent with training exercises on military installations may also impact the avian community (Eberly and Keating 2006).

Before monitoring can be used by land managers to guide conservation efforts, sound program designs and analytic methods are necessary to produce unbiased population estimates (Sauer and 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 et al. 2002, Thompson 2002). Addressing spatial variation entails the use of probabilistic sampling designs that allow population estimates to be extended over the entire area of interest (Thompson et al. 1998). Adjusting for incomplete detection involves the use of appropriate sampling and analytic methods to address the fact that few, if any, species are so conspicuous that they are detected with certainty during surveys, even when present (Pollock et al. 2002, Thompson 2002). Accounting for these two sources of variation ensures observed trends reflect true population changes rather than artifacts of sampling and observation processes (Pollock et al. 2002,Thompson 2002).

In order to provide local land managers with unbiased and reliable information on avian communities on Camp Guernsey, the Rocky Mountain Bird Observatory (RMBO) utilized a probabilistic sampling design based on the "Integrated Monitoring in Bird Conservation Regions (IMBCR)" (White et al. 2014) design for this study. Important properties of the IMBCR design that relate to this study are:

- All vegetation types are available for sampling.
- Strata are based on fixed attributes; this will allow us to relate changes in bird populations to changes on the landscape through time.
- Local population estimates and trends can be directly compared to regional scales.
- Coordination among partners can reduce the costs of monitoring per partner.

Using the IMBCR design, RMBO's monitoring objectives are to:

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1. 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;
2. Provide basic habitat association data for bird species to address habitat management issues;
3. Provide robust occupancy estimates that account for incomplete detection and are comparable at different geographic extents;
4. 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.

In addition to the density and occupancy estimates generated using data collected during IMBCR grid-based surveys, RMBO conducted additional analyses to model Pygmy Nuthatch density using habitat features. We conducted habitat modeling for this species because it was observed on Camp Guernsey, Pygmy Nuthatch represents a priority species as designated by Partners in Flight and the Wyoming Military Department, and this species is an indicator species for mature ponderosa pine. RMBO also performed several targeted surveys to determine raptor nesting locations and assess the relative health of riparian habitats. Information from the additional analyses and surveys was not included in our occupancy or density estimates but can be used to better inform management for specific and potentially vulnerable areas within Camp Guernsey.

METHODS

Study Area

Camp Guernsey spans more than 79,000 acres of habitat dominated by short-grass prairie interspersed with small stands of ponderosa pine and isolated stretches of riparian habitat. At the time of this report, much of Camp Guernsey is leased for grazing by private entities.

Camp Guernsey lies within the Badlands and Prairies Bird Conservation Region (BCR 17). BCR 17 is characterized by rolling plains and mixed-grass prairie that contain large, continuous, tracts of intact dry grassland managed predominately as ranchland (US North American Bird Conservation Initiative 2000). The western portion of BCR 17 contains pine and spruce forests at higher elevations. BCR 17 covers portions of five states: Montana; North Dakota; South Dakota; Wyoming and Nebraska.

IMBCR surveys have been conducted within the Wyoming portion of BCR 17 since 2009. We include density and occupancy estimates for the Wyoming portion of BCR 17 as a geographically relevant comparable to Camp Guernsey.

Grid-based Landbird Sampling Design

Using a design consistent with the IMBCR program, RMBO has identified Camp Guernsey as a single and distinct stratum for songbird monitoring. The spatial extent of the stratum was bounded by the installation boundary; provided by Camp Guernsey staff. At Camp Guernsey's request, the impact area and range areas within the installation boundary were made unavailable for sampling to reduce conflicts with military operations. The Camp Guernsey stratum therefore represents the remaining extent of Camp Guernsey.

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Estimates from six strata sampled under the IMBCR program were combined using a weighted mean to produce occupancy and density estimates for the entire extent of the Wyoming portion of BCR 17. The six strata used to represent the Wyoming portion of BCR 17 were defined using the following political boundaries: the Wyoming portion of the Black Hills National Forest, the Buffalo Bureau of Land Management (BLM) Field Office, the Casper BLM Field Office, the Newcastle BLM Field Office, the Thunder Basin National Grassland and all other lands within the Wyoming portion of BCR 17.

Within the Camp Guernsey and Wyoming BCR 17 strata, RMBO followed the IMBCR design, in which, generalized random-tessellation stratification (GRTS), a spatially-balanced sampling algorithm, was used to select sample units (Stevens and Olsen 2004). The GRTS design has several appealing properties with respect to long-term monitoring of birds at large spatial scales:

- Spatially-balanced sampling is generally more efficient than simple random sampling of natural resources (Stevens and Olsen 2004). Incorporating information about spatial autocorrelation in the data can increase precision in density estimates;

- All sample units in the sampling frame are ordered, such that any set of consecutively numbered units is a spatially well-balanced sample (Stevens and 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.

    The IMBCR design defines sampling units as 1-km^2 cells that were used to create a uniform grid over the entire BCR. All spatial data were compiled using ArcGIS 10.1 (Environmental Systems Research Institute 2012).

Grid-based Landbird Sampling Methods

Within each grid cell we established a 4 x 4 grid of 16 points spaced 250 meters apart (Figure 1). Surveyors with excellent aural and visual bird-identification skills conducted field work. Prior to conducting surveys, surveyors completed an intensive seven-day training program to ensure they had a complete understanding of field protocols and sufficient knowledge of bird identification. Surveyors attempted to survey all points within a grid cell each morning; however, not all 16 points were surveyed within every grid cell. Inclement weather, no access to private land and decreased bird activity were the most common reasons for all 16 points not being surveyed during the sampling of a grid cell.

Figure 1. IMBCR 1- km2 sample cell containing 16 survey points arranged in a 4 X 4 matrix.

Point counts (Buckland et al. 2001) were conducted following protocol established by IMBCR partners (Hanni et al. 2013). Surveyors conducted surveys in the morning, beginning 30 minutes before sunrise and concluding no later than 10:30 AM. For every bird detected during the six-minute period, observers recorded the species, sex, horizontal distance from the observer, minute and type of detection (e.g., call, song, visual). Surveyors measured distances to each bird using laser rangefinders. When it was not possible to measure the distance to a bird, observers estimated the distance by measuring to a nearby object. Surveyors recorded birds flying over but not using the immediate surrounding landscape. While surveyors traveled between points within a grid

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cell they recorded the presence of any species that had not been previously detected during one of the six-minute counts that morning. The opportunistic detections of these species were used for the creation of a species inventory and distribution mapping purposes for Camp Guernsey. Opportunistic detections between point count stations were not included in the occupancy and density analyses.

Surveyors 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. They 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, surveyors recorded time, ambient temperature, cloud cover, precipitation and wind speed. Surveyors navigated to each point using hand-held Global Positioning System (GPS) units. Before beginning each six-minute count, surveyors recorded vegetation data within a 50-meter radius of the point. Vegetation data included the dominant habitat type; structural stage and the relative abundance; percent cover and mean height of trees and shrubs by species; grass height; and ground cover types. Surveyors recorded vegetation data quietly to allow birds the time to return to normal habits prior to beginning each avian point count. For more detailed information about survey methods, refer to RMBO's Field Protocol for Spatially Balanced Sampling of Landbird Populations on our Avian Data Center website:
http://rmbo.org/v3/Portals/5/Protocols/2012%20Field_protocol_for_spacially_balanced_sampling_final.pdf.

RMBO surveyors conducted avian point counts within 20 distinct grid cells resulting in a total of 244 individual point count stations surveyed within the Camp Guernsey stratum (Figures 2 and 3). Surveys occurred between 24 May and 16 June, 2013. A total of 498 point count surveys were conducted within 40 distinct grid cells within the 6 strata representing the Wyoming portion of BCR 17. Surveys within the Wyoming portion of BCR 17 were conducted between 19 May and 11 July, 2013.

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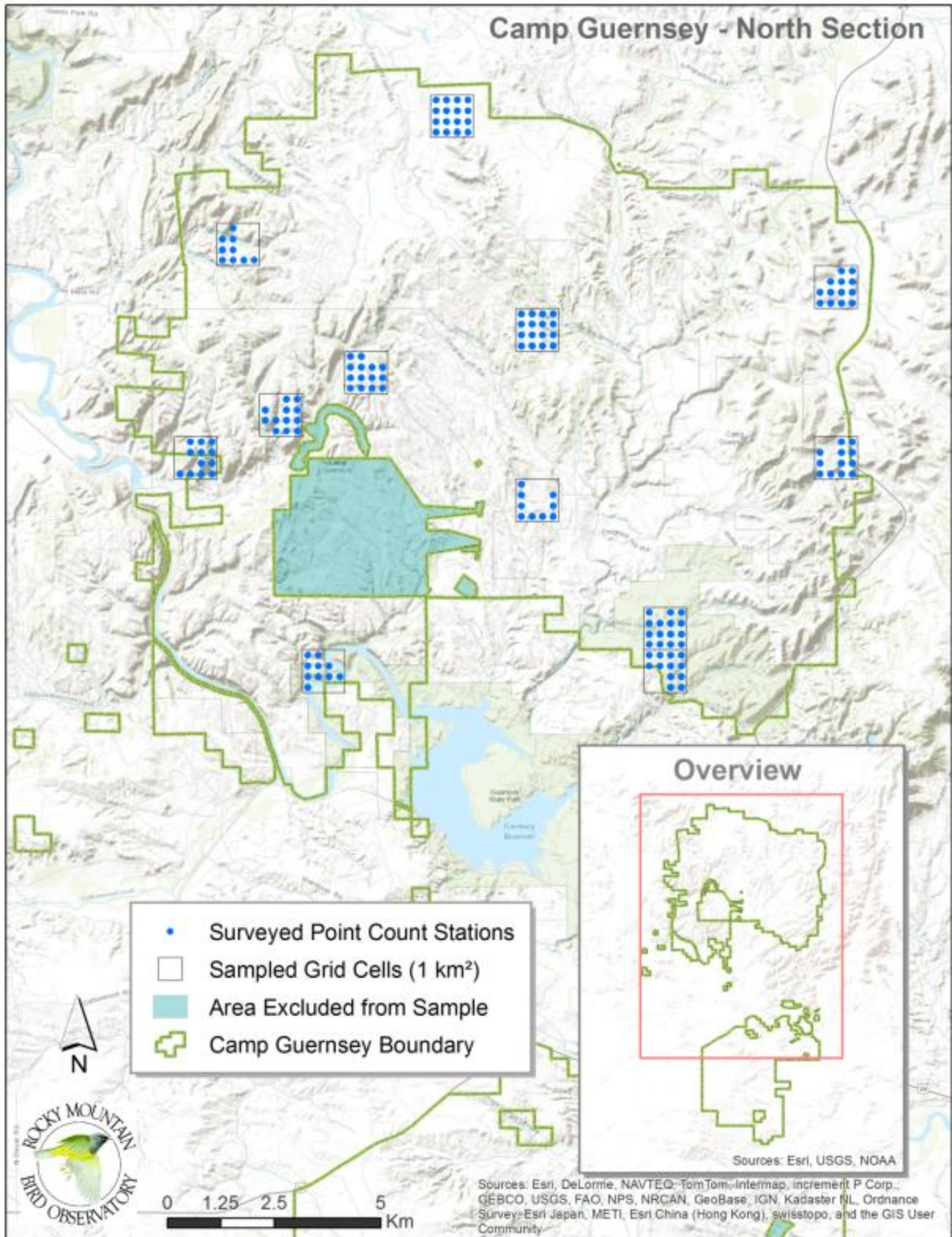
Figure 2. Locations of surveyed point count stations within the northern portion of Camp Guernsey in 2013.
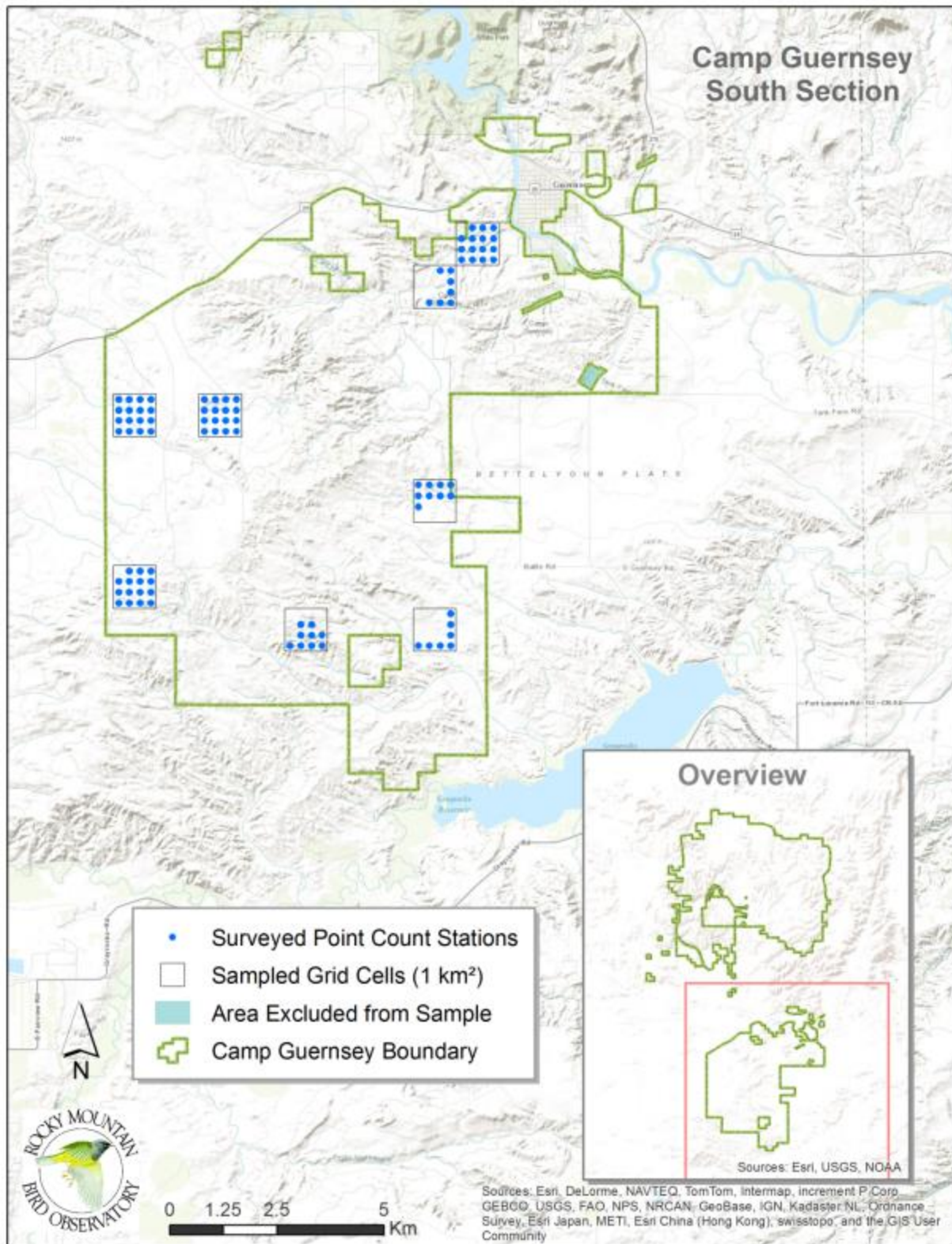
Figure 3. Locations of surveyed point count stations within the southern portion of Camp Guernsey in 2013.

Grid-based Landbird Data Analysis

Grid-based Landbird Density Analysis
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 three critical assumptions be met: 1) all birds at and near the sampling location (distance = 0) are detected; 2) distances to birds are measured accurately; and 3) birds do not move in response to the observer's presence (Buckland et al. 2001, Thomas et al. 2010).

Analysis of distance data includes fitting a detection function to the distribution of recorded distances (Buckland et al. 2001). The distribution of distances can be a function of characteristics of the object (e.g., for birds, size and color, movement, volume of song or call and frequency of call), the surrounding environment (e.g., density of vegetation) and observer ability. Because detectability varies among species, we analyzed these data separately for each species. We attempted to estimate densities of all species detected on Camp Guernsey and any of the strata comprising the Wyoming portion of BCR 17. The development of robust density estimates typically requires 80 or more independent detections (n ≥ 80) within the entire sampling area. When there were an insufficient number of avian detections for a species in 2013 to adequately estimate a species' detection probability, we included detection information from previous years to supplement the data set. We excluded birds flying over, but not using the immediate surrounding landscape, birds detected while migrating (not breeding), juvenile birds, and birds detected between points from analyses.

We estimated bird densities using the new RIMBCR package in Program R (R Core Team 2013) developed by Paul Lukacs of the University of Montana. RIMBCR streamlined data analysis procedures we had previously completed in multiple steps. RIMBCR calls the raw data from the IMBCR SQL server database maintained by RMBO and outputs final estimates in tabular format. For each species, RIMBCR fit one of three detection functions: global detection functions across years, detection functions modeling year as a covariate, and year-specific detection functions. RIMBCR used Akaike's Information Criterion (AIC) corrected for small sample size (AIC_c) and model selection theory to select the most parsimonious detection function for each species (Burnham and Anderson 2002). RIMBCR incorporated the SPSURVEY package (Kincaid 2008) in Program R to estimate density, population size and confidence intervals for each species. The SPSURVEY package uses spatial information from the survey locations to improve estimates of the variance of density. We computed density estimates for each stratum within the Wyoming portion of BCR 17 and for Camp Guernsey. Estimates for the Wyoming portion of BCR 17 were then created by calculating an area-weighted mean of the individual stratum-level estimates for the six strata making up the Wyoming portion of BCR 17.

Modeling Habitat for Pygmy Nuthatch

We extended a generalized multinomial mixture model developed by Royle (2004) and Chandler et al. (2011) to estimate population density, availability and probabilities of detection using spatial replication (Sparks et al. in prep). We developed a hierarchical model for Pygmy Nuthatch using three years of data (2010-2012) from the IMBCR program and the 2013 survey data collected on Camp Guernsey. The generalized multinomial mixture model used is a three level hierarchical model. The first level models the number of individuals at a sampling location, the second level models availability, the probability that an individual in the sample is available

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at the point, and the third level models detection probability. We used an Information Theoretic Approach to select the best model. Covariates considered on abundance were percent cover of ponderosa pine within the 1km^2 sampling grid (derived from the LandFire GISLANDFIRE vegetation layer), percent secondary habitat cover, mean elevation, BCR and year. The covariates considered on availability were BCR and year. Covariates considered on detection were Julian date and year. The distribution maps were created by using the coefficient estimates and corresponding covariates throughout Camp Guernsey ownership using the United States National Grid (USNG). We anticipated the density results produced through this analysis to differ from the density estimates presented through our Distance analysis because of the inclusion of vegetation and land cover covariates which were not incorporated in the primary Distance analysis.

Grid-based Landbird Occupancy Analysis

Occupancy estimation is most commonly used to quantify the proportion of sample units (i.e., 1-km^2 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 multi-scale occupancy model 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 (Theta) and 3) the proportion of sampling units occupied by a species (Psi).

We truncated the data, using only detections less than 125m from the sample points. Truncating the data at less than 125m allowed us to use bird detections over a consistent plot size and ensured that the points were independent (points were spread 250m apart), which in turn allowed us to estimate Theta (the proportion of points occupied within each sampling unit) (Pavlacky et al. 2012).

We expected that 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 (Psi) for each stratum by evaluating four models with different structure for detection (*p*) and availability (represented by the proportion of points occupied within a grid cell) (Theta). Within these models, the estimates of *p* and Theta were held constant across the BCRs and/or allowed to vary by BCR. Models are defined as follows:

Model 1: Constrained *p* and Theta by holding these parameters constant across BCRs;
Model 2: Held *p* constant, but allowed Theta to vary across BCRs;
Model 3: Allowed *p* to vary across BCRs, but held Theta constant across BCRs;
Model 4: Allowed both *p* and Theta to vary across BCRs.

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We ran model 1 for species with less than 10 detections in all BCRs or less than 10 detections in all but 1 BCR. We ran models 1 through 4 for species with greater than 10 detections in more than 1 BCR. For the purpose of estimating regional variation in detection (p) and availability (Theta), we pooled data for BCRs with fewer than 10 detections into adjacent BCRs with sufficient numbers of detections. We used AIC corrected for small sample size (AIC_c) and model selection theory to evaluate models from which estimates of Psi were derived for each species (Burnham and Anderson 2002). We model averaged the estimates of Psi from models 1 through 4 and calculated unconditional standard errors (Burnham and Anderson 2002).

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 Theta (Nichols et al. 2008, Pavlacky et al. 2012). We considered both p and Theta to be nuisance variables that were important for generating unbiased estimates of Psi. Theta 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 et al. 2012).

The RIMBCR package streamlined occupancy analyses by calling the raw data from the IMBCR SQL server database and incorporating the R code we created in previous years. 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 p and Theta. The RIMBCR program utilized program MARK (White and Burnham 1999) and package RMark (Laake 2013) to fit the multi-scale occupancy models and to estimate model parameters. We combined stratum-level estimates of Psi using an area-weighted mean to produce the Wyoming portion of BCR 17 estimates. Sampling variances and standard errors for the combined estimates of Psi were estimated in RIMBCR using the delta method (Powell 2007). We estimated the proportion of sampling units occupied (Psi) for all species that were detected on a minimum of 10 points and were less than 125 m from each point, except in cases where model convergence failed. We did not report occupancy estimates for species occurring on fewer than 10 points because of unreliable model convergence.

Riparian Area Searches

RMBO conducted three days of avian area searches in targeted riparian areas based on conversations with the natural resource manager for the Wyoming Military Department. Surveys were conducted in the Patten Creek and Broom Creek drainages on separate days and a pair of riparian area searches were conducted along South Broom Creek and near the North Platte River just south of the impact area on a single day (Figure 4).

Area search data were collected between 5AM and 11PM by experienced observers on days when weather met the conditions for conducting grid-based landbird surveys. Raw counts of individuals by species were recorded. Additionally, the observers recorded if the individuals detected were observed in a pair, flock, foraging, carrying nesting material, engaging in a territorial display or if an active nest was found. These data were not incorporated in the grid-based landbird occupancy and density analyses and resulting estimates because the methods did not allow for estimating incomplete detection or account for survey effort. Table 1 and Figure 4 show the UTM locations of start and end points for the riparian area search transects and the locations of the area searches; respectively.

Table 1. UTM coordinates of start and end points during area searches in riparian habitat in Camp Guernsey. UTM coordinates are projected in NAD83, Zone 13.

Area Search Location	Start UTM Easting	Start UTM Northing	End UTM Easting	End UTM Northing
Broom Creek Canyon	518650	4692800	518270	4696000
Patten Creek	522152	4698892	521882	4698719
S. Broom Creek Canyon	517493	4689103	517636	4690390
S of Impact Area	513558	4689837	512572	4689228

Raptor Surveys

RMBO surveyors searched for raptor nests on Camp Guernsey during four afternoons. One raptor survey was conducted on foot within Broom Creek Canyon. The other three surveys were conducted primarily from vehicles and were focused on visiting the previously known raptor nests illustrated in Figures 5 and 6. Observers attempted to identify the species associated with the nest (if birds were present), recorded UTM coordinates of observed nests and documented nestlings or parents that were seen. These data were not incorporated in the grid-based landbird occupancy and density analyses or resulting estimates because the methods did not allow for estimating incomplete detection or account for survey effort.
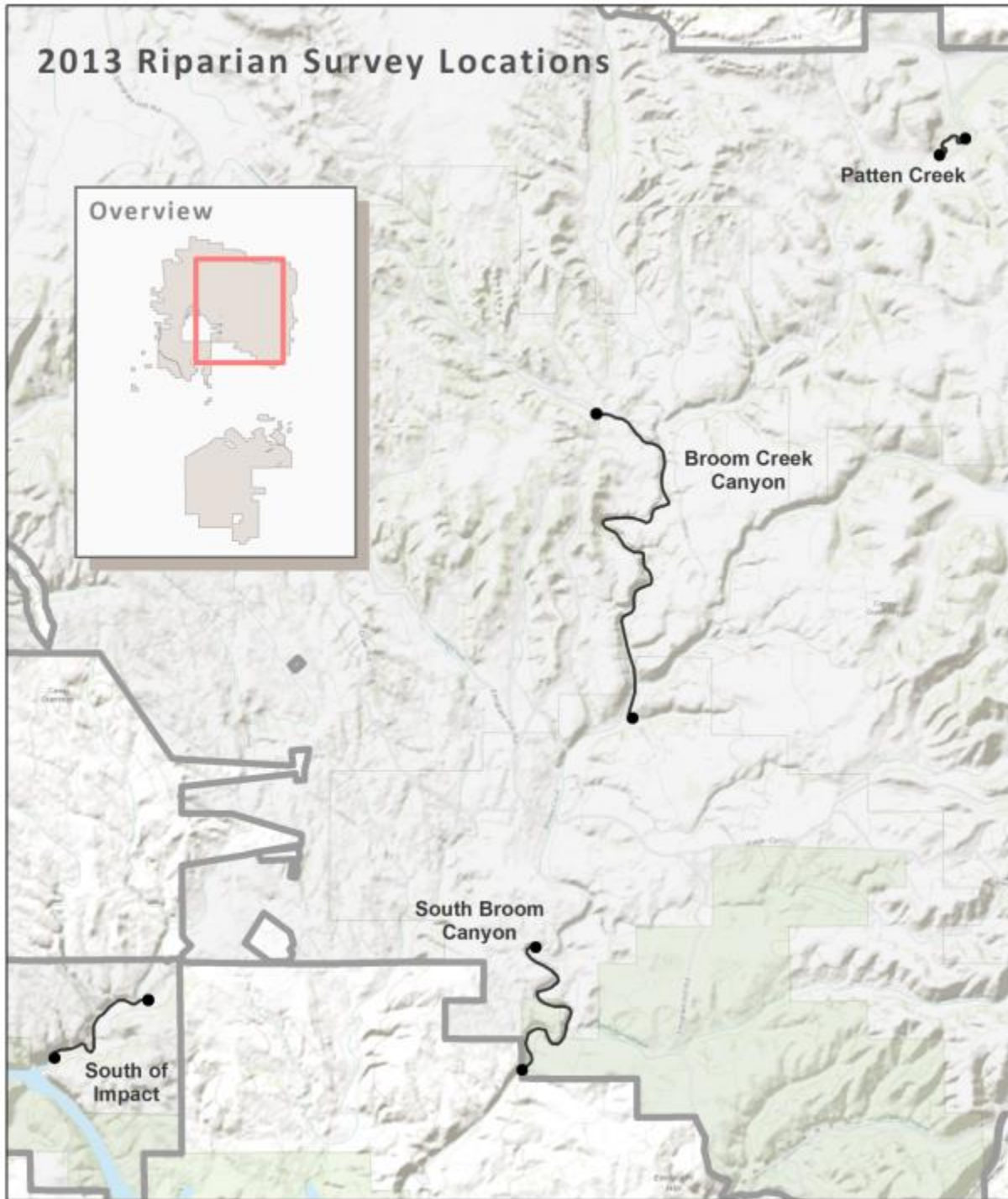
Figure 4. Locations of 2013 area searches conducted in riparian habitat on Camp Guernsey.
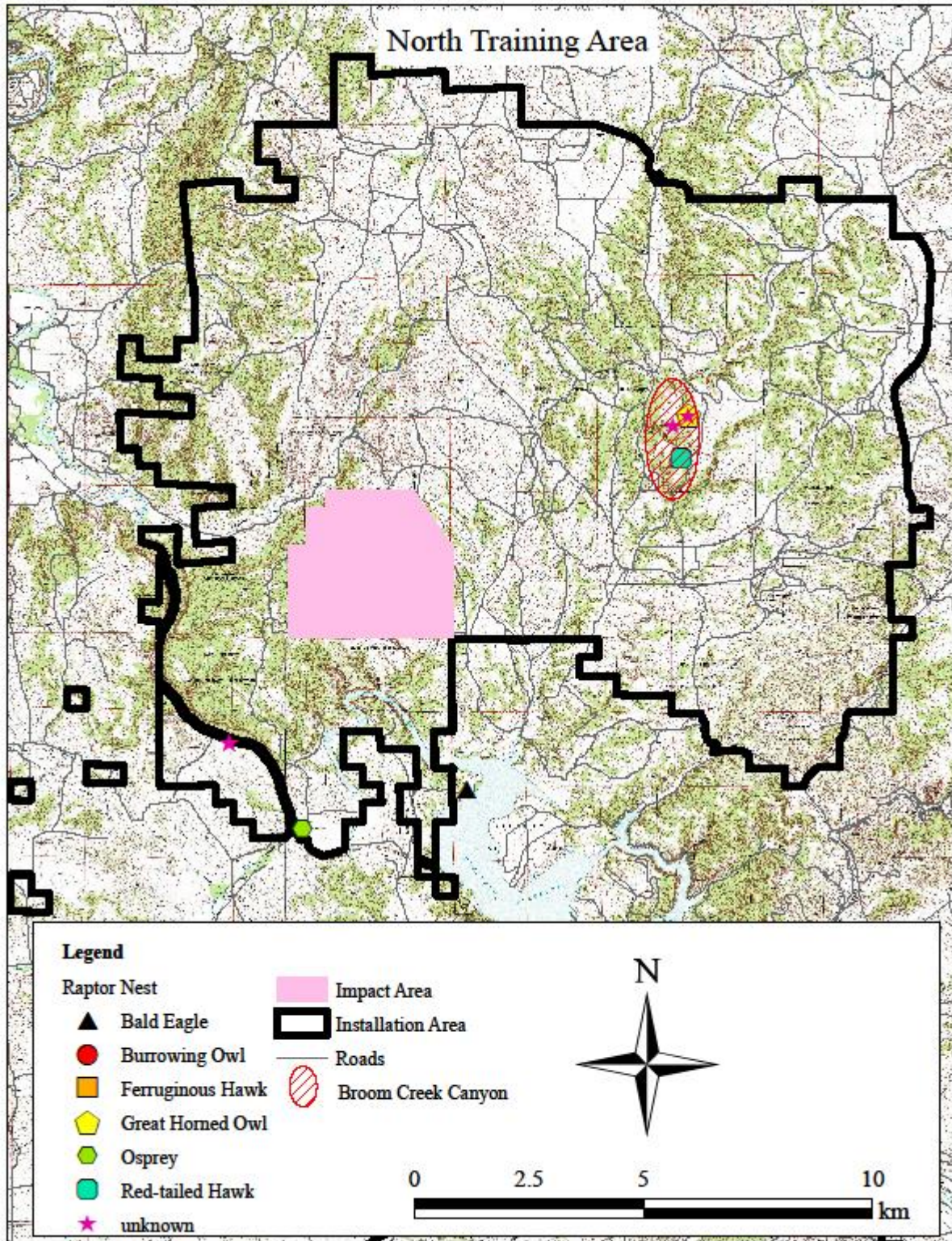
Figure 5. Raptor nest locations that were visited during raptor surveys conducted within the North Training Area on Camp Guernsey in 2013. Figure provided by the Wyoming Military Department.
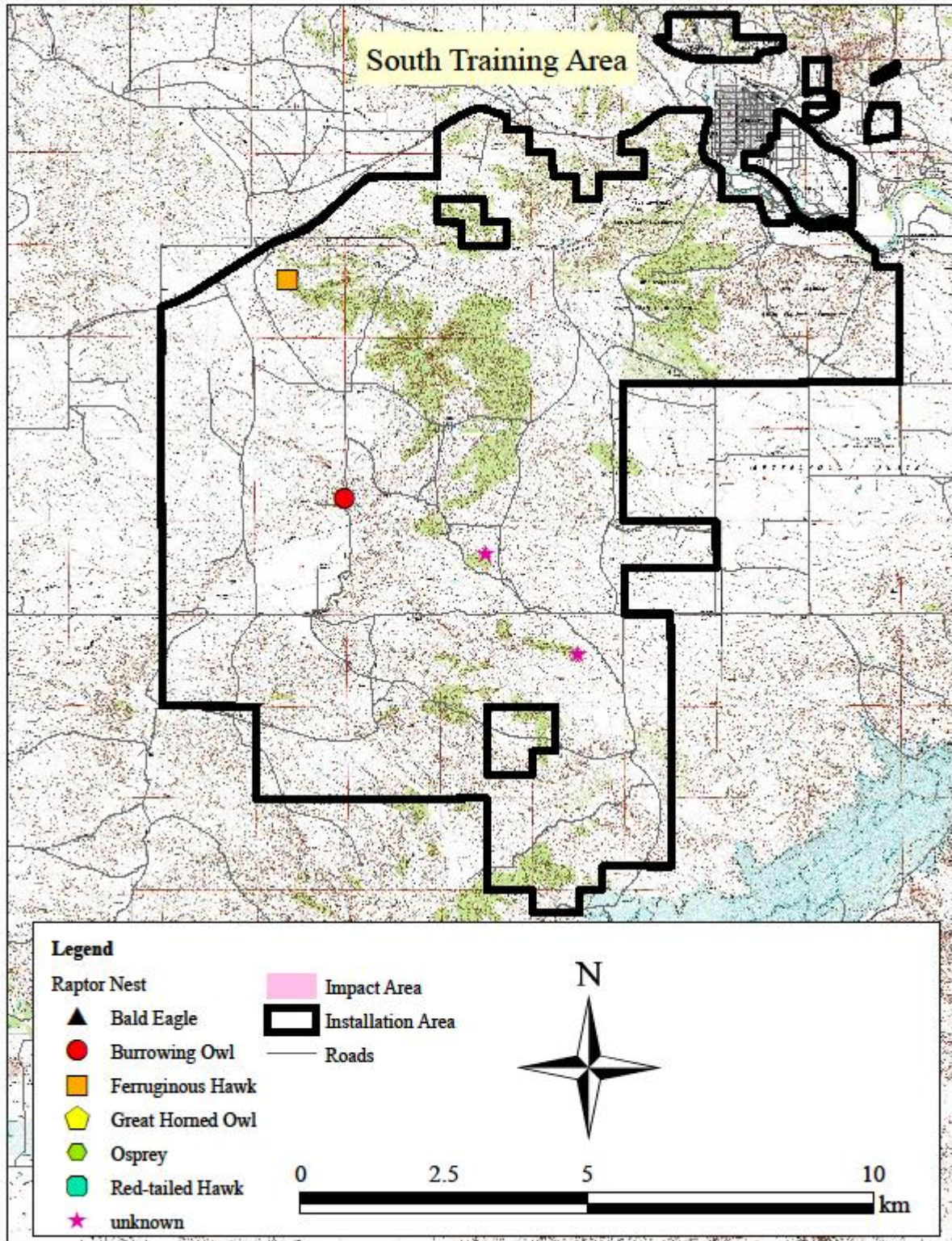
Figure 6. Raptor nest locations that were visited during raptor surveys conducted within the South Training Area on Camp Guernsey in 2013. Figure provided by the Wyoming Military Department.

RESULTS

Grid-based Landbird Surveys

We detected 2,620 individual birds during 244 point count surveys on 20 unique 1 km^2 grid cells (10.74 individuals/point count) within Camp Guernsey, compared to 6,413 individual birds detected during 498 point count surveys on 40 unique 1 -km^2 grid cells (12.88 individuals/point count) within the Wyoming portion of BCR 17. Surveyors detected 79 avian species during point counts on Camp Guernsey and 105 species within the Wyoming portion of BCR 17 in 2013.

Density and Occupancy Estimates
Using the RIMBCR analysis program, we estimated the densities of 67 species found on Camp Guernsey (Table 2). We calculated the coefficient of variation (% CV) for all estimates to provide a unit of measurement for the precision of the results. The % CV demonstrates the relationship between the standard deviation of the estimate and the mean. Generally, a % CV less than 50% reflects a very precise estimate, a % CV of 50% to 100% is considered moderately precise and estimates with a % CV greater than 100% cannot be considered precise. Twenty-two estimates for species on Camp Guernsey have a % CV of less than 50 (Table 2). Additionally, we estimated densities of 82 species within the Wyoming portion of BCR 17; 39 of which had robust estimates with a % CV of less than 50 (Table 2). In total, we estimated densities of 101 species that occur within Camp Guernsey or the Wyoming portion of BCR 17 (Table 2). Twenty-four of these species have received special designation within BCR 17 by Partners in Flight. Twenty one of the species (31%) for which we estimated Camp Guernsey densities exhibited significantly higher densities on Camp Guernsey than throughout the Wyoming portion of BCR 17. Conversely, 33 of the 82 species (40%) for which we estimated WY BCR 17 densities exhibited significantly higher densities within WY BCR 17 than on Camp Guernsey.

Using the RIMBCR package we were able to estimate occupancy rates (the proportion of 1km^2 grid cells expected to be occupied by one or more individuals) of 66 of the 79 species detected on Camp Guernsey during point counts (Table 3). We calculated occupancy estimates with a % CV less than 50 for 26 of these species. Additionally, we calculated occupancy rates (the proportion of 1km^2 grid cells expected to be occupied by the species) for 84 species within the Wyoming portion of BCR 17; all of which have a % CV less than 50. In total, we estimated occupancy rates for 99 species that occur within Camp Guernsey and/or the Wyoming portion of BCR 17. Twenty-one of the species we estimated occupancy rates for have received special designation within BCR 17 by Partners in Flight. 30 of the 66 species (45%) for which we estimated Camp Guernsey occupancy rates exhibited higher occupancy rates (psi) on Camp Guernsey than throughout the Wyoming portion of BCR 17. Conversely, 43 of the 84 (52%) species for which we estimated WY BCR 17 occupancy rates exhibited significantly higher Psi values within WY BCR 17 than on Camp Guernsey.

The results can also be viewed can be viewed at the Rocky Mountain Avian Data Center (http://rmbo.org/v3/avian/ExploretheData.aspx) by visiting http://www.rmbo.org/new_site/adc/QueryWindow.aspx#N4IgzgLgTghhCuBbEAuEB1AmgWgCI HldsBhAcRQAJcBTABxigkWoDsIKB7AMyuq9bDUK2CsRiJaFUvGpQWggJ4UQAXyAAA== and then clicking the "Run Query" button near the top of the "Explore the Data" screen on the Rocky Mountain Avian Data Center. Additional occupancy and density results for other geographic regions that may be of interest to Camp Guernsey managers can be viewed at the Rocky Mountain Avian Data Center (http://rmbo.org/v3/avian/ExploretheData.aspx). Other regional estimates that may act as appropriate comparisons include 2013 Wyoming statewide estimates:

http://www.rmbo.org/new_site/adc/QueryWindow.aspx#N4IgzgrgDgpgTmALnAhoiBbEAuEB1AT
RABoQBPGFOHEAJgAYBGAZhAF8gAA2013 Wyoming Statewide Estimates

Detailed directions on how to run customized queries on the Rocky Mountain Avian Data Center
can be found in Appendix A or at: http://rmbo.org/v3/avian/ExploretheData/UsageTips.aspx

Table 2. Estimated densities of breeding bird species on Camp Guernsey and the Wyoming portion of BCR 17 for 2013. The estimated densities per km^2 (D), the upper (UL D) and lower (LL D) 95% confidence limits for D, the total estimated population size of the study area (N), the number of independent detections used in analyses (n), percent coefficient of variation of estimates (% CV) and the number of sample cells used in analyses (S) are shown. Densities that are significantly higher in Camp Guernsey than the WY portion of BCR 17 (confidence limits do not overlap) or vice versa are bolded. The % CV indicates the precision of the estimate with values below 50% representing very precise estimates, values between 50% and 100% representing fairly robust estimates and values greater than 100% representing estimates with a low level of precision. The species names of BCR 17 priority species, as designated by Partners in Flight, are italicized.

	WY BCR-17						Camp Guernsey					
Common Name	D	LL D	UL D	N	n	% CV D	D	LL D	UL D	N	n	% CV D
American Crow	0.46	0.10	2.11	29,780	32	90	0.60	0.33	1.10	168	27	30
American Goldfinch	6.57	2.40	17.99	421,871	31	55	5.85	2.89	11.82	1,638	30	35
American Kestrel	0.25	0.05	1.38	15,986	2	107	0.81	0.23	2.84	226	5	70
American Redstart	**0.20**	**0.08**	**0.49**	12,790	14	49	0	0	0	0	0	0
American Robin	8.90	4.23	18.71	570,952	162	39	6.74	3.61	12.60	1,889	38	31
Ash-throated Flycatcher	0	0	0	0	0	0	**0.59**	**0.22**	**1.57**	165	6	50
Barn Swallow	0.16	0.05	0.48	10,037	4	62	0.50	0.09	2.92	140	1	102
Black-billed Magpie	0.41	0.10	1.69	26,480	9	82	0.04	0.01	0.22	11	1	99
Black-capped Chickadee	5.45	1.50	19.75	349,650	72	73	1.25	0.39	4.03	351	6	61
Black-headed Grosbeak	0.32	0.08	1.21	20,214	11	78	**3.73**	**1.95**	**7.14**	1,045	22	32
Blue Jay	0.41	0.10	1.61	26,331	9	79	0.14	0.04	0.52	39	2	70
Blue-gray Gnatcatcher	0.90	0.18	4.48	57,989	1	97	**15.19**	**7.50**	**30.77**	4,254	24	35
Brewer's Blackbird	13.73	4.92	38.25	880,680	34	56	1.92	0.70	5.27	537	5	52
Brewer's Sparrow	21.55	12.09	38.41	1,382,687	255	30	3.95	1.00	15.61	1,107	22	73
Brown Creeper	**1.34**	**0.26**	**6.84**	86,073	2	100	0	0	0	0	0	0
Brown Thrasher	0	0	0	0	0	0	**0.21**	**0.06**	**0.75**	58	2	68
Brown-headed Cowbird	22.21	13.79	35.77	1,424,977	171	25	27.56	17.37	43.73	7,717	127	23
Bullock's Oriole	1.57	0.43	5.75	100,841	10	74	2.61	1.02	6.66	730	11	47
Canada Goose	0.43	0.14	1.34	27,553	16	64	0.19	0.04	0.94	54	6	89
Canyon Wren	0	0	0	0	0	0	**0.04**	**0.01**	**0.24**	12	1	101

	WY BCR-17						Camp Guernsey					
Common Name	D	LL D	UL D	N	n	% CV D	D	LL D	UL D	N	n	% CV D
Cassin's Kingbird	0	0	0	0	0	0	**0.30**	**0.10**	**0.89**	84	3	56
Cassin's Sparrow	0	0	0	0	0	0	**0.12**	**0.02**	**0.71**	34	1	103
Cedar Waxwing	**4.73**	**0.92**	**24.26**	303,760	8	100	0	0	0	0	0	0
Chestnut-collared Longspur	**0.03**	**0.01**	**0.08**	1,670	2	66	0	0	0	0	0	0
Chipping Sparrow	15.76	7.02	35.37	1,011,332	144	43	29.45	17.43	49.74	8,246	75	26
Clay-colored Sparrow	**0.50**	**0.10**	**2.50**	31,951	2	99	0	0	0	0	0	0
Cliff Swallow	0.16	0.03	0.81	10,074	1	101	**6.37**	**1.63**	**24.90**	1,784	9	73
Common Grackle	4.60	0.85	24.80	295,423	7	104	1.61	0.36	7.19	451	4	83
Common Nighthawk	0.23	0.06	0.89	14,541	13	79	1.05	0.49	2.28	295	9	38
Common Raven	**0.21**	**0.04**	**1.06**	13,177	3	100	0	0	0	0	0	0
Cordilleran Flycatcher	**0.06**	**0.02**	**0.19**	4,047	5	61	0	0	0	0	0	0
Dark-eyed Junco	6.24	2.39	16.29	400,113	78	52	0.45	0.08	2.63	125	1	102
Downy Woodpecker	0.01	0.00	0.06	789	1	101	0.35	0.06	2.09	99	1	103
Dusky Flycatcher	0.66	0.20	2.13	42,101	18	66	0.60	0.17	2.17	168	2	68
Eastern Kingbird	1.33	0.37	4.80	85,091	6	73	2.39	0.96	5.96	669	18	46
European Starling	**0.67**	**0.13**	**3.38**	43,122	1	99	0	0	0	0	0	0
Field Sparrow	**0.09**	**0.02**	**0.42**	5,474	15	97	0	0	0	0	0	0
Grasshopper Sparrow	1.12	0.46	2.73	71,923	29	48	0.25	0.04	1.39	69	1	99
Green-tailed Towhee	**1.00**	**0.20**	**4.99**	64,150	4	98	0	0	0	0	0	0
Hairy Woodpecker	1.25	0.28	5.52	80,236	8	88	0.75	0.20	2.74	209	2	69
Hermit Thrush	**0.00**	**0.00**	**0.01**	149	1	100	0	0	0	0	0	0
Horned Lark	18.14	8.50	38.72	1,163,800	249	40	16.51	6.90	39.47	4,622	99	44
House Finch	0	0	0	0	0	0	**0.46**	**0.12**	**1.71**	128	2	70
House Wren	4.83	1.47	15.86	309,891	23	67	7.32	3.37	15.92	2,050	35	39
Killdeer	0.34	0.10	1.13	22,074	6	67	0.84	0.27	2.64	236	6	60
Lark Bunting	**27.09**	**12.18**	**60.26**	1,738,343	543	43	2.61	0.96	7.07	731	24	50

Common Name	WY BCR-17						Camp Guernsey					
	D	LL D	UL D	N	n	% CV D	D	LL D	UL D	N	n	% CV D
Lark Sparrow	4.93	2.23	10.87	316,044	47	42	**32.63**	**21.73**	**49.01**	9,138	149	20
Lazuli Bunting	0	0	0	0	0	0	**0.64**	**0.16**	**2.52**	180	3	73
Least Flycatcher	**0.10**	**0.02**	**0.55**	6,616	1	103	0	0	0	0	0	0
Lesser Goldfinch	0	0	0	0	0	0	**1.65**	**0.33**	**8.29**	461	2	95
Loggerhead Shrike	**0.54**	**0.20**	**1.49**	34,697	6	55	0	0	0	0	0	0
Mallard	**0.24**	**0.07**	**0.79**	15,370	3	67	0	0	0	0	0	0
McCown's Longspur	**0.06**	**0.01**	**0.29**	3,626	1	100	0	0	0	0	0	0
Mountain Bluebird	1.81	0.78	4.20	116,307	14	45	5.70	3.25	9.97	1,595	25	27
Mountain Plover	**0.01**	**0.00**	**0.05**	624	1	105	0	0	0	0	0	0
Mourning Dove	2.54	1.50	4.30	162,765	56	27	5.38	3.19	9.08	1,507	67	26
Northern Flicker	0.88	0.36	2.17	56,566	29	49	0.41	0.12	1.43	116	5	65
Northern Harrier	**0.05**	**0.01**	**0.24**	2,925	1	102	0	0	0	0	0	0
Northern Mockingbird	**0.00**	**0.00**	**0.02**	303	1	99	0	0	0	0	0	0
Northern Rough-winged Swallow	6.76	1.87	24.38	433,489	8	73	0.66	0.11	3.88	184	1	104
Orchard Oriole	**0.69**	**0.12**	**4.12**	44,322	1	114	0	0	0	0	0	0
Ovenbird	**3.12**	**0.99**	**9.80**	200,316	138	64	0	0	0	0	0	0
Pine Siskin	0.47	0.13	1.65	30,019	32	72	0.71	0.20	2.54	199	2	67
Pinyon Jay	0	0	0	0	0	0	**0.14**	**0.02**	**0.84**	40	1	102
Plumbeous Vireo	0.48	0.17	1.35	30,644	24	57	0.42	0.11	1.64	116	3	73
Pygmy Nuthatch	0	0	0	0	0	0	**0.27**	**0.05**	**1.53**	76	1	99
Red Crossbill	**1.74**	**0.42**	**7.23**	111,403	16	84	0	0	0	0	0	0
Red-breasted Nuthatch	**3.05**	**0.78**	**11.95**	195,437	59	79	0.12	0.02	0.68	33	1	101
Red-eyed Vireo	**0.07**	**0.02**	**0.20**	4,466	10	57	0	0	0	0	0	0
Red-headed Woodpecker	0	0	0	0	0	0	**0.36**	**0.06**	**2.08**	100	2	103
Red-naped Sapsucker	**0.18**	**0.06**	**0.58**	11,723	6	64	0	0	0	0	0	0
Red-tailed Hawk	0.13	0.03	0.68	8,471	2	100	0.18	0.04	0.75	51	2	79

Common Name	WY BCR-17						Camp Guernsey					
	D	LL D	UL D	N	n	% CV D	D	LL D	UL D	N	n	% CV D
Red-winged Blackbird	**5.59**	**2.10**	**14.87**	358,962	54	53	0	0	0	0	0	0
Ring-necked Pheasant	**0.01**	**0.00**	**0.05**	573	6	100	0	0	0	0	0	0
Rock Wren	1.31	0.66	2.58	83,932	25	36	**6.72**	**4.30**	**10.49**	1,880	116	22
Ruby-crowned Kinglet	**0.04**	**0.02**	**0.10**	2,552	6	52	0	0	0	0	0	0
Sage Thrasher	0.08	0.02	0.28	5,076	6	72	0.04	0.01	0.21	10	1	102
Savannah Sparrow	0	0	0	0	0	0	**0.39**	**0.07**	**2.20**	109	1	99
Say's Phoebe	0.06	0.02	0.16	3,566	6	56	**1.37**	**0.71**	**2.67**	384	23	33
Sharp-tailed Grouse	**0.01**	**0.00**	**0.04**	485	2	101	0	0	0	0	0	0
Spotted Towhee	7	3	17	468,482	59	45	9.15	4.96	16.88	2,561	56	30
Swainson's Hawk	0	0	0	5,446	1	101	0	0	0	0	0	0
Swainson's Thrush	0	0	2	24,585	8	86	0	0	0	0	0	0
Townsend's Solitaire	**1**	**0**	**2**	32,556	20	81	0	0	0	0	0	0
Tree Swallow	0	0	0	0	0	0	**0.94**	**0.16**	**5.65**	264	2	105
Upland Sandpiper	0	0	1	14,010	8	87	0.20	0.05	0.73	55	6	70
Veery	0	0	0	1,764	5	101	0	0	0	0	0	0
Vesper Sparrow	9	4	17	556,655	166	36	5.36	1.85	15.50	1,501	68	54
Violet-green Swallow	11	4	32	703,854	8	60	4.32	0.96	19.44	1,209	3	83
Warbling Vireo	1	0	3	71,341	77	52	0.20	0.04	1.17	57	1	100
Western Flycatcher	0	0	0	3,942	5	61	0	0	0	0	0	0
Western Kingbird	1	0	1	33,163	12	53	**8.65**	**3.49**	**21.41**	2,422	54	46
Western Meadowlark	18	13	27	1,180,400	911	19	18.85	13.63	26.09	5,279	518	16
Western Tanager	1	0	2	48,020	55	42	0.47	0.12	1.91	133	3	75
Western Wood-Pewee	1.08	0.51	2.28	69,296	61	40	3.70	1.90	7.21	1,036	36	33
White-breasted Nuthatch	**1.07**	**0.34**	**3.36**	68,436	11	64	0	0	0	0	0	0
White-throated Swift	0	0	0	0	0	0	**15.19**	**3.01**	**76.55**	4,252	9	97
Wild Turkey	0.89	0.19	4.13	57,140	7	92	0.24	0.10	0.55	67	10	42

Common Name	WY BCR-17						Camp Guernsey					
	D	LL D	UL D	N	n	% CV D	D	LL D	UL D	N	n	% CV D
Wilson's Snipe	**0.06**	**0.01**	**0.29**	3,586	1	100	0	0	0	0	0	0
Yellow Warbler	1.62	0.63	4.19	104,179	5	51	2.05	0.64	6.54	573	9	60
Yellow-rumped Warbler	4.06	2.02	8.19	260,724	81	37	0.94	0.32	2.81	264	3	56

Table 3. Estimated proportion of 1km^2 sample units occupied (Psi), percent coefficient of variation of Psi (% CV), the standard error associated with Psi (SE), and number of sample cells with one or more detections (nTran) of breeding bird species on Camp Guernsey and the Wyoming portion of BCR 17. Psi values can be interpreted as the percent of the landscape occupied by each species and/or the probability that a 1km^2 grid cell will have one or more individuals of that species. Psi values that are significantly higher in Camp Guernsey than the WY portion of BCR 17 (standard errors do not overlap) or vice versa are bolded. The % CV indicates the precision of the estimate with values below 50% representing very precise estimates, values between 50% and 100% representing fairly robust estimates and values greater than 100% representing estimates with a low level of precision. S indicates the number of sample cells used in analyses. Species names are italicized for BCR 17 priority species, as designated by Partners in Flight.

Species	WY BCR 17 (S = 40)				Camp Guernsey (S = 20)			
	Psi	SE	% CV	nTran	Psi	SE	% CV	nTran
American Crow	**0.11**	**0.02**	**20**	5	0	0	0	0
American Goldfinch	0.62	0.03	5	13	0.53	0.12	22	10
American Kestrel	0.49	0.07	15	5	0.76	0.32	43	5
American Redstart	**0.09**	**0.02**	**21**	7	0	0	0	0
American Robin	0.40	0.03	7	19	0.50	0.11	22	10
Ash-throated Flycatcher	0	0	0	0	**0.26**	**0.10**	**39**	5
Barn Swallow	0.02	0.00	13	3	0.08	0.08	98	1
Black-billed Magpie	**0.12**	**0.03**	**24**	1	0	0	0	0
Black-capped Chickadee	**0.27**	**0.03**	**10**	16	0.16	0.08	53	3
Black-headed Grosbeak	0.10	0.02	21	4	**0.59**	**0.13**	**22**	10
Blue Jay	**0.19**	**0.03**	**15**	5	0.07	0.06	98	1
Blue-gray Gnatcatcher	0.07	0.02	23	1	**0.62**	**0.11**	**18**	12
Brewer's Blackbird	**0.36**	**0.03**	**8**	10	0.21	0.09	45	4
Brewer's Sparrow	**0.61**	**0.03**	**5**	19	0.15	0.08	53	3
Brown Creeper	**0.09**	**0.02**	**23**	2	0	0	0	0
Brown Thrasher	0	0	0	0	**0.18**	**0.13**	**69**	2
Brown-headed Cowbird	0.80	0.02	3	30	0.75	0.10	13	15
Bullock's Oriole	0.26	0.03	11	5	0.28	0.11	39	5
Canada Goose	0.21	0.06	28	1	0.15	0.17	115	1
Cassin's Kingbird	0	0	0	0	**0.12**	**0.08**	**67**	2
Cassin's Sparrow	0	0	0	0	**0.05**	**0.05**	**97**	1
Cedar Waxwing	**0.11**	**0.02**	**22**	4	0	0	0	0
Chestnut-collared Longspur	**0.01**	**0.00**	**15**	2	0	0	0	0
Chipping Sparrow	0.32	0.03	9	17	**0.70**	**0.10**	**15**	14
Clay-colored Sparrow	**0.07**	**0.02**	**23**	1	0	0	0	0
Cliff Swallow	0.02	0.00	17	1	**0.18**	**0.10**	**53**	3
Common Grackle	0.09	0.02	23	1	0.12	0.08	67	2
Common Nighthawk	0.03	0.00	8	7	**0.23**	**0.12**	**54**	3
Common Raven	**0.09**	**0.02**	**23**	1	0	0	0	0
Common Yellowthroat	**0.08**	**0.02**	**23**	1	0	0	0	0
Cordilleran Flycatcher	0.01	0.00	12	3	0.06	0.06	98	1

Species	WY BCR 17 (S = 40)				Camp Guernsey (S = 20)			
	Psi	SE	% CV	nTran	Psi	SE	% CV	nTran
Dark-eyed Junco	**0.23**	**0.03**	**11**	15	0.05	0.05	97	1
Downy Woodpecker	0.00	0.00	24	1	0.08	0.08	99	1
Dusky Flycatcher	0.09	0.02	19	7	0.10	0.07	67	2
Dusky Grouse	**0.21**	**0.05**	**24**	1	0	0	0	0
Eastern Bluebird	**0.00**	**0.00**	**16**	2	0	0	0	0
Eastern Kingbird	0.27	0.03	12	3	**0.47**	**0.14**	**31**	7
European Starling	**0.15**	**0.02**	**16**	2	0	0	0	0
Field Sparrow	**0.01**	**0.00**	**19**	2	0	0	0	0
Grasshopper Sparrow	0.10	0.02	16	7	0.10	0.07	67	2
Green-tailed Towhee	**0.07**	**0.02**	**23**	1	0	0	0	0
Hairy Woodpecker	0.13	0.02	16	8	0.24	0.11	45	4
Hermit Thrush	**0.00**	**0.00**	**23**	1	0	0	0	0
Horned Lark	0.36	0.03	8	13	0.40	0.11	27	8
House Finch	0	0	0	0	**0.21**	**0.17**	**81**	2
House Wren	0.15	0.02	15	7	**0.40**	**0.11**	**27**	8
Killdeer	0.12	0.02	19	2	0.19	0.10	54	3
Lark Bunting	**0.32**	**0.03**	**8**	16	0.20	0.09	45	4
Lark Sparrow	0.35	0.03	8	12	**0.92**	**0.07**	**7**	18
Lazuli Bunting	0	0	0	0	**0.11**	**0.07**	**67**	2
Least Flycatcher	**0.02**	**0.00**	**17**	1	0	0	0	0
Lesser Goldfinch	0	0	0	0	**0.12**	**0.08**	**67**	2
Loggerhead Shrike	**0.40**	**0.06**	**14**	4	0	0	0	0
Mallard	**0.25**	**0.04**	**16**	2	0	0	0	0
McCown's Longspur	**0.02**	**0.00**	**17**	1	0	0	0	0
Mountain Bluebird	0.31	0.03	10	7	**0.76**	**0.12**	**16**	13
Mountain Chickadee	0	0	0	0	**0.05**	**0.05**	**97**	1
Mountain Plover	**0.01**	**0.00**	**17**	1	0	0	0	0
Mourning Dove	0.45	0.03	7	15	0.58	0.12	20	11
Northern Flicker	**0.21**	**0.03**	**13**	11	0.06	0.06	97	1
Northern Harrier	**0.19**	**0.05**	**25**	1	0	0	0	0
Northern Rough-winged Swallow	**0.31**	**0.03**	**11**	7	0.14	0.09	68	2
Orchard Oriole	**0.11**	**0.03**	**24**	1	0	0	0	0
Ovenbird	**0.16**	**0.02**	**14**	12	0	0	0	0
Pine Siskin	0.01	0.00	12	3	**0.12**	**0.08**	**67**	2
Plumbeous Vireo	0.11	0.02	16	9	0.11	0.07	67	2
Pygmy Nuthatch	0	0	0	0	**0.19**	**0.14**	**74**	2
Red Crossbill	**0.08**	**0.02**	**19**	10	0	0	0	0
Red-breasted Nuthatch	**0.19**	**0.02**	**12**	15	0.05	0.05	97	1
Red-eyed Vireo	**0.01**	**0.00**	**10**	4	0	0	0	0
Red-headed Woodpecker	0	0	0	0	**0.06**	**0.06**	**98**	1

Species	WY BCR 17 (S = 40)				Camp Guernsey (S = 20)			
	Psi	SE	% CV	nTran	Psi	SE	% CV	nTran
Red-naped Sapsucker	**0.01**	**0.00**	**10**	4	0	0	0	0
Red-tailed Hawk	0.01	0.00	28	1	0.23	0.27	118	1
Red-winged Blackbird	**0.38**	**0.03**	**8**	7	0	0	0	0
Rock Wren	0.34	0.03	9	6	**0.82**	**0.10**	**13**	15
Ruby-crowned Kinglet	**0.00**	**0.00**	**12**	3	0	0	0	0
Savannah Sparrow	0	0	0	0	**0.05**	**0.05**	**97**	1
Say's Phoebe	0.04	0.01	13	2	**0.48**	**0.17**	**35**	6
Spotted Towhee	0.32	0.03	9	12	**0.55**	**0.11**	**20**	11
Swainson's Thrush	**0.08**	**0.02**	**22**	4	0	0	0	0
Townsend's Solitaire	**0.09**	**0.02**	**21**	7	0	0	0	0
Tree Swallow	0	0	0	0	**0.07**	**0.06**	**98**	1
Turkey Vulture	0	0	0	0	**0.35**	**0.20**	**56**	3
Upland Sandpiper	0	0	0	0	**0.13**	**0.09**	**67**	2
Veery	**0.00**	**0.00**	**23**	1	0	0	0	0
Vesper Sparrow	0.45	0.03	7	16	0.51	0.11	22	10
Violet-green Swallow	0.19	0.03	14	5	0.17	0.09	53	3
Warbling Vireo	0.09	0.02	19	11	0.05	0.05	97	1
Western Bluebird	**0.07**	**0.02**	**23**	1	0	0	0	0
Western Kingbird	0.13	0.02	17	4	**0.61**	**0.14**	**22**	10
Western Meadowlark	0.76	0.03	3	24	0.75	0.10	13	15
Western Tanager	0.16	0.02	14	14	0.15	0.08	53	3
Western Wood-Pewee	0.25	0.03	11	14	**0.51**	**0.11**	**22**	10
White-breasted Nuthatch	**0.17**	**0.03**	**15**	6	0.06	0.05	97	1
White-throated Swift	0	0	0	0	**0.18**	**0.10**	**54**	3
Wild Turkey	**0.01**	**0.00**	**19**	2	0	0	0	0
Yellow Warbler	0.28	0.03	10	4	0.20	0.09	45	4
Yellow-rumped Warbler	0.32	0.03	9	18	0.25	0.10	39	5

Pygmy Nuthatch Distribution Model

Pygmy Nuthatch abundance was highest in areas represented by approximately 60% ponderosa pine tree cover within the LANDFIRE GIS layer (USFS 2008) (Figure 7). We found little evidence that Pygmy Nuthatch density was affected by elevation or secondary habitat cover. The ponderosa pine and BCR covariates were the best at predicting abundance. Figure 8 below shows the predicted Pygmy Nuthatch abundance based on the percent ponderosa pine canopy cover within the 1km^2 grid cells.
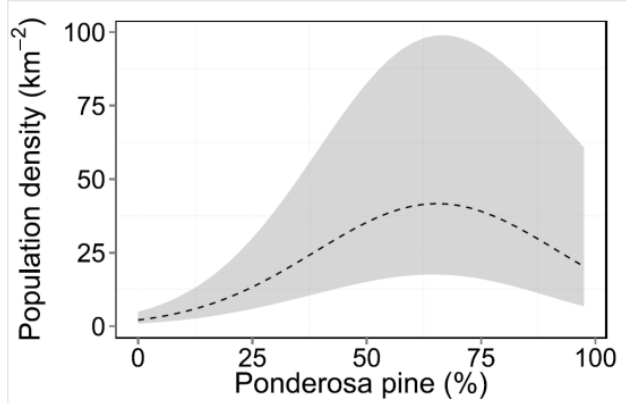

Figure 7. Predicted Pygmy Nuthatch density based on % ponderosa pine canopy cover.

Raptor Surveys

RMBO surveyors observed 12 instances of territorial birds or nests during the 4 afternoon raptor surveys (Table 4). Two of the nests were active at the time of the survey. Additionally, observers discovered one pair of Merlins demonstrating territorial behavior. A subsequent survey to determine the location of a possible Merlin nest was unsuccessful. Nine of the observed nests were unoccupied; therefore, surveyors were not able to make a determination on the species. It is possible that some of the unknown species nests' may have been built or used by corvids rather than raptors.

Table 4. Nests observed during the afternoon raptor surveys in 2013 on Camp Guernsey. The associated species, UTM information and notes are listed. UTM coordinates were projected in NAD83, zone 13.

| Species	UTM Easting	UTM Northing	NOTES
Ferruginous Hawk	512921	4676888	Occupied nest on rocky outcrop 100m S of coordinates. Three nestlings with food. Adult seen on approach.
Merlin	518021	4670326	Observed territorial pair. Pair not found on 6/15 follow-up visit.
Osprey	510565	4686054	Occupied nest 69m ENE of coordinates.
Unknown Bird	517544	4670397	Unoccupied nest; unknown species.
Unknown Bird	518141	4670261	Unoccupied nest; unknown species.
Unknown Bird	518046	4670242	Unoccupied nest; unknown species.
Unknown Bird	518014	4670229	Unoccupied nest; unknown species.
Unknown Bird	517928	4670267	Unoccupied nest; unknown species.
Unknown Bird	517358	4670562	Unoccupied nest; unknown species.
Unknown Bird	516593	4671848	Unoccupied nest; unknown species.
Unknown Bird	516487	4672040	Unoccupied nest; unknown species.
Unknown Bird	509036	4698552	Unoccupied nest; unknown species.
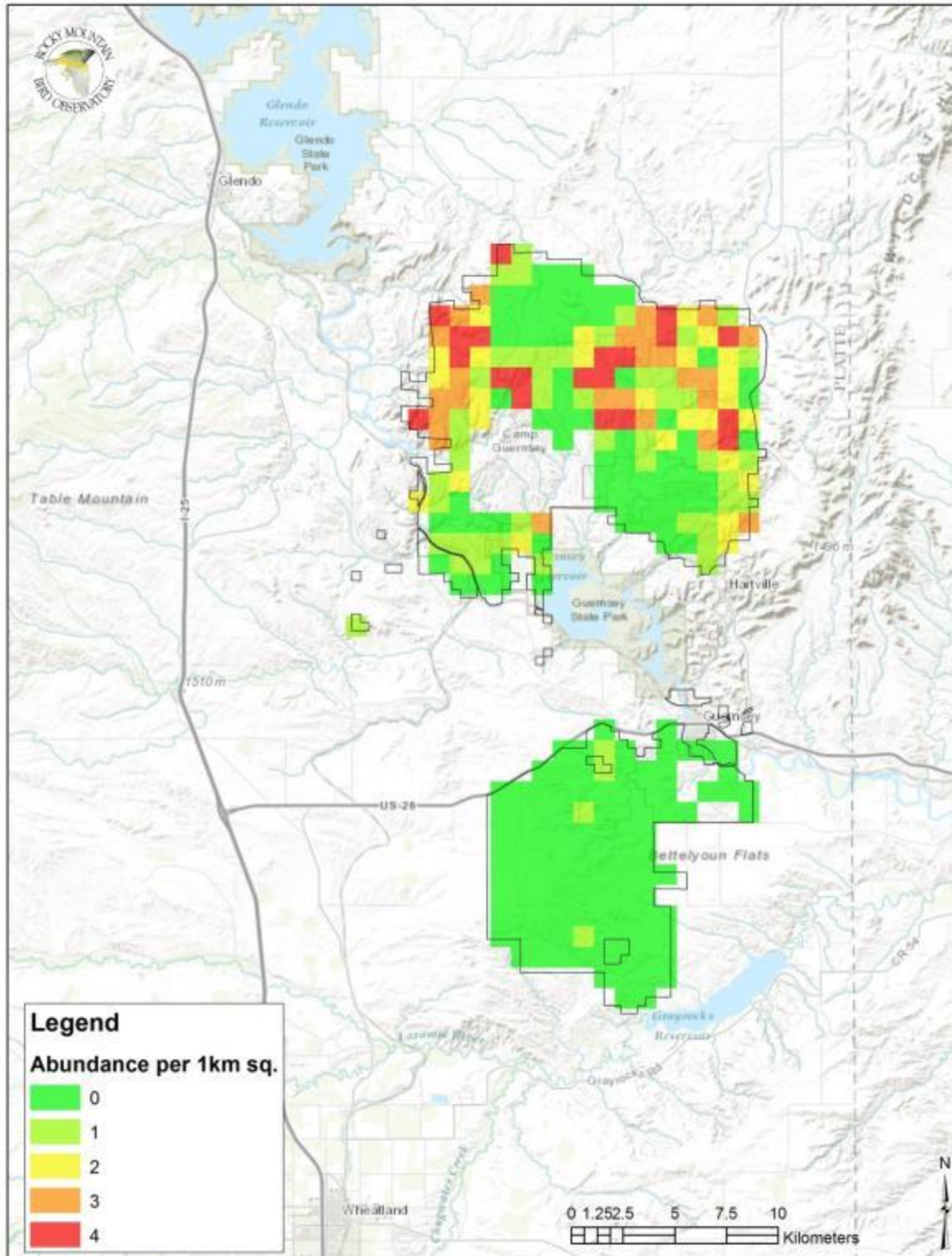
Figure 8. Predicted Pygmy Nuthatch density within Camp Guernsey based on habitat-based distribution modeling.

Riparian Area Searches

RMBO surveyors detected 1,288 individual birds of 54 species during 3 days of area searches within riparian habitat on Camp Guernsey (Table 5). The five most common species detected within riparian habitat during the area searches included Cliff Swallow, Brown-headed Cowbird, House Wren, Violet-green Swallow and Spotted Towhee. Of the 54 species detected during the riparian area searches, moderate to strong evidence of breeding was observed for 17 species. In addition, nests of 5 of the 54 were observed (Cliff Swallow, Violet-green Swallow, Yellow Warbler, American Robin and White-throated Swift); resulting in a total of 22 species that are likely to breed or have been confirmed to be breeding within Camp Guernsey riparian habitats. Eight of these species have received special designation within BCR 17 by Partners in Flight. Additional surveys would likely have further increased the number of suspected and confirmed breeders.

Table 5. Number of individual birds detected at each site, total number of individuals detected, observed behavior and levels of evidence for breeding by species on Camp Guernsey during three days of riparian habitat area searches. Behavior codes are as follows: Disp = Territorial/Breeding display, Flk = Flock, For = Foraging, Mat = Carrying material, Nst = Active nest observed, and Pr = Pair. Behaviors leading to the determination of the breeding status are bolded. Italicized species are designated as species of continental concern, continental stewardship, or regional concern by Partner's in Flight for Bird Conservation Region 17. Non-indigenous species are represented with an asterisk.

Species	Broom Creek Canyon	Patten Creek	South Broom Creek Canyon	S of Impact Area	Total Count	Camp Guernsey Breeding Status	Observed Behavior
American Goldfinch	2	2	3	9	16	Moderate Evidence	Pr
American Kestrel	3				3		
American Robin	10	2	8	3	23	Confirmed Breeding	Mat, **Nst**
Ash-throated Flycatcher				2	2	Moderate Evidence	Pr
Barn Swallow			1		1		
Black-capped Chickadee	1				1		
Black-headed Grosbeak	6	2	8	3	19	Moderate Evidence	Pr
Blue-gray Gnatcatcher	6		5	8	19	Moderate Evidence	For, **Pr**
Brewer's Blackbird	6				6		Flk
Brown-headed Cowbird	43	2	14	13	72	Moderate Evidence	Flk, **Pr**
Bullock's Oriole	1			2	3		
Canyon Wren	1			2	3		
Cassin's Kingbird	2				2		
Chipping Sparrow	2		3		5		
Cliff Swallow	20		6	606	632	Confirmed Breeding	For, Flk, Pr, **Nst**
Common Grackle	1			1	2		
Common Nighthawk	2				2		
Common Raven	6				6		
Eastern Bluebird	1				1		
Eastern Kingbird		1		3	4		
European Starling*	3				3	Moderate Evidence	Pr
Great-horned Owl			1		1		

Species	Broom Creek Canyon	Patten Creek	South Broom Creek Canyon	S of Impact Area	Total Count	Camp Guernsey Breeding Status	Observed Behavior
House Finch *	2	1	2		5		
House Wren	27	1	29	12	69		
Killdeer		2			2	Moderate Evidence	Pr
Lark Sparrow	5	2		2	9		
Lazuli Bunting	1			1	2		
Lesser Goldfinch			9	2	11		
Mallard			2	2	4	Moderate Evidence	Pr
Mountain Bluebird	5		3		8	Moderate Evidence	Pr
Mourning Dove	6	3	16	10	35	Moderate Evidence	Flk, **Pr**
Northern Flicker	5		1		6		
Northern Rough-winged Swallow			3		3	Moderate Evidence	For, **Pr**
Pine Siskin				1	1		
Plumbeous Vireo				3	3		
Red-breasted Nuthatch				1	1		
Red-tailed Hawk	1			1	2		
Red-winged Blackbird		5		6	11	Strong Evidence	Pr, **Disp**
Rock Wren	15		5	7	27		
Say's Phoebe	11		4		15	Strong Evidence	Mat
Spotted Towhee	19		19	13	51	Moderate Evidence	Pr
Tree Swallow				2	2	Moderate Evidence	Pr
Turkey Vulture	5				5		
Violet-green Swallow	36		17	12	65	Confirmed Breeding	For, Flk, Pr, **Nst**
Western Kingbird		3		2	5		
Western Meadowlark	15	6			21		
Western Wood-Pewee	8	2	3	5	18	Moderate Evidence	Pr
White-breasted Nuthatch	2				2		
White-throated Swift	8			8	16	Confirmed Breeding	Flk, For, Pr, Disp, **Nst**
Wild Turkey	2	1		1	4		

Species	Broom Creek Canyon	Patten Creek	South Broom Creek Canyon	S of Impact Area	Total Count	Camp Guernsey Breeding Status	Observed Behavior
Wood Duck			4		4	Moderate Evidence	Pr
Yellow Warbler	3	2	28	13	46	Confirmed Breeding	Pr, **Nst**
Yellow-breasted Chat			5	3	8		
Yellow-rumped Warbler	1				1		

DISCUSSION

Temporal and Spatial Comparisons

The IMBCR program's ability to make comparisons between small-scale locations, large regions, and across years can provide managers with important information about the lands they manage. Data collected and results produced for Camp Guernsey can be used in the following ways to inform avian conservation:

1) Population estimates can be compared in space and time. For example, estimates for Camp Guernsey 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 be used to make informed management decisions about 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) Annual estimates of density and occupancy 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;

4) 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 km^2 and the occupancy estimate for Western Meadowlark is 0.57, managers can estimate that 68,400 km^2 (120,000 km^2 * 0.57) of habitat within that stratum is occupied by Western Meadowlarks.

Management Implications

Camp Guernsey is located in a unique transition zone near the eastern extent of the range for many avian species (e.g., Dusky Grouse, Green-tailed Towhee and Ash-throated Flycatcher) and near the western extent of the range for other species (e.g., Red-headed Woodpecker, Cassin's Sparrow and Cassin's Kingbird). As such, Camp Guernsey provides habitat for a comparatively large number of avian species. Despite Camp Guernsey's relatively diverse avian community, we detected fewer species throughout Camp Guernsey than the Wyoming portion of BCR 17 likely due to the smaller geographic area. Additionally, the sampling intensity within the Wyoming portion of BCR 17 was twice that of the effort on Camp Guernsey (S = 40 versus S = 20; respectively), the surveys occurred over a wider breadth of habitats and included more variation in elevation. Thirty-one percent of the species for which we estimated occupancy rates exhibited higher occupancy within Camp Guernsey than the Wyoming portion of BCR 17 which indicates Camp Guernsey is important habitat for a considerable number of species. In particular, occupancy estimates for seven Partners in Flight BCR 17 priority species (Red-headed Woodpecker, Lazuli Bunting, Pine Siskin, Common Nighthawk, Eastern Kingbird, Rock Wren and Lark Sparrow) were higher on Camp Guernsey. These species are generally found within grassland, riparian, and ponderosa pine habitats which are abundant within Camp Guernsey.

Many of the species that we estimated occupy a larger proportion of the landscape within the Wyoming portion of BCR 17 than on Camp Guernsey are associated with higher elevation sites (e.g., Hermit Thrush, Ruby-crowned Kinglet and Red-naped Sapsucker), do not have a range

that overlaps Camp Guernsey (e.g., Field Sparrow, Green-tailed Towhee and Ovenbird) or are exotic species (i.e., European Starling). Likely, the sampling RMBO conducts within the Wyoming portion of the Black Hills National Forest increases the region-wide estimates of the higher elevation species occupancy rates and the broader geographic region of the Wyoming portion of BCR 17 allows for the overlap of additional species' ranges. The pattern of species for which densities were higher in Camp Guernsey and the Wyoming portion of BCR 17 is similar to that shown in the occupancy rates.

The relative abundance of songbirds recorded in the Wyoming portion of BCR 17 was considerably higher than that observed on Camp Guernsey (over 2 birds per point count higher). This is likely due to the Wyoming portion of BCR 17 being the first region within the state that is surveyed each summer and, as a result, migrating individuals are often detected on surveys. Conversely, the majority of Camp Guernsey surveys occurred after most migrants had passed through the region because of necessary coordination with Camp Guernsey range control. Migrants were removed from the density and occupancy analyses but were included in the relative abundance calculations quoted in the results section earlier in this document. Summing species' densities for all of Camp Guernsey (272 individuals per 1km^2) and the Wyoming portion of BCR 17 (277 individuals per 1km^2) shows that Camp Guernsey bird densities are similar to that of the surrounding region. This exercise highlights the need to differentiate between breeding birds and potentially migrating individuals during data collection as well as account for the incomplete detection of individuals in the analyses instead of relying on relative abundance measures.

Avian species diversity was rather high in the riparian areas where we conducted area searches. The stretches of South Broom Creek Canyon and the riparian areas south of the Impact Area were isolated and relatively undisturbed aside from the presence of some invasive plant species. Observers witnessed a considerable amount of breeding activity within a single morning which indicates these areas may be important population sources. The active Cliff Swallow colony of nearly 600 individuals south of the Impact Area is of particular biological value and efforts should be made to prevent disturbance in the area. Additionally, the raptor surveys did provide breeding evidence for two important raptor species: Ferruginous Hawk (Partners in Flight BCR 17 priority species) and Merlin (a low density species that is sensitive to disturbance). We were able to produce occupancy or density estimates through the IMBCR grid-based point count surveys for 46 of the 54 (85%) species detected during the area searches. We believe this demonstrates that the grid-based landbird sampling program adequately monitors the breeding riparian species thereby reducing the need for continued area searches, provided the grid-based landbird sampling program continues. If a more complete list of breeding riparian and/or raptor species and nest sites is desired, we recommend at least doubling the survey intensity. Camp Guernsey encompasses approximately 79,000 acres of habitat and was not sufficiently covered in the three mornings of riparian area searches or during the three afternoons of raptor surveys performed in our 2013 survey effort.

Given the demonstrated conservation value of Camp Guernsey, we recommend that installation managers and personnel attempt to reduce disturbance to both the birds and landscape in the future when possible. Non-native plant removal and eliminating cattle grazing in the south Broom Creek Canyon and riparian corridor south of the Impact Area would improve the habitat in these areas. Other disturbance activities should be minimized in these areas as well during the breeding season (May through July). Lastly, managers should avoid the installation of new roadways and restrict vehicle travel to existing roadways whenever possible to reduce linear pathways of trampled vegetation. These pathways fragment habitat and can act as travel corridors to meso-carnivores which are generally detrimental to avian reproduction and fecundity.

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APPENDIX A: AVIAN DATA CENTER USAGE TIPS

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, Species, Stratum, Super Stratum, BCR, State, County, Habitat, Year, Priority Species List, or Management Entity. 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, NEON, Migration Phenology or NPS study designs.

Species: This filter allows users to select data and results for a particular species.

Stratum: This filter allows users to select data and results for a particular stratum.

Super Stratum: This filter allows users to select data and results for multiple stratum that were analyzed jointly (e.g., the entire Bridger-Teton National Forest which is broken up into 2 strata or the entire state of Colorado which is broken up into 29 strata).

BCR: This filter will allow users to select data and results for a particular BCR.

State: This filter will allow users to select data and results for a particular state.

County: This filter will allow users to select data and results for a particular county. Please note that only raw count data and survey locations are available at the county level.

Year: This filter will allow users to select data and results for a particular year.

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.

Management Entity: This filter will allow users to select data and results for All Other Lands, US Forest Service (USFS), Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Indian Affairs (BIA), Department of Defense (DOD), or US Fish and Wildlife Service (USFWS). 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.

USFS:
Tier One – Management Entity – US Forest Service
Tier Two – Management Region – USFS Regions (correct!)
Tier Three – Management Unit – NF or NG management units
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 Park Units
Tier Four – Mgmt Forest – 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 – Installation Unit
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 Region
Tier Three – Management Unit – Reservation
Tier Four – National Forest or Grassland – Not applicable
Tier Five – Management District – Not applicable

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

USFWS:
Tier One – Management Entity – US Fish and Wildlife Service
Tier Two – Management Region – USFWS Region
Tier Three – Management Unit – USFWS Unit
Tier Four – National Forest or Grassland – Not applicable
Tier Five – Management District – Not applicable

The Nature Conservancy:
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

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 more than one query 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 new query can be run and the two windows can then be viewed side by side.

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 grid cells are represented by blue semi-transparent circles) in Google Earth. If you have filtered by species, survey locations where that species was not detected will be represented by the blue circle. Locations where that species was detected will have a pink dot in the center of the blue circle. To see the specific name of a survey location, move the mouse arrow over the blue circle. After a moment the name of the surveyed grid cell should appear. You may view the bird detection info for a grid cell 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. Partners wishing for more precise location information to be displayed should request a password from RMBO via email (it@rmbo.org). 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 RMBO 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 boundary layers
You may add the following layers to the map: Bird Conservation Region boundaries, BIA boundaries, DOD boundaries, NPS boundaries, and USFS 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. If you left click your mouse inside of any of these boundaries a text box will appear that contains the name of the region encompassed by the boundary.

Viewing Occupancy/Density Results (Occupancy and Density Tabs)
Viewing Tables
You may view a table of occupancy or density results 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 will display the species for which the estimate was produced, the stratum the estimate pertains to, the year, Psi (proportion of grid cells expected to be occupied), the number of grid cells the species was detected on, the standard error (SE) of the estimate, and the percent coefficient of variation (% CV). The density tables will display the species for which the estimate was produced, the stratum or habitat type that the estimate pertains to, the year, the number of birds expected per km^2 (D), the total number of individuals expected to reside within the stratum (N), the percent coefficient of variation (% CV), and the number of individuals detected (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 simply by clicking on the peach colored row in the table.

Knowing which species have estimates
To restrict the species filter to display only those species for which occupancy 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. To save images, the best option is to take a screenshot. Use the Print Screen key on Windows or Command-Shift-3 on a Mac.

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/super strata 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'd 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 are available for 2010 to 2013 via the ADC as well as density results for 2009 thru 2013.

Viewing Raw Count Statistics (Species Counts Tab)
You may view the raw count of detections for each species (left table) and the effort (expressed as the number of points surveyed) (right table) for your query by clicking on the "Species Counts" tab located next to the "Density Tab" in the upper left corner of your screen. Both the counts and effort tables 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 "Super Strata", viewing counts by Stratum is an excellent way of getting a list of all the strata that comprise a Super Strata. If you would prefer to view effort expressed as the number of grid cells surveyed, click on the "View Options" button located at the top of the screen and check the box labeled "Show effort by number of grid cells instead of by point".