Wintering Bird Inventory and Monitoring in Priority Conservation Areas in Chihuahuan Desert Grasslands in Mexico: 2008 results

Annual report
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In Cooperation With:

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ROCKY MOUNTAIN BIRD OBSERVATORY

Mission: To conserve birds and their habitats

Vision: Native bird populations are sustained in healthy ecosystems

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

RMBO accomplishes its mission by:

Partnering with state and federal natural resource agencies, private landowners, schools, and other nonprofits for conservation.

Studying bird responses to habitat conditions, ecological processes, and management actions to provide scientific information that guides bird conservation efforts.

Monitoring long-term trends in bird populations for our region.

Providing active, experiential, education programs that create an awareness and appreciation for birds.

Sharing the latest information in land management and bird conservation practices.

Developing voluntary, working partnerships with landowners to engage them in conservation.

Working across political and jurisdictional boundaries including, counties, states, regions, and national boundaries. Our conservation work emphasizes the Western United States, including the Great Plains, as well as Latin America.

Creating informed publics and building consensus for bird conservation needs.

ROCKY MOUNTAIN BIRD OBSERVATORY

On behalf of RMBO, I am pleased to submit the following technical report.

Arvind Panjabi
Director, International Program

Suggested Citation:
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Cover Photo: Grassland bird technicians during training at the Reserva Ecológica El Uno, Chihuahua, 2008.

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EXECUTIVE SUMMARY

Many grassland bird species are of high continental conservation concern due to large-scale, continuing habitat loss and degradation over much of their range that has led to population declines, which are all compounded by long-term drought through much of the region. Chihuahuan Desert grasslands are globally important to many grassland birds of western North America, especially in winter, but they are increasingly being lost to agriculture, desertification, and shrub encroachment and devaluation by the invasion of exotics. There is very little information on wintering grassland bird distribution, abundance, habitat use, and seasonal movements to guide conservation in this region.

In January 2007, we initiated a first-ever, region-wide pilot survey to inventory, research and monitor wintering birds in Chihuahuan Desert Grassland Priority Conservation Areas (GPCAs) in Mexico to provide information to facilitate their conservation in this region (Panjabi et. al 2007). This effort was continued in January and February of 2008. We used GIS to identify grasslands in the region and we conducted 497 one kilometer line transects at randomly-selected grassland sites across the GPCAs. These surveys generated information on 34 grassland associated species, including 30 priority species of high regional or continental conservation interest to Partners in Flight (PIF), the U.S. Fish and Wildlife Service (USFWS), The Nature Conservancy, and/or the Instituto Nacional de Ecología (INE). We obtained reasonably precise density estimates for 31 species, including 18 priority species, across GPCAs, and post-stratified estimates separately by GPCA, survey block, and grassland type. We assessed key vegetation and habitat parameters at each site that we believed could be important in determining grassland bird use.

Densities and richness of wintering grassland birds varied across GPCAs. Some species showed strong gradients of abundance across the region, particularly from north to south, suggesting limited distributions. There was also evidence of changes in regional distribution between 2007 and 2008, suggesting plasticity in wintering range among some species.

Unfortunately, the habitat features preferred by many grassland birds were rare or uncommon in many of the GPCAs. Thirty-four percent of our transects had greater than 3% shrub cover -- a threshold above which habitat use appears to decline for some grassland species (Panjabi et al. 2007). Given the widespread degradation of grasslands in the region, and the preference of many species for relatively rare grassland conditions (e.g., little or no shrub cover, moderate to high grass cover), the immediate protection and restoration of grasslands in the Chihuahuan Desert may be the best strategy for maintaining the region's carrying capacity for wintering grassland species in light of the rapidly increasing conversion of grasslands to croplands.

INTRODUCTION

Populations of many grassland bird species, including 27 species of continental importance for Partners in Flight (PIF) and/or the U.S. Fish and Wildlife Service (USFWS), are undergoing massive population declines (Sauer et al. 2008). Reasons for many declines are still poorly understood, but likely are related to past and on-going habitat loss and degradation over much of their range. Threats to native grasslands are accelerating in many regions due to expanding agriculture, urbanization, desertification, and invasive species.

The western Great Plains, from southern Alberta and Saskatchewan to southern New Mexico and west Texas, have the most extensive and intact native grasslands remaining in North America, and support the most important breeding areas for the greatest number of grassland bird species (Figure 1A). Over 90% of grassland-breeding bird species in the area are migratory; only the Galliforms (i.e., prairie chickens, grouse) are truly resident. The greatest number of migratory grassland species in the region over-winter in the Chihuahuan Desert of northern Mexico and the southwestern United States (Figure 1B). Native grasslands are limited in this region, occupying less than 12% of the Chihuahuan Desert (Bird Conservation Region 35) in Mexico, yet they are globally important for the over-winter survival of many millions of North American grassland birds. However, little information exists on the distribution, abundance, habitat use, and movements of wintering birds in this region. In addition, no baseline data exist to monitor regional population trends for wintering grassland birds. This information is urgently needed to guide conservation actions and evaluate impacts from continuing grassland conversion, climate change, and/or grassland restoration for wintering and resident grassland birds in the Chihuahuan Desert. The goal of this project is to provide this information through a standardized random-sampling scheme that allows for local and regional population monitoring, prioritization of conservation areas for various species, and insight into species-specific habitat requirements.

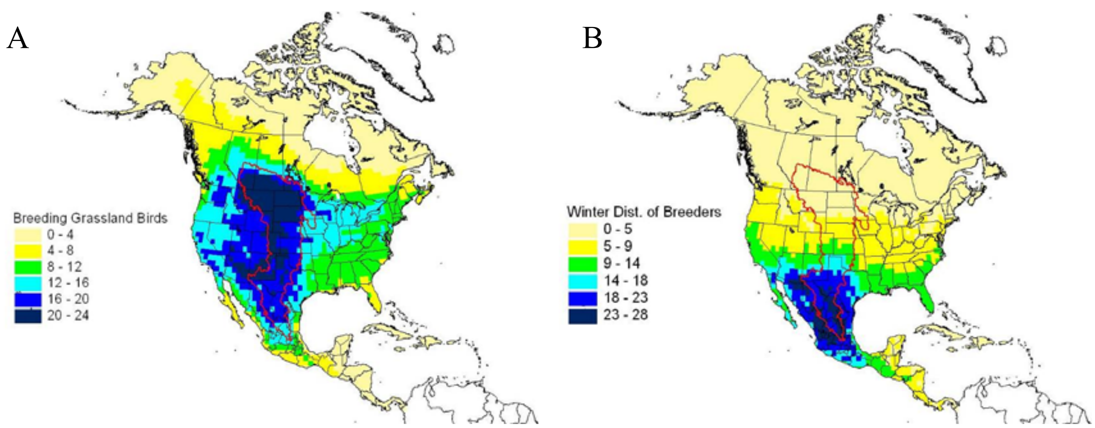


Figure 1. Overlay of breeding (A) and wintering (B) ranges for grassland bird species of the western Great Plains (courtesy P. Blancher, Canadian Wildlife Service).

In cooperation with the Universidad Autónoma de Nuevo León (UANL), we implemented avian surveys across eight Grassland Priority Conservation Areas (GPCAs) in the Chihuahuan Desert of Mexico in January and February of 2007 and 2008. UANL coordinated field survey teams through a network of regional partners, including Profauna Chihuahua, Profauna Coahuila, Universidad Juárez de Durango, UANL, TNC-Chihuahua and RMBO. According to the most recent GIS available (INEGI Series III 2003), the survey blocks in these eight GPCAs (Sonorita, Janos, Valles Centrales, Valle Colombia, Cuchillas de la Zarca, Mapimí, Cuatro Ciénegas, and El Tokio) encompassed 22,619 km^2 of grassland in seven states, including Sonora, Chihuahua, Coahuila, Durango, Zacatecas, Nuevo León, and San Luís Potosí. Our primary objective was to estimate abundance of all grassland birds in these areas, while emphasizing priority species as identified by major bird conservation initiatives including (but not limited to) PIF, TNC, USFWS, and INE.

The goals and objectives of this project were identified with participation from over 20 partners from universities, NGO's, and federal and state agencies in the U.S. and Mexico, at the 3rd International Symposium on Grasslands, in Chihuahua, Chihuahua, Mexico, in August 2006. A detailed account of the program goals, study design, and methodology are given by Panjabi et al. (2006).

METHODS

Study Design

Prior to the 2007 field season, we used GIS data available from CONABIO (Inventario Forestal 2002) and TNC (CEC and TNC 2005) to identify target vegetation types (native grasslands, halophytic vegetation, and gypsophytic vegetation), roads, and GPCAs within Bird Conservation Regions 34 (Sierra Madre Occidental) and 35 (Chihuahuan Desert) in Mexico. Although this project focused on the Chihuahuan Desert, it was necessary to include BCR 34, as BCR 35 does not encompass grasslands near and within the Sierra Madre Occidental, such as in Janos, Sonorita and other parts of Chihuahua, Sonora and Durango. We placed a grid of approximately 18 x 18 km blocks over this area to identify potential survey sites and ensure dispersion among samples. In order to avoid spending time in areas with little grassland, we eliminated blocks with less than 5 km of road intersecting the targeted vegetation types. We included 142 blocks that intersected with GPCAs and met the other aforementioned criteria in our study area. From these, we randomly selected 80 blocks for sampling (Figure 2) in proportion to their availability within each GPCA. Using GIS, we placed points 500 m apart along all roads that intersected with grassland in each block and randomly-numbered these to mark potential start locations for line transects.

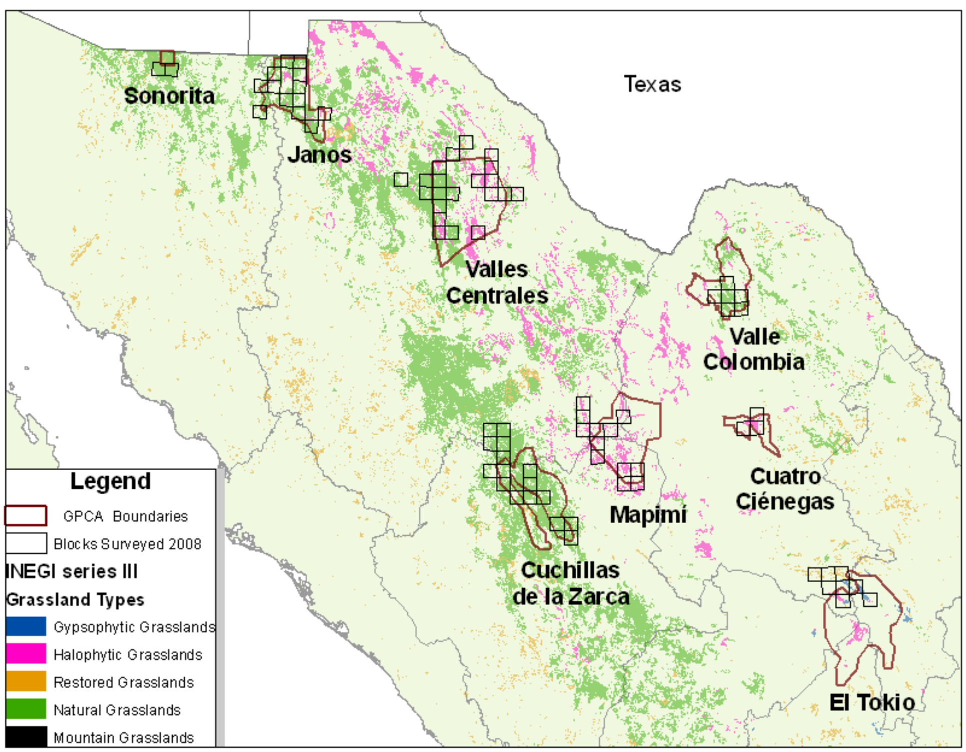


Figure 2. Grassland types, Grassland Priority Conservation Areas (GPCAs), and 2008 survey blocks in northern Mexico.

We instructed observers to scout transect surveys routes prior to conducting surveys, to locate the lowest numbered random points in suitable grassland habitat, and obtain landowner permission for access. Transect starting points that were in unsuitable habitat (e.g., desert shrubland, agricultural fields), or were inaccessible (i.e., access denied, road no longer existed, etc.) were eliminated and replaced with the next successively numbered random point. If all points in a block were unsuitable, the block was discarded and replaced with the nearest available block.

Nonetheless, 44% of transect locations established in 2007 had to be replaced in 2008, primarily due to excessive shrub cover at these sites. In some cases, replacement sites could be found within the same block, but in others, the entire block had to be replaced. In Mapimí, Valles Centrales and El Tokio, sufficient survey blocks were visited, checked and discarded due to lack of habitat that it became necessary to add new survey blocks outside the GPCA boundary in order to maintain a sampling effort proportional to the size of the original GPCA. In addition, the entire GPCA of Valle Colombia was shifted 30-km to the east to encompass more and better grasslands, including its namesake valley (Panjabi et al. 2007). This resulted in a loss of two blocks that were no longer within the new boundary of the GPCA. In addition, two blocks were surveyed in Sonorita GPCA in 2008 where none were surveyed in 2007.

Pilot surveys in 2007 revealed that the GIS for roads generally included fewer roads than what actually existed on the present-day landscape, and roads sometimes were misaligned with their actual locations. In new blocks established in 2008 and in existing blocks where all sampling locations were being reestablished, we updated the existing GIS for roads prior to the 2008 field season by digitizing additional roads that appeared on INEGI (Instituto Nacional de Estadística y Geografía) topographic map images (.tif files) but not the roads .shp file and created a new set of randomized start points for the block. This reallocation of samples occurred within blocks for Valles Centrales, Valle Colombia, and Mapimí and El Tokio. Additionally, we digitized roads in El Tokio that intersected important grasslands from GIS data provided by UANL.

In total, we added 27 new survey blocks into the study area in 2008. This addition, along with the removal of two blocks that fell outside the GPCA of Valle Colombia after we corrected its boundary, brought the total number of survey blocks in the study area to 168. Forty-eight of these blocks had already been disqualified (Figure 3) for one or more reasons. These losses resulted from the conversion of grassland to agriculture, unacceptably high levels of shrub encroachment, and/or the incorrect identification of vegetation types and roads in the GIS.

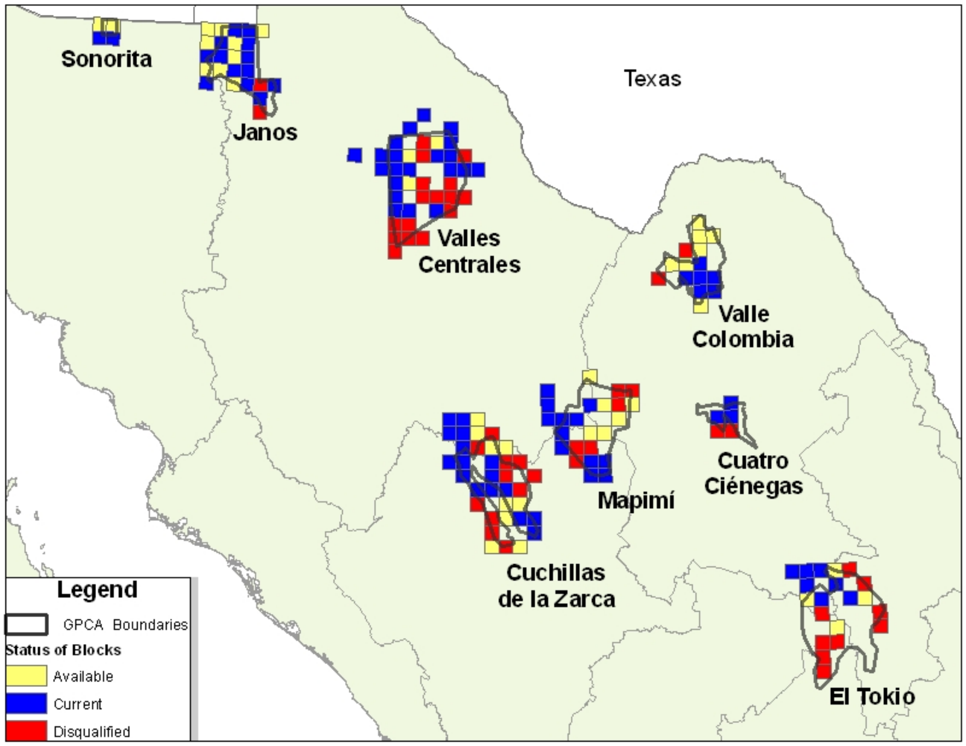


Figure 3. The status and distribution of the 168 survey blocks.

The inclusion of these additional blocks was necessary to maintain effort sufficient to generate needed sample sizes on species and incorporate grasslands adjacent to the pre-defined GPCA boundaries. Some of these grasslands were previously known as important areas for grassland birds (e.g. Rancho Los Angeles and the valleys of La India and Tanque de Emergencia near El Tokio). In retrospect, many of the grasslands excluded from the original delineation of the GPCAs appeared to be eligible for inclusion in the study design (see Panjabi et al., 2007). We also used recent grass cover data from INEGI to select blocks and reallocate random points for the 2008 effort. This new GIS land cover data generally mirrored the previous GIS (Inventario Forestal 2002) but was typically more restrictive in its classification of grasslands, especially in El Tokio (Figure 4). In El Tokio, we also used additional grassland polygons provided by UANL that had not been included in original study design or in the updated INEGI grass cover data.

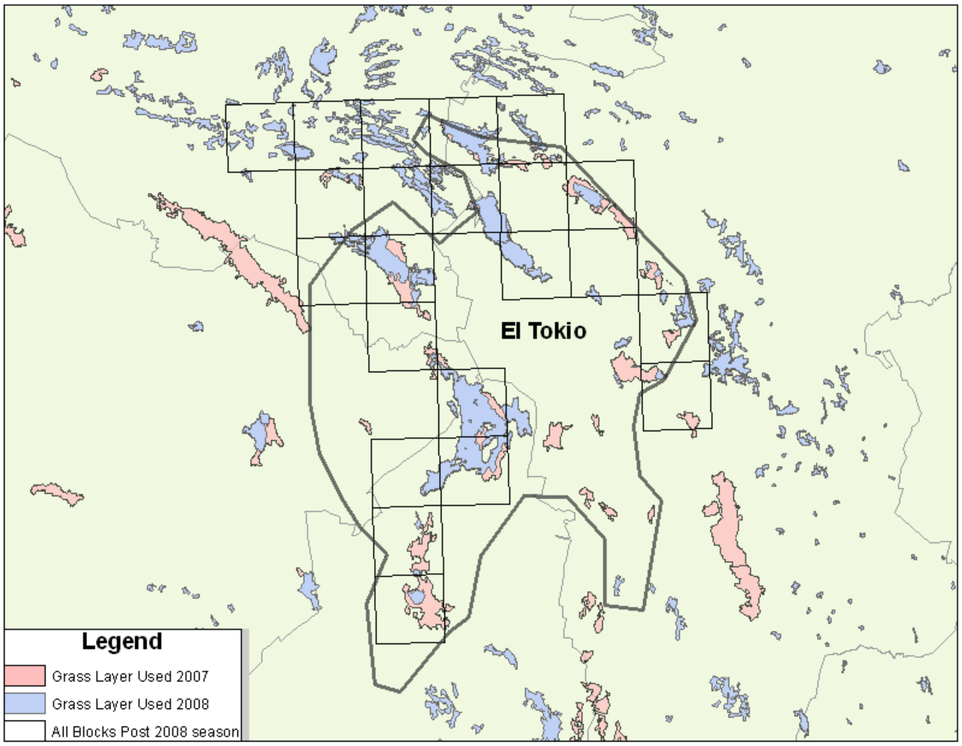


Figure 4. Differences in grassland extent between updated INEGI series III GIS (2003) and Inventario Forestal GIS (2002) used in 2006 study design in the GPCA of El Tokio. Polygons colored pink represent areas no longer considered grassland.

In Valles Centrales, we added three blocks just outside the border of the GPCA to offset the loss of blocks to new agriculture. Twenty-one percent of blocks in this GPCA have already been converted to agriculture since 2003 (P. Calderón, pers. comm.). We added seven extra survey blocks to Cuchillas de la Zarca, including two within the extent of the original study design that became usable with the digitization of more roads. The other five were contiguous with the original blocks, adjacent to the northwest corner of the GPCA. In Mapimí, we added three blocks on the northwest side of the GPCA, also contiguous with original blocks. We added four blocks in El Tokio, one within the extent of the original study design and three directly adjacent to the northwestern-most original blocks. As discussed in Panjabi et al. (2007), we made major modifications to the GPCA boundary of Valle Colombia prior to the 2008 field season to include major areas of grassland that were originally excluded. These modifications moved the entire GPCA boundary approximately 45 km to the east and caused two blocks to be excluded that no longer intersected with the GPCA boundary. The result of this eastward shift was a more complete encompassment of the region's grasslands and data that better reflected the true densities of grassland species of this area. In the eastern half of this GPCA, we created 10 blocks where the study design criteria were met (p. 9). Prior to the application of randomly numbered points, we digitized roads in these new blocks from INEGI topographic maps where they were missing from the GIS road data.

The addition of supplemental blocks allowed us to maintain the robust sampling sizes we achieved in 2007 and include adjacent areas of grasslands that are likely important which were omitted from the original delineation of GPCA boundaries.

Roads frequently existed that were not shown in the GIS data. In situations where pre-identified points were not accessible, observers dropped these points and replaced them with the next lowest-numbered random point, or if other roads were available near the originally-selected point, they used GPS to navigate to a point nearest to the original start location on the "new" road. The new point served as surrogate for the randomly located transect start point, all other conditions (i.e., habitat) being equal.

Survey Protocol

The bird survey methodology employed follows that described by Buckland et al. (2001) and tailored to this study as described by Panjabi et al. (2007). We paired six one kilometer line transects (Figure 5) within each block, with each pair starting from a random point and heading in opposite directions perpendicular to the road.

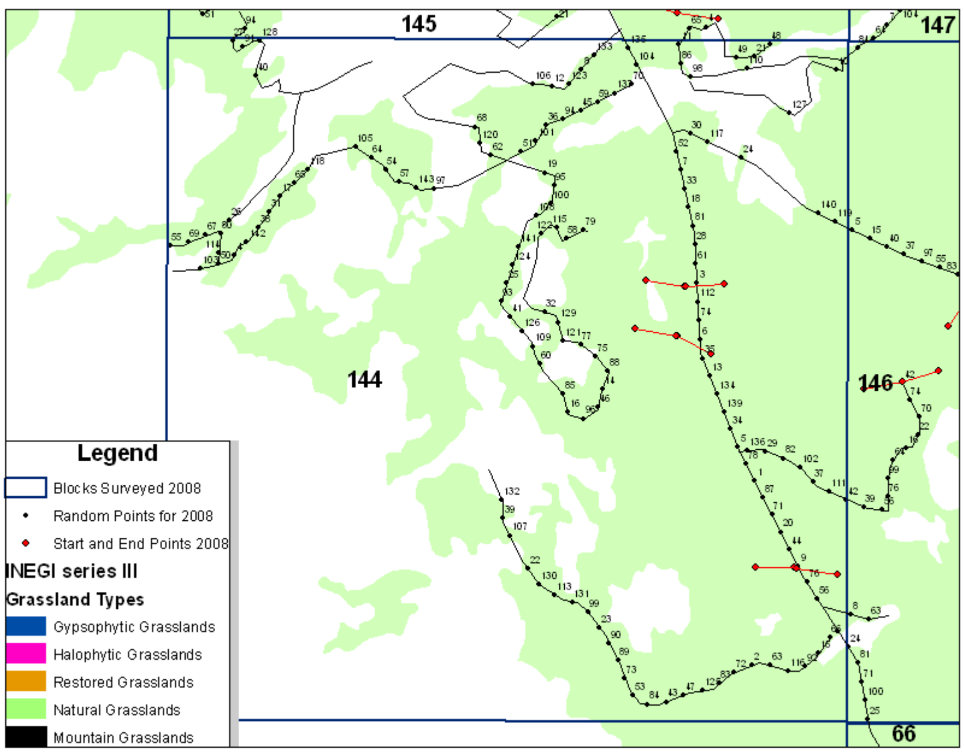


Figure 5. Example of survey block with locations of selected transects from randomly-numbered points along roads that intersect with grassland (Cuchillas de la Zarca, Block 144).

In a few occasions where available grasslands were limited within the survey block, we did not pair transects. Sixteen of the 497 transects surveyed were "bent" to stay in appropriate habitat and avoid obstacles such as shrubland, cliffs, or other non-grassland situations. We redirected one transect avoid crossing the U.S./Mexico border. We estimated lateral distances (m) from the transect line to each bird or bird cluster detected using laser rangefinders. For each detection, we recorded the cluster size, detection method (song, call, wing-noise, pecking/drumming, or other), and transect segment where the bird was located (0–250 m, 250–500 m, 500–750 m, or 750–1000m). On average, observers completed 1-km line transects in 42 minutes (Std. Dev. = ±14.02).

Vegetation Surveys

After completing line transects, we conducted vegetation surveys along transects bisecting the 1-km bird transect perpendicularly at 100-m intervals, as determined using GPS (Figure 6). These vegetation transects were generally conducted immediately following the bird survey, but in a few cases, observers returned on a different day during the study period to conduct these surveys Along each vegetation transect, we surveyed ground cover parameters out to 10 meters on both sides of the transect and shrub cover parameters out to 20 meters (Figure 6).

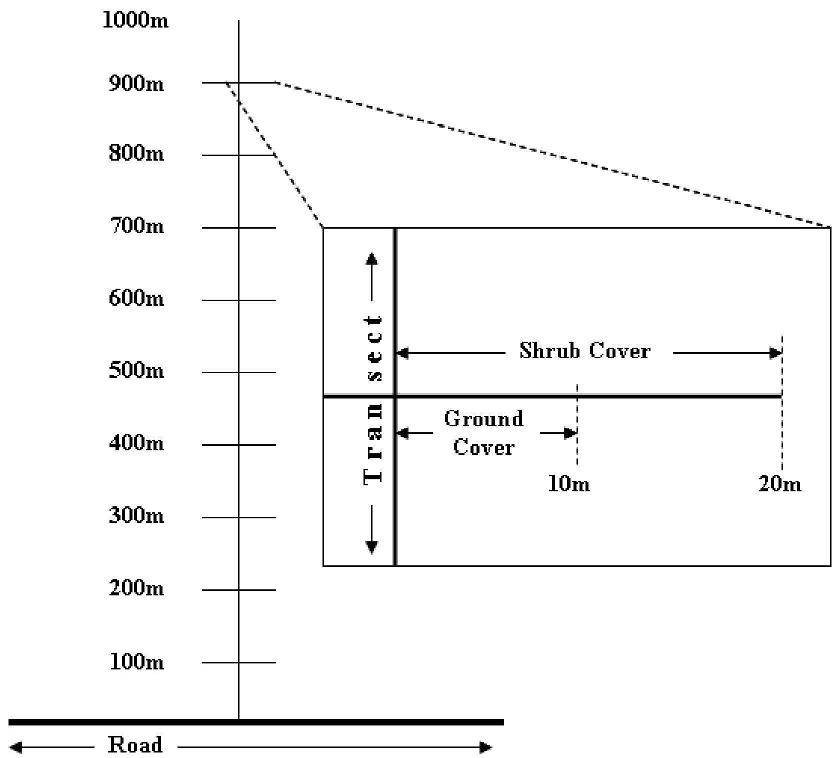


Figure 6. Design of vegetation survey transects for ground and shrub cover.

To measure both ground and shrub cover, we used a line-intercept approach (Canfield 1941) modified so that rather than measure precise lengths of the line intercepted by any cover type, we determined occupancy of line segments (25 cm each, marked on a nylon rope) based on the dominant cover type, either standing grass, bare ground or 'other'. 'Other' cover included all cover not classified as either standing grass or bare ground, including detritus, small rocks, forbs, matted dead grass, low cactus and woody vegetation (<0.3m in height), and any made-made objects (e.g., litter, barbed wire, etc.). For shrub coverage, we considered 5 cm on either side of an intercepted branch as occupied by shrub cover, so that gaps up to 10 cm between intercepted branches were treated as continuous cover. Ground cover and shrub cover were mutually exclusive on the first 10 m of the vegetation transect (i.e., we did not included segments occupied by shrubs in the ground cover measurements). For each transect we also recorded textual descriptions of habitat characteristics and landscape features.

Grassland type – we classified the type of grassland surveyed by each transect (using the INEGI series III GIS) as either natural, halophytic, gypsophytic or 'other' (see Figure 2 for distribution). Most transects fell entirely in one type or another. Where transects overlapped two or more types, we assigned the dominant grassland type to the transect. We classified transects as belonging to the 'other' category if they were located in 'restored grasslands' (an uncommon INEGI categorization), 'induced grasslands' (a mix of enhanced native, planted, or other non-native grasslands), outside polygons identified as grassland in the GIS, or in areas not clearly dominated by a single grassland type. In some instances when transects were not located in an identified grassland type, but the region was dominated by a single grassland type, we assigned the transect to the nearest type. We used data from 2008 only in these estimates of relative densities.

Other Field Procedures

We began surveys at dawn and continued until the six line transects in each survey block were completed, usually within six hours. Start and end times were recorded for each transect. Due to weather, road conditions, and variability in the time needed to complete both bird and vegetation surveys, sometimes finishing by 1300 hours, our target end time, was not possible. Eighty-nine percent of transects were finished by 1300 hours, and 96% were completed by 1400 hours.

We used Beaufort scales to estimate atmospheric conditions (sky, wind, precipitation, etc.) at the start and end of each transect. We did not conduct surveys during winds higher than category 4 (20-29 kph) or during any precipitation greater than drizzle.

We noted incidental observations of a subset of priority species (Appendix A) in each survey block, in particular when the species had not otherwise been recorded on line transect surveys.

Training

We lengthened the training session from seven days in 2007 to ten days in 2008. The extended training allowed us more time to raise and answer questions regarding the protocols and practice bird identification skills by sight and sound. Nine of the twelve field technicians were returnees from the 2007 field season which greatly increased the overall skill level in our project. This year's training was also made more effective by better weather. In 2007, nearly the entire training session was complicated by a lingering and unusually powerful weather system with accompanying daily snowfall.

As in 2007, we reviewed all protocols and practiced visual and aural identification of all regularly occurring bird species, both in the class, using PowerPoint presentations and handouts, and in the field. We also used PowerPoint presentations to outline the basics of distance-sampling theory, the study design for this project, and data analysis and reporting. We conducted daily bird identification quizzes in the field and used mean scores to evaluate observers' bird identification skill at the start and end of the training program. We also conducted field tests on distance estimation skills by walking along the edge of a two-track road and having observers estimate lateral distance to shrubs and other notable objects in front of us. When we advanced to the point nearest to the object, we measured to the object from the line to obtain the true distance. Observers quickly improved accuracy of their estimation skills in this way.

We distributed written protocols detailing block and transect selection, avian and vegetation surveys, and a user's guide detailing the exact steps to be used in laying-out transects with the GPS unit. We also gave out copies of a PowerPoint presentation of useful identification tips and a compact disc with relevant vocalizations of all commonly encountered grassland species.

Data Analysis

In our analyses of bird densities, we pooled data from 2007 and 2008, using only transects from 2007 that were retained in 2008, to augment sample sizes and create more robust detection functions. Due to the replacement of 44% of transects in 2008, the 2007 densities and accompanying data presented in this report differ from those in the 2007 report. These sites were replaced primarily due to excessive shrub cover. We suggest the 2007 and 2008 density estimates presented in this report better reflect wintering bird populations in Chihuahuan desert grasslands in each year.

We generated all density estimates using program Distance 5.0, Release 2 (Thomas et al. 2006). Line transects were the primary sampling unit. Although transects generally were paired, we have not utilized a paired approach for analyses thus far, although we intend to do so in the future. In most cases, we right-truncated species datasets between 5-15% to eliminate outliers and improve model performance. In a few cases, specific truncation points were chosen to correspond to where detectability dropped below 10-20%. Truncation points were principally selected using chi-square and Kolmogorov-Smirnov goodness-of-fit tests and visual assessments of model fit of the detection function. We used global detection functions for each species and post-stratified density estimates by GPCA, survey block, and grassland type (separate analyses). We used the following function/expansion combinations to model the detection function for each bird species, Half-normal/Cosine, Hazard-rate/Simple-polynomial, Hazard-rate/Cosine and Uniform/Cosine. In general, we used Akaike's Information Criterion (AIC) and AICc, to select the highest ranking model (Burnham and Anderson 2002). When AIC was similar among two competing models (generally within 2 points), but the variance around D (density) differed substantially, we considered the default AIC selection of sequential expansion terms for each model and selected the model with the fewest expansion terms. In a few instances, heaping of recorded distances around commonly used distances (e.g., 25 m, 50 m, etc) caused poor model fit. In these cases, we grouped observations into equal distance bins to improve performance of models. We ran analyses for all grassland-associated species or species groups with at least 20 independent observations across all transects; 10 of 36 species or species groups had fewer than 60 observations. We also estimated density for the Short-eared Owl (n=18). Although small sample sizes such as this are below those recommended by the authors of program Distance (n>60), some species for which we obtained relatively small sample sizes are of conservation interest. Thus, we felt it was better to present density estimates for these species in a manner consistent with other species that considers detection probability and provides comparable measures of precision, rather than present unadjusted indices of abundance.

RESULTS

Species Richness

We calculated average richness of grassland associated bird species in each GPCA (Table 1) by tallying the number of grassland associated species and genera (among those identified in this report) recorded on each transect in each GPCA (excluding unknowns) and averaging these across all transects in the GPCA. For this report, "grassland associated bird species" includes all species that depend on (entirely or in part) or prefer, native grasslands in the Chihuahuan Desert during winter.

Table 1. Numbers of grassland-associated species in each GPCA with average species richness/transect.

GPCA	Grassland associated species detected across all transects	Transects Surveyed	Average Species Richness / Transect	Standard Error
Cuatro Ciénegas	9	18	1.92	0.26
Cuchillas de la Zarca	26	96	5.97	0.28
Janos	30	78	5.58	0.32
Mapimí	27	71	3.64	0.22
Sonorita	18	12	6.66	0.64
El Tokio	25	60	2.77	0.19
Valles Centrales	27	126	4.07	0.16
Valle Colombia	15	36	2.72	0.28

Detections vs. Individuals

The number of individuals detected of a particular species often differs significantly from its number of detections. Analyzing detections (clusters of birds recorded as a single group) rather than individuals is an integral part of distance analysis which incorporates flock size (cluster size) into the estimation of the detection functions. Program Distance then considers average cluster size as a variable in the detection function created for any given species.

Summary

We recorded 5625 detections of birds or bird clusters on line transects in 2008. These detections were comprised of 27,208 individuals of 115 species (Appendix B), including 30 species considered to be of high continental, national, or regional conservation importance to PIF, USFWS, TNC, or INE (Table 4). Of the total number of individuals detected, we did not identify 1596 to the species level. Of these, unknown detections of grassland associated species were of 489 Spizella sparrows, 449 unidentified meadowlarks (*Sturnella spp*.), 270 unidentified sparrows, 29 *Ammodramus* sparrows, 67 either Savannah Sparrows (*Passerculus sandwichensis*) or *Ammodramus spp*. (a new unknown category used this year), and 15 unidentified longspurs (*Calcarius spp*.). .

Table 4. Grassland associated conservation priority species detected on line-transects in Chihuahuan Desert Grassland Priority Conservation Areas (GPCAs) in Mexico.

Common Name	Scientific Name	Partners in Flight[1]			USFWS BCC 2002[2]			TNC "Unlucky 13"[3]	INE[4]
		U.S.-Canada	BCR34	BCR35	National	BCR34	BCR35		
Scaled Quail	*Callipepla squamata*	Y	Y	Y				Y	
Northern Harrier	*Circus cyaneus*		Y	Y	Y		Y		
Bald Eagle	*Haliaeetus leucocephalus*								Y
Harris's Hawk	*Parabuteo unicinctus*		Y						Y
White-tailed Hawk	*Buteo albicaudatus*								Y
Ferruginous Hawk	*Buteo regalis*		Y	Y	Y	Y	Y	Y	Y
Golden Eagle	*Aquila chrysaetos*								Y
Aplomado Falcon	*Falco femoralis*		Y	Y					Y
Prairie Falcon	*Falco mexicanus*		Y	Y	Y				Y
Sandhill Crane	*Grus canadensis*								Y
Mountain Plover	*Charadrius montanus*		Y	Y	Y	Y	Y	Y	Y
Long-billed Curlew	*Numenius americanus*			Y	Y		Y	Y	
Burrowing Owl	*Athene cunicularia*		Y	Y	Y		Y	Y	
Long-eared Owl	*Asio otus*			Y					
Short-eared Owl	*Asio flammeus*	Y	Y	Y	Y				Y
Loggerhead Shrike	*Lanius ludovicianus*		Y	Y	Y		Y		
Sprague's Pipit	*Anthus spragueii*	Y		Y	Y	Y	Y	Y	
Cassin's Sparrow	*Aimophila cassinii*		Y	Y	Y		Y	Y	
Botteri's Sparrow	*Aimophila botterii*					Y			
Brewer's Sparrow	*Spizella breweri*	Y	Y	Y	Y				
Clay-colored Sparrow	*Spizella pallida*			Y					
Worthen's Sparrow	*Spizella wortheni*			Y					Y
Vesper Sparrow	*Pooecetes gramineus*			Y					
Lark Sparrow	*Chondestes grammacus*			Y					
Lark Bunting	*Calamospiza melanocorys*		Y	Y	Y	Y	Y	Y	
Grasshopper Sparrow	*Ammodramus savannarum*				Y	Y			
Baird's Sparrow	*Ammodramus bairdii*	Y			Y	Y	Y	Y	
McCown's Longspur	*Calcarius mccownii*	Y		Y	Y		Y	Y	
Chestnut-collared Longspur	*Calcarius ornatus*		Y	Y	Y	Y	Y	Y	
Eastern Meadowlark	*Sturnella magna*		Y	Y					

[1] Partners in Flight Species Assessment Database. 2005. Rocky Mountain Bird Observatory Website (www.rmbo.org/pif/pifdb.html). Regional priority status reflects both breeding and wintering regional conservation assessments for BCRs 34 and 35.
[2] U.S. Fish and Wildlife Service. 2002. Birds of conservation concern 2002. Division of Migratory Bird Management, Arlington, Virginia. 99 pp. http://migratorybirds.fws.gov/reports/bcc2002.pdf
[3] The Nature Conservancy, Prairie Wings project. http://www.nature.org/initiatives/programs/birds/explore/
[4] Instituto Nacional de Ecología. NORMA Oficial Mexicana NOM-059-ECOL-2001. http://www.ine.gob.mx/ueajei/publicaciones/normas/rec_nat/no_059_a2b.html

Vegetation

We are currently analyzing bird-habitat relationships in the 2008 data set, but due to a more complex and time consuming analysis, as well as a late discovery of a minor calculation error, these results are not ready for inclusion in this report. We are modeling habitat relationships using bird detections and cover types using generalized linear models (GLM). There are four components to the habitat modeling analysis; 1) goodness of fit testing using the Poisson distribution in the GLM (if there is evidence of over-dispersion, then a negative binomial distribution is used to improve the fit of the model), 2) best model selection using AIC and AIC weights (or QAIC for over-dispersed count data) among competing models, 3) estimation of regression coefficients and corresponding confidence limits, and 4) graphing correlations among significant vegetation variables and bird abundance to aid in interpretations. We anticipate synthesizing these analyses into a manuscript in 2009. In this report, we have included density analyses post-stratified by grassland type for all species included in the Species Account section (p. 21) which gives some indication of grassland type preferences among species.

To calculate the proportion of ground cover and shrub cover types for each transect, we averaged counts of occupied line segments for each cover type across all vegetation transects bisecting each bird transect. For each GPCA, we then averaged all transect-level estimates to estimate average cover for each type in each GPCA (Figure 7). Cuatro Ciénegas had the least grass cover and the most bare ground, followed closely by El Tokio. Grass cover was similar across the remaining GPCAs; however, in Valles Centrales the 'other' cover type was combined in the field with grass cover, therefore the grass coverage shown is an over-estimation of true grass cover. Because of this inconsistency in data collection, data from Valles Centrales were excluded from the habitat relationship analyses that are still pending. Valles Centrales showed the second highest percent of bare ground cover (which was not affected by this error) and Cuchillas de la Zarca the lowest. 'Other' cover was lowest in Cuatro Ciénegas, El Tokio and Valle Colombia. Shrub cover was lowest in El Tokio and Valles Centrales and highest in Mapimí (Figure 8).

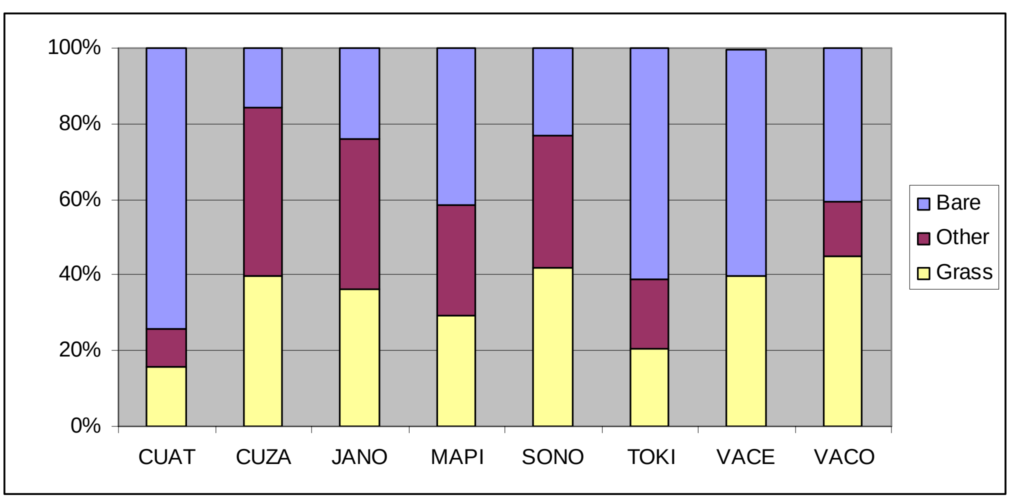


Figure 7. Percent and types of ground cover among GPCAs.
Note: The categories of 'other' and 'grass' were combined in VACE.
GPCAs: CUAT = Cuatro Ciénegas, CUZA = Cuchillas de la Zarca, JANO = Janos, MAPI = Mapimí, SONO = Sonorita, TOKI = El Tokio, VACE = Valles Centrales, VACO = Valle Colombia

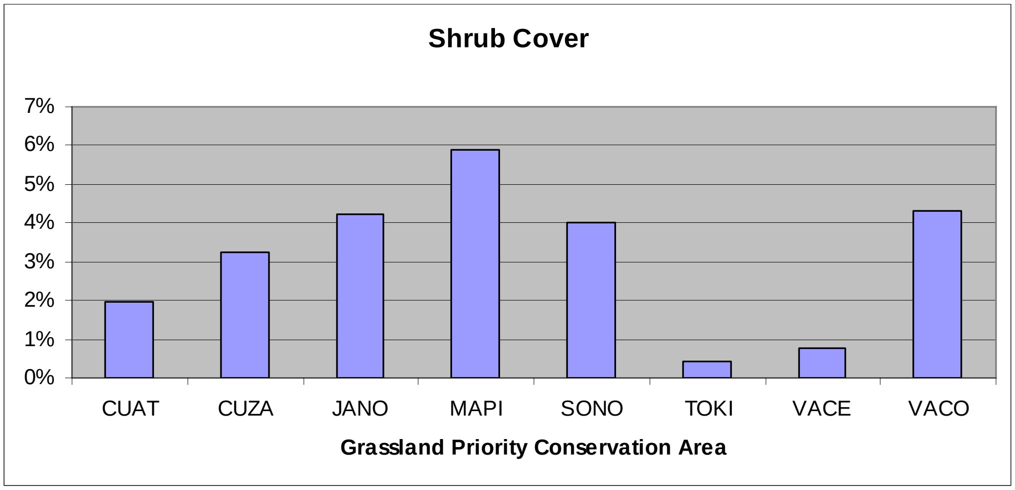


Figure 8. Percent shrub cover in each GPCAs.
GPCAs: CUAT = Cuatro Ciénegas, CUZA = Cuchillas de la Zarca, JANO = Janos, MAPI = Mapimí, SONO = Sonorita, TOKI = El Tokio, VACE = Valles Centrales, VACO = Valle Colombia

Species Accounts

In this section, we present densities of each species for several strata. Bar graphs show densities for 2007 and 2008 in each GPCA and across GPCAs (i.e. global) with corresponding 95% confidence intervals. The data used to generate these graphs are presented in Appendix C. Where densities change significantly between years, we provide the estimated effect size using the delta method (Powell 2007).

Figures depicting distribution and density across survey blocks are based on 2008 data only, and were derived through Program Distance using global detection functions and post-stratified density estimates for each block. Sample sizes for density estimates at the block level are much smaller than at the GPCA level and the corresponding variance is much higher (frequently 50-100% of *D* or higher). These maps are intended display gross geographic patterns of distribution and density and caution should be used in interpreting densities at the block level. .

For each species, we present density estimates of species in four grassland types in 2008, natural, halophytic, gypsophytic, and ‘other’. Estimates were generated through Program Distance using global detection models and post-stratifying estimates by each grassland type. Grassland types are those assigned by the INEGI series III GIS as described under “Vegetation surveys” under Methods. These estimates indicate use of grassland types by each species and provide insight into habitat availability for species in each GPCA.

At the bottom of each table, we present the global density estimate for each year based on the species’ average density in each grassland type across all GPCAs. These estimates may vary slightly from the global estimates presented elsewhere in this report due differences in the strata averages used to calculate the global averages.

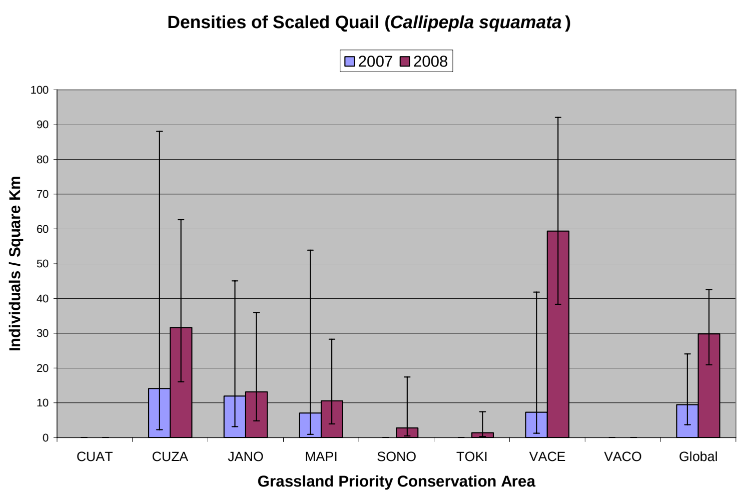
Due to its lack of detections in 2008, we did not include Mountain Bluebird (*Sialia currucoides*) in the species accounts. This apparent absence is noteworthy and may reflect significant variability in its winter range between years. Density estimates for this species (for 2007) may be found in Appendix C.

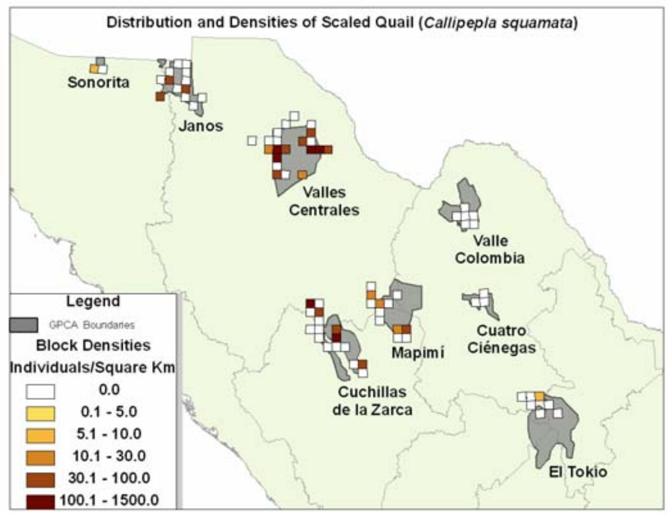
Additional notes regarding the species accounts: 1) we did not survey the GPCA of Sonorita (SONO) in 2007 and 2) the number of global detections (*n*) is generally smaller in 2007 than in 2008 due to smaller number of transects included in the analyses for that year.

Abbreviations of GPCAs used in the species accounts are as follows: CUAT = Cuatro Ciénegas, CUZA = Cuchillas de la Zarca, JANO = Janos, MAPI = Mapimí, SONO = Sonorita, TOKI = El Tokio, VACE = Valles Centrales, VACO = Valle Colombia

Scaled Quail (*Callipepla squamata*)

We detected Scaled Quail more commonly in the northern and western GPCAs. The percentage of transects on which it occurred rose 80% from 2007 to 2008. Global density increased by 20.4 birds/km^2 (95% CI = 6.3, 34.5) between years. Populations in Valles Centrales appear to have increased the most. There appears to be no significant difference in density between halophytic and natural grasslands.

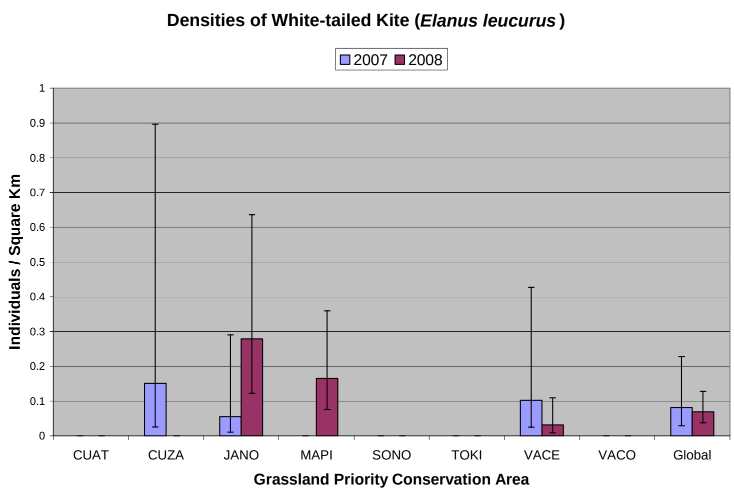


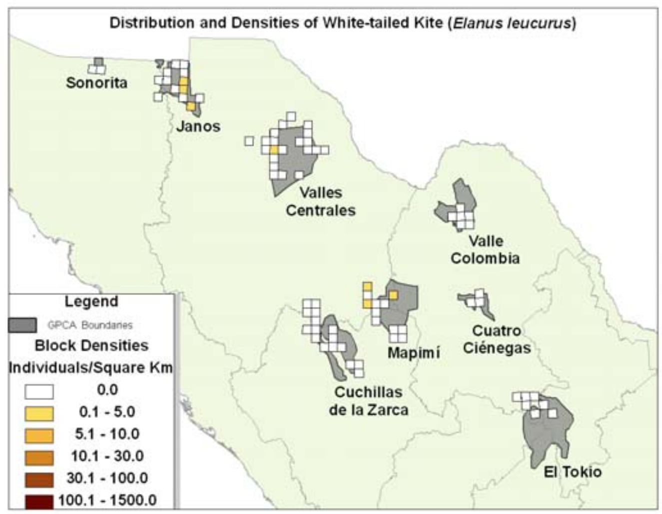


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
	Gypsophytic	0.00				0	
	Halophytic	22.41	32.10	12.07	41.61	17	
Scaled Quail *Callipepla squamata*	Natural	30.27	24.12	18.96	48.33	28	
	Other	14.17	60.84	4.35	46.17	4	
	Global 2007	9.43	49.53	3.70	24.04	15	0.05
	Global 2008	29.85	18.18	20.93	42.56	49	0.09

White-tailed Kite (*Elanus leucurus*)

We did not detect White-tailed Kite frequently in either 2007 or 2008 and it was present on only a small percentage of transects (<4%) in both years. In 2008, we detected White-tailed Kite in Janos, where it occurs at the edge of its mapped range (Howell and Webb 1995), and in Valles Centrales, and Mapimí. Global densities were similar between years. There were not sufficient data to reliably elucidate grassland type preferences.

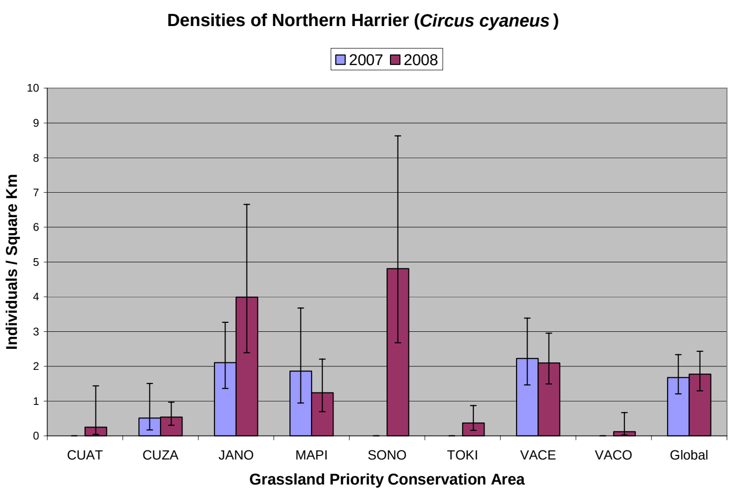


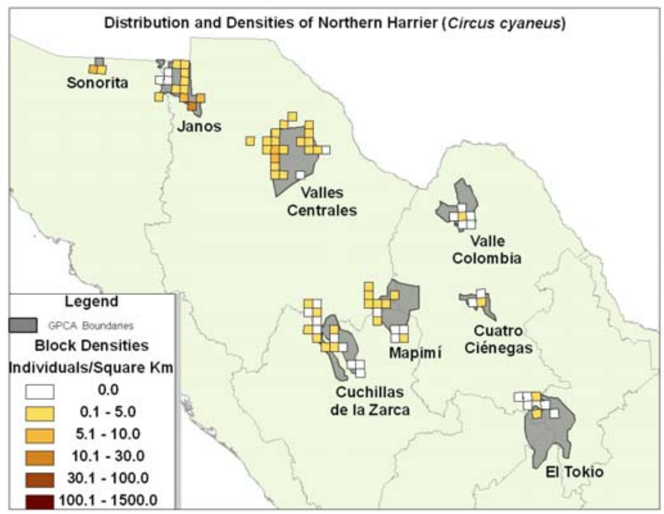


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
White-tailed Kite *Elanus leucurus*	Gypsophytic	0.00				0	
	Halophytic	0.12	38.88	0.06	0.26	7	
	Natural	0.12	40.95	0.06	0.26	11	
	Other	0.00				0	
	Global 2007	0.08	55.02	0.03	0.23	5	0.02
	Global 2008	0.07	31.83	0.04	0.13	19	0.03

Northern Harrier (*Circus cyaneus*)

Northern Harrier was present on a relatively high proportion of transects in 2007 and 2008, most frequently in western GPCAs. Global densities were similar between years, both globally and within each GPCA, except in Janos, where an increase was observed from 2007 to 2008, and in Cuatro Ciénegas, El Tokio, and Valle Colombia (among sites retained from 2007 to 2008) where the species was detected for the first time in 2008. No preference of grassland type was apparent.

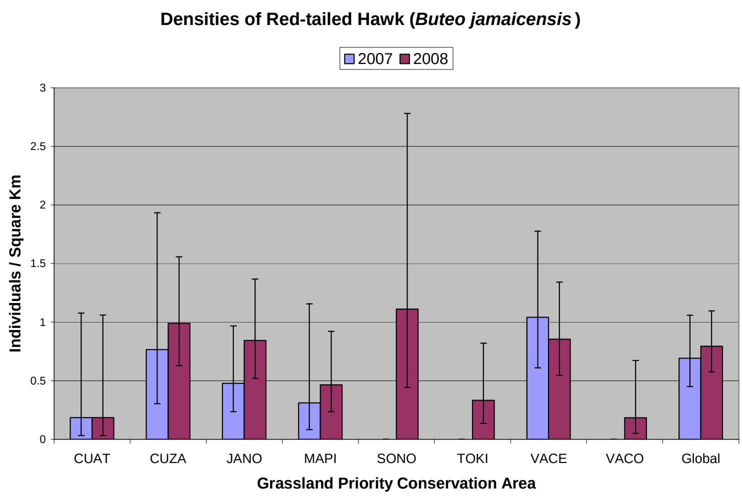


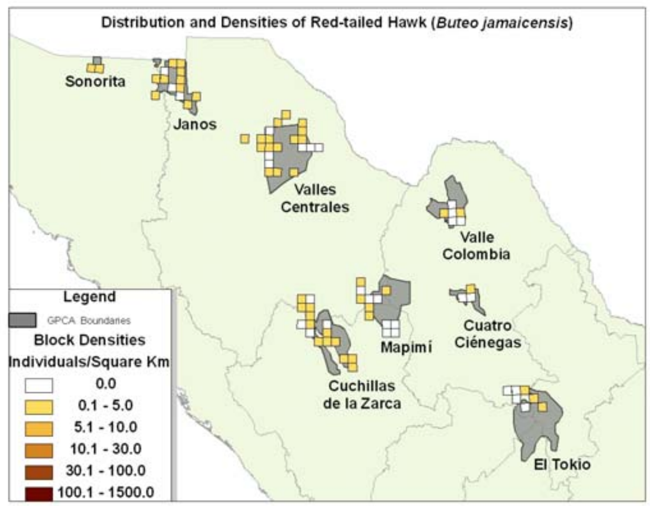


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Northern Harrier *Circus cyaneus*	Gypsophytic	0.00				0	
	Halophytic	1.60	19.95	1.09	2.36	56	
	Natural	1.83	21.72	1.20	2.79	94	
	Other	1.01	34.67	0.51	1.99	8	
	Global 2007	1.68	16.98	1.20	2.34	73	0.30
	Global 2008	1.77	16.19	1.29	2.43	159	0.25

Red-tailed Hawk (*Buteo jamaicensis*)

Red-tailed Hawk was widely distributed across our study area and it occurred on nearly 20% of transects in both years. However, we detected this species for the first time in 2008 in El Tokio and Valle Colombia (among sites retained from 2007). Global densities were similar between years. No grassland type preference was apparent.

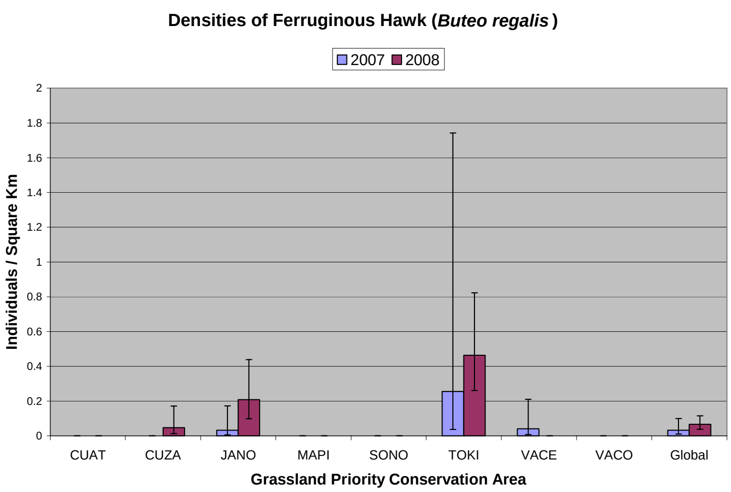


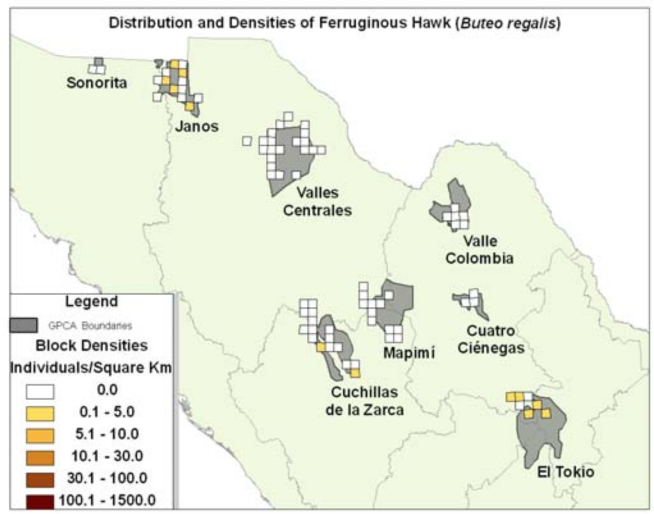


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Red-tailed Hawk *Buteo jamaicensis*	Gypsophytic	0.64	52.47	0.23	1.74	5	
	Halophytic	0.78	24.94	0.48	1.26	31	
	Natural	0.88	18.77	0.61	1.27	60	
	Other	0.44	49.67	0.17	1.13	4	
	Global 2007	0.69	21.90	0.45	1.06	37	0.17
	Global 2008	0.79	16.48	0.58	1.10	102	0.19

Ferruginous Hawk (*Buteo regalis*)

We detected Ferruginous Hawk most frequently in Janos and El Tokio and rarely in Cuchillas de la Zarca. Densities were low both years, but the species was perhaps slightly more widespread in 2008. It occurred on <5% of transects in both years. Densities in gypsophytic grasslands were higher, likely due to presence of Mexican prairie dogs (*Cynomys mexicanus*) in El Tokio, the only GPCA with gypsophytic grasslands.

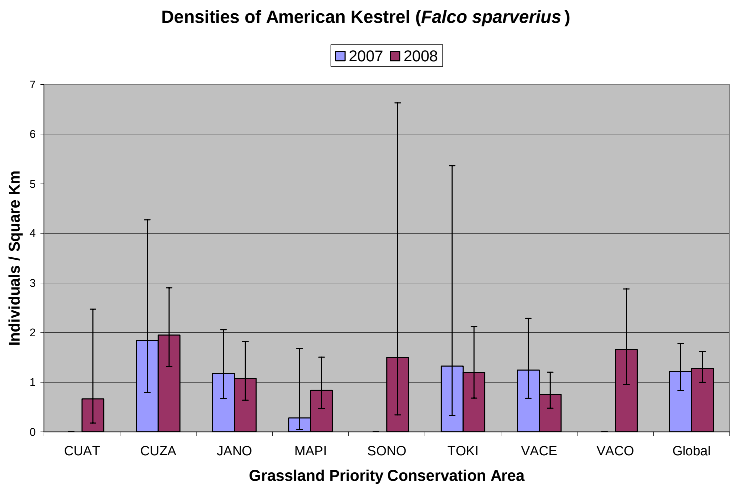


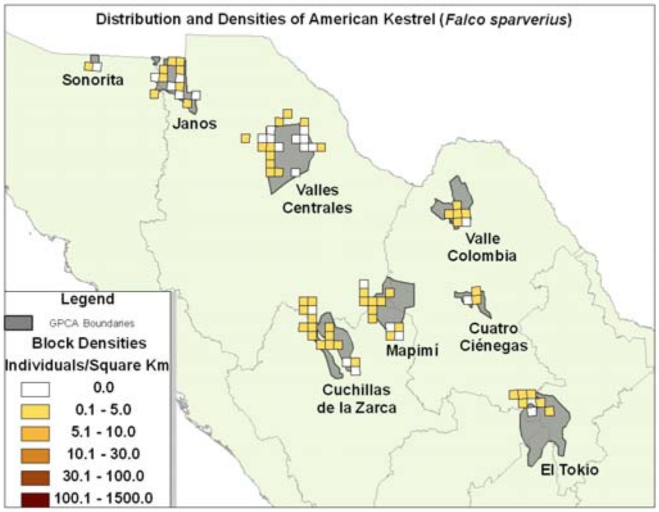


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Ferruginous Hawk *Buteo regalis*	Gypsophytic	0.67	32.70	0.35	1.27	9	
	Halophytic	0.01	101.98	0.00	0.07	1	
	Natural	0.07	38.86	0.03	0.14	8	
	Other	0.19	58.49	0.06	0.57	3	
	Global 2007	0.03	60.04	0.01	0.10	3	0.01
	Global 2008	0.07	28.62	0.04	0.11	21	0.04

American Kestrel (*Falco sparverius*)

American Kestrel was distributed widely across our study area and it occurred on roughly 20% of transects in both 2007 and 2008. Densities varied little between years although we detected it for the first time in Cuatro Ciénegas and Valle Colombia in 2008 (among sites kept from the 2007 dataset). No specific grassland type was clearly preferred.

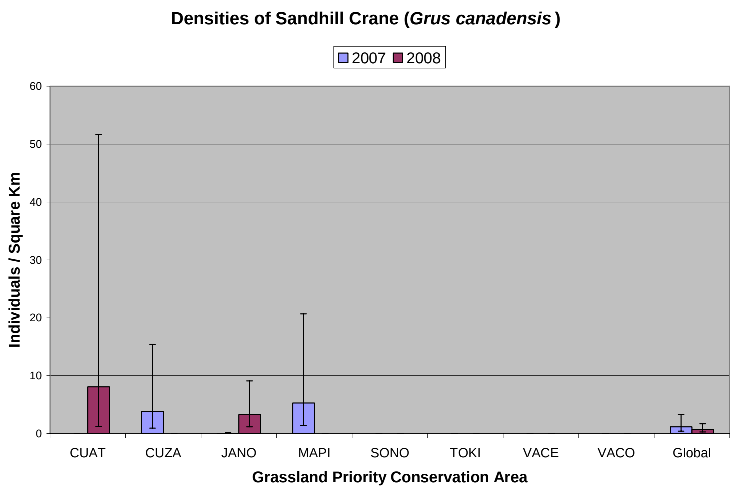


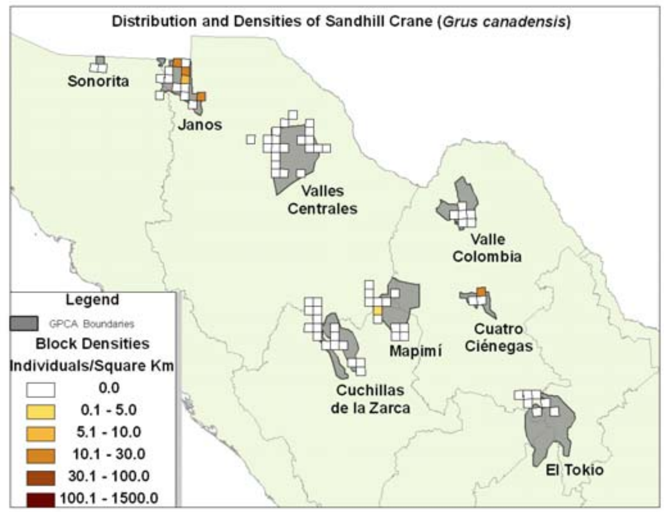


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
American Kestrel *Falco sparverius*	Gypsophytic	0.65	56.24	0.22	1.90	3	
	Halophytic	0.66	23.89	0.41	1.05	17	
	Natural	1.58	14.16	1.20	2.09	65	
	Other	2.42	28.32	1.38	4.24	12	
	Global 2007	1.22	19.38	0.83	1.78	35	0.18
	Global 2008	1.27	12.37	1.00	1.62	98	0.21

Sandhill Crane (*Grus canadensis*)

Sandhill Crane occurred on a small number of transects (<4%), mostly in Janos, but also in Cuatro Ciénegas and Mapimí. The small sample size for this species precludes meaningful interpretation of changes in global density or of grassland type preferences.

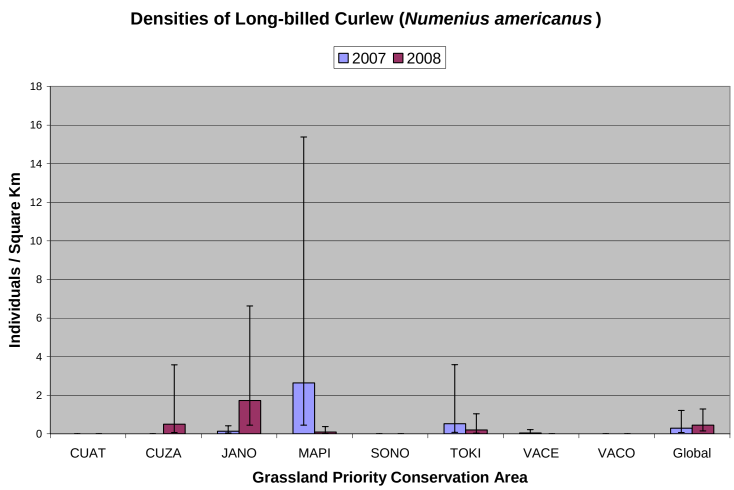


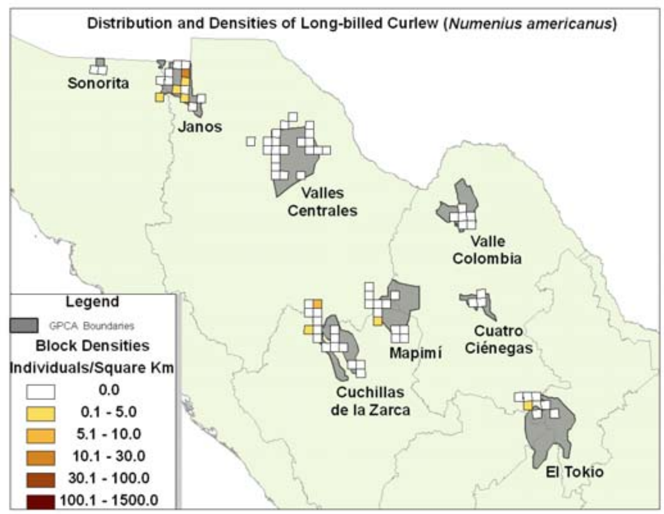


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Sandhill Crane *Grus canadensis*	Gypsophytic	0.00				0	
	Halophytic	2.20	64.95	0.68	7.09	15	
	Natural	0.43	74.70	0.12	1.61	2	
	Other	0.00				0	
	Global 2007	1.16	55.07	0.41	3.30	12	0.03
	Global 2008	0.67	49.57	0.26	1.69	17	0.01

Long-billed Curlew (*Numenius americanus*)

Long-billed Curlew occurred on 3% of transects each year with the highest densities in 2008 in Janos. The species was also found in Cuchillas de la Zarca, Mapimi, and El Tokio. The small sample size for this species precludes meaningful interpretation of effects due to year or grassland type.

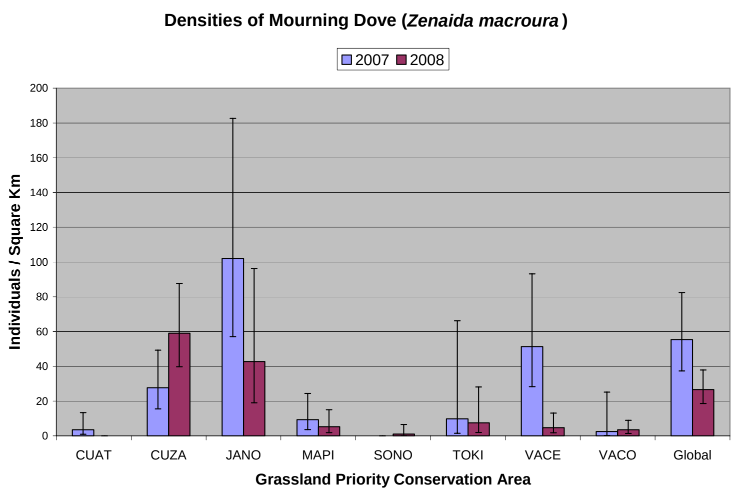


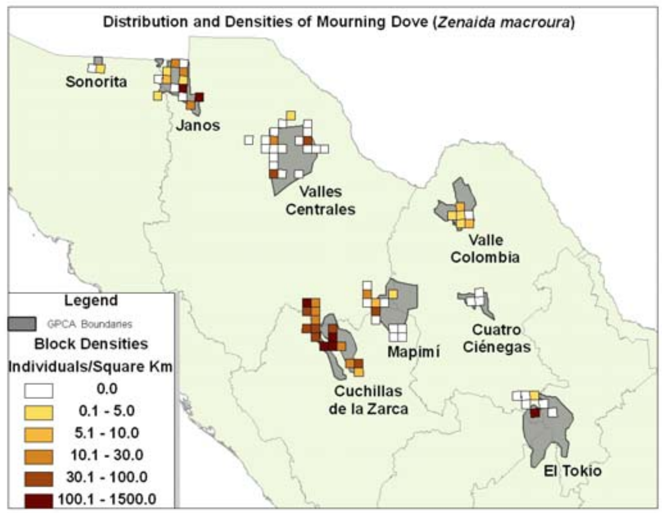


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Long-billed Curlew *Numenius americanus*	Gypsophytic	0.00				0	
	Halophytic	1.04	83.96	0.24	4.52	8	
	Natural	0.31	65.00	0.09	1.08	9	
	Other	0.41	100.94	0.07	2.23	1	
	Global 2007	0.29	78.38	0.07	1.21	8	0.03
	Global 2008	0.44	55.65	0.15	1.29	19	0.03

Mourning Dove (*Zenaida macroura*)

Mourning Dove was widely distributed across all GPCAs although densities were highest in Janos and Cuchillas de la Zarca in 2008. It occurred on 55% fewer transects in 2008 than in 2007. Global density decreased by 28.8 birds/km^2 (95% CI=-53.0, -4.7) from 2007 to 2008 with a significant decreases in most GPCAs except for Cuchillas de la Zarca where it increased. Mourning Doves appear to prefer natural grasslands over most other grassland types.

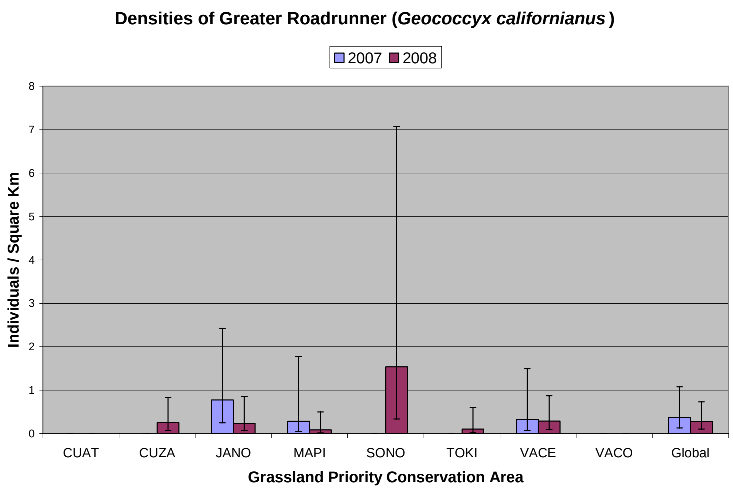


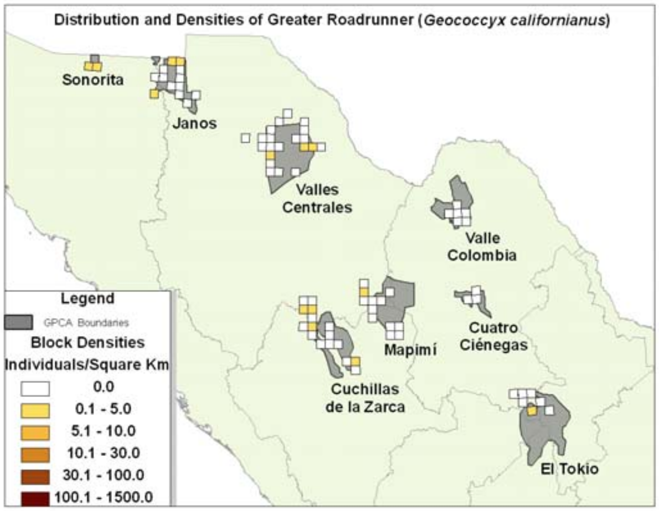


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Mourning Dove *Zenaida macroura*	Gypsophytic	27.18	80.20	6.47	114.25	9	
	Halophytic	9.14	48.54	3.69	22.66	25	
	Natural	39.59	20.60	26.52	59.09	145	
	Other	1.17	74.11	0.30	4.47	3	
	Global 2007	55.44	20.37	37.28	82.44	179	0.44
	Global 2008	26.60	18.17	18.67	37.91	191	0.20

Greater Roadrunner (*Geococcyx californianus*)

Although not particularly associated with grasslands, we found Greater Roadrunner most frequently in some of the western GPCA grasslands. The percentage of transects on which it occurred was low in both years and there was no apparent change in global density nor preference for any grassland type.

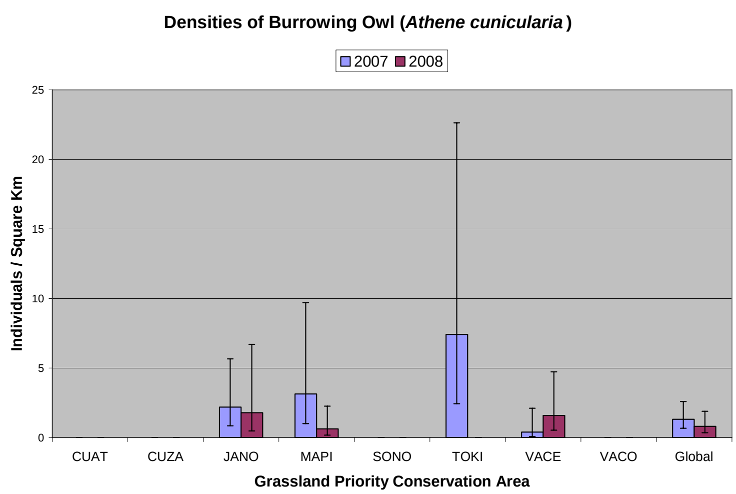


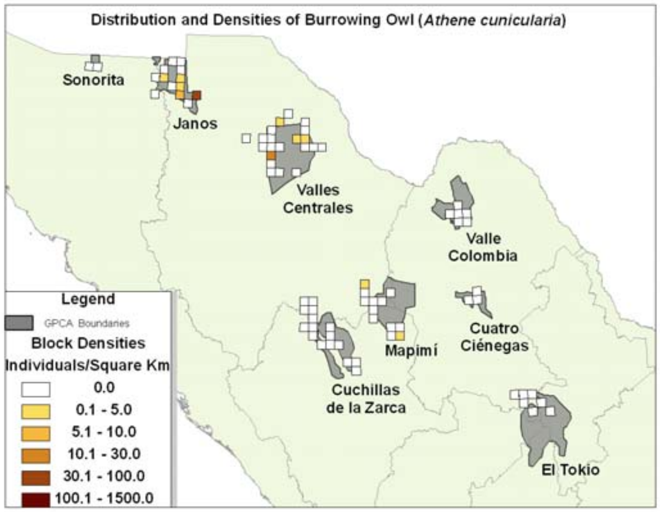


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Greater Roadrunner *Geococcyx californianus*	Gypsophytic	0.51	118.12	0.08	3.33	1	
	Halophytic	0.27	85.19	0.06	1.20	3	
	Natural	0.68	68.92	0.19	2.47	12	
	Other	0.87	117.90	0.13	5.66	2	
	Global 2007	0.37	57.70	0.13	1.08	12	0.04
	Global 2008	0.28	51.55	0.10	0.73	18	0.03

Burrowing Owl (*Athene cunicularia*)

We found Burrowing Owls in Janos, Valles Centrales and Mapimí in 2008. Surprisingly, none were found in El Tokio this year, where known populations do exist, especially amongst Mexican prairie dog colonies. Sample sizes are not large enough for meaningful interpretation of grassland preference or changes in global density.

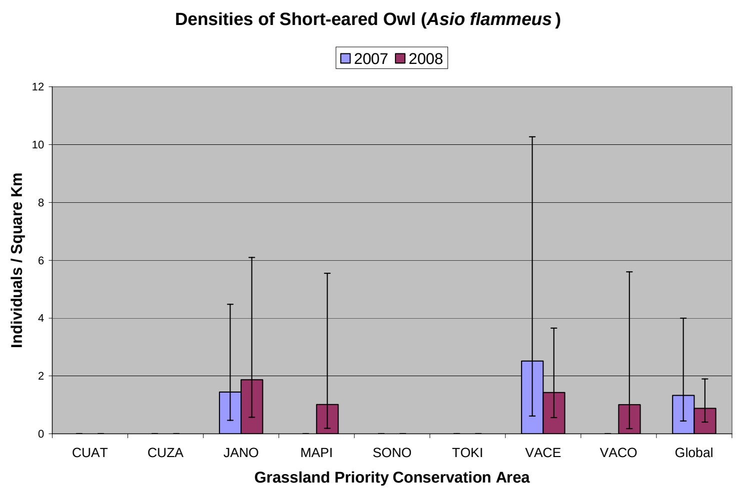


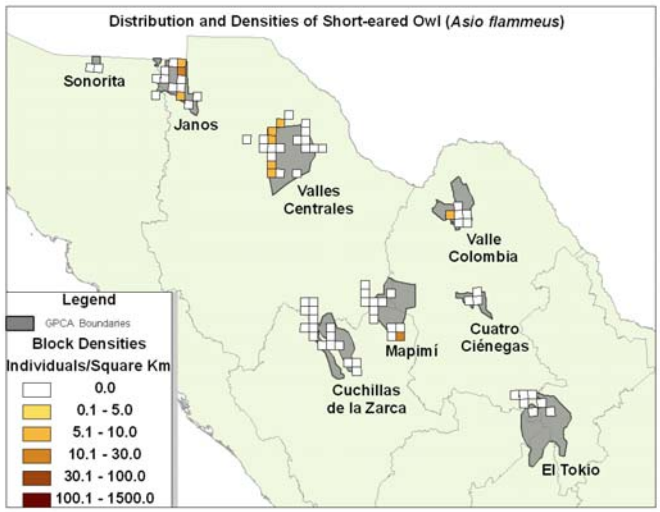


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
	Gypsophytic	0.00				0	
	Halophytic	3.62	91.36	0.62	21.01	6	
Burrowing Owl *Athene cunicularia*	Natural	0.73	57.74	0.25	2.15	6	
	Other	0.00				0	
	Global 2007	1.32	35.33	0.67	2.60	14	0.08
	Global 2008	0.81	44.22	0.35	1.89	14	0.03

Short-eared Owl (*Asio flammeus*)

We found Short-eared Owl in Janos, Valles Centrales, Mapimí, and Valle Colombia. It occurred on a relatively low percentage of transects both years (<5%). In Mapimí and Valle Colombia, we detected this species for the first time in 2008 (among sites kept from the 2007 dataset). Sample sizes are too small for meaningful interpretation of changes in global density or grassland preference. However the species was found in both natural and halophytic grasslands and likely has a preference for tall grasslands, at least for daytime roosts

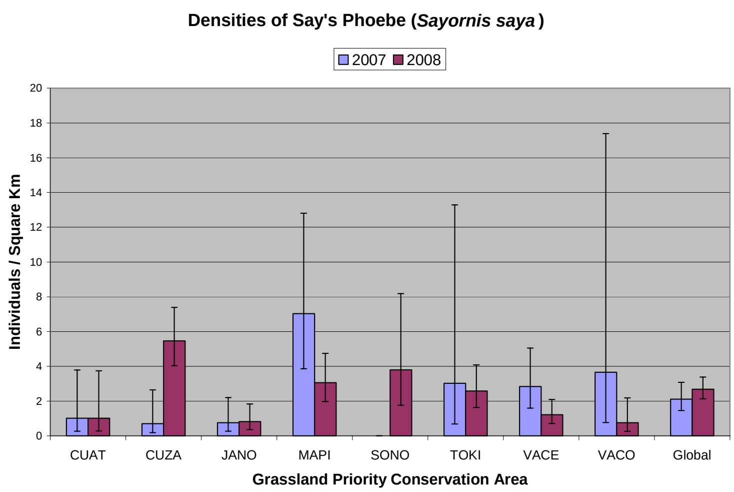


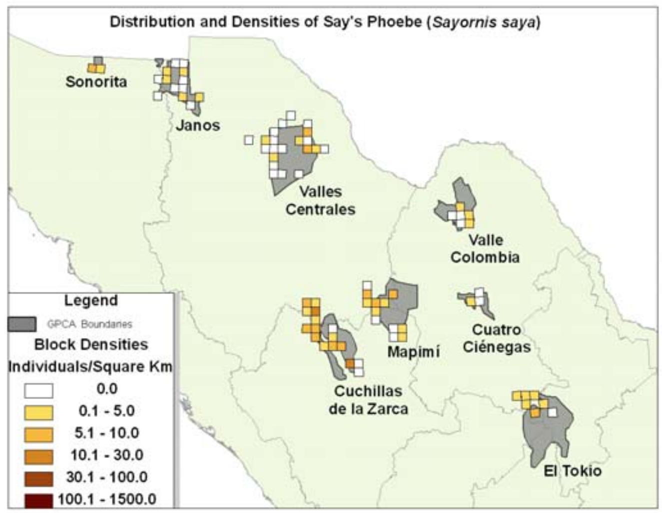


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Short-eared Owl *Asio flammeus*	Gypsophytic	0.00				0	
	Halophytic	1.19	64.40	0.36	3.88	6	
	Natural	0.53	61.23	0.17	1.66	5	
	Other	0.00				0	
	Global 2007	1.33	59.90	0.44	4.00	7	0.04
	Global 2008	0.88	40.30	0.41	1.90	11	0.02

Say's Phoebe (*Sayornis saya*)

We found Say's Phoebe in all GPCAs in relatively low densities. The percentage of transects it occurred on increased slightly between years (19% to 23%), although density remained similar. In Cuchillas de la Zarca, density increased nearly 700% in 2008. Densities in most other GPCAs decreased or remained constant. There was not a significant change in global density between years. There was no clear preference for any grassland types.

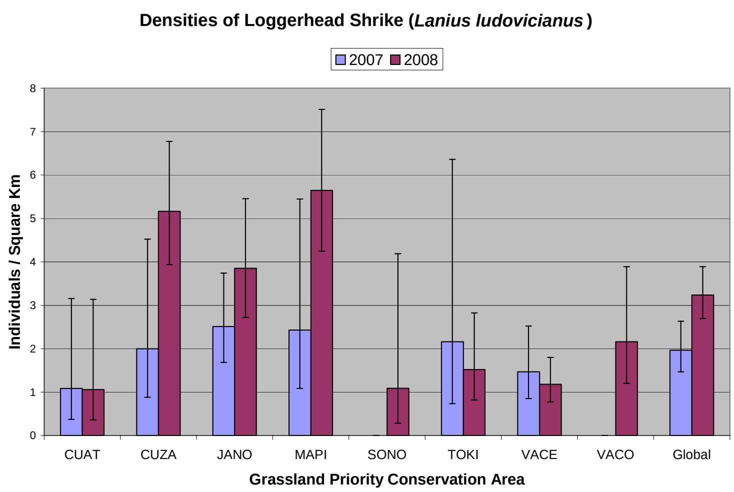


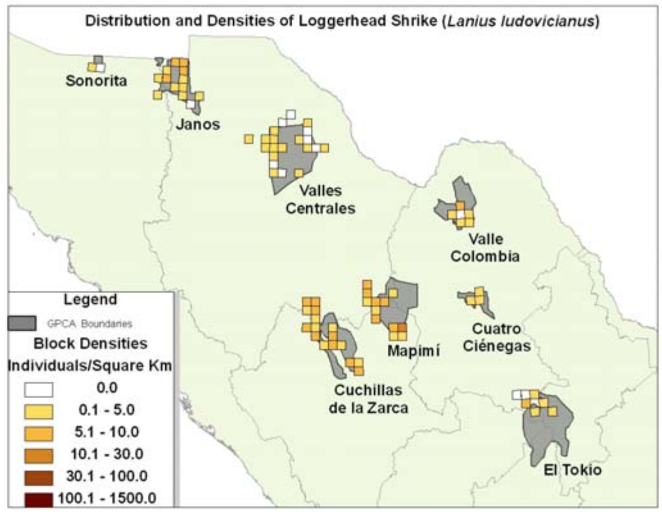


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Say's Phoebe *Sayornis saya*	Gypsophytic	1.60	42.13	0.70	3.65	5	
	Halophytic	2.29	18.89	1.58	3.31	38	
	Natural	2.73	15.11	2.03	3.66	74	
	Other	3.57	25.98	2.13	5.99	13	
	Global 2007	2.11	19.12	1.45	3.07	50	0.19
	Global 2008	2.68	11.75	2.13	3.38	130	0.23

Loggerhead Shrike (*Lanius ludovicianus*)

Loggerhead Shrike was found in 85% of study blocks and in all GPCAs. This species global density increased by 1.3 birds/km^2 (95%CI = 0.4, 2.2) from 2007 to 2008. The proportion of transects on which it occurred also increased. Loggerhead Shrike showed no clear preference for any grassland types.

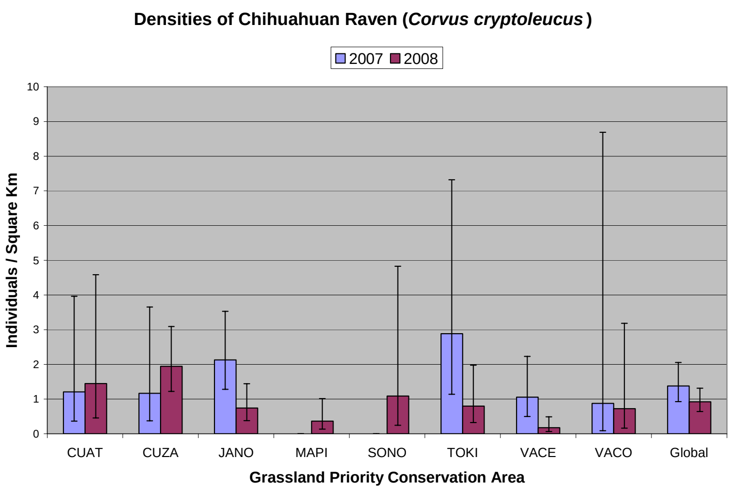


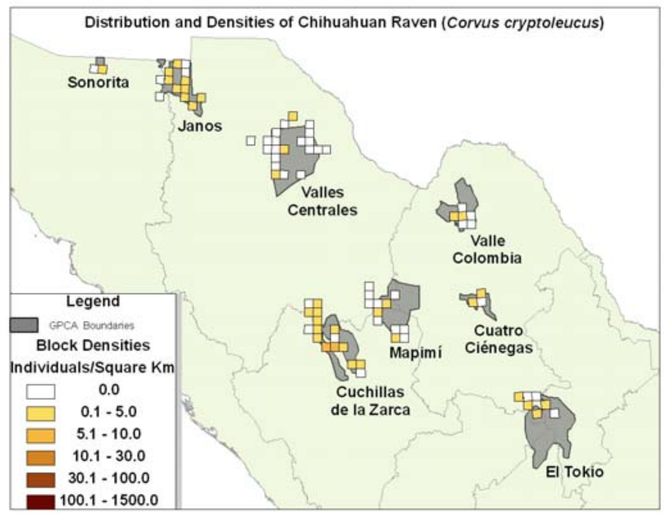


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Loggerhead Shrike *Lanius ludovicianus*	Gypsophytic	1.06	50.84	0.40	2.82	5	
	Halophytic	2.91	13.54	2.23	3.79	76	
	Natural	3.39	9.95	2.79	4.12	130	
	Other	2.18	35.90	1.07	4.42	12	
	Global 2007	1.96	14.88	1.47	2.63	61	0.26
	Global 2008	3.24	9.34	2.69	3.89	227	0.34

Chihuahuan Raven (*Corvus cryptoleucus*)

Chihuahuan Raven was widely distributed in most GPCAs. Between 2007 and 2008 there was a 38% decrease in the percentage of transects on which it occurred, although changes in global density were not significant. However, improved identification of this species (and separation from Common Raven, *C. corax*) in 2008 could account for the observed decreases. There was also no clear preference for grassland type, although halophytic grasslands may have been used less than natural and 'other' grasslands.

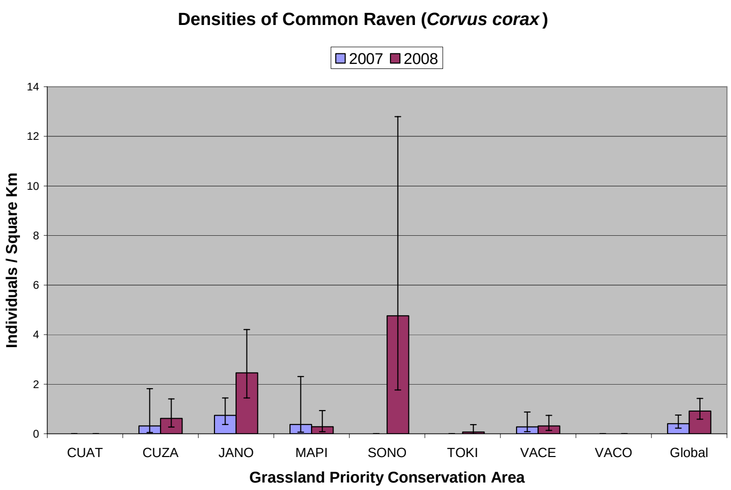


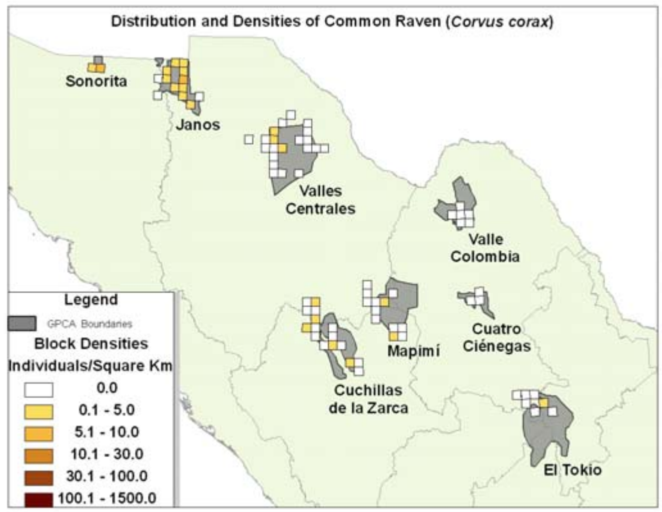


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Chihuahuan Raven *Corvus cryptoleucus*	Gypsophytic	0.60	48.34	0.24	1.54	4	
	Halophytic	0.43	35.49	0.22	0.85	13	
	Natural	1.20	20.64	0.81	1.80	51	
	Other	0.91	74.21	0.23	3.61	4	
	Global 2007	1.38	20.40	0.93	2.05	46	0.21
	Global 2008	0.92	18.26	0.64	1.31	72	0.13

Common Raven (*Corvus corax*)

We found Common Raven primarily in western GPCAs, although one observation was made in El Tokio. The proportion of transects on which this species occurred was relatively constant between years, although global density increased by .5 birds/km^2 (95% CI = 0.02, 1.0), perhaps due to the addition of the Sonorita GPCA in 2008. Natural grasslands appear to have been used more than other types. Difficulty in separating this species from Chihuahuan Raven warrants caution in interpretation of results, especially for 2007.

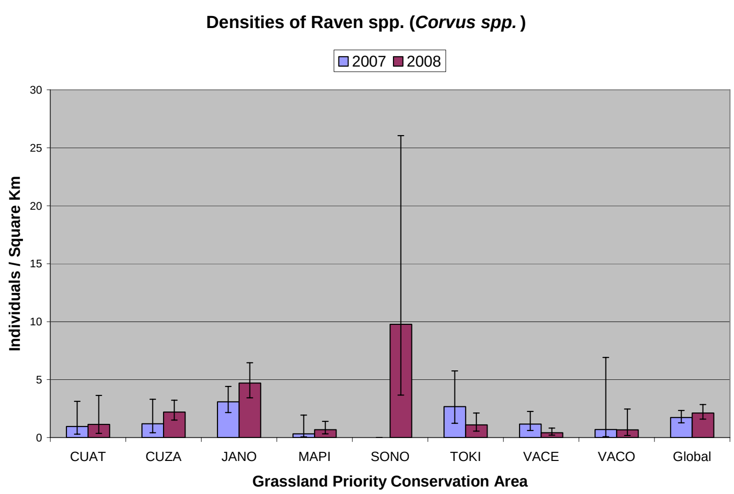


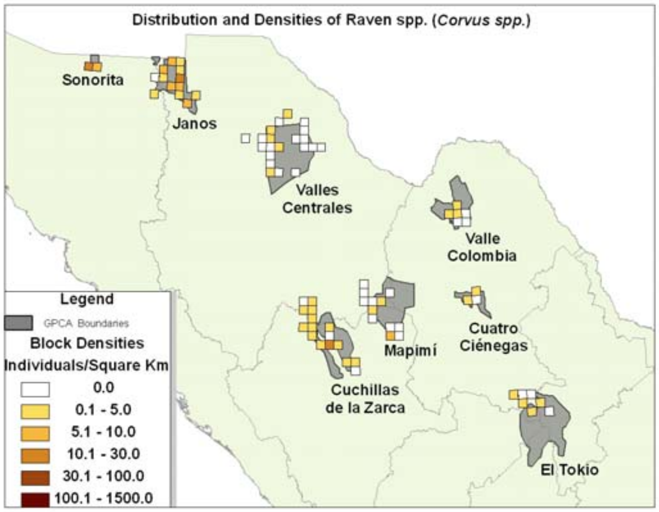


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Common Raven *Corvus corax*	Gypsophytic	0.14	102.00	0.03	0.81	1	
	Halophytic	0.23	47.89	0.09	0.57	7	
	Natural	1.26	25.98	0.76	2.09	50	
	Other	0.00				0	
	Global 2007	0.41	31.60	0.22	0.76	20	0.09
	Global 2008	0.92	22.70	0.59	1.43	59	0.10

Raven spp. (*Corvus spp.*)

Raven spp. are the aggregation of Chihuahuan Raven, Common Raven, and all unidentified ravens. This genus was widely distributed throughout all GPCAs but was particularly common in Sonorita, Janos, and Cuchillas de la Zarca. Density did not change significantly between years across GPCAs although they did vary within some GPCAs. Natural grasslands appear to be preferred overall.

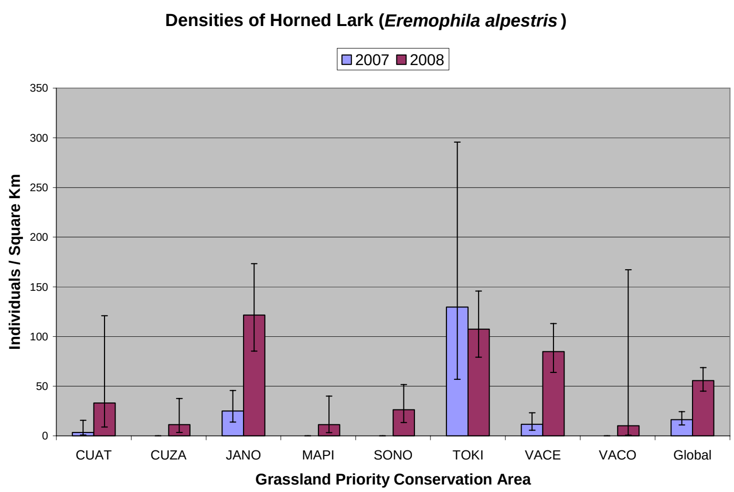


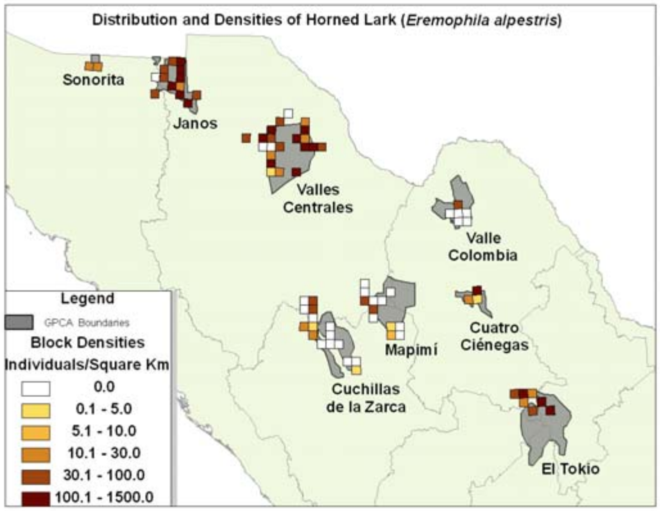


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	N	Prop. of Transects
Raven spp. *Corvus spp.*	Gypsophytic	1.12	41.78	0.50	2.53	9	
	Halophytic	0.60	26.19	0.36	1.00	24	
	Natural	2.73	15.08	2.03	3.66	139	
	Other	1.06	49.47	0.41	2.73	8	
	Global 2007	1.72	15.76	1.26	2.34	80	0.30
	Global 2008	2.13	14.70	1.59	2.84	178	0.26

Horned Lark (*Eremophila alpestris*)

Horned Lark was widely distributed in most GPCAs although it highest densities were measured in Janos, Valles Centrales, and El Tokio. Between 2007 and 2008 there was a 61% increase in the percentage of transects on which it occurred and global density increased by 39.3 birds/km^2 (95%CI = 25.8, 52.8). Large increases in density occurred in Janos and Valles Centrales. Horned Lark appeared to prefer gypsophytic grasslands (found only in El Tokio) when compared to other grassland types.

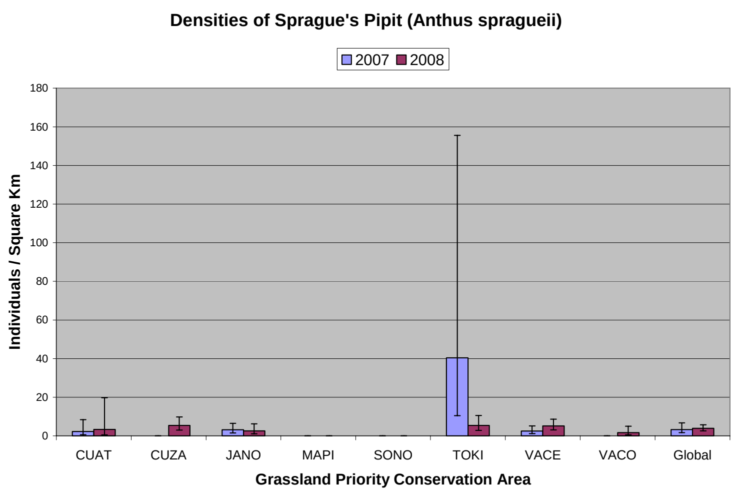


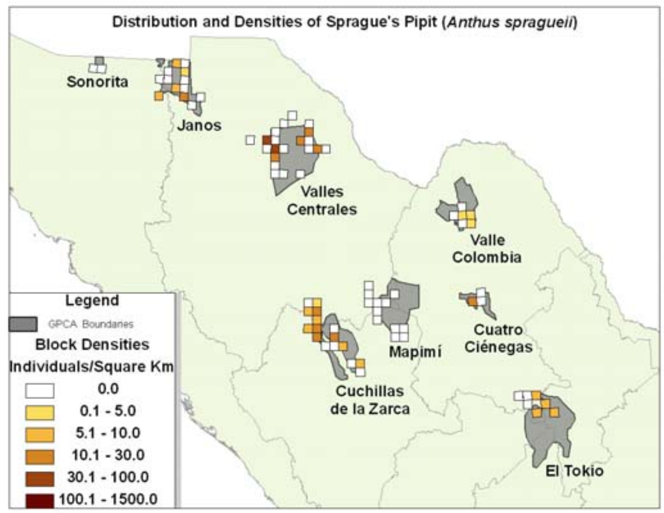


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Horned Lark *Eremophila alpestris*	Gypsophytic	193.71	19.58	131.86	284.59	140	
	Halophytic	69.27	19.95	46.96	102.18	93	
	Natural	48.50	16.58	35.10	67.04	165	
	Other	41.90	27.50	24.37	72.07	74	
	Global 2007	16.33	20.33	10.96	24.35	162	0.23
	Global 2008	55.65	10.80	45.03	68.77	472	0.37

Sprague's Pipit (*Anthus spragueii*)

We detected Sprague's Pipit in all GPCAs in 2008 except for Sonorita and Mapimí. Both the proportion of transects on which it occurred and its global density remained essentially unchanged between 2007 and 2008. Grassland preference is not clear, but may be lower in halophytic grasslands. The high density (and confidence interval) reflected for El Tokio is a result of two apparent flocks of this species on a single transect (N=6, 7), which require further verification.

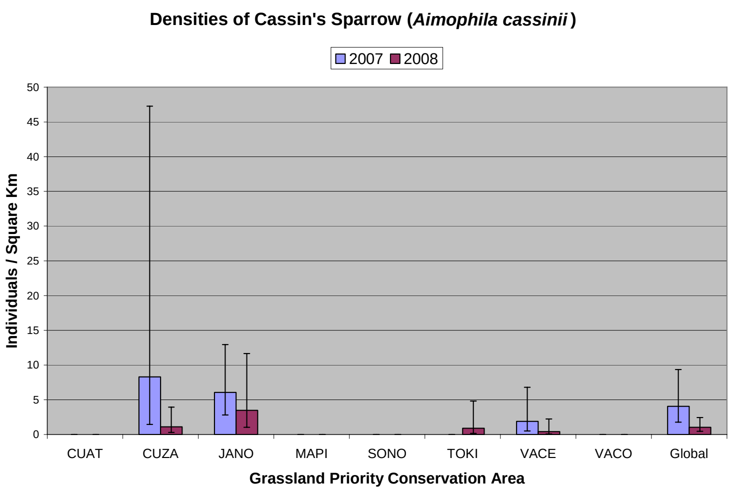


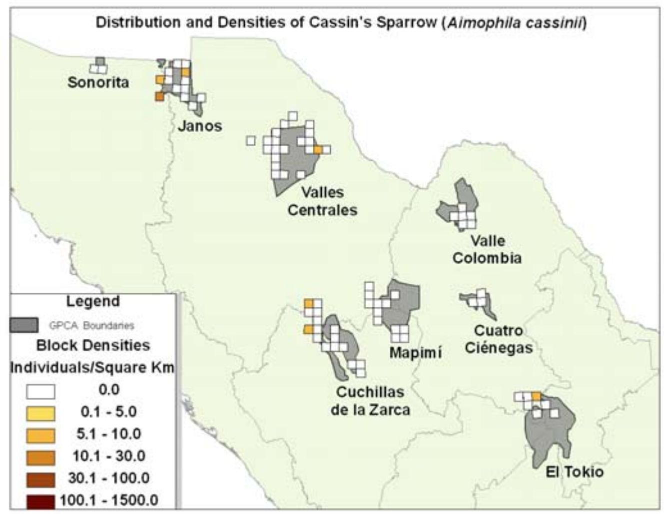


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Sprague's Pipit *Anthus spragueii*	Gypsophytic	6.88	42.95	3.00	15.80	10	
	Halophytic	1.88	36.29	0.94	3.77	13	
	Natural	4.84	25.54	2.95	7.93	46	
	Other	1.61	74.96	0.42	6.23	3	
	Global 2007	3.31	35.29	1.64	6.68	27	0.11
	Global 2008	3.88	20.39	2.61	5.78	72	0.12

Cassin's Sparrow (*Aimophila cassinii*)

We found Cassin's Sparrow in low numbers in Janos, Valles Centrales, Cuchillas de la Zarca, and El Tokio. This species occurred on only 1% of transects in 2008, compared to 6% in 2007. Although this is one of the most common and detectable breeding bird species in Chihuahuan Desert grasslands and the southern Great Plains, it appears Cassin's Sparrow depart these areas in winter. Anecdotal observations suggest it may prefer shrubby grasslands with mesquite, sotol and other vegetation more typical in foothills than open plains (A. Panjabi, pers. obs.). The small sample size precludes meaningful interpretation of population changes or grassland preferences.

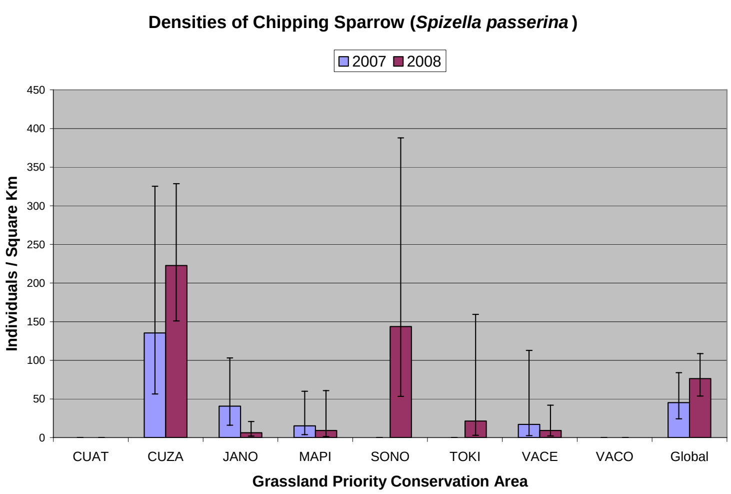


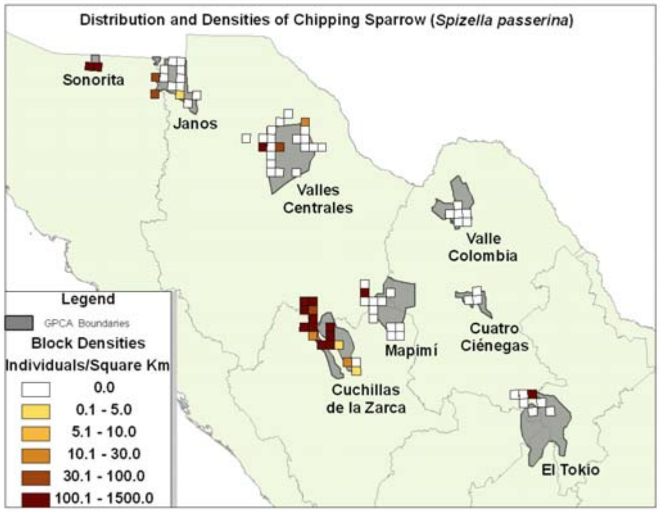


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Cassin's Sparrow *Aimophila cassinii*	Gypsophytic	0.00				0	
	Halophytic	0.00				0	
	Natural	2.17	42.66	0.97	4.86	7	
	Other	2.38	100.04	0.44	12.93	1	
	Global 2007	4.06	41.23	1.76	9.35	12	0.06
	Global 2008	1.05	45.14	0.45	2.46	9	0.01

Chipping Sparrow (*Spizella passerina*)

We found Chipping Sparrow in a few blocks in most GPCAs, mainly where there was taller woody vegetation, but it was especially common in Cuchillas de la Zarca and Sonorita. The proportion of transects on which it occurred was similar between years and there may have been a slight increase in global density. Densities were highest in natural grasslands.

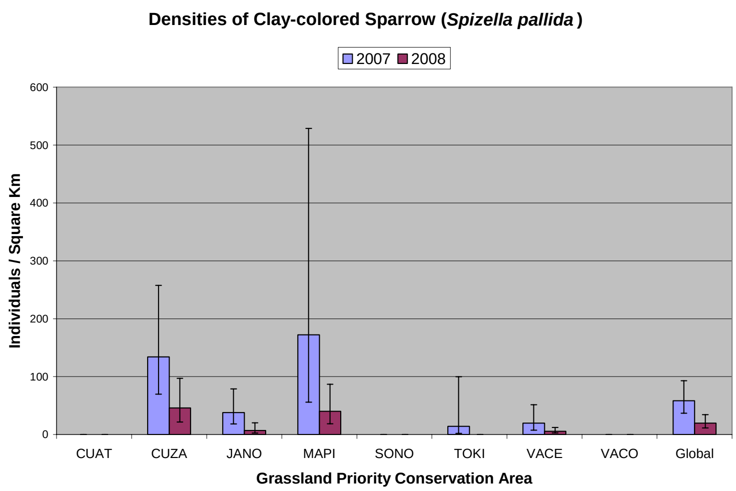


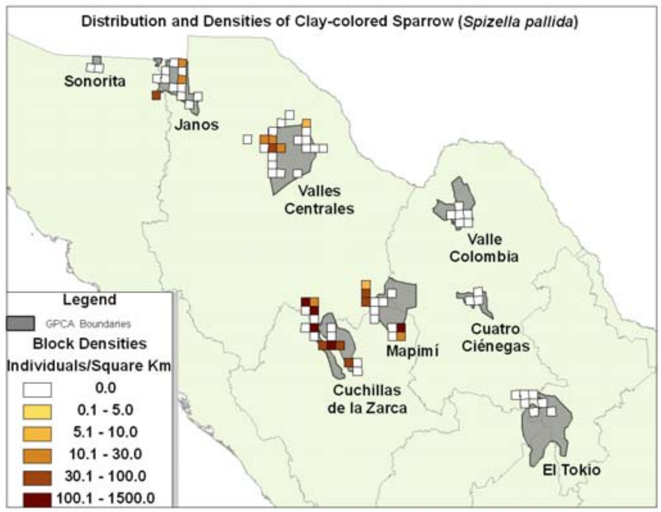


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Chipping Sparrow *Spizella passerina*	Gypsophytic	0.00				0	
	Halophytic	4.27	94.93	0.84	21.84	4	
	Natural	105.53	20.29	71.11	156.61	151	
	Other	54.48	76.19	13.31	223.04	6	
	Global 2007	45.25	31.64	24.39	83.94	50	0.14
	Global 2008	76.39	17.96	53.80	108.48	161	0.15

Clay-colored Sparrow (*Spizella pallida)*

Clay-colored Sparrow appears to winter mainly in the southwestern portion of the study area. Densities were highest in Cuchillas de la Zarca and Mapimí. Between 2007 and 2008 there was a 66% decrease in the number of transects on which the species was found and a decrease in global density of 39.3 birds/km^2 (95%CI = -52.8, -25.8). Densities also appeared to decline in most GPCAs in which it occurred in 2007. Improvements by observers in identification of Spizella sparrows in 2008 could be confounding effects to some degree. Densities of both Brewer's and Chipping sparrows increased in 2008. Clay-colored Sparrow appears to use halophytic and natural grasslands equally.

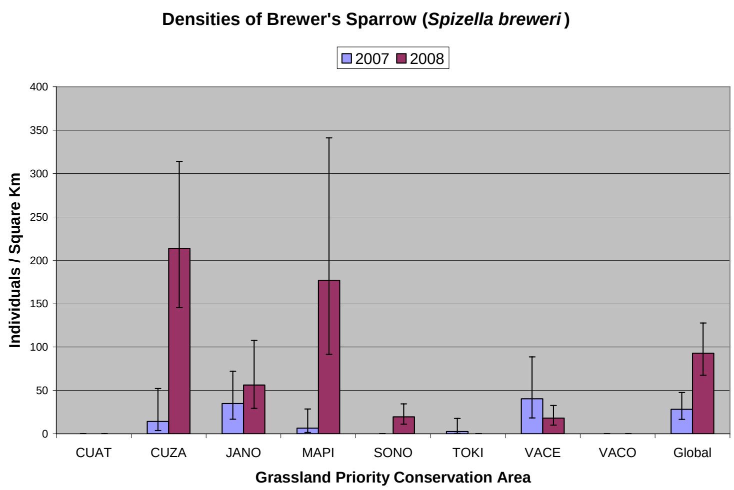


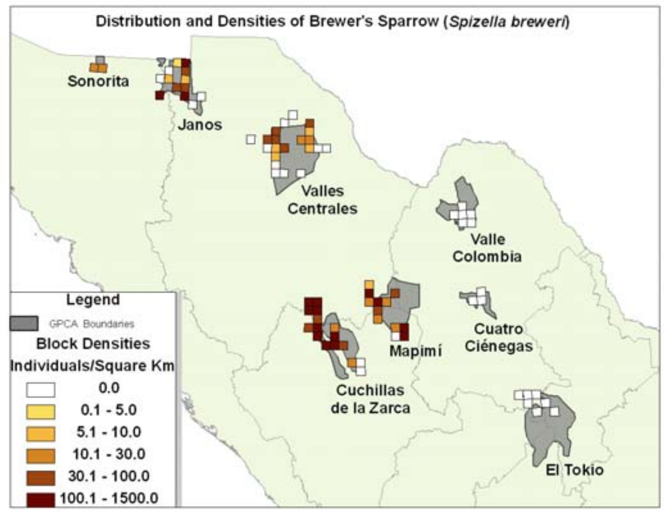


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Clay-colored Sparrow *Spizella pallida*	Gypsophytic	0.00				0	
	Halophytic	25.02	40.37	11.62	53.84	30	
	Natural	25.27	29.60	14.26	44.79	36	
	Other	0.72	100.57	0.13	3.93	1	
	Global 2007	58.40	23.82	36.72	92.88	98	0.25
	Global 2008	19.69	28.50	11.33	34.21	68	0.08

Brewer's Sparrow (*Spizella breweri*)

Brewer's Sparrow was found only in the five westernmost GPCAs, although the species has been recorded in the other areas. There was a 31% percent increase in the number of transects on which it occurred between years and a 230% increase in global density from 2007 to 2008 (64.7 birds/km^2, 95%CI = 31.3, 98.1), including significant increases in Cuchillas de la Zarca and Mapimí. However, improvements by observers in identification of Spizella sparrows in 2008 could be exaggerating the apparent effect.

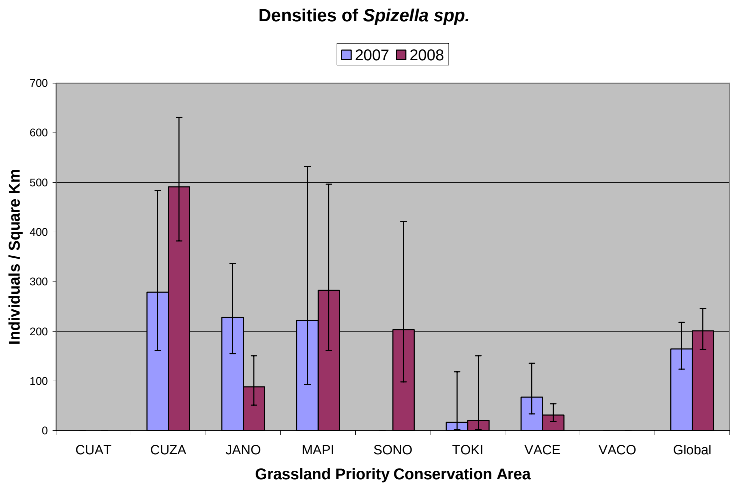


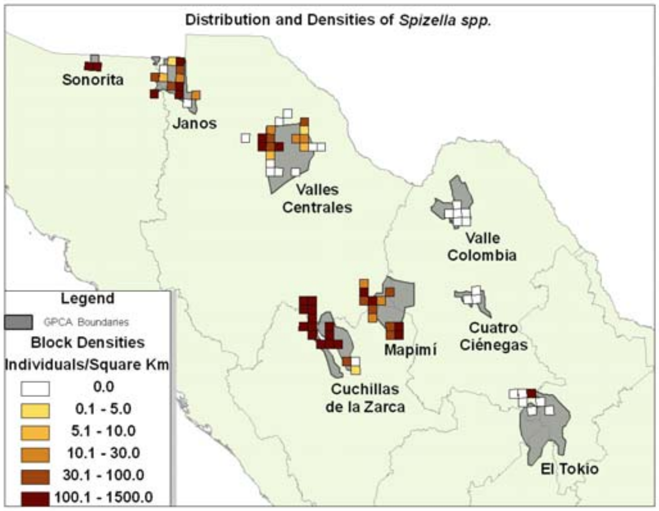


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Brewer's Sparrow *Spizella breweri*	Gypsophytic	0.00				0	
	Halophytic	83.79	31.79	45.52	154.24	94	
	Natural	107.39	19.95	72.86	158.28	203	
	Other	5.38	97.42	0.88	32.77	3	
	Global 2007	28.14	27.22	16.60	47.68	54	0.22
	Global 2008	92.86	16.36	67.48	127.76	300	0.29

Spizella spp.

Spizella spp. is the aggregation of Chipping Sparrow, Clay-colored Sparrow, Brewer's Sparrow, and unidentified *Spizella* sparrows. *Spizella spp.* were largely restricted to the western GPCAs, and with the exception of some Chipping Sparrows found in a single block in El Tokio, were apparently absent from Valle Colombia, Cuatro Ciénegas, and El Tokio. Between 2007 and 2008, there was a slight (17%) decrease in the proportion of transects on which they occurred but a possible increase in density overall. A significant increase occurred in Cuchillas de la Zarca, whereas decreases were observed in Janos and Valles Centrales... These changes suggest a southerly shift in distribution between years for this group of similar species. Natural grasslands are likely preferred over other types.

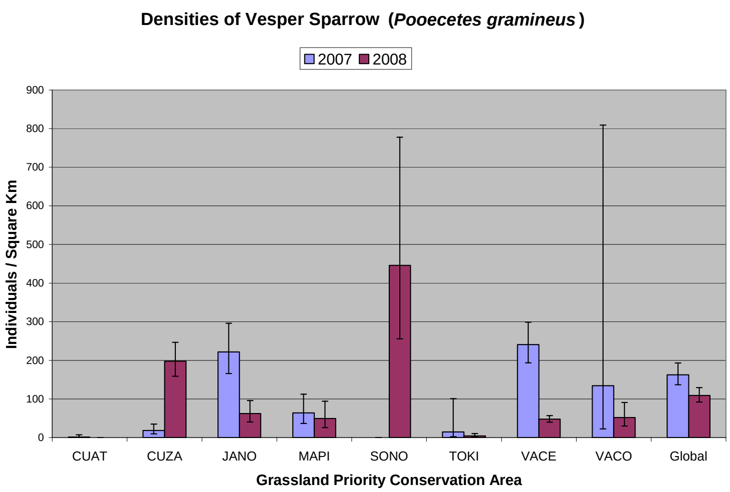


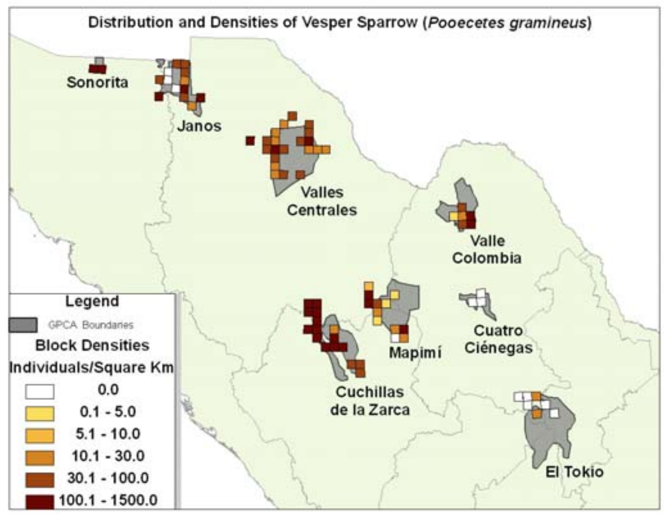


Scientific Name	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Spizella spp.	Gypsophytic	0.00				0	
	Halophytic	136.93	27.17	80.93	231.66	168	
	Natural	237.87	12.36	186.78	302.93	424	
	Other	78.34	60.64	25.20	243.60	12	
	Global 2007	164.41	14.46	123.83	218.29	250	0.46
	Global 2008	200.73	10.39	163.76	246.05	604	0.38

Vesper Sparrow (*Pooecetes gramineus*)

Vesper Sparrow was widely distributed and usually abundant but we detected it less often in El Tokio and not at all in Cuatro Ciénegas. From 2007 to 2008 there was a 20% decrease in the number of transects on which it occurred and a significant decrease in global density (-53.3 birds/km^2, 95%CI = -86.8, -19.9). There was also an apparent southerly shift in distribution between years, as densities in Janos and Valles Centrales (both northern GPCAs) decreased significantly while density in Cuchillas de la Zarca increased more than 10-fold. There is a clear preference in Vesper Sparrow for natural grasslands.

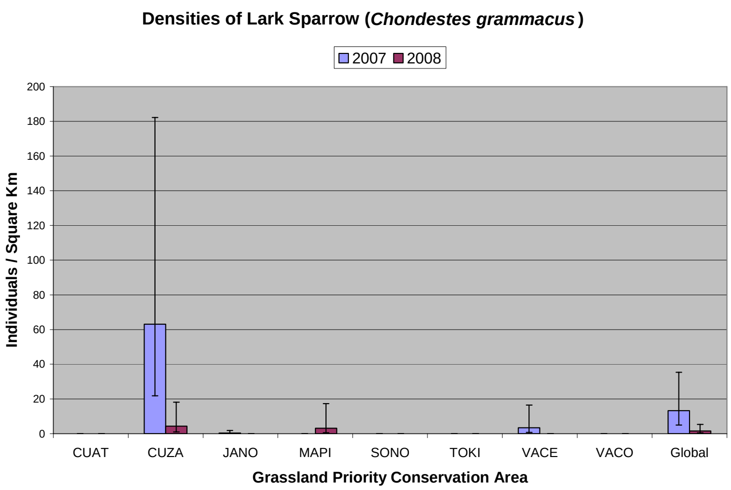


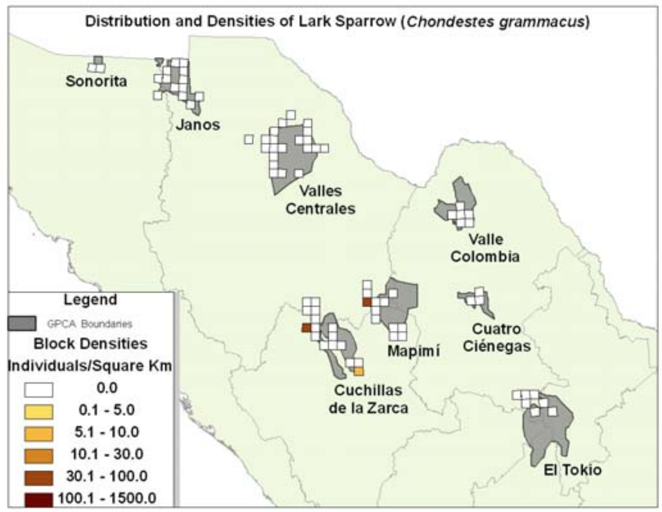


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Vesper Sparrow *Pooecetes gramineus*	Gypsophytic	0.00				0	
	Halophytic	36.51	18.72	25.33	52.64	160	
	Natural	126.93	9.84	104.69	153.90	552	
	Other	32.45	53.67	11.73	89.72	29	
	Global 2007	162.42	8.76	136.74	192.93	612	0.70
	Global 2008	109.11	8.59	92.14	129.22	741	0.56

Lark Sparrow (*Chondestes grammacus*)

We rarely observed Lark Sparrow in our study area in either year; it was found only in Cuchillas de la Zarca and Mapimí in 2008. Although sample size is small, there was a possible decrease from 2007 to 2008, especially in Cuchillas de la Zarca. The scarcity of observations from our study areas, coupled with anecdotal observations in foothill shrubland and other brushy habitats suggests the species may have very different winter habitat requirements than other grasslands species. There are insufficient data for meaningful interpretation of grassland type preferences, but the species was found in both halophytic and natural grasslands.

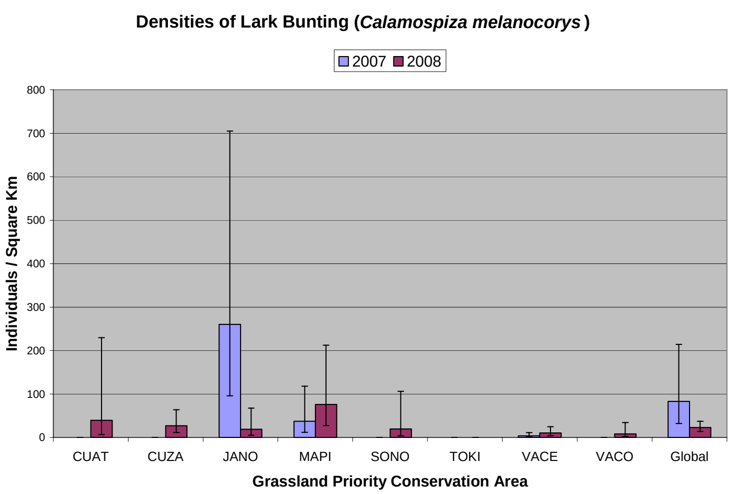


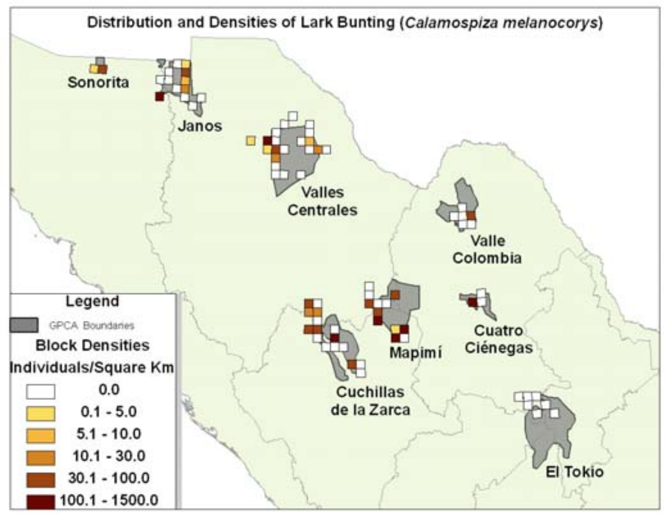


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Lark Sparrow *Chondestes grammacus*	Gypsophytic	0.00				0	
	Halophytic	1.86	112.28	0.31	11.11	4	
	Natural	2.20	88.99	0.46	10.53	4	
	Other	0.00				0	
	Global 2007	13.27	51.57	4.97	35.42	16	0.04
	Global 2008	1.53	67.45	0.43	5.36	8	0.01

Lark Bunting (*Calamospiza melanocorys*)

Lark Bunting was widely distributed in 2008 and we detected it in all km^2 GPCAs except for El Tokio. Between 2007 and 2008 there was a 40% decrease in the number of transects on which it occurred and a significant decrease in global density (-60.0 birds/km^2, 95%CI = -143.2, 23.1). However, while the density of this species plummeted in Janos, it increased slightly in most other GPCAs including Cuatro Ciénegas, Cuchillas de la Zarca, and Valle Colombia, where it was not observed in 2007, as well as in other areas. This pattern of population changes suggest the population was more dispersed in 2008 than in 2007. Natural and halophytic grassland types appear to be preferred.

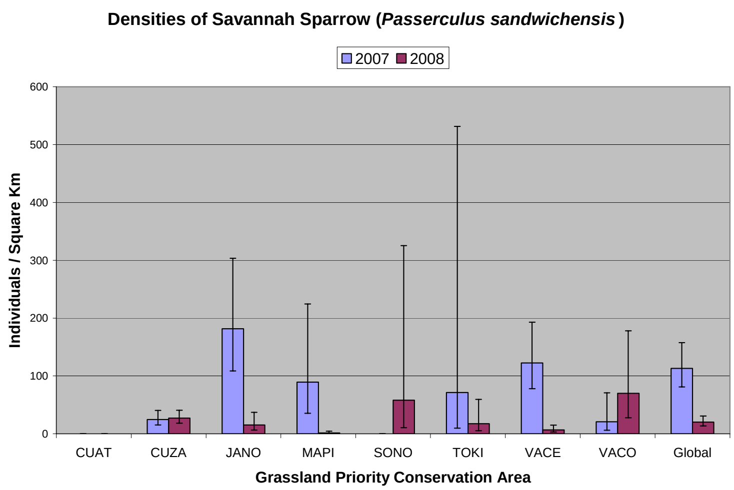


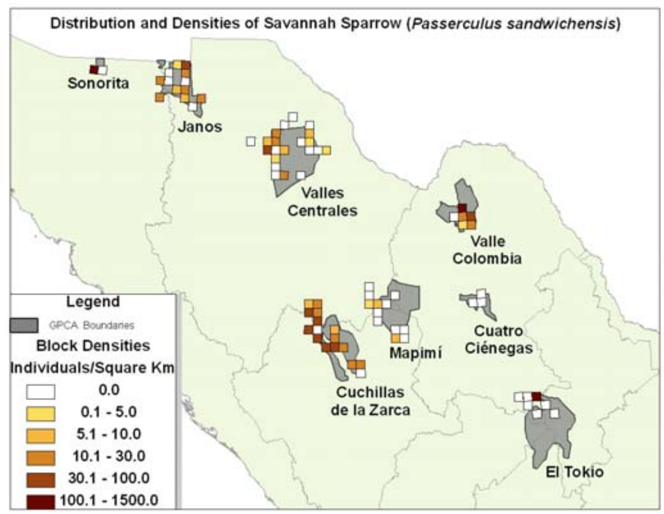


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Lark Bunting *Calamospiza melanocorys*	Gypsophytic	0.00				0	
	Halophytic	47.24	56.39	16.57	134.65	28	
	Natural	29.60	30.51	16.40	53.41	32	
	Other	0.00				0	
	Global 2007	82.74	50.76	31.99	214.00	61	0.15
	Global 2008	22.70	25.57	13.81	37.31	63	0.09

Savannah Sparrow (*Passerculus sandwichensis*)

We found Savannah Sparrow in all GPCAs except Cuatro Ciénegas although its densities were higher in the western GPCAs and Valle Colombia. The percentage of transects on which it occurred dropped 63% from 2007 to 2008 and global density dropped significantly as well (-92.6 birds/km^2, 95%CI = -131.2, -53.9). There were significant decreases in Janos, Mapimí, Valles Centrales, and possibly El Tokio. Savannah Sparrow appears to favor natural and 'other' grassland types and may avoid halophytic and gypsophytic grasslands.

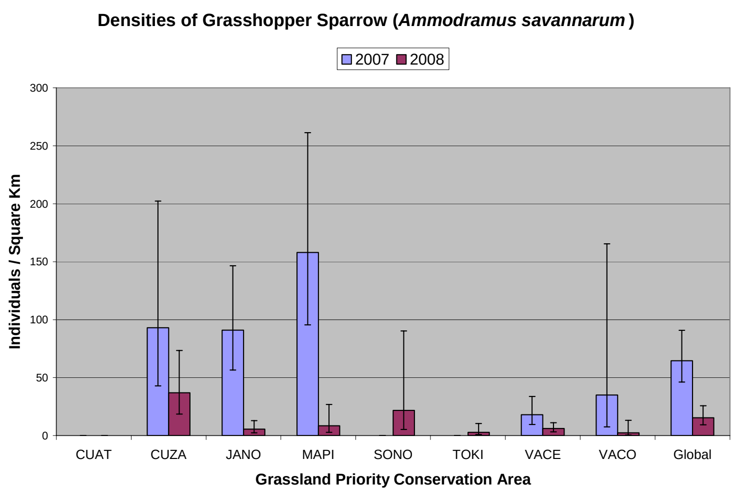


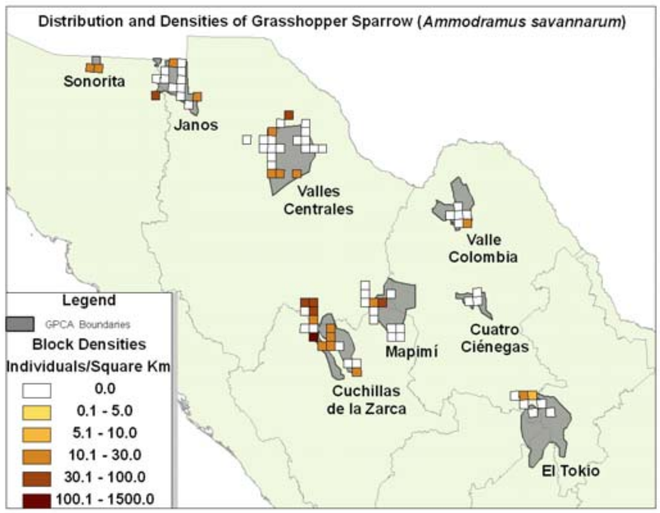


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Savannah Sparrow *Passerculus sandwichensis*	Gypsophytic	0.00				0	
	Halophytic	3.49	30.70	1.93	6.30	15	
	Natural	27.74	19.43	19.01	40.50	136	
	Other	34.34	66.78	10.11	116.61	21	
	Global 2007	112.97	17.04	80.97	157.61	314	0.46
	Global 2008	20.40	20.71	13.60	30.62	172	0.17

Grasshopper Sparrow (*Ammodramus savannarum*)

We found Grasshopper Sparrow in all GPCAs except for Cuatro Ciénegas. The proportion of transects on which it occurred declined steeply (-72%) from 2007 to 2008 as did global density (-49.3 birds/km^2, 95%CI = -72.6, -26.0). Significant decreases also occurred in Cuchillas de la Zarca, Janos and Mapimí. Grasshopper Sparrow appears to favor natural grasslands over other types.

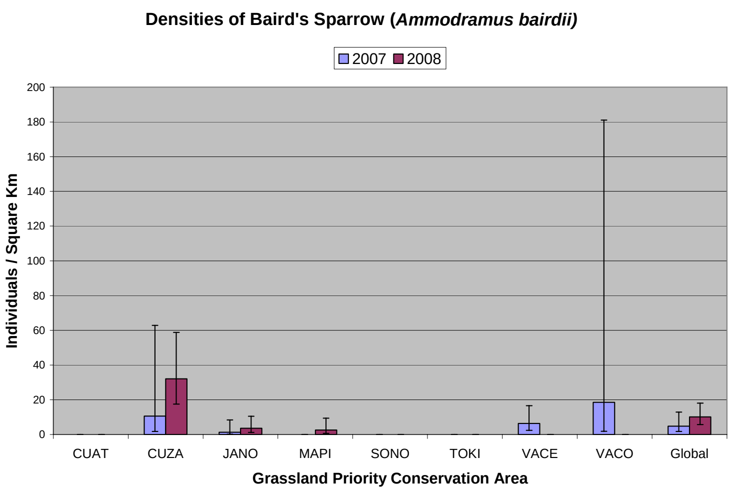


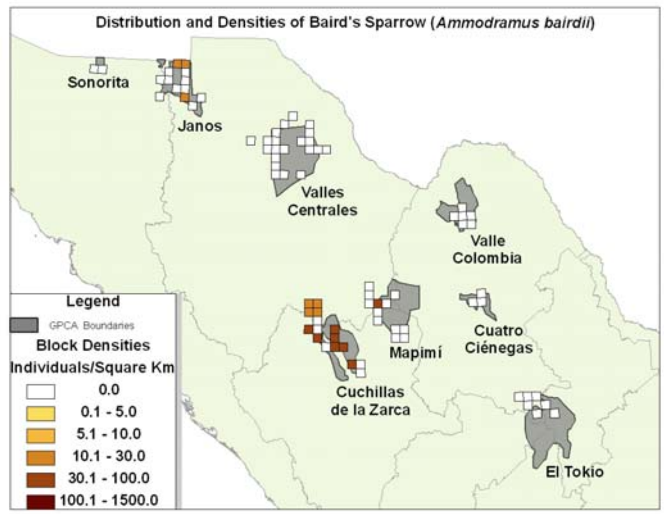


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Grasshopper Sparrow *Ammodramus savannarum*	Gypsophytic	0.00				0	
	Halophytic	5.20	35.44	2.64	10.24	12	
	Natural	12.28	29.99	6.89	21.88	55	
	Other	5.35	56.97	1.83	15.67	3	
	Global 2007	64.67	17.26	46.09	90.73	138	0.32
	Global 2008	15.38	26.46	9.19	25.73	70	0.09

Baird's Sparrow (*Ammodramus bairdii*)

We found Baird's Sparrow primarily in Cuchillas de la Zarca; although it was also found on three blocks in Janos and one in Mapimí. In both years it occurred on only a small proportion of transects (<.06). It is notable that Baird's Sparrow was detected in Valles Centrales on five occasions in 2007, but not at all in 2008, possibly due to observer differences. These findings, together with observations from scouting surveys in the Sierra Madre Occidental (see 2008 interim report), suggest this species may winter extensively in higher elevation grasslands on the wintering grounds. Baird's Sparrow shows a strong preference for natural grasslands.



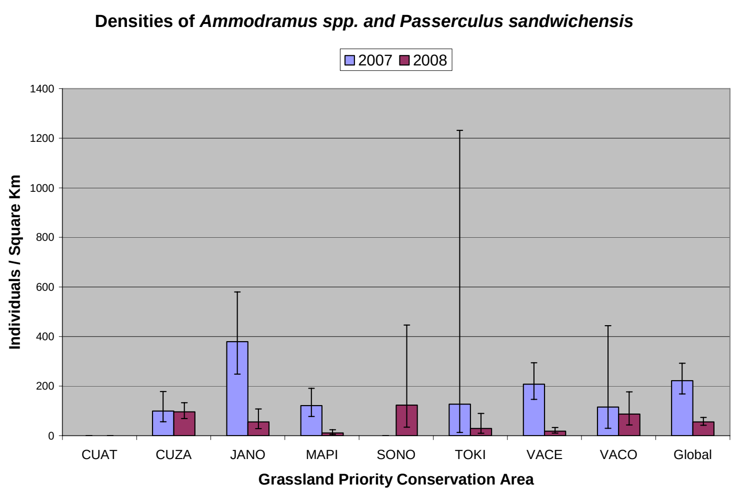


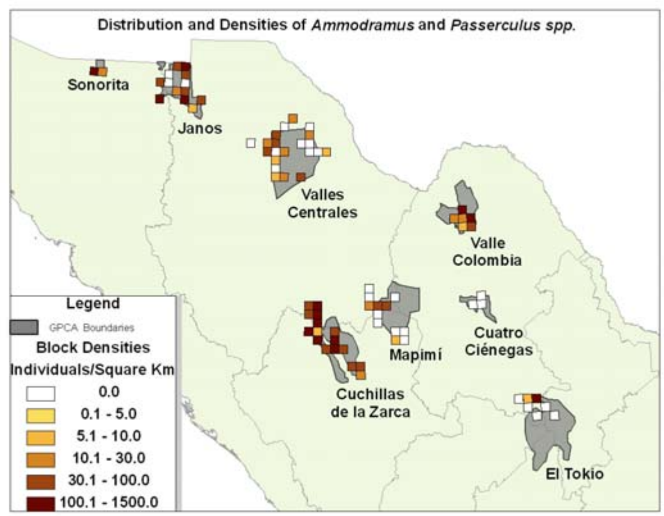
Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Baird's Sparrow *Ammodramus bairdii*	Gypsophytic	0.00				0	
	Halophytic	1.17	73.01	0.32	4.25	2	
	Natural	14.31	30.88	7.90	25.92	37	
	Other	0.00				0	
	Global 2007	4.76	52.78	1.76	12.91	9	0.03
	Global 2008	10.14	29.73	5.70	18.01	39	0.05

Ammodramus spp. and *Passerculus sandwichensis*

This species grouping was created due to behavioral similarities between *Ammodramus* sparrows and Savannah Sparrow upon flushing, which sometimes makes identification in the field difficult. This aggregation includes Grasshopper Sparrow, Baird's Sparrow, unidentified *Ammodramus* sparrows and individuals that could only be narrowed down to the *Ammodramus* or *Passerculus* genera. This classification was not used during data collection in 2007, but was created post-hoc.

Ammodramus spp. and Savannah Sparrows were found in all GPCAs except for Cuatro Ciénegas. From 2007 to 2008 there was a 61% decrease in the number of transects on which they were found and global density decreased by 75% (-166.5 birds/km^2, 95%CI = -229.8, -103.2). Sharp decreases also occurred in Janos, Mapimí, El Tokio and Valles Centrales. Since there was no option in 2007 to identify unknown sparrows to this level, individuals that were narrowed down to either of these genera but not more specifically were likely recorded as "unidentified sparrow" and thus not included in these analyses. Therefore, densities in 2007 may be under-estimates. This group of sparrows appears to favor natural grasslands while avoiding gypsophytic and halophytic grassland types.



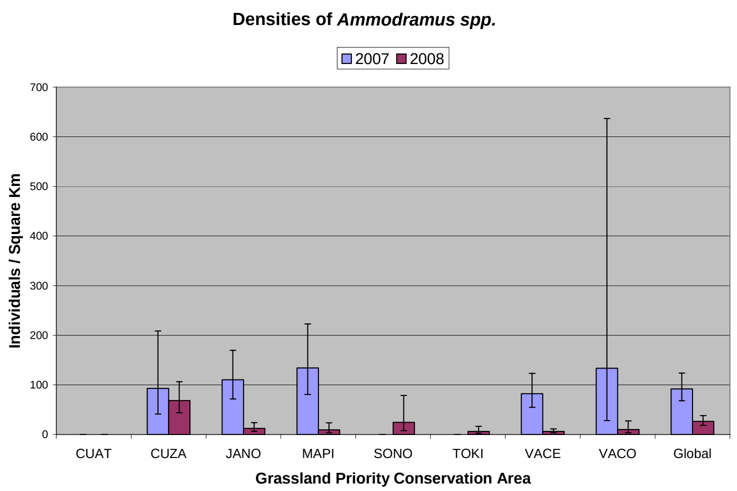


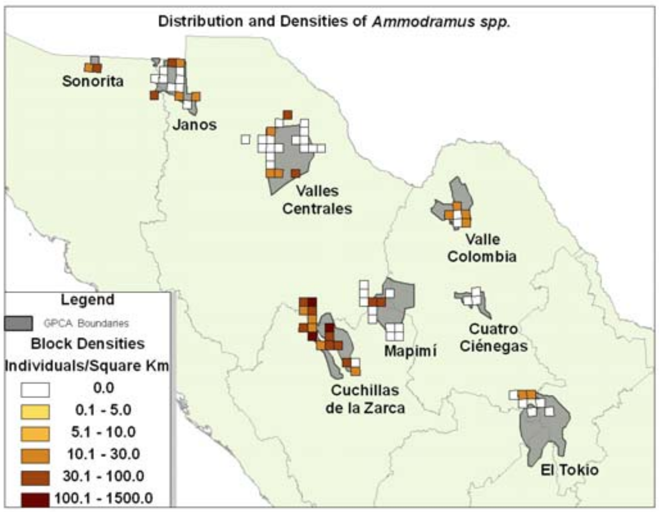
Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Ammodramus spp. and Savannah Sparrow *Passerculus sandwichensis*	Gypsophytic	0.00				0	
	Halophytic	10.85	22.43	7.01	16.78	36	
	Natural	57.20	14.51	43.08	75.96	286	
	Other	44.99	57.39	15.41	131.30	22	
	Global 2007	222.12	14.10	168.56	292.71	507	0.64
	Global 2008	55.67	14.09	42.24	73.37	344	0.25

Ammodramus spp.

Ammodramus spp. is the aggregate of Grasshopper Sparrow, Baird's Sparrow, and sparrows identified only to the genus *Ammodramus*. This genus was found in each GPCA except Cuatro Ciénegas and was most abundant in 2008 in Cuchillas de la Zarca. Overall, there was a 65% decrease in the number of transects on which *Ammodramus spp*. occurred from 2007 to 2008, and significant global decrease across GPCAs (-65.4 birds/km^2, 95%CI = -94.4, -36.4). Significant declines occurred in Janos, Mapimí, Valles Centrales, and Valle Colombia. This genus appears to favor natural grasslands over other types.

Note: The use of the *Ammodramus spp*. or Savannah Sparrow category in 2008 somewhat confounds the interpretation of these data between years as it potentially reduced the use of *Ammodramus spp*. as an identifying code by increasing awareness among the field crew of the similarity in flushing behavior between these genera. This should not be an issue in future years or a problem when comparing back to the 2008 dataset.

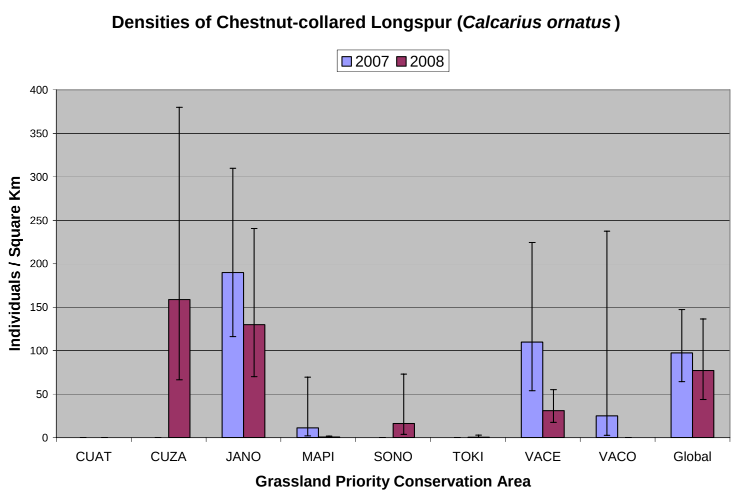


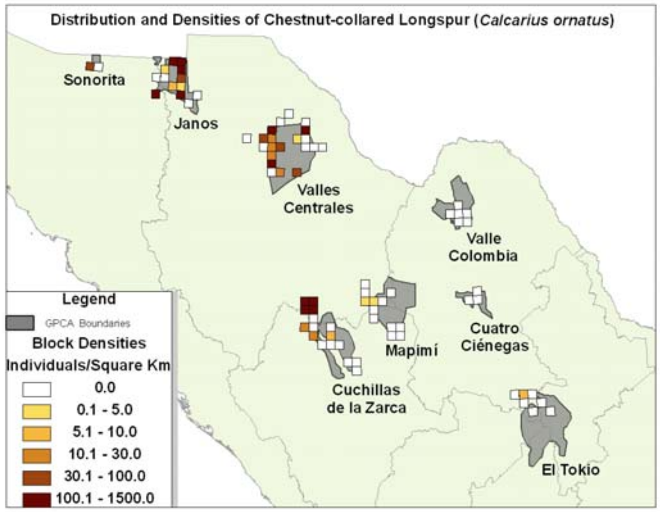


Scientific Name	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Ammodramus spp.	Gypsophytic	0.00				0	
	Halophytic	7.94	35.66	4.02	15.67	15	
	Natural	33.18	27.07	19.66	55.99	116	
	Other	13.45	49.11	5.29	34.24	6	
	Global 2007	91.92	15.18	68.28	123.75	232	0.43
	Global 2008	26.52	18.49	18.47	38.08	137	0.15

Chestnut-collared Longspur (*Calcarius ornatus*)

We found Chestnut-collared Longspur primarily in the western and northern GPCAs, with the exception of one detection in El Tokio. The proportion of transects on which it occurred decreased 48% between 2007 and 2008 although a slight decrease in global density was not significant. Chestnut-collared Longspur had a strong preference for natural grasslands.

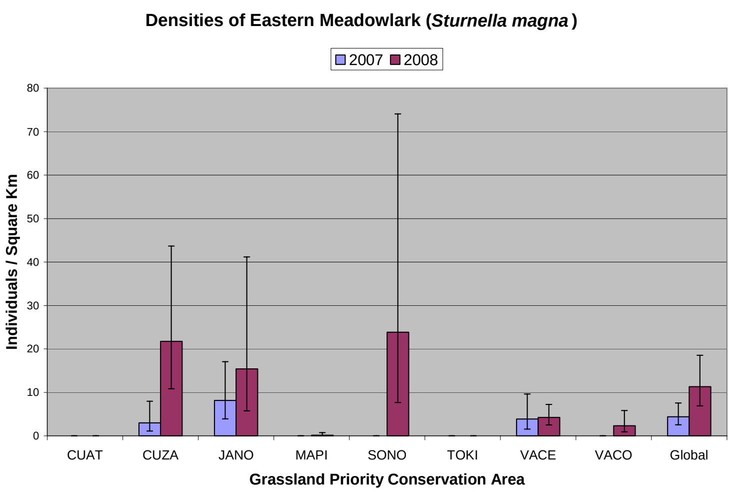


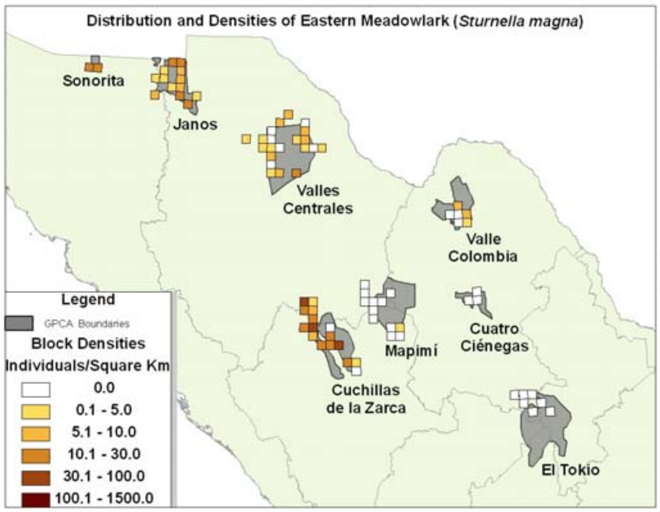


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Chestnut-collared Longspur *Calcarius ornatus*	Gypsophytic	0.00				0	
	Halophytic	25.55	39.52	11.93	54.75	18	
	Natural	130.70	27.51	76.82	222.36	118	
	Other	8.16	95.06	1.57	42.35	7	
	Global 2007	97.31	21.27	64.31	147.23	171	0.27
	Global 2008	77.31	29.24	43.81	136.40	145	0.14

Eastern Meadowlark (*Sturnella magna*)

We found Eastern Meadowlark in most GPCAs except Cuatro Ciénegas and El Tokio (we detected it only once in Mapimí). The proportion of transects on which it occurred increased slightly and global density increased significantly (6.9 birds/km^2, 95%CI = 0.7, 13.1). There was a significant increase in density in Cuchillas de la Zarca from 2007 to 2008, possibly due to improved identification among meadowlark species. Eastern Meadowlark showed a strong preference for natural grassland types.

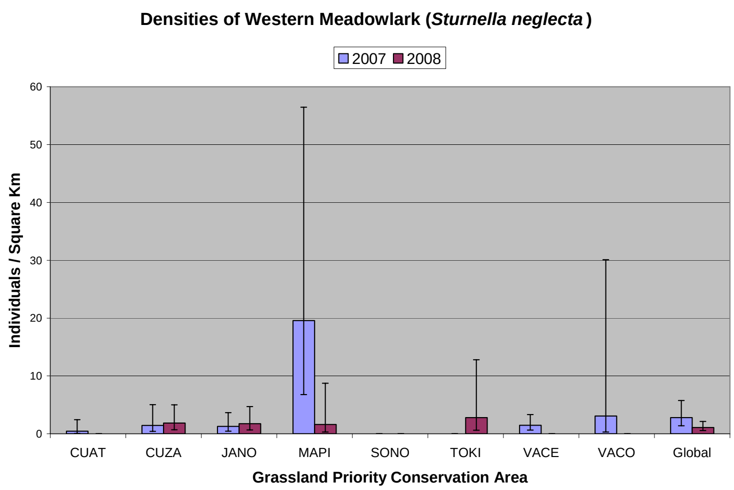


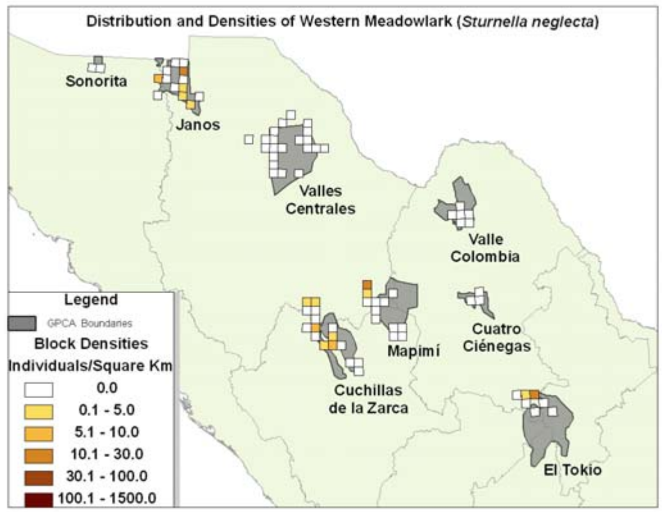


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	N	Prop. of Transects
Eastern Meadowlark *Sturnella magna*	Gypsophytic	0.00				0	
	Halophytic	2.73	35.37	1.38	5.43	24	
	Natural	16.60	27.41	9.77	28.19	126	
	Other	1.07	74.29	0.28	4.09	3	
	Global 2007	4.39	28.09	2.55	7.56	55	0.17
	Global 2008	11.32	25.42	6.92	18.53	157	0.21

Western Meadowlark (*Sturnella neglecta*)

Western Meadowlark was distributed mainly in the southern and western GPCAs, but we did not find it in Valles Centrales, Cuatro Ciénegas, Valle Columbia, or in Sonorita, the western-most GPCA. The percentage of transects on which it occurred declined from 2007 to 2008 (69% decrease) as did global density. Density also decreased in Valles Centrales, Mapimí and Valle Colombia. The low number of observations in each grassland type precludes meaningful interpretation of preferences among grassland types.

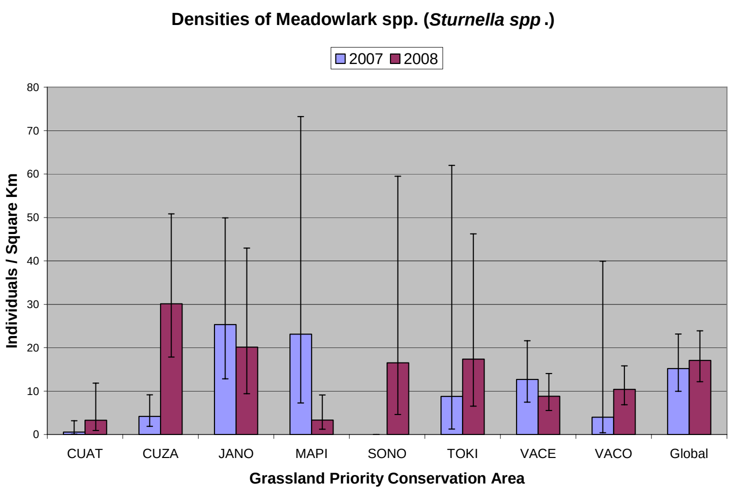


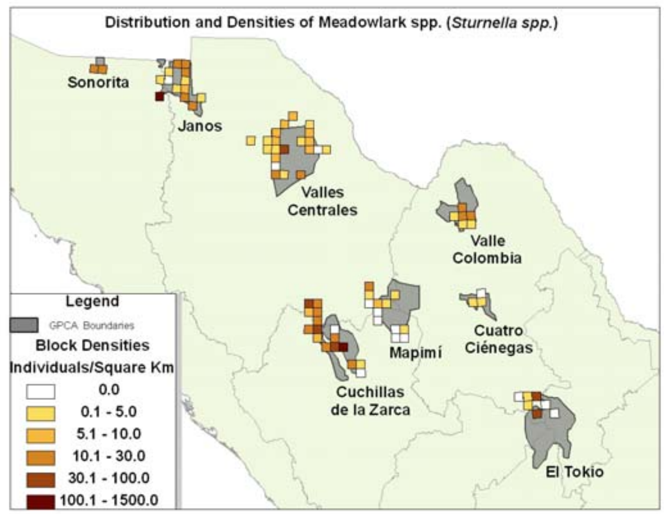


Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Western Meadowlark *Sturnella neglecta*	Gypsophytic	0.00				0	
	Halophytic	1.24	69.52	0.35	4.33	8	
	Natural	0.93	52.22	0.35	2.45	17	
	Other	5.04	87.83	1.05	24.07	8	
	Global 2007	2.82	36.70	1.38	5.74	37	0.13
	Global 2008	1.08	35.62	0.54	2.13	33	0.04

Meadowlark spp. (*Sturnella spp.*)

Meadowlark spp. is the aggregation of Eastern Meadowlark, Western Meadowlark, and unidentified meadowlarks. This genus is difficult to identify without decent views or audible calls and therefore 38% *Sturnella* were not identified to species. This genus was widely distributed throughout the entire study area. The percentage of transects on which it occurred was identical between years (37%) and there was no significant change in global density. However, density of meadowlarks increased significantly in Cuchillas de la Zarca in 2008 and decreased significantly in Mapimí. This genus appears to favor natural and 'other' grasslands, although it uses halophytic grasslands.





Common Name *Scientific Name*	Stratum	Density Estimate	%CV	LCL	UCL	n	Prop. of Transects
Meadowlark spp. *Sturnella spp.*	Gypsophytic	0.00				0	
	Halophytic	6.86	29.17	3.89	12.11	46	
	Natural	23.46	19.48	16.06	34.29	201	
	Other	29.41	49.80	11.42	75.73	23	
	Global 2007	15.18	21.60	9.96	23.14	127	0.37
	Global 2008	17.06	17.27	12.18	23.90	279	0.37

DISCUSSION AND RECOMMENDATIONS

Densities for several species changed across our study areas in 2008. Six species increased in density while six species decreased. A few species appeared to shift populations into the southwestern region, particularly into Cuchillas de la Zarca GPCA. Cuchillas de la Zarca and other grasslands in the foothills of the Sierra Madre Occidental may be especially important for some grassland species, particularly when conditions may be poor elsewhere. Availability of food and cover may be more consistent in foothill and montane locations due to greater rainfall at higher elevations. Relative to other GPCAs, Cuchillas de la Zarca appears to be particularly important for Baird's Sparrows, although preliminary results from scouting surveys (Panjabi and Levandoski 2008) suggests other montane grasslands in the Sierra Madre Occidental, such as those in the Papagochic Valley near Gomez Farias, may also be important for this species. Cuchillas de la Zarca has received considerably less conservation attention than other grassland areas in the Chihuahuan Desert region. There are no proposed or current protected areas in this GPCA, although opportunities for protection may be greater than in other GPCAs where conversion to croplands is driving up land prices and quickly reducing available habitat. Increased conservation efforts for this GPCA appear to be warranted.

Differing patterns of species density among grassland types suggest requirements for certain grasses may vary by species. Among species that had reasonable sample sizes for interpreting results (n>30), at least eight species (Northern Harrier, Red-tailed Hawk, Say's Phoebe, Loggerhead Shrike, Clay-colored Sparrow, Brewer's Sparrow, Lark Bunting, and Western Meadowlark) showed no strong differences in density between halophytic and natural grasslands. On the other hand, at least 13 species (American Kestrel, Mourning Dove, Chihuahuan Raven, Common Raven, Sprague's Pipit, Chipping Sparrow, Vesper Sparrow, Savannah Sparrow, Grasshopper Sparrow, Baird's Sparrow, Chestnut-collared Longspur, and Eastern Meadowlark) had higher densities in natural grasslands than in halophytic grasslands. However, several of these species also had similar or at least moderate densities in 'other' grasslands, suggesting perhaps that restored or enhanced grasslands may also have conservation value for these species. Only Horned Lark had significantly higher densities in halophytic grasslands than natural grasslands, and this species actually had highest densities in gypsophytic grasslands.

Project evaluation and future directions

Challenges

GPCA locations and boundaries – Most current GPCAs boundaries include considerable areas of non-grassland habitat and exclude some adjacent grassland for no apparent reason. The boundaries in many cases seem somewhat arbitrary, and in some GPCAs, such as El Tokio, exclude important well-known grasslands that support key conservation targets (i.e. Valle La India, which supports breeding Worthen's Sparrow). In several GPCAs where we have had to eliminate a large number of survey blocks due to a lack of suitable habitat, including Cuchillas de la Zarca, Mapimí, Valles Centrales, and El Tokio, we have had to extend our study area beyond the current GPCA boundaries in order to maintain a comparable level of effort in these areas as in 2007.

It is questionable as to why Cuatro Cienegas should be recognized as a priority area for grassland conservation, as the grasslands here appear to support relatively few grassland birds. Given the paucity of grassland bird data resulting from our efforts there over the last few years, it is worth considering whether we should divert this effort elsewhere.

No GPCAs have been identified in montane grasslands, although these grasslands are used by many grassland species. We suggest further effort should be devoted to characterizing bird use and abundance in these grasslands, as they appear to be important for some species.

Overall, we suggest that the process of delineating GPCAs in the Chihuahuan Desert should not be considered complete. Current GPCA boundaries should be carefully reviewed, scrutinized, and adjusted to better encompass the important grasslands of the Chihuahuan Desert, and additional GPCAs should be considered, especially in the Sierra Madre Occidental.

GIS – Despite making a considerable effort in locating a higher quality road data for GIS we were unsuccessful. The inaccurate data continued to be a problem that affected placing new transects and on-the-ground navigation. We instituted the digitization of road layers from INEGI topographic maps and GPS data to cope with these challenges (see Study Design, p. 8). After we successfully replaced transects that were located in unacceptably shrubby habitat from the 2007 pilot field season, we now anticipate most transects will be kept through future years of research. However, continued loss of habitat will likely require a subset of study blocks and transects to be relocated each year in order to maintain a comparable level of effort.

Vegetation Surveys – Acknowledging the unanticipated time commitment needed to complete this year's vegetation surveys, we will redesign the surveys to allow for a more timely completion that will allow avian transects to be completed within the preferred time of day. Due to time and budget constraints we will likely have to eliminate empirical measurements and rely on visual estimates instead. However, we will maintain the same basic approach by estimating coverage of various ground cover types using continuous rather than categorical parameters, and we will restrict our ground cover estimates to a 5-m radius circle and shrub cover estimates to a 50-m radius circle. We will focus heavily on calibration among observers on estimating cover and truthing our estimates. Apart from the time-intensive nature of the 2008 vegetation surveys, another drawback was that short grasses that were sparsely distributed, such as in prairie dog (*Cynomys ludovicianus* and *mexicanus*) colonies, tended to be underestimated since they were rarely dominant within a line segment. We also did not have time to classify other types of ground cover such as forbs, cacti and woody growth. Visual estimates in 2009 should alleviate these problems.

Loss of Habitat – Many areas within the GPCAs of Valles Centrales, Janos and El Tokio are experiencing rapid conversion of their native grasslands to agriculture. This was particularly apparent this year in Valles Centrales and from communications with our collaborators at Profauna Chihuahua we expect this trend to continue. The loss of these grasslands represents not only an increased difficulty in surveying this GPCA, but more importantly, the loss of a critical wintering area for migrant grassland species. According to our data, many species of concern winter in this area and will likely be affected by this significant loss of habitat. Among these are Scaled Quail, Ferruginous Hawk, Aplomado Falcon, Long-billed Curlew, Burrowing Owl, Short-eared Owl, Loggerhead Shrike, Sprague's Pipit, Clay-colored Sparrow, Brewer's Sparrow, Vesper Sparrow, Lark Bunting, Grasshopper Sparrow, Baird's Sparrow, Chestnut-collared Longspur, McCown's Longspur, and Eastern Meadowlark. Perhaps most vulnerable to these losses are the last remaining nesting pairs of Aplomado Falcon in northern Mexico (Macias-Duarte et. al 2007) and the last historic population of this species along the borderlands (there are ongoing reintroduction efforts in Texas and New Mexico). We have also received reports of rapid acquisition of lands in the Janos area for future conversion to agriculture in anticipation of the area's declaration as a biosphere reserve (pers. comm. Jurgin Hoth, TNC). Biosphere reserves in Mexico are often largely comprised of private and communally-owned ejido lands; continued conversion of lands before new regulations are in place will likely have severe consequences for the region's remaining grasslands and its grassland-dependent fauna. We suggest a massive outreach and education campaign, along with both domestic and international political pressure, may be the only way to halt the accelerating conversion of grasslands to croplands.

Gaps in Regional Coverage – While this study covers a very large geographic extent it is currently limited to Mexico. There are large areas of Chihuahuan Desert grasslands that are currently not incorporated in this study in Arizona, New Mexico, and Texas. The exclusion of these regions precludes many conclusions to be drawn based on changes in density in the current study design. To better understand yearly changes in density, yearly changes in distribution must be better gauged so as to not mistake apparent population changes for regional shifts in occupied wintering range. A focus on expanding this methodology, perhaps with additional partners in the U.S., should be explored to gain a more complete picture of wintering grassland bird communities in the Chihuahuan Desert grassland ecosystem. Currently, RMBO is collaborating with Sul Ross University to expand this study into the Marfa-Marathon grasslands and additional sites in southern Chihuahua in 2009. We are also collaborating with the National Park Service to expand this survey into NPS lands in the Chihuahuan Desert network.

Successes

GPS – In 2008 we replaced the GPS units used in the field in 2007 with better models (Garmin® E-trex™ Vista) which allowed for several advancements in accuracy. We preloaded transect start- and end-points for easy navigation to maintained transect locations and we instructed field technicians how to create end-points at a predetermined distance from the start-point while establishing new transects. This greatly improved the accuracy of transect lengths. Also, we employed a GPS feature that monitored deviation from course which allowed us to maintain a straight line during our one kilometer long transects.

Training and Technicians – With a longer training session in 2008, more cooperative weather, and daily bird identification quizzes we were able to improve identification skills among observers. Virtually all attendees scored above 80% and many scored higher. The number of unidentified birds in our data dropped from 2007 to 2008 (2,550 to 1,596; a 37% decrease) along with the number of unidentified sparrows (954 to 270; a 72% decrease) and the number of unidentified longspurs (673 to 15; a 98% decrease). Total individuals detected in 2007 and 2008 were similar (25,409 and 27,208, respectively). We spent more time emphasizing the importance of aural identification and we believe the huge reduction in unknown longspurs was due to this effort. Collectively, these figures tend to indicate improvements in identification skills despite decreases in densities for a few species of sparrows between years. These improvements likely resulted from a high return rate among technicians (nine of 12), a longer training session, and an overall reduction in the number of technicians conducting the surveys (from 22 to 12).

New Data Entry Website – RMBO developed a new data entry website for the 2008 season that allowed for quality controls to be implemented and data collection to be centralized to a SQL database. The quality of data was noticeably improved and less time was needed to clean it up.

Relocation of Transects – Many transects in 2007 were located in habitat that more resembled desert shrubland than grassland, despite being identified as grassland in the GIS. After reviewing the vegetation and bird data for all transects, we decided to relocate large percentage (44%) to areas with less shrub coverage. Only 34% of our transects had greater than 3% shrub cover this year, compared to 66% in 2007. This increased the number of detections for several priority species.

New Location for a Critically Endangered Species Found – A previously unknown area for wintering Worthen's Sparrows was discovered by two of our observers in a new survey block in the northwestern part of El Tokio (actually outside the current GPCA boundary). Unfortunately estimation of density for this species is impossible due to small sample size.

Planned improvements and related project expansions

Collaborator Questionnaire – After the end of the field season we developed an online questionnaire and the feedback was used to inform us of areas where we could make improvements from the perspective of our field technicians. The vast majority of the 63% of technicians who responded reported that the protocols were well understood and the training session was effective. There were a few requests for more focus on certain aspects of the training in 2009, including increased review of species that are difficult to identify, one request for more practice with the advanced GPS usage we adopted in 2008, and more dry runs of transects. We aim to fulfill these requests in a seven day training session in January 2009.

Expansion of Efforts – New surveys in northeastern Chihuahua, the GPCA of Marfa, grasslands near Marathon, TX and the nearby foothills of the Glass Mountains will be surveyed by a former technician on the project who is now pursuing a Master's degree from Sul Ross University. Another former technician will initiate doctoral studies concurrently with our research in Cuchillas de la Zarca investigating the wintering ecology of Baird's Sparrow. Facets of this study are anticipated to include distribution, abundance, habitat use, over-wintering survival, genetics, and analyses of physiological conditions of this species of concern in Cuchillas de la Zarca. RMBO will assist both candidates in their research.

Through money provided by Sonoran Joint Venture, survey efforts in the GPCA of Sonorita will be expanded from two to six blocks. Staff experienced in avian studies from Pronatura Noroeste will be attending our training session and conducting these surveys.

With money provided by the National Park Service and the financial and staff support of TNC, we will be implementing a telemetry study of overwintering grassland birds on the TNC property, Reserva Ecológico "El Uno" which is inside the GPCA of Janos. Twenty-six transmitters will be deployed to elucidate daily and seasonal movement with the goal of better understanding winter home-range sizes of a small suite of species. If recapture of these individuals is successful, important information regarding changes in body condition over the course of the winter can be linked with habitat characteristics. Target species include Sprague's Pipit, Cassin's Sparrow, Vesper Sparrow, Savannah Sparrow, Lark Bunting, Grasshopper Sparrow, Baird's Sparrow, and Chestnut-collared Longspur.

Public Outreach – With funding provided by the US Forest Service International Program, Pronatura Noreste, and TNC, RMBO and UANL will publish 15,000 copies of a pocket field guide to Chihuahuan Desert grassland birds in Spanish for distribution to landowners, managers and students in the 2009 season. The guide will be based on RMBO's english version, A Pocket Guide to Prairie Birds (Gillihan and VerCauteren, 2003).

Data Entry Website – While the development of a data entry website permitted quality control over data compilation in 2008 we see opportunities for continued improvements of this website. Further quality controls will be implemented in time for the 2009 data collection.

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APPENDIX A. List of priority species recorded outside regular surveys.

All raptors excepting Red-tailed Hawk (*Buteo jamaicensis*) and American Kestrel (*Falco sparverius*)

Scaled Quail	(*Callipepla squamata*)
Gambel's Quail	(*Callipepla gambelii*)
Montezuma Quail	(*Cyrtonyx montezumae*)
Sandhill Crane	(*Grus canadensis*)
Mountain Plover	(*Charadrius montanus*)
Long-billed Curlew	(*Numenius americanus*)
Burrowing Owl	(*Athene cunicularia*)
Loggerhead Shrike	(*Lanius ludovicianus*)
Sprague's Pipit	(*Anthus spragueii*)
Worthen's Sparrow	(*Spizella wortheni*)
Baird's Sparrow	(*Ammodramus bairdii*)
McCown's Longspur	(*Calcarius mccownii*)

APPENDIX B. Numbers of individuals (N) and number of detections (n) of all species detected in Chihuahuan Desert grasslands in 2008.

GPCAs: CUAT = Cuatro Ciénegas, CUZA = Cuchillas de la Zarca, JANO = Janos, MAPI = Mapimí, SONO = Sonorita, TOKI = El Tokio, VACE = Valles Centrales, VACO = Valle Colombia

		CUAT		CUZA		JANO		MAPI		SONO		TOKI		VACE		VACO		All GPCAs	
Common Name	*Scientific Name*	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n
Snow Goose	*Chen caerulescens*			2036	5	100	3											2136	8
Gadwall	*Anas strepera*			4	1													4	1
American Wigeon	*Anas americana*			7	1													7	1
Mallard	*Anas platyrhynchos*					1	1											1	1
Northern Shoveler	*Anas clypeata*			35	4	3	1											38	5
Northern Pintail	*Anas acuta*			2	1													2	1
Green-winged Teal	*Anas crecca*			35	3													35	3
Ring-necked Duck	*Aythya collaris*			1	1													1	1
Lesser Scaup	*Aythya affinis*									1	1							1	1
Bufflehead	*Bucephala albeola*			40	1													40	1
Unidentified Duck	*Anatinae*	1	1			1	1											2	2
Scaled Quail	*Callipepla squamata*			186	9	95	13	65	10	2	1	5	1	450	24			803	58
Gambel's Quail	*Callipepla gambelii*					26	1			1	1							27	2
Black Vulture	*Coragyps atratus*			7	1													7	1
Turkey Vulture	*Cathartes aura*			135	53	11	6	47	35			1	1	14	8			208	103
White-tailed Kite	*Elanus leucurus*					11	11	6	6					2	2			19	19
Northern Harrier	*Circus cyaneus*	1	1	12	12	76	63	22	19	13	12	5	5	60	53	1	1	190	166
Sharp-shinned Hawk	*Accipiter striatus*			1	1	1	1											2	2
Cooper's Hawk	*Accipiter cooperii*			2	2	1	1	1	1									4	4
Harris's Hawk	*Parabuteo unicinctus*			5	4	15	2											20	6
Red-tailed Hawk	*Buteo jamaicensis*	1	1	32	28	22	20	13	12	4	4	6	6	34	32	2	2	114	105
Ferruginous Hawk	*Buteo regalis*			2	2	7	7					12	12					21	21
Buteo sp.	*Buteo sp.*			2	2	1	1	1	1			1	1	1	1			6	6
Golden Eagle	*Aquila chrysaetos*					2	2			2	2							4	4
Unidentified Hawk	*Accipitrinae*					2	1			1	1							3	2
American Kestrel	*Falco sparverius*	2	2	37	37	23	20	10	10	3	2	17	17	16	16	10	10	118	114
Merlin	*Falco columbarius*			5	5									1	1			6	6
Aplomado Falcon	*Falco femoralis*													3	3			3	3
Prairie Falcon	*Falco mexicanus*			2	2	3	3	3	3					3	3			11	11
American Coot	*Fulica americana*			4	1													4	1
Sandhill Crane	*Grus canadensis*	431	8			416	8	1	1									848	17
Killdeer	*Charadrius vociferus*			10	5	2	1			2	1							14	7
Mountain Plover	*Charadrius montanus*					23	2					33	5	6	2			62	9

		CUAT		CUZA		JANO		MAPI		SONO		TOKI		VACE		VACO		All GPCAs	
Common Name	*Scientific Name*	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n
Spotted Sandpiper	*Actitis macularius*			12	1													12	1
Greater Yellowlegs	*Tringa melanoleuca*	5	2	7	1													12	3
Long-billed Curlew	*Numenius americanus*			21	3	57	11	13	4			5	1					96	19
Eurasian Collared-Dove	*Streptopelia decaocto*					9	2											9	2
White-winged Dove	*Zenaida asiatica*			33	16			1	1									34	17
Mourning Dove	*Zenaida macroura*			561	102	391	72	34	12	1	1	72	14	48	7	10	6	1117	214
Inca Dove	*Columbina inca*			15	1													15	1
Greater Roadrunner	*Geococcyx californianus*			4	4	3	3	1	1	3	3	1	1	6	6			18	18
Barn Owl	*Tyto alba*					2	2											2	2
Great-horned Owl	*Bubo virginianus*					2	2											2	2
Burrowing Owl	*Athene cunicularia*					31	9	2	2			2	2	9	5			44	18
Short-eared Owl	*Asio flammeus*					5	5	2	1					6	6	1	1	14	13
Acorn Woodpecker	*Melanerpes formicivorus*			1	1													1	1
Gila Woodpecker	*Melanerpes uropygialis*									3	3							3	3
Golden-fronted Woodpecker	*Melanerpes aurifrons*			2	2													2	2
Ladder-backed Woodpecker	*Picoides scalaris*			7	7	7	7			4	4			3	3			21	21
Northern Flicker	*Colaptes auratus*			3	3	25	19	2	1	8	7	3	3	1	1			42	34
Unidentified Woodpecker	*Picidae*					2	2											2	2
Empidonax sp.	*Empidonax sp.*			2	2													2	2
Black Phoebe	*Sayornis nigricans*			3	3					2	2							5	5
Eastern Phoebe	*Sayornis phoebe*			3	3													3	3
Say's Phoebe	*Sayornis saya*	2	2	59	58	8	8	28	27	6	6	17	17	17	14	4	4	141	136
Vermilion Flycatcher	*Pyrocephalus rubinus*	1	1	11	6													12	7
Cassin's Kingbird	*Tyrannus vociferans*			2	2													2	2
Unidentified Kingbird	*Tyrannus sp.*											1	1					1	1
Loggerhead Shrike	*Lanius ludovicianus*	7	5	79	70	51	48	63	63	2	2	14	14	23	21	12	12	251	235
Mexican Jay	*Aphelocoma ultramarina*			10	4	7	3											17	7
Chihuahuan Raven	*Corvus cryptoleucus*	6	5	55	39	19	14	8	6	3	2	11	8	7	5	15	7	124	86
Common Raven	*Corvus corax*			16	9	59	35	5	4	29	13	1	1	10	6			120	68
Unidentified Raven	*Corvus sp.*	1	1			53	36	1	1	2	2	7	6					64	46
Horned Lark	*Eremophila alpestris*	127	15	158	11	1069	142	99	13	35	12	922	230	1194	69	41	2	3645	494
Tree Swallow	*Tachycineta bicolor*			31	5			1	1									32	6
Bridled Titmouse	*Baeolophus wollweberi*			7	1													7	1
Verdin	*Auriparus flaviceps*			2	1			5	5			1	1					8	7
Bushtit	*Psaltriparus minimus*			10	4													10	4

		CUAT		CUZA		JANO		MAPI		SONO		TOKI		VACE		VACO		All GPCAs	
Common Name	Scientific Name	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n
Cactus Wren	*Campylorhynchus brunneicapillus*	3	2	78	64	55	36	18	16	3	3	3	2	5	5	5	3	170	131
Rock Wren	*Salpinctes obsoletus*			5	3	1	1					1	1					7	5
Canyon Wren	*Catherpes mexicanus*			5	4													5	4
Bewick's Wren	*Thryomanes bewickii*					5	4			1	1							6	5
Unidentified Wren	*Troglodytidae*					1	1											1	1
Ruby-crowned Kinglet	*Regulus calendula*			7	4	2	2											9	6
Blue-gray Gnatcatcher	*Polioptila caerulea*							1	1									1	1
Black-tailed Gnatcatcher	*Polioptila melanura*			1	1	1	1	37	24					4	2			43	28
Western Bluebird	*Sialia mexicana*			9	6	7	1					27	8					43	15
American Robin	*Turdus migratorius*			1	1	1	1											2	2
Northern Mockingbird	*Mimus polyglottos*	9	9	22	15			2	2			9	3			1	1	43	30
Curve-billed Thrasher	*Toxostoma curvirostre*	1	1	30	27	20	18	21	17	6	5	8	7	5	5	4	4	95	84
Crissal Thrasher	*Toxostoma crissale*					2	2											2	2
European Starling	*Sturnus vulgaris*					6	1											6	1
American Pipit	*Anthus rubescens*					1	1					56	2	1	1			58	4
Sprague's Pipit	*Anthus spragueii*	3	1	32	23	10	7					17	16	40	25	3	3	105	75
Cedar Waxing	*Bombycilla cedrorum*							1	1									1	1
Phainopepla	*Phainopepla nitens*			1	1	6	5	2	1									9	7
Orange-crowned Warbler	*Vermivora celata*			1	1													1	1
Yellow-rumped Warbler	*Dendroica coronata*	12	11	5	4													17	15
Green-tailed Towhee	*Pipilo chlorurus*			1	1	6	5	8	4					1	1			16	11
Spotted Towhee	*Pipilo maculatus*					1	1	2	1									3	2
Canyon Towhee	*Pipilo fuscus*			76	53	8	8			5	4	4	3	12	9			105	77
Cassin's Sparrow	*Aimophila cassinii*			2	2	5	5					1	1	1	1			9	9
Botteri's Sparrow	*Aimophila botterii*											1	1					1	1
Rufous-crowned Sparrow	*Aimophila ruficeps*			15	11	1	1	4	2							1	1	21	15
Aimophila sp.	*Aimophila sp.*			4	1									1	1	3	3	8	5
Chipping Sparrow	*Spizella passerina*			1392	137	22	8	29	4	75	7	59	5	51	5			1628	166
Clay-colored Sparrow	*Spizella pallida*			212	20	26	7	178	31					34	11			450	69
Brewer's Sparrow	*Spizella breweri*			1135	163	237	44	636	89	16	10			98	26			2122	332
Worthen's Sparrow	*Spizella wortheni*											7	3					7	3
Spizella sp.	*Spizella sp.*			56	12	135	10	293	47	27	3							511	72
Vesper Sparrow	*Pooecetes gramineus*			925	338	252	88	217	100	246	52	15	12	297	149	148	61	2100	800
Lark Sparrow	*Chondestes grammacus*			17	4			9	4			6	2					32	10
Black-throated Sparrow	*Amphispiza bilineata*	1	1	215	70	53	18	437	151	22	9	8	5	32	14	20	10	788	278

		CUAT		CUZA		JANO		MAPI		SONO		TOKI		VACE		VACO		All GPCAs	
Common Name	*Scientific Name*	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n	N	n
Sage Sparrow	*Amphispiza belli*			10	3									2	1			12	4
Lark Bunting	*Calamospiza melanocorys*	64	1	238	9	242	10	827	28	53	5			118	9	27	5	1569	67
Savannah Sparrow	*Passerculus sandwichensis*			135	69	46	22	4	3	27	6	45	24	33	17	102	35	392	176
Grasshopper Sparrow	*Ammodramus savannarum*			58	48	5	5	7	5	3	3	2	2	16	14	1	1	92	78
Baird's Sparrow	*Ammodramus bairdii*			38	36	3	3	4	3									45	42
Ammodramus sp.	*Ammodramus sp.*			14	12	6	6			1	1	3	3	1	1	4	4	29	27
Ammodramus sp. or Savannah Sparrow	*Ammodramus sp. or P. sandwichensis*			27	23	33	20	2	2			1	1	1	1	3	3	67	50
Song Sparrow	*Melospiza melodia*							1	1	1	1							2	2
Unidentified Melospiza	*Melospiza sp.*					1	1											1	1
White-throated Sparrow	*Zonotrichia albicollis*			10	5													10	5
White-crowned Sparrow	*Zonotrichia leucophrys*	1	1	22	9	76	18	4	1	11	4			71	18	20	6	205	57
Unidentified Sparrow	*Emberizidae*			151	43	92	50			25	7			2	1			270	101
Dark-eyed Junco	*Junco hyemalis*					5	2											5	2
McCown's Longspur	*Calcarius mccownii*					169	2	3	3									172	5
Chestnut-collared Longspur	*Calcarius ornatus*			1523	24	1661	95	6	4	19	3	3	1	517	24			3729	151
Unidentified Longspur	*Calcarius sp.*									15	1							15	1
Pyrrhuloxia	*Cardinalis sinuatus*	1	1	14	12	12	5	1	1									28	19
Eastern Meadowlark	*Sturnella magna*			204	66	115	43	1	1	27	8	2	1	51	35	8	7	408	161
Western Meadowlark	*Sturnella neglecta*			24	11	18	10	15	4			22	8					79	33
Unidentified Meadowlark	*Sturnella sp.*	13	6	75	26	148	23	16	7	2	1	102	19	63	16	30	26	449	124
Brewer's Blackbird	*Euphagus cyanocephalus*	272	6							17	1							289	7
Brown-headed Cowbird	*Molothrus ater*			19	1													19	1
Unidentified Cowbird	*Molothrus sp.*			72	1													72	1
Unidentified Blackbird	*Icteridae*					1	1											1	1
House Finch	*Carpodacus mexicanus*	6	1			3	3	7	3	1	1	31	5					48	13
Pine Siskin	*Carduelis pinus*									3	1							3	1
Lesser Goldfinch	*Carduelis psaltria*			6	1													6	1
Unidentified Bird	*Aves*	4	1			28	10	77	38	6	2							115	51
All Species		975	86	10603	1905	6170	1194	3304	839	739	221	1570	482	3371	680	476	218	27208	5625

APPENDIX C. Densities of bird species in Chihuahuan Desert grasslands within and across GPCAs in 2007 and 2008. *Density Estimate* is individuals / km^2, *%CV* is percentage coefficient of variance, *LCL* and *UCL* are lower- and upper-confidence limits, respectively at the 95% level, *n* is number of detections used in analysis.
GPCAs: CUAT = Cuatro Ciénegas, CUZA = Cuchillas de la Zarca, JANO = Janos, MAPI = Mapimí, SONO = Sonorita, TOKI = El Tokio, VACE = Valles Centrales, VACO = Valle Colombia

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Scaled Quail *Callipepla squamata*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	14.12	109.11	2.26	88.10	1
		2008	31.67	35.44	16.01	62.66	9
	JANO	2007	11.94	73.77	3.16	45.06	7
		2008	13.13	54.15	4.79	36.01	7
	MAPI	2007	7.03	121.41	0.92	53.89	3
		2008	10.54	52.75	3.93	28.26	7
	SONO	2008	2.79	99.97	0.45	17.42	1
	TOKI	2007	0.00				0
		2008	1.40	100.40	0.26	7.42	1
	VACE	2007	7.25	91.17	1.26	41.84	4
		2008	59.40	22.49	38.32	92.09	24
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	9.43	49.53	3.70	24.04	15
		2008	29.85	18.18	20.93	42.56	49
White-tailed Kite *Elanus leucurus*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	0.15	104.83	0.03	0.90	1
		2008	0.00				0
	JANO	2007	0.06	100.13	0.01	0.29	2
		2008	0.28	43.24	0.12	0.64	11
	MAPI	2007	0.00				0
		2008	0.17	40.46	0.08	0.36	6
	SONO	2008	0.00				0
	TOKI	2007	0.00				0
		2008	0.00				0
	VACE	2007	0.10	78.02	0.02	0.43	2
		2008	0.03	70.53	0.01	0.11	2
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	0.08	55.02	0.03	0.23	5
		2008	0.07	31.83	0.04	0.13	19

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Northern Harrier *Circus cyaneus*	CUAT	2007	0.00				0
		2008	0.25	101.11	0.04	1.44	1
	CUZA	2007	0.51	56.48	0.17	1.51	3
		2008	0.54	29.90	0.30	0.97	12
	JANO	2007	2.11	22.42	1.36	3.26	32
		2008	3.99	26.31	2.39	6.66	58
	MAPI	2007	1.86	34.03	0.94	3.68	9
		2008	1.24	29.74	0.70	2.21	17
	SONO	2008	4.81	28.57	2.68	8.63	12
	TOKI	2007	0.00				0
		2008	0.37	44.94	0.16	0.87	5
	VACE	2007	2.23	21.38	1.47	3.39	29
		2008	2.10	17.48	1.49	2.95	53
	VACO	2007	0.00				0
		2008	0.12	100.67	0.02	0.67	1
	Global	2007	1.68	16.98	1.20	2.34	73
		2008	1.77	16.19	1.29	2.43	159
Red-tailed Hawk *Buteo jamaicensis*	CUAT	2007	0.18	100.75	0.03	1.08	1
		2008	0.18	99.64	0.03	1.06	1
	CUZA	2007	0.77	47.49	0.30	1.93	6
		2008	0.99	23.33	0.63	1.56	28
	JANO	2007	0.48	36.65	0.24	0.97	10
		2008	0.84	24.80	0.52	1.37	20
	MAPI	2007	0.31	70.08	0.08	1.16	2
		2008	0.47	35.35	0.24	0.92	9
	SONO	2008	1.11	44.41	0.44	2.78	4
	TOKI	2007	0.00				0
		2008	0.33	47.51	0.14	0.82	6
	VACE	2007	1.04	27.40	0.61	1.78	18
		2008	0.86	23.20	0.54	1.34	32
	VACO	2007	0.00				0
		2008	0.18	71.02	0.05	0.67	2
	Global	2007	0.69	21.90	0.45	1.06	37
		2008	0.79	16.48	0.58	1.10	102

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Ferruginous Hawk *Buteo regalis*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	0.00				0
		2008	0.05	72.76	0.01	0.17	2
	JANO	2007	0.03	100.79	0.01	0.17	1
		2008	0.21	38.90	0.10	0.44	7
	MAPI	2007	0.00				0
		2008	0.00				0
	SONO	2008	0.00				0
	TOKI	2007	0.26	100.77	0.04	1.74	1
		2008	0.46	29.43	0.26	0.82	12
	VACE	2007	0.04	99.21	0.01	0.21	1
		2008	0.00				0
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	0.03	60.04	0.01	0.10	3
		2008	0.07	28.62	0.04	0.11	21
American Kestrel *Falco sparverius*	CUAT	2007	0.00				0
		2008	0.66	68.93	0.18	2.47	2
	CUZA	2007	1.84	42.89	0.79	4.27	7
		2008	1.95	20.24	1.31	2.90	32
	JANO	2007	1.17	28.84	0.67	2.06	13
		2008	1.08	26.79	0.64	1.82	14
	MAPI	2007	0.28	104.55	0.05	1.68	1
		2008	0.84	29.98	0.47	1.51	10
	SONO	2008	1.50	75.20	0.34	6.63	2
	TOKI	2007	1.33	66.70	0.33	5.36	2
		2008	1.20	28.98	0.68	2.12	12
	VACE	2007	1.25	31.15	0.68	2.29	12
		2008	0.76	23.81	0.48	1.20	16
	VACO	2007	0.00				0
		2008	1.66	27.71	0.96	2.88	10
	Global	2007	1.22	19.38	0.83	1.78	35
		2008	1.27	12.37	1.00	1.62	98

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Sandhill Crane *Grus canadensis*	CUAT	2007	0.00				0
		2008	8.08	110.96	1.26	51.70	8
	CUZA	2007	3.81	76.31	0.94	15.44	2
		2008	0.00				0
	JANO	2007	0.03	100.13	0.00	0.13	1
		2008	3.26	55.17	1.17	9.10	8
	MAPI	2007	5.29	74.04	1.35	20.69	9
		2008	0.01	98.06	0.00	0.04	1
	SONO	2008	0.00				0
	TOKI	2007	0.00				0
		2008	0.00				0
	VACE	2007	0.00				0
		2008	0.00				0
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	1.16	55.07	0.41	3.30	12
		2008	0.67	49.57	0.26	1.69	17
Long-billed Curlew *Numenius americanus*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	0.00				0
		2008	0.50	92.19	0.07	3.58	3
	JANO	2007	0.13	62.59	0.04	0.42	3
		2008	1.72	72.65	0.45	6.63	11
	MAPI	2007	2.64	103.08	0.45	15.38	3
		2008	0.09	84.21	0.02	0.38	4
	SONO	2008	0.00				0
	TOKI	2007	0.52	100.92	0.08	3.58	1
		2008	0.20	100.03	0.04	1.04	1
	VACE	2007	0.04	100.24	0.01	0.22	1
		2008	0.00				0
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	0.29	78.38	0.07	1.21	8
		2008	0.44	55.65	0.15	1.29	19

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Mourning Dove *Zenaida macroura*	CUAT	2007	3.48	71.23	0.91	13.37	2
		2008	0.00				0
	CUZA	2007	27.59	29.20	15.45	49.29	32
		2008	59.06	20.29	39.76	87.72	101
	JANO	2007	101.99	30.13	56.97	182.56	79
		2008	42.80	42.73	19.02	96.31	52
	MAPI	2007	9.38	48.95	3.59	24.46	11
		2008	5.27	54.37	1.85	15.01	11
	SONO	2008	1.05	100.43	0.17	6.57	1
	TOKI	2007	9.72	100.03	1.43	66.14	1
		2008	7.46	73.83	1.97	28.17	13
	VACE	2007	51.35	30.78	28.30	93.18	53
		2008	4.75	52.32	1.73	13.09	7
	VACO	2007	2.53	99.76	0.25	25.18	1
		2008	3.47	49.52	1.35	8.94	6
	Global	2007	55.44	20.37	37.28	82.44	179
		2008	26.60	18.17	18.67	37.91	191
Greater Roadrunner *Geococcyx californianus*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	0.00				0
		2008	0.25	66.54	0.08	0.83	4
	JANO	2007	0.77	62.68	0.25	2.43	9
		2008	0.24	72.00	0.07	0.85	3
	MAPI	2007	0.29	109.86	0.05	1.77	1
		2008	0.09	109.48	0.01	0.50	1
	SONO	2008	1.54	84.17	0.33	7.08	3
	TOKI	2007	0.00				0
		2008	0.10	109.31	0.02	0.60	1
	VACE	2007	0.32	88.57	0.07	1.50	2
		2008	0.29	59.62	0.10	0.87	6
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	0.37	57.70	0.13	1.08	12
		2008	0.28	51.55	0.10	0.73	18

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Burrowing Owl *Athene cunicularia*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	0.00				0
		2008	0.00				0
	JANO	2007	2.19	50.72	0.85	5.66	7
		2008	1.79	70.12	0.48	6.70	7
	MAPI	2007	3.13	59.20	1.01	9.69	3
		2008	0.63	72.05	0.17	2.27	2
	SONO	2008	0.00				0
	TOKI	2007	7.42	53.65	2.44	22.63	3
		2008	0.00				0
	VACE	2007	0.39	102.53	0.07	2.11	1
		2008	1.59	57.87	0.53	4.72	5
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	1.32	35.33	0.67	2.60	14
		2008	0.81	44.22	0.35	1.89	14
Short-eared Owl (*Asio flammeus*)	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	0.00				0
		2008	0.00				0
	JANO	2007	1.44	62.02	0.46	4.48	3
		2008	1.87	65.29	0.57	6.10	4
	MAPI	2007	0.00				0
		2008	1.02	103.45	0.19	5.55	1
	SONO	2008	0.00				0
	TOKI	2007	0.00				0
		2008	0.00				0
	VACE	2007	2.52	80.23	0.62	10.28	4
		2008	1.43	50.13	0.56	3.65	5
	VACO	2007	0.00				0
		2008	1.00	102.93	0.18	5.60	1
	Global	2007	1.33	59.90	0.44	4.00	7
		2008	0.88	40.30	0.41	1.90	11

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Say's Phoebe *Sayornis saya*	CUAT	2007	1.01	69.44	0.27	3.79	2
		2008	1.01	68.72	0.27	3.74	2
	CUZA	2007	0.70	71.76	0.18	2.65	2
		2008	5.47	15.34	4.04	7.39	58
	JANO	2007	0.76	57.14	0.26	2.20	6
		2008	0.82	42.07	0.37	1.83	7
	MAPI	2007	7.03	29.73	3.86	12.81	17
		2008	3.06	22.43	1.97	4.75	24
	SONO	2008	3.80	36.22	1.76	8.18	5
	TOKI	2007	3.02	71.68	0.69	13.29	3
		2008	2.58	23.24	1.63	4.08	17
	VACE	2007	2.84	29.35	1.60	5.05	18
		2008	1.22	27.72	0.71	2.09	14
	VACO	2007	3.66	61.43	0.77	17.39	2
		2008	0.76	56.04	0.26	2.18	3
	Global	2007	2.11	19.12	1.45	3.07	50
		2008	2.68	11.75	2.13	3.38	130
Loggerhead Shrike *Lanius ludovicianus*	CUAT	2007	1.08	54.21	0.37	3.16	3
		2008	1.06	54.15	0.36	3.14	4
	CUZA	2007	2.00	41.23	0.88	4.52	8
		2008	5.16	13.81	3.94	6.77	69
	JANO	2007	2.51	20.26	1.69	3.74	28
		2008	3.85	17.70	2.72	5.46	43
	MAPI	2007	2.43	40.71	1.08	5.45	7
		2008	5.65	14.44	4.25	7.51	62
	SONO	2008	1.09	67.66	0.28	4.19	2
	TOKI	2007	2.16	49.76	0.73	6.36	3
		2008	1.52	31.70	0.82	2.82	14
	VACE	2007	1.47	27.70	0.85	2.52	12
		2008	1.18	21.54	0.78	1.80	21
	VACO	2007	0.00				0
		2008	2.16	29.61	1.20	3.89	12
	Global	2007	1.96	14.88	1.47	2.63	61
		2008	3.24	9.34	2.69	3.89	227

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Chihuahuan Raven *Corvus cryptoleucus*	CUAT	2007	1.21	62.11	0.37	3.96	4
		2008	1.45	59.95	0.46	4.59	5
	CUZA	2007	1.17	60.16	0.37	3.65	6
		2008	1.95	23.84	1.22	3.09	32
	JANO	2007	2.13	26.00	1.28	3.53	22
		2008	0.74	34.49	0.38	1.44	10
	MAPI	2007	0.00				0
		2008	0.36	54.87	0.13	1.01	5
	SONO	2008	1.09	75.80	0.25	4.83	2
	TOKI	2007	2.89	44.55	1.14	7.32	4
		2008	0.80	47.37	0.32	1.98	8
	VACE	2007	1.05	38.96	0.50	2.23	9
		2008	0.18	55.05	0.06	0.49	5
	VACO	2007	0.87	99.92	0.09	8.69	1
		2008	0.72	84.45	0.16	3.19	5
	Global	2007	1.38	20.40	0.93	2.05	46
		2008	0.92	18.26	0.64	1.31	72
Common Raven *Corvus corax*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	0.31	103.66	0.05	1.82	1
		2008	0.62	43.15	0.27	1.41	8
	JANO	2007	0.74	34.66	0.38	1.44	13
		2008	2.46	27.57	1.44	4.20	29
	MAPI	2007	0.38	105.96	0.06	2.31	2
		2008	0.28	65.65	0.09	0.94	4
	SONO	2008	4.76	48.95	1.77	12.80	11
	TOKI	2007	0.00				0
		2008	0.07	101.49	0.01	0.37	1
	VACE	2007	0.28	63.53	0.09	0.88	4
		2008	0.32	44.09	0.14	0.74	6
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	0.41	31.60	0.22	0.76	20
		2008	0.92	22.70	0.59	1.43	59

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Raven spp. *Corvus spp.*	CUAT	2007	0.96	61.86	0.29	3.13	4
		2008	1.15	59.69	0.36	3.62	5
	CUZA	2007	1.19	53.04	0.43	3.30	7
		2008	2.21	19.34	1.51	3.22	44
	JANO	2007	3.08	18.25	2.16	4.41	46
		2008	4.70	16.19	3.42	6.45	69
	MAPI	2007	0.32	105.20	0.05	1.95	2
		2008	0.68	38.08	0.32	1.40	11
	SONO	2008	9.78	50.72	3.67	26.05	17
	TOKI	2007	2.67	36.54	1.24	5.76	5
		2008	1.09	34.43	0.56	2.13	15
	VACE	2007	1.17	33.91	0.60	2.26	15
		2008	0.41	36.52	0.20	0.83	11
	VACO	2007	0.69	99.77	0.07	6.91	1
		2008	0.67	71.81	0.18	2.46	6
	Global	2007	1.72	15.76	1.26	2.34	80
		2008	2.13	14.70	1.59	2.84	178
Horned Lark *Eremophila alpestris*	CUAT	2007	3.50	82.46	0.78	15.74	4
		2008	32.97	70.20	8.99	120.92	14
	CUZA	2007	0.00				0
		2008	11.36	60.63	3.43	37.60	10
	JANO	2007	25.09	30.95	13.80	45.62	66
		2008	121.66	18.08	85.43	173.25	138
	MAPI	2007	0.00				0
		2008	11.30	69.56	3.19	40.05	13
	SONO	2008	26.33	33.26	13.46	51.53	12
	TOKI	2007	129.68	37.88	56.88	295.61	60
		2008	107.33	15.52	79.09	145.66	214
	VACE	2007	11.53	36.39	5.71	23.27	32
		2008	84.90	14.59	63.78	113.01	69
	VACO	2007	0.00				0
		2008	10.23	138.02	0.63	167.15	2
	Global	2007	16.33	20.33	10.96	24.35	162
		2008	55.65	10.80	45.03	68.77	472

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Mountain Bluebird *Sialia currucoides*	CUAT	2007	3.98	97.99	0.65	24.16	5
		2008	0.00				0
	CUZA	2007	3.04	73.77	0.78	11.78	3
		2008	0.00				0
	JANO	2007	1.11	59.93	0.37	3.36	10
		2008	0.00				0
	MAPI	2007	10.62	55.12	3.74	30.18	20
		2008	0.00				0
	SONO	2008	0.00				0
	TOKI	2007	0.42	97.62	0.06	2.73	1
		2008	0.00				0
	VACE	2007	0.52	81.61	0.12	2.22	3
		2008	0.00				0
	VACO	2007	10.62	121.61	1.04	108.33	3
		2008	0.00				0
	Global	2007	2.17	33.90	1.13	4.17	45
		2008	0.00				0
Sprague's Pipit *Anthus spragueii*	CUAT	2007	2.25	69.83	0.60	8.46	2
		2008	3.38	101.09	0.58	19.73	1
	CUZA	2007	0.00				0
		2008	5.40	30.72	2.99	9.78	21
	JANO	2007	3.12	38.20	1.50	6.50	11
		2008	2.61	45.93	1.10	6.22	7
	MAPI	2007	0.00				0
		2008	0.00				0
	SONO	2008	0.00				0
	TOKI	2007	40.44	69.86	10.51	155.57	7
		2008	5.42	34.40	2.79	10.54	15
	VACE	2007	2.46	38.04	1.18	5.12	7
		2008	5.15	26.75	3.07	8.64	25
	VACO	2007	0.00				0
		2008	1.69	57.64	0.57	4.98	3
	Global	2007	3.31	35.29	1.64	6.68	27
		2008	3.88	20.39	2.61	5.78	72

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Cassin's Sparrow *Aimophila cassinii*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	8.29	87.68	1.46	47.26	2
		2008	1.10	71.44	0.31	3.93	2
	JANO	2007	6.05	39.76	2.82	12.96	8
		2008	3.48	66.89	1.04	11.66	5
	MAPI	2007	0.00				0
		2008	0.00				0
	SONO	2008	0.00				0
	TOKI	2007	0.00				0
		2008	0.90	100.79	0.17	4.82	1
	VACE	2007	1.87	71.73	0.52	6.80	2
		2008	0.43	101.16	0.08	2.25	1
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	4.06	41.23	1.76	9.35	12
		2008	1.05	45.14	0.45	2.46	9
Chipping Sparrow *Spizella passerina*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	135.52	45.17	56.46	325.27	25
		2008	222.66	19.95	150.91	328.52	135
	JANO	2007	40.76	48.73	16.11	103.14	15
		2008	6.20	62.70	1.86	20.71	7
	MAPI	2007	15.00	75.37	3.76	59.90	6
		2008	8.99	117.08	1.33	60.82	3
	SONO	2008	143.66	49.92	53.20	387.92	7
	TOKI	2007	0.00				0
		2008	21.45	113.50	2.89	159.40	4
	VACE	2007	17.10	90.05	2.59	112.85	4
		2008	9.23	75.53	2.03	41.93	5
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	45.25	31.64	24.39	83.94	50
		2008	76.39	17.96	53.80	108.48	161

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Clay-colored Sparrow *Spizella pallida*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	133.92	33.64	69.56	257.84	46
		2008	45.95	39.10	21.75	97.08	20
	JANO	2007	37.84	38.13	18.16	78.85	19
		2008	7.13	55.76	2.53	20.09	7
	MAPI	2007	172.06	60.00	55.99	528.75	20
		2008	40.12	40.46	18.54	86.80	30
	SONO	2008	0.00				0
	TOKI	2007	14.15	105.56	2.00	99.82	2
		2008	0.00				0
	VACE	2007	19.57	50.19	7.44	51.47	11
		2008	5.71	38.76	2.70	12.10	11
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	58.40	23.82	36.72	92.88	98
		2008	19.69	28.50	11.33	34.21	68
Brewer's Sparrow *Spizella breweri*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	14.16	70.31	3.84	52.23	9
		2008	213.64	19.76	145.38	313.94	149
	JANO	2007	34.80	37.62	16.80	72.10	20
		2008	56.18	33.68	29.34	107.59	38
	MAPI	2007	6.58	78.32	1.51	28.63	2
		2008	176.79	34.16	91.63	341.09	78
	SONO	2008	19.59	27.62	11.11	34.57	9
	TOKI	2007	2.60	100.27	0.38	17.68	1
		2008	0.00				0
	VACE	2007	40.28	41.28	18.30	88.64	22
		2008	18.15	30.24	10.08	32.67	26
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	28.14	27.22	16.60	47.68	54
		2008	92.86	16.36	67.48	127.76	300

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Spizella spp.	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	278.92	27.92	160.77	483.90	81
		2008	491.16	12.79	382.22	631.15	324
	JANO	2007	228.26	19.84	154.83	336.51	93
		2008	88.08	27.73	51.43	150.85	65
	MAPI	2007	222.20	45.48	92.75	532.31	31
		2008	282.91	28.95	161.15	496.67	150
	SONO	2008	203.16	36.80	97.94	421.43	19
	TOKI	2007	16.84	106.77	2.39	118.59	3
		2008	20.31	113.39	2.73	150.89	4
	VACE	2007	67.41	36.43	33.44	135.89	42
		2008	31.37	27.62	18.32	53.72	42
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	164.41	14.46	123.83	218.29	250
		2008	200.73	10.39	163.76	246.05	604
Vesper Sparrow *Pooecetes gramineus*	CUAT	2007	1.24	101.52	0.21	7.29	1
		2008	0.00				0
	CUZA	2007	18.16	33.12	9.43	34.96	15
		2008	197.69	11.19	158.67	246.30	319
	JANO	2007	221.61	14.74	165.95	295.93	217
		2008	62.14	22.06	40.37	95.65	75
	MAPI	2007	64.08	28.14	36.57	112.29	38
		2008	49.26	33.31	25.83	93.94	91
	SONO	2008	445.81	27.46	255.64	777.46	51
	TOKI	2007	14.78	99.86	2.17	100.52	2
		2008	4.09	48.62	1.63	10.25	9
	VACE	2007	240.53	10.93	193.73	298.64	329
		2008	47.55	8.97	39.87	56.72	149
	VACO	2007	134.32	81.48	22.29	809.43	10
		2008	51.86	28.36	29.68	90.61	47
	Global	2007	162.42	8.76	136.74	192.93	612
		2008	109.11	8.59	92.14	129.22	741

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Lark Sparrow *Chondestes grammacus*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	63.05	56.17	21.82	182.22	12
		2008	4.31	78.33	1.03	18.08	4
	JANO	2007	0.35	100.65	0.07	1.84	1
		2008	0.00				0
	MAPI	2007	0.00				0
		2008	3.14	104.06	0.57	17.29	4
	SONO	2008	0.00				0
	TOKI	2007	0.00				0
		2008	0.00				0
	VACE	2007	3.45	87.69	0.72	16.48	3
		2008	0.00				0
	VACO	2007	0.00				0
		2008	0.00				0
	Global	2007	13.27	51.57	4.97	35.42	16
		2008	1.53	67.45	0.43	5.36	8
Lark Bunting *Calamospiza melanocorys*	CUAT	2007	0.00				0
		2008	39.62	100.04	6.84	229.51	1
	CUZA	2007	0.00				0
		2008	27.05	44.78	11.47	63.78	9
	JANO	2007	260.21	53.56	96.03	705.09	43
		2008	18.97	65.62	5.33	67.56	9
	MAPI	2007	37.54	60.46	11.95	117.95	8
		2008	76.14	55.02	27.28	212.52	26
	SONO	2008	19.58	85.01	3.61	106.12	4
	TOKI	2007	0.00				0
		2008	0.00				0
	VACE	2007	3.80	55.10	1.33	10.83	10
		2008	10.40	45.19	4.38	24.68	9
	VACO	2007	0.00				0
		2008	8.35	79.22	2.03	34.36	5
	Global	2007	82.74	50.76	31.99	214.00	61
		2008	22.70	25.57	13.81	37.31	63

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Savannah Sparrow *Passerculus sandwichensis*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	24.77	24.43	15.22	40.31	22
		2008	27.23	20.46	18.26	40.61	69
	JANO	2007	181.60	26.46	108.59	303.70	116
		2008	15.28	46.36	6.33	36.88	22
	MAPI	2007	89.18	47.96	35.42	224.52	15
		2008	1.45	62.68	0.45	4.61	3
	SONO	2008	58.18	96.58	10.40	325.38	6
	TOKI	2007	71.42	100.32	9.60	531.40	3
		2008	17.67	66.98	5.25	59.40	21
	VACE	2007	122.51	23.10	77.84	192.83	154
		2008	6.72	41.37	3.01	15.02	17
	VACO	2007	20.77	47.28	6.10	70.73	4
		2008	70.01	49.39	27.54	177.97	34
	Global	2007	112.97	17.04	80.97	157.61	314
		2008	20.40	20.71	13.60	30.62	172
Grasshopper Sparrow *Ammodramus savannarum*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	93.03	39.35	42.76	202.43	27
		2008	36.94	35.68	18.60	73.38	43
	JANO	2007	91.04	24.39	56.53	146.61	62
		2008	5.58	44.15	2.41	12.93	5
	MAPI	2007	158.03	24.86	95.54	261.38	36
		2008	8.50	62.77	2.70	26.81	5
	SONO	2008	21.73	72.36	5.23	90.30	3
	TOKI	2007	0.00				0
		2008	2.90	70.64	0.81	10.34	2
	VACE	2007	18.05	32.29	9.63	33.82	11
		2008	6.00	31.83	3.25	11.09	11
	VACO	2007	34.92	61.57	7.37	165.39	2
		2008	2.40	100.72	0.44	13.12	1
	Global	2007	64.67	17.26	46.09	90.73	138
		2008	15.38	26.46	9.19	25.73	70

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Baird's Sparrow *Ammodramus bairdii*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	10.57	105.36	1.78	62.89	3
		2008	32.10	31.38	17.51	58.83	34
	JANO	2007	1.29	119.48	0.20	8.39	1
		2008	3.55	59.11	1.20	10.53	3
	MAPI	2007	0.00				0
		2008	2.57	72.63	0.70	9.40	2
	SONO	2008	0.00				0
	TOKI	2007	0.00				0
		2008	0.00				0
	VACE	2007	6.37	50.89	2.44	16.60	4
		2008	0.00				0
	VACO	2007	18.49	100.72	1.89	181.06	1
		2008	0.00				0
	Global	2007	4.76	52.78	1.76	12.91	9
		2008	10.14	29.73	5.70	18.01	39
Ammodramus *spp.* and *Passerculus sandwichensis.*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	99.58	28.84	55.81	177.68	52
		2008	95.93	16.43	69.49	132.43	183
	JANO	2007	397.49	21.72	248.46	579.64	196
		2008	55.42	34.45	28.58	107.47	54
	MAPI	2007	121.36	22.69	77.00	191.28	45
		2008	11.39	39.04	5.38	24.09	13
	SONO	2008	123.83	67.88	34.34	446.53	10
	TOKI	2007	127.11	120.21	13.11	1232.4	2
		2008	29.55	60.50	9.73	89.80	21
	VACE	2007	207.53	17.64	146.56	293.87	200
		2008	18.12	30.53	10.01	32.82	30
	VACO	2007	115.54	52.17	30.10	443.57	12
		2008	87.41	36.29	43.18	176.94	33
	Global	2007	222.12	14.10	168.56	292.71	507
		2008	55.67	14.09	42.24	73.37	344

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Ammodramus spp.	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	92.90	40.98	41.40	208.48	32
		2008	68.40	22.69	43.91	106.55	91
	JANO	2007	110.30	22.03	71.66	169.78	92
		2008	12.33	34.66	6.31	24.08	13
	MAPI	2007	134.20	25.16	80.74	223.06	36
		2008	9.29	49.57	3.65	23.60	7
	SONO	2008	24.61	57.21	7.68	78.88	4
	TOKI	2007	0.00				0
		2008	6.15	52.54	2.29	16.50	5
	VACE	2007	82.27	20.62	54.84	123.41	63
		2008	6.17	30.38	3.43	11.11	12
	VACO	2007	133.46	62.14	27.96	636.99	9
		2008	10.20	51.83	3.80	27.40	5
	Global	2007	91.92	15.18	68.28	123.75	232
		2008	26.52	18.49	18.47	38.08	137
Chestnut-collared Longspur *Calcarius ornatus*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	0.00				0
		2008	158.80	46.06	66.38	379.91	23
	JANO	2007	189.72	25.23	116.17	309.83	108
		2008	129.67	32.05	69.94	240.40	90
	MAPI	2007	11.07	109.62	1.76	69.46	5
		2008	0.56	60.74	0.18	1.72	4
	SONO	2008	16.35	78.51	3.66	73.01	3
	TOKI	2007	0.00				0
		2008	0.52	100.34	0.10	2.74	1
	VACE	2007	109.95	37.25	53.83	224.56	56
		2008	31.04	29.41	17.50	55.07	24
	VACO	2007	24.89	105.04	2.61	237.59	2
		2008	0.00				0
	Global	2007	97.31	21.27	64.31	147.23	171
		2008	77.31	29.24	43.81	136.40	145

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Eastern Meadowlark *Sturnella magna*	CUAT	2007	0.00				0
		2008	0.00				0
	CUZA	2007	2.99	50.41	1.13	7.97	8
		2008	21.76	36.34	10.85	43.68	65
	JANO	2007	8.15	38.58	3.89	17.07	34
		2008	15.40	52.47	5.76	41.18	41
	MAPI	2007	0.00				0
		2008	0.15	99.18	0.03	0.77	1
	SONO	2008	23.86	57.88	7.69	74.09	8
	TOKI	2007	0.00				0
		2008	0.00				0
	VACE	2007	3.85	48.38	1.55	9.61	13
		2008	4.26	27.00	2.52	7.21	35
	VACO	2007	0.00				0
		2008	2.34	47.80	0.94	5.85	7
	Global	2007	4.39	28.09	2.55	7.56	55
		2008	11.32	25.42	6.92	18.53	157
Western Meadowlark *Sturnella neglecta*	CUAT	2007	0.42	100.58	0.07	2.45	1
		2008	0.00				0
	CUZA	2007	1.45	65.48	0.42	5.04	5
		2008	1.86	52.54	0.69	4.99	11
	JANO	2007	1.28	55.87	0.45	3.65	8
		2008	1.76	52.61	0.66	4.70	10
	MAPI	2007	19.56	55.99	6.77	56.47	12
		2008	1.60	90.04	0.29	8.74	4
	SONO	2008	0.00				0
	TOKI	2007	0.00				0
		2008	2.80	83.75	0.61	12.80	8
	VACE	2007	1.45	43.21	0.64	3.31	9
		2008	0.00				0
	VACO	2007	3.06	101.08	0.31	30.09	2
		2008	0.00				0
	Global	2007	2.82	36.70	1.38	5.74	37
		2008	1.08	35.62	0.54	2.13	33

Common Name *Scientific Name*	GPCA	Year	Density Estimate	%CV	LCL	UCL	n
Meadowlark spp. *Sturnella spp.*	CUAT	2007	0.55	99.45	0.10	3.16	1
		2008	3.29	67.36	0.91	11.84	4
	CUZA	2007	4.17	39.57	1.90	9.17	11
		2008	30.10	27.02	17.83	50.79	100
	JANO	2007	25.32	35.17	12.85	49.90	53
		2008	20.11	39.61	9.41	42.96	52
	MAPI	2007	23.09	61.16	7.28	73.24	10
		2008	3.32	51.84	1.21	9.10	11
	SONO	2008	16.51	63.29	4.59	59.47	7
	TOKI	2007	8.76	107.88	1.24	61.97	5
		2008	17.34	52.14	6.51	46.21	22
	VACE	2007	12.69	27.39	7.44	21.62	45
		2008	8.82	23.83	5.53	14.06	50
	VACO	2007	3.98	99.95	0.40	39.89	2
		2008	10.40	21.09	6.84	15.83	33
	Global	2007	15.18	21.60	9.96	23.14	127
		2008	17.06	17.27	12.18	23.90	279