Wintering Grassland Bird Densities in Chihuahuan Desert Grassland Priority Conservation Areas, 2007-2010

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***Cover Photo**:* Chihuahuan Desert grasslands in the Malpaís Grassland Priority Conservation Area in eastern Durango. Photo by Jose Hugo Martinez Guerrero.

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EXECUTIVE SUMMARY

Many grassland bird species are of high conservation concern due to major population declines and continuing habitat loss and degradation over much of their range. More than 80% of grassland bird species breeding in western North America overwinter in the Chihuahuan Desert grasslands of southwestern USA and northern Mexico. These grasslands are increasingly being lost and degraded through agricultural conversion, desertification and shrub encroachment, especially in Mexico. However, there is little information on wintering grassland bird distribution, abundance, habitat use and spatiotemporal patterns to guide strategic habitat conservation in the region.

In January 2007, Rocky Mountain Bird Observatory (RMBO), together with Universidad Autónoma de Nuevo León, initiated a first-ever, region-wide pilot survey to inventory, research and monitor wintering birds at 468 randomly-selected grassland sites in seven Chihuahuan Desert Grassland Priority Conservation Areas (GPCAs) in northern Mexico. This effort was expanded in 2008, 2009 and 2010 to eventually include 735 sites in 11 GPCAs in northern Mexico and western Texas.

At each site we used 1- km line transects with distance sampling to quantify bird populations and ocular estimation to sample vegetation conditions and characterize habitat structure. These surveys generated data on habitat conditions and abundance of 50 grassland obligate or facultative species in the 11 GPCAs, including 30 priority species of high regional or continental conservation interest. We obtained reasonably precise annual estimates of density for 29 species, including 18 priority species, in at least one GPCA within or across years.

Our results show that wintering grassland bird density varies across the Chihuahuan Desert in both time and space. Some species showed clear patterns of consistent high use or avoidance among the GPCAs. For others, the picture is less clear. More time is needed to evaluate what appears to be more sporadic species-specific use of some grassland areas.

Grasslands, particularly those relatively free of shrubs and other woody vegetation, are a limited and shrinking habitat in the Chihuahuan Desert. Recent agricultural expansion is rapidly reducing the extent of Chihuahuan Desert grasslands, particularly in northern Mexico. Precise rates of grassland loss are not known, but they appear to be increasing and unsustainable. Shrub encroachment and desertification are also a serious and pervasive threat to Chihuahuan Desert grasslands. Given that most declining migratory grassland birds from western North America depend on the limited grasslands of the Chihuahuan Desert for their survival, continued loss of these grasslands will likely exacerbate ongoing population declines and could soon create a permanent bottleneck limiting the conservation and recovery of North American grassland bird species. We hope the information provided here can help spur much-needed conservation action in this highly threatened ecosystem.

RESUMEN EJECUTIVO

Existe una alta preocupación por la conservación de muchas especies de aves de pastizal debido

a sus disminuciones poblacionales notables y a la pérdida y degradación continua de sus hábitats sobre gran parte de sus distribuciones. Más del 80% de las especies de aves de pastizal reproduciéndose en el oeste de Norteamérica pasan el invierno en los pastizales del Desierto Chihuahuense del suroeste de los Estados Unidos y el norte de México. Estos pastizales se están perdiendo y degradando cada vez más por su conversión a terrenos agrícolas, desertificación, y proliferación de plantas arbustivas, especialmente en México. Sin embargo, existe poca información sobre los patrones de distribución, abundancia, uso de hábitat y espacio-temporales de las aves de pastizal en el invierno para guiar la conservación estratégica de hábitat en la región.

En enero de 2007, Rocky Mountain Bird Observatory (RMBO), junto con la Universidad Autónoma de Nuevo León, inició el primer estudio piloto regional para realizar un inventario, e investigar y monitorear aves durante el invierno en 468 sitios de pastizal aleatoriamente seleccionados en siete Áreas Prioritarias de Conservación de Pastizales (APCP) del Desierto Chihuahuense en el norte de México. Este esfuerzo fue expandido en 2008, 2009, y 2010 para finalmente incluir 735 sitios en 11 APCPs en el norte de México y el oeste de Texas.

En cada sitio, utilizamos transectos lineales de 1 km de longitud con muestreo de distancia para cuantificar las poblaciones de aves y utilizamos estimaciones oculares para muestrear las condiciones de la vegetación y caracterizar la estructura del hábitat. Estos transectos generaron datos sobre la condición del hábitat y abundancia de 49 especies de pastizal obligadas y facultativas en las 11 APCPs, incluyendo 30 especies prioritarias de interés de conservación regional y continental. Obtuvimos estimaciones anuales de densidad razonablemente precisas de 29 especies, incluyendo 10 especies prioritarias en al menos una APCP por año y a través de los años.

Nuestros resultados muestran que la densidad de aves de pastizal varía a través del Desierto Chihuahuense en tiempo y espacio. Algunas de las especies mostraron patrones claros de alto uso o evitación consistentes entre las APCPs. Para otras, la escena es menos clara. Se requiere más tiempo para evaluar lo que parece ser un uso específico más esporádico de áreas por especie en algunas áreas de pastizal.

Los pastizales, particularmente aquellos relativamente libres de arbustos y otras plantas leñosas, son un hábitat limitado y en contracción en el Desierto Chihuahuense. La expansión agrícola reciente está reduciendo rápidamente la extensión de los pastizales del Desierto Chihuahuense, particularmente en el norte de México. La velocidad precisa con la que se están perdiendo los pastizales es desconocida, pero parecen estarse incrementando y son insostenibles. La proliferación de plantas arbustivas y a desertificación son también amenazas serias y prevalentes para los pastizales del Desierto Chihuahuense. Dado que la mayoría de aves de pastizal migratorias que están disminuyendo dependen de los pastizales limitados del Desierto Chihuahuense para su supervivencia, la continua pérdida de estos pastizales probablemente exacerbará las disminuciones poblacionales en curso y podrían pronto crear un cuello de botella permanente limitando la conservación y recuperación de las aves de pastizal de Norteamérica. Esperamos que la información que proveemos en este documento pueda ayudar a motivar acciones de conservación tan necesarias en este ecosistema altamente amenazado.

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INTRODUCTION

Populations of many grassland bird species, including 27 species of continental or regional importance for Partners in Flight (PIF) and/or the U.S. Fish and Wildlife Service (USFWS), are undergoing steep, widespread and long-term population declines (Sauer et al. 2008). Reasons for many declines are still poorly understood, but likely relate 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 western 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). Ninety percent of grassland-associated (obligate and facultative) bird species breeding in the western Great Plains are migratory, and more than 90% of these overwinter in the Chihuahuan Desert of northern Mexico and the southwestern United States, making this a continentally-important region for grassland birds (Figure 1B). Native grasslands in the Chihuahuan Desert are restricted in distribution, and while the current GIS (INEGI 2003) suggest that grasslands occupy roughly 15% of the Chihuahuan Desert (Bird Conservation Region 35) in Mexico, resolution among grassland condition is poor, and the actual extent of open, relatively shrub-free grasslands that are required by most grassland-obligate bird species is much less than this and probably closer to around 5%.

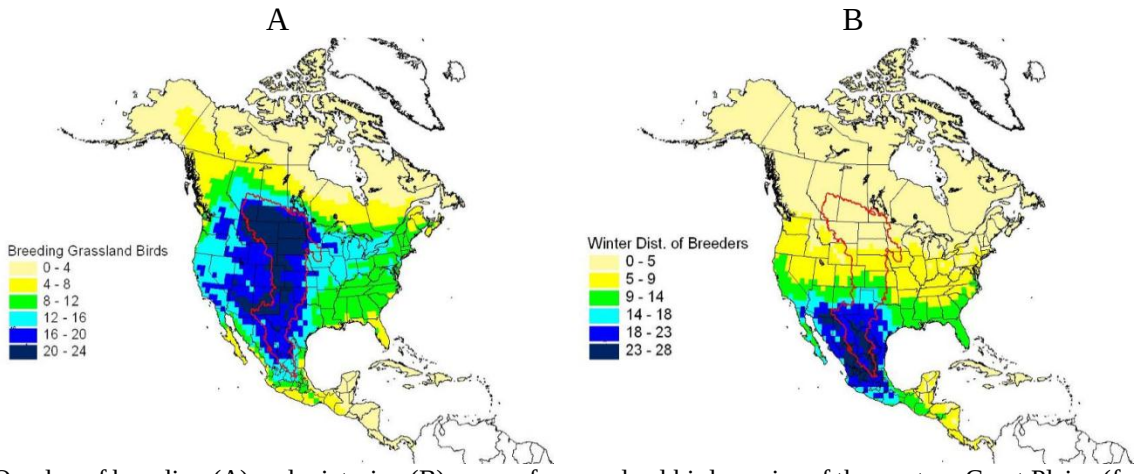

Figure 1. Overlay of breeding (A) and wintering (B) ranges for grassland bird species of the western Great Plains (from Blancher 2003).

Little information exists to guide grassland bird conservation in the Chihuahuan Desert. Information on the regional distribution, abundance, habitat use and spatiotemporal patterns of wintering grassland birds and on trends in grassland extent and condition is urgently needed to advance strategic conservation actions for priority species while opportunities still exist. This information will also enable the evaluation of impacts from continuing grassland loss and climate change, as well as conservation actions, in the Chihuahuan Desert. The goal of this project is to provide this information through a random-sampling design that allows for local and regional inference to populations, prioritization of conservation areas based on species distribution and abundance, and insight into species-specific habitat requirements.

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 Ciudad Chihuahua, Chihuahua, Mexico, in August 2006. Our primary objective is to estimate abundance of all grassland birds in Grassland Priority Conservation Areas (GPCAs), emphasizing priority species as identified by

the federal governments of Canada, the U.S. or Mexico, or by major bird conservation initiatives such PIF, The U.S. Shorebird Conservation Plan and The Nature Conservancy. A detailed account of the program goals, study design, and methodology are given by Panjabi et al. (2006) and updated by Levandoski et al. (2009).

METHODS

In cooperation with the Universidad Autónoma de Nuevo León (UANL) and Sul Ross State University (SRSU) we implemented avian and habitat surveys in 11 GPCAs in northern Mexico and western Texas in the winters of 2007 - 2010 (Levandoski et al. 2009, Panjabi et al. 2010). These GPCAs were identified by the Commission for Environmental Cooperation (CEC) and The Nature Conservancy (TNC) (CEC and TNC 2005) through a tri-national series of workshops involving regional experts from all parts of North America's central grasslands. Subsequently, through an effort commissioned by the CEC, we analyzed available GIS and RMBO bird survey data to propose modifications and additions to the original suite of GPCAs and solicited input from a broad array of biologists and range scientists on these proposals (Pool and Panjabi 2010). Our proposed amendments to the original GPCAs, which included seven adjusted boundaries and the addition of four new GPCAs, have since been ratified by the CEC. The GPCAs in this study include Cuatro Ciénegas, Cuchillas de la Zarca, Janos, Lagunas del Este, Malpaís, Mapimí, Marfa, El Tokio, Sonoita, Valles Centrales and Valle Colombia (Figure 2). We treated the single study block in Llano Las Amapolas as part of Lagunas del Este due to its proximity and the lack of additional samples in that GPCA. We did not survey in the newly created Alto Conchos GPCA.

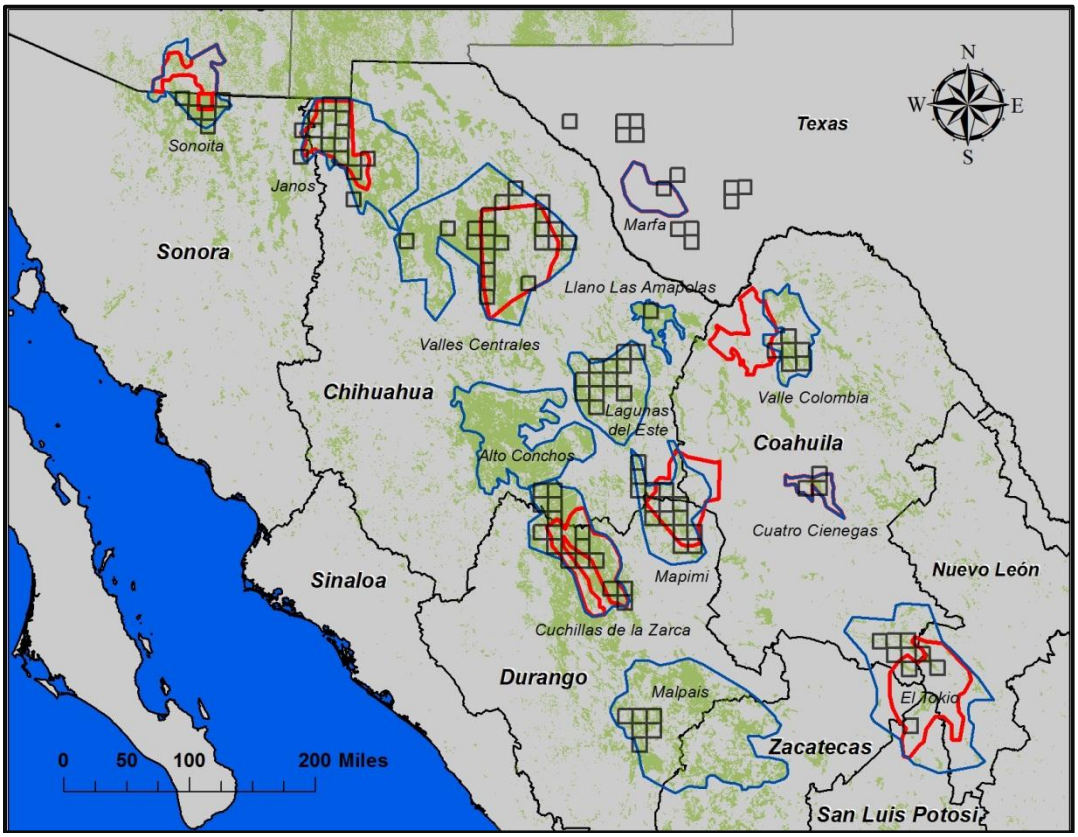

Figure 2. Chihuahuan Desert GPCA boundaries and wintering grassland bird sampling blocks surveyed in 2010. Original GPCA boundaries (CEC and TNC 2005) in red; revised boundaries and new GPCA boundaries (Pool and Panjabi 2010) in blue; grasslands in olive-green.

We used the classification of grassland obligate and facultative bird species by Vickery et al. (1999) as a starting point to determine "grassland-associated" status among bird species detected on our survey, but with some modifications. We did not include in our "grassland-associated species" designation any waterfowl, herons or cowbirds considered "facultative" by Vickery et al., and we considered Bald Eagle, Golden Eagle and White-tailed Kite as facultative grassland species whereas Vickery did not include these on either list (scientific names are given in Appendix A). Our reasoning is that waterfowl do not inhabit arid Chihuahuan grasslands in winter, the only heron to be expected is Cattle Egret (an exotic species), and cowbirds rarely are found in arid grasslands, unless there are trees or tall shrubs present. On the other hand, Bald Eagles can be expected in more northerly desert grasslands in winter, especially around prairie dog towns, and Golden Eagles are a regular inhabitant of arid grasslands year-round and especially in winter. White-tailed Kites also readily utilize arid grasslands. We also made a few changes to obligate and facultative designations as assigned by Vickery et al. (1999). We did not consider American Pipit as a grassland obligate species, but rather as a facultative species, given that it is only rarely encountered in Chihuahuan Desert grasslands in winter and is more likely to occur around water bodies and barren ground. We also include Brewer's Sparrow as a grassland facultative species, as it is one of the most abundant bird species in Chihuahuan Desert grasslands, and its winter abundance is positively correlated with grass cover (Panjabi et al. 2008). Finally, we consider Worthen's Sparrow to be a grassland obligate species, for although it nests in shrubs and seems to require a shrubland edge, it is not found away from grasslands.

Study Design

We overlaid a grid of roughly 18 x 18 km^2 cell blocks across the Chihuahuan Desert and Sierra Madre Oriental Bird Conservation Regions to create a sampling frame for desert grasslands within GPCAs. Potential samples were cells that intersected with GPCAs and had at least 5 km of road access to grasslands as identified in the GIS (INEGI 2003). Due to poor correspondence between some GPCA boundaries and actual locations of grassland in the vicinity of these GPCAs, we added additional cell blocks to the sampling pool that met the aforementioned criteria, but were outside the original GPCA boundaries. This sampling design was described in detail by Panjabi et al. (2006), with modifications by Levandoski et al. (2009). We added additional GPCAs to the sampling frame in 2008 and 2009, as described by Panjabi et al. (2010), and the Malpaís grasslands in southeastern Durango in 2010 (Figure 2). In each sampling block we established randomly numbered points at 500 m intervals along roads intersecting grasslands, and established six paired 1-km line transects in each block, starting at the three lowest numbered points that met habitat requirements for native grasslands with <25% shrub cover.

Line-transect Protocol

Our bird survey methodology followed Buckland (2001), modified slightly for this study (Panjabi et al. 2007, Levandoski et al. 2009, Panjabi et al. 2010). We initiated surveys in most GPCAs in early January and completed surveys on or before March 5th, with the exception of Marfa where transects were conducted through March, and in Malpaís, which was surveyed in mid-December 2009. Each pair of one-kilometer line transects started from a randomly selected point along a road and headed in opposite directions perpendicular to the road. In a few occasions where available grasslands were limited within the survey block, we split paired transects to start from different random points. During the course of the day, each pair of technicians surveyed the six transects in each block starting at sunrise and continuing until completion, which was generally before 1300 hours. Sometimes, due to weather, road conditions, and variability in the time needed to complete both bird and vegetation surveys, finishing all transects within six hours was not possible. We recorded start and end times for each transect survey. We used Beaufort scales to categorize 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 observed in between transects in each survey block in order to provide a more complete inventory of grassland birds in each survey block (see Levandoski et al. 2009).

From each starting point, technicians used Garmin E-trex Vista GPS units to establish the end point of the transect 1000 m away and maintain their position on the line while conducting the survey. Observers used a sighting compass to help select a point on the horizon that corresponded with the direction of the transect end point, and used this bearing to help visualize the transect line in front of them. Observers recorded all birds detected during each survey and used laser rangefinders to estimate lateral distances from the transect line to each bird or bird cluster detected. Bird clusters were defined as groups of two or more individuals of the same species occurring within 25 m of the first individual detected. For each detection, we recorded the cluster size, detection method (visual, 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 750–1000 m). If observers encountered a major obstacle, such as an international border, cliff or other impassable terrain, or if the transect would otherwise bisect a large area (>250 m) of non-grassland habitat, they turned the transect 90° in a randomly chosen direction to avoid the obstacle.

Vegetation Protocol

Vegetation survey protocol has varied slightly over the years. In 2008 we used a modified line-intercept approach described by Levandoski et al. (2009). But due to time constraints for data collection, we sampled ground and shrub cover parameters using ocular estimates in 2009 and 2010. In order to minimize potential bias and calibrate observers' estimation skills, we trained observers in estimating vegetation cover on plots where all parameters had been either measured directly or estimated through quantitative sampling. An analysis of shrub cover estimates from 2008 and 2009 using the two different approaches revealed no significant differences in most GPCAs (Panjabi in prep.). A comparison of ocular vs. quantitative sampling methods for the same ground and shrub cover parameters in shortgrass prairie in Colorado found that ocular sampling provides similar results (i.e., within 2%) as quantitative sampling for grass and shrub cover, whereas ocular estimates of bare ground were 2-5% higher than quantitative estimates and ocular estimates of 'other' cover were 6-7% lower than quantitatively sampled estimates (Panjabi in prep.). These findings suggest that ocular sampling of vegetation cover parameters provide a reasonably accurate assessment of grassland vegetation conditions.

In 2009 and 2010 we estimated vegetation parameters at 10 sub-sampling stations at 100 m intervals along each 1-km bird transect (Figure 3). These surveys were conducted immediately following each bird survey. At each sub-sampling station we made ocular estimates of ground cover within 5-m radius circular plots. To estimate ground cover, technicians looked directly down to the ground out to 2 meters in four cardinal directions, estimated the percent cover in each direction, averaged these, and then extrapolated the estimate out to 5 m, adjusting it for obvious variances. Ground cover estimates were broken down into five categories: woody shrubs/trees, bare ground, grass, herbaceous, and 'other' cover types (combined). Up to three 'other' ground cover types were identified and listed in rank-order of dominance. 'Other' cover categories were: loose vegetation, cactus, woody vegetation, rock, yucca, animal excrement, and cryptobiotic crust. Average height was recorded for grass and herbaceous cover. Shrub cover was also estimated within 50 m of each sampling station using a similar approach. The habitat assessment also included characterizations of landscape-level site attributes including general topography (flatland, rolling hills, foothills, montane valleys, desert valleys, steep slopes and mesa top), adjacent habitats, landownership, and dominant grassland type. Grassland types followed the classification by INEGI (2003) which includes 'natural', halophytic, gypsophytic, induced or exotic grasslands. Gypsophytic and halophytic grasslands are defined by soil characteristics, whereas 'natural' grasslands include all other native grasslands apart from halophytic and gypsophytic grasslands. Presence or absence of prairie dogs and kangaroo rats was also recorded at each site in 2010.

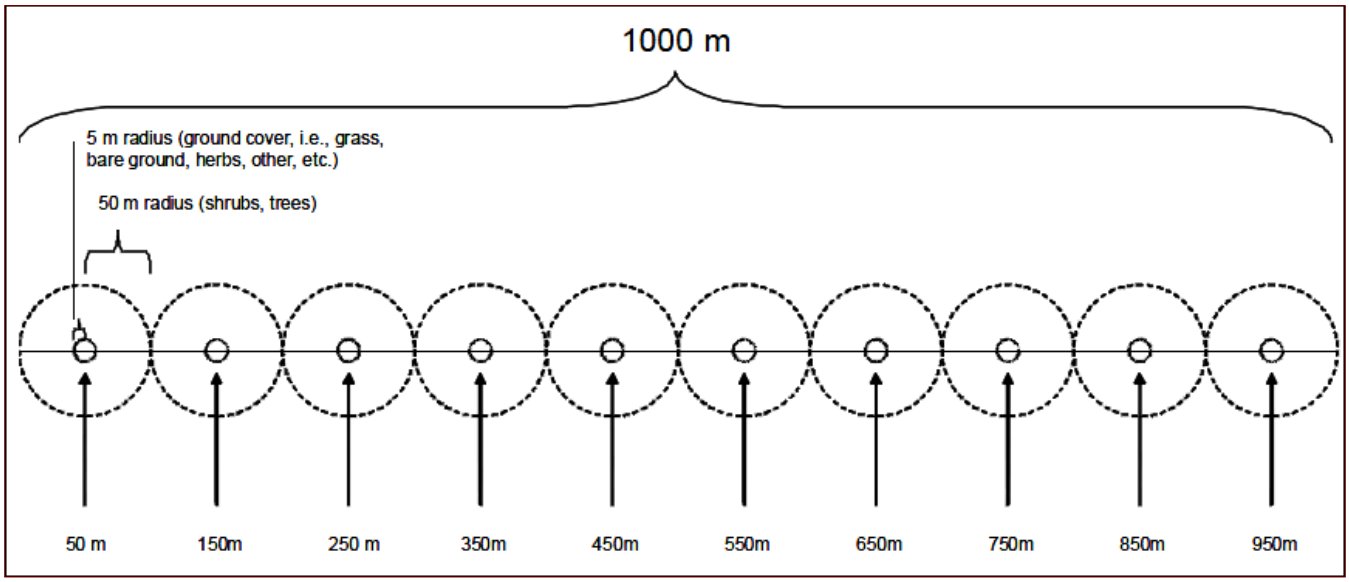

Figure 3. Design of vegetation survey transects for ground and shrub cover.

Training

We held a mandatory week-long training session for all technicians to explain, practice and review all field protocols. Most technicians also participated in a volunteer week-long effort to capture and band grassland birds prior to the training. As in previous years, we conducted both classroom and field-based training.

In-class training utilized PowerPoint presentations and hand-outs to cover sampling theory and project design, data collection and analysis, bird identification and past years' projects results. We distributed written protocols detailing transect establishment, avian and vegetation surveys and a user's guide detailing the exact steps 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.

Field training covered grassland bird identification by sight and sound, lateral distance estimation, site selection and transect establishment, vegetation sampling and estimation of vegetation parameters, GPS use, as well as in-hand study of grassland birds captured in mist nets. We conducted daily bird identification quizzes in the field and used mean scores to evaluate and track technicians' bird identification skills over the course of the training program. All technicians were required to achieve at least an 80% average score across all bird identification quizzes in order to pass the training class and conduct bird surveys. We conducted field tests of distance estimation skills by walking along the edge of a two-track road and having technicians estimate lateral distance from the edge of the road 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 actual perpendicular distance. Technicians quickly improved accuracy of their lateral distance estimation skills in this way. We also conducted mock transects in small groups so trainees could learn survey procedures and ask questions as they arose.

Data entry

All data was entered directly by technicians into RMBO's online database. The data entry website has been updated annually to improve functionality, user friendliness and quality controls.

Density Analyses

All density analyses were performed using program Distance 5.0, Release 2 (Thomas et al. 2006). We pooled data across years to augment species' sample sizes and create more robust detection functions. We ran analyses

for all grassland-obligate species, and selected grassland facultative species with at least 28 independent observations across all transects in all years (29 species total), and post-stratified estimates by Year and by GPCA. We also conducted pooled density analyses of all 29 species combined and post-stratified estimates by Year and GPCA. Four species analyzed (Mountain Plover, Long-billed Curlew, Burrowing Owl, and Short-eared Owl) had fewer than 60 observations, the minimum number recommended for analysis by the authors of program Distance. We chose to run analyses and present comparable results for these fours species with low sample size because they are of high conservation interest, and we felt that presenting abundance estimates that consider detection probability and provide comparable measures of error would be more useful than presenting unadjusted indices of abundance. However, caution should be used in interpreting these density estimates and special attention should be paid to associated measures of error.

In most cases, we right-truncated the furthest detections (those above the 85-95th percentile) of each species to eliminate outliers from the dataset and improve model performance. Truncation points were principally selected using Kolmogorov-Smirnov goodness-of-fit tests and visual assessments of model fit of the detection function. In a few cases, specific truncation points were chosen to correspond to where detectability dropped to 15% as recommended by Buckland (2001). 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 distance bins to improve performance of models and used a chi-square Goodness-of-Fit test to determine the truncation point.

We used global detection functions (all years and GPCAs) to model detectability of each species and post-stratified density estimates by GPCA-Year. 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 adjusted for small sample sizes (AICc) to select the highest ranking model (Burnham and Anderson 2002). When AICc was similar among two competing models (generally within 2 points), but the variance around the density point estimate differed substantially, we considered the default AIC selection of sequential adjustment terms for each model and selected the model with the fewest parameters.

RESULTS AND DISCUSSION

Survey Effort

In 2010, we surveyed 735 transects in 121 sampling blocks across the 11 Chihuahuan Desert GPCAs. Since the initial sampling plan was developed in 2007, survey effort has increased 57% (Table 1). Although only 210 transects were retained from the initial sampling effort in 2007, 468 transects were originally sampled. Two-hundred and fifty-eight of these were discarded due to habitat criteria and replaced with new sites in 2008. Survey effort increased from 2007-2010 within the six of the seven GPCAs originally included in the 2007 sampling plan and four new GPCAs were added. Sonoita was added to the sampling frame in 2008, Lagunas del Este and Marfa were added in 2009, and Malpaís was added in 2010.

Table 1. Annual survey effort in each Chihuahuan Desert Grassland Priority Conservation Area (GPCA).

Grassland Priority Conservation Area	2007		2008		2009		2010	
	Blocks	Transects	Blocks	Transects	Blocks	Transects	Blocks	Transects
Cuatro Ciénegas (CUAT)	3	18	3	18	3	18	3	18
Cuchillas de la Zarca (CUZA)	16	24	16	96	16	96	17	102
Janos (JANO)	13	73	13	78	13	78	14	84
Lagunas del Este (LAGU)					13	76	13	76
Malpaís (MALP)							6	36
Mapimí (MAPI)	12	23	12	71	13	76	14	78
Marfa (MARF)					14	78	13	77
Sonoita (SONO)			2	12	5	36	5	36
El Tokio (TOKI)	9	9	7	60	8	62	8	60
Valles Centrales (VACE)	21	58	21	126	21	126	22	132
Valle Colombia (VACO)	1	6	6	36	6	36	6	36
All GPCAs	78	210	80	497	112	682	121	735

Bird Density and Distribution

Technicians recorded 49,322 birds of 143 species in 2010, including 50 grassland associated species, including 31 priority species (Appendix A). This total is 24% less than the number of birds recorded in 2009, despite an 8% increase in effort. As in previous years, the most abundant species observed was Chestnut-collared Longspur (n=8211), despite a 46% drop in individuals since 2009. We estimated annual densities from 2007 to 2010 for 29 grassland bird species (including 18 priority species) in all 11 GPCAs (Appendix B). Here we present and discuss average species' densities in each GPCA during this 4-year period in order to provide a longer-term view of the relative importance of each GPCA for various grassland bird species in winter. We also examine gross changes in grassland bird densities and community structure in each GPCA across years.

Total grassland bird density (all 29 species analyzed combined) differed significantly across years, with substantially higher densities in 2007 and 2009 across the Chihuahuan Desert GPCAs (Figure 4). However, this pattern is not uniform across all the GPCAs. For example, densities in southern GPCAs, including Cuchillas de la Zarca, Malpaís, Mapimí, and El Tokio, were high in 2010 compared to other years and GPCAs (see GPCA accounts below). The high densities in southern GPCAs in 2010, coupled with low densities in northern GPCAs, including Sonoita, Janos, Valles Centrales, Lagunas del Este and Marfa, suggest that many species' wintering populations shifted into the southern Chihuahuan Desert in 2010. Thus, grasslands in the southern Chihuahuan Desert may be particularly important in sustaining grassland bird populations when conditions in the northern desert are unsuitable. Nonetheless, given the overall lower density in 2010, it appears there also may have been a large reduction in total global population size of species wintering primarily in the Chihuahuan Desert.

While the average total wintering grassland bird density in the region was roughly 400 birds/km^2 across all GPCAs and years (Figure 4), the four-year average wintering grassland bird density in each GPCA differed significantly among some GPCAs but not others (Figure 5). Cuchillas de la Zarca, Janos, Lagunas del Este, Malpaís (2010 only), Mapimí and Valle Colombia had higher average combined grassland bird densities than the other GPCAs. Combined grassland bird density was significantly lower in Cuatro Ciénegas than in other GPCAs. In most GPCAs, the combined grassland bird density was driven in large part by a single species that far outnumbered all others.

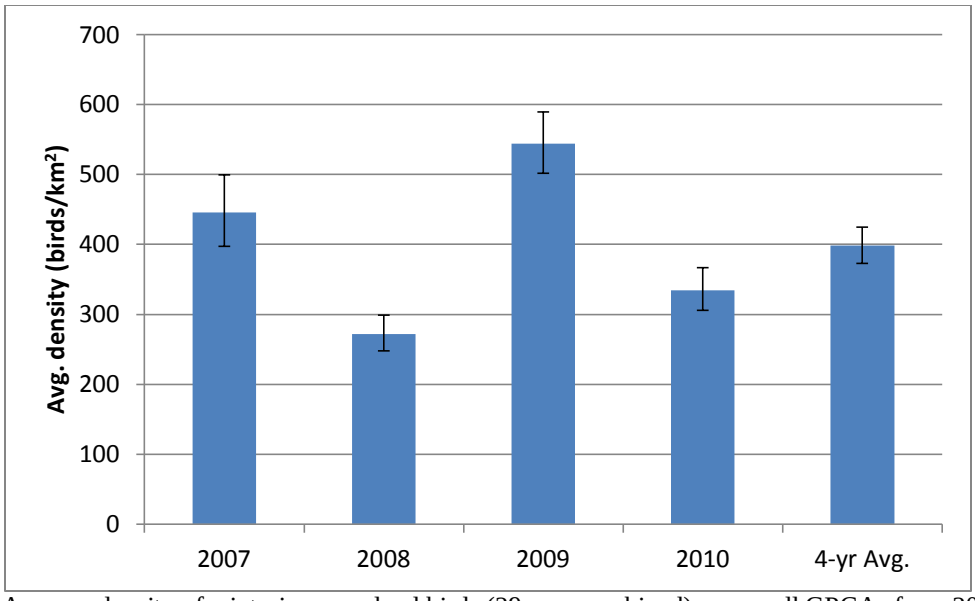

Figure 4. Average density of wintering grassland birds (29 spp. combined) across all GPCAs from 2007-2010.

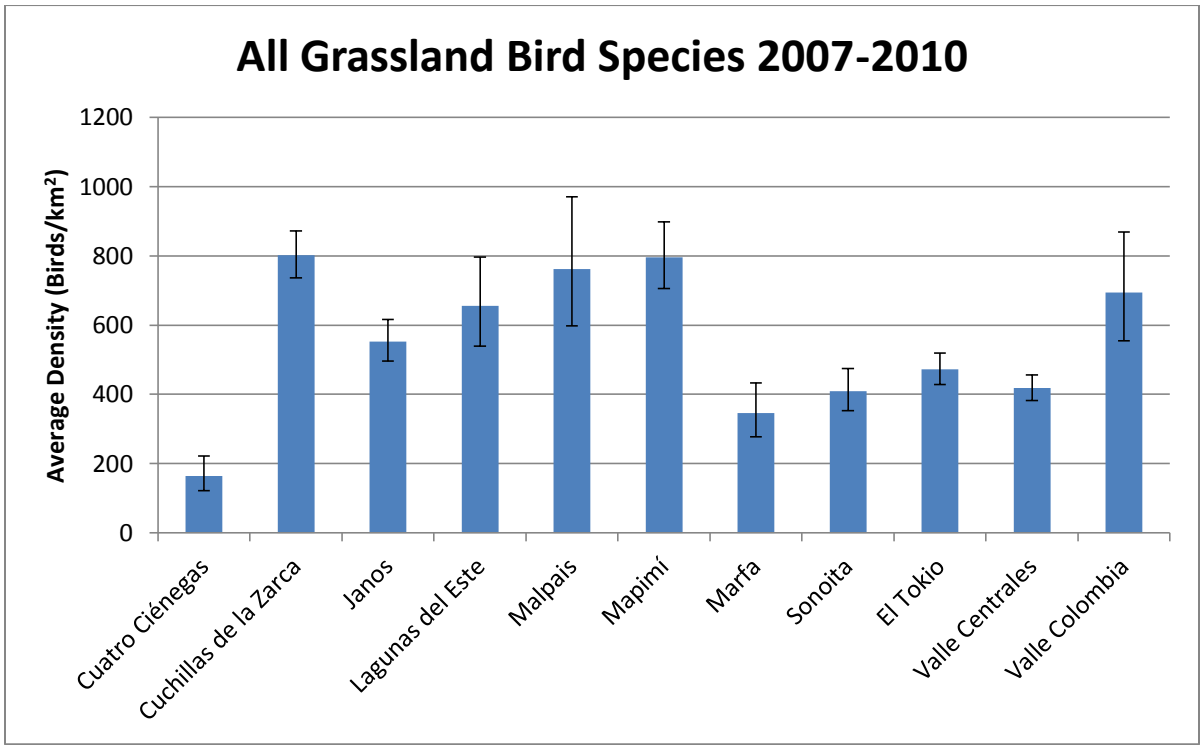

Figure 5. Four-year average (2007-2010) wintering grassland bird density (29 spp. combined) in each GPCA.

Habitat characteristics

Results of vegetation and habitat surveys are presented in Appendix C, and discussed in the following GPCA accounts.

Cuatro Ciénegas

The Cuatro Ciénegas GPCA encompasses 1,531 km^2 of Chihuahuan Desert shrublands, grasslands, croplands and wetlands in central Coahuila (Figure 2). The area is better known for its unique wetlands than its grasslands, which support a relatively low density and diversity of birds. Nonetheless, these grasslands are likely important in buffering the globally-rare wetlands from agricultural encroachment and run-off. Threats to grasslands here include conversion to cropland and excessive grazing pressure. The GPCA includes the 84,347 ha Cuatro Ciénegas Natural Protected Area. Landownership is 56% communal (ejido), 39% private, and 6% state.

The grasslands in this GPCA are entirely halophytic (100%). They occur mostly in flat basins (89%), although they do extend into the foothills (6%) and slopes (6%) of the surrounding mountains. Ground cover is mostly lacking (bare ground = 58%) and grass (22%) and forb (2%) cover are relatively low. Shrub cover (5%) and 'other' (14%) cover are moderate in comparison with other GPCAs. Average grass height is 22 cm and average forb height is 10 cm.

In general, grassland birds are relatively few in Cuatro Ciénegas. The most abundant species is the Horned Lark, which outnumbers all other bird species by more than 15:1 (Figure 6). Sandhill Crane, Long-billed Curlew, Loggerhead Shrike, Mountain Bluebird and Sprague's Pipit can also be found regularly in Cuatro Ciénegas. A single Peregrine Falcon observed here is also noteworthy. Large numbers of Lark Buntings and Savannah Sparrows were present only in 2008 (a year when densities were depressed in many core areas), and Brewer's Sparrows were found here for the first time in 2010. This variability in grassland bird presence and abundance over time underscores the need for long-term studies to fully assess grassland bird community structure in any given location.

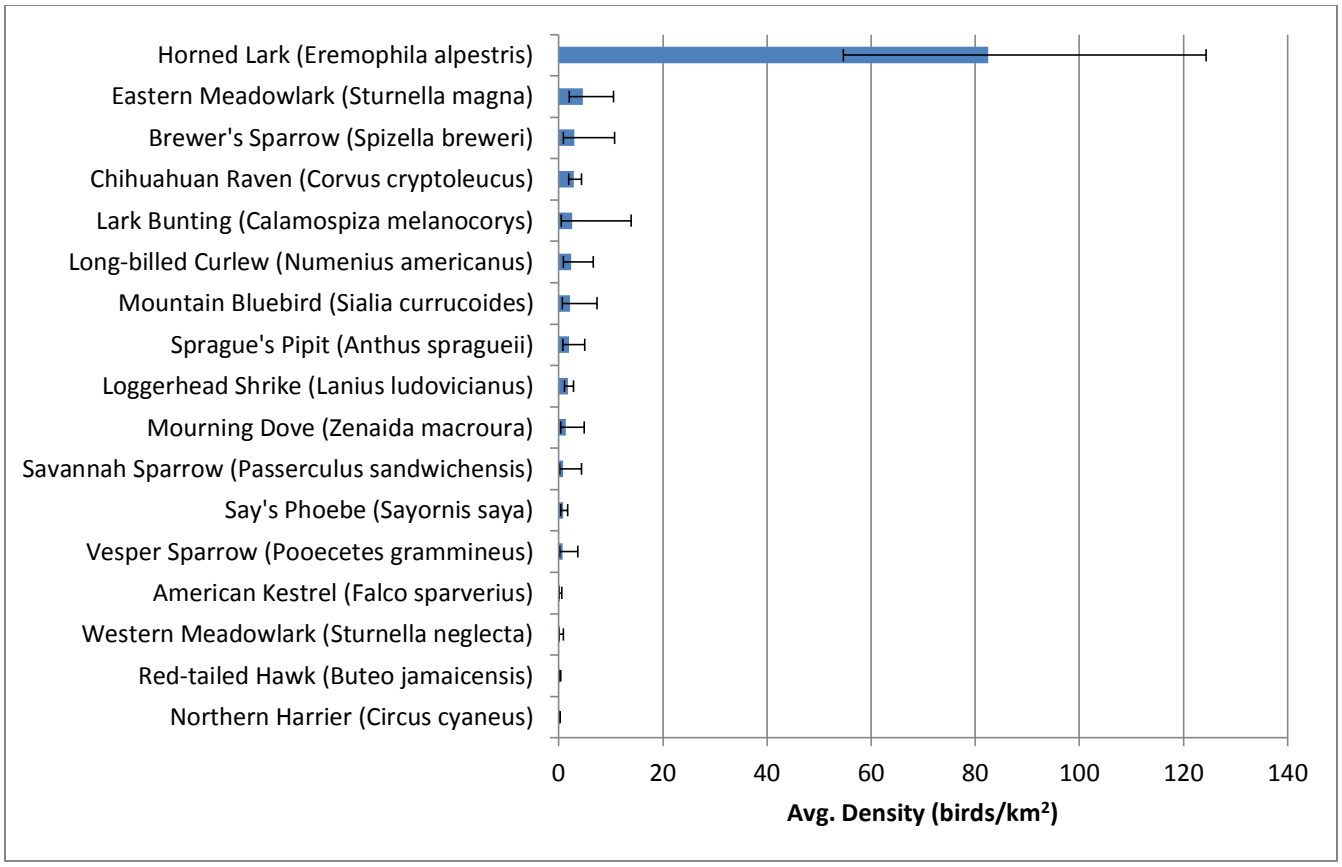

Figure 6. Four-year average density of wintering grassland bird species in Cuatro Ciénegas GPCA 2007-2010.

Total grassland bird density varied dramatically across years, with roughly three times as many birds/km^2 in 2009 and 2010 as in 2007 and 2008 (Figure 7). This increase appears to have been driven largely by an increase in Horned Larks (Appendix B).

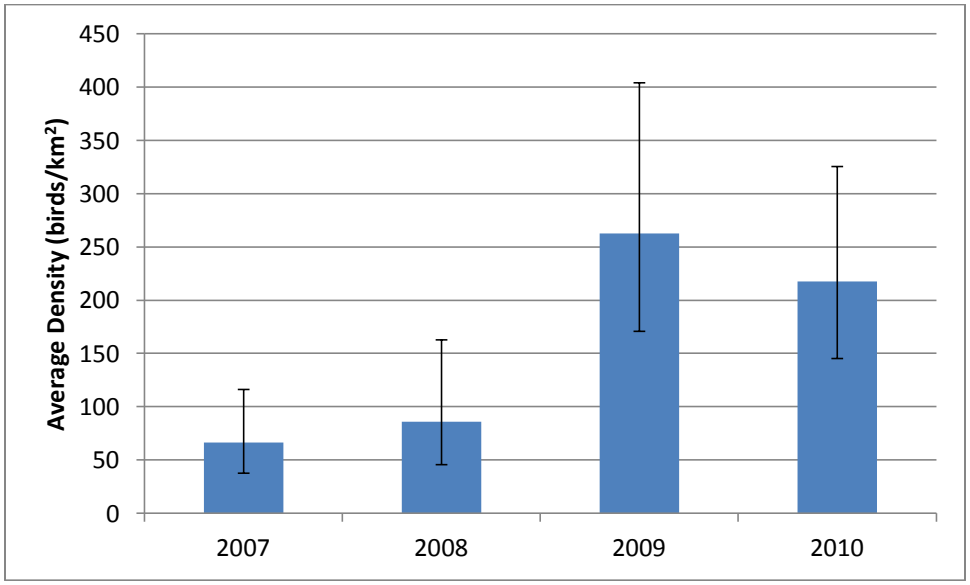

Figure 7. Total annual density of wintering grassland birds in Cuatro Ciénegas GPCA 2007-2010.

Cuchillas de la Zarca

Cuchillas de la Zarca encompasses 5,914 km^2 of mostly grasslands, shrublands, woodlands and croplands along the eastern foothills of the Sierra Madre Occidental in northern Durango (Figure 2). Due to poor alignment of the GPCA with the grasslands in this region, we have expanded our survey effort beyond the GPCA boundary (Figure 2). A proposal by RMBO to revise the boundary of this GPCA (Pool and Panjabi 2010) was recently approved by the CEC. The grasslands here are almost entirely (99%) 'natural' grasslands situated among rolling hills (69%) and flat lands (25%). Grassland ownership is 53% communal and 43% private.

The grasslands in Cuchillas de la Zarca are characterized by relatively high grass cover (56%), low bare ground cover (16%), high forb cover (9%), and high woody shrub cover (6%). Trees (mainly oaks) are more prevalent in this GPCA than most others, due to the higher elevation. Average grass height was 20 cm and average forb height was 13 cm.

Nearly one-third of all grassland birds in Cuchillas de la Zarca are Chipping Sparrows (Figure 8), although their density depends largely on the extent of tree and shrub cover. Other grassland species of exceptional abundance include Vesper Sparrow (which reaches its peak density here), Brewer's Sparrow, Grasshopper Sparrow and Savannah Sparrow. Although not exceptionally abundant relative to other species, Baird's Sparrow is more abundant in Cuchillas de la Zarca than any other GPCA, thus making this the most important GPCA for this species in winter. A large diversity of other grassland bird species is also found in Cuchillas de la Zarca.

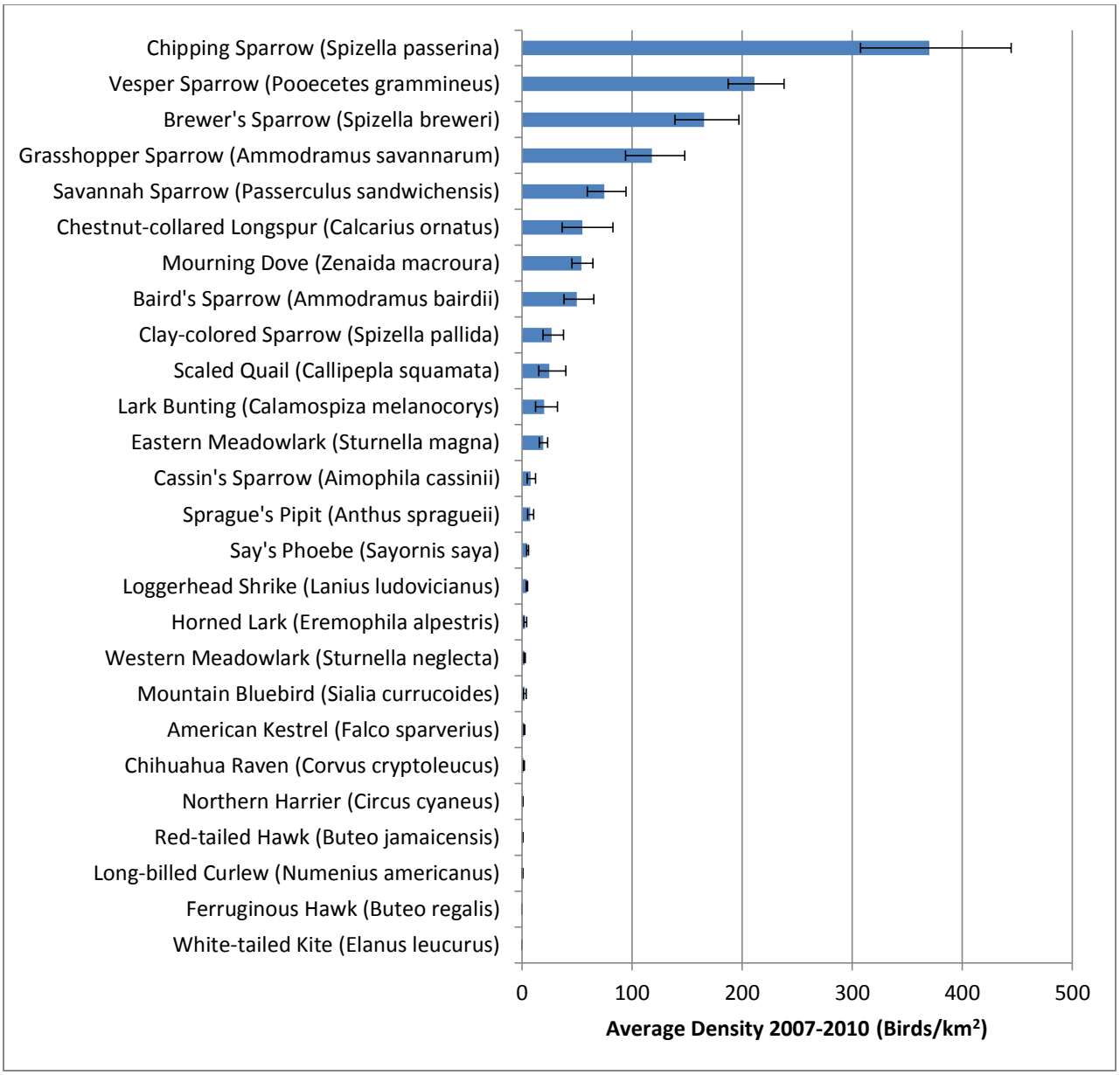

Figure 8. Four-year average density of wintering grassland bird species in Cuchillas de la Zarca GPCA 2007-2010.

In 2010, the grasslands in Cuchillas de la Zarca supported nearly 1100 grassland birds per square kilometer (Figure 9), more than any other in Mexico. Wintering grassland bird density increased in Cuchillas de la Zarca in both 2008 and 2010, when it declined in most other GPCAs, suggesting the grassland birds may have shifted their populations into this region to take advantage of more favorable conditions. The Cuchillas de la Zarca grasslands may be important refugia for wintering grassland birds when conditions elsewhere in the Chihuahuan Desert are unsuitable.

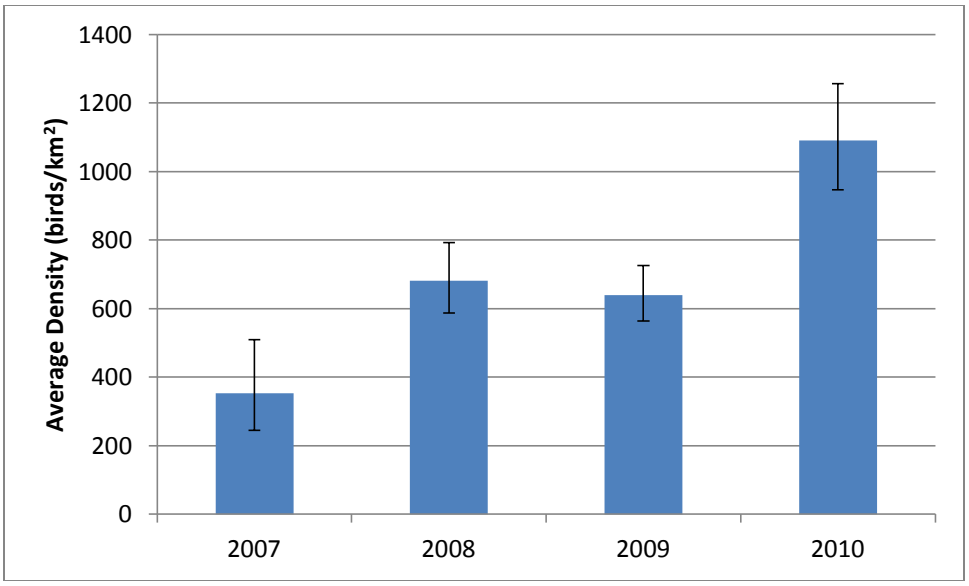

Figure 9. Total annual density of wintering grassland birds in Cuchillas de la Zarca GPCA 2007-2010.

Janos

The Janos GPCA encompasses 4,866 km^2 of desert grasslands, shrublands, woodlands and croplands in the northwestern corner of Chihuahua, just east of the Sierra Madre Occidental (Figure 2). Janos supports the only known population of black-tailed prairie dogs in Mexico. However, the Janos complex, which was once recognized as the largest in the world (55,000 ha), has been reduced by 73% since 1988 (Ceballos et al. 2010). Threats in the area include conversion of grassland to cropland, shrub encroachment and excessive grazing pressure. Encompassing much of the current GPCA is the 526,091-ha Janos Biosphere Reserve, decreed in 2009. However, extensive grasslands exist outside of the current biosphere reserve and GPCA boundaries. A proposal to revise the boundary of this GPCA (Pool and Panjabi 2010) was recently approved by the CEC.

The Janos grasslands occur primarily in the flat basins (71%) of the Chihuahuan Desert and also among rolling hills (13%) and foothills (12%) of the Sierra Madre Occidental. Grassland ownership in the GPCA is 71% private and 29% communal (ejido). Grasslands here are mostly 'natural' grasslands (75%), halophytic grasslands (15%) and mixed halophytic and 'natural' grasslands (8%). These grasslands are characterized by moderate grass (44%), bare ground (31%) and 'other' (12%) cover, and relatively high forbs (9%) and woody shrub (5%) cover. Average grass height was 25 cm and average forb height was 12 cm.

Janos supports the greatest number of grassland bird species among the GPCAs (Appendix A). Chestnut-collared Longspur is the most abundant species in the area (Figure 10) and it approaches its maximum wintering density here. Other common grassland bird species in the area include Vesper, Savannah, Brewer's and Grasshopper sparrows, and Lark Bunting. Baird's Sparrow occurs locally in grasslands with suitable structure but is otherwise uncommon. Sprague's Pipit can also be locally fairly common in grasslands with little to no shrub cover, and overall occurs in moderate density in Janos compared to other GPCAs (Appendix B).

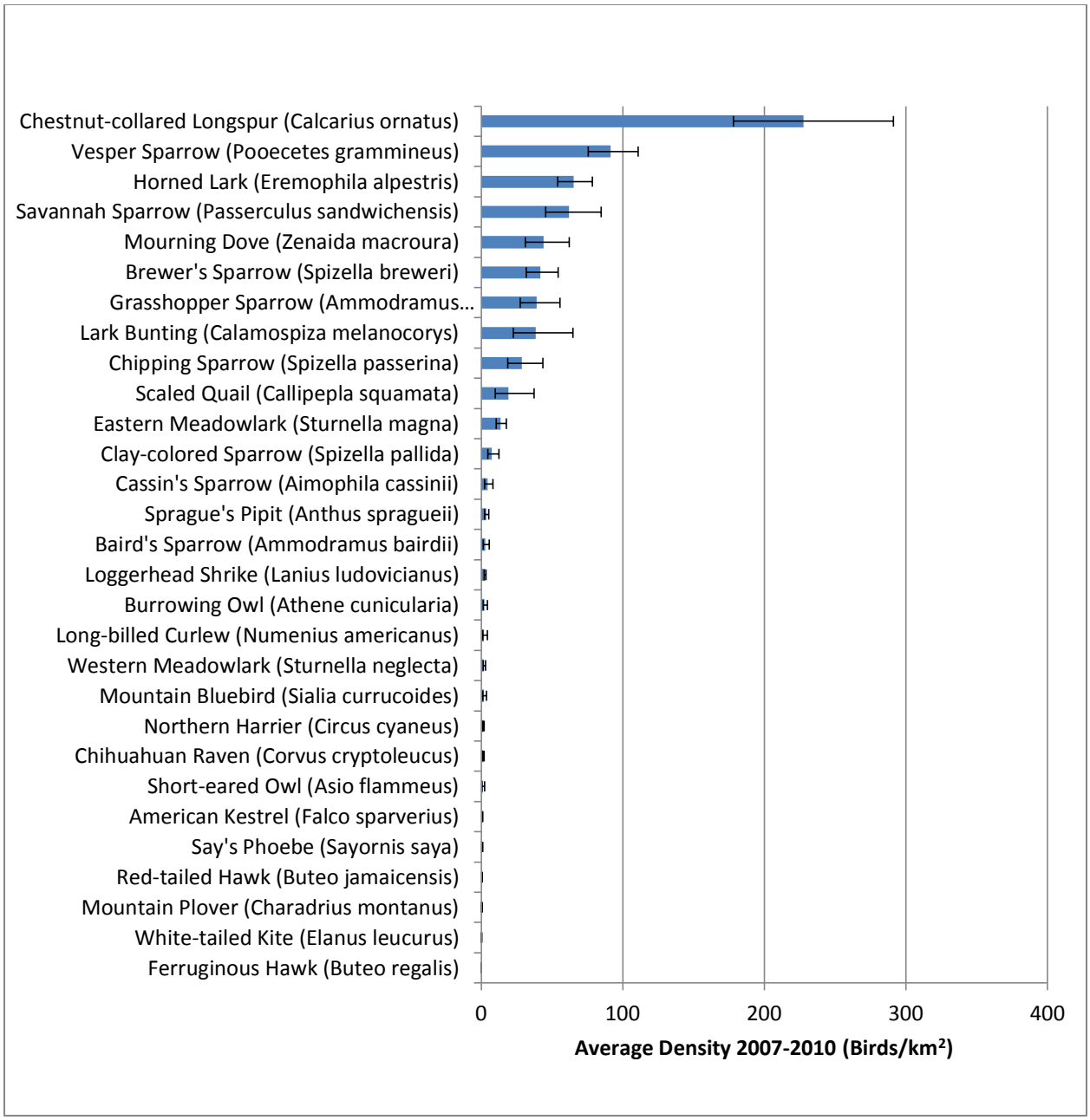

Figure 10. Four-year average density of wintering grassland bird species in Janos GPCA 2007-2010.

The Janos grasslands support one of the highest densities of wintering Northern Harriers in the Chihuahuan Desert. It also supports moderate densities of Short-eared Owls, which can be locally common in some years. Golden and Bald Eagles both occur in Janos in winter, with Golden Eagles also nesting locally. In early 2010, Aplomado Falcons, likely birds hacked at reintroduction sites in New Mexico, were also present in the area.

Because Janos still supports some large areas of prairie dogs, it is one of only two GPCAs that presently support Mountain Plover populations. The prairie dog complex in Janos also supports significant numbers of Ferruginous Hawk, Long-billed Curlew, Burrowing Owl and McCown's Longspur, among other species. This highly localized habitat is poorly represented in our sample, thus prairie dog associated species like these are not well represented in our results.

Total grassland bird density was highest in 2007 and 2009 and lowest in 2010 (Figure 11). The large drop in 2010 corresponds with decreases in density among most species, especially Savannah, Vesper and Brewer's Sparrow, and also Lark Bunting and Horned Lark (Appendix B). Interestingly, densities of Baird's Sparrow, Grasshopper Sparrow and Chestnut-collared Longspur remained relatively stable from 2009 to 2010.

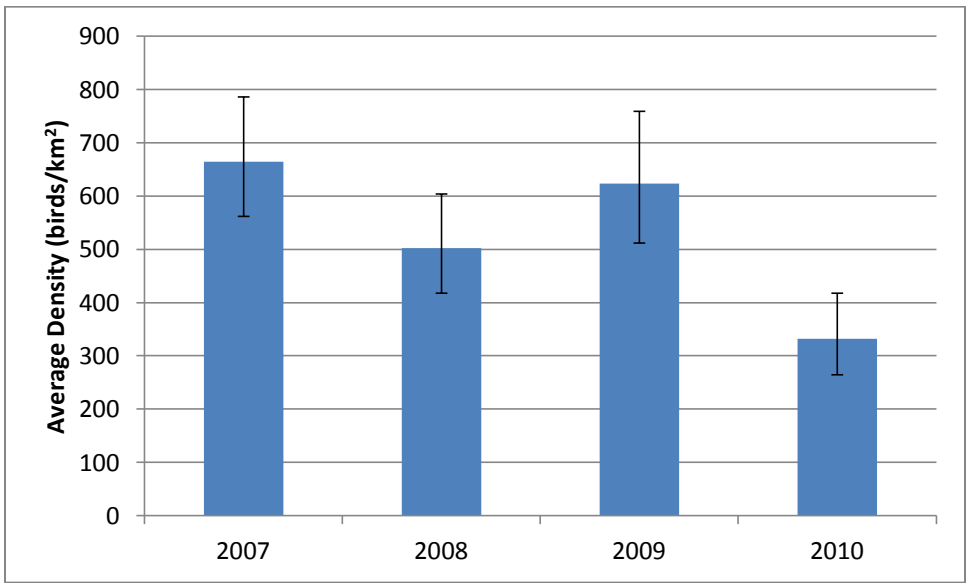

Figure 11. Total annual density of wintering grassland birds in Janos GPCA 2007-2010.

Lagunas del Este

The Lagunas del Este area spans 8,967 km^2 of endorheic basins in eastern Chihuahua (Figure 2) and supports extensive Chihuahuan Desert shrubland with scattered grasslands and some seasonal saline lakes. A proposal by RMBO to include Lagunas del Este as a GPCA based on the high levels of use of the area by many grassland bird species (Pool and Panjabi 2010), was recently approved by the CEC. The grasslands here are primarily located in flat basins (79%) and to a lesser extent in rolling hills (16%). Grassland ownership is private (72%) and communal (28%).

The grasslands in Lagunas del Este are mostly halophytic (68%) and to a lesser extent 'natural' (32%). Relative to other GPCAs, the grasslands here are characterized by high grass cover (52%), and moderate levels of shrub cover (5%), bare ground (30%), forb (4%) and 'other' (11%) cover. Average grass height in 2010 was 25 cm and average forb height was 11 cm.

Birds found in relatively high density in the Lagunas del Este grasslands include Chestnut-collared Longspurs, Vesper Sparrows, Clay-colored Sparrows, Grasshopper Sparrows, Lark Buntings, Scaled Quail and Northern Harriers (Figure 12). The area also supports Baird's Sparrows and probably represents the eastern edge of their regular winter distribution; however, it appears annual population density is quite variable here (Appendix B). Sprague's Pipit also occurs in moderate relative abundance. Other birds of interest found in Lagunas del Este in low to moderate numbers include Ferruginous Hawk, Long-billed Curlew, Short-eared Owl, Burrowing Owl, Loggerhead Shrike and Mountain Bluebird.

Based on the two years we have surveyed the Lagunas del Este grasslands, it appears that, like many other areas, grassland bird density may vary greatly between years. Combined grassland bird density in 2010 was 25% of what it was in 2009, due to large drops in density in nearly all species.

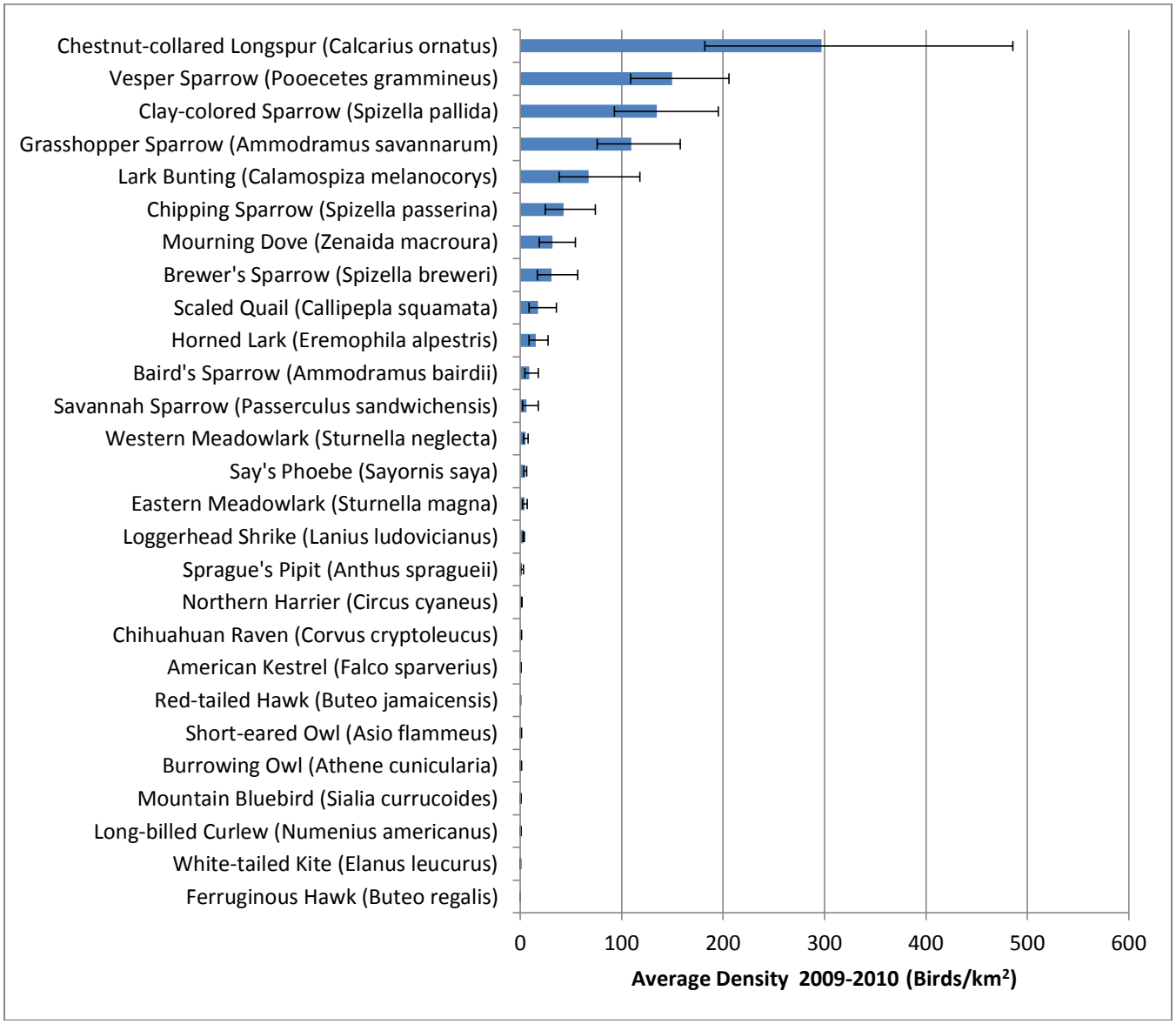

Figure 12. Two-year average density of wintering grassland bird species in Lagunas del Este GPCA 2009-2010.

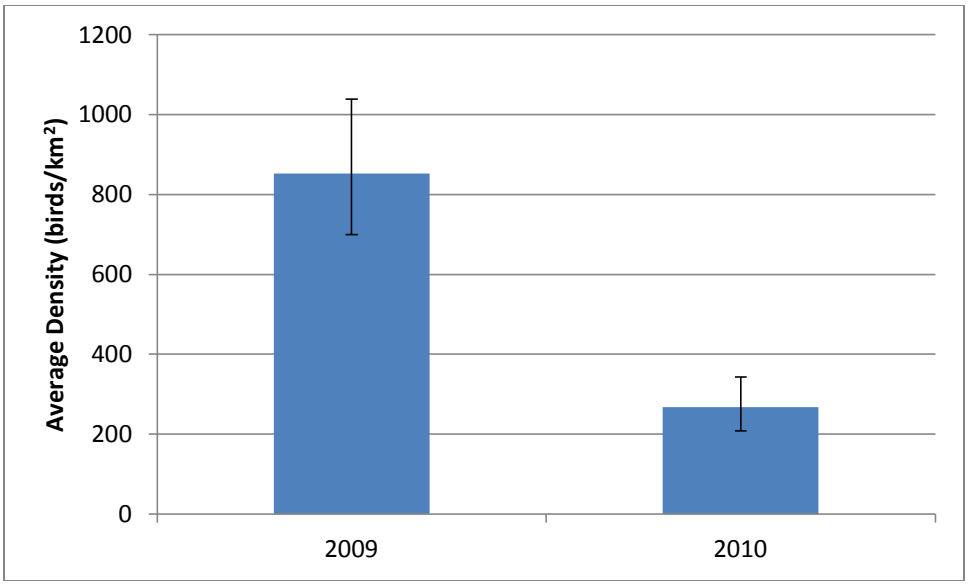

Figure 13. Total annual density of wintering grassland birds in the Lagunas del Este GPCA 2009-2010.

Malpaís

The grasslands of southeastern Durango and northwestern Zacatecas, just east of the Sierra Madre Occidental, constitute one of the largest grassland complexes in Mexico. A proposal by RMBO to recognize this area as a GPCA (Pool and Panjabi 2010) was recently approved by the CEC. The Malpaís grasslands, so named for the western portion of this complex, is the most southerly North American GPCA. Only a small portion of the GPCA was included in our sampling frame in 2010 (Figure 2), and the name "Malpaís" refers mainly to this portion of the larger GPCA. Results presented in this report thus pertain only to this small portion of the larger GPCA. The area contains a mix of desert shrublands, grasslands and croplands. Threats to grasslands in this region are poorly documented, but are assumed to be high given already extensive fragmentation and conversion of grasslands to cropland. Grasslands in the portion of Malpaís we surveyed occur mostly in rolling hills (50%), flatlands (42%), foothills (6%) and steep slopes (3%).

Grasslands in the Malpaís region consist mostly of 'natural' grasslands (89%), and to a lesser degree halophytic grasslands (11%). These grasslands had relatively high average grass (61%) and forb (11%) cover, moderate levels of 'other' cover (11%), and relatively low levels of shrub cover (3%) and bare ground (14%). Average grass height was 34 cm and average forb height was 18 cm.

Malpaís was first added to our sampling frame in 2010, thus only one year bird data exists for this area. Total grassland bird density (29 spp.) was 821 bird/km^2 (CV=12%, 95% confidence interval = 648, 1040 birds/km^2), among the highest of any GPCA in 2010. The area supported high regional densities of Chipping, Brewer's, Vesper, Grasshopper and Clay-colored Sparrows, and Lark Buntings (Figure 14). Baird's Sparrows were apparently also present in moderate numbers in this area (J.H. Martinez, pers. comm.), although relatively few were encountered on surveys. Loggerhead Shrike density was higher in this GPCA than any other. Other birds of interest found here also include Ferruginous Hawk, Mountain Bluebird, Sprague's Pipit and Cassin's Sparrow. Interestingly, no Horned Larks were detected in Malpaís.

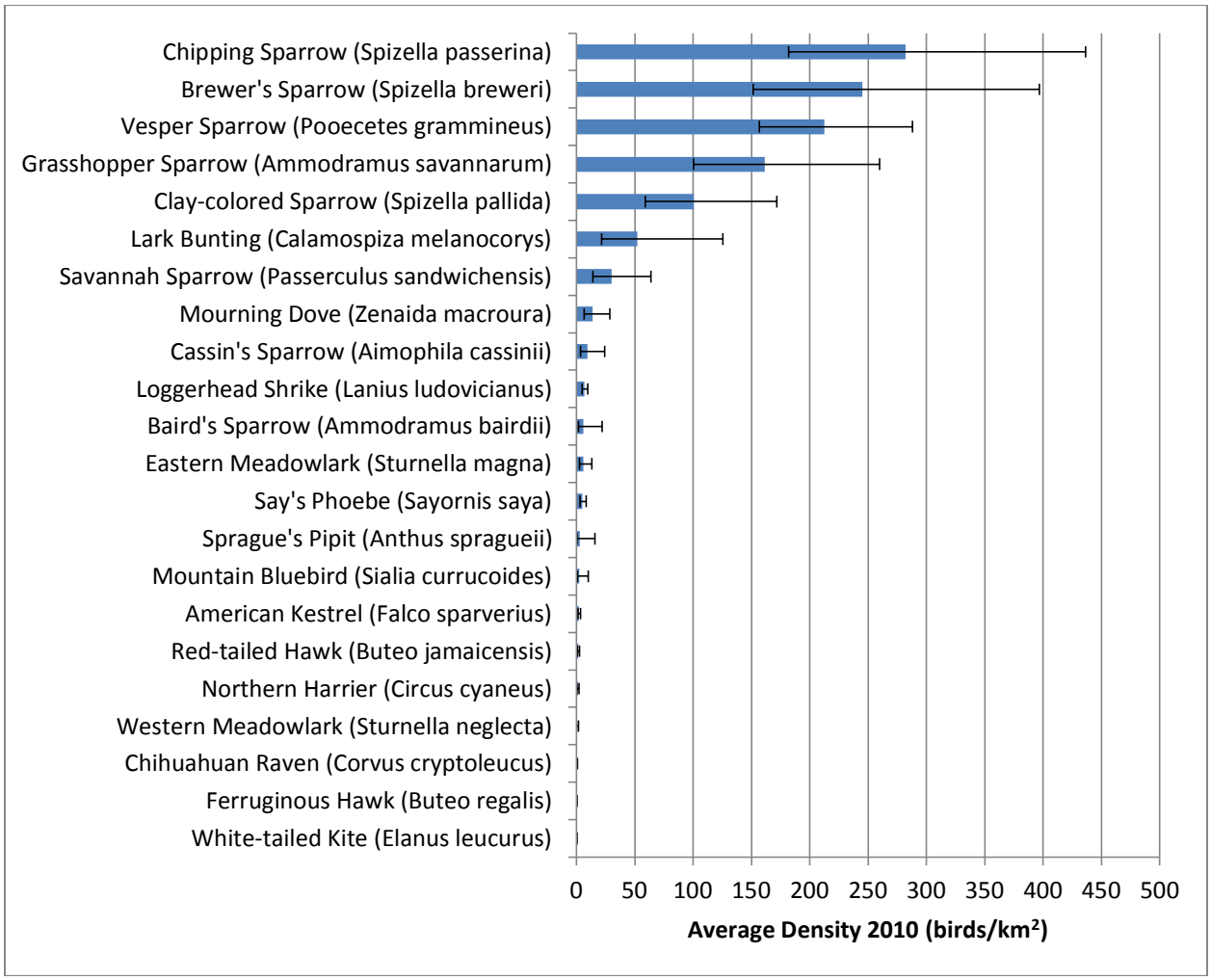

Figure 14. Average density of wintering grassland bird species in the Malpaís GPCA 2010.

Mapimí

The Mapimí GPCA encompasses 6,824 km^2 of desert shrublands, grasslands and croplands in the border region of southeastern Chihuahua, northwestern Durango, and western Coahuila (Figure 2). Grasslands here occur almost exclusively in the flat lands (97%) and conversion of these grasslands to croplands and excessive grazing pressure are the primary threats to grassland birds and other biodiversity. Within the Mapimí GPCA is the 20,000 ha Mapimí Biosphere Reserve. However, much of grasslands in the area occur outside the biosphere reserve boundary – and outside the present GPCA boundary. A proposal by RMBO to revise the boundary for this GPCA (Pool and Panjabi 2010) was recently approved by the CEC.

The grasslands in Mapimí are a mix of 'natural' (46%) and halophytic (51%) grasslands. These grasslands are characterized by relatively low average grass (32%), forb (7%) and woody (3%) cover, and relatively high levels of 'other' cover (15%) and bare ground (45%). Average grass height is 29 cm and average forb height is 15 cm.

Grassland bird density tripled in Mapimí from 2008 to 2009, and remained high in 2010. This increase was apparently driven in large part by especially large increases in Brewer's Sparrows, Lark Buntings and Vesper

Sparrows (Appendix B). In 2009 and 2010 the Mapimí grasslands supported between 900-1000 grassland birds/km^2, making them among the most important grasslands in Mexico.

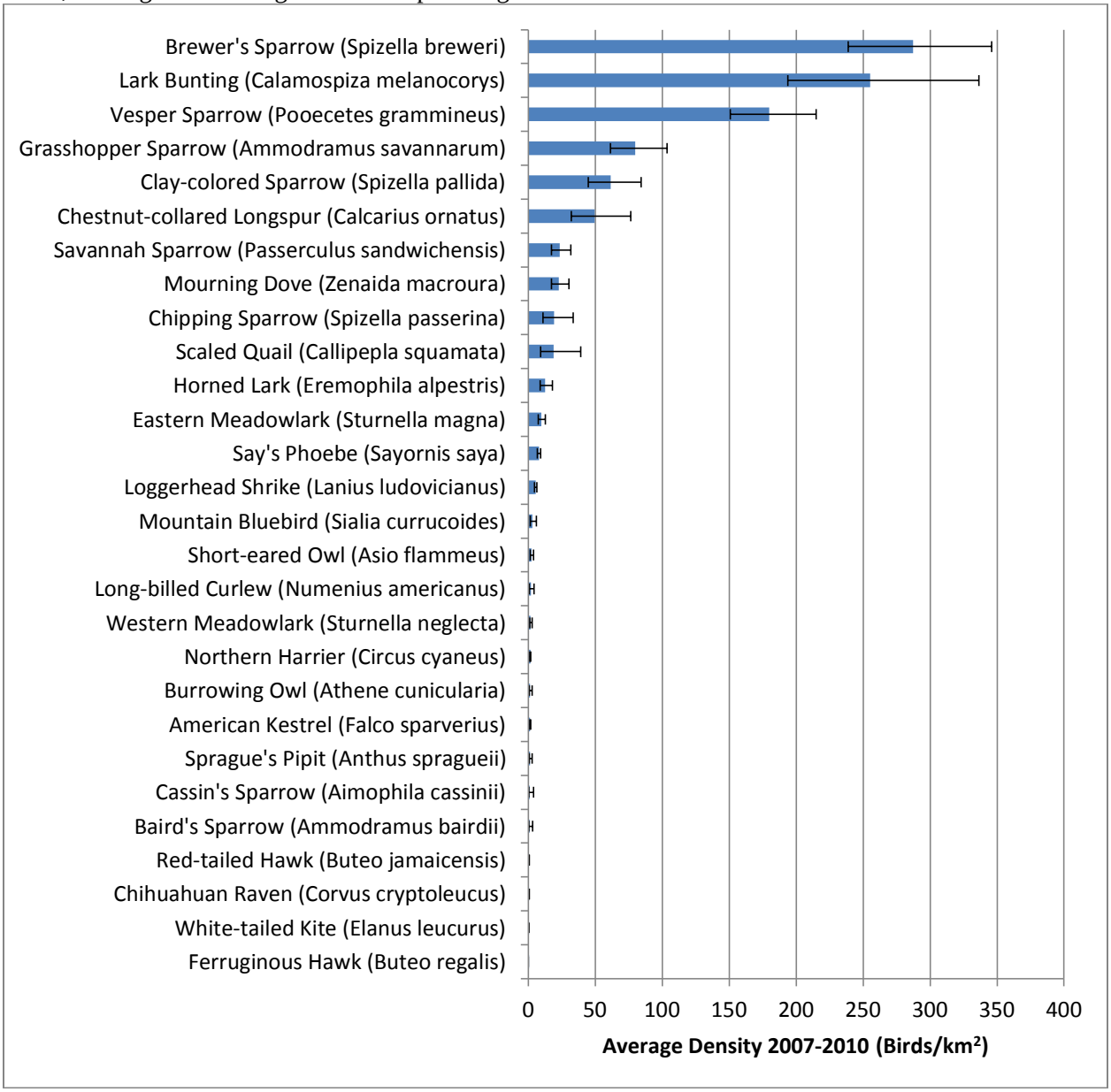

Figure 15. Four-year average density of wintering grassland bird species in Mapimí GPCA 2007-2010.

Mapimí supports the highest average densities of Short-eared Owl, Say's Phoebe, Brewer's Sparrow and Lark Bunting among any of the GPCAs studied. It also supports high densities of Scaled Quail, Loggerhead Shrike and Vesper, Grasshopper and Clay-colored Sparrow, and moderate densities of Chestnut-collared Longspur, relative to other GPCAs. Baird's Sparrow and Sprague's Pipit are present in low densities. Other grassland birds of conservation interest found here include Ferruginous Hawk, Northern Harrier, Burrowing Owl and Cassin's Sparrow.

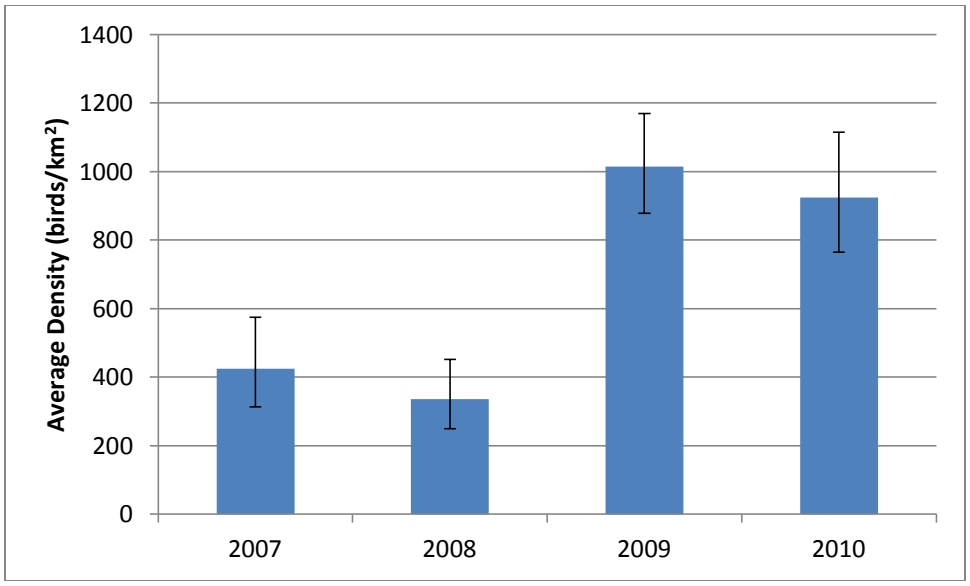

Figure 16. Total annual density of wintering grassland birds in Mapimí GPCA 2007-2010.

Marfa

The Marfa GPCA in the Trans-Pecos region of western Texas encompasses 3,123 km^2 of Chihuahuan Desert grasslands and shrublands, although the grasslands in the Trans-Pecos region extend far beyond the boundaries of the Marfa GPCA. Due to limited access to private lands, we included available grasslands surrounding the Marfa GPCA in our sampling frame. Even within this larger area, access was limited to certain properties where access was possible. Our grassland sites in the greater Marfa region occurred mainly in flat areas (75%), with some also in rolling hills (12%) and foothills (3%). Landownership was mainly private (at least 95%).

Grasslands within our study areas around Marfa were mostly 'natural' (67%) and halophytic (24%). They contained an average of 6% woody shrub cover, 53% grass cover, 32% bare ground, 2% forb cover and 4% other ground cover. Average grass height was 21 cm; average forb height was 2 cm.

Chestnut-collared Longspur is by far the most numerous grassland bird species around the Marfa GPCA, and its density in this area was among the highest measured among any GPCA in 2009. However, its density dropped by 93% in 2010, more dramatically than in other GPCAs. Other grassland species, including Vesper, Grasshopper, Savannah and Clay-colored Sparrow occur in moderate to low densities, at least in some years. A single Baird's Sparrow was found each year, suggesting it may be a rare but perhaps regular winter resident in this area. Sprague's Pipit occurred in moderate to low densities relative to other GPCAs. Other grassland species of conservation interest found in the area include Ferruginous Hawk, Northern Harrier, Long-billed Curlew, Burrowing Owl, Loggerhead Shrike and Mountain Bluebird.

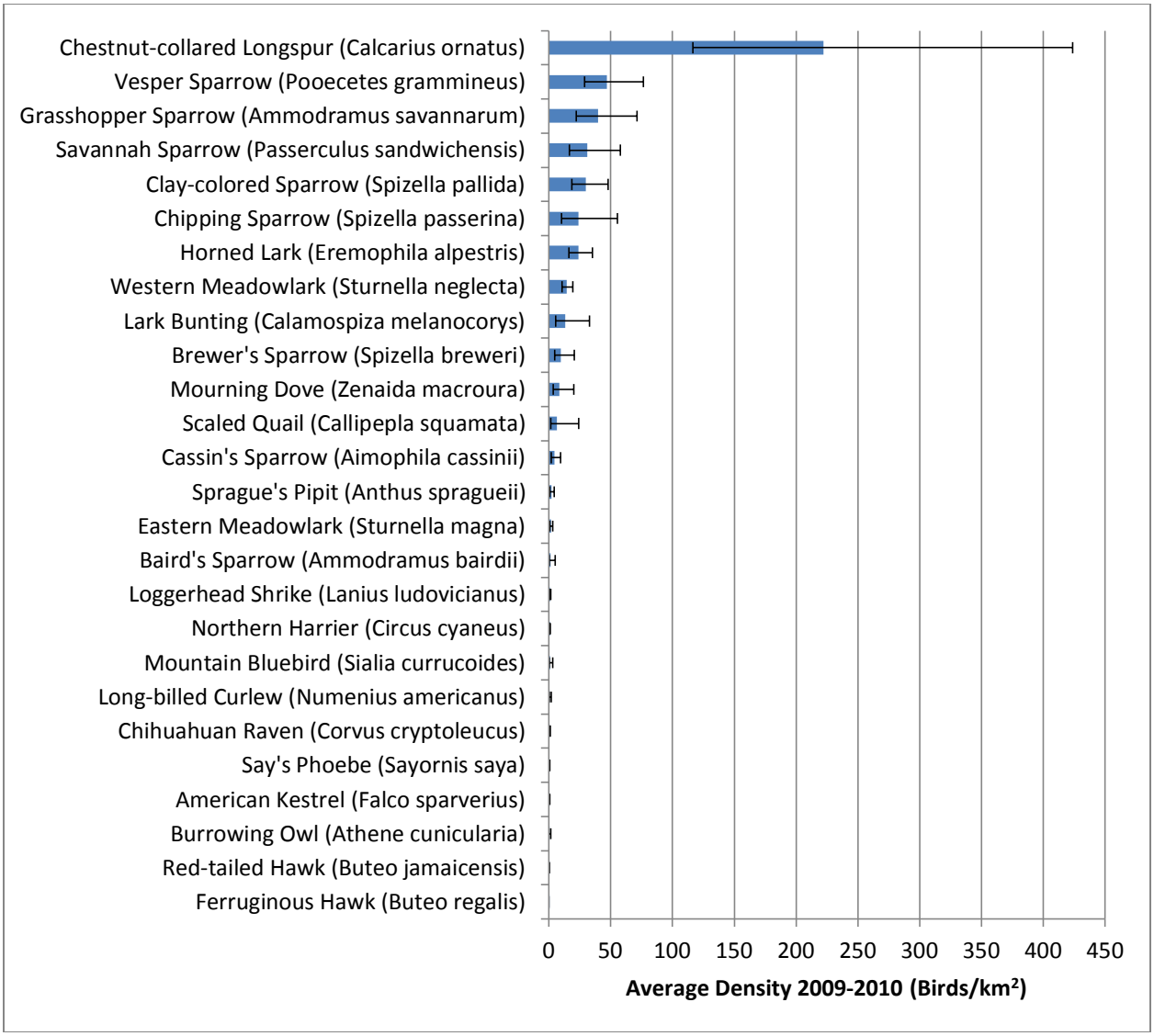

Figure 17. Two-year average density of wintering grassland bird species in Marfa GPCA 2009-2010.

Total grassland bird density in Marfa dropped by roughly 75% from 2009 to 2010, due largely to a 93% decrease in Chestnut-collared Longspur density (Appendix B). Densities of at least eight other species also declined from 2009 to 2010, including Northern Harrier, Scaled Quail, Mourning Dove, Chipping Sparrow, Savannah Sparrow, Grasshopper Sparrow, Vesper Sparrow and Western Meadowlark.

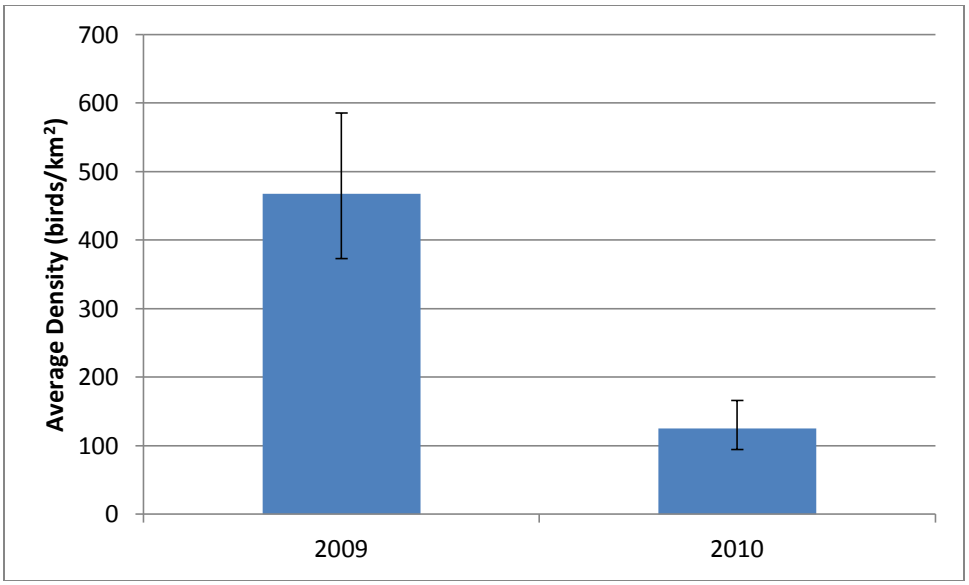

Figure 18. Total annual density of wintering grassland birds in the Marfa GPCA and surrounding areas 2009-2010.

Sonoita

The Sonoita GPCA spans 2,998 km^2 along the U.S.-Mexico border in northwest Sonora and southeast Arizona. Our survey efforts to date have included only the Mexican portion of the GPCA, although we have extended our survey effort beyond the GPCA boundary in Mexico to align more closely with the full extent of the grasslands on this side of the border (Figure 2). A proposal by RMBO to revise the boundary of this GPCA (Pool and Panjabi 2010) was recently approved by the CEC.

The grasslands of this area occur mostly on flat lands (67%) and rolling hills (33%). Grassland ownership is mostly communal (69%), followed by private (31%). Grasslands here are predominantly 'natural' grasslands, characterized by relatively high grass cover (60%), a low percentage of bare ground (23%), and moderate amounts of forbs (5%) and woody shrub cover (5%).

Grassland bird species densities are not as strongly skewed toward a single species in Sonoita as in some GPCAs (Figure 19). The most abundant species wintering here include Chestnut-collared Longspur and Vesper Sparrow, although their densities here are considerably lower than in some other GPCAs. Other grassland birds wintering in the area in significant numbers include Northern Harrier, Horned Lark, Savannah, Chipping and Grasshopper sparrows, and Eastern Meadowlark, the latter of which occurs in highest density here relative to other GPCAs. Baird's Sparrow is found in relatively high density in Sonoita (although estimates for this GPCA have poor precision) and Sprague's Pipit occurs in moderate density relative to other GPCAs (Appendix B). Other grassland birds of interest include six Aplomado Falcons observed here in early 2010.

Grassland bird density appears to have declined in Sonoita from 2008 to 2010 (Figure 20), likely driven in large part by decreases in Chipping and Vesper Sparrows. The GPCA was not surveyed in 2007.

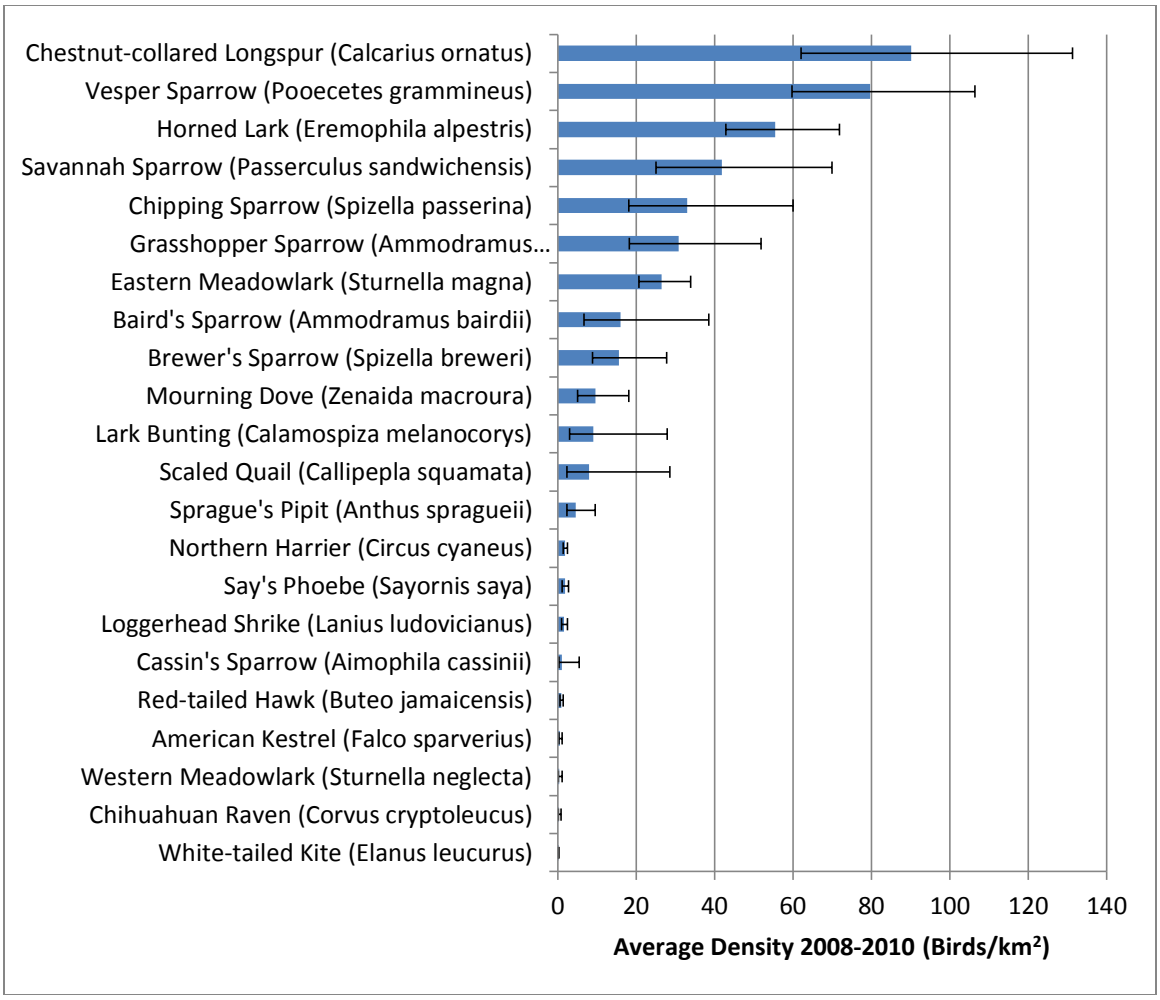

Figure 19. Three-year average density of wintering grassland bird species in Sonoita GPCA 2008-2010

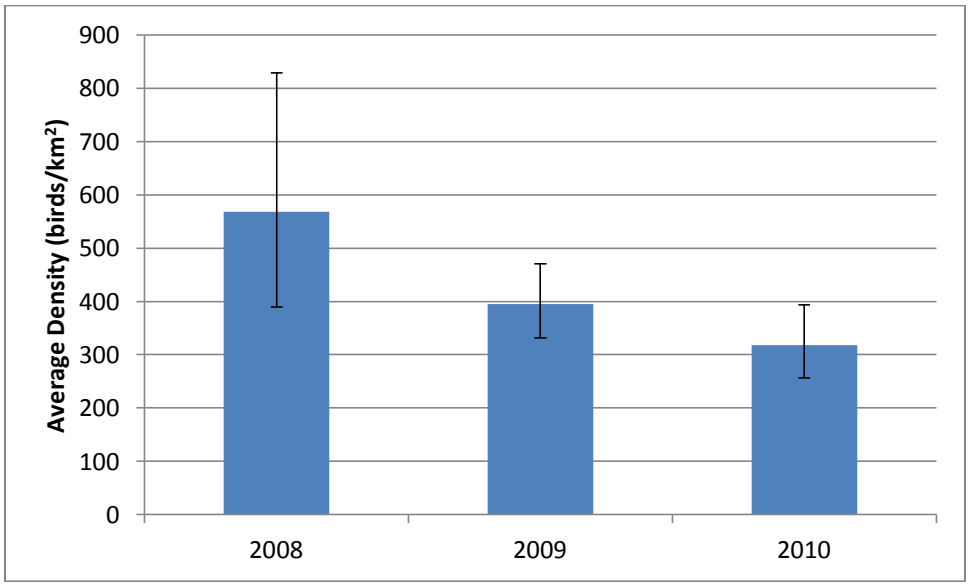

Figure 20. Total annual density of wintering grassland birds in Sonoita GPCA 2007-2010.

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El Tokio

The El Tokio GPCA is one of the larger Chihuahuan Desert GPCAs, encompassing nearly 9,364 km^2 of Chihuahuan Desert shrubland, grasslands, woodlands and croplands in the borderlands region of southern Coahuila, southwestern Nuevo Leon, northeastern Zacatecas and northern San Luis Potosí (Figure 2). Due to the limited extent of grasslands within the original GPCA boundary, we expanded our survey effort to more closely align with the actual extent of grasslands in the area. A proposal by RMBO to revise the boundary of this GPCA (Pool and Panjabi 2010) was recently approved by the CEC. The El Tokio grasslands are well-known for being the only home of the Mexican prairie dog (Cynomys mexicanus), which in turn supports a large assemblage of wintering prairie dog associated species, including Long-billed Curlew, Mountain Plover and Burrowing Owl. Threats to grasslands in El Tokio include conversion to cropland and excessive grazing pressure. Grassland ownership is mostly communal (68%), followed by private lands (28%), and a small amount of state lands (2%). The GPCA includes the 9,000-ha Llano de la Soledad, which is a state protected area, a Western Hemisphere Shorebird Reserve Network (WHSRN) site and an Important Bird Area.

The grasslands here are primarily gypsophytic grasslands (80%), which tend to be short-statured, sparse grasslands. 'Natural' grasslands accounted for 20% of surveys sites in this GPCA. The El Tokio grasslands occur mainly in flat basins (77%), but also in foothills (8%), montane valleys (8%) and on steep slopes (7%). The grasslands of El Tokio are characterized by low woody shrub (<1%) and grass (22%) cover, moderate amounts of forb (6%) and 'other' (14%) cover, and a high percentage of bare ground (57%). Average grass and forb height in El Tokio are lower than any other GPCA, 10 and 6 cm, respectively.

With an average density of 273 birds/km^2, Horned Larks comprise roughly 58% of all grassland birds in El Tokio. Savannah Sparrow is the next most abundant species, although close behind is Sprague's Pipit, which occurs here in perhaps slightly higher average density than in any other GPCA (8.61 birds/km^2). Other common grassland bird species found here include Chipping, Vesper and Grasshopper sparrows, Mourning Dove, Scaled Quail, and Western Meadowlark, although densities of all these species are considerably lower than in other GPCAs. On the other hand, both Ferruginous Hawk and Mountain Plover occur in higher densities in El Tokio than in any other GPCA. This GPCA also supports the global population of Worthen's Sparrow, a species with an estimated global population of approximately 200 individuals, listed as endangered by IUCN. A total of 42 Worthen's Sparrows have been observed by field crews in El Tokio as part of this project.

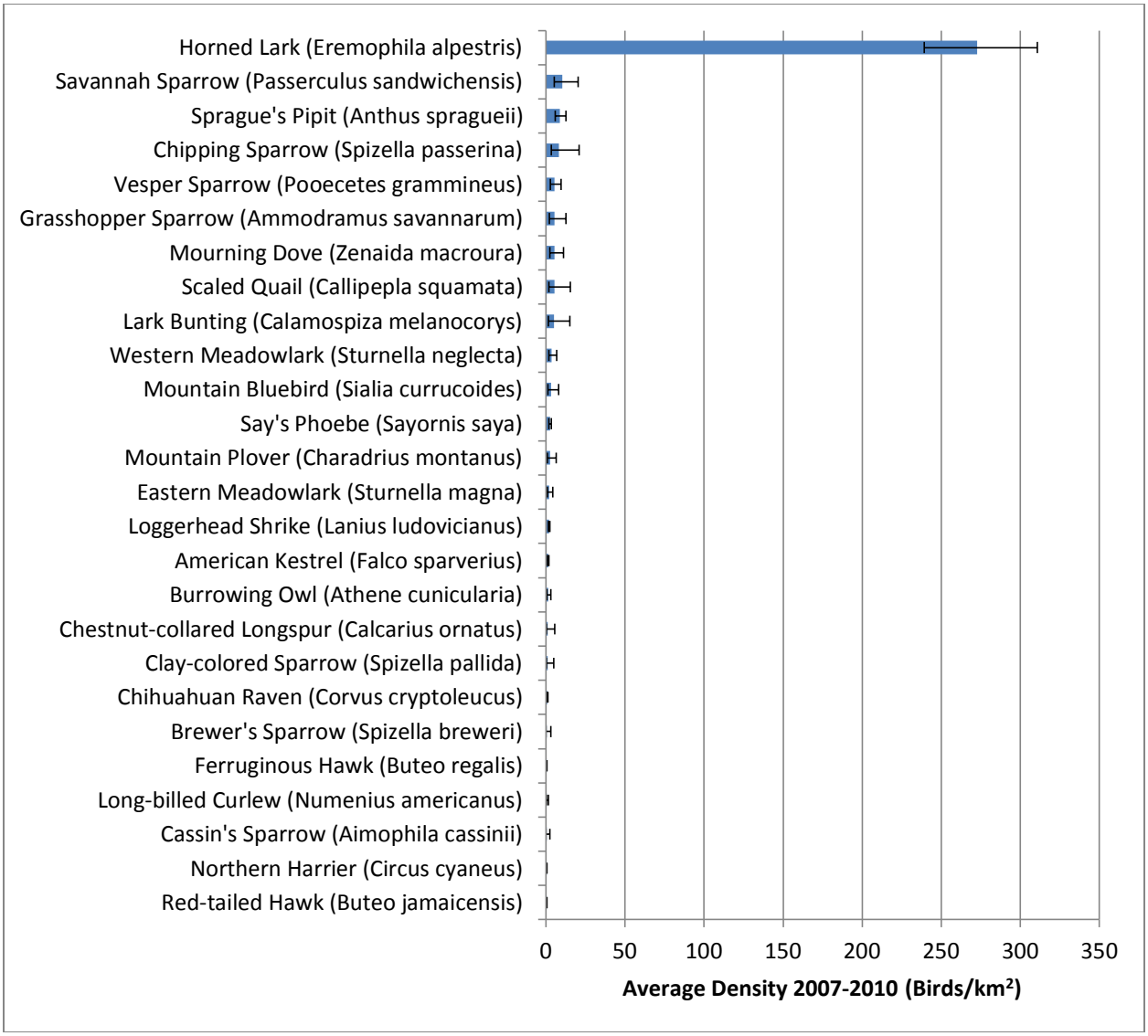

Figure 21. Four-year average density of wintering grassland bird species in El Tokio GPCA 2007-2010.

Combined grassland bird density in El Tokio, which is driven in part by the density of Horned Larks, appears to have been increasing since 2008. Indeed, Horned Lark density doubled from 2008 to 2009, although it remained stable in 2010. Thus, the significant increase in wintering grassland bird density in 2010 appears to have been driven by increases across multiple other species (Appendix B).

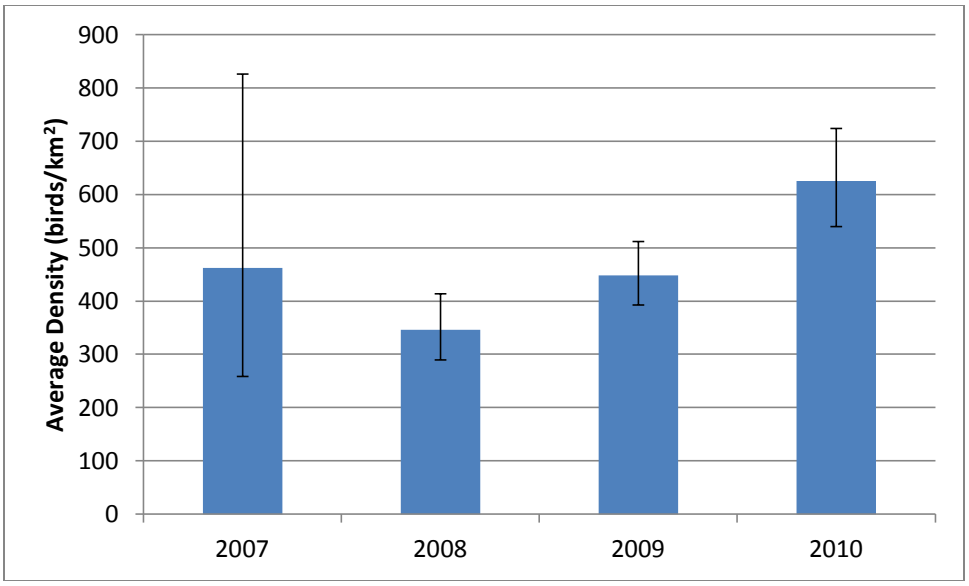

Figure 22. Total annual density of wintering grassland birds in El Tokio GPCA 2007-2010.

Valles Centrales

Valles Centrales is the largest GPCA in Mexico, encompassing 10,316 km^2 of Chihuahuan Desert shrubland, grassland, woodland and cropland in central Chihuahua (Figure 2). Due to limited grassland availability within the eastern portion of the GPCA and poor correspondence between the GPCA boundary and the actual extent of grasslands in the area, we have expanded our sampling effort to more closely align with grasslands in the area, particularly toward the west. A proposal by RMBO to revise the boundary of this GPCA (Pool and Panjabi 2010) was recently approved by the CEC. Grassland ownership in Valles Centrales is roughly 80% private and 18% communal. The Valles Centrales grassland complex is perhaps the most extensive in Mexico, and the area supports an extensive list of grassland bird species, second in total species only to Janos (Mountain Plover has not been found in the Valles Centrales). From a grassland conservation perspective, the Valles Centrales are perhaps best known as the home of the last native Aplomado Falcon breeding population in the Chihuahuan Desert – at least until recently. Due to unrestricted cropland development within its core breeding habitat, the Aplomado Falcon population in the Valles Centrales has dwindled from 24 pairs in 2000 to two active breeding pairs in 2010 (A. Macias-Duarte, pers. comm.).

Clearing of native grassland for new croplands is expanding rapidly in the Valles Centrales and threatens to greatly reduce available habitat not only for the Aplomado Falcon but also for a large number of other grassland bird species. Grasslands in the Valles Centrales have supported average densities of grassland birds as high as 750 birds/km^2, and local densities in high-quality grasslands are likely much higher. Based on our sampling locations, 81% of grasslands in the Valles Centrales are in flat basins, which are most vulnerable to development, while 14% are in rolling hills or foothills, and another 4% are in montane valleys. Since 2005, more than 400,000 ha of rangelands have been sold for farming in the Valles Centrales, and much of the flat lands within these areas have already been converted to cropland (Profauna-Chihuahua, unpublished data.). Grassland conversion is showing no signs of slowing down, despite the global economic recession, and intensified conservation efforts are needed immediately to save the Valles Centrales grasslands from near-total annihilation.

Grasslands in the Valles Centrales are mostly 'natural' grasslands (63%), followed by halophytic grasslands (34%). These grasslands are characterized on average by moderately high grass (45%), bare ground (42%) and

woody shrub (4.5%) cover, and low forb (2%) and 'other' (9%) cover. Average grass height is relatively high at 35 cm; average forb height is relatively low at 6.6 cm.

The grasslands of Valles Centrales support high densities of Chestnut-collared Longspur, and likely represent part of their core winter range. Other grassland species found in moderate to high density include Vesper Sparrow, Horned Lark, Brewer's Sparrow, Savannah Sparrow, Grasshopper Sparrow, and Scaled Quail, the latter of which occurs in highest average density here relative to other GPCAs. Baird's Sparrow also occurs in relatively high density compared to other GPCAs, as does Sprague's Pipit (Appendix B). Other birds of note found here in significant numbers include Northern Harrier, Prairie Falcon, Merlin, Golden Eagle, Short-eared Owl, Burrowing Owl, Sandhill Crane, Loggerhead Shrike, Lark Bunting, Cassin's Sparrow, Clay-colored Sparrow and McCown's Longspur.

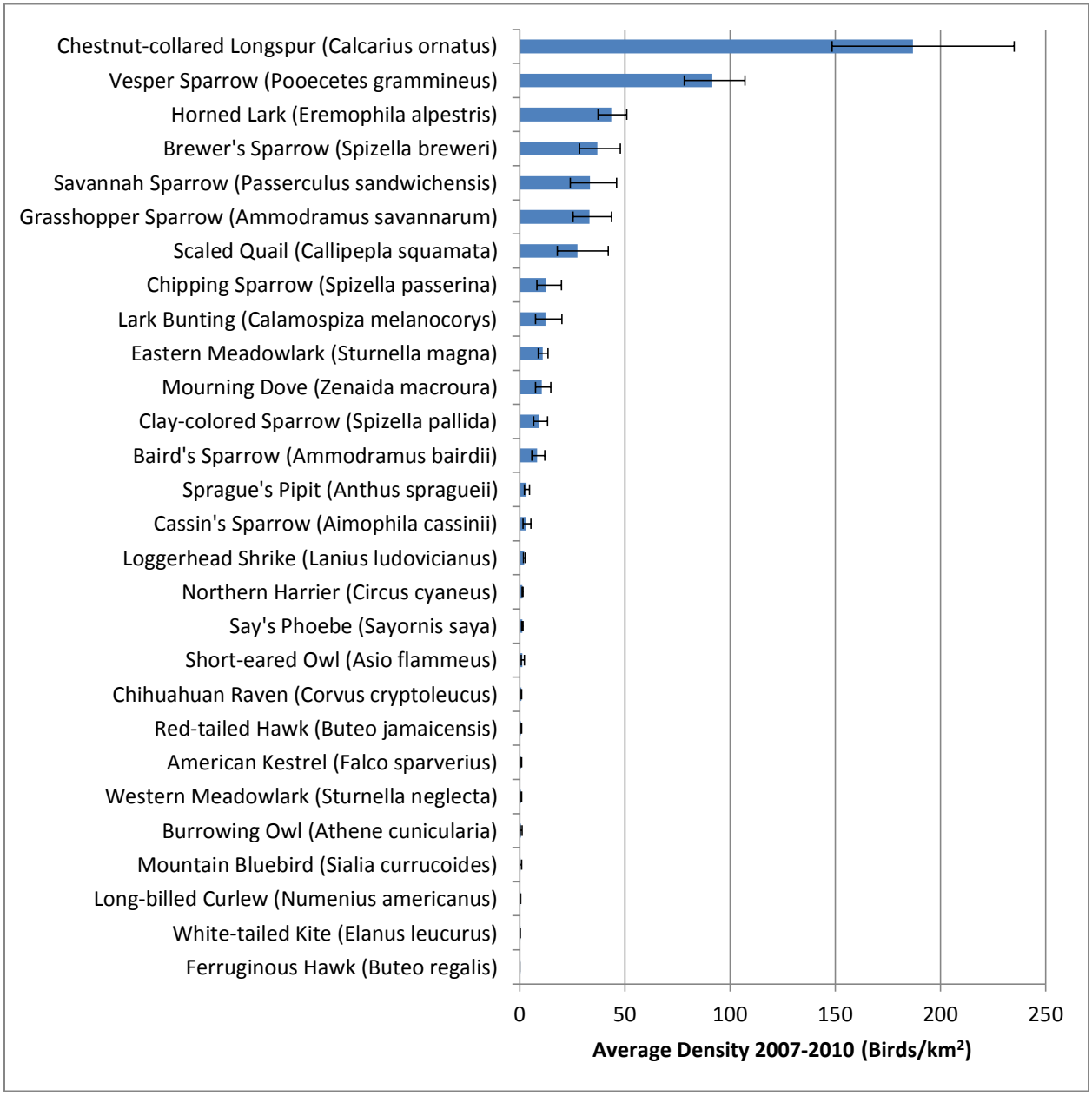

Figure 23. Four-year average density of wintering grassland bird species in Valles Centrales GPCA 2007-2010.

Total grassland bird density in Valles Centrales was highest in 2007, dropped dramatically in 2008, and increased slightly in 2009 (Figure 23). The large decrease in total grassland bird density from 2007 to 2008 mirrors large concomitant decreases in some of the most abundant species including Savannah Sparrow, Vesper Sparrow and Chestnut-collared Longspur (Appendix B). But while Chestnut-collared Longspur density rebounded in 2009 and 2010, densities of the other grassland sparrows have not. The large inter-annual variation in bird species abundance in Valles Centrales underscores the need for long-term studies to accurately characterize grassland bird use in any given area. Had we not conducted this survey in 2007, the avifaunal assessment of this GPCA would have been substantially different, given the lower densities in 2008-2010.

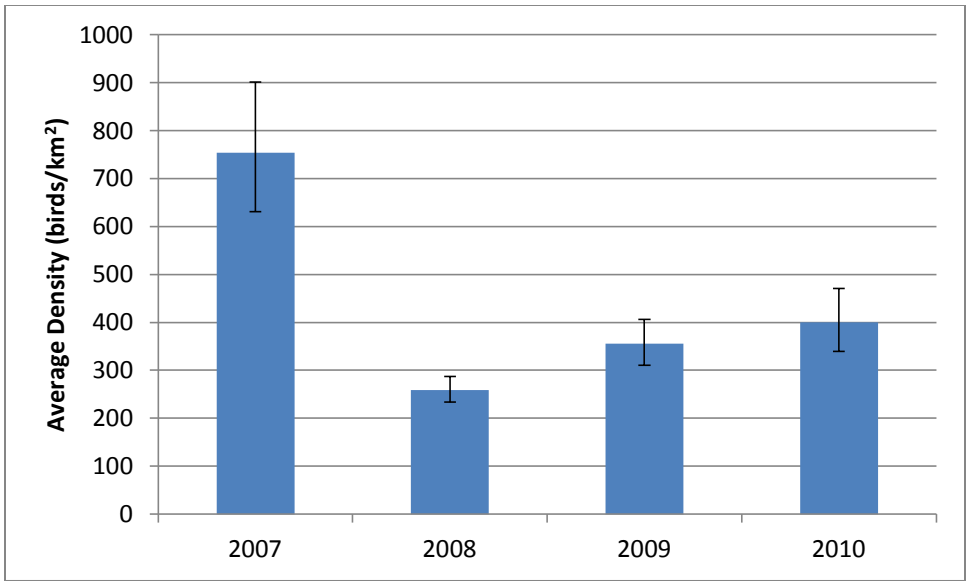

Figure 7. Total annual density of wintering grassland birds in Valles Central GPCA 2007-2010.

Valle Colombia

The Valle Colombia GPCA encompasses 4,477 km^2 of Chihuahuan Desert grasslands and shrublands in northern Coahuila (Figure 2). The original GPCA boundary was displaced about 30 km to the west, thus survey efforts in 2007 only included a small portion of the current Valle Colombia GPCA. We realigned the existing boundary to encompass the Valle Colombia basin in 2008. A proposal by RMBO to revise the boundary of this GPCA (Pool and Panjabi 2010) was recently approved by the CEC. The grasslands of Valle Colombia occur mainly in intermontane valleys (92%) and to a lesser degree amongst rolling hills (8%). Grassland ownership is entirely private.

Only 'natural' grasslands are found in Valle Colombia. These grasslands are characterized by relatively high average grass cover (50%), moderate amounts of forbs (4%), 'other' cover (13%) and bare ground (30%). Shrub cover is 5% on average. Average grass height is 43 cm; average forb height is 24 cm.

Valle Colombia has supported the highest average densities of Savannah Sparrows among any GPCA. Vesper and Grasshopper Sparrow densities have also been exceptionally high in Valle Colombia. Despite its northerly location, Chestnut-collared Longspur densities have been relatively low. Other grasslands species found in moderate abundance here include Northern Harrier, Scaled Quail, Loggerhead Shrike, Sprague's Pipit, Cassin's Sparrow, Baird's Sparrow, Lark Bunting and Eastern Meadowlark. Other grassland-associated species of interest

found in Valle Colombia include Harris' Hawk, Ferruginous Hawk, Short-eared Owl, Mountain Bluebird, Clay-colored Sparrow and Field Sparrow.

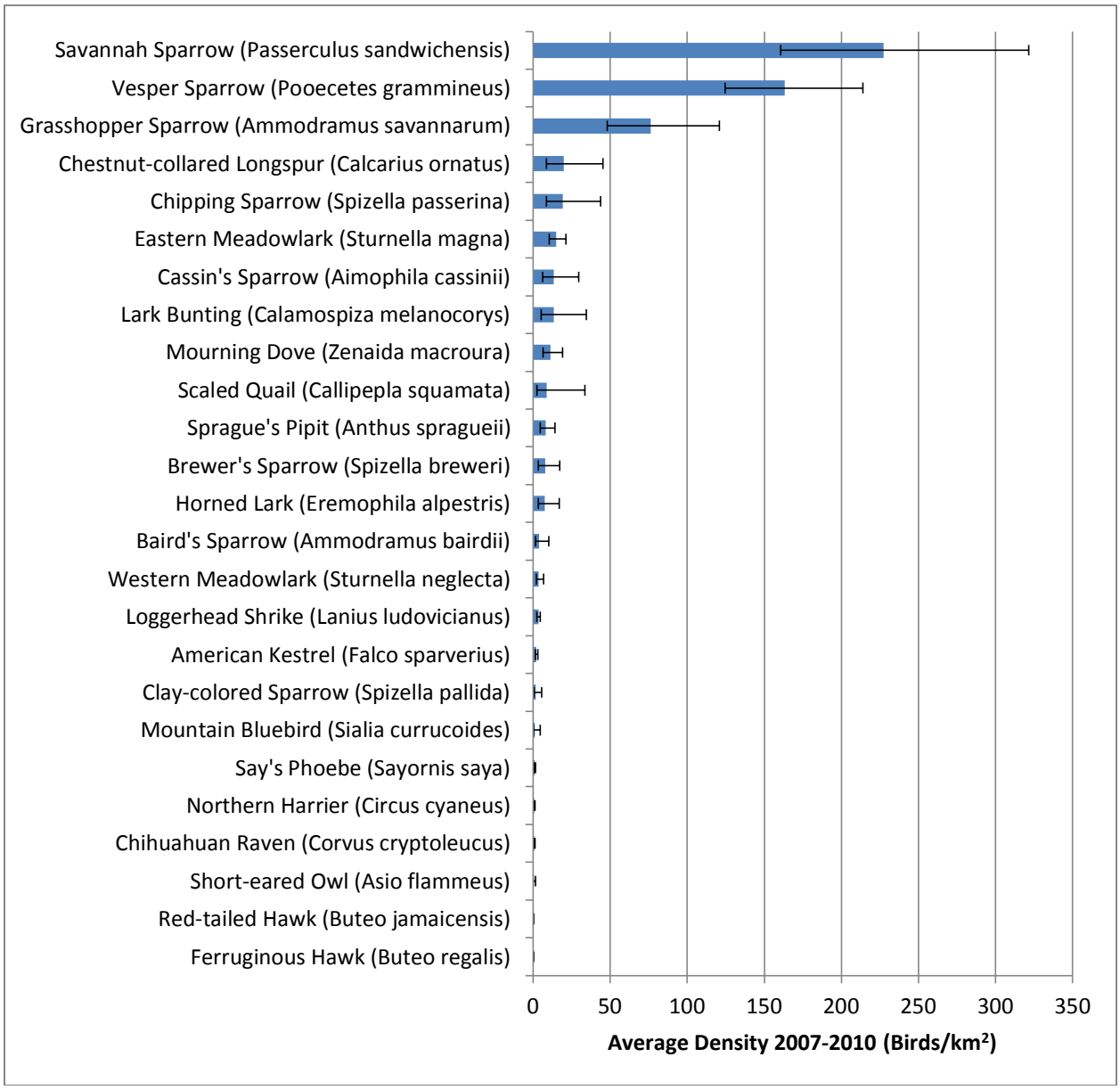

Figure 8. Four-year average density of wintering grassland bird species in Valle Colombia GPCA 2007-2010.

Because only 1 sampling block with 6 km of transect was retained from 2007, little weight should be given to results from that year. Grassland bird density spiked in 2009, nearly reaching an average of 1200 birds/km2 across all species. This increase is largely attributable to dramatic increases in Grasshopper, Savannah and Vesper Sparrow, which together account for roughly 90% of all birds in Valle Colombia in 2009, although many other species showed increases that year as well, including Scaled Quail, American Kestrel, Northern Harrier, Mourning Dove, Sprague's Pipit, Brewer's Sparrow, Cassin's Sparrow, Clay-colored Sparrow, Chipping Sparrow and Eastern and Western Meadowlark (Appendix B).

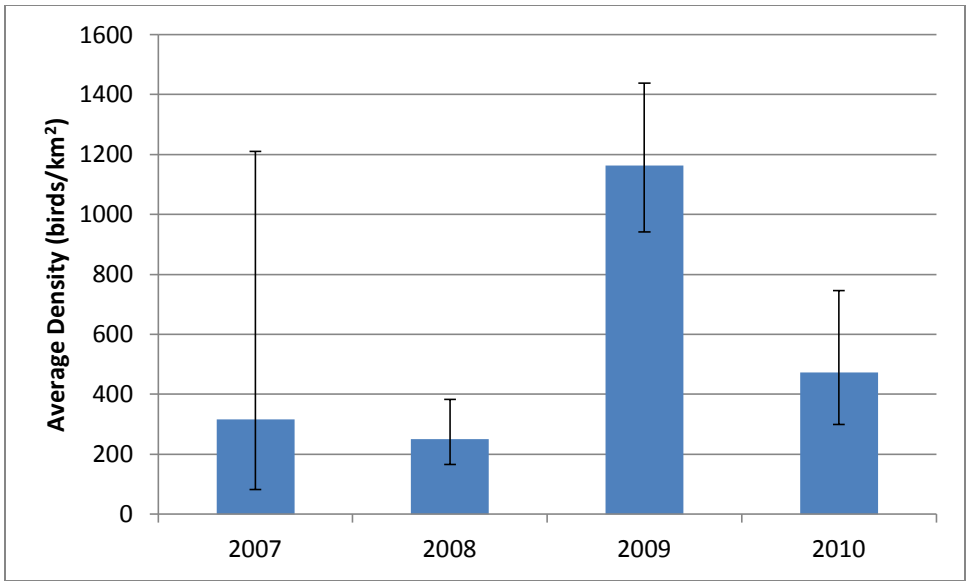

Figure 7. Total annual density of wintering grassland birds in Valle Colombia GPCA 2007-2010.

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APPENDIX A. NUMBERS OF BIRD SPECIES OBSERVED IN EACH GPCA FROM 2007-2010.

Species names in **bold face** are "grassland-associated species" (obligate and facultative).
*indicates priority species status as identified by PIF (WWW.RMBO.ORG/PIF/PIFDB.HTML), USFWS (HTTP://WWW.FWS.GOV/MIGRATORYBIRDS/NEWREPORTSPUBLICATIONS/SPECIALTOPICS/BCC2008/BCC2008.PDF), or SEMARNAT (HTTP://WWW.SEMARNAT.GOB.MX/LEYESYNORMAS/NORMAS%20OFICIALES%20MEXICANAS%20VIGENTES/NOM-ECOL-059-2001.PDF).

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*	**2009**										2		**2**
Greater White-fronted Goose	*Anser albifrons*	**2009**		5192										**5192**
Snow Goose	*Chen caerulescens*	**2008**		2036	193									**2229**
		2009		2985	1							105		**3091**
		2010		817	6									**823**
Ross's Goose	*Chen rossii*	**2010**		14										**14**
Gadwall	*Anas strepera*	**2007**		55										**55**
		2008		4										**4**
		2009		17										**17**
		2010		23										**23**
American Wigeon	*Anas americana*	**2008**		7										**7**
		2009			6					1				**7**
		2010			2									**2**
Mallard	*Anas platyrhynchos*	**2007**			4							21		**25**
		2008			1									**1**
		2009			2					3				**5**
		2010			7					10				**17**
Blue-winged Teal	*Anas discors*	**2007**		2										**2**
Northern Shoveler	*Anas clypeata*	**2007**										130		**130**
		2008		35	3									**38**
		2009		41						353				**394**
		2010		2			30			7		2		**41**
Northern Pintail	*Anas acuta*	**2007**		3										**3**
		2008		2										**2**
		2009		23										**23**
		2010		9			2							**11**
Green-winged Teal	*Anas crecca*	**2007**						18						**18**
		2008		35										**35**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
		2009		71								17		**88**
		2010		22			31							**53**
		2007						1				1		**2**
	Anas sp.	**2009**		2					1					**3**
		2010		1			1							**2**
Ring-necked Duck	*Aythya collaris*	**2008**		1										**1**
		2009		23										**23**
Lesser Scaup	*Aythya affinis*	**2007**										15		**15**
		2008								1				**1**
Bufflehead	*Bucephala albeola*	**2007**		1								20		**21**
		2008		40										**40**
		2009		15										**15**
		2010		4	3									**7**
Common Merganser	*Mergus merganser*	**2009**								5				**5**
		2010		1										**1**
Ruddy Duck	*Oxyura jamaicensis*	**2009**								2				**2**
		2010		5										**5**
Unidentified Duck		**2007**			2							1		**3**
		2008	1		1									**2**
		2009								1				**1**
Scaled Quail*	***Callipepla squamata***	**2007**		22	54			9				25		**110**
		2008		186	95			65		2	5	450		**803**
		2009		126	58	42		44	42	14	1	61	10	**398**
		2010		98	53	45		1			10	27		**234**
Gambel's Quail	*Callipepla gambelii*	**2007**			8									**8**
		2008			26					1				**27**
		2009			25									**25**
		2010			11									**11**
Montezuma Quail*	***Cyrtonyx montezumae***	**2009**			4									**4**
		2010		14			11							**25**
Western Grebe	*Aechmophorus occidentalis*	**2009**		31						1				**32**
Great Blue Heron	*Ardea herodias*	**2009**								1				**1**
		2010		3			3							**6**
Great Egret	*Ardea alba*	**2009**		1						1				**2**
		2010					1							**1**
Cattle Egret	*Bubulcus ibis*	**2010**					1							**1**
Black-crowned Night-Heron	*Nycticorax nycticorax*	**2010**					4							**4**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
Black Vulture	*Coragyps atratus*	**2008**		7										**7**
		2010						4						**4**
Turkey Vulture	*Cathartes aura*	**2007**		57	3			13			1			**74**
		2008		135	11			47			1	14		**208**
		2009		51	5	4		56	4		18	1		**139**
		2010		67	15		21	39	2		2	37		**183**
White-tailed Kite	***Elanus leucurus***	**2007**		2	3							3		**8**
		2008			11			6				2		**19**
		2009				5		4				1		**10**
		2010				2	1	3		1				**7**
Bald Eagle*	***Haliaeetus leucocephalus***	**2010**			1									**1**
Northern Harrier*	***Circus cyaneus***	**2007**		3	34			9				34		**80**
		2008	1	12	76			22		13	5	60	1	**190**
		2009		17	44	42		32	30	14	7	39	17	**242**
		2010		26	10	21	11	36	9	13	2	24	4	**156**
Sharp-shinned Hawk	*Accipiter striatus*	**2007**		1										**1**
		2008		1	1									**2**
		2009										1		**1**
		2010		1	1			2				1		**5**
Cooper's Hawk	*Accipiter cooperii*	**2007**		1										**1**
		2008		2	1			1						**4**
		2009		3	1	4								**8**
		2010		3		2								**5**
Harris's Hawk*	***Parabuteo unicinctus***	**2007**		5	2							1		**8**
		2008		5	15			1						**21**
		2009		3								2	2	**7**
		2010		2	3			3				1		**9**
Unidentified Hawk		**2007**			2									**2**
		2008			1					1				**2**
		2009			1			3		1				**5**
White-tailed Hawk*	***Buteo albicaudatus***	**2010**					2							**2**
Red-tailed Hawk	***Buteo jamaicensis***	**2007**	1	6	14			2				23	1	**47**
		2008	1	32	22			13		4	6	34	2	**114**
		2009		13	10	14		10	9	8	7	18	4	**93**
		2010		15	9	10	17	12	6	9	2	13	1	**94**
Ferruginous Hawk*	***Buteo regalis***	**2007**			1						1	1		**3**
		2008		2	7						12			**21**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
		2009		6	3				1		25	2	1	**38**
		2010			6	2	2	1	2		16		2	**31**
		2008		2	1			1			1	1		**6**
	Buteo sp.	**2009**				2			1	1	1			**5**
		2010			1						1		2	**4**
		2008			2					2				**4**
Golden Eagle*	***Aquila chrysaetos***	**2009**			1				2		3	3		**9**
		2010			1			1	1	2				**5**
Crested Caracara	***Caracara cheriway***	**2009**									3			**3**
		2010									4			**4**
		2007		8	16			5			2	15		**46**
American Kestrel	***Falco sparverius***	**2008**	2	37	23			10		3	17	16	10	**118**
		2009	1	46	15	17		33	17	6	18	15	28	**196**
		2010		35	7	8	15	21	1		22	11	13	**133**
		2007		6	4							2		**12**
Merlin	***Falco columbarius***	**2008**		5								1		**6**
		2009		4				2				1		**7**
		2010		2	1		2	1						**6**
		2008										3		**3**
Aplomado Falcon*	***Falco femoralis***	**2009**										2		**2**
		2010								6		3		**9**
Peregrine Falcon*	***Falco peregrinus***	**2009**	1			2				1				**4**
		2007		1	1							2		**4**
Prairie Falcon*	***Falco mexicanus***	**2008**		2	3			3				3		**11**
		2009		1		7			1			1		**10**
		2010				2		2			1	2		**7**
		2008		4										**4**
American Coot	*Fulica americana*	**2009**		15										**15**
		2010		86										**86**
		2007		163	3			186						**352**
Sandhill Crane*	***Grus canadensis***	**2008**	431		416			1						**848**
		2009	69		306			13						**388**
		2010	81	69	895		280					896		**2221**
		2007			1									**1**
Killdeer	***Charadrius vociferus***	**2008**		10	2					2				**14**
		2009	1	18	2				2	1				**24**
		2010	5	5			4			4				**18**
Mountain Plover*	***Charadrius montanus***	**2007**									8			**8**
		2008			23						33			**56**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
		2009									9			**9**
		2010									41			**41**
Black-necked Stilt	*Himantopus mexicanus*	**2010**					4							**4**
American Avocet	*Recurvirostra americana*	**2007**										10		**10**
Spotted Sandpiper	*Actitis macularius*	**2008**		12										**12**
Greater Yellowlegs	*Tringa melanoleuca*	**2008**	5	7										**12**
		2009								1				**1**
		2010	4				2							**6**
Long-billed Curlew*	***Numenius americanus***	**2007**			12			24			2	1		**39**
		2008		21	57			13			5			**96**
		2009	7		147	2		1	4					**161**
		2010	14		60			32	12		20			**138**
Western Sandpiper	*Calidris mauri*	**2009**								17				**17**
Least Sandpiper	*Calidris minutilla*	**2009**		13						33				**46**
		2010		3										**3**
Stilt Sandpiper	*Calidris himantopus*	**2007**										1		**1**
Long-billed Dowitcher	*Limnodromus scolopaceus*	**2010**		7			5							**12**
Wilson's Snipe	*Gallinago delicata*	**2010**					1							**1**
Ring-billed Gull	*Larus delawarensis*	**2010**		1										**1**
Eurasian Collared-Dove	*Streptopelia decaocto*	**2007**			7									**7**
		2008			9									**9**
		2009		2	8									**10**
		2010			6		1							**7**
White-winged Dove	*Zenaida asiatica*	**2007**		10								1	1	**12**
		2008		33				1						**34**
		2009		57		2					1	19		**79**
		2010		56	1		15							**72**
Mourning Dove	***Zenaida macroura***	**2007**	5	68	797			62			7	774	1	**1714**
		2008		561	378			34		1	72	48	10	**1104**
		2009		452	294	690		219	61	58	14	279	43	**2110**
		2010		529	279	80	42	62	3	30	34	89	21	**1169**
Inca Dove	*Columbina inca*	**2008**		15										**15**
		2010					6			27				**33**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
Greater Roadrunner	*Geococcyx californianus*	**2007**			10			1				3		**14**
		2008		4	3			1		3	1	6		**18**
		2009	1	3	9							1	1	**15**
		2010		1		1	3	2				1		**8**
Barn Owl	***Tyto alba***	**2007**						1						**1**
		2008			2									**2**
Great Horned Owl	*Bubo virginianus*	**2008**			2									**2**
		2009			2									**2**
		2010		1			3			5				**9**
Burrowing Owl*	***Athene cunicularia***	**2007**			12			4			6	1		**23**
		2008			31			2			2	9		**44**
		2009			6	2		3	3		5	2		**21**
		2010			5			4			7			**16**
Long-eared Owl*	***Asio otus***	**2007**			1									**1**
		2010				1								**1**
Short-eared Owl*	***Asio flammeus***	**2007**			5			2				6		**13**
		2008			5			2				6	1	**14**
		2009			2			6				5		**13**
		2010			1	1		15				1		**18**
White-throated Swift	*Aeronautes saxatalis*	**2010**					1							**1**
Acorn Woodpecker	*Melanerpes formicivorus*	**2007**		1	1									**2**
		2008		1										**1**
		2009		1						2				**3**
		2010		4										**4**
Gila Woodpecker	*Melanerpes uropygialis*	**2008**								3				**3**
		2009								2				**2**
Golden-fronted Woodpecker	*Melanerpes aurifrons*	**2008**		2										**2**
		2010					1				1			**2**
Williamson's Sapsucker	*Sphyrapicus thyroideus*	**2009**		2										**2**
Yellow-bellied Sapsucker	*Sphyrapicus varius*	**2007**		1										**1**
		2010		2										**2**
Ladder-backed Woodpecker	*Picoides scalaris*	**2007**	1		10							1		**12**
		2008		7	7					4		3		**21**
		2009	1	7	14					2	6	2	5	**37**
		2010		11	24	3	9	2	1	5	2	4	4	**65**
Arizona Woodpecker	*Picoides arizonae*	**2010**								1				**1**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
Northern Flicker	*Colaptes auratus*	**2007**			17									**17**
		2008		3	25			2		8	3	1		**42**
		2009		2	4					5	4		2	**17**
		2010		5	13	3	1		4	7	3	2	9	**47**
	Picoides sp.	**2007**			13									**13**
		2008		3	19			1		7	3	1		**34**
		2009		2	4					5	4		2	**17**
		2010		4	14	4	1		3	6	2	1	7	**42**
Gray Flycatcher	*Empidonax wrightii*	**2009**		12										**12**
		2010		15			20				1			**36**
Dusky Flycatcher	*Empidonax oberholseri*	**2010**					1							**1**
Cordilleran Flycatcher	*Empidonax occidentalis*	**2010**					1							**1**
	Empidonax sp.	**2007**		3										**3**
		2008		2										**2**
		2009									1			**1**
		2010		1										**1**
Black Phoebe	*Sayornis nigricans*	**2008**		3						2				**5**
		2009								5				**5**
		2010					2							**2**
Eastern Phoebe	*Sayornis phoebe*	**2007**											1	**1**
		2008		3										**3**
		2009										2		**2**
		2010											2	**2**
Say's Phoebe	***Sayornis saya***	**2007**	2	3	8			20			3	19	2	**57**
		2008	2	59	8			28		6	17	17	4	**141**
		2009	1	68	4	81		109	8	10	25	12	4	**322**
		2010	2	64	10	35	23	83	3	6	25	17	4	**272**
Vermilion Flycatcher	*Pyrocephalus rubinus*	**2007**			1									**1**
		2008	1	11										**12**
		2009		9	1					3	1	1		**15**
		2010		8			9							**17**
Ash-throated Flycatcher	*Myiarchus cinerascens*	**2010**					1							**1**
Cassin's Kingbird	*Tyrannus vociferans*	**2007**		1										**1**
		2008		2										**2**
		2009		1								1		**2**
		2010					3							**3**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
Western Kingbird	*Tyrannus verticalis*	**2007**										1		**1**
	Tyrannus sp.	**2008**									1			**1**
		2009									1			**1**
Loggerhead Shrike*	***Lanius ludovicianus***	**2007**	3	8	32			10			3	16		**72**
		2008	7	78	51			63		2	14	23	12	**250**
		2009	9	74	46	47		48	20	12	24	49	37	**366**
		2010	6	58	25	48	34	71	14	6	25	55	16	**358**
Hutton's Vireo	*Vireo huttoni*	**2010**		1										**1**
Mexican Jay	*Aphelocoma ultramarina*	**2007**		1	13									**14**
		2008		10	7									**17**
		2009		6										**6**
		2010		16						7				**23**
Chihuahuan Raven	***Corvus cryptoleucus***	**2007**	5	9	38						6	27	1	**86**
		2008	6	55	19			8		3	11	7	15	**124**
		2009	37	36	73	25		10	48		18	34	4	**285**
		2010	3	18	39	17	1	10			2	18	2	**110**
Common Raven	*Corvus corax*	**2007**		2	18			2			1	5		**28**
		2008		16	59			5		29	1	10		**120**
		2009	2		46	9		5	6	30	8	13		**119**
		2010	14	4	16	2	2	17	6	57	17	3	13	**151**
	Corvus sp.	**2007**			9									**9**
		2008	1		36			1		2	6			**46**
		2009	1		14	1		2		3	5		2	**28**
		2010			7			1						**8**
Horned Lark	***Eremophila alpestris***	**2007**	7		199						138	126		**470**
		2008	127	146	1068			99		35	922	1194	41	**3632**
		2009	91	6	485	165		35	108	131	2187	398	24	**3630**
		2010	107	242	694	615		668	139	317	1717	2120	103	**6722**
Tree Swallow	*Tachycineta bicolor*	**2007**			1									**1**
		2008		31				1						**32**
		2009		16	6			14		5		92		**133**
		2010		15	16		2		1			6		**40**
Violet-green Swallow	*Tachycineta thalassina*	**2009**										2		**2**
Bridled Titmouse	*Baeolophus wollweberi*	**2007**		4	2									**6**
		2008		7										**7**
		2009		4	14									**18**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
Black-crested Titmouse	*Baeolophus atricristatus*	**2010**							5					**5**
Verdin	*Auriparus flaviceps*	**2007**		3	3									**6**
		2008		2				5			1			**8**
		2009			1	1								**2**
		2010		5	8		2	6	2				1	**24**
Bushtit	*Psaltriparus minimus*	**2007**		5	5									**10**
		2008		10										**10**
		2009		6	2					6	19			**33**
		2010		30			1							**31**
Cactus Wren	*Campylorhynchus brunneicapillus*	**2007**	1	15	45			1			4	4		**70**
		2008	3	77	55			18		3	3	5	5	**169**
		2009	1	66	80	10		4	12	2	13	12	9	**209**
		2010	6	71	58	14	35	5	19	1	17	16	6	**248**
Rock Wren	*Salpinctes obsoletus*	**2007**		1	4									**5**
		2008		5	1						1			**7**
		2009		4	3	1								**8**
		2010		1	6	2				1	7			**17**
Canyon Wren	*Catherpes mexicanus*	**2007**		2	2									**4**
		2008		5										**5**
		2009		2										**2**
		2010		1		1							1	**3**
Bewick's Wren	*Thryomanes bewickii*	**2007**			11								2	**13**
		2008			5					1				**6**
		2009			6								7	**13**
		2010		6	6	2	7				1	1		**23**
House Wren	*Troglodytes aedon*	**2007**		1										**1**
		2010					2							**2**
Marsh Wren	*Cistothorus palustris*	**2009**	1											**1**
		2010	1											**1**
Unidentified Wren		**2008**			1									**1**
Ruby-crowned Kinglet	*Regulus calendula*	**2007**		14	2									**16**
		2008		7	2									**9**
		2009		2	1					3				**6**
		2010		13	1			2						**16**
Blue-gray Gnatcatcher	*Polioptila caerulea*	**2007**		3								1		**4**
		2008						1						**1**
		2009		6		3		1			1		2	**13**

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		2010	1	10			1		1			3	1	**17**
Black-tailed Gnatcatcher	*Polioptila melanura*	**2007**		1	2			3						**6**
		2008		1	1			37				4		**43**
		2009				8		12	2			3		**25**
		2010		3	2	2		13	1		1	3		**25**
Eastern Bluebird	***Sialia sialis***	**2007**		2										**2**
		2009			2									**2**
		2010			4	17				9				**30**
Western Bluebird	***Sialia mexicana***	**2007**		2										**2**
		2008		9	7						27			**43**
		2009		12							11			**23**
		2010		2	6					4	11			**23**
Mountain Bluebird	***Sialia currucoides***	**2007**	19	21	21			125			1	8	14	**209**
		2009		42	3	1		10	2		34		6	**98**
		2010		149	43		3	31	1		80			**307**
	Sialis sp.	**2007**			3									**3**
		2010									20			**20**
American Robin	*Turdus migratorius*	**2007**		1										**1**
		2008		1	1									**2**
		2010			2					1				**3**
Northern Mockingbird	*Mimus polyglottos*	**2007**	3	3				5			1		1	**13**
		2008	9	22				2			9		1	**43**
		2009	5	16		7		14		1	3		3	**49**
		2010	6	3			6	6			3	1		**25**
Sage Thrasher	*Oreoscoptes montanus*	**2007**	1		1			4						**6**
		2009			1	3		7	2				1	**14**
		2010		1	8			2				1		**12**
Curve-billed Thrasher	*Toxostoma curvirostre*	**2007**		8	35			2			3	1		**49**
		2008	1	30	20			21		6	8	5	4	**95**
		2009	3	35	47	4		13	6	1	16	3	9	**137**
		2010		38	26	13	32	15	8	1	23	6	3	**165**
Crissal Thrasher	*Toxostoma crissale*	**2007**			1							1		**2**
		2008			2									**2**
		2009			2					1				**3**
		2010			5									**5**
	Toxostoma sp.	**2010**			1									**1**
European Starling	*Sturnus vulgaris*	**2007**			1									**1**
		2008			6									**6**
		2009			3									**3**

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American Pipit	***Anthus rubescens***	**2007**	2					1			435			**438**
		2008			1						56	1		**58**
		2009	51						5		428			**484**
		2010	21				45				369			**435**
Sprague's Pipit*	***Anthus spragueii***	**2007**	2		11						7	7		**27**
		2008	1	31	10						17	26	3	**88**
		2009		36	12	2		5	2	12	28	3	18	**118**
		2010	2	23	5	6	3	6	8	1	20	7	9	**90**
	Anthus sp.	**2007**						1			2			**3**
		2008										2		**2**
		2009		1										**1**
		2010	1											**1**
Cedar Waxwing	*Bombycilla cedrorum*	**2008**						1						**1**
Phainopepla	*Phainopepla nitens*	**2007**	56	3								3		**62**
		2008		1	6			2						**9**
		2009		5	2									**7**
		2010		3	5									**8**
Orange-crowned Warbler	*Vermivora celata*	**2008**		1										**1**
		2009	1	1										**2**
Yellow-rumped Warbler	*Dendroica coronata*	**2007**	14											**14**
		2008	12	5										**17**
		2009	6	2										**8**
		2010	16	1	1									**18**
Black-throated Gray Warbler	*Dendroica nigrescens*	**2010**		1			1							**2**
Townsend's Warbler	*Dendroica townsendi*	**2010**					3							**3**
Hepatic Tanager	*Piranga flava*	**2010**					3							**3**
Summer Tanager	*Piranga rubra*	**2010**		3										**3**
Green-tailed Towhee	*Pipilo chlorurus*	**2007**		4	23									**27**
		2008		1	6			8				1		**16**
		2009		4	10	3		4	1			9		**31**
		2010		16	1	1	6	5	1			1		**31**
Spotted Towhee	*Pipilo maculatus*	**2007**			3									**3**
		2008			1			2						**3**
		2010		1									2	**3**
Canyon Towhee	***Pipilo fuscus***	**2007**		12	8						4		1	**25**
		2008		75	8					5	4	12		**104**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
		2009		49	13	28		2	12	4	12	4		**124**
		2010		43	32	20	56		5		6	5	2	**169**
Cassin's Sparrow*	***Aimophila cassinii***	**2007**		4	8							5		**17**
		2008		2	5						1	1		**9**
		2009		7	3	1		2	25	1		2	20	**61**
		2010		20	2		4	2	1	1		11	3	**44**
Botteri's Sparrow*	***Aimophila botterii***	**2007**		8										**8**
		2008									1			**1**
		2009		1										**1**
		2010		1			1							**2**
Rufous-crowned Sparrow	***Aimophila ruficeps***	**2007**		4	1								1	**6**
		2008		15	1			4					1	**21**
		2009		7	13					1			22	**43**
		2010		5	10	9	5							**29**
	Aimophila sp.	**2008**		1								1	3	**5**
		2009									1		1	**2**
		2010						1					2	**3**
Chipping Sparrow	***Spizella passerina***	**2007**		157	192			17				43		**409**
		2008		1392	22			29		75	59	51		**1628**
		2009		1861	193	386		12	224	32	35	59	67	**2869**
		2010		3203	12	162	524	47	9	101	65	99	1	**4223**
Clay-colored Sparrow*	***Spizella pallida***	**2007**		237	127			259			7	55	1	**686**
		2008		212	26			178				34		**450**
		2009		148		1300		230	156			125	3	**1962**
		2010		99		219	186	205	76			24		**809**
Brewer's Sparrow*	***Spizella breweri***	**2007**		40	184			34			1	130		**389**
		2008		1124	237			636		16		98		**2111**
		2009		692	320	49		1319	54	3		322	31	**2790**
		2010	18	1336	27	230	513	1394	42	1	10	728	4	**4303**
Field Sparrow	***Spizella pusilla***	**2010**											1	**1**
Worthen's Sparrow*	***Spizella wortheni***	**2008**									7			**7**
		2009									5			**5**
		2010									30			**30**
Black-chinned Sparrow	*Spizella atrogularis*	**2007**		6										**6**
		2010					3							**3**
	Spizella sp.	**2007**		1	43			1				1		**46**
		2008		12	12			47		3				**74**
		2009		11	11	13		22	7			3	1	**68**
		2010		1		17	3	10	2		1		3	**37**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
Vesper Sparrow*	***Pooecetes gramineus***	**2007**	1	28	780			107			7	776	31	**1730**
		2008		908	252			217		246	15	297	148	**2083**
		2009		1607	442	947		916	253	142	8	836	965	**6116**
		2010		1683	94	82	332	494	1	66	4	571	244	**3571**
Lark Sparrow	***Chondestes grammacus***	**2007**		66	1			1				8		**76**
		2008		17				9			6			**32**
		2009		326	1	5		1	1					**334**
		2010		197		1	31							**229**
Black-throated Sparrow	*Amphispiza bilineata*	**2007**		70	143			53			1	30		**297**
		2008	1	213	53			437		22	8	32	20	**786**
		2009	1	119	103	151		229	157	14	9	130	14	**927**
		2010	12	205	178	206	21	150	64	21	9	154	69	**1089**
Sage Sparrow	*Amphispiza belli*	**2008**		10								2		**12**
		2009							27			3		**30**
		2010						13	9			26	10	**58**
Unidentified Sparrow		**2007**		22	206						1	17		**246**
		2008		43	51					7		1		**102**
		2009		33	147	2		47		19		5	3	**256**
		2010			9	2			5				1	**17**
Lark Bunting*	***Calamospiza melanocorys***	**2007**			2556			230				127		**2913**
		2008	64	245	242			827		53		118	35	**1584**
		2009		3	248	1022		6035	120		271	33	53	**7785**
		2010		329	92	39	48	2279	107		1328	440	6	**4668**
Savannah Sparrow	***Passerculus sandwichensis***	**2007**		30	516			91			25	366	4	**1032**
		2008	135		46			4		27	45	32	94	**383**
		2009	1	417	427	48		117	213	137	22	162	1042	**2586**
		2010		652	42		31	58		83	4	96	813	**1779**
Grasshopper Sparrow*	***Ammodramus savannarum***	**2007**		44	86			45				19	2	**196**
		2008		58	5			7		3	2	16	1	**92**
		2009		80	21	202		98	49	13	8	71	117	**659**
		2010		165	19	6	48	50	5	20		50	2	**365**
Baird's Sparrow*	***Ammodramus bairdii***	**2007**		3	1							4	1	**9**
		2008		37	3			4						**44**
		2009		49	6	12			1	5		30	4	**107**
		2010		72	3	3	2	1	1	20		15	2	**119**
Savannah Sparrow + *Ammodramus* spp.	*Passerculus sandwichensis* + *Ammodramus sp.*	**2008**		23	21			2			1	1	3	**51**
		2009		74	6	3		16		6	1	21	16	**143**
		2010		78	13	1	17	6				2	10	**127**
	Ammodramus sp.	**2007**		1	29							52	6	**88**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
		2008		12	6					1	3	1	4	**27**
		2009		54	46	14		10	1	28	1	53	21	**228**
		2010		25	20	8	9	7	6	3	1	26	11	**116**
Song Sparrow	*Melospiza melodia*	**2007**						4						**4**
		2008						1		1				**2**
Lincoln's Sparrow	*Melospiza lincolnii*	**2007**		5	10							2		**17**
		2009		9	5			5				1	7	**27**
		2010		3			2			1				**6**
	Melospiza sp.	**2008**			1									**1**
White-throated Sparrow	*Zonotrichia albicollis*	**2008**		10										**10**
		2009			2									**2**
White-crowned Sparrow	*Zonotrichia leucophrys*	**2007**			42			2				18		**62**
		2008	1	22	83			4		11		71	20	**212**
		2009		2	22	2			8	5		19	77	**135**
		2010		9	119		36		18	54		23	2	**261**
Dark-eyed Junco	*Junco hyemalis*	**2007**		1	24									**25**
		2008			5									**5**
		2009			2									**2**
		2010		4	1									**5**
McCown's Longspur*	***Calcarius mccownii***	**2007**			7							16		**23**
		2008			169			3						**172**
		2009			60				1	2				**63**
		2010				4								**4**
Chestnut-collared Longspur*	***Calcarius ornatus***	**2007**			1403			23				1111	12	**2549**
		2008		1514	1661			6		19	3	517		**3720**
		2009		936	1262	5578		564	1707	291		4749	159	**15246**
		2010		2344	660	456		631	63	239		3399	419	**8211**
	Calcarius sp.	**2007**			3			7						**10**
		2008								1				**1**
		2009							1	1			1	**3**
		2010			1	1						1		**3**
Northern Cardinal	*Cardinalis cardinalis*	**2009**		2										**2**
		2010		1			1			1				**3**
Pyrrhuloxia	*Cardinalis sinuatus*	**2007**		2	3			2						**7**
		2008	1	14	12			1						**28**
		2009		4	1	13		4	7			1		**30**
		2010	2	35	2	2	8	4				5		**58**
Eastern Meadowlark*	***Sturnella magna***	**2007**		9	72							21		**102**
		2008		204	115			1		27	2	51	8	**408**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
		2009	17	149	184	2		95	9	89	26	79	49	**699**
		2010	3	318	207	47	15	146	3	83	3	144	66	**1035**
Western Meadowlark	***Sturnella neglecta***	**2007**	1	11	12			55				11	2	**92**
		2008		24	18			15			22			**79**
		2009		22	8	173		32	272	1	22	8	42	**580**
		2010		35	39	7	1	11	41	1	35	2	2	**174**
	Sturnella sp.	**2008**										16	26	**42**
		2009		40	33	2		11		12	4	23	7	**132**
		2010	2	10	13	5		10			21	8	18	**87**
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	**2009**								2				**2**
Brewer's Blackbird	***Euphagus cyanocephalus***	**2008**	272							17				**289**
		2009	464		13							8	24	**509**
		2010	1771	52			74			4	20	15	60	**1996**
Unidentified Blackbird		**2008**			1									**1**
		2009			1									**1**
		2010			1									**1**
Great-tailed Grackle	*Quiscalus mexicanus*	**2007**									1			**1**
		2009			1			361		1				**363**
		2010	8					65		18		3		**94**
Brown-headed Cowbird	*Molothrus ater*	**2007**		62				20						**82**
		2008		19										**19**
		2009		42	1					39				**82**
		2010		18			20			17				**55**
Unidentified Cowbird		**2008**		1										**1**
House Finch	*Carpodacus mexicanus*	**2007**			45						75			**120**
		2008	6		3			7		1	31			**48**
		2009		11	7					8	2	7	4	**39**
		2010	1	15	6	2	1	10		42	42	30	16	**165**
Pine Siskin	*Carduelis pinus*	**2008**								3				**3**
Lesser Goldfinch	*Carduelis psaltria*	**2007**		49										**49**
		2008		6										**6**
		2009		3	1									**4**
		2010		1	1				1					**3**
House Sparrow	*Passer domesticus*	**2007**			6									**6**
		2009			3					10				**13**
		2010			4									**4**
Unidentified		**2007**			4									**4**

Common Name	Scientific Name	Year	Cuatro Ciénegas	Cuchillas de la Zarca	Janos	Lagunas del Este	Malpais	Mapimí	Marfa	Sonoita	El Tokio	Valle Centrales	Valle Colombia	Total
Bird		**2008**	1		10			38		2		2		**53**
		2009			17					3		1		**21**
		2010	5		4	2				1	1		2	**15**
All Birds (combined)		**2007**	129	1408	8043			1462			753	4123	85	**16003**
		2008	1095	10116	5914			3005		684	1470	3308	475	**26067**
		2009	773	16475	5461	11159		10847	3705	1633	3376	7970	2991	**64390**
		2010	2112	13730	4041	2495	2775	6793	717	1321	4089	9254	1995	**49322**
All Birds	**Total**	**All yrs**	**4109**	**41729**	**23459**	**13654**	**2775**	**22107**	**4422**	**3638**	**9688**	**24655**	**5546**	**156030**

APPENDIX B. DENSITY ESTIMATES FOR GRASSLAND-ASSOCIATED SPECIES BY YEAR AND GPCA.

Key: D = Density estimate; %CV = Coefficient of Variation on D; LCL, UCL = lower and upper 95% confidence limit on D; n = post-truncation number of independent detections used in estimating D

American Kestrel (Falco sparverius) n = 443					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.55	0.28	0.00
	%CV	0.00	68.84	100.15	0.00
	LCL	0.00	0.15	0.05	0.00
	UCL	0.00	2.05	1.61	0.00
Cuchillas de la Zarca	D	1.34	1.83	2.35	1.62
	%CV	40.02	18.53	16.04	16.46
	LCL	0.60	1.27	1.71	1.17
	UCL	2.97	2.63	3.22	2.24
Janos	D	0.96	0.96	0.83	0.30
	%CV	26.75	25.74	32.19	59.53
	LCL	0.57	0.58	0.45	0.10
	UCL	1.63	1.59	1.56	0.89
Lagunas del Este	D			0.72	0.26
	%CV			28.45	49.25
	LCL			0.41	0.10
	UCL			1.26	0.67
Malpaís	D				2.06
	%CV				26.48
	LCL				1.21
	UCL				3.48
Mapimí	D	0.43	0.70	2.04	1.35
	%CV	69.62	30.00	20.25	23.75
	LCL	0.12	0.39	1.37	0.85
	UCL	1.57	1.25	3.04	2.15
Marfa	D			0.83	0.06
	%CV			26.03	100.15
	LCL			0.50	0.01
	UCL			1.38	0.34
Sonoita	D		0.83	0.83	0.00
	%CV		67.56	45.05	0.00
	LCL		0.22	0.35	0.00
	UCL		3.20	1.99	0.00
El Tokio	D	1.10	1.33	1.21	1.66
	%CV	66.53	23.92	26.86	22.77
	LCL	0.27	0.83	0.72	1.06
	UCL	4.45	2.13	2.05	2.61
Valles Centrales	D	1.21	0.63	0.47	0.43
	%CV	28.02	24.00	30.42	29.34
	LCL	0.70	0.39	0.26	0.25
	UCL	2.10	1.01	0.86	0.77
Valle Colombia	D	0.00	1.38	3.61	1.67
	%CV	0.00	27.79	24.33	36.28
	LCL	0.00	0.79	2.22	0.82
	UCL	0.00	2.40	5.87	3.40

Baird's Sparrow (*Ammodramus bairdii*) n=219					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	12.83	35.17	52.47	71.28
	%CV	100.61	29.93	20.81	18.78
	LCL	2.28	19.67	34.90	49.31
	UCL	72.28	62.86	78.89	103.04
Janos	D	1.54	1.43	4.31	3.99
	%CV	100.59	100.19	57.31	57.36
	LCL	0.29	0.27	1.49	1.38
	UCL	8.14	7.54	12.44	11.54
Lagunas del Este	D			14.65	2.94
	%CV			41.60	70.51
	LCL			6.61	0.83
	UCL			32.46	10.42
Malpaís	D				6.13
	%CV				69.95
	LCL				1.70
	UCL				22.05
Mapimí	D	0.00	1.56	0.00	1.44
	%CV	0.00	100.20	0.00	100.19
	LCL	0.00	0.30	0.00	0.27
	UCL	0.00	8.23	0.00	7.57
Marfa	D			1.43	1.44
	%CV			100.20	100.20
	LCL			0.27	0.27
	UCL			7.52	7.57
Sonoita	D		0.00	3.10	34.08
	%CV		0.00	100.21	48.82
	LCL		0.00	0.57	13.35
	UCL		0.00	16.86	87.03
El Tokio	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Valles Centrales	D	5.80	0.00	15.03	10.60
	%CV	57.03	0.00	24.89	30.63
	LCL	2.00	0.00	9.26	5.86
	UCL	16.77	0.00	24.41	19.16
Valle Colombia	D	0.00	0.00	6.21	6.21
	%CV	0.00	0.00	69.97	69.98
	LCL	0.00	0.00	1.72	1.72
	UCL	0.00	0.00	22.35	22.34

Brewer's Sparrow (*Spizella breweri*) n=1576					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	12.08
	%CV	0.00	0.00	0.00	68.71
	LCL	0.00	0.00	0.00	3.26
	UCL	0.00	0.00	0.00	44.84
Cuchillas de la Zarca	D	33.37	170.45	140.22	218.27
	%CV	47.76	13.45	16.53	13.16
	LCL	13.07	130.75	101.27	168.40
	UCL	85.16	222.20	194.17	282.90
Janos	D	31.51	57.38	74.22	5.20
	%CV	23.33	21.16	21.45	49.26
	LCL	19.92	37.85	48.68	2.06
	UCL	49.83	87.00	113.17	13.13
Lagunas del Este	D			22.87	38.72
	%CV			50.78	39.90
	LCL			8.81	18.01
	UCL			59.38	83.24
Malpaís	D				245.11
	%CV				24.13
	LCL				151.38
	UCL				396.87
Mapimí	D	13.95	124.85	501.88	310.39
	%CV	73.37	27.37	10.45	14.03
	LCL	3.58	73.08	408.14	235.21
	UCL	54.40	213.32	617.14	409.60
Marfa	D			12.56	7.02
	%CV			38.90	82.32
	LCL			5.95	1.67
	UCL			26.51	29.40
Sonoita	D		81.71	6.06	3.02
	%CV		24.27	69.84	100.10
	LCL		48.44	1.68	0.56
	UCL		137.86	21.76	16.40
El Tokio	D	12.04	0.00	0.00	0.00
	%CV	100.04	0.00	0.00	0.00
	LCL	1.77	0.00	0.00	0.00
	UCL	82.06	0.00	0.00	0.00
Valles Centrales	D	45.24	22.31	32.79	6.06
	%CV	37.83	19.60	26.55	20.29
	LCL	21.76	15.20	19.57	34.75
	UCL	94.07	32.75	54.94	76.92
Valle Colombia	D	0.00	0.00	18.17	6.06
	%CV	0.00	0.00	50.85	69.82
	LCL	0.00	0.00	6.87	1.69
	UCL	0.00	0.00	48.09	21.76

Burrowing Owl (*Athene cunicularia*) n=48					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Janos	D	3.18	2.97	2.55	0.79
	%CV	50.79	50.75	50.52	73.29
	LCL	1.23	1.15	0.99	0.21
	UCL	8.23	7.67	6.55	2.89
Lagunas del Este	D			0.43	0.00
	%CV			102.15	0.00
	LCL			0.08	0.00
	UCL			2.33	0.00
Malpaís	D				0.00
	%CV				0.00
	LCL				0.00
	UCL				0.00
Mapimí	D	2.82	0.46	1.31	1.70
	%CV	72.36	102.06	60.62	53.21
	LCL	0.74	0.09	0.43	0.63
	UCL	10.70	2.48	3.97	4.58
Marfa	D			0.85	0.00
	%CV			73.27	0.00
	LCL			0.23	0.00
	UCL			3.11	0.00
Sonoita	D		0.00	0.00	0.00
	%CV		0.00	0.00	0.00
	LCL		0.00	0.00	0.00
	UCL		0.00	0.00	0.00
El Tokio	D	10.95	0.00	0.00	2.20
	%CV	54.24	0.00	0.00	63.82
	LCL	3.58	0.00	0.00	0.69
	UCL	33.49	0.00	0.00	7.06
Valles Centrales	D	0.57	1.30	0.00	0.00
	%CV	102.16	48.66	0.00	0.00
	LCL	0.11	0.52	0.00	0.00
	UCL	3.10	3.23	0.00	0.00
Valle Colombia	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00

Cassin's Sparrow (*Aimophila cassinii*) n=95					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.0	0.0	0.0	0.0
	%CV	0.0	0.0	0.0	0.0
	LCL	0.0	0.0	0.0	0.0
	UCL	0.0	0.0	0.0	0.0
Cuchillas de la Zarca	D	6.5	1.7	5.2	15.9
	%CV	70.7	71.4	41.6	30.4
	LCL	1.8	0.5	2.4	8.8
	UCL	24.2	6.2	11.5	28.5
Janos	D	8.2	5.5	2.2	2.0
	%CV	43.3	66.9	71.3	71.3
	LCL	3.6	1.6	0.6	0.6
	UCL	18.7	18.3	7.8	7.2
Lagunas del Este	D			0.0	0.0
	%CV			0.0	0.0
	LCL			0.0	0.0
	UCL			0.0	0.0
Malpaís	D				9.3
	%CV				49.5
	LCL				3.6
	UCL				24.0
Mapimí	D	0.0	0.0	1.1	2.2
	%CV	0.0	0.0	100.8	100.8
	LCL	0.0	0.0	0.2	0.4
	UCL	0.0	0.0	5.9	11.6
Marfa	D			7.6	1.1
	%CV			43.4	100.7
	LCL			3.3	0.2
	UCL			17.4	5.8
Sonoita	D		0.0	2.4	0.0
	%CV		0.0	100.8	0.0
	LCL		0.0	0.4	0.0
	UCL		0.0	12.9	0.0
El Tokio	D	0.0	1.4	0.0	0.0
	%CV	0.0	100.8	0.0	0.0
	LCL	0.0	0.3	0.0	0.0
	UCL	0.0	7.6	0.0	0.0
Valles Centrales	D	2.9	0.7	0.7	7.4
	%CV	71.2	100.8	100.8	36.3
	LCL	0.8	0.1	0.1	3.7
	UCL	10.6	3.5	3.5	14.8
Valle Colombia	D	0.0	0.0	35.4	7.1
	%CV	0.0	0.0	45.9	57.4
	LCL	0.0	0.0	14.6	2.4
	UCL	0.0	0.0	85.7	20.9

Chestnut-collared Longspur (*Calcarius ornatus*) n=1334					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	0.00	47.83	27.18	102.53
	%CV	0.00	34.95	42.30	28.16
	LCL	0.00	24.40	12.16	59.32
	UCL	0.00	93.78	60.80	177.21
Janos	D	301.63	239.31	186.82	190.41
	%CV	20.64	21.50	21.18	24.12
	LCL	201.05	156.92	123.26	118.80
	UCL	452.51	364.94	283.15	305.18
Lagunas del Este	D			483.48	110.47
	%CV			28.73	39.49
	LCL			276.17	51.79
	UCL			846.43	235.65
Malpaís	D				0.00
	%CV				0.00
	LCL				0.00
	UCL				0.00
Mapimí	D	43.69	11.44	51.34	84.45
	%CV	100.59	60.93	36.72	28.83
	LCL	7.72	3.73	25.30	48.16
	UCL	247.18	35.08	104.17	148.08
Marfa	D			414.27	29.00
	%CV			35.09	29.02
	LCL			210.35	16.48
	UCL			815.88	51.04
Sonoita	D		51.18	68.26	124.95
	%CV		72.09	32.40	22.96
	LCL		12.37	36.02	79.10
	UCL		211.83	129.37	197.39
El Tokio	D	0.00	3.41	0.00	0.00
	%CV	0.00	100.26	0.00	0.00
	LCL	0.00	0.64	0.00	0.00
	UCL	0.00	18.10	0.00	0.00
Valles Centrales	D	187.73	38.70	286.96	234.77
	%CV	27.67	22.20	16.47	15.20
	LCL	109.13	25.09	207.79	174.29
	UCL	322.94	59.68	396.30	316.24
Valle Colombia	D	82.24	0.00	22.76	28.44
	%CV	100.07	0.00	78.70	58.88
	LCL	8.22	0.00	5.57	9.41
	UCL	823.18	0.00	93.11	86.01

Clay-colored Sparrow (*Spizella pallida*) n=665					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	120.00	18.20	10.98	26.38
	%CV	26.70	31.77	36.71	32.03
	LCL	70.01	9.84	5.42	14.20
	UCL	205.69	33.65	22.22	49.01
Janos	D	23.43	8.05	0.00	0.00
	%CV	28.91	51.04	0.00	0.00
	LCL	13.34	3.09	0.00	0.00
	UCL	41.17	20.98	0.00	0.00
Lagunas del Este	D			220.91	48.33
	%CV			20.64	32.13
	LCL			147.28	25.91
	UCL			331.36	90.15
Malpaís	D				100.74
	%CV				26.90
	LCL				59.06
	UCL				171.84
Mapimí	D	80.28	37.55	85.11	54.26
	%CV	45.74	33.51	21.34	32.60
	LCL	32.59	19.61	55.98	28.85
	UCL	197.75	71.90	129.40	102.07
Marfa	D			33.27	26.53
	%CV			27.74	40.76
	LCL			19.36	12.16
	UCL			57.15	57.88
Sonoita	D		0.00	0.00	0.00
	%CV		0.00	0.00	0.00
	LCL		0.00	0.00	0.00
	UCL		0.00	0.00	0.00
El Tokio	D	19.79	0.00	0.00	0.00
	%CV	100.21	0.00	0.00	0.00
	LCL	2.90	0.00	0.00	0.00
	UCL	134.91	0.00	0.00	0.00
Valles Centrales	D	17.05	7.76	12.06	4.96
	%CV	33.70	29.75	30.19	37.54
	LCL	8.85	4.36	6.72	2.42
	UCL	32.84	13.80	21.62	10.17
Valle Colombia	D	0.00	0.00	4.98	0.00
	%CV	0.00	0.00	70.05	0.00
	LCL	0.00	0.00	1.38	0.00
	UCL	0.00	0.00	17.94	0.00

Chihuahuan Raven (*Corvus cryptoleucus*) n=334					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	1.35	1.69	7.79	0.68
	%CV	58.83	57.51	19.71	69.21
	LCL	0.43	0.55	5.22	0.18
	UCL	4.26	5.20	11.63	2.53
Cuchillas de la Zarca	D	1.40	2.23	1.56	0.78
	%CV	56.62	20.73	25.26	31.54
	LCL	0.47	1.49	0.95	0.42
	UCL	4.16	3.35	2.55	1.43
Janos	D	2.10	1.02	1.33	1.75
	%CV	22.66	29.14	33.26	23.58
	LCL	1.35	0.58	0.70	1.10
	UCL	3.28	1.80	2.54	2.77
Lagunas del Este	D			0.96	0.56
	%CV			48.39	42.51
	LCL			0.39	0.25
	UCL			2.39	1.27
Malpaís	D				0.17
	%CV				100.43
	LCL				0.03
	UCL				0.91
Mapimí	D	0.00	0.51	0.32	0.47
	%CV	0.00	52.46	49.80	46.97
	LCL	0.00	0.19	0.13	0.19
	UCL	0.00	1.37	0.82	1.15
Marfa	D			1.02	0.00
	%CV			33.00	0.00
	LCL			0.54	0.00
	UCL			1.93	0.00
Sonoita	D		1.53	0.00	0.00
	%CV		72.35	0.00	0.00
	LCL		0.37	0.00	0.00
	UCL		6.33	0.00	0.00
El Tokio	D	2.70	0.81	1.28	0.20
	%CV	40.23	38.72	30.62	100.40
	LCL	1.12	0.39	0.71	0.04
	UCL	6.49	1.72	2.33	1.08
Valles Centrales	D	1.16	0.24	0.97	0.58
	%CV	31.54	53.13	23.50	31.25
	LCL	0.63	0.09	0.61	0.32
	UCL	2.15	0.64	1.53	1.06
Valle Colombia	D	1.23	1.01	0.51	0.17
	%CV	100.21	70.29	56.84	100.41
	LCL	0.12	0.28	0.17	0.03
	UCL	12.24	3.66	1.49	0.92

Chipping Sparrow (*Spizella passerina*) n=848					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	128.56	260.88	363.21	543.18
	%CV	38.75	14.87	11.86	12.58
	LCL	59.44	194.74	287.68	424.23
	UCL	278.09	349.50	458.56	695.49
Janos	D	38.08	12.69	50.78	14.13
	%CV	32.22	44.01	33.57	74.42
	LCL	20.37	5.49	26.51	3.78
	UCL	71.20	29.31	97.26	52.92
Lagunas del Este	D			51.84	33.80
	%CV			33.63	48.64
	LCL			27.03	13.50
	UCL			99.42	84.60
Malpaís	D				281.82
	%CV				21.91
	LCL				182.04
	UCL				436.30
Mapimí	D	50.60	8.28	10.43	28.01
	%CV	69.70	100.24	49.41	36.54
	LCL	13.74	1.57	4.11	13.85
	UCL	186.34	43.69	26.45	56.64
Marfa	D			40.48	7.63
	%CV			51.02	57.32
	LCL			15.54	2.64
	UCL			105.45	22.06
Sonoita	D		115.23	16.47	21.92
	%CV		39.73	56.44	60.29
	LCL		49.88	5.67	7.09
	UCL		266.24	47.84	67.83
El Tokio	D	0.00	13.17	9.58	3.29
	%CV	0.00	78.93	74.33	100.21
	LCL	0.00	3.27	2.54	0.62
	UCL	0.00	52.97	36.07	17.46
Valles Centrales	D	13.67	7.78	10.95	18.75
	%CV	49.08	44.47	55.21	32.85
	LCL	5.40	3.36	3.95	9.95
	UCL	34.64	18.03	30.39	35.31
Valle Colombia	D	0.00	0.00	54.92	5.49
	%CV	0.00	0.00	44.99	100.18
	LCL	0.00	0.00	23.00	1.01
	UCL	0.00	0.00	131.13	29.81

Eastern Meadowlark (*Sturnella magna*) n=982					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	15.90	2.65
	%CV	0.00	0.00	43.99	100.12
	LCL	0.00	0.00	6.55	0.46
	UCL	0.00	0.00	38.56	15.35
Cuchillas de la Zarca	D	6.40	15.53	20.98	24.16
	%CV	53.71	19.64	15.91	13.18
	LCL	2.26	10.56	15.34	18.63
	UCL	18.12	22.83	28.70	31.31
Janos	D	8.88	9.51	20.57	15.38
	%CV	25.41	30.56	21.26	25.20
	LCL	5.40	5.25	13.54	9.39
	UCL	14.61	17.23	31.24	25.18
Lagunas del Este	D			0.31	7.86
	%CV			100.12	27.94
	LCL			0.06	4.55
	UCL			1.65	13.56
Malpaís	D				5.90
	%CV				40.49
	LCL				2.68
	UCL				13.00
Mapimí	D	0.00	0.33	11.35	19.70
	%CV	0.00	100.06	20.83	15.96
	LCL	0.00	0.06	7.53	14.38
	UCL	0.00	1.76	17.10	27.00
Marfa	D			2.45	0.92
	%CV			38.39	57.15
	LCL			1.17	0.32
	UCL			5.12	2.66
Sonoita	D		13.93	33.18	23.85
	%CV		33.34	16.94	18.05
	LCL		6.84	23.62	16.61
	UCL		28.37	46.60	34.25
El Tokio	D	0.00	0.00	5.02	1.19
	%CV	0.00	0.00	42.88	74.16
	LCL	0.00	0.00	2.21	0.32
	UCL	0.00	0.00	11.41	4.49
Valles Centrales	D	4.96	6.58	11.35	17.38
	%CV	47.39	16.20	18.40	16.08
	LCL	2.01	4.79	7.91	12.67
	UCL	12.21	9.05	16.28	23.83
Valle Colombia	D	0.00	4.62	15.93	25.88
	%CV	0.00	45.23	28.38	23.80
	LCL	0.00	1.92	9.06	16.09
	UCL	0.00	11.08	28.01	41.63

Ferruginous Hawk (*Buteo regalis*) n=87					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	0.00	0.04	0.10	0.00
	%CV	0.00	70.70	44.26	0.00
	LCL	0.00	0.01	0.04	0.00
	UCL	0.00	0.15	0.24	0.00
Janos	D	0.03	0.16	0.08	0.12
	%CV	100.22	40.04	57.37	44.14
	LCL	0.01	0.07	0.03	0.05
	UCL	0.15	0.34	0.23	0.28
Lagunas del Este	D			0.00	0.05
	%CV			0.00	70.56
	LCL			0.00	0.02
	UCL			0.00	0.19
Malpaís	D				0.11
	%CV				69.90
	LCL				0.03
	UCL				0.40
Mapimí	D	0.00	0.00	0.00	0.03
	%CV	0.00	0.00	0.00	100.22
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.14
Marfa	D			0.03	0.05
	%CV			100.22	70.40
	LCL			0.00	0.01
	UCL			0.14	0.18
Sonoita	D		0.00	0.00	0.00
	%CV		0.00	0.00	0.00
	LCL		0.00	0.00	0.00
	UCL		0.00	0.00	0.00
El Tokio	D	0.22	0.40	0.72	0.54
	%CV	100.18	26.83	24.38	27.37
	LCL	0.03	0.24	0.45	0.32
	UCL	1.52	0.68	1.16	0.92
Valles Centrales	D	0.04	0.00	0.03	0.00
	%CV	100.16	0.00	70.73	0.00
	LCL	0.01	0.00	0.01	0.00
	UCL	0.19	0.00	0.11	0.00
Valle Colombia	D	0.00	0.00	0.06	0.11
	%CV	0.00	0.00	100.22	70.00
	LCL	0.00	0.00	0.01	0.03
	UCL	0.00	0.00	0.31	0.40

Grasshopper Sparrow (*Ammodramus savannarum*) n=880					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	126.43	55.43	108.54	184.72
	%CV	40.48	32.14	18.68	15.13
	LCL	56.55	29.76	75.19	137.15
	UCL	282.67	103.25	156.68	248.80
Janos	D	106.77	5.53	23.99	25.68
	%CV	23.65	57.18	30.19	31.99
	LCL	67.11	1.92	13.33	13.81
	UCL	169.88	15.95	43.18	47.77
Lagunas del Este	D			209.13	9.45
	%CV			17.77	52.23
	LCL			147.31	3.55
	UCL			296.88	25.13
Malpaís	D				161.52
	%CV				23.80
	LCL				100.43
	UCL				259.75
Mapimí	D	183.89	8.03	126.98	68.49
	%CV	24.51	70.40	16.44	26.18
	LCL	111.66	2.27	91.80	41.04
	UCL	302.83	28.45	175.65	114.29
Marfa	D			69.89	9.25
	%CV			33.34	43.82
	LCL			36.63	4.01
	UCL			133.33	21.30
Sonoita	D		35.90	39.90	19.92
	%CV		71.98	27.68	65.32
	LCL		8.67	23.01	5.94
	UCL		148.61	69.19	66.78
El Tokio	D	0.00	4.79	11.61	0.00
	%CV	0.00	70.28	59.31	0.00
	LCL	0.00	1.35	3.87	0.00
	UCL	0.00	17.00	34.78	0.00
Valles Centrales	D	17.39	7.92	51.17	47.70
	%CV	36.05	37.16	21.09	20.55
	LCL	8.64	3.89	33.88	31.91
	UCL	35.00	16.13	77.31	71.30
Valle Colombia	D	57.69	3.97	223.54	3.99
	%CV	61.30	100.14	21.25	100.13
	LCL	12.11	0.73	146.11	0.74
	UCL	274.76	21.54	341.99	21.66

Horned Lark (*Eremophila alpestris*) n=2619					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	9.56	33.41	172.22	114.76
	%CV	77.70	46.09	30.54	25.14
	LCL	2.24	13.24	91.79	68.13
	UCL	40.74	84.29	323.13	193.29
Cuchillas de la Zarca	D	0.00	4.38	0.88	3.39
	%CV	0.00	30.29	70.43	49.33
	LCL	0.00	2.43	0.25	1.34
	UCL	0.00	7.89	3.11	8.55
Janos	D	39.78	77.55	96.43	46.28
	%CV	23.52	12.89	18.41	18.08
	LCL	25.05	60.08	67.05	32.40
	UCL	63.17	100.09	138.69	66.09
Lagunas del Este	D			11.88	18.73
	%CV			63.53	28.49
	LCL			3.72	10.74
	UCL			37.90	32.67
Malpaís	D				0.00
	%CV				0.00
	LCL				0.00
	UCL				0.00
Mapimí	D	0.00	7.83	9.11	23.90
	%CV	0.00	51.81	43.06	20.74
	LCL	0.00	2.96	4.00	15.89
	UCL	0.00	20.72	20.71	35.96
Marfa	D			25.96	21.66
	%CV			29.70	25.38
	LCL			14.55	13.17
	UCL			46.30	35.62
Sonoita	D		43.12	71.89	43.07
	%CV		21.51	19.25	19.59
	LCL		27.05	48.84	29.06
	UCL		68.74	105.83	63.82
El Tokio	D	281.08	155.20	329.67	329.83
	%CV	36.77	12.92	8.75	10.14
	LCL	123.84	120.02	277.01	269.58
	UCL	637.95	200.69	392.34	403.54
Valles Centrales	D	23.87	23.43	55.32	60.70
	%CV	31.95	11.11	13.81	11.71
	LCL	12.79	18.82	42.16	48.20
	UCL	44.57	29.17	72.60	76.46
Valle Colombia	D	0.00	2.38	10.79	10.78
	%CV	0.00	100.03	70.18	58.36
	LCL	0.00	0.44	2.99	3.59
	UCL	0.00	12.92	38.98	32.36

Lark Bunting (*Calamospiza melanocorys*) n=552					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	10.51	0.00	0.00
	%CV	0.00	100.48	0.00	0.00
	LCL	0.00	1.81	0.00	0.00
	UCL	0.00	61.06	0.00	0.00
Cuchillas de la Zarca	D	0.00	17.36	3.88	42.88
	%CV	0.00	36.98	71.06	30.55
	LCL	0.00	8.54	1.09	23.74
	UCL	0.00	35.29	13.79	77.45
Janos	D	104.56	21.95	26.84	6.79
	%CV	37.27	39.90	41.54	74.83
	LCL	51.03	10.22	12.14	1.80
	UCL	214.25	47.12	59.32	25.56
Lagunas del Este	D			124.54	9.99
	%CV			29.89	61.32
	LCL			69.67	3.25
	UCL			222.63	30.77
Malpaís	D				52.08
	%CV				45.57
	LCL				21.63
	UCL				125.42
Mapimí	D	64.83	68.98	523.67	222.68
	%CV	53.99	37.76	14.25	22.13
	LCL	22.80	33.36	396.10	144.44
	UCL	184.33	142.63	692.33	343.32
Marfa	D			17.02	9.78
	%CV			65.28	61.45
	LCL			5.20	3.17
	UCL			55.70	30.17
Sonoita	D		63.28	0.00	0.00
	%CV		57.28	0.00	0.00
	LCL		19.75	0.00	0.00
	UCL		202.70	0.00	0.00
El Tokio	D	0.00	0.00	0.00	15.82
	%CV	0.00	0.00	0.00	59.90
	LCL	0.00	0.00	0.00	5.23
	UCL	0.00	0.00	0.00	47.85
Valles Centrales	D	32.85	13.46	3.01	10.51
	%CV	41.88	37.24	100.49	51.86
	LCL	14.71	6.60	0.58	4.00
	UCL	73.33	27.43	15.71	27.59
Valle Colombia	D	0.00	26.23	10.55	5.28
	%CV	0.00	71.83	70.39	100.45
	LCL	0.00	7.09	2.92	0.97
	UCL	0.00	96.97	38.20	28.72

Long-billed Curlew (*Numenius americanus*) n=53					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	1.61	8.03
	%CV	0.00	0.00	104.37	57.18
	LCL	0.00	0.00	0.27	2.72
	UCL	0.00	0.00	9.63	23.76
Cuchillas de la Zarca	D	0.00	0.88	0.00	0.00
	%CV	0.00	64.48	0.00	0.00
	LCL	0.00	0.28	0.00	0.00
	UCL	0.00	2.83	0.00	0.00
Janos	D	1.20	3.72	1.86	1.04
	%CV	64.26	54.67	72.24	79.95
	LCL	0.37	1.35	0.52	0.26
	UCL	3.84	10.23	6.73	4.18
Lagunas del Este	D			0.38	0.00
	%CV			103.58	0.00
	LCL			0.07	0.00
	UCL			2.07	0.00
Malpaís	D				0.00
	%CV				0.00
	LCL				0.00
	UCL				0.00
Mapimí	D	3.71	1.62	0.38	2.61
	%CV	104.31	84.17	104.36	51.14
	LCL	0.64	0.38	0.07	1.01
	UCL	21.65	6.93	2.11	6.78
Marfa	D			0.37	0.75
	%CV			104.36	76.17
	LCL			0.07	0.20
	UCL			2.04	2.86
Sonoita	D		0.00	0.00	0.00
	%CV		0.00	0.00	0.00
	LCL		0.00	0.00	0.00
	UCL		0.00	0.00	0.00
El Tokio	D	3.20	0.48	0.00	0.48
	%CV	104.48	104.34	0.00	104.38
	LCL	0.47	0.09	0.00	0.09
	UCL	22.02	2.67	0.00	2.68
Valles Centrales	D	0.50	0.00	0.00	0.00
	%CV	104.35	0.00	0.00	0.00
	LCL	0.09	0.00	0.00	0.00
	UCL	2.78	0.00	0.00	0.00
Valle Colombia	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00

Loggerhead Shrike (*Lanius ludovicianus*) n=876					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	1.23	1.64	2.46	1.64
	%CV	54.18	45.48	42.09	58.11
	LCL	0.42	0.66	1.05	0.53
	UCL	3.59	4.09	5.77	5.12
Cuchillas de la Zarca	D	2.27	5.11	4.61	4.14
	%CV	40.01	12.26	12.90	12.05
	LCL	1.02	4.01	3.57	3.27
	UCL	5.03	6.52	5.95	5.26
Janos	D	2.45	3.71	3.33	1.32
	%CV	20.70	17.93	19.90	25.48
	LCL	1.63	2.60	2.25	0.80
	UCL	3.68	5.28	4.93	2.18
Lagunas del Este	D			3.11	3.31
	%CV			18.17	17.10
	LCL			2.17	2.36
	UCL			4.45	4.64
Malpaís	D				6.90
	%CV				16.99
	LCL				4.90
	UCL				9.72
Mapimí	D	2.53	6.21	4.40	6.68
	%CV	34.66	13.93	14.04	10.71
	LCL	1.26	4.71	3.33	5.40
	UCL	5.08	8.18	5.81	8.26
Marfa	D			1.14	1.05
	%CV			33.82	31.03
	LCL			0.59	0.57
	UCL			2.19	1.92
Sonoita	D		1.23	2.06	1.03
	%CV		67.46	34.07	42.23
	LCL		0.32	1.05	0.45
	UCL		4.75	4.03	2.34
El Tokio	D	2.45	1.48	1.56	2.59
	%CV	49.67	28.73	27.28	24.42
	LCL	0.83	0.84	0.91	1.60
	UCL	7.24	2.60	2.66	4.19
Valles Centrales	D	1.54	1.22	2.46	3.10
	%CV	26.06	20.11	16.68	14.43
	LCL	0.92	0.83	1.77	2.34
	UCL	2.57	1.82	3.42	4.12
Valle Colombia	D	0.00	2.45	5.14	3.09
	%CV	0.00	29.32	27.47	24.20
	LCL	0.00	1.37	2.98	1.90
	UCL	0.00	4.40	8.89	5.01

Mountain Bluebird (*Sialia currucoides*) n=104					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	8.63	0.00	0.00	0.00
	%CV	65.54	0.00	0.00	0.00
	LCL	2.47	0.00	0.00	0.00
	UCL	30.17	0.00	0.00	0.00
Cuchillas de la Zarca	D	2.39	0.00	3.50	2.75
	%CV	70.54	0.00	45.28	41.90
	LCL	0.65	0.00	1.49	1.24
	UCL	8.82	0.00	8.23	6.10
Janos	D	3.86	0.00	0.80	2.60
	%CV	54.53	0.00	101.17	48.85
	LCL	1.40	0.00	0.15	1.04
	UCL	10.65	0.00	4.26	6.51
Lagunas del Este	D			0.41	0.00
	%CV			101.21	0.00
	LCL			0.08	0.00
	UCL			2.18	0.00
Malpaís	D				2.56
	%CV				75.28
	LCL				0.66
	UCL				9.96
Mapimí	D	17.29	0.00	2.88	1.61
	%CV	46.56	0.00	56.60	62.47
	LCL	6.98	0.00	1.01	0.51
	UCL	42.87	0.00	8.21	5.03
Marfa	D			1.20	0.40
	%CV			101.17	101.18
	LCL			0.23	0.08
	UCL			6.36	2.13
Sonoita	D		0.00	0.00	0.00
	%CV		0.00	0.00	0.00
	LCL		0.00	0.00	0.00
	UCL		0.00	0.00	0.00
El Tokio	D	3.44	0.00	8.06	1.56
	%CV	100.47	0.00	53.38	101.16
	LCL	0.51	0.00	2.97	0.29
	UCL	23.28	0.00	21.87	8.34
Valles Centrales	D	1.62	0.00	0.00	0.00
	%CV	75.56	0.00	0.00	0.00
	LCL	0.42	0.00	0.00	0.00
	UCL	6.20	0.00	0.00	0.00
Valle Colombia	D	18.78	0.00	0.87	0.00
	%CV	101.20	0.00	101.18	0.00
	LCL	1.90	0.00	0.16	0.00
	UCL	185.53	0.00	4.75	0.00

Mourning Dove (*Zenaida macroura)* n=1023					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	5.56	0.00	0.00	0.00
	%CV	68.67	0.00	0.00	0.00
	LCL	1.50	0.00	0.00	0.00
	UCL	20.60	0.00	0.00	0.00
Cuchillas de la Zarca	D	49.91	51.96	73.75	38.41
	%CV	20.86	14.61	12.85	15.59
	LCL	32.66	38.96	57.26	28.27
	UCL	76.27	69.28	95.00	52.19
Janos	D	57.31	40.58	43.82	35.28
	%CV	18.17	35.19	38.68	48.13
	LCL	40.05	20.56	20.84	14.23
	UCL	82.01	80.09	92.14	87.43
Lagunas del Este	D			48.03	15.84
	%CV			31.95	50.63
	LCL			25.82	6.12
	UCL			89.33	41.01
Malpaís	D				13.76
	%CV				37.24
	LCL				6.63
	UCL				28.56
Mapimí	D	25.69	7.71	41.69	17.45
	%CV	49.77	33.82	17.01	28.78
	LCL	9.69	4.00	29.81	9.96
	UCL	68.06	14.85	58.31	30.59
Marfa	D			16.06	0.65
	%CV			48.45	100.15
	LCL			6.44	0.12
	UCL			40.04	3.40
Sonoita	D		4.18	12.54	8.35
	%CV		100.17	51.62	38.27
	LCL		0.67	4.68	3.94
	UCL		26.14	33.61	17.66
El Tokio	D	5.54	10.86	1.62	3.34
	%CV	100.09	55.20	100.13	48.99
	LCL	0.81	3.87	0.31	1.32
	UCL	37.76	30.48	8.58	8.45
Valles Centrales	D	47.72	2.76	7.15	4.36
	%CV	21.79	37.28	32.68	36.86
	LCL	31.03	1.35	3.81	2.15
	UCL	73.37	5.64	13.42	8.84
Valle Colombia	D	10.07	8.31	22.30	2.79
	%CV	99.95	45.05	36.71	69.90
	LCL	1.00	3.48	10.85	0.77
	UCL	101.04	19.88	45.86	10.02

Mountain Plover (*Charadrius montanus)* n=28					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Janos	D	0.00	0.75	0.00	0.00
	%CV	0.00	78.73	0.00	0.00
	LCL	0.00	0.19	0.00	0.00
	UCL	0.00	2.98	0.00	0.00
Lagunas del Este	D			0.00	0.00
	%CV			0.00	0.00
	LCL			0.00	0.00
	UCL			0.00	0.00
Malpaís	D				0.00
	%CV				0.00
	LCL				0.00
	UCL				0.00
Mapimí	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Marfa	D			0.00	0.00
	%CV			0.00	0.00
	LCL			0.00	0.00
	UCL			0.00	0.00
Sonoita	D		0.00	0.00	0.00
	%CV		0.00	0.00	0.00
	LCL		0.00	0.00	0.00
	UCL		0.00	0.00	0.00
El Tokio	D	8.60	2.92	0.63	3.24
	%CV	103.53	70.19	103.45	76.25
	LCL	1.25	0.83	0.11	0.84
	UCL	59.01	10.29	3.45	12.50
Valles Centrales	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Valle Colombia	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00

Northern Harrier (*Circus cyaneus*) n=581					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.22	0.00	0.00
	%CV	0.00	100.20	0.00	0.00
	LCL	0.00	0.04	0.00	0.00
	UCL	0.00	1.26	0.00	0.00
Cuchillas de la Zarca	D	0.45	0.48	0.60	0.96
	%CV	55.50	27.74	26.31	20.82
	LCL	0.15	0.28	0.36	0.64
	UCL	1.31	0.82	1.00	1.45
Janos	D	1.73	2.62	1.51	0.47
	%CV	18.71	23.21	25.39	30.40
	LCL	1.19	1.66	0.92	0.26
	UCL	2.50	4.13	2.48	0.84
Lagunas del Este	D			1.59	0.88
	%CV			21.49	23.78
	LCL			1.04	0.55
	UCL			2.43	1.40
Malpaís	D				1.08
	%CV				34.35
	LCL				0.55
	UCL				2.11
Mapimí	D	1.51	0.88	1.65	1.77
	%CV	32.20	27.59	19.81	17.03
	LCL	0.79	0.51	1.12	1.26
	UCL	2.88	1.50	2.44	2.47
Marfa	D			1.20	0.40
	%CV			25.34	34.11
	LCL			0.73	0.21
	UCL			1.98	0.78
Sonoita	D		3.92	1.42	1.41
	%CV		25.23	25.72	27.97
	LCL		2.28	0.85	0.81
	UCL		6.73	2.36	2.46
El Tokio	D	0.00	0.33	0.44	0.13
	%CV	0.00	43.55	41.65	70.33
	LCL	0.00	0.14	0.20	0.04
	UCL	0.00	0.75	0.99	0.46
Valles Centrales	D	1.97	1.64	1.18	0.71
	%CV	18.21	13.02	17.30	24.07
	LCL	1.37	1.27	0.84	0.45
	UCL	2.82	2.11	1.66	1.14
Valle Colombia	D	0.00	0.11	1.85	0.44
	%CV	0.00	100.15	27.86	60.04
	LCL	0.00	0.02	1.06	0.14
	UCL	0.00	0.59	3.22	1.34

Red-tailed Hawk (*Buteo jamaicensis*) n=294					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.19	0.19	0.00	0.00
	%CV	100.09	99.97	0.00	0.00
	LCL	0.03	0.03	0.00	0.00
	UCL	1.12	1.12	0.00	0.00
Cuchillas de la Zarca	D	0.80	0.96	0.43	0.48
	%CV	44.20	19.97	27.52	25.33
	LCL	0.33	0.65	0.25	0.29
	UCL	1.92	1.42	0.73	0.79
Janos	D	0.48	0.85	0.27	0.33
	%CV	33.11	21.88	39.71	38.47
	LCL	0.25	0.55	0.13	0.16
	UCL	0.91	1.31	0.58	0.70
Lagunas del Este	D			0.32	0.32
	%CV			36.59	36.54
	LCL			0.16	0.16
	UCL			0.65	0.65
Malpaís	D				1.44
	%CV				26.41
	LCL				0.85
	UCL				2.43
Mapimí	D	0.30	0.44	0.46	0.54
	%CV	69.22	31.70	29.98	29.60
	LCL	0.08	0.24	0.26	0.30
	UCL	1.09	0.81	0.83	0.96
Marfa	D			0.22	0.18
	%CV			43.77	49.23
	LCL			0.10	0.07
	UCL			0.51	0.45
Sonoita	D		1.16	0.78	0.77
	%CV		42.83	36.65	31.89
	LCL		0.47	0.38	0.41
	UCL		2.86	1.59	1.45
El Tokio	D	0.00	0.35	0.34	0.12
	%CV	0.00	45.94	45.99	70.25
	LCL	0.00	0.15	0.14	0.03
	UCL	0.00	0.84	0.81	0.41
Valles Centrales	D	0.78	0.88	0.50	0.36
	%CV	29.57	19.79	22.38	28.85
	LCL	0.44	0.60	0.32	0.20
	UCL	1.40	1.30	0.77	0.63
Valle Colombia	D	0.00	0.19	0.29	0.10
	%CV	0.00	69.85	56.21	100.10
	LCL	0.00	0.05	0.10	0.02
	UCL	0.00	0.69	0.84	0.53

Say's Phoebe (*Sayornis saya*) n=700					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.95	0.95	0.47	0.95
	%CV	68.81	68.66	100.03	68.66
	LCL	0.25	0.25	0.08	0.26
	UCL	3.52	3.50	2.74	3.51
Cuchillas de la Zarca	D	0.65	5.03	5.49	5.03
	%CV	69.74	14.26	13.45	13.33
	LCL	0.18	3.80	4.21	3.87
	UCL	2.40	6.66	7.16	6.54
Janos	D	0.71	0.66	0.44	0.81
	%CV	57.03	39.64	49.15	34.03
	LCL	0.24	0.31	0.17	0.42
	UCL	2.03	1.41	1.11	1.57
Lagunas del Este	D			6.61	3.03
	%CV			18.53	19.86
	LCL			4.59	2.05
	UCL			9.53	4.49
Malpaís	D				5.15
	%CV				23.20
	LCL				3.24
	UCL				8.20
Mapimí	D	5.83	2.74	11.72	9.03
	%CV	29.58	22.49	10.68	11.32
	LCL	3.20	1.76	9.49	7.21
	UCL	10.62	4.27	14.48	11.29
Marfa	D			0.66	0.33
	%CV			39.66	57.12
	LCL			0.31	0.11
	UCL			1.40	0.95
Sonoita	D		2.85	2.37	0.71
	%CV		42.81	30.98	56.20
	LCL		1.16	1.28	0.25
	UCL		7.01	4.38	2.06
El Tokio	D	2.83	2.28	2.48	2.85
	%CV	71.05	23.64	29.21	27.55
	LCL	0.65	1.43	1.40	1.66
	UCL	12.34	3.63	4.40	4.89
Valles Centrales	D	2.66	0.94	0.74	1.01
	%CV	29.00	25.55	38.97	24.61
	LCL	1.51	0.57	0.35	0.63
	UCL	4.70	1.55	1.57	1.64
Valle Colombia	D	3.43	0.71	0.95	0.71
	%CV	61.23	56.11	59.87	56.19
	LCL	0.72	0.24	0.31	0.25
	UCL	16.36	2.05	2.92	2.06

Savannah Sparrow (*Passerculus sandwichensis*) n=1685					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	3.36	0.00
	%CV	0.00	0.00	100.09	0.00
	LCL	0.00	0.00	0.58	0.00
	UCL	0.00	0.00	19.50	0.00
Cuchillas de la Zarca	D	48.74	41.27	73.08	115.51
	%CV	23.24	18.23	19.99	18.93
	LCL	30.37	28.83	49.35	79.64
	UCL	78.23	59.06	108.22	167.52
Janos	D	87.66	15.58	142.61	7.95
	%CV	21.22	32.39	22.60	49.85
	LCL	57.72	8.31	91.47	3.12
	UCL	133.13	29.21	222.34	20.30
Lagunas del Este	D			11.93	0.00
	%CV			58.68	0.00
	LCL			4.04	0.00
	UCL			35.26	0.00
Malpaís	D				29.94
	%CV				38.82
	LCL				14.00
	UCL				64.03
Mapimí	D	25.88	2.54	40.81	25.01
	%CV	40.02	57.04	19.79	28.52
	LCL	11.65	0.88	27.63	14.34
	UCL	57.51	7.33	60.28	43.63
Marfa	D			62.12	0.00
	%CV			31.21	0.00
	LCL			33.87	0.00
	UCL			113.96	0.00
Sonoita	D		30.31	69.07	18.50
	%CV		83.50	33.27	28.95
	LCL		6.12	35.80	10.41
	UCL		150.15	133.26	32.89
El Tokio	D	20.10	18.19	9.80	1.01
	%CV	70.88	57.43	43.39	100.07
	LCL	4.62	6.25	4.27	0.19
	UCL	87.38	52.92	22.48	5.35
Valles Centrales	D	151.06	7.64	24.97	13.43
	%CV	22.41	25.33	24.30	36.72
	LCL	97.02	4.67	15.55	6.64
	UCL	235.20	12.51	40.10	27.14
Valle Colombia	D	36.54	48.58	509.00	151.63
	%CV	40.82	38.45	18.28	38.53
	LCL	12.38	22.87	352.65	71.29
	UCL	107.84	103.18	734.67	322.52

Scaled Quail (*Callipepla squamata*) n=113					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	12.77	27.12	27.27	22.94
	%CV	101.66	36.66	36.63	44.06
	LCL	2.24	13.43	13.51	9.97
	UCL	72.73	54.76	55.03	52.80
Janos	D	32.16	25.72	12.87	7.96
	%CV	63.02	53.56	58.58	71.58
	LCL	10.17	9.48	4.37	2.22
	UCL	101.69	69.78	37.88	28.56
Lagunas del Este	D			17.51	17.57
	%CV			50.77	50.85
	LCL			6.76	6.77
	UCL			45.37	45.57
Malpaís	D				0.00
	%CV				0.00
	LCL				0.00
	UCL				0.00
Mapimí	D	42.73	27.98	22.02	0.00
	%CV	101.03	58.50	45.59	0.00
	LCL	7.53	9.50	9.29	0.00
	UCL	242.43	82.39	52.21	0.00
Marfa	D			12.82	0.00
	%CV			75.39	0.00
	LCL			3.38	0.00
	UCL			48.69	0.00
Sonoita	D		27.81	9.27	0.00
	%CV		100.88	100.94	0.00
	LCL		4.43	1.69	0.00
	UCL		174.39	50.73	0.00
El Tokio	D	0.00	5.56	5.39	5.56
	%CV	0.00	100.93	100.92	100.92
	LCL	0.00	1.04	1.01	1.04
	UCL	0.00	29.71	28.79	29.71
Valles Centrales	D	23.10	63.07	13.21	7.92
	%CV	61.82	24.38	46.05	58.86
	LCL	7.41	39.28	5.55	2.69
	UCL	71.99	101.27	31.43	23.28
Valle Colombia	D	0.00	0.00	27.83	0.00
	%CV	0.00	0.00	74.92	0.00
	LCL	0.00	0.00	7.20	0.00
	UCL	0.00	0.00	107.55	0.00

Short-eared Owl (*Asio flammeus*) n=43					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Janos	D	1.40	1.74	0.87	0.40
	%CV	58.47	62.04	71.51	100.90
	LCL	0.48	0.56	0.24	0.08
	UCL	4.12	5.42	3.13	2.14
Lagunas del Este	D			0.00	0.45
	%CV			0.00	100.91
	LCL			0.00	0.08
	UCL			0.00	2.37
Malpaís	D				0.00
	%CV				0.00
	LCL				0.00
	UCL				0.00
Mapimí	D	0.00	0.47	1.79	5.24
	%CV	0.00	100.91	50.76	32.12
	LCL	0.00	0.09	0.69	2.82
	UCL	0.00	2.52	4.64	9.76
Marfa	D			0.00	0.00
	%CV			0.00	0.00
	LCL			0.00	0.00
	UCL			0.00	0.00
Sonoita	D		0.00	0.00	0.00
	%CV		0.00	0.00	0.00
	LCL		0.00	0.00	0.00
	UCL		0.00	0.00	0.00
El Tokio	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Valles Centrales	D	2.35	1.33	1.07	0.27
	%CV	79.67	45.99	51.18	100.89
	LCL	0.58	0.56	0.41	0.05
	UCL	9.54	3.17	2.79	1.41
Valle Colombia	D	0.00	0.94	0.00	0.00
	%CV	0.00	100.90	0.00	0.00
	LCL	0.00	0.17	0.00	0.00
	UCL	0.00	5.12	0.00	0.00

Sprague's Pipit (*Anthus spragueii*) n=255					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	3.88	0.00	0.00	3.88
	%CV	69.48	0.00	0.00	69.50
	LCL	1.04	0.00	0.00	1.04
	UCL	14.51	0.00	0.00	14.52
Cuchillas de la Zarca	D	0.00	7.11	10.37	6.87
	%CV	0.00	28.79	27.44	26.10
	LCL	0.00	4.07	6.08	4.14
	UCL	0.00	12.43	17.66	11.42
Janos	D	4.82	2.70	4.50	2.09
	%CV	40.09	47.38	31.74	45.03
	LCL	2.24	1.10	2.43	0.89
	UCL	10.38	6.60	8.32	4.90
Lagunas del Este	D			0.92	1.84
	%CV			100.63	50.13
	LCL			0.17	0.72
	UCL			4.86	4.72
Malpaís	D				2.88
	%CV				100.66
	LCL				0.53
	UCL				15.71
Mapimí	D	0.00	0.00	1.85	2.26
	%CV	0.00	0.00	50.21	53.17
	LCL	0.00	0.00	0.72	0.84
	UCL	0.00	0.00	4.74	6.08
Marfa	D			0.45	3.61
	%CV			100.62	43.53
	LCL			0.08	1.58
	UCL			2.37	8.25
Sonoita	D		0.00	9.72	0.97
	%CV		0.00	38.51	100.65
	LCL		0.00	4.59	0.18
	UCL		0.00	20.60	5.30
El Tokio	D	11.60	5.83	10.18	9.33
	%CV	71.65	34.28	28.97	31.44
	LCL	2.66	3.00	5.79	5.06
	UCL	50.55	11.33	17.91	17.20
Valles Centrales	D	4.24	6.34	0.83	1.94
	%CV	37.42	23.65	58.33	43.56
	LCL	2.06	4.00	0.29	0.85
	UCL	8.73	10.04	2.42	4.42
Valle Colombia	D	0.00	1.93	15.56	7.78
	%CV	0.00	70.59	38.04	45.69
	LCL	0.00	0.53	7.41	3.23
	UCL	0.00	7.02	32.69	18.76

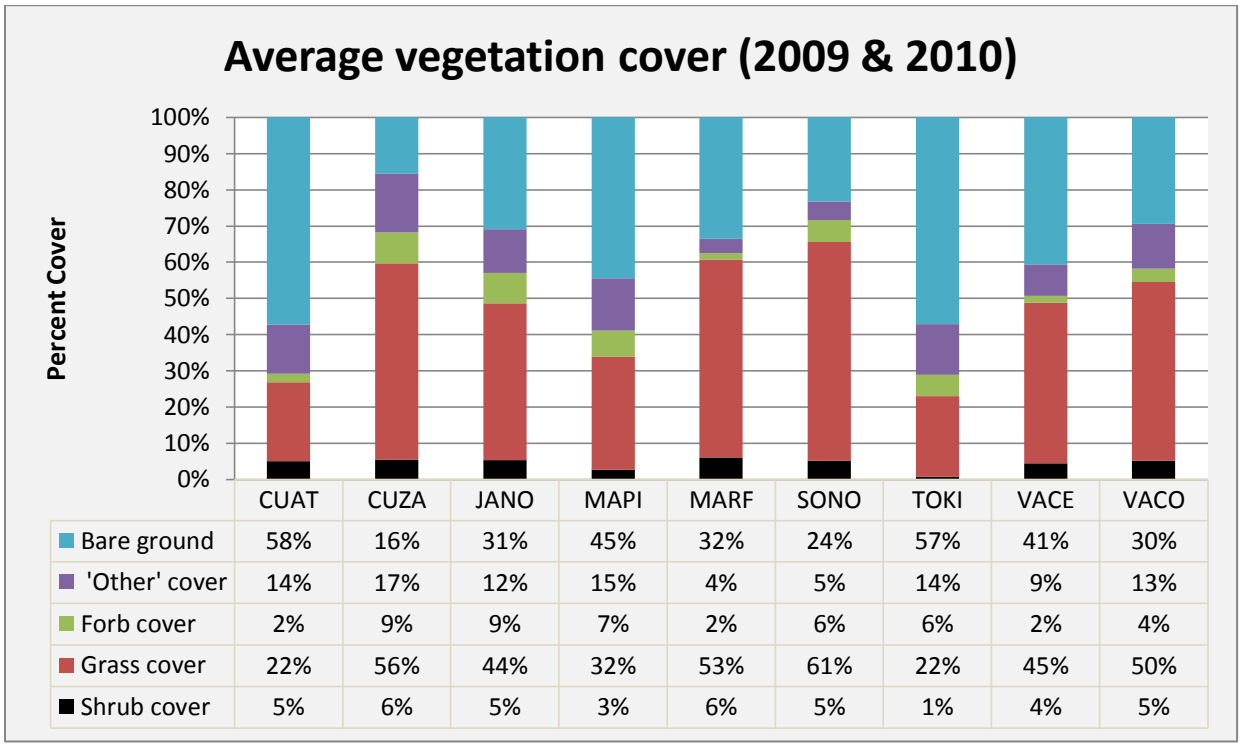
Vesper Sparrow (*Pooecetes gramineus*) n=4890					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	2.79	0.00	0.00	0.00
	%CV	100.20	0.00	0.00	0.00
	LCL	0.48	0.00	0.00	0.00
	UCL	16.18	0.00	0.00	0.00
Cuchillas de la Zarca	D	25.03	166.57	233.76	279.57
	%CV	27.58	9.09	8.31	9.74
	LCL	14.31	139.16	198.37	230.65
	UCL	43.80	199.38	275.48	338.87
Janos	D	157.91	56.21	145.46	16.19
	%CV	11.47	18.63	16.98	34.71
	LCL	125.78	38.92	104.00	8.28
	UCL	198.26	81.19	203.45	31.67
Lagunas del Este	D			285.76	13.24
	%CV			15.08	33.80
	LCL			212.03	6.88
	UCL			385.12	25.49
Malpaís	D				212.51
	%CV				15.12
	LCL				156.73
	UCL				288.14
Mapimí	D	88.03	66.78	325.30	169.87
	%CV	23.46	31.55	10.96	13.12
	LCL	54.51	36.13	261.79	131.01
	UCL	142.16	123.42	404.21	220.27
Marfa	D			93.41	0.00
	%CV			23.87	0.00
	LCL			58.46	0.00
	UCL			149.25	0.00
Sonoita	D		213.76	92.25	22.33
	%CV		22.39	14.92	26.16
	LCL		131.59	68.30	13.25
	UCL		347.25	124.58	37.63
El Tokio	D	11.12	9.22	4.88	0.84
	%CV	100.00	44.03	51.63	100.05
	LCL	1.63	3.97	1.85	0.16
	UCL	75.76	21.40	12.89	4.44
Valles Centrales	D	299.38	59.03	88.43	31.83
	%CV	10.10	7.13	14.18	18.49
	LCL	244.85	51.28	66.90	22.14
	UCL	366.05	67.94	116.89	45.74
Valle Colombia	D	111.13	73.65	356.55	67.09
	%CV	67.89	26.06	14.17	28.33
	LCL	20.16	43.79	268.02	38.18
	UCL	612.75	123.89	474.33	117.88

Western Meadowlark (*Sturnella neglecta*) n = 486					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.69	0.00	0.00	0.00
	%CV	100.29	0.00	0.00	0.00
	LCL	0.12	0.00	0.00	0.00
	UCL	4.03	0.00	0.00	0.00
Cuchillas de la Zarca	D	1.92	1.40	1.92	3.08
	%CV	60.09	39.48	27.05	26.50
	LCL	0.61	0.66	1.13	1.84
	UCL	6.03	2.98	3.25	5.15
Janos	D	1.38	1.45	0.97	3.73
	%CV	42.84	45.51	46.85	29.60
	LCL	0.61	0.61	0.40	2.10
	UCL	3.12	3.43	2.34	6.64
Lagunas del Este	D			9.37	0.66
	%CV			21.85	49.76
	LCL			6.10	0.26
	UCL			14.38	1.68
Malpaís	D				0.34
	%CV				100.29
	LCL				0.06
	UCL				1.87
Mapimí	D	6.42	0.70	1.65	1.13
	%CV	46.22	61.12	34.02	51.30
	LCL	2.59	0.23	0.86	0.43
	UCL	15.92	2.15	3.19	2.96
Marfa	D			24.07	4.52
	%CV			15.87	26.23
	LCL			17.62	2.71
	UCL			32.87	7.54
Sonoita	D		0.00	0.35	0.35
	%CV		0.00	100.38	100.40
	LCL		0.00	0.06	0.06
	UCL		0.00	1.89	1.89
El Tokio	D	0.00	1.88	2.23	7.31
	%CV	0.00	55.18	38.82	45.52
	LCL	0.00	0.67	1.05	3.07
	UCL	0.00	5.27	4.70	17.39
Valles Centrales	D	1.95	0.00	0.79	0.20
	%CV	39.14	0.00	50.14	70.96
	LCL	0.92	0.00	0.31	0.06
	UCL	4.15	0.00	2.03	0.70
Valle Colombia	D	5.03	0.00	10.10	0.70
	%CV	100.29	0.00	30.84	100.38
	LCL	0.50	0.00	5.49	0.13
	UCL	50.34	0.00	18.56	3.79

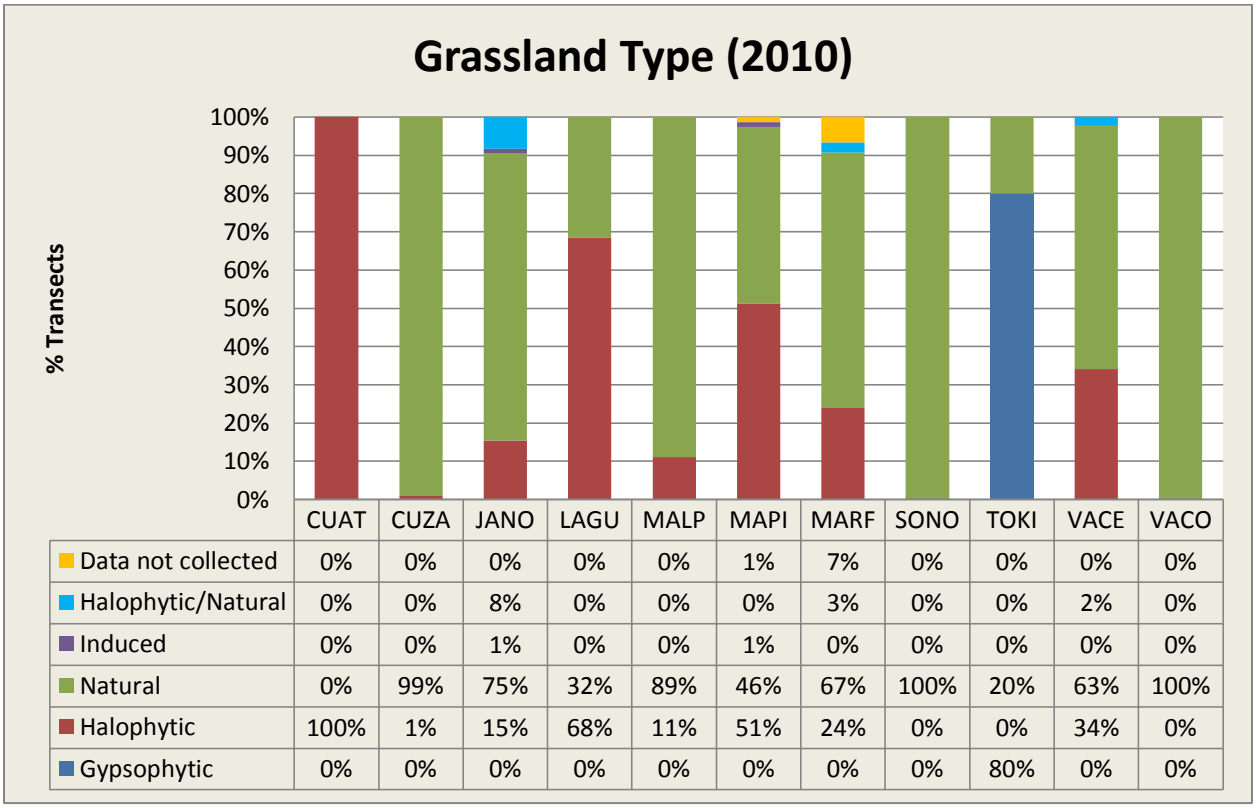
White-tailed Kite (*Elanus leucurus*) n=39					
GPCA		**2007**	**2008**	**2009**	**2010**
Cuatro Ciénegas	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Cuchillas de la Zarca	D	0.13	0.00	0.00	0.00
	%CV	102.81	0.00	0.00	0.00
	LCL	0.02	0.00	0.00	0.00
	UCL	0.72	0.00	0.00	0.00
Janos	D	0.09	0.46	0.00	0.00
	%CV	102.38	47.73	0.00	0.00
	LCL	0.02	0.19	0.00	0.00
	UCL	0.49	1.13	0.00	0.00
Lagunas del Este	D			0.13	0.09
	%CV			61.09	73.56
	LCL			0.04	0.02
	UCL			0.39	0.32
Malpaís	D				0.09
	%CV				102.34
	LCL				0.02
	UCL				0.50
Mapimí	D	0.00	0.27	0.17	0.13
	%CV	0.00	45.08	53.70	61.07
	LCL	0.00	0.12	0.06	0.04
	UCL	0.00	0.64	0.47	0.39
Marfa	D			0.00	0.00
	%CV			0.00	0.00
	LCL			0.00	0.00
	UCL			0.00	0.00
Sonoita	D		0.00	0.00	0.09
	%CV		0.00	0.00	102.38
	LCL		0.00	0.00	0.02
	UCL		0.00	0.00	0.50
El Tokio	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00
Valles Centrales	D	0.11	0.05	0.03	0.00
	%CV	73.45	73.76	102.39	0.00
	LCL	0.03	0.01	0.00	0.00
	UCL	0.42	0.19	0.14	0.00
Valle Colombia	D	0.00	0.00	0.00	0.00
	%CV	0.00	0.00	0.00	0.00
	LCL	0.00	0.00	0.00	0.00
	UCL	0.00	0.00	0.00	0.00

APPENDIX C. RESULTS OF HABITAT SURVEYS IN GPCAS: VEGETATION COVER, GRASSLAND TYPE, TOPOGRAPHY AND LANDOWNERSHIP.

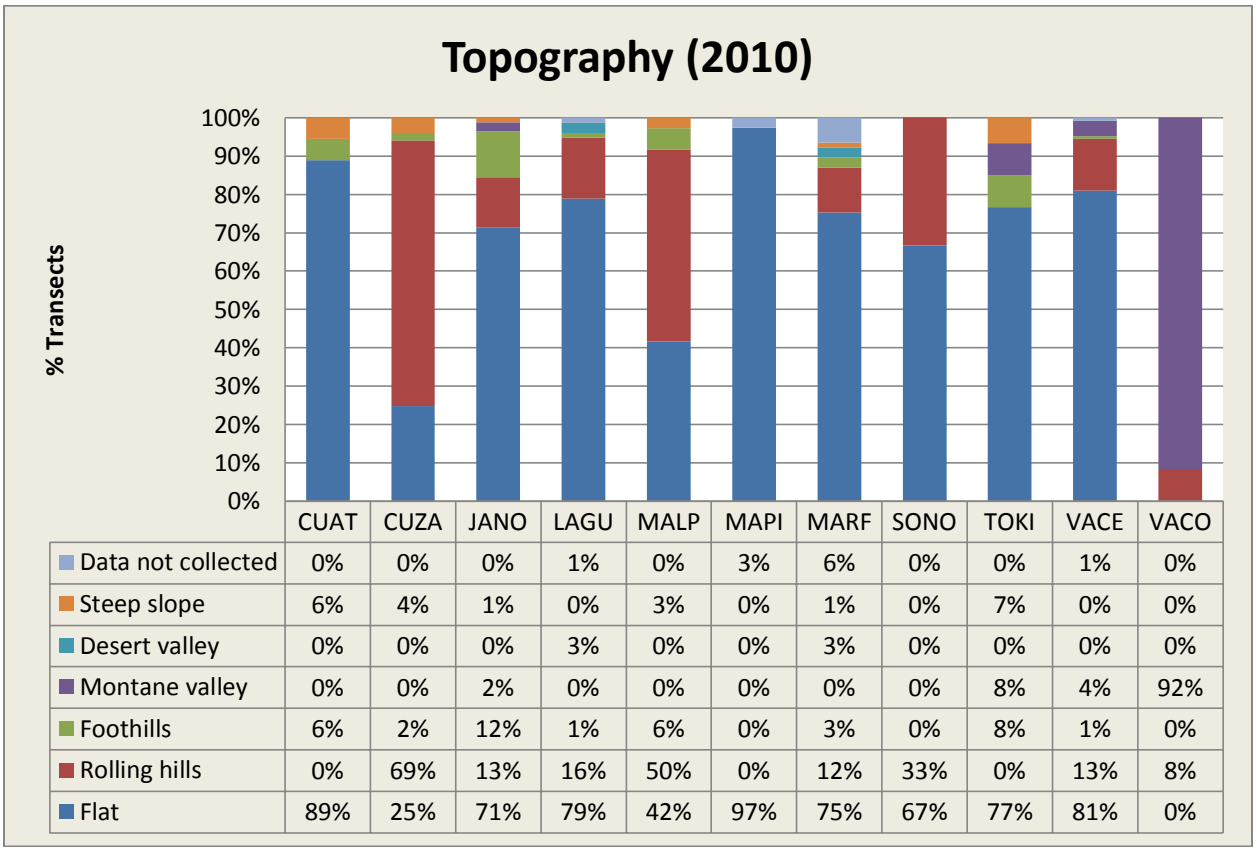
GPCAs: CUAT=Cuatro Ciénegas; CUZA=Cuchillas de la Zarca; JANO=Janos; MAPI=Mapimí; MARF=Marfa; SONO=Sonoita; TOKI=El Tokio; VACE=Valles Centrales; VACO=Valle Colombia



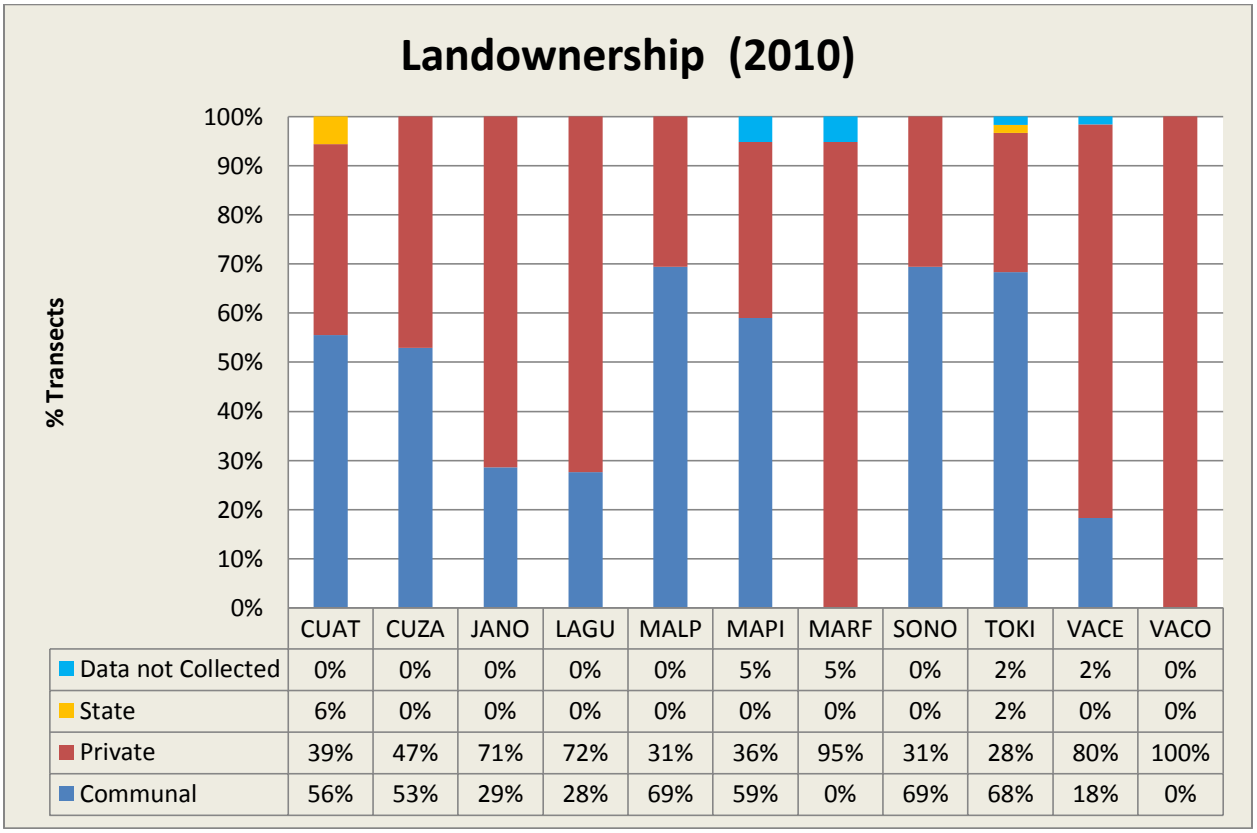
	CUAT	CUZA	JANO	MAPI	MARF	SONO	TOKI	VACE	VACO
Bare ground	58%	16%	31%	45%	32%	24%	57%	41%	30%
'Other' cover	14%	17%	12%	15%	4%	5%	14%	9%	13%
Forb cover	2%	9%	9%	7%	2%	6%	6%	2%	4%
Grass cover	22%	56%	44%	32%	53%	61%	22%	45%	50%
Shrub cover	5%	6%	5%	3%	6%	5%	1%	4%	5%



	CUAT	CUZA	JANO	LAGU	MALP	MAPI	MARF	SONO	TOKI	VACE	VACO
Data not collected	0%	0%	0%	0%	0%	1%	7%	0%	0%	0%	0%
Halophytic/Natural	0%	0%	8%	0%	0%	0%	3%	0%	0%	2%	0%
Induced	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%
Natural	0%	99%	75%	32%	89%	46%	67%	100%	20%	63%	100%
Halophytic	100%	1%	15%	68%	11%	51%	24%	0%	0%	34%	0%
Gypsophytic	0%	0%	0%	0%	0%	0%	0%	0%	80%	0%	0%



	CUAT	CUZA	JANO	LAGU	MALP	MAPI	MARF	SONO	TOKI	VACE	VACO
Data not collected	0%	0%	0%	1%	0%	3%	6%	0%	0%	1%	0%
Steep slope	6%	4%	1%	0%	3%	0%	1%	0%	7%	0%	0%
Desert valley	0%	0%	0%	3%	0%	0%	3%	0%	0%	0%	0%
Montane valley	0%	0%	2%	0%	0%	0%	0%	0%	8%	4%	92%
Foothills	6%	2%	12%	1%	6%	0%	3%	0%	8%	1%	0%
Rolling hills	0%	69%	13%	16%	50%	0%	12%	33%	0%	13%	8%
Flat	89%	25%	71%	79%	42%	97%	75%	67%	77%	81%	0%



	CUAT	CUZA	JANO	LAGU	MALP	MAPI	MARF	SONO	TOKI	VACE	VACO
Data not Collected	0%	0%	0%	0%	0%	5%	5%	0%	2%	2%	0%
State	6%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%
Private	39%	47%	71%	72%	31%	36%	95%	31%	28%	80%	100%
Communal	56%	53%	29%	28%	69%	59%	0%	69%	68%	18%	0%