

## **Chapter 1 Richness and conservation of the birdlife of the municipality of San Felipe Orizatlan, Hidalgo, Mexico**

### **Capítulo 1 Riqueza y conservación de la avifauna del municipio de San Felipe Orizatlán, Hidalgo, México**

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## Abstract

Between 2020 and 2021, a bird inventory was conducted in the municipality of San Felipe Orizatlán, Hidalgo. A total of 213 bird species were recorded through visual and auditory observations, captures, collections and photographic records. We found 136 resident species, 41 species catalogued as winter visitors, 17 species considered as winter passage visitors, 10 migratory species, nine species are summer visitors and 12 bird species have populations with more than one seasonality category. In the case of 15 species in some category of endemism for Mexico, including four species exclusive to the country. In addition, 28 species were identified in risk categories according to the Mexican Official Standard, three of which are considered in danger of extinction. The analysis of species by vegetation type showed that the greatest richness was found in the secondary vegetation of the medium subperennial rainforest with 126 species, followed by the preserved medium subperennial rainforest with 86 species, riparian vegetation with 83 species, urban areas with 69 species and tropical oak forests with 60 species. In conclusion, the municipality of San Felipe Orizatlán has a high richness of both resident and migratory species that should be protected, especially the sites with relatively conserved vegetation cover that can serve as habitat for species that are in some category of risk.

## Vertebrates, Birds, Inventory, Geographic distribution, Conservation, Ecology, Huasteca region

### Resumen

Entre el 2020 y 2021 se realizó un inventario de aves en el municipio de San Felipe Orizatlán, Hidalgo. Se registraron 213 especies de aves mediante observaciones visuales, auditivas, capturas, colectas y registros fotográficos. Se encontraron 136 especies residentes, 41 especies catalogadas como visitantes de invierno, 17 especies consideradas como visitante de invierno de paso, 10 especies migratorias de paso, nueve especies son visitantes de verano y 12 especies de aves tienen poblaciones con más de una categoría de estacionalidad. En el caso de 15 especies en alguna categoría de endemismo para México, incluyendo cuatro especies exclusivas del país. Además, se identificaron 28 especies en categorías de riesgo según la Norma Oficial Mexicana, siendo tres de ellas consideradas en peligro de extinción. El análisis de especies por tipo de vegetación refleja que la mayor riqueza se presentó en la vegetación secundaria de la selva mediana subperenifolia con 126 especies, seguida por la selva mediana subperenifolia conservada con 86 especies, la vegetación riparia con 83 especies, las zonas urbanas con 69 especies y los bosques de encino tropical con 60 especies. En conclusión, el municipio de San Felipe Orizatlán presenta una alta riqueza de especies tanto residentes como migratorias que debería ser protegida, principalmente los sitios con cobertura vegetal relativamente conservada que pueden servir de hábitat para especies que se encuentran en alguna categoría de riesgo.

## Vertebrados, Aves, Inventario, Distribución geográfica, Conservación, Ecología, Región Huasteca

### 1 Introduction

Local bird studies are indispensable to broaden knowledge of the geographical distribution, ecology and conservation of this group of vertebrates. Avifaunal inventories in the Neotropics are necessary, as there are still information gaps in many regions, which limits the long-term conservation of birds (Rojas-Soto and Oliveras de Ita, 2005).

In general, the development of avifaunal inventories in Mexico and the Neotropics has been characterised by a notorious lack of continuity (Escalante *et al.*, 1993). Therefore, inventories at a municipal scale can help us to understand the relationships and changes in species richness at a local level within natural environmental heterogeneity, such as between areas with different degrees of disturbance (Villa-Bonilla *et al.*, 2008). Conducting bird inventories at the local level not only contributes to the preservation of biological diversity, but also provides valuable information that can influence decision-making at the community and governmental levels.

In Mexico, several central Mexican states have partial avifaunal inventories, such as Hidalgo, which until 1994 had only 28 studies corresponding to different ornithological topics (Rodríguez-Yáñez *et al.*, 1994). This has generated a partial knowledge of the areas of greatest bird richness and diversity in this entity (Martínez-Morales *et al.*, 2007). However, the potential richness of the Huasteca region, located in the northeastern part of the state of Hidalgo, has not been accurately assessed, resulting in an almost total lack of knowledge of the avifauna in several municipalities in the region (Valencia-Herverth *et al.*, 2008).

The purpose of this study is to contribute to the avifaunal knowledge of the Huasteca region, mainly in the municipality of San Felipe Orizatlán, Hidalgo. This will be done by evaluating the richness and abundance of the birds present in the different types of vegetation and land use present in this municipality, which will contribute to future studies so that bird management and conservation plans can be drawn up at the municipal level.

In this context, this paper explores the importance of conducting bird inventories at the municipal level, highlighting their role in biodiversity conservation, promoting sustainable practices and strengthening the connection between communities and their natural environment. A detailed understanding of local avifauna is not only essential for preserving natural heritage, but also contributes to building communities that are more resilient and aware of the importance of caring for the natural heritage they share.

## 1.1 Methodology

### 1.1.1 Study area

The municipality of San Felipe Orizatlán is located in the northeast of Hidalgo, with a surface area of 3602.7 km<sup>2</sup>, representing 1.77% of the state's surface area. It is located at 21° 24', 21° 06' north latitude and 98° 28', 98° 42' west longitude. Its altitude ranges from 80 to 660 metres above sea level (INEGI, 2004). The municipality has a semi-warm humid climate with year-round rainfall (A)C(f), with an average annual ambient temperature of 25°C and annual precipitation between 1,200 and 3,000 mm (Hernández-Cerda and Carrasco-Anaya, 2004). The vegetation types present are medium sub-evergreen forest, tropical oak forest (*Quercus* spp.), riparian vegetation (Puig, 1976). In addition, there is a mosaic of secondary vegetation, cattle pasture, agricultural crops and urbanised areas.

### 1.1.2 Field work

The present research was carried out from March 2020 to November 2021 in 57 sampling points in the municipality of San Felipe Orizatlán, in the northeast of the state of Hidalgo, these areas presented natural vegetation (i.e., medium sub evergreen forest, oak forest, riparian vegetation) and anthropized areas (secondary vegetation, urban vegetation and cattle pasture). The choice of sampling localities was made on the basis of the richness and activity of birds observed with the naked eye. In addition, the degree of conservation of the vegetation type in the area (Fig. 1).

The intensive search census method was used, which consists of carrying out a series of consecutive censuses in different previously known areas, where the observer records the species detected without the strict limitation of the time of day (Villaseñor and Santana, 2003). In addition, it increases the probability of detecting inconspicuous or silent species (Ralph *et al.*, 1996). Species detection was carried out by means of visual and auditory records and the collection of specimens. For visual records, 10 x 50 mm binoculars were used, and species identification was carried out with the help of different field guides (Peterson and Chalif, 1989; Howell and Webb, 1995; National Geographic, 2002; Sibley, 2000 and Kaufman, 2005).

To complement the inventory, auditory recordings were used, using bird songs obtained from CDs (Boesman, 2005) to compare and determine the songs of some species that were not observed. Four 3 x 12 m mist nets with 35 mm mesh aperture were used to collect specimens, which were placed in the undergrowth 20 cm above the ground.

### 1.2.3 Data analysis

The systematic listing follows the order proposed by the American Ornithological Society and its latest supplements (Chesser *et al.*, 2023). Bird endemism is based on the criteria established by González-García and Gómez de Silva (2003), where an endemic species (e) is considered to be one that is only found in Mexico; a quasi-endemic (q) is one whose distribution invades no more than 35,000 km<sup>2</sup> into another neighbouring country; a semi-endemic species (s) is considered as such when they are endemic to a country or region during one season of the year. The risk categories were taken from the criteria established in the Norma Oficial Mexicana (SEMARNAT, 2010), and as indicated by the International Union for Conservation of Nature (IUCN, 2023).

The seasonality of the avifauna was determined through literature review following the criteria established by Howell and Webb (1995), whose categories are: breeding resident (R), winter visitor (VI), summer resident (V), winter visitor/migratory passage (IP) and migratory passage (MP). The abundance of the species studied was grouped into three categories: abundant (A) species recorded with more than 15 individuals per month; scarce (E) species not recorded continuously, but with five to 14 individuals observed and rare (R) species not observed in long periods of time with four or less individuals (Coates-Estrada *et al.*, 1985; Bojorges, 2004).

Richness by vegetation type (medium sub-evergreen forest, tropical oak forest (*Quercus* spp.), riparian vegetation, secondary vegetation, cattle pasture, agricultural crops and urbanised areas) was determined by considering the site where each species was recorded during the study. Species accumulation models (Herzog *et al.*, 2002) were used to determine the degree of completeness of the listing, where all data from systematic sampling plus casual records were considered. Non-parametric estimators such as Jackknife 1 and Bootstrap in EstimateS Ver. 9.1 (Colwell, 2013) were used for this purpose, as they allow the use of presence-absence data and do not assume "a priori" a type of distribution of the dataset (Moreno, 2001). Sampling months served as the unit of effort and the curve was fitted based on 100 random repetitions according to the order of the samples (Colwell and Coddington, 1994), with the results obtained plotting the observed richness and the estimated richness.

### 1.3 Results and discussion

Twenty-two orders, 55 families and 213 species of birds were recorded for the municipality of San Felipe Orizatlán (Appendix 1). The best represented family is Parulidae with 18 species, followed by Icteridae with 16 species, Tyrannidae with 15 species, Ardeidae with 13 species, Accipitridae with 11 species and Cardinalidae with 10 species. According to the non-parametric estimators, between 81% and 90% of the bird species present in the municipality of San Felipe Orizatlán were recorded. According to the Jackknife 1 estimator, 263 species are expected and the Bootstrap estimator estimates the presence of 238 species (Fig. 1.1). The analysis of the sampling data through the species accumulation curve shows that in the first five months more than 50% of the species were recorded, complemented by the months of December and January in which most of the winter visitor species were recorded.

As for species endemic to Mexico, 15 species were found in some category of endemism: four species endemic to Mexico (*Psittacara holochlorus*, *Amazona viridigenalis*, *Momotus coeruliceps*, *Catharus occidentalis*). In addition, six species (*Amazilia yucatanensis*, *Corvus imparatus*, *Toxostoma longirostre*, *Arremonops rufivirgatus*, *Icterus graduacauda*, *Basileuterus rufifrons*) are considered quasi endemic and five species (*Cyananthus latirostris*, *Tyrannus vociferans*, *Vireo cassinii*, *I. cucullatus*, *I. bullockii*) are considered semi endemic. Four introduced species (*Bubulcus ibis*, *Columba livia*, *Streptopelia decaocto*, *Passer domesticus*) were also recorded.

There were 28 species in one of the risk categories in the Official Mexican Standard (SEMARNAT, 2010). Of these, three species (*Cairina moschata*, *Amazona viridigenalis*, *Setophaga chrysoparia*) are considered endangered. Seven species are listed as endangered and 18 species are under special protection criteria under Mexican law. At the international level, two species (*A. viridigenalis* and *S. chrysoparia*) are considered Endangered (EN) and four species (*Colinus virginianus*, *Egretta rufescens*, *Vireo bellii*, *Passerina ciris*) are in the Near Threatened (NT) category, populations of these birds are declining globally and protection measures are urgently needed (IUCN, 2023).

A total of 136 species were recorded as permanent residents, 41 as winter visitors, 17 as winter passage visitors, 10 as passage migrants, nine as summer visitors. In the case of 12 species of birds (*Chaetura vauxi*, *Himantopus mexicanus*, *Ardea alba*, *Egretta thula*, *E. caerulea*, *E. tricolor*, *Buteo jamaicensis*, *Petrochelidon pyrrhonota*, *Polioptila caerulea*, *Troglodytes aedon*, *Molothrus ater*) have populations with different seasonality, so they share some of the categories mentioned, such is the case of *Chaetura vauxi*, which has resident populations and others are winter visitors passing through. *Petrochelidon pyrrhonota* has summer visitor and migratory populations. For eight species (*Ardea alba*, *Egretta caerulea*, *E. thula*, *E. tricolor*, *Buteo jamaicensis*, *Troglodytes aedon*, *Polioptila caerulea*, *Molothrus ater*), they have both resident and winter visitor populations. Species abundance varied widely, with 91 species being rare with abundances of less than four individuals, 50 species were considered scarce and 72 species had high abundances (Appendix 1).

The analysis of species by vegetation type showed that the highest species richness was found in the secondary vegetation of the medium subperennial rainforest with 126 species, followed by the conserved medium subperennial rainforest with 86 species, riparian vegetation with 83 species, urban areas with 69 species and tropical oak forests with 60 species. Livestock pastures and agricultural crops had similar species richness (48 and 46 species, respectively), with the secondary vegetation of oak forests having the lowest number of species with only 21. Most of the vegetation cover present in the municipality is under different degrees of disturbance, which has generated a mosaic of medium-sized forest fragments and regenerating secondary vegetation, the latter being the ones that contribute the most species to this study (Fig. 1.2). Taking into account the exclusivity that many species have to the different habitats, this varied greatly, with riparian vegetation representing a very high exclusivity with 23 species, followed by the secondary vegetation of the medium-sized forest with 13 species and the oak forests with 10 species (Fig. 1.2).

#### 1.4 Conclusions

The study conducted in the municipality of San Felipe Orizatlán has provided valuable information on avifaunal diversity in the region. With a total of 213 species recorded, it is estimated that between 81% and 90% of the avifauna present in the area has been covered according to the Jackknife 1 and Bootstrap estimators. In this municipality there is evidence that 42.5% of birds recorded for the state of Hidalgo (Ortiz-Pulido and Zuria, 2017) may be present at some time of the year. For the first time, 183 bird species are recorded for the municipality of San Felipe Orizatlán, as there was only evidence of 30 species in a partial inventory published in 1977 (Bjelland and Ray, 1977).

Of note is the presence of 15 species in some category of endemism for Mexico, including four species exclusive to the country (*Psittacara holochlorus*, *Amazona viridigenalis*, *Momotus coeruliceps*, *Catharus occidentalis*). In addition, 28 species were identified in risk categories according to the Mexican Official Standard, three of which are considered endangered. At the international level, two species are in the Endangered category and four in the Near Threatened category.

The temporal distribution of the birds reveals that the dynamics of the avifauna changed according to the seasons of the year, with a higher proportion of resident birds with 61% (136 species). The 41 species catalogued as winter visitors reveal the strong seasonal influence on the local avifauna. These birds find temporary refuge in the municipality during the colder months, and the presence of these species not only increases the diversity observed, but also acts as an indicator of the health of the ecosystem, the quality of the environment and the resources available in relation to the seasons of the year (Díaz-Bohórquez *et al.*, 2021).

The 10 migratory passage species (*Coccyzus americanus*, *Archilochus colubris*, *Pluvialis dominica*, *Ictinia mississippiensis*, *Tyrannus forficatus*, *Vireo olivaceus*, *Petrochelidon pyrrhonota*, *Icterus spurius*, *Setophaga chrysoparia*, *Piranga olivacea*) underline the importance of the municipality in the global network of bird habitats. These birds use the region as a stopover point on their migratory journeys, highlighting the relevance of maintaining healthy ecosystems and migratory corridors to ensure the success of these annual movements (Cotton *et al.*, 2009). The recording of these species is not only a testament to the connectivity of habitats globally, but also a call to action to conserve and protect these essential corridors.

The presence of nine species listed as summer visitors (*Cypseloides niger*, *Anthracothorax prevostii*, *Ictinia plumbea*, *Myiodynastes luteiventris*, *Legatus leucophaeus*, *Progne chalybea*, *Hirundo rustica*, *Petrochelidon pyrrhonota*, *Cyanerpes cyaneus*) suggests that the municipality serves as a temporary habitat for birds that take advantage of the resources available during the warm season. This phenomenon not only contributes to the diversity of species observed but may also have important implications in terms of the genetic diversity and adaptability of local populations.

Overall, the diversity of migratory birds in this inventory not only expands the list of species recorded, but also highlights the need to consider movement dynamics and habitat interconnectedness in conservation efforts at the municipal and regional levels. The study area incurs a high degree of migratory birds at different times of the year (Cotton *et al.*, 2009), so it is essential to conserve the potential sites where these birds arrive, which not only benefits the migratory birds themselves, but also enriches and strengthens the local ecosystem.

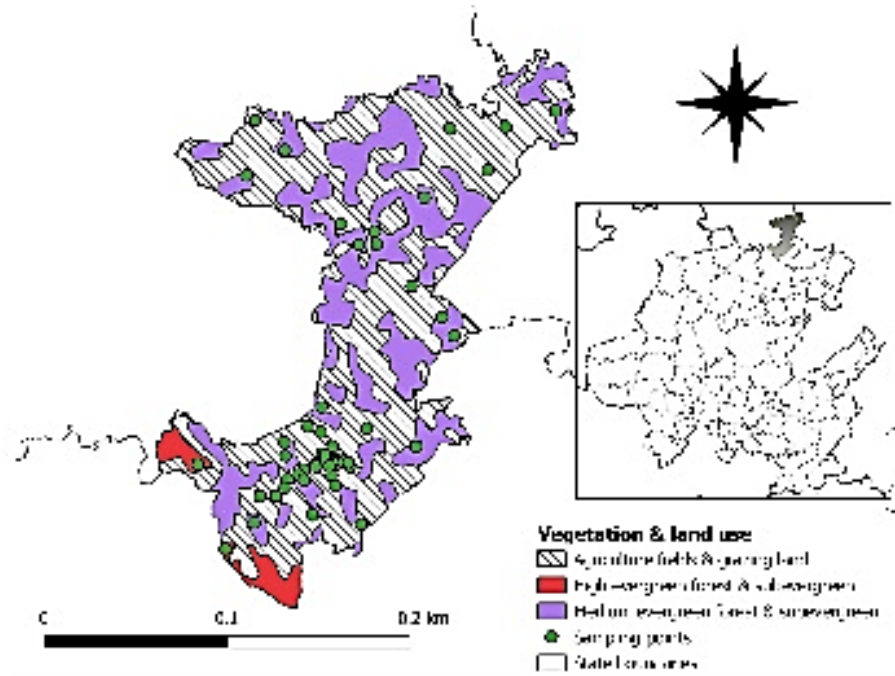
In summary, the detailed analysis of species according to vegetation type clearly reveals the close relationship between avifaunal richness and habitat diversity in the area studied (Sáenz *et al.*, 2006). The preservation of the secondary vegetation of the subperennial medium rainforest and the preserved subperennial medium rainforest is a priority to maintain the biodiversity of both resident and migratory birds in this region (Rappole, 1983). The significant presence of species in urban areas also underlines the importance of considering conservation strategies in anthropogenic environments (Bautista-Trejo *et al.*, 2023). This suggests the need to implement measures to mitigate the negative impacts of urbanisation on natural habitats and to foster harmonious coexistence between birds and human communities (Barragán and Silva, 2023).

Riparian vegetation, or riverine vegetation, emphasises its importance as an ecological corridor and vital habitat for a wide variety of birds. These riparian environments often provide a unique combination of resources, such as food, shelter and breeding sites, which attract diverse bird species (Ruvalcaba-Ortega *et al.*, 2008; Balderas-SanMiguel *et al.*, 2020). In this habitat 83 bird species were recorded, which could play a fundamental role in the conservation of aquatic and water body-associated species such as birds belonging to the families Anatidae, Podicipedidae, Rallidae, Recurvirostridae, Charadriidae, Jacanidae, Scolopacidae, Laridae, Ciconiidae, Anhingidae, Phalacrocoracidae, Pelecanidae, Ardeidae, Threskiornithidae and Alcedinidae. As these areas often harbour aquatic ecosystems such as rivers and streams, they can be essential for birds that depend on these specific habitats for their subsistence, being a refuge for 38 species were migratory in this area. The connectivity offered by these riparian areas can facilitate bird migration and promote interaction between populations, thus contributing to genetic health and population dynamics (Ruvalcaba-Ortega *et al.*, 2008). Riparian vegetation is a valuable component of the landscape, contributing significantly to the richness of bird species in the municipality. Its conservation and sustainable management are necessary to ensure the preservation of biological diversity and the healthy functioning of aquatic ecosystems, as well as to maintain connectivity between different habitats.

These results underline the importance of conserving and protecting different habitats used by birds in San Felipe Orizatlán, especially for those species at risk of extinction. The study provides a solid basis for future research and conservation actions, contributing to the understanding and preservation of the rich avian biodiversity in the region. In conclusion, the municipality of San Felipe Orizatlán has a high richness of both resident and migratory species that should be protected, mainly sites with relatively conserved vegetation cover that can serve as habitat for species that are in some category of risk such as *Cairina moschata*, *Amazona viridigenalis* and *Setophaga chrysoparia* that are considered endangered and require protection of their populations at the local level.

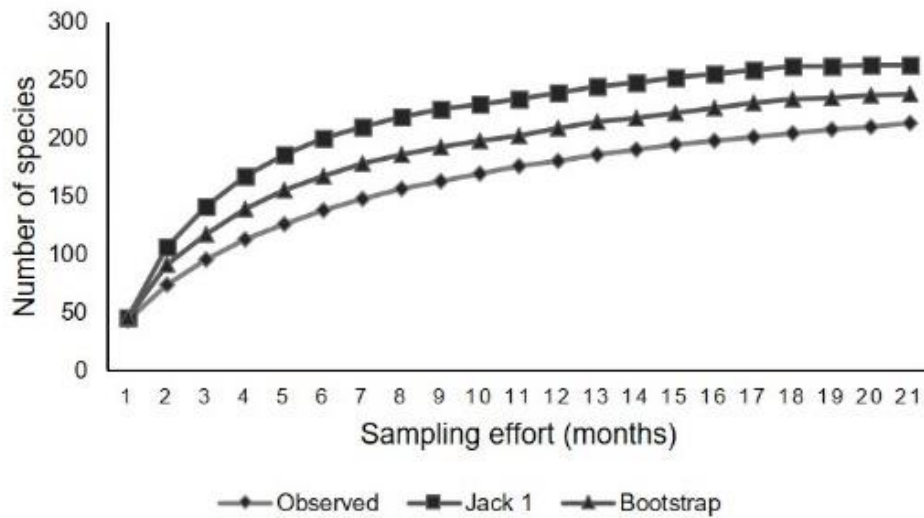
1.5 Annexes

**Figure 1** Geographical location of the study area, indicating the sampling points and vegetation type in the municipality of San Felipe Orizatlán

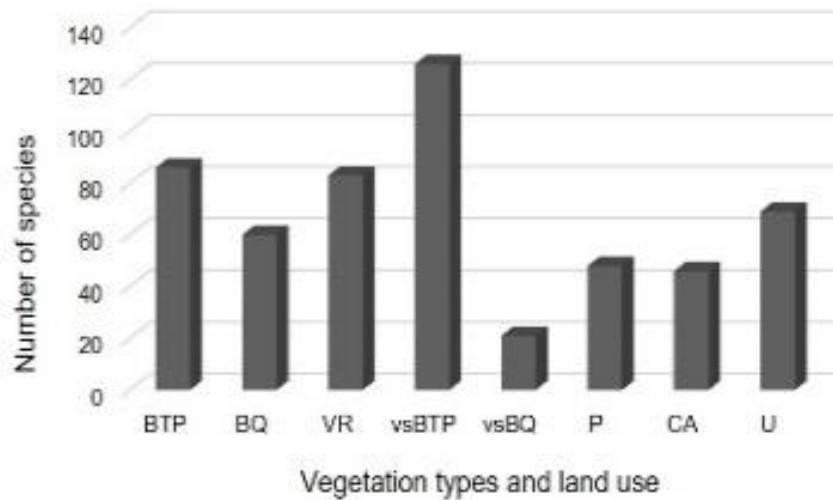


Source: own elaboration

**Figure 1.1** Bird species accumulation curves for the municipality of San Felipe Orizatlán. Data are presented for observed and expected species from two species accumulation models (Jackknife 1 and Bootstrap 1)



**Figure 1.2** Number of bird species recorded by vegetation type and land use in the municipality of San Felipe Orizatlán, Hidalgo



**Appendix I.** Bird species present in the municipality of San Felipe Orizatlán, Hidalgo, Mexico. Indicated for each species are relative abundance (Abundant, Scarce and Rare), seasonality (R = resident, V = summer visitor, VI = winter visitor, IP = winter visitor/migratory passage, MP = migratory passage), distribution type (E = endemic, CS = quasi endemic, SE = semi endemic, I = exotic-invasive), risk category (P = endangered, A = threatened, Pr = subject to special protection), vegetation or land use type (B = vegetation or land use type, B = vegetation or land use type, B = vegetation or land use type, B = vegetation or land use type, B = vegetation or land use type, B = vegetation or land use type, B = vegetation or land use type, B = vegetation or land use type, B = vegetation or land use type, B = vegetation or land use type, A = threatened, Pr = subject to special protection), vegetation type or land use (BTP = tropical evergreen forest, BQ = Quercus forest, VR = riparian vegetation, vsBTP = tropical evergreen forest secondary vegetation, vsBQ = Quercus forest secondary vegetation, P = livestock grazing, CA = agricultural crops, U = urban area).

Species	ABU	EST	TD	NOM	Type of vegetation/land use
<b>TINAMIFORMES</b>					
<b>Tinamidae</b>					
<i>Crypturellus cinnamomeus</i>	Es	R		Pr	BT, VST
<b>ANSERIFORMES</b>					
<b>Anatidae</b>					
<i>Dendrocygna autumnalis</i>	A	R			VR
<i>Cairina moschata</i>	Es	R		P	VR, BT
<i>Aix sponsa</i>	Es	VI			VR
<i>Spatula discors</i>	A	VI			VR
<i>Anas fulvigula</i>	R	VI		A	VR
<i>Anas crecca</i>	R	VI			VR
<b>GALLIFORMES</b>					
<b>Cracidae</b>					
<i>Ortalis vetula</i>	A	R			BT, VST
<b>Odontophoridae</b>					
<i>Colinus virginianus</i>	A	R			VST, P
<b>PODICIPEDIFORMES</b>					
<b>Podicipedidae</b>					
<i>Tachybaptus dominicus</i>	Es	R		Pr	VR
<i>Podilymbus podiceps</i>	Es	R			VR
<b>COLUMBIFORMES</b>					
<b>Columbidae</b>					
<i>Columba livia</i>	A	R	In		U
<i>Patagioenas flavirostris</i>	A	R			BT, BQ
<i>Streptopelia decaocto</i>	Es	R	In		U
<i>Columbina inca</i>	Es	R			BT, BQ, VST, VSQ, CA, U
<i>Columbina passerina</i>	Es	R			VST, CA
<i>Columbina talpacoti</i>	A	R			VR, VST, P, CA
<i>Geotrygon montana</i>	Es	R			BT, BQ, VST, VSQ
<i>Leptotila verreauxi</i>	A	R			BQ, VR, VST, P
<i>Zenaida asiatica</i>	A	R			BT, BQ, VST, P, CA, U



<b>CUCULIFORMES</b>				
<b>Cuculidae</b>				
<i>Crotophaga sulcirostris</i>	A	R		BQ, VR, VST, P
<i>Piaya cayana</i>	A	R		BT, BQ, VR, VST, P, CA
<i>Coccyzus americanus</i>	R	MP		BQ
<b>CAPRIMULGIFORMES</b>				
<b>Caprimulgidae</b>				
<i>Chordeiles minor</i>	R	MP		BT, VST
<i>Nyctidromus albicollis</i>	Es	R		VR, VST
<b>APODIFORMES</b>				
<b>Apodidae</b>				
<i>Cypseloides niger</i>	Es	V		VST
<i>Chaetura vauxi</i>	Es	R, IP		VR, U
<b>Trochilidae</b>				
<i>Anthracothorax prevostii</i>	Es	V		BT, VST, U
<i>Archilochus colubris</i>	Es	MP		BQ, U
<i>Cynanthus latirostris</i>	Es	R	SE	BT, VR, VST, U
<i>Cynanthus canivetii</i>	A	R		BT, VST, U
<i>Pampa curvipennis</i>	A	R		BT, VST, U
<i>Amazilia yucatanensis</i>	A	R	CE	BT, BQ, VR, VST, VSQ, U
<b>GRUIFORMES</b>				
<b>Rallidae</b>				
<i>Aramides albiventris</i>	R	R		VR
<i>Gallinula galeata</i>	R	R		VR, P
<i>Fulica americana</i>	Es	R		VR, P
<i>Porphyrio martinicus</i>	R	R		VR, P
<b>CHARADRIIFORMES</b>				
<b>Recurvirostridae</b>				
<i>Himantopus mexicanus</i>	R	R, IP		VR, P
<b>Charadriidae</b>				
<i>Pluvialis dominica</i>	R	MP		VR
<i>Charadrius vociferus</i>	A	R		VR, VST P
<b>Jacanidae</b>				
<i>Jacana spinosa</i>	A	R		VR, VST, P
<b>Scolopacidae</b>				
<i>Gallinago delicata</i>	A	VI		VR, P
<i>Actitis macularius</i>	A	IP		BT, VST, VR, P
<i>Tringa semipalmata</i>	R	IP		VR
<b>Laridae</b>				
<i>Leucophaeus atricilla</i>	R	VI		VR
<i>Larus argentatus</i>	R	VI		BQ, VR, VSQ, U
<b>CICONIIFORMES</b>				
<b>Ciconiidae</b>				
<i>Mycteria americana</i>	R	VI	Pr	VR, P
<b>SULIFORMES</b>				
<b>Anhingidae</b>				
<i>Anhinga anhinga</i>	R	R		VR
<b>Phalacrocoracidae</b>				
<i>Nonnopterum auritus</i>	R	VI		VR
<i>Nonnopterum brasilianus</i>	A	R		BT, VR, P
<b>PELECANIFORMES</b>				
<b>Pelecanidae</b>				
<i>Pelecanus erythrorhynchos</i>	R	VI		VR
<b>Ardeidae</b>				
<i>Botaurus lentiginosus</i>	R	VI	A	VR, VST
<i>Tigrisoma mexicanum</i>	Es	R	Pr	BT, VR
<i>Ardea herodias</i>	R	VI		VR
<i>Ardea alba</i>	A	R, VI		VR, P
<i>Egretta thula</i>	A	R, VI		BT, VR
<i>Egretta caerulea</i>	A	R, VI		BT, VR, VST
<i>Egretta tricolor</i>	R	R, VI		VR, VST, U
<i>Egretta rufescens</i>	R	R	Pr	VR, P
<i>Bubulcus ibis</i>	A	R	In	VR, P, U
<i>Butorides virescens</i>	A	R		BT, BQ, VR, VST, U
<i>Nycticorax nycticorax</i>	R	R		VR
<i>Nyctanassa violacea</i>	R	R		VR
<i>Cochlearius cochlearius</i>	E	R		VR, VST
<b>Threskiornithidae</b>				
<i>Eudocimus albus</i>	A	VI		BT, VR, VST, P
<i>Plegadis chihi</i>	A	VI		BT, VR, CA, P

<i>Platalea ajaja</i>	R	VI			VR, P
<b>CATHARTIFORMES</b>					
<b>Cathartidae</b>					
<i>Coragyps atratus</i>	A	R			BT, BQ, VR, VST, VSQ, CA, P, U
<i>Cathartes aura</i>	A	R			BT, BQ, VST
<b>ACCIPITRIFORMES</b>					
<b>Accipitridae</b>					
<i>Accipiter cooperii</i>	R	VI	Pr		VST, U
<i>Ictinia mississippiensis</i>	R	MP	Pr		VST, U
<i>Ictinia plumbea</i>	R	V	Pr		BQ
<i>Geranospiza caerulescens</i>	R	R	A		BQ
<i>Buteogallus anthracinus</i>	Es	R	Pr		BT, BQ, VST
<i>Rupornis magnirostris</i>	A	R			BT, BQ, VR, VST, VSQ, CA
<i>Parabuteo unicinctus</i>	R	R	Pr		CA, U
<i>Buteo lineatus</i>	R	VI	Pr		BQ, U
<i>Buteo plagiatus</i>	E	R			BT, BQ, VR, VST, VSQ
<i>Buteo brachyurus</i>	R	R			BT, VST, U
<i>Buteo jamaicensis</i>	R	R, VI			P
<b>STRIGIFORMES</b>					
<b>Tytonidae</b>					
<i>Tyto alba</i>	R	R			VST, U
<b>Strigidae</b>					
<i>Glaucidium brasilianum</i>	Es	R			BT, VST, CA
<i>Strix virgata</i>	Es	R			BT, VST, CA, U
<b>TROGONIFORMES</b>					
<b>Trogonidae</b>					
<i>Trogon elegans</i>	R	R			BT
<i>Trogon collaris</i>	R	R	Pr		BQ
<b>CORACIIFORMES</b>					
<b>Momotidae</b>					
<i>Momotus coeruliceps</i>	A	R	E		BT, VST, VR
<b>Alcedinidae</b>					
<i>Megaceryle torquata</i>	A	R			VR
<i>Chloroceryle amazona</i>	Es	R			VR
<i>Chloroceryle americana</i>	A	R			VR
<b>PICIFORMES</b>					
<b>Picidae</b>					
<i>Melanerpes formicivorus</i>	A	R			BQ, VSQ, VST
<i>Melanerpes aurifrons</i>	A	R			BT, BQ, VST, CA, U
<i>Dryocopus lineatus</i>	Es	R			BT, BQ, VSQ, CA
<i>Campephilus guatemalensis</i>	R	R	Pr		BT
<b>FALCONIFORMES</b>					
<b>Falconidae</b>					
<i>Herpetotheres cachinnans</i>	R	R			BT, VR
<i>Micrastur semitorquatus</i>	R	R	Pr		BT, VST
<i>Caracara plancus</i>	A	R			BT, VR, VST, VSQ, P
<i>Falco sparverius</i>	Es	IP			VST, CA, P
<i>Falco femoralis</i>	R	R	A		BT
<i>Falco rufigularis</i>	R	R			BT, U
<b>PSITTACIFORMES</b>					
<b>Psittacidae</b>					
<i>Psittacara holochlorus</i>	A	R	E	A	BT, VR
<i>Pionus senilis</i>	R	R		A	BT, VST
<i>Amazona viridigenalis</i>	Es	R	E	P	BQ, VST
<i>Amazona autumnalis</i>	A	R			BT, BQ
<b>PASSERIFORMES</b>					
<b>Tyriridae</b>					
<i>Tityra semifasciata</i>	A	R			BT, VR, VST
<i>Pachyramphus major</i>	R	R			VST
<i>Pachyramphus aglaiae</i>	Es	R			BT, BQ, VST
<b>Tyrannidae</b>					
<i>Myiarchus tuberculifer</i>	Es	R			BT, VST, VSQ, CA
<i>Myiarchus tyrannulus</i>	Es	R			BT, BQ, VST
<i>Pitangus sulphuratus</i>	A	R			BT, VR, VST, CA, P
<i>Megarynchus pitangua</i>	Es	R			VST
<i>Myiozetetes similis</i>	A	R			BT, VR, VST, VSQ
<i>Myiodynastes luteiventris</i>	R	V			BQ, VR
<i>Legatus leucophaeus</i>	R	V			BQ
<i>Tyrannus melancholicus</i>	A	R			VST, P
<i>Tyrannus vociferans</i>	R	R	SE		CA, P

<i>Tyrannus forficatus</i>	R	MP		BT
<i>Empidonax minimus</i>	Es	VI		BQ, VR, VST, CA
<i>Sayornis nigricans</i>	R	R		VR
<i>Sayornis phoebe</i>	Es	IP		BT, VR, VST, VSQ, CA, P, U
<i>Sayornis saya</i>	R	VI		VR, VST, CA
<i>Pyrocephalus rubinus</i>	A	VI		BT, BQ, VR, VST, CA, P, U
<b>Thamnophilidae</b>				
<i>Thamnophilus doliatus</i>	R	R		BQ, VST
<b>Furnariidae</b>				
<i>Xiphorhynchus flavigaster</i>	R	R		BT
<b>Vireonidae</b>				
<i>Cyclarhis gujanensis</i>	R	R		VST
<i>Vireo griseus</i>	R	R		BQ, VST
<i>Vireo bellii</i>	R	IP		VST, U
<i>Vireo huttoni</i>	R	R		VST
<i>Vireo flavifrons</i>	R	IP		VST
<i>Vireo cassinii</i>	R	VI	SE	VST
<i>Vireo solitarius</i>	R	IP		BQ, VSQ, P
<i>Vireo olivaceus</i>	R	MP		VST
<b>Corvidae</b>				
<i>Psilorhinus morio</i>	A	R		BT, BQ, VR, VST, VSQ, CA, P
<i>Cyanocorax yncas</i>	A	R		BT, VST, U
<i>Corvus imparatus</i>	Es	R	CE	P, U
<i>Corvus cryptoleucus</i>	R	VI		U
<b>Paridae</b>				
<i>Baeolophus atricristatus</i>	A	R		BT, BQ, VST
<b>Hirundinidae</b>				
<i>Tachycineta bicolor</i>	Es	VI		BT, VST, U
<i>Tachycineta albilinea</i>	R	R		VR
<i>Stelgidopteryx serripennis</i>	A	R		VR, VST, CA
<i>Progne chalybea</i>	R	V		VST, U
<i>Hirundo rustica</i>	A	V		VST, CA, U
<i>Petrochelidon pyrrhonota</i>	R	V, MP		U
<b>Regulidae</b>				
<i>Regulus calendula</i>	A	VI		VR, U
<b>Bombycillidae</b>				
<i>Bombycilla cedrorum</i>	Es	IP		VR, VST
<b>Ptiliogonatidae</b>				
<i>Phainopepla nitens</i>	R	R		VST
<b>Poliophtilidae</b>				
<i>Poliophtila caerulea</i>	A	R, VI		BT, BQ, VR, VST, CA
<b>Troglodytidae</b>				
<i>Pheugopedius maculipectus</i>	E	R		BQ, VST
<i>Henicorhina leucosticta</i>	R	R		BT, VST
<i>Campylorhynchus zonatus</i>	A	R		BQ, VST, U
<i>Troglodytes aedon</i>	R	R, VI		VST
<b>Mimidae</b>				
<i>Dumetella carolinensis</i>	A	IP		BT, BQ, VST, CA
<i>Toxostoma longirostre</i>	R	R	CE	BQ
<i>Mimus polyglottos</i>	Es	R		BT, VR, VST, CA, P
<b>Turdidae</b>				
<i>Myadestes occidentalis</i>	Es	R	Pr	BT
<i>Catharus occidentalis</i>	R	R	E	BT
<i>Turdus grayi</i>	A	R		BT, VR, VST, VSQ, CA, U
<b>Passeridae</b>				
<i>Passer domesticus</i>	A	R	In	U
<b>Fringillidae</b>				
<i>Euphonia affinis</i>	A	R		BT, VST, U
<i>Euphonia hirundinacea</i>	A	R		BT, VR, VST, U
<i>Haemorhous mexicanus</i>	R	R		VST
<b>Passerellidae</b>				
<i>Arremonops rufivirgatus</i>	A	R	CE	BQ, VST, VSQ, U
<b>Icteriidae</b>				
<i>Icteria virens</i>	R	IP		CA, U
<b>Icteridae</b>				
<i>Xanthocephalus xanthocephalus</i>	R	VI		VST, VSQ
<i>Sturnella magna</i>	R	R		VST, P
<i>Amblycercus holosericeus</i>	R	R		VST, P
<i>Psarocolius montezuma</i>	A	R	Pr	BT, BQ, VR, VST
<i>Icterus wagleri</i>	R	R		VST

<i>Icterus spurius</i>	R	MP		BQ, CA
<i>Icterus cucullatus</i>	A	R	SE	BT, VST, P, CA, U
<i>Icterus bullockii</i>	R	VI	SE	VST
<i>Icterus gularis</i>	A	R		BT, BQ, VST, P, CA, U
<i>Icterus graduacauda</i>	R	R	CE	BQ
<i>Icterus galbula</i>	R	VI		VST, CA, U
<i>Agelaius phoeniceus</i>	R	R		VR
<i>Molothrus aeneus</i>	A	R		BT, VST, CA, P, U
<i>Molothrus ater</i>	A	R, VI		CA, P, U
<i>Dives dives</i>	A	R		VST, VSQ, P, CA
<i>Quiscalus mexicanus</i>	A	R		BT, BQ, VR, VST, VSQ, P, CA, U
<b>Parulidae</b>				
<i>Seiurus aurocapilla</i>	Es	VI		U
<i>Vermivora cyanoptera</i>	R	IP		BQ
<i>Mniotilta varia</i>	A	VI		BT, BQ, VST, CA, U
<i>Leiothlypis peregrina</i>	R	IP		U
<i>Leiothlypis celata</i>	Es	VI		U
<i>Geothlypis tolmiei</i>	R	VI	A	VST, U
<i>Geothlypis trichas</i>	R	VI		BQ, VST, U
<i>Setophaga citrina</i>	R	IP		BT, BQ
<i>Setophaga ruticilla</i>	Es	IP		BQ, VST, CA
<i>Setophaga magnolia</i>	R	VI		VST, U
<i>Setophaga petechia</i>	R	IP		BQ
<i>Setophaga dominica</i>	A	IP		BT, BQ, U
<i>Setophaga townsendi</i>	R	VI		VST, U
<i>Setophaga chrysoparia</i>	R	MP	P	BQ, VST
<i>Setophaga virens</i>	A	VI		BT, BQ, VST, CA, U
<i>Basileuterus rufifrons</i>	R	R	CE	BQ
<i>Basileuterus culicivorus</i>	Es	R		BT, VST, CA, U
<i>Cardellina pusilla</i>	A	VI		BT, BQ, VR, VST, CA, P, U
<b>Cardinalidae</b>				
<i>Piranga rubra</i>	Es	VI		BT, BQ
<i>Piranga olivacea</i>	R	MP		BT, VST
<i>Piranga ludoviciana</i>	Es	IP		BT
<i>Habia fuscicauda</i>	R	R		BT, VST
<i>Cardinalis cardinalis</i>	R	R		VST, P
<i>Pheucticus ludovicianus</i>	Es	VI		VST, U
<i>Cyanocompsa parellina</i>	Es	R		VST, U
<i>Passerina caerulea</i>	R	VI		VST, U
<i>Passerina cyanea</i>	R	VI		VST, P
<i>Passerina ciris</i>	Es	VI	Pr	VST, VSQ, U
<b>Thraupidae</b>				
<i>Thraupis episcopus</i>	A	R		VST, CA, U
<i>Thraupis abbas</i>	A	R		BT, VR, VST, CA, U
<i>Volatinia jacarina</i>	A	R		BT, VST, CA
<i>Cyanerpes cyaneus</i>	R	R, V		BT, VST, U
<i>Tiaris olivaceus</i>	Es	R		VST, VSQ, P
<i>Sporophila torqueola</i>	A	R		VR, VST, CA, P, U
<i>Saltator atriceps</i>	A	R		BT, BQ, VST, P

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