

**Breeding, Migratory, and Wintering Birds of the Northern Jaguar Reserve
East-Central Sonora, Mexico**

An Update Based on July 2008 and January 2009 Surveys

FINAL REPORT

Prepared by:
Aaron D. Flesch
School of Natural Resources
University of Arizona
325 Biological Sciences East
Tucson Arizona 85721
flesch@ag.arizona.edu

Prepared for:
Peter Warshall and Diana Hadley
Northern Jaguar Project Inc.
2114 W. Grant Road
Tucson, Arizona 85745
www.northernjaguarproject.org



Río Aros © A. Flesch



Slate-throated Redstart © M. Skroch

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Introduction

In 2008, I reported on the status, distribution, and abundance of breeding and migratory birds on the newly established Northern Jaguar Reserve based on surveys that I completed in July and September 2007 (Flesch 2008a). During that effort, I documented 124 species of birds, 71% of which were potential breeders (32% confirmed) and 25% were migratory species. Bird density of all species combined was similar in July and September but Neotropical migratory species that typically breed north of the reserve accounted for 44% of total bird abundance in September versus only 1% in July. Results from 2007 indicated that the Northern Jaguar Reserve supports a diverse community of breeding and migratory birds including several species that are at or near their northern distributional limits.

At the request of Northern Jaguar Project, I endeavored to repeat surveys completed in 2007, during the summer and fall of 2008. Surveys in July 2008 were successful and highly productive yet intense monsoon storms followed by Hurricane Norbert precluded vehicle access to much of the reserve shortly thereafter. These logistical constraints however, provided an excellent opportunity to describe the status and distribution of wintering birds on the reserve for which little information was available. Therefore I modified our original objectives and completed surveys in July 2008 and January 2009.

Objectives

I focused on the following objectives:

- 1) Estimate bird species presence and abundance during the breeding and wintering seasons.
- 2) Describe relative abundance and the residency and breeding status of all bird species detected between 2007 and 2009.
- 3) Synthesize data so as to provide a basis for future efforts.

Methods

Detailed descriptions of survey routes, sampling methods, and analyses are provided by Flesch (2008a) and are described here only briefly. To survey birds, we used distance sampling (Buckland et al. 2001) and a more flexible method that involved counting the number of individuals, pairs or flocks I detected along each transect. This second method allowed us to extend the length of transects and to survey across a wider range of times of day. During surveys, we recorded all evidence of breeding and noted species that we detected incidentally while in camp or while traveling on the reserve. In summer, we surveyed from 30 min before local sunrise to approximately four hours after sunrise. In winter, we began surveys 1-2 hours after local sunrise and often surveyed into the afternoon because bird activity was typically low in early morning, increased in late morning, and often remained high into midday. During all seasons, we slowly walked transects and often stopped to record species and estimate distance to each bird that we detected with use of a rangefinder.

To assess the breeding and residency status of bird on the Northern Jaguar Reserve, we used all observation that we have obtained since the beginning of the project. To assess breeding status, we searched for nests and completed behavioral observations of birds and used the criteria of the North American Ornithological Atlas Committee (1990) to classify breeding status as possible, probable, or confirmed. To assess residency and migratory status, we supplemented observations that we

Table 1: Transects visited and bird detections obtained during distance sampling along line transects in July 2008 and January 2009 on the Northern Jaguar Reserve. Detections include singles, pairs, and flocks.

Transect	Segment	Transect length		Detections		Individuals		Detections / 100 m		Individuals / 100 m	
		July (m)	Jan. (m)	July	Jan.	July	Jan.	July	Jan.	July	Jan.
Los Pavos	Canyon	700		152		164		21.7		23.4	
Los Pavos	Upper	1050		147		160		14.0		15.2	
Rio Aros	Section 1	1720	900	183	116	197	147	10.6	12.9	11.5	16.3
Hubaral	Lower	1150	1150	189	46	204	101	16.4	4.0	17.7	8.8
Hubaral	Upper	520	520	107	17	123	17	20.6	3.3	23.7	3.3
Babisal Abajo		1700	1700	291	85	308	147	17.1	5.0	18.1	8.6
Babisal Arriba		700	700	133	40	151	44	19.0	5.7	21.6	6.3
Huijalo Abajo		1400	1400	285	37	304	63	20.4	2.6	21.7	4.5
Mesa Encinosa	Camp to tank	470	470	65	63	85	124	13.8	13.4	18.1	26.4
Mesa Encinosa	Road and Mesa	850	850	112	38	133	57	13.2	4.5	15.6	6.7
Mesa Encinosa	Huijalo Arriba	200		23		45		11.5		22.5	
La Ventana		1880	1880	419	135	442	295	22.3	7.2	23.5	15.7

obtained between 2007 and 2009 with information from Sonora (van Rossem 1945, Marshall 1957, Russell and Monson 1998, O'Brien et al. 2006, Flesch 2008b) and our knowledge of the seasonal status and natural history of each species.

Results and Discussion

Effort: We completed two field trips to the Northern Jaguar Reserve between 8 and 13 July 2008 (summer) and between 1 and 6 January 2009 (winter). Summer field work was assisted by Moez Ali and winter field work was assisted by Mac Hudson, Glenn Johnson, Christopher Martinez Reynoso, and Matt Skroch. In July 2008, we surveyed all eight transects that we established in July 2007. These transects are as follows: Rio Aros, Mesa Encinosa, los Pavos, Hubaral, Babisal Arriba, Babisal Abajo, Huijalo Abajo, and la Ventana. In January 2009, we surveyed seven transects and excluded los Pavos because road access had not yet been reestablished. We extended the la Ventana transect so that it began at the reserve gate (Appendix A). In winter, we did not use distance sampling along some segments of some transects because bird activity was low (Table 1). Overall transect length averaged 1.5 km in summer and 1.4 km in winter.

Detections: We detected 2,316 individuals in summer and 995 individuals in winter along all transects combined. Mean number of single birds, pairs, and flocks (e.g. detections on Table 1) and mean number of individuals per 100 m of transect were similar in July. In January, however, mean number of individuals detected per 100 m was roughly 2 times greater than that for detections because many individuals were found in flocks. Number of detections of all species combined per unit effort varied between 2007 and 2008. We detected 12.8 ± 1.0 individuals per 100 m (\pm SE) in 2007 versus 17.2 ± 1.3 individuals per 100 m in 2008 along the same eight transects ($t_7 = 4.56$, $P = 0.0026$, paired t -test).

We detected 136 species of birds during the 2008-2009 project year, 91 species in summer and 93 species in winter. We added 27 species to the reserve list that had not been detected previously, 9 in summer and 18 in winter (Table 2). Species that were new to the reserve were mainly winter residents (e.g. white-eared hummingbird, buff-breasted flycatcher, brown-backed solitaire, and slate-

throated redstart) yet also included several notable summer residents such as blue mockingbird and plain-capped starthroat.

Overall Status: Since July 2009, we have detected 152 species of birds on the Northern Jaguar Reserve; 93 species (62%) are potential breeders and 52 species (34%) are winter residents or migrants. Of species that potentially breed on the reserve, 46% (43) have been confirmed breeding, 33% (30) are probable breeders, and 21% (20) are possible breeders (Table 3). Cooper's hawk, and American kestrel may breed but observations were not at times when they typically do so; common merganser may also breed but only males were detected. We are uncertain about the status of seven species (green heron, short-tailed hawk, band-tailed pigeon, northern pygmy-owl, blue-throated hummingbird, plain-capped starthroat, and loggerhead shrike). In addition to these 151 species, I also flushed an unidentified meadowlark from dense grass on Mesa Encinosa on 12 January 2009. This individual was likely an eastern meadowlark but was not identified to species.

Summer: We confirmed breeding by 36 species during summer 2008 (Table 2). Most notably, Moez Ali found the nest of a fan-tailed warbler in Huijalo Abajo that contained four young (Fig. 1). The nest was placed on the ground in a small alcove in a shallow cut bank immediately along the drainage channel and we observed both the male and female bringing food to nestlings. This is the first documented nest of fan-tailed warbler in the state of Sonora (Russell and Monson 1998). Also of note was a nest of a least grebe that contained one egg (Fig. 2). The nest was located at the edge of the small pond along the road between Huijalo and Babisal canyons and consisted of a small platform of grass and forbs near the edge of the pond's shallow south end. This is the northernmost nest and confirmed breeding locality for least grebe in the state of Sonora (Russell and Monson 1998). I also observed a female Montezuma quail with two dependent young in upper Huijalo Canyon on Mesa Encinosa. Other notable breeding records included occupied nests of violet-crowned hummingbird (Babisal Abajo) and elegant trogon (los Pavos and la Ventana; in palm) and a blue-gray gnatcatcher nest that contained three eggs on Mesa Encinosa. As in 2007, a single yellow-green vireo was singing vigorously in lower Huijalo Abajo but did not appear to be paired.

Surveys during summer 2008 greatly increased our knowledge of bird distribution on the reserve and featured a number of notable observations. A blue mockingbird was singing in upper Huijalo Abajo just below the plunge pool at the upper end of the transect. This area harbors patches of dense shrubs and a fairly open canopy of large trees and palms. The bird was observed with another individual that we flushed from dense shrubby on the west side of the canyon and attempts to locate a nest were unsuccessful. Blue mockingbird was not detected in this area in 2007 and my familiarity with their vocalizations suggests they may not have been present. A single white-striped woodcreeper was calling in Huijalo Abajo near the road and was the first observation of this species on the reserve away from Babisal Canyon. We detected sulphur-bellied flycatcher along two additional transects in 2008; a single bird was in willows in la Ventana Canyon and a pair with a dependent young was in oaks in Huijalo Arriba. Moez Ali observed a group of seven Gambel's quail in the uplands above the Babisal Abajo transect which was the first observation of this species on the reserve. An adult whiskered screech-owl was calling from the slopes of Mesa Encinosa and was in the same area as in 2007. Tape-playback surveys for whiskered screech-owl in Babisal Canyon were negative. Moez Ali observed four singing male fan-tailed warblers along the Huijalo Abajo transect in 2008 in an area where I observed only two in 2007. This increase in abundance was likely related to wetter conditions in 2008 as both of the new 2008 territories were in reaches of the canyon that were dry in July 2007. Further, a single fan-tailed warbler was singing in the slot canyon along the Hubaral transect in area where the species was not detected in 2007. As in 2007, we observed three nesting pairs of streak-backed orioles in Huijalo Abajo in 2008 and an additional nesting pair in Babisal Arriba in an area that was occupied by only a used nest at the same time of year in 2007. Moez Ali watched a female plain-capped starthroat hawking insects along the Rio Aros on 10

Table 2: Birds species ($n = 136$) detected between 8-13 July 2008 and 1-6 January 2009 on the Northern Jaguar Reserve in east-central Sonora. All observations were obtained by Aaron D. Fleisch, Glenn Johnson, Moez Ali, Mac Hudson, Matt Skroch, and Christopher Martinez Reynoso. Bolded "x" indicate species that were added to the reserve list during the 2008- 2009 field season.

Common Name	Latin Name	July-08	Jan.-09	Breeding evidence from July 2008
ring-necked duck	<i>Aythya collaris</i>		x	
common merganser	<i>Mergus merganser</i>		x	
elegant quail	<i>Callipepla douglasii</i>	x	x	paired
Gambel's quail	<i>Callipepla gambelii</i>	x		present in suitable breeding habitat
Montezuma quail	<i>Cyrtornyx montezumae</i>	x		fledged young
least grebe	<i>Tachybaptus dominicus</i>	x	x	nest with egg
great blue heron	<i>Ardea herodias</i>	x	x	present in suitable breeding habitat
green heron	<i>Butorides virescens</i>		x	
black vulture	<i>Coragyps atratus</i>	x		present in suitable breeding habitat
turkey vulture	<i>Cathartes aura</i>	x	x	present in suitable breeding habitat
sharp-shinned hawk	<i>Accipiter striatus</i>		x	
Cooper's hawk	<i>Accipiter cooperii</i>	x	x	
common black-hawk	<i>Buteogallus anthracinus</i>	x		fledged young
gray hawk	<i>Asturina nitida maxima</i>	x		fledged young
short-tailed hawk	<i>Buteo brachyurus</i>	x		
red-tailed hawk	<i>Buteo jamaicensis</i>	x	x	fledged young
American kestrel	<i>Falco sparverius</i>		x	
peregrine falcon	<i>Falco peregrinus</i>	x	x	present in suitable breeding habitat
Wilson's snipe	<i>Gallinago delicata</i>		x	
band-tailed pigeon	<i>Patagioenas fasciata</i>	x		
white-winged dove	<i>Zenaida asiatica</i>	x	x	nest with young
mourning dove	<i>Zenaida macroura</i>	x	x	paired
Inca dove	<i>Columbina inca</i>		x	
common ground-dove	<i>Columbina passerine</i>	x	x	paired
white-tipped dove	<i>Leptotila verreauxi</i>	x	x	fledged young
military macaw	<i>Ara militaris</i>	x		paired
yellow-billed cuckoo	<i>Coccyzus americanus</i>	x		paired
greater roadrunner	<i>Geococcyx californianus</i>	x		singing
western screech-owl	<i>Megascops kennicottii</i>	x	x	calling in suitable breeding habitat
whiskered screech-owl	<i>Megascops trichopsis</i>	x		calling in suitable breeding habitat
great horned owl	<i>Bubo virginianus</i>		x	
elf owl	<i>Micrathene whitneyi</i>	x		
lesser nighthawk	<i>Chordeiles acutipennis</i>	x		present in suitable breeding habitat
buff-collared nightjar	<i>Caprimulgus ridgwayi</i>	x		calling in suitable breeding habitat
broad-billed hummingbird	<i>Cynanthus latirostris</i>	x	x	nest with eggs
white-eared hummingbird	<i>Hylocharis leucotis</i>		x	
violet-crowned hummingbird	<i>Amazilia violiceps</i>	x	x	occupied nest
plain-capped starthroat	<i>Helimaster constantii</i>	x		
elegant trogon	<i>Trogon elegans</i>	x	x	occupied nest
green kingfisher	<i>Chloroceryle Americana</i>		x	
acorn woodpecker	<i>Melanerpes formicivorus</i>		x	
Gila woodpecker	<i>Melanerpes uropygialis</i>	x	x	nest with young
ladder-backed woodpecker	<i>Picoides scalaris</i>	x		fledged young
northern flicker	<i>Colaptes auratus</i>	x		paired
gilded flicker	<i>Colaptes chrysoides</i>	x	x	occupied nest
white-striped woodcreeper	<i>Lepidocolaptes leucogaster</i>	x	x	calling in suitable breeding habitat

northern beardless-tyrannulet	<i>Campostoma imberbe</i>	x	x	paired
greater pewee	<i>Contopus pertinax</i>		x	
western wood-pewee	<i>Contopus sordidulus</i>	x		paired
Hammond's flycatcher	<i>Empidonax hammondii</i>		x	
gray flycatcher	<i>Empidonax wrightii</i>		x	
dusky flycatcher	<i>Empidonax oberholseri</i>		x	
pacific-slope flycatcher	<i>Empidonax difficilis</i>		x	
buff-breasted flycatcher	<i>Empidonax fulvifrons</i>		x	
black phoebe	<i>Sayornis nigricans</i>	x	x	fledged young
Say's phoebe	<i>Sayornis saya</i>		x	
vermillion flycatcher	<i>Pyrocephalus rubinus</i>	x	x	fledged young
dusky-capped flycatcher	<i>Myiarchus tuberculifer</i>	x		nest with young
ash-throated flycatcher	<i>Myiarchus cinerascens</i>	x	x	paired
Nutting's flycatcher	<i>Myiarchus nuttingi</i>	x	x	calling in suitable breeding habitat
brown-crested flycatcher	<i>Myiarchus tyrannulus</i>	x		occupied nest
sulphur-bellied flycatcher	<i>Myiodynastes luteiventris</i>	x		nest with young
tropical kingbird	<i>Tyrannus melancholicus</i>	x		paired
Cassin's kingbird	<i>Tyrannus vociferans</i>		x	
thick-billed kingbird	<i>Tyrannus crassirostris</i>	x		occupied nest
western kingbird	<i>Tyrannus verticalis</i>	x		
rose-throated becard	<i>Pachyramphus aglaiae</i>	x		occupied nest
Bell's vireo	<i>Vireo bellii</i>	x		singing
plumbeous vireo	<i>Vireo plumbeus</i>		x	
Cassin's vireo	<i>Vireo cassinii</i>		x	
Hutton's vireo	<i>Vireo huttoni</i>		x	
yellow-green vireo	<i>Vireo flavoviridis</i>	x		singing in breeding habitat but not paired
Mexican jay	<i>Aphelocoma ultramarine</i>	x	x	present in suitable breeding habitat
common raven	<i>Corvus corax</i>	x	x	fledged young
northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	x		present in suitable breeding habitat
bridled titmouse	<i>Baeolophus wollweberi</i>		x	
verdin	<i>Auriparus flaviceps</i>	x	x	fledged young
cactus wren	<i>Campylorhynchus brunneicapillus</i>	x	x	paired
rock wren	<i>Salpinctes obsoletus</i>	x	x	singing in breeding habitat but not paired
canyon wren	<i>Catherpes mexicanus</i>	x	x	singing in breeding habitat but not paired
Sinaloa wren	<i>Thryothorus Sinaloa</i>	x	x	nest with young
house wren	<i>Troglodytes aedon</i>		x	
ruby-crowned kinglet	<i>Regulus calendula</i>		x	
blue-gray gnatcatcher	<i>Polioptila caerulea</i>	x	x	nest with eggs
black-tailed gnatcatcher	<i>Polioptila melanura</i>		x	
black-capped gnatcatcher	<i>Polioptila nigriceps</i>	x	x	paired
brown-backed solitaire	<i>Myadestes occidentalis</i>		x	
hermit thrush	<i>Catharus guttatus</i>		x	
northern mockingbird	<i>Mimus polyglottos</i>	x	x	paired
curve-billed thrasher	<i>Toxostoma curvirostre</i>	x	x	occupied nest
blue mockingbird	<i>Melanotis caerulescens</i>	x		paired
phainopepla	<i>Phainopepla nitens</i>	x	x	
orange-crowned warbler	<i>Vermivora celata</i>		x	
Lucy's warbler	<i>Vermivora luciae</i>	x		singing in breeding habitat after season
yellow-rumped warbler	<i>Dendroica coronata</i>		x	
black-throated gray warbler	<i>Dendroica nigrescens</i>		x	
Townsend's warbler	<i>Dendroica townsendi</i>		x	
Wilson's warbler	<i>Wilsonia pusilla</i>		x	

painted redstart	<i>Myioborus pictus</i>		x	
slate-throated redstart	<i>Myioborus miniatus</i>		x	
fan-tailed warbler	<i>Euthlypis lachrymose</i>	x		nest with young
rufous-capped warbler	<i>Basileuterus rufifrons</i>	x	x	paired
yellow-breasted chat	<i>Icteria virens</i>	x		singing
hepatic tanager	<i>Piranga flava</i>	x	x	calling in suitable breeding habitat
summer tanager	<i>Piranga rubra</i>	x		fledged young
western tanager	<i>Piranga ludoviciana</i>	x		
green-tailed towhee	<i>Pipilo chlorurus</i>		x	
canyon towhee	<i>Pipilo fuscus</i>	x	x	paired
rufous-winged sparrow	<i>Aimophila carpalis</i>	x	x	nest with eggs
Cassin's sparrow	<i>Aimophila cassinii</i>	x		singing
rufous-crowned sparrow	<i>Aimophila ruficeps</i>	x	x	nest with eggs
rusty sparrow	<i>Aimophila rufescens</i>	x		singing
five-striped sparrow	<i>Aimophila quinquestriata</i>	x		fledged young
chipping sparrow	<i>Spizella passerine</i>		x	
clay-colored sparrow	<i>Spizella pallida</i>		x	
vesper sparrow	<i>Pooecetes gramineus</i>		x	
lark sparrow	<i>Chondestes grammacus</i>		x	
Lincoln's sparrow	<i>Melospiza lincolni</i>		x	
grasshopper sparrow	<i>Ammodramus savannarum</i>		x	
white-crowned sparrow	<i>Zonotrichia leucophrys</i>		x	
northern cardinal	<i>Cardinalis cardinalis</i>	x	x	singing
pyrrhuloxia	<i>Cardinalis sinuatus</i>	x	x	paired
black-headed grosbeak	<i>Pheucticus melanocephalus</i>	x	x	occupied nest
blue grosbeak	<i>Passerina caerulea</i>	x		nest with young
lazuli bunting	<i>Passerina amoena</i>		x	
varied bunting	<i>Passerina versicolor</i>	x		paired
painted bunting	<i>Passerina ciris</i>	x		
unknown meadowlark	<i>Sturnella sp.</i>		x	
bronzed cowbird	<i>Molothrus aeneus</i>	x		singing
brown-headed cowbird	<i>Molothrus ater</i>	x		singing
black-vented oriole	<i>Icterus wagleri</i>	x	x	nest with young
hooded oriole	<i>Icterus cucullatus</i>	x	x	nest with young
streak-backed oriole	<i>Icterus pustulatus</i>	x		nest with young
Scott's oriole	<i>Icterus parisorum</i>	x	x	singing
house finch	<i>Carpodacus mexicanus</i>	x	x	nest with young
lesser goldfinch	<i>Carduelis psaltria</i>	x	x	singing

July 2008. Notable migratory species that we detected during July included two early western kingbirds and three painted buntings.

Winter. Surveys in winter enabled us to assess the status and distribution of birds on the reserve during a time of year for which no data were available. Although numbers of detections were not especially high during winter (Table 1), we detected 18 species that had not been previously observed on the reserve including several species that were not known to winter in this region of Sonora. Our most significant finding during winter 2009 was the presence a fairly large community of both Neotropical migratory species and elevational migrants that were using a variety of environments on the reserve. Notably, some species that we found to be wintering on the reserve were at or near the northern edge of their winter range and some species were found well outside of their known winter range. Wintering Neotropical migrants included two Cassin's kingbirds, 10



Figure 1: Fan-tailed warbler nest with four young found along the Huijalo Abajo transect on 12 July 2008. This is the first nest of this species known in the state of Sonora (photo by Moez Ali).



Figure 2: Least grebe nest with one egg near the edge of the pond along the access road between Huijalo and Babisal canyons, 11 July 2008. This is the northernmost nest and breeding locality known in the state of Sonora (photo by Moez Ali).

Cassin's vireos, 13 orange-crowned warblers, 67 yellow-rumped warblers, 76 black-throated gray warblers, seven Townsend's warblers, two Wilson's warblers, 17 Lazuli buntings, and one Scott's oriole (Table 4). Cassin's kingbirds, Wilson's warbler, and Scott's oriole typically winter south of the reserve. Numbers of black-throated gray warblers and Townsend's warbler which winter in low densities north to southern Arizona were especially high on the reserve. Interestingly, Cassin's vireo was much more common during winter (12) than plumbeous vireo (2) yet plumbeous vireo was more common during migration in September 2007 (15) than Cassin's vireo (2). We detected >100 individual *Empidonax* flycatchers during winter most of which were gray, Hammond's, dusky, and "western" flycatchers (Table 4).

In January 2008, we detected several species that typically nest at high elevations in oak woodland, pine forest, or mixed-conifer forest and that migrant to lowlands in winter. Presence of several species of such elevational migrants was notable. We detected two brown-backed solitaires in Huijalo Abajo on 5 January 2009, which were the first winter records in the region. Presence of brown-backed solitaire was not entirely unexpected because they occur locally during the breeding season to the north of the reserve in the Sierra Huachinera (A. Flesch, unpublished data) and in the adjacent Sierra Tabaco (Lammertink et al. 1996). We detected two slate-throated redstarts in dense shrubs and vines that were overhanging the Río Aros approximately 1000 m below the confluence of Arroyo los Chinos (see cover photo). These attractive warblers nest in high-elevation coniferous forests and although there are no summer records from areas north of the reserve in Sonora, they may nest at higher elevations in the Rio Aros watershed in neighboring Chihuahua. Another elevational migrant that was not known to winter as far north of the reserve included a white-eared hummingbird in Huijalo Abajo. Greater pewee was present in low numbers in winter in Huijalo Abajo and Babisal Arriba and buff-breasted flycatcher was even less common along the Rio Aros and in la Ventana.

Several species that are uncommon in summer were much more common in winter whereas for other species the opposite pattern was observed. Nutting's flycatchers are rare on the reserve in summer yet >30 individuals were detected in winter when they were present on all transects. In contrast, blue-gray gnatcatchers are extremely local in the summer when breed in oak scrub on Mesa Encinosa yet were common throughout much of the reserve in winter. Black-capped gnatcatchers, however, which are common during summer, were rare in winter suggesting they make seasonal movements. Similar, five-striped sparrows, which are abundant during summer, were not found during winter.

We found tall, dense stands of perennial bunchgrasses on the Mesa Encinosa in January 2009. While hiking in these grasslands on the ridge of the Sierra Zetasora on 5 January we flushed a single grasshopper sparrow and an unidentified meadowlark. Presence of these species suggests the reserve supports small populations of wintering grassland birds that are extremely uncommon in the region.

Conclusions

The Northern Jaguar Reserve supports a diverse assemblage of breeding, wintering, and migratory birds and a varied range of environments that occur across a wide elevation range. Since 2007, we have observed 152 species of birds on the reserve, including 93 species that are potential breeders, 46% of which we have confirmed breeding. Several species that we observed on the reserve had not been reported previously in this region of Sonora (Russell and Monson 1998, O'brien 2006, Warshall 2007) including winter residents such as white-eared hummingbird, brown-backed solitaire, and slate-throated redstart, summer residents such as blue mockingbird, fan-tailed warbler, and yellow grosbeak, and permanent residents such as least grebe and white-striped woodcreeper.

During July 2008, we resurveyed transects that we initially surveyed in July 2007. Although we found higher overall abundance of birds in 2008, species composition was similar and only nine new species were added to the reserve list in July 2008. In January 2009, we surveyed these same transects for the first time during winter and found 18 species that had not been previously found on the reserve. Observations during winter 2009 filled an important gap of knowledge by documenting a number of Neotropical migratory species and elevational migrants on the reserve during winter. Notably several of these species were not known to occur during winter as far north as the reserve.

In addition to the 152 species that we detected on the reserve between 2007 and 2009, Warshall and others (2007) observed 11 species in April 2007 that we have yet to detect. These species include zone-tailed hawk, osprey, killdeer, broad-tailed hummingbird, white-throated swift, belted kingfisher, violet-green swallow, Bewick's wren, Virginia's warbler, hermit warbler, and pine siskin. Of these species, only zone-tailed hawk, killdeer, and white-throated swift are potential breeding species. More effort, especially that during spring migration will produce observations of additional species of birds in future years.

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Table 3: Status of all bird species ($n = 152$) that we detected on the Northern Jaguar Reserve in east-central Sonora during field surveys in July 2007, September 2007, July 2008, and January 2009.

Common Name	Latin Name	Breeding Status			Overall Status
		Possible	Probable	Confirmed	
greater white-fronted goose	<i>Anser albifrons</i>				rare migrant
ring-necked duck	<i>Aythya collaris</i>				winter resident or visitant
common merganser	<i>Mergus merganser</i>				winter resident, likely breeds along Rio Aros
wild turkey	<i>Meleagris gallopavo</i>	x			uncommon resident
elegant quail	<i>Callipepla douglasii</i>		x		common resident
Gambel's quail	<i>Callipepla gambelii</i>	x			rare summer resident
Montezuma quail	<i>Cyrtonyx montezumae</i>			x	common resident at higher elevations
least grebe	<i>Tachybaptus dominicus</i>			x	likely resident at pond between Babisal and Huijalo
great blue heron	<i>Ardea herodias</i>	x			resident, could breed along Rio Aros
green heron	<i>Butorides virescens</i>				likely winter resident or visitant
black vulture	<i>Coragyps atratus</i>	x			summer resident
turkey vulture	<i>Cathartes aura</i>	x			common summer resident, rare in winter
sharp-shinned hawk	<i>Accipiter striatus</i>				winter resident and migrant
Cooper's hawk	<i>Accipiter cooperii</i>				winter resident and migrant, could breed
common black-hawk	<i>Buteogallus anthracinus</i>			x	uncommon summer resident in wet canyons and along Rio Aros
gray hawk	<i>Asturina nitida maxima</i>			x	uncommon summer resident
short-tailed hawk	<i>Buteo brachyurus</i>				unknown status
red-tailed hawk	<i>Buteo jamaicensis</i>			x	fairly common resident
American kestrel	<i>Falco sparverius</i>				winter resident and migrant, could breed
peregrine falcon	<i>Falco peregrinus</i>	x			uncommon resident
spotted sandpiper	<i>Actitis macularia</i>				winter resident and migrant
Wilson's snipe	<i>Gallinago delicata</i>				winter resident
band-tailed pigeon	<i>Patagioenas fasciata</i>				unknown status
white-winged dove	<i>Zenaida asiatica</i>			x	common resident
mourning dove	<i>Zenaida macroura</i>		x		common resident
Inca dove	<i>Columbina inca</i>				rare winter resident
common ground-dove	<i>Columbina passerina</i>		x		common resident

white-tipped dove	<i>Leptotila verreauxi</i>		x	resident but rare in winter
military macaw	<i>Ara militaris</i>		x	rare summer resident
yellow-billed cuckoo	<i>Coccyzus americanus</i>		x	fairly common summer resident
greater roadrunner	<i>Geococcyx californianus</i>	x		uncommon summer resident, not seen in winter but likely resident
western screech-owl	<i>Megascops kennicottii</i>		x	uncommon resident
whiskered screech-owl	<i>Megascops trichopsis</i>	x		resident on Mesa Encinosa
great horned owl	<i>Bubo virginianus</i>	x		uncommon resident
northern pygmy-owl	<i>Glaucidium gnoma</i>			unknown status, maybe locally present in oak woodlands
elf owl	<i>Micrathene whitneyi</i>	x		uncommon summer resident
lesser nighthawk	<i>Chordeiles acutipennis</i>	x		rare summer resident
buff-collared nightjar	<i>Caprimulgus ridgwayi</i>		x	fairly common summer resident
broad-billed hummingbird	<i>Cynanthus latirostris</i>		x	common summer resident, rare in winter
white-eared hummingbird	<i>Hylocharis leucotis</i>			rare winter resident or visitant
Berylline hummingbird	<i>Amazilia beryllina</i>			migrant
violet-crowned hummingbird	<i>Amazilia violiceps</i>		x	common summer resident, rare in winter
blue-throated hummingbird	<i>Lampornis clemenciae</i>			unknown status
plain-capped starthroat	<i>Heliomaster constantii</i>			rare migrant, possible summer resident
black-chinned hummingbird	<i>Archilochus alexandri</i>			migrant
rufous hummingbird	<i>Selasphorus rufus</i>			migrant
elegant trogon	<i>Trogon elegans</i>		x	fairly common summer resident in canyons, rare in winter
green kingfisher	<i>Chloroceryle americana</i>		x	rare resident or migrant
acorn woodpecker	<i>Melanerpes formicivorus</i>	x		uncommon resident on Mesa Encinosa
Gila woodpecker	<i>Melanerpes uropygialis</i>		x	common resident
ladder-backed woodpecker	<i>Picoides scalaris</i>		x	common resident
Arizona woodpecker	<i>Picoides arizonae</i>	x		uncommon resident on Mesa Encinosa
northern flicker	<i>Colaptes auratus</i>		x	rare summer resident in oaks, possibly more common in winter
gilded flicker	<i>Colaptes chrysoides</i>		x	common resident
white-striped woodcreeper	<i>Lepidocolaptes leucogaster</i>		x	resident in Babisal Canyon, present in summer in Huijalo Canyon
northern beardless-tyrannulet	<i>Camptostoma imberbe</i>		x	fairly common resident
greater pewee	<i>Contopus pertinax</i>			uncommon winter resident in montane canyons, possible migrant
western wood-pewee	<i>Contopus sordidulus</i>		x	fairly common summer resident
Hammond's flycatcher	<i>Empidonax hammondi</i>			uncommon winter resident and migrant

gray flycatcher	<i>Empidonax wrightii</i>			uncommon winter resident and migrant
dusky flycatcher	<i>Empidonax oberholseri</i>			uncommon winter resident and migrant
pacific-slope flycatcher	<i>Empidonax difficilis</i>			rare winter resident and migrant
buff-breasted flycatcher	<i>Empidonax fulvifrons</i>			rare winter resident, possible migrant
black phoebe	<i>Sayornis nigricans</i>		x	resident in wet places
Say's phoebe	<i>Sayornis saya</i>			uncommon winter resident and migrant
vermillion flycatcher	<i>Pyrocephalus rubinus</i>		x	common summer resident, rare in winter
dusky-capped flycatcher	<i>Myiarchus tuberculifer</i>		x	common summer resident
ash-throated flycatcher	<i>Myiarchus cinerascens</i>	x		uncommon resident
Nutting's flycatcher	<i>Myiarchus nuttingi</i>	x		rare summer resident, common winter resident
brown-crested flycatcher	<i>Myiarchus tyrannulus</i>		x	fairly common summer resident
sulphur-bellied flycatcher	<i>Myiodynastes luteiventris</i>		x	fairly common summer resident in canyon woodlands
tropical kingbird	<i>Tyrannus melancholicus</i>	x		uncommon summer resident in valley bottoms
Cassin's kingbird	<i>Tyrannus vociferans</i>			rare winter resident or visitant
thick-billed kingbird	<i>Tyrannus crassirostris</i>		x	fairly common summer resident
western kingbird	<i>Tyrannus verticalis</i>			common migrant
rose-throated becard	<i>Pachyramphus aglaiae</i>		x	fairly common summer resident in canyon woodlands
loggerhead shrike	<i>Lanius ludovicianus</i>			unknown status
Bell's vireo	<i>Vireo bellii</i>		x	common summer resident along Rio Aros
plumbeous vireo	<i>Vireo plumbeus</i>			uncommon winter resident and common migrant
Cassin's vireo	<i>Vireo cassinii</i>			uncommon winter resident and common migrant
Hutton's vireo	<i>Vireo huttoni</i>			uncommon winter resident and migrant
warbling vireo	<i>Vireo gilvus</i>			common migrant
yellow-green vireo	<i>Vireo flavoviridis</i>	x		rare summer resident, pair occupancy not yet confirmed
Mexican jay	<i>Aphelocoma ultramarina</i>		x	uncommon resident on Mesa Encinosa
common raven	<i>Corvus corax</i>		x	uncommon resident
northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	x		likely summer resident and migrant
cliff swallow	<i>Petrochelidon pyrrhonota</i>		x	Summer resident along Rio Aros
bridled titmouse	<i>Baeolophus wollweberi</i>		x	uncommon resident on Mesa Encinosa
verdin	<i>Auriparus flaviceps</i>		x	common resident
cactus wren	<i>Campylorhynchus brunneicapillus</i>		x	common resident
rock wren	<i>Salpinctes obsoletus</i>		x	uncommon resident

canyon wren	<i>Catherpes mexicanus</i>		x	uncommon resident	
Sinaloa wren	<i>Thryothorus sinaloa</i>			x	common summer resident, uncommon or not readily detected in winter
house wren	<i>Troglodytes aedon</i>				uncommon winter resident and migrant
ruby-crowned kinglet	<i>Regulus calendula</i>				common winter resident
blue-gray gnatcatcher	<i>Poliophtila caerulea</i>			x	uncommon resident on Mesa Encinosa, fairly common winter resident
black-tailed gnatcatcher	<i>Poliophtila melanura</i>		x		summer resident in arid scrub, winter resident or migrant elsewhere
black-capped gnatcatcher	<i>Poliophtila nigriceps</i>		x		summer resident in tall thornscrub or woodland, uncommon winter resident
brown-backed solitaire	<i>Myadestes occidentalis</i>				winter resident in moist canyon forests
hermit thrush	<i>Catharus guttatus</i>				uncommon winter resident
northern mockingbird	<i>Mimus polyglottos</i>		x		common summer resident along Rio Aros, uncommon in winter
curve-billed thrasher	<i>Toxostoma curvirostre</i>			x	uncommon resident
blue mockingbird	<i>Melanotis caerulescens</i>		x		rare summer resident in Huijalo Canyon with one pair present
phainopepla	<i>Phainopepla nitens</i>	x			status unknown
orange-crowned warbler	<i>Vermivora celata</i>				uncommon winter resident and common migrant
Nashville warbler	<i>Vermivora ruficapilla</i>				common migrant
Lucy's warbler	<i>Vermivora luciae</i>		x		common summer resident and migrant
yellow warbler	<i>Dendroica petechia</i>				uncommon migrant
yellow-rumped warbler	<i>Dendroica coronata</i>				common winter resident and likely during migration
black-throated gray warbler	<i>Dendroica nigrescens</i>				common winter resident and migrant
Townsend's warbler	<i>Dendroica townsendi</i>				rare winter resident and migrant
MacGillivray's warbler	<i>Oporornis tolmiei</i>				uncommon migrant
Wilson's warbler	<i>Wilsonia pusilla</i>				very rare winter resident and common migrant
painted redstart	<i>Myioborus pictus</i>				uncommon winter resident
slate-throated redstart	<i>Myioborus miniatus</i>				rare winter resident along Rio Aros
fan-tailed warbler	<i>Euthlypis lachrymosa</i>			x	uncommon to rare summer resident along wet rocky canyon bottoms
rufous-capped warbler	<i>Basileuterus rufifrons</i>			x	fairly common resident on canyon slopes
yellow-breasted chat	<i>Icteria virens</i>			x	common summer resident
hepatic tanager	<i>Piranga flava</i>	x			uncommon winter resident, rare in summer on Mesa Encinosa
summer tanager	<i>Piranga rubra</i>			x	common summer resident
western tanager	<i>Piranga ludoviciana</i>				common migrant
green-tailed towhee	<i>Pipilo chlorurus</i>				uncommon winter resident
canyon towhee	<i>Pipilo fuscus</i>		x		common resident

rufous-winged sparrow	<i>Aimophila carpalis</i>			x	common resident
Cassin's sparrow	<i>Aimophila cassinii</i>	x			summer resident in field at la Ventana
rufous-crowned sparrow	<i>Aimophila ruficeps</i>			x	resident on grassy slopes
rusty sparrow	<i>Aimophila rufescens</i>	x			rare summer resident on shrubby slopes on Mesa Encinosa
five-striped sparrow	<i>Aimophila quinquestrata</i>			x	abundant summer resident
chipping sparrow	<i>Spizella passerina</i>				common winter resident
clay-colored sparrow	<i>Spizella pallida</i>				rare migrant and winter resident
vesper sparrow	<i>Pooecetes gramineus</i>				rare winter resident
lark sparrow	<i>Chondestes grammacus</i>				uncommon winter resident
Lincoln's sparrow	<i>Melospiza lincolnii</i>				uncommon winter resident
grasshopper sparrow	<i>Ammodramus savannarum</i>				rare winter resident
white-crowned sparrow	<i>Zonotrichia leucophrys</i>				common winter resident
northern cardinal	<i>Cardinalis cardinalis</i>			x	common resident
pyrrhuloxia	<i>Cardinalis sinuatus</i>		x		uncommon resident
yellow grosbeak	<i>Pheucticus chrysopheplus</i>	x			unknown status, could breed in Babisal Canyon
black-headed grosbeak	<i>Pheucticus melanocephalus</i>			x	common summer resident, uncommon in winter
blue grosbeak	<i>Passerina caerulea</i>			x	common summer resident
lazuli bunting	<i>Passerina amoena</i>				fairly common migrant and winter resident
varied bunting	<i>Passerina versicolor</i>			x	common summer resident
painted bunting	<i>Passerina ciris</i>				uncommon migrant in late summer
unknown meadowlark	<i>Sturnella sp.</i>				likely winter resident, likely was eastern
bronzed cowbird	<i>Molothrus aeneus</i>			x	uncommon summer resident
brown-headed cowbird	<i>Molothrus ater</i>		x		uncommon summer resident
black-vented oriole	<i>Icterus wagleri</i>			x	uncommon resident
hooded oriole	<i>Icterus cucullatus</i>			x	common to abundant summer resident in palms, rare in winter
streak-backed oriole	<i>Icterus pustulatus</i>			x	uncommon summer resident in large wooded canyons
Bullock's oriole	<i>Icterus bullockii</i>				uncommon migrant
Scott's oriole	<i>Icterus parisorum</i>		x		uncommon summer resident, rare in winter
house finch	<i>Carpodacus mexicanus</i>			x	common resident
lesser goldfinch	<i>Carduelis psaltria</i>		x		common resident

Table 4: Distribution and abundance of birds detected along transects on the Northern Jaguar Reserve in July 2008 and January 2009. Numbers indicate singles, singing males, or pairs, x indicates common species for which abundance was not estimated, C = colony, F = female, J = juvenile, M = male, P = pair, S = sign, T = territory, Y = dependant young, NE = nest with eggs, NY = nest with young, UN = used nest, ON = occupied nest. For example a 6, 2Y indicates I observed six individuals two of which were dependant young.

	July 2008								January 2009							
	Los Pavos	Rio Aros	Hubaral	Babisal Abajo	Babisal Arriba	Huijalo Abajo	Mesa Encinosa	La Ventana	Rio Aros	Hubaral	Babisal Abajo	Babisal Arriba	Huijalo Abajo	Mesa Encinosa	La Ventana	
Day of month	9	10	10	11	11	12	12	13	4	4	3	3	5	5	6	
common merganser									3M							
elegant quail	20		12	6	2		10	20		13	12		2			
Gambel's quail				7												
Montezuma quail						1	15,2Y	5								
great blue heron		1							2							
black vulture	4	2		3				3								
turkey vulture	8	5	6	7	4	4	6	5				2				
sharp-shinned hawk									1		1		2			
Cooper's hawk	1									3		1				
common black-hawk		3,2Y			1P			1,NY								
gray hawk					1P,NY	2Y		3,2Y								
short-tailed hawk						1										
red-tailed hawk			1Y	1			1	1	2			4	1	2	1	
American kestrel									1					1	1	
peregrine falcon	1								1							
Wilson's snipe														1		
band-tailed pigeon					2	1										
white-winged dove	90,2Y	75	60,NE	40	25,ON	45	40,ON	60,NY	1					25	60	
mourning dove	4	3		3			1	2	4	1	3		1	6	5	
Inca dove										1						
common ground-dove	30	45	15	30	10	20	15	40	3	1				4	3	
white-tipped dove	10	2	14,2Y	10	12	15	4	4		1?			1		1?	
military macaw				1P	3	1										
yellow-billed cuckoo		4	1	4	2	4	12	8								
greater roadrunner	2		3				1									
western screech-owl						1		1					1		2	
whiskered screech-owl							1									
great horned owl										1						
elf owl						2		1								
lesser nighthawk						1										
buff-collared nightjar	8		6		1	3		1								

	July 2008								January 2009							
	Los Pavos	Rio Aros	Hubaral	Babisal Abajo	Babisal Arriba	Hujjalo Abajo	Mesa Encinosa	La Ventana	Rio Aros	Hubaral	Babisal Abajo	Babisal Arriba	Hujjalo Abajo	Mesa Encinosa	La Ventana	
unknown hummingbird									1		1	3	2		2	
broad-billed hummingbird	5	6	2	7	4	10	6	10,NE				4	2			
white-eared hummingbird													1			
violet-crowned hummingbird	4	8		6,ON	2	5	1	4				2				
plain-capped starthroat		1F														
elegant trogon	3T,ON		5T		1	5	1T	2T,ON		3		1	3			
green kingfisher															1P	
acorn woodpecker														2		
Gila woodpecker	15	6	15,NY	x,NY	6	15,NY	8	15,NY	3	4	2		4	3	6	
ladder-backed woodpecker	6	2	3	2	2	4	5,1Y	4	2		1	1	7	4	5	
northern flicker										1?						
gilded flicker	8	2	1,ON	3								1				
white-striped woodcreeper					2	1						2				
northern beardless-tyrannulet		1	4	5	4	4	4	5	1		1	4			3	
greater pewee												3	4			
western wood-pewee			5		6	7	1	1								
unknown Empidonax									6	10	4	5	10		10	
Hammond's flycatcher												1	6		1	
gray flycatcher									5	4	4		1	3	12	
dusky flycatcher									1	3		2	3			
pacific-slope flycatcher									1	3	3		4			
buff-breasted flycatcher									1						1	
black phoebe		3,2Y		1	1			1	1	2	4	5	1	1	3	
Say's phoebe									3		2	1		2	3	
vermillion flycatcher	1	11	2	3,ON	1			15,Y								
dusky-capped flycatcher	3		8	9	8,NY	7	8,ON	12								
ash-throated flycatcher	15		3	6		2	5	4			3	2	2		3	
Nutting's flycatcher	1								5	6	2	5	4	12	2	
brown-crested flycatcher	4	2	6,ON	6	5	6	3	6								
sulphur-bellied flycatcher			2		3	6,NY	2,Y	1								
tropical kingbird		4		2				1								
Cassin's kingbird															2	
thick-billed kingbird	2		2	3	3,ON	6		3								
western kingbird								2								
rose-throated becard					6	8,ON										
Bell's vireo		18						12								

	July 2008								January 2009							
	Los Pavos	Rio Aros	Hubaral	Babisal Abajo	Babisal Arriba	Hujjalo Abajo	Mesa Encinosa	La Ventana	Rio Aros	Hubaral	Babisal Abajo	Babisal Arriba	Hujjalo Abajo	Mesa Encinosa	La Ventana	
plumbeous vireo												1		1		
Cassin's vireo									2	2		2	3	1		
Hutton's vireo										4		1		4		
yellow-green vireo						1S										
Mexican jay							10							8		
common raven	2	2,Y	1	3		2	2	1	2			2	3	2		
northern rough-winged swallow		6														
bridled titmouse														2		
verdin	10,Y	10		8	2	5	3	10	4	4	2	2	5	4		
cactus wren	20		10	7	4	4	12	5	3	3	2			8		
rock wren			2				1		2				1	1		
canyon wren	2	4	6	2	4	4	4	10	3	20	3	4	20	10		
Sinaloa wren	1		5	1	6	14,NY	3	3		1	1	2	6	2		
house wren									2	1	1	1	2	3		
ruby-crowned kinglet									12	30	8	8	10	12		
blue-gray gnatcatcher							3,NE		6	20	6		25	6		
black-tailed gnatcatcher									1P	1				2		
black-capped gnatcatcher	8	5,2Y	7	10	3	10	4	10	1P			2		1		
brown-backed solitaire													2			
hermit thrush										1		1	2			
northern mockingbird	25			1		1	3	1	2							
curve-billed thrasher	20	3	6	7	2	2	6,ON	3	3	2		2	2	2		
blue mockingbird														1P		
phainopepla								1	6					1		
orange-crowned warbler										1		3	3	6		
Lucy's warbler		2		1				2								
yellow-rumped warbler									8	5	3	1		15		
black-throated gray warbler									10	10		12	20	14		
Townsend's warbler												3	4			
Wilson's warbler													2			
painted redstart										2	1	3	7	3		
slate-throated redstart									2							
fan-tailed warbler			1S		1S	4,NY										
rufous-capped warbler	1		5	1	6	7	3	3		3		3	10	3		
yellow-breasted chat	35	50	25	45	15	15	22	x								
hepatic tanager							1					2	3	10		

	July 2008								January 2009							
	Los Pavos	Rio Aros	Hubaral	Babisal Abajo	Babisal Arriba	Hujjalo Abajo	Mesa Encinosa	La Ventana	Rio Aros	Hubaral	Babisal Abajo	Babisal Arriba	Hujjalo Abajo	Mesa Encinosa	La Ventana	
summer tanager	2	2	3	4	6,FL	8,CF	2	10								
western tanager						1F										
green-tailed towhee									4	2			5		4	
canyon towhee	15	1	12	7	1	4		4	2	7	6	2		14	12	
rufous-winged sparrow	30,NE	10	4	24				8	3	5	5					
Cassin's sparrow								1S								
rufous-crowned sparrow	1					2	25,NE	5			1			8	2	
rusty sparrow								1S								
five-striped sparrow	60	3	25,Y	10	8	15	40	x								
chipping sparrow									6	4	20			150	25	
clay-colored sparrow															1	
vesper sparrow														3		
lark sparrow									2					2		
Lincoln's sparrow										2	2			1	1	
grasshopper sparrow														1		
white-crowned sparrow									4	5					25	
northern cardinal	15	x	12	x	6	7	8	10	6	4	4	1	3	10	10	
pyrrhuloxia	2								2	2	2				4	
black-headed grosbeak	5		6		2	8	20,ON						1	6	2	
blue grosbeak	15	x	3	x,NY		12	12	16								
lazuli bunting									3	2				8	4	
varied bunting	20	20	18	x	10	10	20	x								
unknown meadowlark														1		
bronzed cowbird	1			6	3			6								
brown-headed cowbird	7	10	3	14	2	3	3	6								
black-vented oriole	4	1	3	1	2	5,NY	1				3	2	2			
hooded oriole	12	1	50,NY	30,NY	12	20,NY	3	12,ON							1M	
streak-backed oriole					1,NY	3,NY										
Scott's oriole							4						1M	1?		
house finch	45	2	20	12	4	7,2Y	3	12,NY	35	30	25	1	4	45	80	
lesser goldfinch	3	6	3	4	2	25	8	40	2		12	1	1	12	25	

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Appendix A: Location of start and end coordinates of transects along which I surveyed birds on the Northern Jaguar Reserve in July 2008 and January 2009.

Transect	Segment	Point name - date	UTM E 12N NAD 27 Mex.	UTM N 12N NAD 27 Mex.	Approximate Altitude
Los Pavos	Canyon	st	674627	3263157	830
Los Pavos	Canyon	end	673891	3263314	819
Los Pavos	Road above ranch	st	675060	3263260	849
Los Pavos	Road above ranch	end	675961	3263801	896
Rio Aros	Section 1	st	681760	3258640	470
Rio Aros	Section 1	end	682083	3259407	475
Rio Aros	Section 1	end Sept 2007 and Jan 2009	682815	3259779	465
Rio Aros	Section 2	st	681134	3260338	500
Rio Aros	Section 2	end	680702	3260618	508
Hubaral	Lower	st	678589	3257977	600
Hubaral	Lower	end	677900	3257141	633
Hubaral	Upper	st	677903	3256984	635
Hubaral	Upper	end	677980	3256511	685
Babisal Abajo	Babisal Abajo	st	680742	3252932	725
Babisal Abajo	Babisal Abajo	end	681983	3253554	688
Babisal Arriba	Babisal Arriba	st	680742	3252932	725
Babisal Arriba	Babisal Arriba	end	680525	3252415	790
Huijalo Abajo	Huijalo Abajo	end	681791	3247423	910
Huijalo Abajo	Huijalo Abajo	st	681667	3248780	760
Mesa Encinosa	Camp to tank	st	682508	3246386	1000
Mesa Encinosa	Camp to tank	end	681339	3246149	1000
Mesa Encinosa	Road and Mesa	st	682043	3246231	1050
Mesa Encinosa	Huijalo Arriba	end	680541	3245992	1150
Mesa Encinosa	Huijalo Arriba	end July 2008	680768	3246051	1150
Mesa Encinosa	Huijalo Arriba	st	680811	3246192	1100
Mesa Encinosa	Road and Mesa	end	682091	3246501	1100
La Ventana	La Ventana	st	684579	3244563	740
La Ventana	La Ventana	st July 2008	684830	3244540	740
La Ventana	La Ventana	end	684888	3245860	730