Winter Distribution of the Willow Flycatcher (*Empidonax traillii*) in Guatemala and Mexico

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Concern for the Southwestern Willow Flycatcher (*Empidonax traillii extimus*) has stimulated increased research, management, and conservation of the species on its North American breeding grounds. To supplement current knowledge of breeding populations, recent studies in Latin America (Koronkiewicz et al. 1998; Koronkiewicz and Whitfield 1999; Koronkiewicz and Sogge 2000; Lynn and Whitfield 2000, 2002; Nishida and Whitfield 2003, 2004, 2006) have focused on wintering ecology. We extended these efforts by surveying for Willow Flycatchers from December 8 – 24, 2005 in Guatemala and February 20 – March 4, 2006 in Mexico. Our goals were to identify territories occupied by wintering Willow Flycatchers, describe habitat in occupied areas, collect blood and feather samples, make colorimeter readings, relocate previously banded individuals, and identify potential threats to wintering Willow Flycatcher populations.

We spent a total of 54.3 survey and 75.4 banding hours at six locations in Guatemala and three in Mexico. In Guatemala, we surveyed locations in both the eastern and Pacific coast lowlands and detected a minimum of 115 Willow Flycatchers, of which we captured and banded 36. In Mexico, we revisited three locations that had been surveyed in 2002 and 2004. We detected 85 Willow Flycatchers and banded 27. We re-sighted four of 29 (14%) previously banded birds and captured one bird approximately 217 m from its original banding site. This re-sighting rate is low when compared to those for Costa Rica (43% at Bolsón, 77% at Chomes; Koronkiewicz 2002) and other parts of Mexico (64% Guerrero, Oaxaca, and Chiapas; Nishida and Whitfield 2004).

Willow Flycatchers appeared to use a wide range of habitats throughout their wintering range, including those impacted by agriculture and cattle ranching. Until more detailed analyses of occupied and unoccupied habitat are performed, it will be difficult to assess whether winter habitat currently limits Willow Flycatcher populations. However, growth in ranching and agriculture throughout Latin America are likely to directly, or indirectly, impact the species in the near future.

To develop a well-integrated conservation strategy for Southwestern Willow Flycatchers, further knowledge of their wintering ecology is essential. We recommend continuing broad-scale and/or fine-scale ecological studies. At a broad scale, we suggest further surveys and genetic, stable isotope, and color sampling of birds in Nicaragua, Venezuela and Peru to pin down subspecies identifications and distributions on the wintering grounds. At a fine scale, we suggest trying to better understand the factors that affect habitat quality (e.g., proximity to water, grazing, agriculture, pesticides, insect abundance) and how they influence individual and population fitness. These relationships can only be understood by following a winter population through time.

TABLE OF CONTENTS

INTRODUCTION

In 1995, the Southwestern Willow Flycatcher (*Empidonax traillii extimus*) was listed as federally endangered (USFWS 1995) because of significant declines in its range and numbers. Once a common breeder in riparian areas throughout the southwestern United States, the subspecies has suffered significantly from the loss and degradation of riparian habitat (Unitt 1987, Whitfield and Sogge 1999, Finch and Stoleson 2000). Efforts to recover Southwestern Willow Flycatcher populations have focused on factors that affect survival and reproductive success on the breeding grounds. While this approach is essential, it is incomplete.

Like many North American birds, Southwestern Willow Flycatchers migrate south in late summer and spend approximately eight months in Latin America before returning north. Despite recent research efforts, very little is known about the distribution and ecology of flycatcher populations during their lengthy wintering period. Future conservation efforts may depend critically on understanding this life stage since farming and development continue to reshape the Latin American landscape.

The Southwestern Willow Flycatcher is one of four Willow Flycatcher subspecies which have been delineated according to geographic distributions during the breeding season and very subtle morphological differences (Unitt 1987, Browning 1993). According to breeding bird surveys, all subspecies of Willow Flycatchers have declined across their breeding range from 1966 to 2003 (Sauer 2003). The winter distribution of the entire species extends from North-central Mexico to northern South America but, to date, it has been difficult to reliably assign each subspecies to a particular region.

Since we are not yet able to distinguish subspecies on the wintering grounds, it is important to gather information about the distribution and ecology of the entire species throughout Latin America. It seems reasonable to assume that winter habitat requirements are similar for all subspecies because they share such similar breeding ecology. Nonetheless, continued efforts to identify subspecies and delineate their wintering ranges are crucial.

We traveled to Guatemala and Mexico to collect more data to help distinguish Willow Flycatcher subspecies on the wintering grounds and to continue gaining insight into their winter ecology.

OBJECTIVES

To improve understanding of the distribution and ecology of the Willow Flycatcher in Latin America, we had six objectives:

1. *Locate and describe occupied Willow Flycatcher winter habitat in Guatemala and northern Mexico.*

2. *Identify and compare common habitat characteristics.*

3. *Obtain blood samples for future work on subspecies and gender determination.*

4. *Obtain feather samples to match wintering and breeding locations using stable isotopes.*

5. *Collect colorimeter readings for subspecies determination.*

6. *Identify and describe potential threats to wintering flycatchers and their habitat.*

METHODS

Study areas

We gathered distribution information from museum specimens to identify geographic locations in both Guatemala and Mexico that were likely to harbor wintering Willow Flycatchers (Unitt 1997). We also consulted field guides (Howell and Webb 1995) and spoke to ornithologists familiar with the study regions, including Steven N.G. Howell (1999 pers. comm.), Marco Gonzales, Xico Vega Picos (2004 pers. comm.), and René Corado (2005 pers. comm.) to further refine our list of prospective study areas. In general, we only considered locations that were readily accessible by roads, rivers or other transportation corridors.

After arriving at study locations in Guatemala, we typically searched for multiple sites within 30 km of our base. We only selected sites that appeared to contain appropriate habitat for Willow Flycatchers, based on previous experience and winter habitat descriptions provided by other researchers. We visited locations on both Atlantic and Pacific slopes of the country from December 10-21, 2005, in an effort to cover a wide range of potential wintering locations.

From February 24 – March 12, 2006, we surveyed three geographic locations in northern Mexico, all of which had been previously visited. Our primary goal was to assess return rates and site fidelity of birds banded in 2002 and 2004. All three locations were situated in the Pacific lowlands, an area characterized by distinct rainy (May - October) and dry (November - April) seasons.

Survey and re-sighting technique

We followed the survey protocol described in Sogge et al. (1997) to detect wintering Willow Flycatchers, with slight modifications for use on non-breeding birds (Koronkiewicz and Whitfield 1999, Nishida and Whitfield 2003). Surveys were performed between 0600 and 1100 hours, typically the peak of flycatcher activity. We listened quietly for 1–3 minutes for spontaneously vocalizing birds after arriving at a study site. We then used MP3 players to broadcast Willow Flycatcher vocalizations at volumes similar to naturally singing birds. Song was broadcast for 15–30 seconds followed by a 2–4 minute listening period. We walked transects through appropriate habitat when possible. When vegetation was impassable, we surveyed along the periphery of habitat patches. Playback stations were spaced 20–40 m apart depending on the density of the vegetation. We did not count detections unless we heard a diagnostic "fitz-bew" call. If we located an *Empidonax* flycatcher, but could not confirm it as a Willow Flycatcher, we interrupted the survey to positively identify the bird to species. Interruptions were limited to 30 minutes.

For each site, we recorded general habitat characteristics including distance to water sources, genera of dominant trees and shrubs (when known), estimated canopy heights, severity of human related disturbance, and evidence of any other threats to flycatcher persistence. We also included sketches of each survey site depicting the survey route, important landmarks, water sources, and areas where flycatchers were detected. Land ownership and management information was included whenever possible. As time and attention allowed, we noted other bird species present at each of the study locations. We measured distances to the nearest town, road, or other landmark using Garmin© hand-held GPS (Global Positioning System) units, maps, or the car's odometer reading.

For each Willow Flycatcher, we also noted whether it was detected before or after playback, whether it was banded or not, how it responded to conspecific vocalizations, and whether it showed any other distinct behaviors. We used the GPS units to record both survey and detection coordinates, measure the length of each survey, determine elevation, and estimate the distance between detections and/or capture of individuals between years. We recorded the time, duration, and location

of each detection. In Mexico, we were particularly interested in determining whether birds were banded in previous years. As a result, our efforts there reflect a combination of surveys and re-sighting (see Appendices 1-2). In general, our measure of survey hours reflects the amount of time spent surveying and re-sighting at a particular site. We often surveyed areas in pairs for safety reasons, so survey hours are not equivalent to person hours.

Banding technique

After identifying specific Willow Flycatchers territories during surveys, we returned to capture and band individuals, typically during the following morning. We focused on mist-netting birds whose territories and behaviors facilitated capture because time often constrained our efforts. Individuals that responded strongly to playback and chose predictable flight paths between vegetation were good candidates for capture. Our banding efforts were concentrated in the early morning, beginning around sunrise (~0600 hours), and typically lasted until flycatcher activity waned (~1100 hours).

We used playback of pre-recorded Willow Flycatcher vocalizations to lure birds into mist-nets according to methods described by Sogge et al. (2001) rather than using a large-scale passive mist-netting approach. As a result, our measure of banding hours is relatively small, but does approximate the number of hours that nets were open (i.e. net hours). After we captured a bird, we placed an aluminum USFWS band on its right leg. Until 2004, we had used unmodified aluminum USFWS bands. In 2005, we started using USFWS bands anodized with a bronze color so that we could easily distinguish flycatchers banded on the wintering grounds from those banded on the breeding grounds.

We collected blood and feather samples from captured birds and made a series of color and morphological measures as part of a coordinated effort to distinguish Willow Flycatcher subspecies on their wintering grounds. We used a toenail clip technique to obtain blood from birds, stored samples in 2% sodium dodecyl sulfate buffer solution. We also plucked body feathers, primary coverts, and the fifth primary feather from captured birds and sent them to M. Johnson for stable isotope analysis. Using a Minolta colorimeter we measured reflectance of back and crown feathers and sent the data to T. Koronkiewicz who is using them to help diagnose subspecies. Finally, we recorded wing chord, tail length, culmen width, culmen length, fat score, flight feather wear, molt patterns, and weight of captured birds in addition to noting the capture location with a Garmin hand-held GPS unit (see Appendix 3)

RESULTS

Surveys and re-sighting

In Guatemala, we conducted surveys from December 10-23, 2005 at 14 sites spread among six geographic locations. We detected birds at all six locations (100%) and at 12 of 14 (86%) sites. Over the course of 23.6 survey hours we detected 115 Willow Flycatchers, resulting in a detection rate of 4.9 birds per survey hour (Appendix 4). In contrast to the behavior of breeding birds, very few birds "fitz-bewed" spontaneously. However, once playbacks were performed that provoked interactions among neighboring Willow Flycatchers, fewer were required to identify flycatcher territories.

In Mexico, we conducted surveys from February 21-March 3, 2006 at three locations that had been visited in previous years. Two of three (67%) locations and 4 of 5 (80%) sites harbored Willow Flycatchers. No birds were detected at Guamuchil in 2006, as the original study site was flooded, but birds were present at both Novillero and San Blas sites. We spent a total of 30.7 hours surveying and re-sighting Willow Flycatchers. Across the three locations and five sites, we located 85 Willow Flycatchers, resulting in a detection rate of 2.8 birds per hour (Appendix 5).

At Novillero, we re-sighted two of eight (25%) birds banded in December 2004. At San Blas, we detected none of the 15 (0%) birds banded with bronze anodized USFWS bands at the Cocodrilario Site in December 2004. We did, however, re-sight two of the six (33%) birds wearing standard aluminum USFWS bands since February 2002.

Table 1: Willow Flycatcher detections and banding data for Guatemala.

Survey Location	Dates	Detected	Banded
Los Amates	12/10-13	31	15
El Estor	12/14-16	17	7
Puerto San Jose	12/19-20	41	4
Rio Samala	12/20-21	8	7
Las Avellanas	12/21-22	6	1
Chiquimulilla	12/21-23	12	2

Table 2: Willow Flycatcher detections and banding data for northern Mexico.

Survey Location	Dates	Detected	Banded
El Novillero, Nayarit	2/21-25	25	9
Guamuchil, Sinaloa	2/22-25, 3/3	0	0
San Blas, Nayarit	2/26-28, 3/3	60	18 (1 recapture)

Banding

In Guatemala, we spent 37.4 banding hours capturing 36 birds across 12 sites, for an overall capture rate of 1.0 birds per hour. In Mexico we spent 38.0 hours capturing 27 birds, for an overall capture rate of 0.7 birds per hour. In San Blas, Mexico, we re-captured one of the Willow Flycatchers banded in 2002. The bird was netted in the same pasture, but 217 m from its original capture site. Blood and feather samples were collected from all birds, as were morphological and color measurements.

Habitat characteristics

Suitable winter habitat for Willow Flycatchers has been described as of a combination of four main habitat components: 1) standing or slow moving water and/or saturated soils, 2) patches or stringers of trees, 3) woody shrubs, and 4) open areas (Koronkiewicz et al. 1998; Koronkiewicz and Whitfield 1999; Koronkiewicz and Sogge 2000; Lynn and Whitfield 2000, 2002; Lynn et al. 2003; Nishida and Whitfield 2003, 2004).

In Guatemala, all sites with Willow Flycatchers contained areas of saturated soil and all contained or were adjacent to a river, stream, or marsh. All sites also contained trees, woody shrubs, and open areas. In Mexico, all of the sites we surveyed for Willow Flycatchers were located near slow-moving rivers, lagunas, and associated floodplains with aquatic and emergent vegetation. These seasonally inundated floodplains were bordered by any combination of the following vegetative growth: woody shrubs, patches or stringers of trees, savanna-woodland edge, second-growth woodland, pasture, and agricultural lands. Guatemala sites tended to have taller trees than Mexico sites (10.3 ± 1.1 m versus 5.5 ± 0.9 m, Wilcoxon Test, $P=0.03$) but shrub heights and herbaceous vegetation did not differ ($P>0.20$ for both tests).

Figure 1. Guatemala study sites in 2005.

A. Los Amates, El Rico

B. Los Amates, Finca Nueva

C. Los Amates, Quiche

D. El Estor, Río Sauce

E. Puerto San Jose, Río Achiguate

F. San Sebastian, Río Samala

Figure 2. Mexico Study Sites in 2004 and 2006.

A. Cocodrilario, San Blas–December 2004

B. Cocodrilario, San Blas – February 2006

C. Novillero–December 2004

D. Novillero–February 2006

E. Quimichis–December 2004

F. Quimichis–February 2006

Potential threats

Willow Flycatcher habitat in Guatemala and Mexico varied in the degree and source of human-driven disturbance. In Guatemala, 5 of 14 (36%) sites showed evidence of logging, 3 of 14 (21%) showed evidence of gravel mining, and 11 of 14 (79%) harbored livestock. In Mexico, none of the five sites showed evidence of logging or gravel mining, but all five sites (100%) showed evidence of livestock and 2 of 5 (40%) were severely grazed. Cattle were the most prevalent grazers in both countries, but we noted horses and goats at two and one sites, respectively.

We often detected Willow Flycatchers adjacent to agricultural lands. In Guatemala, 4 of 14 (29%) sites were bordered by crops while 1 of 5 (20%) sites in Mexico were adjacent to crops. Corn, sorghum, and row crops, such as tomatoes were noted in study areas. In Puerto San Jose, Guatemala, sugarcane dominated the landscape around the Río Achiguate site and flycatchers were relegated to small fragmented patches lining the river.

DISCUSSION

Surveys, re-sighting, and banding

Surveys for wintering Willow Flycatchers have been conducted in Panama, El Salvador, Costa Rica, Mexico, and Ecuador (Koronkiewicz and Whitfield 1999, Lynn and Whitfield 2002, Lynn et al. 2003, Nishida and Whitfield 2003, 2004, 2005). Flycatchers detected per unit of effort can be used as a relative index for comparison between larger geographical regions (see Nishida and Whitfield 2003). Of the countries surveyed thus far, El Salvador (Lynn and Whitfield 2000) has been the most productive (6.9 flycatchers/survey hour) while Ecuador (Nishida and Whitfield 2003) was the least productive (0.8 flycatchers/survey hour).

Results from our 2006 surveys in Guatemala and Mexico fall within this range. In Guatemala, we detected 4.9 birds per survey hour, slightly less than in El Salvador. In Mexico, we detected 2.8 birds per survey hour, a rate nearly identical to rates obtained for Nayarit and Pacific Mexico in previous years (2.9 birds per survey hour) (Lynn and Whitfield 2002, Nishida and Whitfield 2005).

While detection rates may provide an index of flycatcher abundances, they are not systematic measures of population numbers. Survey times, survey areas, and surveyor experience have varied among sites and years. In addition, the focus

during some surveys was on locating new birds, while in others it was on re-sighting previously banded individuals.

Because of previous banding efforts in Mexico, we had the potential to re-sight eight individuals banded at Novillero in 2004 and 21 individuals banded at San Blas, six in 2002 and 15 in 2004. We detected two birds (25%) at Novillero and two birds (10%) at San Blas. These figures are comparable to those obtained in efforts to re-sight wintering Willow Flycatchers in Ecuador (17%, Nishida and Whitfield 2004, 2005) but are lower than those obtained in Costa Rica (43% at Bolsón and 77% at Chomes) (Koronkiewicz 2002) or southern Mexico in 2004 (Nishida and Whitfield 2004). High return rates in Costa Rica were thought to indicate potentially high quality habitat able to support relatively larger or more stable populations (Winker et al. 1995, Koronkiewicz and Sogge 2000, Koronkiewicz 2002). However, it may be that return rates vary considerably between years, according to weather or other external events.

Habitat

Willow Flycatcher habitat in Guatemala and Mexico is qualitatively similar to habitat described in other parts of Latin America, typically including standing or moving water, patches or stringers of trees, woody shrubs, and open areas (Koronkiewicz et al. 1998; Koronkiewicz and Whitfield 1999; Koronkiewicz and Sogge 2000; Lynn and Whitfield 2000, 2002; Lynn et al. 2003). Nishida and Whitfield (2003, 2004) also noted that cane species (*caña* in Ecuador, *paja canalera* in Central America) are characteristic of flycatcher habitat in certain areas.

Despite this generalized description of Willow Flycatcher habitat, proximity to standing or flowing water during the rainy season seems to be the only consistent predictor of flycatcher presence. Tree heights and configurations, the presence of woody shrubs, and the amount of open space surrounding winter territories varies considerably. Our surveys in Guatemala were conducted at the beginning of the dry season while Mexico surveys were performed during the middle of dry season. In Costa Rica, Koronkiewicz (2002) found that when Willow Flycatchers select winter territories, water is prevalent. Studies of related acadian flycatchers (*Empidonax virescens)* in Panama, indicates that winter territory selection occurs before water dries up (Morton 1980).

Potential threats

Over the course of our winter Willow Flycatcher study (1999-2006), we have traveled throughout much of the Pacific coast of Guatemala, Mexico, El Salvador, Costa Rica and Panama. In addition, we have worked along a substantial portion of the Río Napo in Ecuador. Given the abundance of secondary growth in all of these regions, it does not appear that Willow Flycatcher populations are currently limited by availability of winter habitat. However, it is possible that habitats which appear suitable to us are actually unsuitable for Willow Flycatchers. Unfortunately, our methods for locating flycatchers do not allow us to reliably quantify differences between occupied and unoccupied habitats or to assess how much of the landscape harbors habitat similar to that currently occupied by Willow Flycatchers.

Nonetheless, it seems likely that availability of quality winter habitat will become an issue for Willow Flycatchers (and other North American migrants) in the near future because of continuing forest destruction (Hartshorn 1992, Houghton et al. 1991). Mills (2006) notes that (even without any human impact) the land area available to birds wintering in Central and South America is much smaller than the land area available to birds on the North American breeding grounds. Thus, populations of migrants tend to be compressed on the wintering grounds. Extensive grazing and farming operations throughout Latin America may exacerbate this process of compression and possibly cause increased levels of intraspecific and interspecific competition.

Farming operations may pose other problems for wintering birds besides habitat loss or degradation. Pesticide use has been suspected as a possible threat to Willow Flycatchers on the wintering grounds (USFWS 1995, Koronkiewicz et al. 1998, Lynn and Whitfield 2002). Agrochemicals are widely used on crops throughout Mexico and Central America. Often small farmers or campesinos in Latin America will try to reverse lower yields or loss of soil fertility through the adoption of chemical inputs that are inappropriately used (Loker 1996). Rather than ameliorating the situation, these methods usually cause further environmental degradation. It is suspected that insectivorous birds are affected by the accumulation of agricultural pesticides or mining by-products and may bioaccumulate these toxicants by feeding on contaminated insects (McCarty and Secord 2000, Mora et al. 2003). Since agrochemical use is ubiquitous throughout Latin America, the effects of different chemicals on Willow Flycatcher populations should be evaluated. Gravel mining, like that seen along the Río Samala, is unlikely to have such a systematic effect though it does directly compromise riparian habitat suitable for flycatchers.

Our ability to characterize threats to wintering Willow Flycatchers was limited by our sampling method. For logistical reasons, we only looked for birds in areas that were easily accessible. A random sampling scheme which includes relatively inaccessible areas might alter our impressions of how much suitable habitat is available to wintering Willow Flycatchers and how widespread are human impacts such as cattle grazing, agriculture, logging, and mining.

RECOMMENDATIONS FOR FUTURE WORK

In order to effectively develop conservation and management strategies for Willow Flycatchers, we need a better understanding their distribution and ecology on the wintering grounds and along migratory routes. Our previous studies in Mexico, Ecuador, El Salvador, Costa Rica, and Panama (Koronkiewicz et al. 1998; Koronkiewicz and Whitfield 1999; Koronkeiwicz and Sogge 2000; Lynn and Whitfield 2000, 2002; Lynn et al. 2003), have provided the first critical steps in this direction. We can build on this foundation of knowledge by exploring both broad- and fine-scale ecological patterns and processes.

Broad-scale studies

Defining the winter range limits for each of the four Willow Flycatcher subspecies is essential for focusing future conservation efforts. Conducting further surveys in Nicaragua, Colombia, Venezuela, and Peru would help to fill gaps in our current knowledge. On each of those visits we would continue to collect genetic, stable isotope, and color data from captured birds, which should eventually allow for subspecies identification of wintering birds on a continental scale.

In addition, use of remotely-sensed images (Gonzales-Rebels et al. 1998), in combination with more detailed habitat analyses and survey data, would allow us to predict the distribution of wintering Willow Flycatchers with relatively little effort. If developed properly, this could be an important tool for detecting critical habitat and for modeling Willow Flycatcher responses to changes in land use over time.

Fine-scale studies

More detailed ecological studies of wintering Willow Flycatchers would also contribute significantly to conserving populations. Just as it is important to understand causes of individual variation in reproductive success on the breeding grounds, it would be equally valuable to understand why some individuals return to their same wintering sites and others do not. A growing number of studies indicate that variation in the quality of winter habitats and individual territories can

have profound fitness consequences for populations and individuals (Bearhop et al. 2004, Latta and Faaborg 2002, Marra et al. 1998, Norris et al. 2004, Sherry and Holmes 1996, Webster et al. 2002). In particular, it seems essential to understand how flycatchers respond to rapidly changing habitats and whether return rates and/or site fidelity are shaped by human-induced changes to the landscape, such as grazing, agriculture, or pesticide use (King et al. 2002). A repeat visit to Guatemala in January – February 2007 should help us to better understand regional variation in the rate at which flycatchers return to wintering sites and possibly provide clues as to the mechanisms involved.

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Appenidix 1. Willow Flycatcher Winter Survey and Detection Summary

Site and Survey Information

Location: _____ Site:_____ Date: _____ Observers: _____

Mileage/direction to nearest landmark (Town, Road, etc.)_____

Start Time: _____ Start UTM: _____ GPS Unit: _____ Waypoint Name: _____

Stop Time: _____ Stop UTM: _____ GPS Unit: _____ Waypoint Name: _____

Elevation: _____ (m) Total length of area surveyed: _____ (m / km) Land Ownership/Management: _____

(Take at least one photo of the site: Photo #: _____ Camera#: _____ Description of Photo:_____)

Topography and Habitat Matrix

(Check one): Flat_____ Gently rolling hills_____ Steep hills_____

Suitable flycatcher habitat (check one): none_____ single island_____ multiple disjunct islands_____ interconnected patches_____ contiguous _____

Other notes:_____

Vegetation

Dominant trees/shrubs: 1)_____ 2)_____ 3)_____

Average height: Trees: _____ (m) Shrubs: _____ (m) Herbaceous Layer: _____ (cm / m)

Other notes: (e.g. successional stage) _____

Disturbance

Evidence of agriculture? **YES NO** (circle one) Type of crops: 1)_____ 2)_____ 3)_____

Evidence of livestock? **YES NO** (circle one) Type (check): cattle_____ sheep_____ goats_____ other (describe)_____

Intensity of grazing: mild_____ moderate_____ severe_____ Description:_____

Evidence of logging? **YES NO** (circle one) Describe:_____

Other habitat impacts or threats? **YES NO** (circle one) Describe:_____

Water

(Check all that apply): (No water_____ Distance to nearest water:_____) Saturated soil_____ Flooded_____ Pond_____ Lake_____ Stream_____ River_____

Other notes: _____

Detection Summary

Total # of detections	# that *Fitz-bewed*	# detected before playback	# detected by each method	
			Aural only	*Both visual and aural*

Narrative:_____

_____

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Map:

Draw a sketch showing details of survey area and any flycatcher detections. Show the location and shape of the patch, useful landmarks, vegetation characteristics, approximate vegetation height and area, flycatcher location and movements, etc. Be certain to take photographs of the site!

Bird Species List:

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Appendix 2. Willow Flycatcher Detection Log

Location:______________________**Site**:_______________________ **Date**: __________ **Observers**: __________

Detection #: ________ Start Time: ________ End Time: __________ GPS Unit: ______

UTM (or distance and direction to nearest UTM): ____________________________________ Waypoint Name: __________

Fitz-bewed at least once? (Y/N)	Detected before playback? (Y/N)	Method of detection? (check one)		Already banded? (check one and record band color[s])			Minimum distance to bird (m)
		Aural only	*Both visual and aural*	*Yes (Colors)*	*No*	*Unknown*	

Describe response to playback and quality/nature of detection (did the bird approach the playback, sing strongly or weakly, and for how long?)

____

____

Detection #: ________ Start Time: ________ End Time: __________ GPS Unit: ______

UTM (or distance and direction to nearest UTM): ____________________________________ Waypoint Name: __________

Fitz-bewed at least once? (Y/N)	Detected before playback? (Y/N)	Method of detection? (check one)		Already banded? (check one and record band color[s])			Minimum distance to bird (m)
		Aural only	*Both visual and aural*	*Yes (Colors)*	*No*	*Unknown*	

Describe response to playback and quality/nature of detection (did the bird approach the playback, sing strongly or weakly, and for how long?)

____

____

Detection #: ________ Start Time: ________ End Time: __________ GPS Unit: ______

UTM (or distance and direction to nearest UTM): ____________________________________ Waypoint Name: __________

Fitz-bewed at least once? (Y/N)	Detected before playback? (Y/N)	Method of detection? (check one)		Already banded? (check one and record band color[s])			Minimum distance to bird (m)
		Aural only	*Both visual and aural*	*Yes (Colors)*	*No*	*Unknown*	

Describe response to playback and quality/nature of detection (did the bird approach the playback, sing strongly or weakly, and for how long?)

____

____

Appendix 3. Winter Willow Flycatcher Banding Sheet

Site: _____ **Date**: _____ **Banders**:_____

UTM:_____ **GPS Unit:** _____ **Waypoint Name:** _____

Start Time (arrival): _____ **End Time (departure):** _____ **Camera #:** _____ **Photo #:** _____

Time Caught	USFWS Band #	Sex	Age	FF Wear	Tail Wear	Fat	Culmen Length	Culmen Width	Wing Chord	Tail Length	Mass	Time Released

Age: HY=hatch year, SY=second year, AHY=after hatch year, ASY=after second year, U=unknown

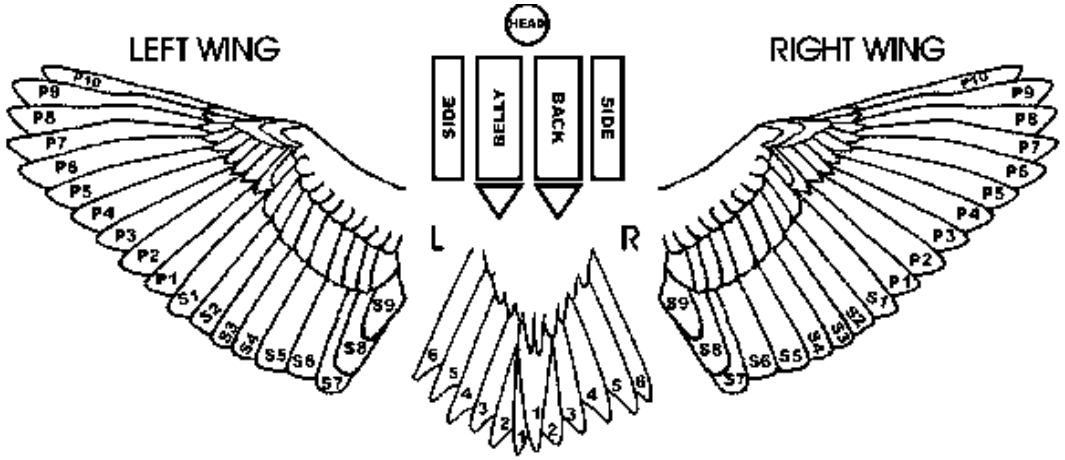
Wear: 0=none, 1=slight, 2=light, 3=moderate, 4=heavy, 5=excessive

Fat: 0=none, 1=trace, 2=light, 3=half, 4=full, 5=bulging, 6=gr. bulging

Detail all active molts and retained feathers in diagram!

Retained Feathers (Y/N)	Active Molt (Y/N)	Body Molt Score (0-4)	Tail older than PP and SS (Y/N)

Molt Score: 0=none, 1=trace, 2=light, 3=medium, 4=heavy



Circle whether you collected the following samples:

Blood: Yes No
Feathers: Yes No
Colorimeter: Yes No

Body Molt: Circle area of molt and use 1-4 to designate degree of molt

Feather molt: Delineate length of actively molting feathers

Retained feathers: Use arrows or braces to indicate retained feathers

Notes:_____

_____

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Appendix 3. Winter Willow Flycatcher Banding Sheet

USFWS Band #: _____

Site: _____ **Date**: _____ **Banders**:_____

Crown Measurements: Page _____

	L*	a*	b*
1			
2			
3			
4			
5			
6			
7			
8			
MAX			
MIN			
AVG			
SD			

Back Measurements: Page_____

	L*	a*	b*
1			
2			
3			
4			
5			
6			
7			
8			
MAX			
MIN			
AVG			
SD			

Notes:_____

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Appendix 4. Willow Flycatcher survey details for Guatemala in December 2005.

Location	Site	Date	Start Location	Stop Location	Time	Hours	Surveyors	Willow Flycatchers	Elevation (m)	Distance (km)
Los Amates	El Rico	10-Dec	15˚14.542'N 89˚6.367'W	15˚14.567'N 89˚6.162'W	0710-1015	3	AS, JGS	15	80	.8
Los Amates	Quiche	10-Dec	15˚14.777'N 89˚02.600'W	15˚14.755'N 89˚02.655'W	0810-0830	.3	DW	2		0.5
Los Amates	Finca Nueva	10-Dec	15˚15.071'N 89˚05.129'W	15˚15.010'N 89˚05.056'W	0730-0845	1.25	MW, RdR	4	102	.7
Los Amates	Finca Nueva	10-Dec	15˚15.493'N 89˚04.281W	15˚15.527'N 89˚03.972'W	1000-1020	.3	MW, RdR, DW	3		.05
Los Amates	Quiche	13-Dec	15˚14.777'N 89˚02.600'W	15˚14.755'N 89˚02.655'W	0630-1030	1.25	MW,DW,JS, AS,RdR	11		1
El Estor	Río Sauce	14-Dec	15˚33.242'N 89˚16.908'W	15˚32.245'N 89˚16.903'W	0908-1127	2.5	ATS, DW, MW, JS, RdR	7	7	.9
El Estor	Quebrada Maxquexara	14-Dec	15˚29.987'N 89˚24.910'W	15˚29.788'N 89˚24.668'W	0641-0800	1.3	ATS, DW	0	7	.7
El Estor	Riacheulo Setal	14-Dec	15˚29.697'N 89˚25.380'W	15˚29.577'N 89˚25.331'W	0710-0755	.75	MW, JS, RdR	0	24	.3
El Estor	Río Sauce	15-Dec	15˚32.659'N 89˚16.827'W	15˚32.571'N 89˚16.893'W	0630-0845	2.25	JS	2	18	.5
El Estor	Finca La Cabana	15-Dec	15˚25.514'N 89˚29.948'W	15˚25.581'N 89˚29.920'W	0810-1030	2.33	MW, DW	10	7	1.3
Pto. San Jose	Finca Yolanda	19-Dec	13˚58.097'N 90˚52.947'W	13˚58.165'N 90˚52.928'W	0642-0842	2	MW, RdR, AS	10	10	.2

Location	Site	Date	Start Location	Stop Location	Time	Hours	Surveyors	Willow Flycatchers	Elevation (m)	Distance (km)
Pto. San Jose	Río Achiguate	19-Dec	13˚55.708'N 90˚54.953'W	13˚56.142'N 90˚54.66'W	0640-1000	3.3	DW, JGS	24	10	2
Río Samala	San Sebastian	20-Dec	14˚34.250'N 91˚38.089'W	14˚34.320'N 91˚38.020'W	0710-0820	1.1	MW, JS, RdR	8	355	1
Chiquimulilla	Finca Las Hojas	21-Dec	14˚0.898'N 90˚23.658'W	14˚0.792'N 90˚23.537'W	0555-0700	1	AS, DW	12	80	1
Las Avellanas		21-Dec			1000-1100	1	AS, DW	6		.5

MP : Met Partway (Indicates that surveyor teams met in the middle, start coordinates are with one group and the end coordinates are with another)
S = E : Start is also the end because the survey was conducted in a circle.
Surveyors: RdR=Rachel del Rio, JS=Justin Schuetz, AS=Ashley Sutton, MW=Mary Whitfield, DW=Dave Wilamowski

Appendix 5. Willow Flycatcher survey details for northern Mexico in February 2006.

Location	Site	Date	Start Location	Stop Location	Time	Hours	Surveyors	Willow Flycatchers	Elevation (m)	Distance (km)
Novillero	Quimichis	21-Feb			1550-1645	1	ATS, DW, JS	1		
Novillero	Quimichis	22-Feb	22˚23.742'N 105˚33.100'W	S=E	0625-0940	3.3	JS	7	2	0.6
Novillero	Puente Novillero	21-Feb	22˚23.667'N 105˚34.695'W	22˚23.696'N 105˚34.713'W	1445-1545	1	AS, JS, DW	2	0	0.5
Novillero	Puente Novillero	22-Feb	22˚23.716'N 105˚34.65'W	22˚23.435'N 105˚34.843'W	0618-0900	2.75	AS, DW	4	4	0.8
Novillero	Puente Novillero	24-Feb	22˚23.623'N 105˚34.692'W	22˚23.309'N 105˚35.677'W	0630-0840	2	ATS, RdR	7		0.5
Guamuchil	El Aeropuerto	22-Feb	25˚26.678'N 108˚4.561	25˚28.725'N 108˚5.367'W	0620-1046	4.3	TK, RdR	0	50	1.9
Guamuchil	El Aeropuerto	23-Feb	25˚26.583'N 108˚4.625'W	25˚26.742'N 108˚4.797'W	0620-0808	1.75	TK, RdR	0	50	0.8
San Blas	Cocodrilario NW11	26-Feb	~21˚31.83'N 105˚12.993'W	~21˚31.727'N 105˚13.145'W	0640-1015	3.5	TK, MW	16	3	1.5
San Blas	Cocodrilario	26-Feb	21˚31.578'N 105˚13.091'W	21˚31.574'N 105˚13.054'W	0633-1011	3.6	JS, AS	13	3	0.5

Location	Site	Date	Start Location	Stop Location	Time	Hours	Surveyors	Willow Flycatchers	Elevation (m)	Distance (km)
San Blas	Cocodrilario	26-Feb	21˚31.679'N 105˚13.2'W	21˚31.734'N 105˚13.157'W	0630-1025	4	RdR,OR	13	0	.1
San Blas	Cocodrilario	27-Feb	21˚31.69'N 105˚13.133'W	21˚31.794'N 105˚13.422'W	0615-0945	3.5	MW, JS	14	0	.8

MP : Met partway (Indicates that surveyor teams met in the middle, start coordinates are with one group and the end coordinates are with another)
S = E: Start is also the end because the survey was conducted in a circle.
Surveyors: TK=Tom Koronkiewicz, RdR=Rachel del Rio, OR=Oscar Ramirez-Rocha, JS=Justin Schuetz, AS=Ashley Sutton, MW=Mary Whitfield, DW=Dave Wilamowski

Appendix 6. Bird species observed during Willow Flycatcher surveys in Guatemala, December 2005. For a more complete list of bird species that winter in these areas, see Howell and Webb (1999). Location Codes: Los Amates (LAm), Puerto San Jose (PSJ), El Estor (EE), Chiquimulilla (C), Las Avellanas (LAv), Río Samala (RS).

Common Name	Latin Name	LAm	PSJ	EE	C	LAv	RS
Lineated Woodpecker	*Dryocopus lineatus*	x	x				
Golden-fronted Woodpecker	*Centurus. aurifrons*	x	x	x	x		
Pale-billed Woodpecker	*Campephilus guatemalensis*			x			
Smoky-brown Woodpecker	*Veniliornis fumigatus*		x				
Barred Ant-shrike	*Thamnophilus doliatus*			x			
Belted Kingfisher	*Megaceryle alcyon*		x	x			
Green Kingfisher	*Chloroceryle americana*			x			
Collared Aracari	*Pteroglossus torquatus*			x			
Groove-billed Ani	*Crotophaga sulcirostris*	x	x	x	x	x	
Squirrel Cuckoo	*Piaya cayana*		x				
Yellow-naped Parrot	*Amazona auropalliata*		x		x		
White-fronted Parrot	*Amazona albifrons*		x				
Red-lored Parrot	*Amazona autumnalis*			x			
Magnificent Hummingbird	*Eugenes fulgens*				x		
Cinnamon Hummingbird	*Amazilia rutila*	x				x	
Turquoise-browed Motmot	*Eumomota superciliosa*	x		x			
Barn Owl	*Tyto alba*		x				
Ferruginous Pygmy Owl	*Glaucidium brasilianum*				x	x	
Buff-collared Nightjar	*Caprimulgus ridgwayi*		x				
Lesser Nighthawk	*Chordeiles acutipennis texensis*					x	
Parauque	*Nyctidromus albicollis*		x				
Spot-bellied Bobwhite	*Colinus leucopogon*					x	
Uniform Crake	*Amaurolimnas concolor*				x		
Ruddy Crake	*Laterallus ruber*			x			
Mourning Dove	*Zenaida macroura*					x	
White-tipped Dove	*Leptotila verreauxi*		x				
Inca Dove	*Columbina inca*	x	x		x	x	
Ruddy Ground-Dove	*Columbina talpacoti*	x	x	x		x	x
Common Moorhen	*Gallinula chloropus*				x		

Common Name	Latin Name	LAm	PSJ	EE	C	LAv	RS
Greater Yellowlegs	*Tringa melanoleuca*		x				
Spotted Sandpiper	*Tringa macularia*	x	x	x			
Curlew spp.	*Zarapito spp.*		x				
Northern Jacana	*Jacana spinosa*	x	x				
Black-necked Stilt	*Himantopus mexicanus*		x				
Killdeer	*Charadrius vociferus*			x			
White-tailed Kite	*Elanus leucurus*		x		x		
Cooper's Hawk	*Accipiter cooperii*						
Common Black Hawk	*Buteogallus anthracinus*			x			
Grey Hawk	*Asturina plagiata*			x			
Roadside Hawk	Buteo magnirostris	x	x				
American Kestrel	*Falco sparverius*					x	
Bat Falcon	*Falco rufigularis*	x					
Collared Forest-Falcon	*Micrastur semitorquatus*				x		
Red Jungle Fowl	*Gallus gallus*						x
Neotropic Cormorant	*Phalacrocorax brasilianus*			x			
Limpkin	*Aramus guarauna*			x			
Little Blue Heron	*Egretta caerulea*	x	x				
Snowy Egret	*Egretta thula*	x	x				
Great Blue Heron	*Ardea herodias*			x			
Great Egret	*Ardea alba*		x	x			
Cattle Egret	*Bubulcus ibis*		x	x	x		
Green Heron	*Butorides virescens*		x	x	x	x	
White Ibis	*Eudocimus albus*		x				
Black Vulture	*Coragyps atratus*	x		x			
Turkey Vulture	*Cathartes aura*		x	x		x	
Wood Stork	*Mycteria americana*			x			
Common Tody-Flycatcher	*Todirostrum cinereum*		x	x	x		
Western Flycatcher	*Empidonax* sp.			x			
Brown-crested Flycatcher	*Myiarchus tyrannulus*			x			
Tropical Kingbird	*Tyrannus melancholicus*	x		x	x		
Western Kingbird	*Tyrannus verticalus*			x	x		
Scissor-tailed Flycatcher	*Tyrannus forficatus*			x	x	x	
Social Flycatcher	*Myiozetetes similis*			x			
Great Kiskadee	*Pitangus sulphuratus*	x	x	x	x	x	x

Common Name	Latin Name	LAm	PSJ	EE	C	LAv	RS
Masked Tityra	*Tityra semifasciata*	x		x			
Rose-throated Becard	*Pachyramphus aglaiae*	x	x		x		
Yellow-throated Vireo	*Vireo flavifrons*	x		x			x
White-eyed Vireo	*Vireo griseus*			x			
White-throated Magpie-Jay	*Calocitta Formosa*		x			x	
Brown Jay	*Cyanocorax morio*	x		x			
Swainson's Thrush	*Catharus ustulatus*					x	
Clay-colored Thrush	*Turdus grayi*	x	x			x	
Grey Catbird	*Dumetella carolinensis*	x		x			
Band-backed Wren	*Campylorhynchus zonatus*	x					
Rugous-naped Wren	*Campylorhynchus rufinucha*		x		x	x	x
House Wren	*Troglodytes aedon*	x					
Gnatcatcher Spp.	*Polioptila spp.*				x		
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*		x				
Grey-breasted Martin	*Progne chalybea*		x				
Barn Swallow	*Hirundo rustica*		x			x	
Lesser Goldfinch	*Carduelis psaltria*						x
Blue-winged Warbler	*Vermivora pinus*	x		x			
Golden-winged Warbler	*Vermivora chrysoptera*			x			
Yellow Warbler	*Dendroica petechia*	x	x	x	x		
Magnolia Warbler	*Dendroica magnolia*	x		x			
American Redstart	*Setophaga ruticilla*	x		x			
Ovenbird	*Seiurus aurocapillus*			x			
Northern Waterthrush	*Seiurus noveboracensis*	x					
Waterthrush spp.	*Seiurus spp.*			x			
MacGillivray's Warbler	*Oporornis tolmiei*						x
Common Yellowthroat	*Geothlypis trichas*	x		x			
Grey-crowned Yellowthroat	*Geothlypis poliocephala*	x	x				
Hooded Warbler	*Wilsonia citrine*			x			
Yellow-breasted Chat	*Icteria virens*		x			x	x
Red-breasted Chat	*Granatellus venustus*					x	
Scrub Euphonia	*Euphonia affinis*	x					
Summer Tanager	*Piranga rubra*	x		x	x		
Blue-grey Tanager	*Thraupis episcopus cana*	x					
Yellow-winged Tanager	*Thraupis abbas*	x					

Common Name	Latin Name	LAm	PSJ	EE	C	LAv	RS
White-collared Seedeater	*Sporophila torqueola*	x	x	x		x	
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			x			
Blue Grosbeak	*Guiraca caerulea*			x	x		
Painted Bunting	*Passerina ciris*		x			x	
Baltimore Oriole	*Icterus galbula*	x	x	x			
Hooded Oriole	*Icterus cucullatus*				x		
Orchard Oriole	*Icterus spurius*		x				x
Melodius Blackbird	*Dives dives*			x	x	x	
Eastern Meadowlark	*Sturnella magna*				x		
Great-tailed Grackle	*Quiscalus mexicanus*	x	x	x		x	x

Appendix 7. Bird species observed during Willow Flycatcher surveys in Mexico, February - March 2006. For a more complete list of bird species that winter in these areas, see Howell and Webb (1999). Location Codes: San Blas (SB), Guamuchil (G), Novillero (N).

Common Name	Latin Name	SB	G	N
Rufous-bellied Chachalaca	*Ortalis wagleri*	x		x
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*		x	x
Ruddy Duck	*Oxyura jamaicensis*			x
Blue-winged Teal	*Anas discors*		x	
Cinnamon Teal	*Anas cyanoptera*			x
Golden-cheeked Woodpecker	*Melanerpes chrysogenys*		x	
Hairy Woodpecker	*Picoides villosus*	x		
Downy Woodpecker	*Picoides pubescens*		x	
Belted Kingfisher	*Megaceryle alcyon*		x	
Green Kingfisher	*Chloroceryle americana*	x	x	x
Groove-billed Ani	*Crotophaga sulcirostris*	x		
Orange-fronted Parakeet	*Aratinga canicularis*	x		
Lesser Nighthawk	*Chordeiles acutipennis texensis*			x
Elegant Quail	*Callipepla douglasii*		x	
Sora	*Porzana Carolina*			x
Purple Gallinule	*Porphyrula martinica*	x	x	
Mourning Dove	*Zenaida macroura*		x	
White-winged Dove	*Zenaida asiatica*	x	x	x
Inca Dove	*Columbina inca*		x	
Ruddy Ground-Dove	*Columbina talpacoti*	x		
Common Moorhen	*Gallinula chloropus*			x
American Coot	*Fulica americana*		x	x
Lesser Yellowlegs	*Tringa flavipes*		x	
Greater Yellowlegs	*Tringa melanoleuca*			x
Spotted Sandpiper	*Tringa macularia*			x
Long-billed Curlew	*Numenius americanus*		x	
Northern Jacana	*Jacana spinosa*		x	x
Black-necked Stilt	*Himantopus mexicanus*		x	
Killdeer	*Charadrius vociferus*		x	
Osprey	*Pandion haliaetus*	x	x	

Common Name	Latin Name	SB	G	N
Sharp-shinned Hawk	*Accipiter striatus*		x	
Common Black Hawk	*Buteogallus anthracinus*	x	x	
Broad-winged Hawk	Buteo platypterus	x		
Roadside Hawk	Buteo magnirostris griseocauda	x		
White-tailed Hawk	*Buteo albicaudatus*	x		
Harris Hawk	*Parabuteo unicinctus*		x	x
Crested Caracara	*Polyborus plancus*		x	
American Kestrel	*Falco sparverius*	x	x	
Laughing Falcon	*Herpetotheres cachinnans*	x		
Least Grebe	*Tachybaptus dominicus*	x		x
Anhinga	*Anhinga anhinga*			x
Neotropic Cormorant	*Phalacrocorax brasilianus*	x		x
Double-crested Cormorant	*Phalacrocorax auritus*	x	x	
Black-crowned Night-Heron	*Nycticorax nycticorax*		x	
Bare-throated Tiger Heron	*Tigrisoma mexicanum*			x
Tricolored Heron	*Egretta tricolor*		x	
Snowy Egret	*Egretta thula*		x	
Great Blue Heron	*Ardea herodias*		x	x
Great Egret	*Ardea alba*	x	x	x
Cattle Egret	*Bubulcus ibis*	x		
Green Heron	*Butorides virescens*	x		x
White Ibis	*Eudocimus albus*	x	x	x
White-faced Ibis	*Plegadis chihi*		x	
Glossy Ibis	*Plegadis falcinellus*	x	x	
Roseate Spoonbill	*Platalea ajaja*	x		x
Black Vulture	*Coragyps atratus*	x	x	
Turkey Vulture	*Cathartes aura*	x	x	
Wood Stork	*Mycteria americana*	x	x	x
Magnificent Frigatebird	*Fregata magnificens*	x		
Western Flycatcher	*Empidonax* sp.	x	x	
Least Flycatcher	*Empidonax minimus*	x		
Black Phoebe	*Sayornis nigricans*		x	
Vermilion Flycatcher	*Pyrocephalus rubinus*	x	x	x
Tropical Kingbird	*Tyrannus melancholicus*	x	x	x
Western Kingbird	*Tyrannus verticalus*		x	

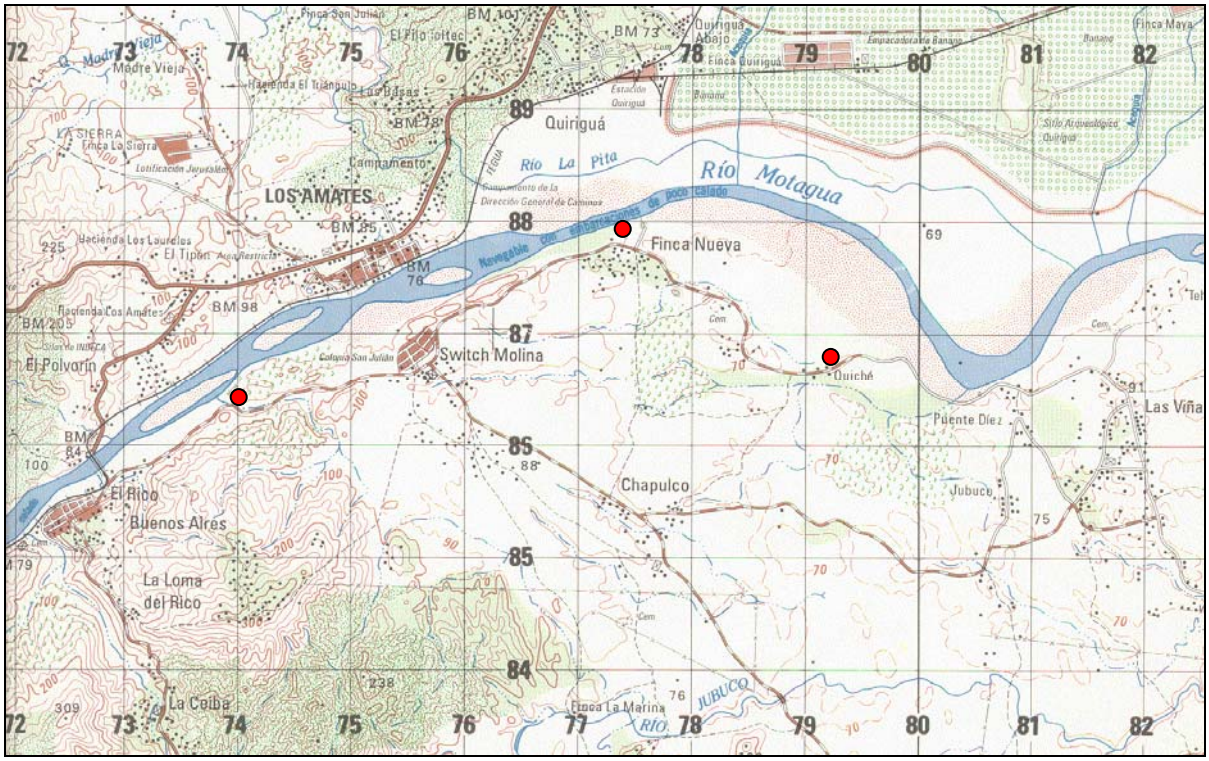
Common Name	Latin Name	SB	G	N
Thick-billed Kingbird	*Tyrannus crassirostris*	x	x	
Social Flycatcher	*Myiozetetes similis*	x	x	
Great Kiskadee	*Pitangus sulphuratus*	x	x	x
Loggerhead Shrike	*Lanius ludovicianus*		x	
Bell's Vireo	*Vireo bellii*	x		
Western Warbling-Vireo	*Vireo swainsonii*		x	
Western Scrub Jay	*Aphelocomacoreulesce*			x
Purplish-backed Jay	*Cyanocorax beecheii*			x
Northern Mockingbird	*Mimus polyglottos*	x	x	x
Curve-billed Thrasher	*Toxostoma curvirostre*		x	
Sinaloa Wren	*Thryothorus sinaloa*	x		
House Wren	*Troglodytes aedon*	x		
Verdin	*Auriparus flaviceps*		x	
Blue-grey Gnatcatcher	*Polioptila caerulea*	x	x	
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	x	x	
Barn Swallow	*Hirundo rustica*	x		
Lesser Goldfinch	*Carduelis psaltria*		x	
Greyish Saltator	*Saltator coerulescens*		x	x
House Finch	*Carpodacus mexicanus*		x	
Lincoln's Sparrow	*Melospiza lincolnii*	x		
Song S parrow	*Melospiza melodia*	x		
White-crowned Sparrow	*Zonotrichia leucophrys*		x	
Lark Sparrow	*Chondestes grammacus*	x	x	
Orange-crowned Warbler	*Vermivora celata*	x	x	x
Northern Parula	*Parula Americana*			x
Yellow Warbler	*Dendroica petechia*	x	x	x
Yellow-rumped Warbler	*Dendroica coronata*	x	x	
Palm Warbler	*Dendroica palmarum*	x		
Black-and-white Warbler	*Mniotilta varia*			x
American Redstart	*Setophaga ruticilla*	x		
Northern Waterthrush	*Seiurus noveboracensis*			x
Common Yellowthroat	*Geothlypis trichas*	x	x	
Grey-crowned Yellowthroat	*Geothlypis poliocephala*		x	
Wilson's Warbler	*Wilsonia pusilla*	x	x	x
Yellow-breasted Chat	*Icteria virens*	x		x

Common Name	Latin Name	SB	G	N
Summer Tanager	*Piranga rubra*	x	x	
White-collared Seedeater	*Sporophila torqueola*	x	x	x
Northern Cardinal	*Cardinalis cardinalis*		x	
Blue Grosbeak	*Guiraca caerulea*	x	x	
Yellow-winged Cacique	*Cacicus melanicterus*	x		
Streak-backed Oriole	*Icterus pustulatus*	x	x	
Hooded Oriole	*Icterus cucullatus*	x		
Orchard Oriole	*Icterus spurius*	x		
Red-winged Blackbird	*Agelaius phoeniceus*	x	x	x
Eastern Meadowlark	*Sturnella magna*	x		
Great-tailed Grackle	*Quiscalus mexicanus*	x	x	x

Appendix 8. Maps and descriptions of survey areas

Los Amates, Guatemala

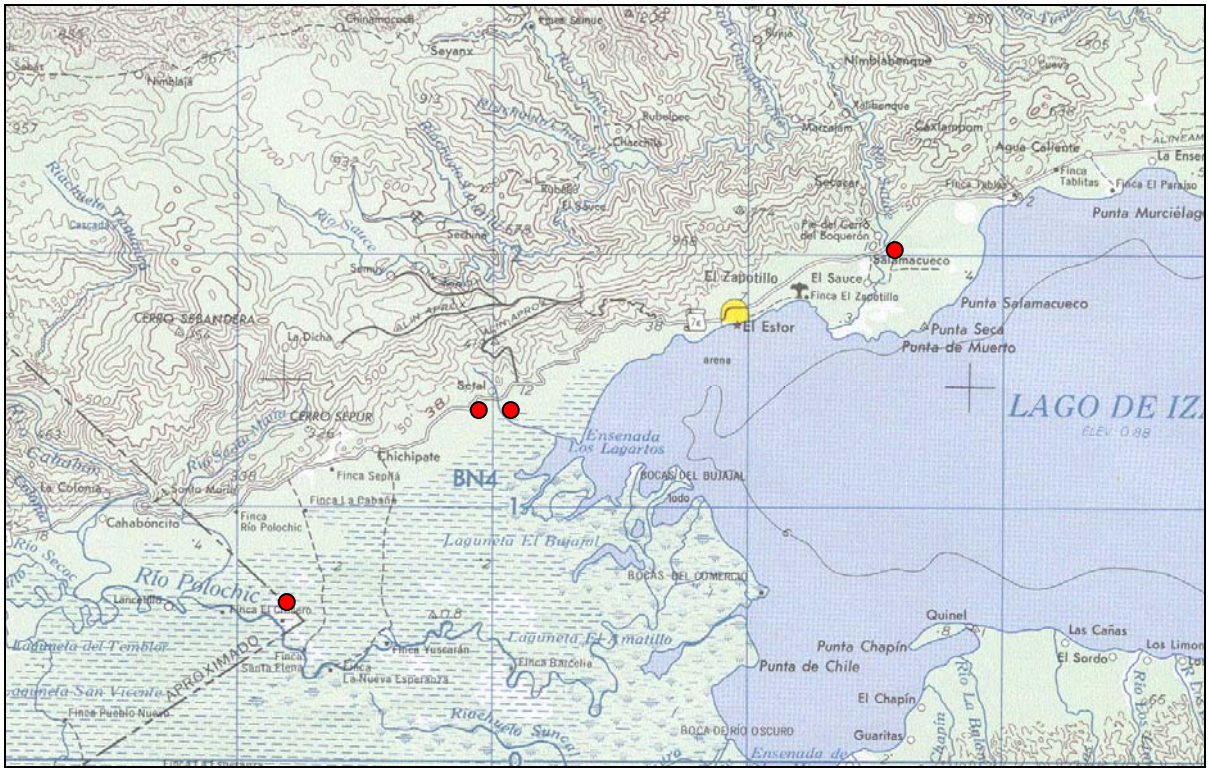
Detail of topographical map of Los Amates, Guatemala 2361 I E754 Edition 3-NIMA. Scale 1:50,000. Red dots depict survey sites.



Los Amates is located along the Río Motagua on the Carribean slope of Guatemala, south of Lago de Izabal. We surveyed for Willow Flycatchers at three sites in low-lying areas adjacent to the river. The western-most site (El Rico) contained a sparsely wooded area (*Salix, Cercropia, Acacia*) situated between cattle pastures. The central section of the survey area contained a hill surrounded by a marsh and was covered with extensive shrubs and vines. The central site (Finca Nueva) harbored small trees and shrubs covered in vines. Though it was not inundated during our surveys, it is possible that water covered the site during the early part of the wet season. The last site (Quiche) was a nearly flat floodplain that almost certainly becomes inundated during the rainy season. Trees scattered over the floodplain were mostly *Salix*, further away from the river, most were *Acacia*.

El Estor, Guatemala

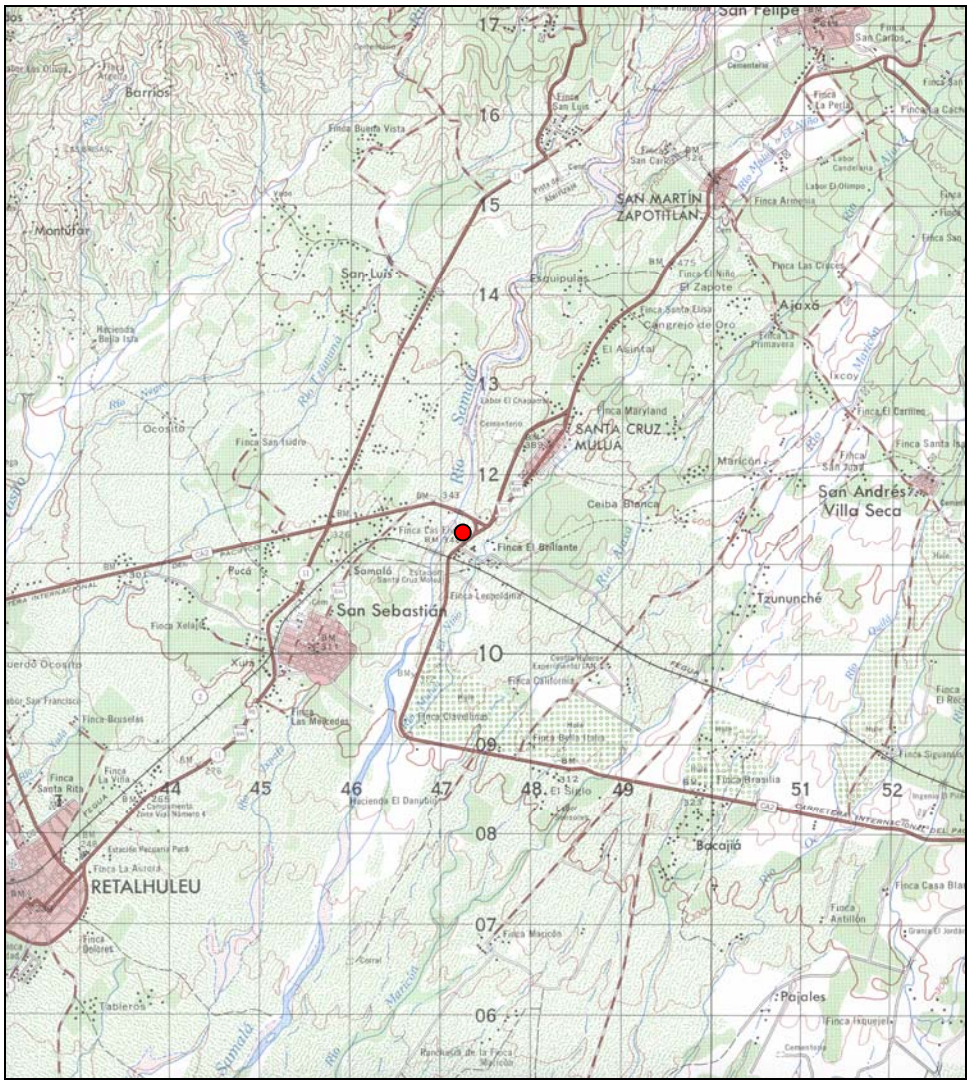
Detail of topographical map of Puerto Barrios, Guatemala; Honduras ND16-1 Series E503. Scale 1:250,000. Red dots depict survey sites.



El Estor is located on the northwest shore of Lago de Izabal. We surveyed four sites in the area. Quebrada Maxqueraxa was a site centered around a small creek which passed through a grazed field. Patches of shrubs and small trees lined the creek bed and fence rows running through the site. Riachuelo Setal was, similarly, a lowland pasture with a stream running through it, but contained fewer secondary growth shrubs and trees, most of which were found along the stream. Neither harbored Willow Flycatchers. The Río Sauce survey site covered low-lying areas adjacent to the Río Sauce, some of which contained caña, some of which were being grazed by cattle. Up river, near the main road running east from El Estor, large agricultural fields bordered the survey area. Finca la Cabana, the last site, was a low-lying mostly flat pasture that was inundated with 5-50 cm of water in sections. One side of the pasture was bordered by a palm plantation.

Río Samala, Guatemala

Detail of topographical map of Retalhuleu, Guatemala HOJA 1859 I.. Scale 1:50,000. Red dot depict survey sites.



The Río Samala site is located northeast of San Sebastian, and more distantly, Retalhuleu at mid-elevation (355 m) on Guatemala's Pacific slope. The site contained patches of short trees and shrubs situated between boulders and sandy areas. Birds tended to cluster closer to the road than the river side of the site due to the extensive area of bare rocks leading down to the river. We noted rather extensive gravel mining operations in the immediate area and roads throughout the survey site that facilitated removal of gravel.

Puerto San Jose, Guatemala
No map available.

Puerto San Jose is located on the Pacific Coast south of Guatemala City. We visited two sites outside of town, one on the Río Achiguate near Chulumar and the other at Finca Yolanda. The Río Achiguate site was a sliver of pasture between the river bank and large agricultural fields (sugarcane). Tall trees lined the pasture with several patches inside as well. There were few shrubs at the site, and we encountered several people cutting tree branches and collecting firewood but Willow Flycatchers were very abundant.

Las Avellenas, Guatemala
No map available.

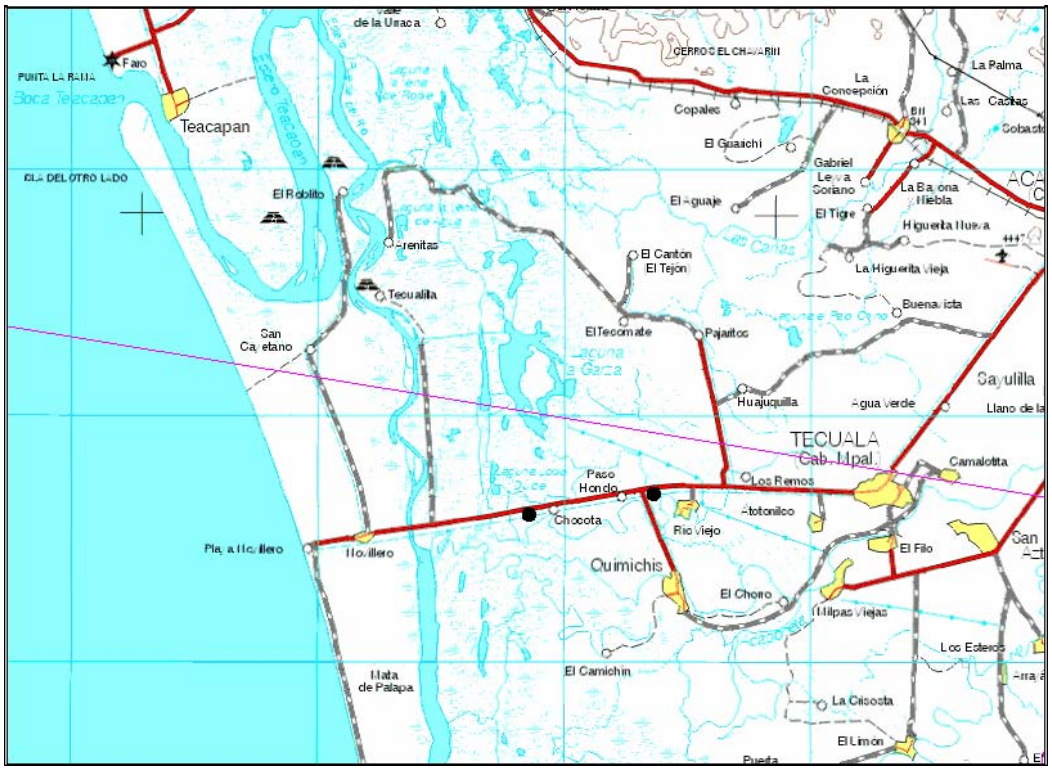
Las Avellenas is located on the Pacific slope of Guatemala southeast of Guatemala City. The site was centered on a gravel pit that has been filled with water. Though reeds bordered the marshy pit, the habitat became very dry and composed of scrubby vegetation only a short distance away. Much of the surrounding area is grazed by cattle though many of the native shrubs appear to remain.

Chiquimulilla, Guatemala
No map available.

Chiquimulilla is also a Pacific slope location south-southeast of Guatemala City. The site was composed of a pasture divided by a creek. The side of the pasture near the road was very dry and contained low scrubby vegetation, scattered bushes, small trees, and several large ceibas. The side more distant from the road was very wet and contained grasses, scattered trees, and shrubs. Running between the two sides was a stream lined with dense strip of trees and shrubs.

El Novillero, Nayarit

Topographical map of Novillero, Nayarit, Mexico. Escuinapa Quad F1305, Instituto Nacional de Estadistica Geografia Einformatica de Mexico; scale: 1:250,000. Major contour lines are 100 meters. Black dots depict detection sites.



Willow Flycatchers were found near Playa Novillero in patches of remnant habitat between cultivated corn fields. Remnant patches of habitat bordered these fields and were bisected by Mimosa (2.5–3 m) filled quebradas. A labyrinth of trails had been cut through the habitat for livestock access and grazing. This low-lying area was seasonally inundated and dominated by several species of *Acacia* (3 m) and mangroves (4–5 m). Though it was dry in some spots, soils overall were saturated with shallow pools of water under mangrove patches and in the quebradas. On the road to Quimichis, Willow Flycatchers were found in a swamp-like area with standing water varying from 0.2–1.2 m in depth (Figure 4). The dominant vegetation was *Mimosa*, *Acacia*, and a large unidentified tree species (8–10 m). Shrubs (2–3 m) were growing directly in the standing water and had stilt roots. Next to the swamp were agricultural fields that had already been cleared.

San Blas, Nayarit

Topographical map of San Blas, Nayarit, Mexico. San Blas Quad F13C29, Instituto Nacional de Estadistica Geografia Einformaticade Mexico; scale: 1:50,000. Major and supplementary contour lines are 20 and 10 meters, respectively. Black dots depict detection sites.

The two survey sites southeast of San Blas were located along a dirt road leading to a crocodile farm 2 km south of Matanchen. Willow Flycatchers were found to the north of this road in a pasture with tall grasses and some standing water. The fairly flat terrain had poor drainage and soils varied from saturated to 30 cm deep with retained water from the rainy season. Some standing water was present near a stream on the northeast side of the site. The drier areas were dominated by mallow (*Malva* sp.), Bermuda (*Cynodon dactylon*), and an unidentified grass (1 m). These patchily distributed shrub areas were dominated by *Mimosa* and *Acacia* (3 m) and border wetland areas. The southeast side was bordered by tall semi-deciduous trees (12 m) interwoven with vines. The other sides were bordered by similar pasture plots with a mix of standing water and shrub vegetation. Overall, the vegetation and grounds were disturbed by cows.

The area surveyed on the southeast side of the road was a lowland marshy area at the base of the foothills. The remnant scrub was used as pasture for cattle and agriculture. Small Acacia and other shrubs (1.5 m) were patchily distributed among a more uniform herbaceous layer (2–2.5 m). Shrubby areas were bisected by wet open pastures and small seasonal ponds. Patches of mangroves were concentrated within the wettest areas of the seasonally wet ponds. Shrub vegetation was dominated by Acacia and Mimosa (2–4 m) and was interspersed by exotics such as lime and papaya. To the northeast was a dense linear strip of riparian trees dominated by Ficus (10–12 m), willows, and other unknown trees. To the southeast were cleared agricultural fields and areas cleared for grazing. Upland areas were dominated by banana and coconut palm plantations. Surveyors in 2002 only found three willow flycatchers using habitat south of the road. Surveys during 2004 found 12 willow flycatchers in this same area. In addition, survey area was expanded during 2004 and an additional 11 willow flycatchers were found in the new area.

Surveys conducted in late January and early February of 2002 described the soils of the area as dry and cracked. It was noted then, however, that saturated soils were present below the surface. This area appears to be seasonally inundated as is evident from the difference in water levels between 2002 and 2004. Surveys conducted during mid-December of 2004 described the same area as a wetland with large ponds of retained rainwater. Water depth was noted to vary from deeply saturated soils to 0.3 m in some locations. Vegetation structure between surveys was quite different between years on both sides of the road. This could help account for the variation in flycatcher numbers between surveys. Vegetation was cleared for cattle grazing, especially on the north side of the road. In addition, on October 25, 2002, class four Hurricane Kenna hit San Blas with 140 mph winds (USA Today 2002). Damage to the vegetation (i.e. many dead trees) could still be seen in late 2004. Clearing for cattle and agriculture was noted both in 2002 and 2004 surveys.