

Appendix E.

Willow Flycatcher Migration and Winter Ecology

A. Introduction

As with all other Neotropical migrants, willow flycatchers (all subspecies) breed in North America, but winter in portions of Central and South America. This migration requires a round trip migration of about 3,000 - 8,000 km (roughly 2,000 to 5,000 miles) each year, depending upon exact breeding and wintering locations of a particular individual. The migration and wintering periods account for over half of the annual cycle of the flycatcher, and therefore are important to the species' ecology and conservation. Unfortunately, it is very difficult to distinguish willow flycatcher subspecies during migration and on the wintering grounds (Hubbard 1999, Yong and Finch 1999). Thus, little of what is known about willow flycatcher migration and wintering ecology is specific to the southwestern willow flycatcher (*Empidonax traillii extimus*). The information below generally pertains to the entire species and not just the endangered subspecies.

A recurring question in the overall study of Neotropical migrants, and one about which there has been much dispute, is whether these species are limited by recruitment (reproductive success on the breeding grounds in North America) or by survivorship during the winter (Rappole 1995, Bohning-Gaese et al. 1993, Sherry and Holmes 1995). As applied to declining or endangered species, such as the southwestern willow flycatcher, this question becomes one of whether the major problems facing the species are in North America or in the Neotropics. Applying this issue further to management actions, the question arises as to whether management should be focused on North America or the Neotropics. There may be a temptation to use the existence of known or potential migration and wintering ground threats as an excuse for avoiding conservation and management actions on the breeding grounds. This course of action (or inaction) is unsupportable. Neotropical migrant birds such as the willow flycatcher have a complex annual cycle that requires favorable conditions during all stages. Limiting or inadequate conditions during any of three periods (migration, winter or breeding) can cause the population to decline and/or prevent recovery. Managing for the flycatcher by addressing only threats on the migration and wintering grounds will fail to address a number of known problems on the breeding grounds (USFWS 1993, USFWS 1995; refer to Appendices F, G, H, I, and J), and recovery of the flycatcher will not be achieved.

A related but also unsupportable contention is sometimes made that it does no good to document and understand the threats on the wintering grounds because U.S. agencies have no regulatory authority to mandate or enforce conservation actions. While it is true that foreign countries through which flycatchers migrate and in which they spend the winter are not obligated to undertake conservation actions, the USFWS and many non-government organizations and conservation groups have active international programs that have successfully promoted foreign conservation issues in the past. Partners-in-Flight is one example of how governments and non-governmental organizations can interact across international boundaries to accomplish important conservation and research activities. Further, many of the conservation actions for wintering flycatchers may involve relatively small, local actions that can be executed with the assistance of foreign biologists and private citizens, without the need for "official" funds or actions. Thus, it is clearly worthwhile to identify conservation

threats and pursue remedial actions outside of the United States.

Although it is important to focus management concerns and actions on both the wintering and breeding grounds of the flycatcher (USFWS 1993, USFWS 1995), one set of data suggests that the primary problems responsible for this bird's endangerment may occur on the breeding grounds. Available data (Unitt 1997) suggest that willow flycatcher subspecies all winter in the same general region (though we do not know if the proportion of each subspecies is similar throughout the winter range). If the southwestern willow flycatcher's decline were due solely or mostly to events on the wintering grounds, then all subspecies of the willow flycatcher should show declines because they all winter over the same region. However, while confirming an overall decline in the western populations (including *E.t. extimus*), Breeding Bird Survey data (from the U.S. Geological Survey) indicate that willow flycatchers are increasing in the central and eastern portions of their range. Willow flycatchers in the eastern and central parts of North America increased at average annual rates of 0.9 and 1.4%, respectively, between 1966 and 1996 (n=628 eastern and 114 western BBS routes; eastern trend significant at $P = 0.05$). By contrast, willow flycatchers in the western regions show an annual decline of 2.3% ($P < 0.01$) for the same period. These differences in population trends are not unexpected, given the fact that mesic riparian habitats that willow flycatchers require in the West are rare and have been severely impacted over the last century (USFWS 1993). In contrast, mesic habitats in which flycatchers breed are widespread in eastern and central North America and are not restricted to riparian corridors. Avian population trends are often difficult to assess, and determining underlying causes can be even more problematic. Factors causing declines in southwestern willow flycatcher populations may occur during the breeding, wintering, and/or migration periods. Prudence dictates that conservation challenges and management actions should be addressed in all three stages of the flycatcher's annual cycle. Certainly there is no justification for suggesting that management actions be restricted only to the breeding grounds or only to the wintering grounds.

B. Migration

Southwestern willow flycatchers are among the latest arriving spring migrants, and typically settle on breeding grounds between early May and early June (Muiznieks et al. 1994, Maynard 1995, Sferra et al. 1997). In south-central Arizona, a few *E.t. extimus* arrive on territories as early as the third week in April (Paradzick et al. 1999). Data on southward departure are few, but it appears that most Southwestern Willow Flycatchers leave their breeding areas in mid- to late August (Arizona Game and Fish Dept unpubl. data, B. Haas unpubl. data).

Because arrival dates of individuals vary annually and geographically, northbound migrant willow flycatchers (of all subspecies) pass through areas of the Southwest in which *E.t. extimus* are actively nesting. Similarly, southbound migrants in late July and August may occur where southwestern willow flycatchers are still breeding (Unitt 1987). This spatial and temporal overlap between migrating and breeding willow flycatchers can cause some confusion as to the actual residency and breeding status of birds detected at a site during May or early June, and detections in the "non-migration" period are often critical in verifying that flycatchers are actually attempting to breed at a site (Unitt 1987, Sogge et al. 1997a).

The migration routes used by southwestern willow flycatcher are not well documented, though more is known of spring migration than of fall migration because it is only during the former that willow flycatchers sing and can therefore be distinguished from other *Empidonax* flycatchers. In spring, mist-netting studies and general flycatcher surveys show that

many willow flycatchers (all subspecies) use riparian habitats along major drainages in the Southwest such as the Rio Grande (Finch and Kelley 1999), Colorado River (McKernan and Braden 1999, Sogge et al. 1997b), San Juan River (Johnson and Sogge 1997, Johnson and O'Brien 1998), and Green River (M. Johnson unpubl. data). On these drainages, migrating flycatchers utilize a variety of riparian habitats, including ones dominated by natives or exotic plant species, or mixtures of both. Where native and non-native habitats co-occur, preliminary evidence suggests that migrating flycatchers favor native habitats, especially willow (Yong and Finch 1997), possibly because of higher insect availability (Moore et al. 1993, DeLay et al. 1999). Migrant southwestern willow flycatchers are also found, though less commonly, in non-riparian habitats.

Many of the willow flycatchers found migrating through riparian areas are detected in riparian habitats or patches that would be unsuitable for breeding (e.g., the vegetation structure is too short or sparse, or the patch is too small). Such migration stopover areas, even though not used for breeding, are critically important resources affecting productivity and survival. Willow flycatchers, like most small passerine birds, require food-rich stopover areas in order to replenish energy reserves and continue their northward or southward migration. First-year migrants travel southward through unfamiliar habitats, and may have difficulty locating stopover sites if the sites are small or highly fragmented. If stopover sites are lacking, migrating birds could fail to find sufficient food and perish. Less dramatic, but perhaps as important ecologically, flycatchers forced to spend more time in poor quality stopover habitats could arrive on the breeding grounds late and/or in poor physical condition, both of which could reduce reproductive fitness (Moore et al. 1993).

C. Wintering Locations and Biology

The willow flycatcher winters in Mexico, Central America, and northern South America (Phillips 1948, Gorski 1969, McCabe 1991, Koronkiewicz et al. 1998, Ridgely and Tudor 1994, Unitt 1999). Recent examination of flycatcher museum skins collected on the wintering grounds (Unitt 1997) suggests that the different subspecies do not winter in separate regions, rather, the subspecies co-occur on the wintering grounds. However, we do not know if the relative proportions of each subspecies are similar throughout the winter range. Two wintering southwestern willow flycatchers were recaptured 4230 and 3668 km (2820 and 2445 miles) from the U.S. breeding sites at which they were banded (Koronkiewicz and Sogge 2001). In Costa Rica, male and female flycatchers wintered at the same sites and showed no evidence of sex-based habitat segregation (Koronkiewicz and Sogge 2000, Koronkiewicz 2002).

Popular literature on the birds of Mexico, Central, and South America describes willow flycatcher wintering habitat as humid to semi-arid, partially open areas such as woodland edges (Stiles and Skutch 1989, Howell and Webb 1995, Ridgely and Gwynne 1989). Second growth forest, brushy savanna edges, and scrubby fields with hedges such as at plantations are also used. In Panamá, Gorski (1969) found them in transitional and edge areas, often near a wetland. Similarly, in Costa Rica, Panamá, and El Salvador, Koronkiewicz et al. (1998), Koronkiewicz and Whitfield (1999), and Lynn and Whitfield (2002) detected willow flycatchers in lagunas and intermittent fresh water wetlands, muddy seeps, seasonally inundated savanna/pasture and sluggish rivers, meandering waterways and oxbows (Figure 1). They found willow flycatchers only in areas that consisted of the these four main elements: 1) standing or slow moving water with associated wetland flora; 2) patches of dense woody shrubs; 3) patches and/or stringers of trees; and 4) open to semi-open

areas. The most commonly used vegetation was patches of woody shrubs (*Mimosa sp.* and *Cassia sp.*) approximately 1-2 m (3-7 ft) tall, bordering and extending into wet areas.

Willow flycatchers defend winter territories at their wintering sites, and these territories remain relatively consistent over the winter (Koronkiewicz and Sogge 2000). Territorial behavior suggests that wintering flycatchers are defending one or more resources, and that high-quality winter habitat may be limited or limiting (Sherry and Holmes 1996). Individual flycatchers also return to the same wintering sites and territories each year (Koronkiewicz and Sogge 2000, Koronkiewicz 2002).



Figure 1. Willow flycatcher habitat adjacent to a sugar cane field, Pese, Panama. Photo taken by M. Whitfield, 2000.

D. Possible Threats to Migrating and Wintering Willow Flycatchers

As noted above, the migration and wintering periods are critical phases in the life of the willow flycatcher. Conservation of *E.t. extimus* must take into account the challenges and threats that the flycatcher faces during its migration and on its wintering grounds. At this time, it is not possible to identify threats specific to the endangered subspecies. However, because the timing and areas of migration and wintering overlap for all subspecies, threats that affect any one subspecies (or the species as a whole) probably affect *E.t. extimus*.

Following are some of the major and/or most obvious known and suspected threats to the flycatcher and its migration/wintering habitat.

1. Habitat Loss and Degradation

The southwestern riparian habitats through which many (likely most) southwestern willow flycatchers migrate make up only a small fraction of the landscape, are highly fragmented, and often highly impacted by human-related activities. Continued loss and degradation of migration stop-over habitats could lead to direct mortality of migrating flycatchers and/or longer migration periods with subsequent late arrival on the breeding grounds. Any of these outcomes could reduce the chances for recovery of the flycatcher. Researchers have estimated that migrating willow flycatchers can fly from about 150 km (Otahal 1998) to 225 km (Yong and Finch 1997) between stopovers (though greater distances may be possible if weather conditions [e.g., wind] are favorable). Thus, spacing of usable stopover habitats should be as continuous as possible, and should not exceed these distances.

The wintering habitats in which flycatchers have recently been found in Costa Rica, Panama, El Salvador, and Mexico (Koronkiewicz et al. 1998, Koronkiewicz and Whitfield 1999, Lynn and Whitfield 2000, Lynn and Whitfield 2002) are similarly rare at the landscape level, and subject to many human-related threats. If wintering willow flycatchers are restricted to these wet lowlands, any changes or impacts to these relatively scarce wetlands could have profound effects on a large proportion of flycatchers. These areas of the Pacific lowlands are essentially remnant woodland-wetlands in a landscape dominated by man-made savannas, pasture lands, and agricultural areas (especially sugar and rice plantations; Figure 2). Koronkiewicz and Whitfield (1999) reported that the principal threat to flycatcher wintering habitat is agriculture-related destruction, and described the loss of two occupied willow flycatcher wintering sites over the course of their short (two month) survey.

Recent increases in human populations in Central and South America have resulted in widespread loss and degradation of native habitats, including conversion of riparian and lowland wet woodlands (e.g., willow flycatcher migration and wintering habitats) to agricultural landscapes. Even if these habitats are not currently limited with respect to the flycatcher, current trends in human population growth will likely continue and further reduce available natural habitats to the point where winter and/or migration habitat becomes limiting.

2. Agrochemicals

Flycatcher wintering sites in Costa Rica, Panama, and El Salvador are embedded within a matrix of intensive agricultural land uses, many of which involve widespread and intensive use of a variety of agrochemicals (Koronkiewicz et

al. 1998, Lynn and Whitfield 2000). Because wintering willow flycatchers forage extensively in wetlands that are adjacent to, or downstream of, agricultural areas, they are potentially exposed (through their prey base) to these chemicals. Recent research on the breeding grounds has identified flycatcher deformities (Sogge and Paxton 2000) and low egg hatchability (Valentine et al. 1988, Whitfield 1999, AGFD unpubl. data) that may be related to environmental toxins on the winter and/or breeding grounds.



Figure 2. Willow flycatcher habitat in La Barra de Santiago, El Salvador. The sugar cane field in the left foreground has been harvested and burned. Willow flycatchers were detected on the other side of the canal. Photo courtesy of M. Whitfield.

E. Potential Actions to Eliminate or Reduce Threats to Migrating and Wintering Flycatchers

At this time, it is not possible to target management actions specifically for the endangered subspecies. However, because the timing and areas of migration and wintering overlap for all subspecies, actions that benefit any one subspecies (or the species as a whole) will probably benefit *E.t. extimus*.

Following are research and management actions that could be used to reduce known and suspected threats to the flycatcher and its migration/wintering habitat.

1. Protect Existing Riparian Habitats

Prevent or minimize loss and degradation of riparian habitats that currently exist. Protection should be afforded to a wide variety of habitats, not simply those that have the characteristics of flycatcher breeding sites. For a migrating flycatcher, almost any riparian vegetation (with the possible exception of *Arundo*) is preferable to rip-rap banks, agricultural fields, or urban development. The presence of water can influence local insect abundance, and thus potential prey base and energy resources. Therefore, keeping water present in or adjacent to riparian habitats is desirable.

2. Restore and Expand Riparian Habitats

Expansion of riparian habitats, and restoration of those that are heavily damaged, will increase the distribution and amount of food (energy) resources available to migrating flycatchers. Thus, opportunities for creation or restoration of riparian vegetation should be pursued wherever possible, especially along portions of major river systems where riparian vegetation is rare or lacking. Again, the presence of water can influence local insect abundance, and thus potential prey base and energy resources. Therefore, riparian restoration or creation projects should include the goal of maintaining water in or adjacent to these riparian habitats.

3. Expand Research on Post-Breeding Movements and Migration Ecology

We know nothing about the immediate movements of flycatchers upon completing their nesting activities. Although recent work has shed some light on migration timing and habitat use within some major southwestern rivers, we know almost nothing about migration. Studies of migration within the U.S. should be expanded. Given that most of the distance that southwestern willow flycatchers travel during migration is outside of the U.S., research should also include the types, locations, and extent of habitats used in these areas. This could identify geographic areas of habitats of particular concern, and allow development of specific management actions. Furthermore, additional research is needed to document important migratory behaviors and pathways in the U.S., including the relative value of different riparian habitats and extent of use of non-riparian habitats. Data on age-specific survivorship during migration could yield valuable insights.

4. Expand Research on Wintering Distribution, Status, and Ecology

Recent work (Koronkiewicz et al. 1998, Koronkiewicz and Whitfield 1999, Lynn and Whitfield 2000, Lynn and Whitfield 2002) has provided valuable information on flycatcher wintering distribution, status, and ecology. However, these data are limited to only Costa Rica, Panama, El Salvador, and Mexico, which represent only a fraction of the willow

flycatcher's winter range. Knowledge of winter distribution, habitat use, and threats is needed for other areas. Furthermore, research is needed on how patch characteristics such as size, vegetative composition, and landscape setting affect habitat quality and, therefore, winter survival and site fidelity. It would also be valuable to determine whether remote sensing and Geographic Information System technology could be used to characterize the distribution and availability of wintering habitat. Further information is also needed on the influence of environmental toxins and other human activities.

5. *Conduct Education and Outreach*

Develop and institute a program to inform the foreign governments and public about the endangered *E.t. extimus*, the importance of migration stopover and winter habitats, and the threats the flycatcher faces during these periods. Work with local biologists, government officials, and private landowners to identify specific actions that can be undertaken, at particular sites, that will benefit wintering and migrating flycatchers.

F. *Literature Cited*

Please see Recovery Plan Section VI.