

Migration in Your Backyard

The Role of Habitat Patches and Plant Phenology on Bird Stop-over Habitat within Tucson and Other Areas of Southwestern North America

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Migrant birds such as Wilson's Warbler *Wilsonia pusilla* (above left), Orange-crowned Warbler *Vermivora celata* (above right), and Yellow-rumped Warbler "Audubon's form" *Dendroica coronata auduboni* (facing page, bottom) time their arrival times to maximize food resources. Almost every warbler species was found to preferentially choose honey mesquite as a foraging substrate and to time their arrivals to coincide with the flowering of this tree on the lower Colorado River.

On 13 January 2014, I presented a summary of my research on neotropical migratory birds to the Tucson Audubon Society. In that presentation, I summarized research that my graduate students and I have been doing in the Southwest over the past 30 years. This short article is a summary of the main points that I made during my presentation. Starting with a brief background on migrating birds, I will cover movement and feeding patterns that we have observed, arrival timing of the migrants, visual cues that birds use in finding stopover habitat, how plant phenology patterns influence the suitability of stopover habitat, and will end with the role that introduced plants play in aiding bird migration in the Tucson area.

In Southwestern North America, riparian habitats have declined precipitously in the last century outside protected areas such as National Parks, Fish and Wildlife Service Refuges, and Biosphere Reserve lands. In the Tucson area, other regions of the Southwestern United States, and northwestern Mexico, the decline of riparian habitat

and loss of native cottonwood (*Populus fremontii*)-willow (*Salix gooddingii*) gallery forests, as well as adjacent mesquite (*Prosopis sp.*) bosques, has often been accompanied by the addition of planted urban vegetation and the invasion of non-native tamarisk (*Tamarisk sp.*), or salt cedar. In Arizona, studies of introduced tamarisk have focused on comparing pure stands of tamarisk to native-dominated stands, and showed that tamarisk monocultures contained less diversity and absolute numbers of birds.

When we correlated bird migration patterns with plant phenology data, we found a strong relationship with plant flowering. One significant correlation was that Wilson's Warbler (WIWA), Audubon's Warbler (AUWA), and other warbler arrivals coincided with honey mesquite flowering on the lower Colorado River. In fact, we found that almost every warbler species preferentially chose honey mesquite as a foraging substrate and utilized this tree significantly more often than would have occurred by chance.

Migrant birds like the Orange-crowned Warbler (OCWA) and Yellow Warbler (YEWA) partition their arrival times to maximize food resources and allow for prey recovery (see Figure 1). Although birds generally arrive at more southern latitudes first during spring migration, we should be aware that a 'leap-frog' migration pattern occurs in spring and fall for many neotropical bird species migrating through Tucson. Thus, the longer-distance migrants, such as WIWA breeding in Alaska, come through most stop-over areas in Tucson at a later date than do those birds wintering just south of the area in northern Mexico.

Both large and small protected areas are important for neotropical migrant bird stop-over sites. Birds appear to assess migrant routes and stop-over habitats at multiple scales, with larger protected areas providing the initial target for stopping. Once a location is chosen, phenological phases of major plant species at the smaller, local scale strongly influence when and where birds stop. Smaller protected areas,

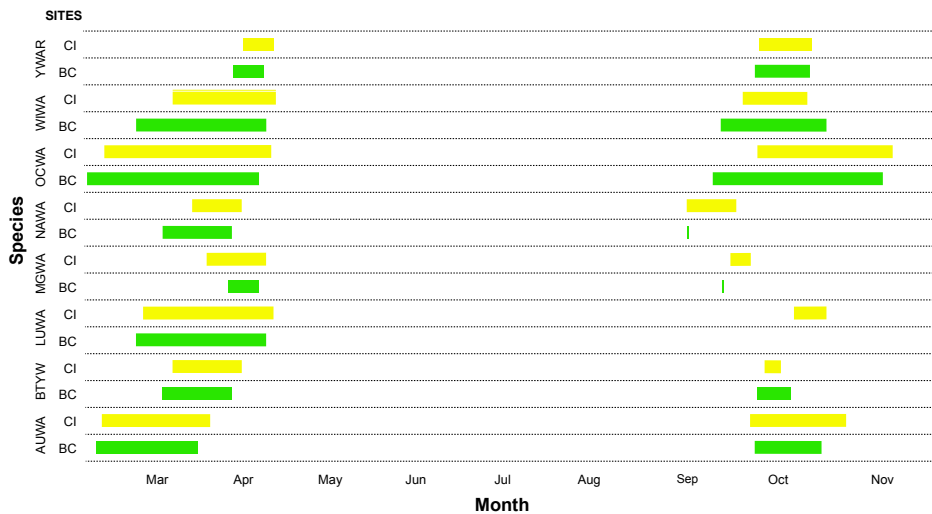


Figure 1. Stopover timing

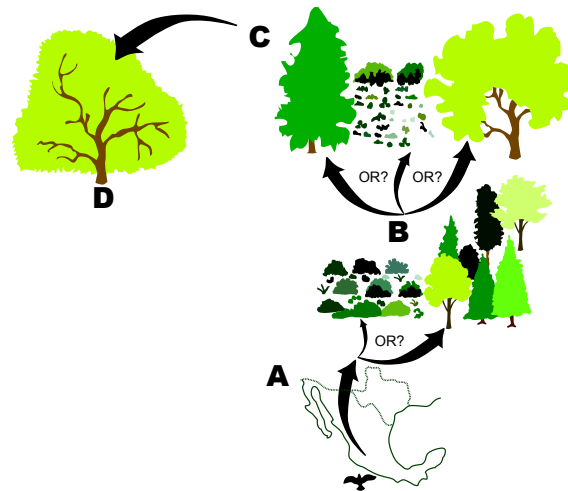


Figure 3. Habitat selection



Figure 2. Migration routes



such as older housing developments in Tucson, golf courses, cemeteries, and wildlife refuges and state parks, provide important vegetation patches and suitable microhabitats for bird refueling during spring migration. Importantly, however,

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Figure 1. STOPOVER TIMING—This figure shows differences in warbler arrival time at two sites in Arizona during the spring and fall migration periods. The 4-letter bird acronyms on the vertical axis are AUWA = Audubon's Warbler (yellow-rump); BTYW = Black-throated Gray Warbler; LUWA = Lucy's Warbler; MGWA = MacGillivray's Warbler; NAWA = Nashville Warbler; OCWA = Orange-crowned Warbler; WIWA = Wilson's Warbler; YWAR = Yellow Warbler. **Figure 2. MIGRATION ROUTES**—Arrows show migration pathways of birds migrating through the Baja area of Mexico to North America. The birds going to California and northern Arizona arrive first, then birds heading further north "leap frog" over the earlier arrivals. **Figure 3. HABITAT SELECTION**—The migration route (A) appears to be a genetically influenced corridor selection, coupled with weather frontal patterns. When following a migration route, a bird then selects specific stop-over habitat next on the basis of large-scale landscape features (B). Once the large-scale feature has been selected, the bird then decides on the type of vegetation patch (C). Finally, the bird makes microhabitat selection about specific foraging and roosting locations within the vegetation patch (D), selecting between native and introduced vegetation. Over time, this selection process ultimately maximizes resources for each bird species during migration stop-over.

these areas must include areas with mixes of native vegetation. We found the greatest abundances of birds, like WIWA, in habitats composed of 40–60% native vegetation with a tamarisk understory and the lowest bird abundances in homogenous introduced plant species stands.

We found that western migrant land bird species arrived at different times within areas around Tucson and along the Colorado River. The birds appear to assess migrant routes and stop-over habitats at multiple scales based on a genetically influenced corridor selection, followed by: 1) large-scale weather patterns; 2) large-scale landscape features; 3) vegetation patches; and then, 4) microhabitat selection within a vegetation patch. Weather, vegetative species, structure (see Figure 3), plant phenology patterns, and food resources variously influence migrating birds that pass through Tucson and all other areas along riparian corridors throughout southwestern North America. For example, each year we found that species arrival dates and numbers of neotropical migrant warblers were variable, being largely influenced by large-scale weather patterns and plant phenology cycles. Protected urban and rural areas are

important stop-over sites because once selected, there was minimal movement by individual birds over the landscape during the stop-over period. Therefore, stop-over and bird foraging patterns were greatly influenced by plant species and phenological patterns of the selected microhabitat.

Neotropical migrant bird species rely on urban and other protected areas in the Southwest, as these habitats provide suitable stop-over and foraging habitat. It thus appears that urban areas, in addition to state and federally managed reserves, provide appropriate landscape features that attract migrating birds, while other protected areas may play a more important role as micro-habitats for stop-over sites. People interested in preserving wildlife must recognize that within their backyards, vegetation, structure, plant species, phenology, abundance, and food availability all play a role in structuring bird migration patterns throughout the Southwest.

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