

In cooperation with The University of Arizona

A Neotropical Migrant Bird's Dilemma—Where to Stop for a Good Meal

To learn how migrating birds determine where to stop and find food, scientists from the U.S. Geological Survey, Northern Arizona University, and The University of Arizona studied the behavior of 28 species of neotropical migrant songbirds—warblers, flycatchers, tanagers, vireos—along the lower Colorado River from 2001 to 2004. Scientists found that just as an interstate traveler is greeted by restaurant billboards, songbirds flying over Cibola National Wildlife Refuge, Arizona, relied on the flowering of honey mesquite (*Prosopis glandulosa*) to detect the presence of insects that they prey upon. Additionally, scientists found that more flowers meant more insects. Understanding where and why migrant birds stop will help land managers better protect key habitats used by these tiny travelers.

For migrant birds that breed in the United States or Canada and winter in Central or South America, migration is an energetically demanding part of their annual cycle. Because of their small size, these neotropical migrant songbirds cannot carry sufficient reserves to migrate nonstop. Choosing appropriate locations to stop and refuel is important to ensure that birds survive migration and reach their destination in a condition suitable for breeding. Insectivorous songbirds, such as the Pacific-slope flycatcher (*Empidonax difficilis*) and Wilson's warbler (*Wilsonia pusilla*), prefer locations with an abundance of insects; yet the "cues" birds use to determine food availability as they travel remain largely a mystery.

Scientists know that birds actively choose when and where to stop during migration; however, until recently relatively little was known about how

individual birds judge the quality of potential stopover locations. One possibility was that birds determined food availability from the types or condition of local trees. The species of tree and their phenological state, (seasonal changes in flowering, leaf-flush, fruiting, leaf-loss) could present birds with obvious and reliable predictors of insect abundance that can be easily assessed at a distance. U.S. Geological Survey, Northern Arizona University, and University of Arizona researchers tested the hypothesis that migrating birds use the species and phenology of trees to determine food availability. They repeatedly monitored two 1-kilometer transects at Cibola National Wildlife Refuge, Arizona. The refuge was selected because it contains choice riparian habitat and is a stopover location for numerous insectivorous neotropical migrants, including many critical and sensitive species.

Walking pre-established transects weekly during the spring migration period (March to May), researchers were able to estimate the abundance of local tree species and follow phenological progression from bare branches, to buds, to leaves, to flowers, and finally fruit. Simultaneously, the scientists estimated bird diversity and abundance and cataloged the habitat preferences of species that they encountered. By comparing when and where birds were found with the availability of each tree species and its corresponding phenological progression, researchers were able to relate patterns of migration with changes in local tree phenology. To ensure that phenological changes really informed the birds about food availability, the researchers also conducted a field experiment and recorded the diversity and abundance of insects on each tree species throughout the



Stephen Minter/ASDM Sonoran Desert Digital Library



Arlene Kozul/ASDM Sonoran Desert Digital Library



Stephen Minter/ASDM Sonoran Desert Digital Library



VIREO ???

The Wilson's, Orange-crowned, and Yellow-rumped Warblers and the Pacific-slope flycatcher (top to bottom above) are some of the many migratory songbirds that stop along the Colorado River during their annual treks from winter habitat in Mexico to breeding grounds in the United States and Canada.

spring. It can be difficult to determine which cues birds are ultimately using to select foraging habitats, because the timing of leafing, flowering, and fruiting events are so closely related. To determine whether leafing or flowering was ultimately the stronger cue, the researchers experimentally removed flowers and assessed changes in bird behaviors.

Data gathered for the five most common tree species—Fremont cottonwood (*Populus fremontii*), Goodding's willow (*Salix gooddingii*), screwbean mesquite (*Prosopis pubescens*), honey mesquite (*Prosopis glandulosa*), and tamarisk (*Tamarix* sp.)—revealed that *only* the flowering of honey mesquite coincided with the spring peak in diversity and abundance of migrating neotropical songbirds moving through the study area. Migrants preferred honey mesquite to all other tree species in the study area and, more than that, they preferred honey mesquite trees with more flowers because these trees harbored more of the insects that the birds preferred to eat.

A field experiment that manipulated the number of flowers on trees clearly demonstrated that birds showed a preference for honey mesquite with more flowers, independent of leaf phenology. Given that the experiment did not greatly change the number of insects present, these findings indicate that the flowers were the signals the birds used to determine how much food was available. The fact that the flowering of honey mesquites coincides with the peak in abundance of migrant birds suggests that the timing and routes used by migrants may have evolved to take advantage of the readily available food resources that the flowering trees advertise.



Stephen Minter/ASDM Digital Library

Lazuli Buntings and Summer Tanagers also pass through the Cibola National Wildlife Refuge.



Scientists found that migratory songbirds relied on the showy flowers of honey mesquite tree to determine where best to stop for food. In reaching this conclusion, U.S. Geological Survey, Northern Arizona University, and University of Arizona scientists experimentally removed flowers to determine if flowering affected insects and was a strong settlement cue.

While our knowledge of how birds select locations to rest and refuel remains limited, this study demonstrates that the flowering phenology of a common tree species acts as a reliable cue for neotropical migrant birds. That the flowering of honey mesquite presents a reliable indicator of actual food availability highlights the importance of this visible signal for migrant bird populations, particularly along the Colorado River.

In the Western United States, neotropical migrant birds and the riparian corridors along which they migrate are topics of conservation concern, and where these avian travelers stop to rest and refuel can have important conservation implications. Understanding where and why migrating birds stop during their annual travels can help land managers better manage key habitats for these long-distance avian travelers.

Securing the future of migrating birds may play an important role in protecting ecosystem function in sensitive desert riparian corridors because healthy bird populations may ameliorate the costs imposed by herbaceous insects on local flora.

While it appears that avian migration along the Colorado River is closely tied to the phenology of honey mesquite, it remains uncertain how the phenology of honey mesquite or other tree species may influence migration along other important migratory corridors that differ geographically and in elevation. These corridors may have different migratory peaks and support different avian

population and species assemblages. For these reasons, more research is required to clarify how tree phenology differs among Western migration corridors and how these differences affect migratory bird populations. Scientists should also begin documenting how climate change and invasion by exotic trees may alter settlement cues that impact migrant bird populations.

*Joseph J. Fontaine
Charles van Riper III*

For more information contact:
U.S. Geological Survey
Southwest Biological Science Center
Sonoran Desert Research Station
Tucson, Arizona
520-621-5508 or
charles_van_riper@usgs.gov
This Fact Sheet and
any updates to it are available
online at <http://pubs.usgs.gov/fs/2009/30?/>