

# Innovations in Bird Migration Research



*The Boreal Forest—North America's Bird Nursery—erupts with billions of migratory birds heading south each fall. Their precise migrations have long been mysteries, but recent technological advances are uncovering clues as to when, where, and how these species navigate their way through the Americas.*



## Citizen Science

Bird observations from everyday citizens can be compiled in internet databases and used to detect migratory patterns. Observations of Canada Warblers are shown here prior to their shift north in April and May.



## Genetic Markers

Embedded in DNA from birth, genetic markers show which portion of the species' breeding range individuals came from. Wilson's Warblers sampled in the winter in western Mexico were found to have come from the northwestern portion of its breeding range.



## Geolocators

Geolocators record changes in light levels to determine location. A Blackpoll Warbler made a non-stop flight from the Maritimes to the Caribbean before continuing to Venezuela. It took a more land-based route back the following spring to Vermont.



## Isotope Analysis

The regions a bird spent portions of its life in can be deduced through analyzing isotopes in feathers or claws. A White-throated Sparrow sampled in Manitoba was found to summer in the central-western Boreal Forest and winter in the southeastern U.S.



## Radar Imaging

Bird migration can be observed en masse using Doppler radar. A wave of migrants begins to cross Lakes Erie and Ontario in May as they head toward breeding grounds further north. Darkness of color reflects density of birds detected.



## Radio Telemetry

Birds fitted with radio transmitters alert equipped radio antennas when they come into range. A Gray-cheeked Thrush in northern Colombia in April was detected a month later near the Hudson Bay coast of Manitoba.



## Satellite Tracking

Satellite transmitting devices provide real-time movement updates. The migration of a Whimbrel was tracked from its breeding grounds in Canada's Mackenzie River Delta to its wintering grounds in Brazil and back again the following spring.