Smithsonian Migratory Bird Center

Neotropical Migratory Bird Basics

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What is a Neotropical migratory bird?

A Neotropical migratory bird is a bird that breeds in Canada and the United States during our summer and spends our winter in Mexico, Central America, South America or the Caribbean islands.

According to a more strict definition used by some scientists, Neotropical migratory birds are Western Hemisphere species in which the **majority** of individuals breeds north of the Tropic of Cancer and winters south of that same latitude. (The Tropic of Cancer is a line of latitude 23 degrees north of the equator which marks the northern extent of the tropics.)

How many kinds are there?

According to the strict definition given above, there are **about 200 species** of Neotropical migratory birds. The majority are songbirds (such as warblers, thrushes, tanagers, and vireos), but there are also many shorebirds (such as sandpipers, plovers, and terns), some raptors (such as hawks, kites and vultures), and a few types of waterfowl (such as teal).

How far do they travel?

Migration distances vary greatly between species and between individual birds of the same species. The shortest migrations are made by birds that breed in the southern United States and winter in Mexico or the West Indies, a trip which can be as short as a few hundred miles.

Examples of birds that make such relatively short migrations include all black-capped vireos and Lucy's warblers, and some painted buntings, northern parulas, and gray catbirds.

Some of the longest migrations are made by shorebirds that nest in the arctic tundra of northernmost Canada and winter as far south as Tierra del Fuego (the southernmost part of South America), a one-way distance of up to 10,000 miles (16,000 kilometers). Red knots and white-rumped sandpipers are 2 species that make this remarkable journey.

Other birds that winter in South America, and thus travel great distances, include: common nighthawks, Swainson's hawks, red-eyed vireos, purple martins, barn and cliff swallows,

blackpoll, cerulean and Connecticut warblers, scarlet tanagers, and bobolinks. A round-trip migration distance for many of these species is as much as 13,600 miles (22,000 kilometers).

Although not technically a *Neotropical* migratory bird, no discussion of long-distance bird migration is complete without mention of the champion globe-trotter of all, the arctic tern.

With nesting grounds as far north as land extends and wintering sites on the opposite end of the earth, arctic terns cover 22,000 miles (35,400 km) annually. Given that the sun never sets while these terns are nesting, nor during the time they spend near the South Pole, arctic terns enjoy more hours of daylight than any other species.

Examples of one-way migration distances

Species	Miles	Breeding Range	Wintering Range
Abbreviations: n=north e=east c=central se=southeast s=south w=west nw=northwest sw=southwest			
Black-capped Vireo	400-1,250	Oklahoma, Texas	w Mexico
Lucy's Warbler	500-1,500	sw U.S.	w Mexico
Painted Bunting	300-3,000	s and se U.S.	Mexico to Panama, West Indies
Northern Parula	300-3,000	se Canada, e U.S.	Florida, West Indies, Mexico to Nicaragua
Wood Thrush	600-3,750	se Canada, e U.S.	Mexico to Panama
Scarlet Tanager	600-4,350	se Canada, e U.S.	nw South America
Cerulean Warbler	2,175-4,500	se Canada, e U.S.	nw South America
Blackpoll Warbler	2,500-5,000	Alaska, Canada, New England	n South America
Purple Martin	600-6,000	s Canada, U.S., Mexico	Brazil, Bolivia to n Argentina
Cliff Swallow	1,250-6,800	Alaska, Canada, U.S., n Mexico	s Brazil, Bolivia to c Argentina
Common Nighthawk	2,500-6,800	most of Canada and U.S.	Colombia to c Argentina
Bobolink	5,000-6,800	s Canada, n U.S.	s Brazil to n Argentina
Swainson's Hawk	3,750-7,500	sw Canada, w U.S.	s Brazil to c Argentina
Lesser Yellowlegs	1,500-9,300	Alaska, n Canada	s U.S., West Indies, South America
Red Knot	1,500-10,000	n Canada	coasts from c U.S. to southern tip of South America

Why do Neotropical migratory birds fly so far?

Because it's too far to walk. Now, seriously, the best explanation for why birds fly such great distances is it allows them to take advantage of seasonally abundant food and to avoid times when or places where food and other resources are scarce.

You may have guessed that they migrate south to avoid the cold of our winter, but there are many species of birds which can and do tolerate cold temperatures, as long as food is plentiful.

The types of food that Neotropical migratory birds need, such as flying insects, caterpillars, fruits and nectar, are super-abundant during our spring and summer, but are not sufficiently available through the winter.

Ultimately, the reason why migration persists is because it increases "breeding success", that is birds are able to raise more young on average by migrating than they would if they remained in the tropics. The abundant, protein-rich food, longer daylight hours, greater area over which the birds can spread, and, possibly, fewer predators account for the potential to raise more young.

At what time do birds migrate?

Most long-distance migratory songbirds and shorebirds, and some waterfowl, migrate at night when conditions are more favorable (cooler temperatures and calmer air) and predators are few.

Whereas the nocturnal migrants (that is, the ones that migrate at night) travel through the air by flapping their wings, birds such as hawks and vultures fly by soaring and gliding on rising currents of air.

These soaring birds must migrate by day, since the rising currents of air which enable them to soar form only during the day as the sun's rays heat the earth. Swallows, swifts, and nighthawks are also diurnal migrants (that is, they migrate by day) because they feed on flying insects that are active only by day.

How high do migrating birds fly?

Like airplane pilots, birds choose a flight altitude depending on at what height the best wind conditions are found. This can vary according to time of day, time of year, features of the earth below, and the weather.

Because winds at higher altitudes are stronger than winds closer to the earth's surface, birds fly higher with tailwinds (winds blowing in the direction in which the bird is migrating) and lower with headwinds (winds blowing in the opposite direction).

In general, nocturnal migrants travel at higher altitudes than diurnal migrants. Of the nocturnal migrants, most shorebirds and waterfowl fly higher on average than do songbirds. Most birds tend to fly higher when crossing large bodies of water than when flying over land.

Some of the highest flight altitudes are attained by shorebirds and a few songbirds that make long-distance, non-stop flights over water. For instance, blackpoll warblers, red knots, and American golden-plovers often travel at 5,000 feet (1,500 meters), and sometimes at more than 12,000 feet (3,600 meters), when flying over the Atlantic Ocean from southern, coastal Canada and New England to South America.

Most birds migrate within the following ranges of altitudes:

	Feet	Meters
75% of songbirds migrate between 500 and 2,000 feet (150- 600 m)		
Songbirds	500-6,000*	150-2,000*
Shorebirds	1,000-13,000	300-4,000
Waterfowl	200-4,000	60-1,200
Raptors	700-4,000	200-1,200

(Birds are capable of flying at much higher altitudes. Bar-headed geese are known to cross the Himalayas at 29,500 feet (9,000 m). The world record holder is a Ruppell's griffon vulture seen at 37,000 feet (11,300 m.) A mallard, which struck an airplane at 21,000 feet (6,400 m), holds the record for the highest documented flight altitude for a bird in North America.)

How fast do birds fly when they are migrating?

Ninety percent of migrating birds fly at airspeeds between 15 and 45 miles per hour (25-70 kilometers per hour). Slower and faster flight speeds have been recorded, but they are exceptions. In general, larger birds fly faster than smaller birds. Below are typical flight speeds, given in miles per hour and kilometers per hour:

	Miles/Hour	Kilometers/Hour
Songbirds	10-30	15-50
Shorebirds	20-40	30-65
Waterfowl	30-50	50-80
Raptors	20-45	30-70

The speed and direction of the wind influences how fast a bird travels. Strong tailwinds (winds blowing in the direction in which the bird is flying) mean faster travel, while headwinds slow a bird's progress.

How long does it take birds to migrate?

A one-way migration can take anywhere from several weeks to 4 months. The pace of migration tends to be faster in the spring, with the pace picking up as a bird gets closer to its breeding area.

For example, a blackpoll warbler heading from Florida to Alaska may take as long as a month to cover the first 1000 miles (an average of about 30 miles a day), whereas the final 2500 miles may take only 2 weeks (an average of 180 miles per day). For most birds, the pace in the fall tends to be more leisurely and more evenly paced.

Typically, migration is accomplished in a series of flights lasting from several hours to several days. Between flights, birds make pit stops for resting and "re-fueling" which last anywhere from a day to a few weeks. Below are examples of approximate daily migration distances given as either an average or a range:

Species	Miles/Day	Kilometers/Day
American Redstart	20-100	30-160
Barn Swallow	90	150
Blue-winged Teal	100	160
Swainson's Thrush	125	200
Swainson's Hawk	106	170
Red Knot	90-600	140-960
Broad-winged Hawk	60-300	100-480

Average daily migration distances understate the amazing capabilities of migratory birds—capabilities that are put to the test when birds are faced with crossing large bodies of water.

For instance, when traveling to South America in the fall, blackpoll warblers depart from New England and the southern coast of Canada on a non-stop flight which takes a minimum of 72 hours. That's 2,000 miles (3,200 km) in three days, or an average of 660 miles per day (1,000 km/day). This degree of exertion is equivalent to a human running 4-minute miles (15 mi/hr; 24 km/hr) for 80 consecutive hours.

How do birds know when to migrate?

Long distance migrants have an internal clock that controls the onset of migration and the pre-migration preparations. Environmental factors set this clock and keep it fine-tuned. It is thought that certain changes in a bird's environment stimulate the production of hormones, which in turn lead to changes in the behavior and physiology of the bird, preparing them for migration.

Southbound migration timing may be fine-tuned by changes in day length. The environmental factors operating on the wintering grounds, where day length is relatively constant, are more subtle and less well understood.

How do they know where to go?

The answer to this question is different for different types of birds, and for birds that migrate short distances (such as within the United States) rather than longer distances. For most

waterfowl species and many short distance migrants, young birds learn migration routes and breeding and wintering ocations from older, more experienced birds, which are most often family members.

For most long distance migrants, birds are born genetically programmed to fly in a certain direction for a certain amount of time. The first migration is completely under genetic control. As birds gain experience, they incorporate learned information. For instance, if they find a particular breeding or wintering location that is good, they may return to this location in the future by relying on learned information.

How do they know which direction to fly?

Experiments done with indigo buntings have revealed one of the cues that migratory birds use to navigate: stars. Buntings specifically use the pattern of stars around the North Star.

If young buntings are prevented from seeing the night sky during a critical stage in their development, they will not be able to orient properly for migration. This ability, therefore, is learned rather than genetically programmed. Other nocturnal migrants probably also use stars for compass direction.

Although the intricacies of how birds navigate remain a mystery, this much seems to hold true: all migratory birds use a variety of cues, and different species seem to rely on some cues more than others. This can vary according to the immediate circumstances, for example, if it is a cloudy night and the stars are obscured, a nocturnal migrant many rely more on other sources of information.

Other cues used by migratory birds include:

- the earth's magnetic fields,
- location of the setting sun (and the pattern of polarized light created),
- topographic features of the landscape (coastlines, rivers, mountain ranges, for example),
- and prevailing wind patterns (wind patterns are seasonal; during migration the wind tends to blow in roughly the appropriate direction for migration).

Suggested Reading:

- *Bird Migration: A General Survey*, Peter Berthold, 1993, Oxford Univeristy Press Inc., New York.
- *Bring Back the Birds*, Russell Greenberg and Jamie Reaser, 1995, Stackpole Books, Mechanicsburg, PA.
- *How Birds Migrate*, Paul Kerlinger, 1995, Stackpole Books, Mechanicsburg, PA.
- *Optimal Migration*, special issue of the Journal of Avian Biology, vol 29, No.4, Dec 1998.
- *Random House Atlas of Bird Migration: Tracing the Journey's of the World's Birds*, edited by Jonathan Elphick, 1995, Random House, New York.