



Most bird species are “hardwired” to automatically do things like hatch, feed, breed, moult, build nests or migrate when changes in day length occur. Annual cycles of changes in day length are predictable, but year-to-year climate variability arising from cycles such as the El Niño-Southern Oscillation or the North Atlantic Oscillation is much less predictable. Successful species must have some flexibility in their life-cycles in order to adapt to such variability. Some species have adjusted to climate changes over the last 40 years better than others. Changes have included warming of the atmosphere and oceans; decreasing snow and ice cover; and lengthening of the average growing season by 12 days. While some species, many of them short-distance migrants, have adjusted to this warming by simply advancing the dates of their activities to better exploit the earlier plant blooms and insect hatchings, other factors complicate their ability to adjust.

Latitudinal Gradients: Regions closer to the poles have been experiencing more profound climate changes than regions closer to the tropics. Long-distance migratory birds (which cross more latitudinal gradients) must deal not only with changes in their northern and southern habitats, but also different rates of change in these habitats. Changes in the conditions along the migration route can further complicate their life cycles. In Europe, many short-distance migrants have taken advantage of the longer breeding season by having two broods of chicks instead of just one. On the other hand, long-distance migrants must cross the Sahara to reach their wintering grounds. Because dry seasons around the desert are now longer and more intense, the birds must start their fall migrations earlier. This prohibits them from having two broods and may place them at a competitive disadvantage.

Altitudinal Gradients: Like the differences between higher and lower latitudes, higher altitude locations have experienced more rapid climate changes than lowlands. Many higher altitude locations are actually experiencing an increase in snow cover volume, which is counteracting the trend in earlier melting. American Robins have traditionally arrived in the Rocky Mountains when the ground becomes bare as snow melts in the spring. Robins are now arriving from their overwintering grounds 14 days earlier than they did in the 1980's. Unfortunately, this advance is not being matched by earlier snow melt and the birds must now wait about 18 days for bare ground – and their food – to appear.



Will Elder, National Park Service

Day-length versus Temperature Cues: North American wood warblers rely primarily on eastern spruce budworms in the northern U.S. and southern Canada for their prey during the spring. Budworm hatching is dependent on temperature and as average temperatures have warmed, the average budworm hatching date has moved earlier in the year. The warblers, however, initiate their migration from the tropics based on day length and have not advanced their departure dates. The birds are now missing peak budworm abundance in the north.

Spring versus Fall Migration: Compared to spring migration, much less is known about how climate influences the timing of autumn, or post-breeding, migration. Preliminary results indicate that years with warmer springs, when events such as breeding and egg hatching occur earlier, also generally correspond to years when the onset of fall migration occurs earlier.

Species-Specific Response: Even disjunct populations within a species tend to respond to similar climate shifts in similar ways. In other words, certain responses to climate change appear to be species-specific traits.

Arrival Times: In many bird species, males arrive at breeding grounds earlier in order to construct nests which attract females. Some scientists have proposed that earlier onset of spring conditions may be increasing the gap between male and female arrival times in certain species.

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