



Scientists have continuously monitored forest bird populations in New Hampshire's Hubbard Brook Experimental Forest since 1969, making their efforts one of the world's longest-running bird studies. The Hubbard Brook bird team works to understand the complete lifecycle of neotropical migrants: species that breed in the northern forests but migrate long distances to overwinter in the tropics. Research efforts include a general survey of all birds in the forest and more detailed studies of individual species, including the American redstart, black-throated blue warbler, and ovenbird.

Why It Matters

The long-term nature of the bird study at Hubbard Brook is essential for understanding how and why bird populations change over time. The overall number of birds in the forest has declined since 1969 and the relative abundance of individual species has also shifted dramatically. Researchers at Hubbard Brook are building knowledge about the roles that birds play in forest ecosystems and the importance of conservation efforts across wintering grounds and migration routes, as well as summer breeding grounds, for migratory birds.



Every summer since 1969, researchers have used spot-mapping to survey all adult breeding birds within an ~25-acre study plot in the Hubbard Brook Experimental Forest.

Key Findings – General Surveys

- While population trends since 1969 vary widely among species, there has been an overall decline in the total abundance of birds at Hubbard Brook.
- Bird abundance peaked in 1972 at 214 individuals in the main study plot.
- The decline in the overall number of birds first became apparent in the late 1970s to mid 1980s, reaching its lowest point in 2002 with just 71 individuals in the main study plot.
- Migratory birds have declined most. Declines in three neotropical migrant species—least fly catchers, wood thrushes, and American redstarts—are responsible for most of the total drop in population numbers.
- Populations of permanent residents, which occur at low abundances in the forest, have remained relatively stable over the course of the study.
- Total bird abundance has been increasing slowly since 2004.
- The shifts in numbers for many species—including population declines of the least fly catchers, wood thrush, and American redstart—are primarily caused by the changing age and structure of the forest. These three species have specific habitat needs, and as the forest ages, those habitats have disappeared. Meanwhile, the aging forest structure became *more* suitable for other species, such as the black-throated green warbler, whose numbers have increased gradually.

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The Hubbard Brook Ecosystem Study is one of the longest running and most comprehensive ecological research programs in the world, taking place within the Hubbard Brook Experimental Forest, a 7,800-acre research site in the White Mountains of New Hampshire.

The USDA Forest Service operates the site and the research program at Hubbard Brook is supported by the National Science Foundation. This research brief is an outreach product of the Hubbard Brook Research Foundation, a nonprofit organization that links environmental science and society.

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Black-throated Blue Warblers

- In addition to the species-specific habitat preferences mentioned above, habitat quality is another important influence on the black-throated blue warbler population during the breeding season.
- The quality of the breeding habitat has to do with how much food is available, the risk from nest predators, and the weather of a given season. These factors determine how many young birds fledge each year. The warm and wet springs and summers during La Niña years, for example, can lead to a spike in the population of caterpillars, which can subsequently lead to well-fed fledglings and higher survival rates.
- During the nonbreeding season, the most important influences on black-throated blue warbler populations are winter habitat quality and mortality during migration.
- Habitat quality during the winter, especially food availability, can influence reproductive success during the following summer.
- Birds from different breeding areas mingle in their winter grounds.
- Mortality rates are highest during migration (More than 85 percent of annual mortality for the black-throated blue warbler occurs during migration, due to hazards like storms and building collisions, and the availability of food and shelter at stopover sites).

Methods

Every summer since 1969, researchers survey all adult breeding birds within an ~25-acre study plot in the Hubbard Brook Experimental Forest. Between early May and July, they walk through the plot several days a week and record every bird they see or hear, noting its location and activities on a map. At the end of the breeding season, the territories identified on the maps can be counted to estimate bird abundance on the plot.

Since 1986, Hubbard Brook researchers have also captured all male and female black-throated blue warblers living within a set of designated plots in the forest and banded them with unique color

combinations. The researchers then use the bands to observe the individuals, map their territories, and monitor nesting activities.



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Looking Forward

Beginning in 2020, researchers are now monitoring migratory birds as they return to Hubbard Brook from their wintering grounds via a set of passive sound recorders in the forest. This new technology will complement on-the-ground observations and help researchers understand how climate change is influencing the timing of natural events like seasonal migration.

Richard Holmes initiated this research in 1969. Current field leads are Scott Sillett and Mike Webster. Nick Rodenhouse consulted on this research brief.

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