

## Evidence of climate change in our own backyards

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Evidence of climate change isn't always as stark or far away as melting

polar ice caps or rising sea temperatures. In fact, says conservation biologist Richard Primack, unmistakable signs of climate change can be seen every day, in every backyard, in towns across America. Primack, a Boston University professor of biology, is working on an award-winning research project to demonstrate the local effects of global climate change. He's using Concord, Mass., as a living laboratory, and he has teamed with Henry David Thoreau, America's great 19th-century nature poet and philosopher, who lived in Concord.

Thoreau identified his occupation as "inspector of snowstorms." He went out on daily walks and made entries in his journal about what he saw in the landscape around Walden Pond during the 1850s, recording bird migration patterns, flowering cycles of plants, and observations about wildlife and temperature. Primack and his collaborator, Abraham Miller-Rushing, do the same making weekly visits to Concord and taking careful note of when flowers are blooming and when birds are returning each migrating season. Comparing their data with that Thoreau recorded, Primack and Miller-Rushing are showing that global warming is already influencing the behavior of plants and wildlife in Boston and its environs.

"There is a lot of evidence that global climate change is starting to affect biological systems," says Primack. "A lot of it seems far away, or not immediately serious. What we're showing is that in one area, one local town, you can see so much evidence of it." By repeating Thoreau's experiments and recording the difference in blooming times and in the seasonal appearance of birds, they've been able to showcase the effects of a warming climate: on average, they say, "spring events" now begin one week earlier than they did in Thoreau's time.

"Flowering times are one of the most sensitive indicators of climate change," Primack says, noting that earlier annual bloom times (and the earlier arrival of birds each spring) correlate to rising annual temperatures. As blooming patterns shift, other processes are affected as well, including pollination and seed dispersal, resulting in potentially dramatic changes to the ecosystem. Thanks to Thoreau's careful record-keeping, Primack, Miller-Rushing, and their team of undergraduate research assistants can essentially go back in time, making comparisons and drawing conclusions about which plant species are most sensitive to climate change.

"We're working in a place people can relate to," Primack says, "and using species that are familiar to people: apple trees, hummingbirds, ducks. It really brings home the message of global climate change."

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