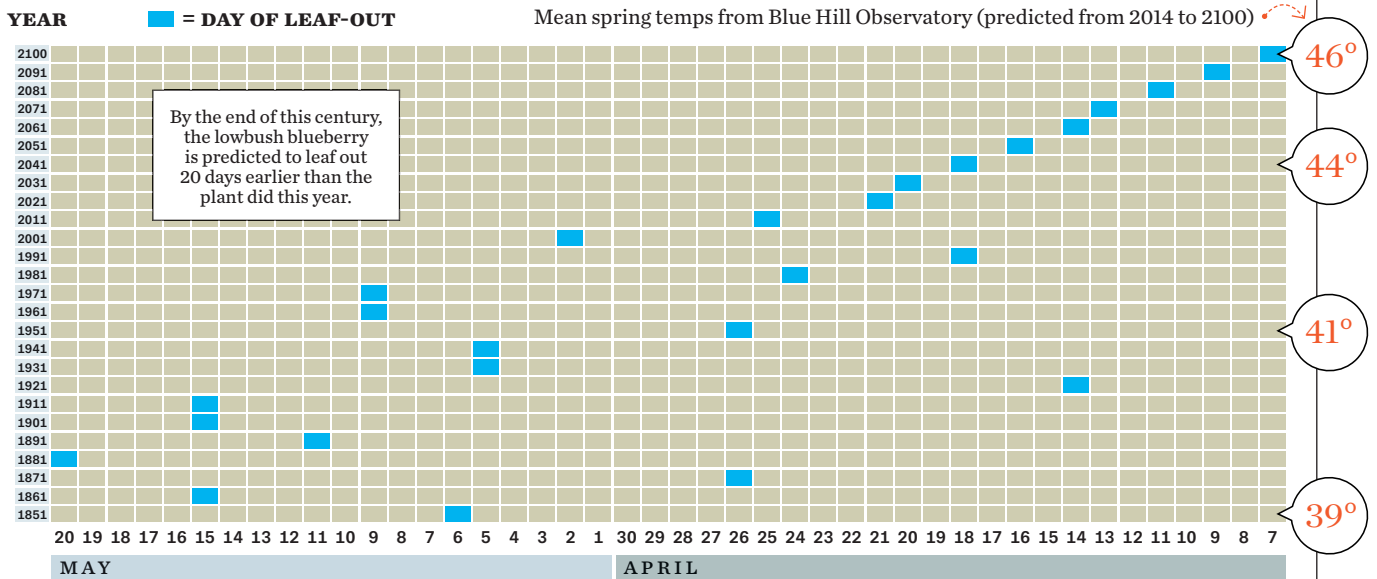


In Thoreau's Woods *TIMING* Is Everything

As plants leaf out earlier, the natural food web may lose its balance | BY ART JAHNKE



RISING TEMPERATURES RESET SOME NATURAL CLOCKS | *Flowers arrive early, but some birds do not*



NO, A BLUEBERRY IS NOT JUST A blueberry. Not when it's attached to a blueberry bush, whose tender new leaves each spring provide food for insects, which pollinate flowers and themselves often become food for birds, which litter the forest with seeds and, yes, sometimes become food for bigger birds, which....You get the picture. A blueberry is one representative of a complex ecosystem, one that can be thrown out of balance

when a single element, like the timing of spring leaf-out, begins to fluctuate. That, according to Richard Primack, a College of Arts & Sciences biology professor, is exactly what is happening in the woods of Concord, Mass. Primack and graduate students Caroline Polgar (GRS'13) and Amanda Gallinat (GRS'17) have been tracking the changing leaf-out times of trees and shrubs at Walden Pond, starting with dates first noted by Henry David

Thoreau in the 1850s. The team has determined that contemporary leaf-out dates are on average 18 days earlier than they were when Thoreau made his observations. At *Bostonia's* request, Primack's team pushed their data one step further to predict leaf-out times for one particularly sensitive species, the lowbush blueberry (*Vaccinium angustifolium*), through the end of the 21st century. The lowbush blueberry's

WARMER SPRINGS WILL LEAD TO ADVANTAGES TO SOME PLANTS.

projected leaf-out date at the end of this century will be April 7, about 20 days earlier than this year's.

While researchers cannot predict the specific impacts of the blueberry's earlier leaf-out on other plants and animals, they can say that there will be consequences. That's because some of the plants and animals whose life cycles have been interwoven for centuries do not respond to warming temperatures in the same way that others do, essentially throwing the ecosystem out of whack.

The Primack Lab has found that on average, insects and plants are responding to warming temperatures similarly (ticks, for example, are emerging earlier to feed on white-footed mice and suburban hikers), and they are staying in sync with each other. Songbirds are not. Many migratory birds, such as the pine warbler and the gray catbird, have been found to have a much weaker response to local temperature changes, instead taking their behavioral cues from the climate in other parts of the country or world, where they winter. This, says Gallinat, could spell trouble for songbirds if they miss the abundance of insects that accompanies the peak of spring leaf-out. Warmer springs also mean earlier flowering times. Gallinat warns that if species like the lowbush blueberry flower early in response to warmer temperatures, but the insects that help pollinate them don't have the same response, the reproductive capacity of the lowbush blueberry could suffer. And so could populations of its pollinators, including honeybees, bumblebees, and other insects.

Earlier leafing out also means a longer photosynthetic growing season, which could change the balance of power among species by giving an advantage to trees and shrubs with strong responses to temperature changes. Primack believes that apple trees and birch trees may thrive, while sugar maple and beech trees may languish. Invasive shrubs, such as non-native barberries and honeysuckle, are likely to be the big winners. ■



◀ If species like the lowbush blueberry flower early in response to warmer temperatures, but the insects that help pollinate them aren't yet thriving, blueberry reproduction will suffer. So could populations of its pollinators, such as honeybees, bumblebees, and other insects.

→ Because songbirds like the pine warbler and gray catbird take their cues from weather in their winter homes, often far from New England, they could arrive in Concord too late to feed on the abundance of bugs that accompanies spring leaf-out.



◀ As spring temperatures grow warmer, trees leaf out earlier. Primack says some species of trees, notably apple and birch, will thrive, but sugar maple and beech, which may not be as competitive, may suffer.