CES Notes – Summer 2017

Of DBH Tapes, Increment Borers, and Wiley Mills -- A closer look at Old Growth in Hopkins Forest

It may come as news to some, but lying amid the eastern reaches of Hopkins Forest, is one of the most significant stands of old-growth forest in our region. Indeed, since the mid-1930s, the 12.5 acre Beinecke Stand has been documented, surveyed and analyzed by the likes of the U.S. Forest Service, renowned old growth guru Bob Leverett, and Professor Henry Art and his students. One feature that makes this tract so special is its relative proximity to civilization; whereas many better known old growth forests occupy remote ridgetops and rock outcrops in far-flung mountainous landscapes, our Beinecke stand sits just over a mile from the Williams campus. A visit to the site soon reveals why it has remained relatively untouched through its 250 plus year history in spite of its proximity: the precipitous terrain and craggy limestone ledges just a few hundred yards above the river rendered this area almost impossible to farm and work in the past, leaving it as a relic of prehistory to study and cherish in our contemporary time.

That's were Nigel Bates '17 comes in. Working with Hank Art -- and student assistants, the "Forest Boys," Peter Lugthart '18 and Jack Page '18 -- this team spent a good part of 2016 measuring trees in the Beinecke Stand and collecting soil, leaves and woody debris to characterize the carbon dynamics within this distinctive ecosystem. As the global climate changes, the subject of carbon sequestration has become paramount in the recent years and this study aimed, in part, to add to that discussion. Previous studies had established that, in general, old-growth forests -- with their aging, hulking and senescencing trees -- would reach a steady state carbon balance; that is, they would respire back as much carbon dioxide to the atmosphere as they fix through photosynthesis. By contrast, scientists have long demonstrated that younger, "aggrading," forests are a net carbon sink, only slowing down their rate of carbon sequestration, or net primary productivity, decades after their establishment. Nigel's goal was to test his assertion, at least in the case of Hopkins Forests' old growth patch.

After a summer and fall diligently plying the stand – and long hours in the lab using gadgets such a Wiley mill to grind down sticks and a muffle furnace burn off the soil carbon, followed by a winter of processing his data -- Nigel came up with some interesting conclusions. The first relates to long term carbon dynamics. Using not only trees, but also soils, litter, herbaceous plants and dead, woody debris to estimate total carbon, Nigel found that, contrary to expectations, there has been an increase in carbon stored in the stand over the last 14 years. While a 2002 survey had documented a reduction in stored carbon that correlated with a the decline in red oak trees, the 2016 survey found that carbon storage had increased dramatically, correlating to an increase in sugar maple (generally considered a late-successional species) dominance in the stand. So, even after 250 years, the Beinecke Stand is still

showing dramatic fluctuations in its carbon balance and not simply succumbing to the “steady state” dynamics that had been thought to typify old growth.

Nigel uncovered another interesting peculiarity with the Hopkins Forest site, this time in the way that it allocates its stored carbon. Unlike three other old growth northern hardwood forests in New England, the Beinecke stand stores much more of its carbon (75%) in living trees compared with 48%, 54% and 66% percent at the other sites. By contrast, our stand has much lower proportions of carbon stored in soil, litter and woody debris than these other, more northerly, sites. Certainly the different latitudes – HMF presumably having warmer temperatures and longer growing seasons -- may contribute to the contrasting patterns in carbon storage among these sites.

Nigel was quick to point out that that his findings are just one more data point in the science of old-growth dynamics and that follow up surveys will be needed to clarify longer term trends. Nonetheless, thanks to this team of Hopkins Forest researchers, we are learning that the dynamics of old-growth forests may be much more complex than we thought, which could give valuable insights into how forests are managed to regulate carbon going forward.

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Photos: Henry Art