Climate change research in partnership with Thoreau

In Professor Richard Primack's Lab at Boston University, we study the effects of climate change on the timing of seasonal biological events and species diversity. By teaming up with Henry David Thoreau and other local naturalists, we investigate how climate change is affecting plants, insects and birds right here in the Boston area.

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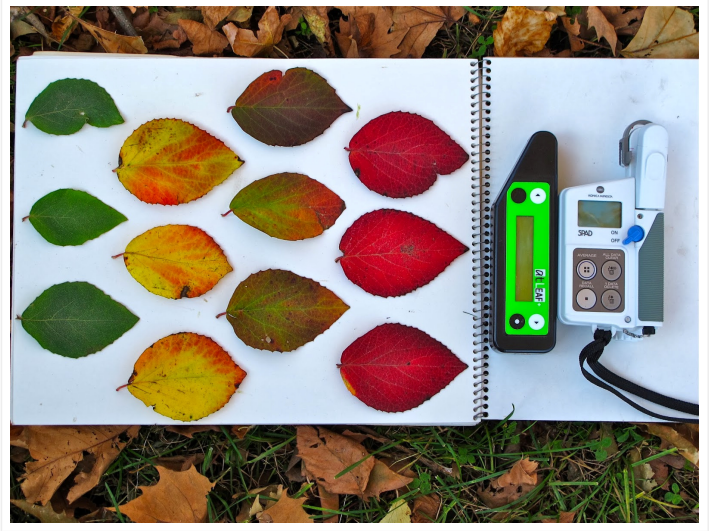
Using handheld chlorophyll meters to monitor leaf senescence

Posted by Amanda Gallinat, Laura Garrison, and Richard Primack

"The Artist is he who detects and applies the law from observation of the works of Genius, whether of man or Nature. The Artisan is he who merely applies the rules which others have detected." -Thoreau

The timing of leaf senescence is of increasing interest to climate change biologists, as leaf senescence marks the end of the growing season and the onset of winter dormancy. Most biologists monitor leaf senescence with somewhat subjective measures of leaf color change and drop. In the Primack Lab, we use a combination of leaf color change and drop to assess the date on which at least 50% of the leaves on an individual are no longer photosynthetically active. Last autumn, we became interested in empirically testing our methods of observation for gauging leaf senescence dates at the Arnold Arboretum.

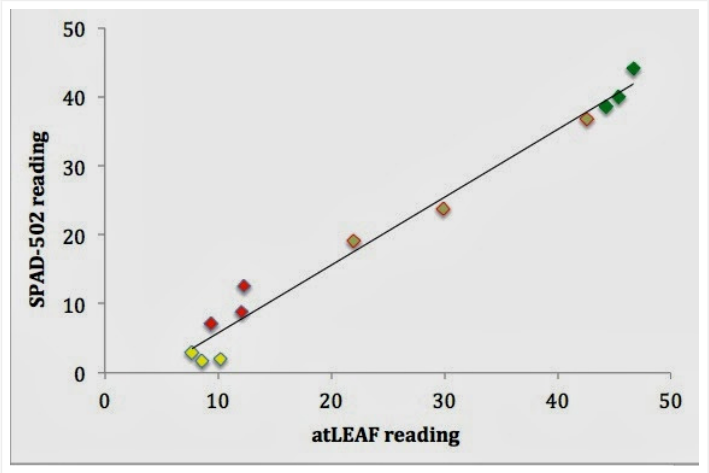


The subjective color categorization of *Viburnum carlesii* leaves, with the atLEAF (left) and SPAD-502 (right).

Predominantly used in agriculture, handheld chlorophyll meters are one way to empirically measure relative chlorophyll content and, by proxy, photosynthetic activity. The most widely used chlorophyll meter on the market,

the Minolta SPAD-502 costs about $2600.00. In constrast, the atLEAF is a relatively new chlorophyll meter which can be purchased for one tenth of the cost. Last autumn, the Primack Lab from Boston University and Laura Garrison from Brown University teamed up to compare the performance of the SPAD-502, the atLEAF, and our own subjective color categorization on leaves at various stages of senescence from the Viburnum and maple collections at the Arnold Arboretum.

We found that the relative chlorophyll readings from the SPAD-502 and atLEAF meters were highly correlated both to one another and to chlorophyll content determined with spectrophotometry. We also found that the relative chlorophyll values from each meter supported our subjective color categorization, with the exception of red leaves which were often difficult to predict.



There is a very strong correlation between atLEAF and SPAD-502 chlorophyll readings for *Viburnum carlesii* leaves. The point colors reflect the color of the leaf measured: green, reddish green, red, and reddish yellow. R^2=0.98.