

# Pics, shoots and leaves: Ecologists turn digital cameras into climate change tools

December 19 2012

---

As digital cameras become better and cheaper, ecologists are turning these ubiquitous consumer devices into scientific tools to study how forests are responding to climate change. And, they say, digital cameras could be a cost-effective way of visually monitoring the spread of tree diseases. The results – which come from 38,000 photographs – are presented at this week's British Ecological Society's Annual Meeting at the University of Birmingham.

Because trees fix carbon dioxide (CO<sub>2</sub>) from the atmosphere and store carbon as biomass and soil [organic matter](#), forests play a vital role in helping regulate climate change. Forests are also affected by climate change, with buds bursting sooner as spring arrives earlier, and ecologists need to understand how this process affects the amount of carbon trees can lock away from the atmosphere.

Studying how forests take up CO<sub>2</sub> during [photosynthesis](#) is a complex and costly business involving a world-wide network called FLUXNET, which monitors the exchange of CO<sub>2</sub> between the atmosphere and forests from more than 500 instrument towers worldwide using a technique known as eddy covariance. Now, Toshie Mizunuma of the University of Edinburgh has developed a way of using the [seasonal changes](#) in forest colour captured in [digital photographs](#) to calculate how much CO<sub>2</sub> [deciduous trees](#) soak up.

"Reliably predicting CO<sub>2</sub> flux isn't easy because it varies a lot due to changes in weather and alterations in forest metabolism caused by pests

and diseases. We also still do not understand what controls the timing of leaves coming out in spring and falling in autumn. So we need a cheaper, simpler way of gathering this long-term data," Mizunuma explains.

To work out how to use digital cameras to capture this data, in 2009 the team working with Mizunuma set up two different camera systems in Alice Holt Forest, Hampshire. A commercial oak forest planted in the 1930s, Alice Holt contains a 90 ha research plot which is part of several long-term studies including the UK Environmental Change Network (ECN) and the European forest health network ICP Forests.

The two cameras were set at different angles: an outdoor webcam with a near-horizontal view and a commercial 'fish-eye' [digital camera](#) looking down at the canopy from the top of a tower. The cameras snapped photos every 30 minutes during daylight for two years – a total of 38,000 pictures, of which the four around midday were analysed.

She then analysed the colour of the forest canopy and compared it to FLUXNET measurements at the site: "The transition of colours from both cameras showed the seasonality of the [forest](#): when budbreak started, the green sharply increased, gradually decreased in summer, and returned to the original level when leaves were shed; the rise of red colour was shown when oak leaves turned yellow in autumn. And the timing of the sharp increase in green coincided with the onset of carbon absorption."

"We estimated the carbon uptake using three fairly simple models, each using information about the level of incoming radiation, which is essential for photosynthesis. The modelled carbon uptake using 'hue', a parameter extracted from the photos, showed the strongest agreement with measured carbon uptake."

According to Mizunuma, the data confirm that digital cameras could be

very useful in monitoring climate change effects in forests: "Our results suggest that digital cameras can be an important aid in monitoring forests and the colour signals can be a useful proxy for photosynthesis. Not only forests, one could install this system or one like it at any long term monitoring site. Long-term ecological observation is now crucial for study in [climate change](#) and biodiversity. Digital cameras provide long-run evident footage with relatively low cost without labour."

**More information:** Toshie Mizunuma will present her full findings on Thursday 20 December 2012 to the British Ecological Society's Annual Meeting at the University of Birmingham.

The paper, Toshie Mizunuma et al (2012) "The relationship between carbon dioxide uptake and canopy colour from two camera systems in a deciduous forest in southern England", [doi: 10.1111/1365-2435.12026](https://doi.org/10.1111/1365-2435.12026) , is published in Functional Ecology on 20 December 2012.

Provided by Wiley

Citation: Pics, shoots and leaves: Ecologists turn digital cameras into climate change tools (2012, December 19) retrieved 24 April 2024 from <https://phys.org/news/2012-12-pics-ecologists-digital-cameras-climate.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.