Explainer

A plain language explainer for decision-makers about research from the Climate Science for Service Partnership (CSSP) Brazil

ForestPlots.net – global collaboration provides new insight on Amazon forests

Tropical forests – Earth's most precious ecosystems – are changing as never before. Meanwhile, careful, long-term measurements are essential to know how, where and why. What if we could unite researchers across the world to understand the ecology of forests, their sensitivity to climate change and how they may help to slow it? ForestPlots.net's mission is to support and connect researchers measuring tropical forests, and to create a shared, scientific picture of their health. This worldwide collaboration is transforming our understanding of tropical forests and their shifting dynamics.

Importance

Ground measurements of tree species, carbon and soils are hard to monitor from space, so fieldwork is essential for validating estimates obtained from satellite images (Chave et al. 2019). Accurate forest measurements are essential to know what species grow where, how much carbon they store and sequester and how this changes over time. ForestPlots.net brings together ground measurements of tropical forests from over 2,500 colleagues across 62 countries. They use standardised protocols and data management procedures. This ensures that measurements from all the teams can be fairly compared, creating a unique global record of forest characteristics.

This huge collaboration has revolutionised our understanding of tropical forests, and how they respond to and affect climate change. The database they have created provides a permanent record and a treasure-trove of information about many of Earth's most precious ecosystems.

Three researchers climb a giant Ceiba tree in Colombia's Chocó region to obtain accurate measurements.

ForestPlots.net supports students in the tropics, fosters collaboration and encourages research led by scientists in the global South, including Brazil.

Approach

Research teams across the world establish forest plots, usually 1 hectare each, and census the trees and other key features of the forest (ForestPlots.net et al. 2021). The plots are remeasured every few years, to observe changes over time and to build a picture of where, how and why forests are changing.

Typical measurements include:

- Biomass
- Soil characteristics
- Plant traits
- Species identification
- Tree-by-tree size, growth and death

The teams comprise many workers who:

- Establish and measure plots tree-by-tree
- Climb trees, sometimes to heights of 20m
- Collect and identify plants and soils
- Manage the data collected
- Administrate, provide IT support, etc.

All workers are trained to follow correct protocols to ensure quality control and good data management. The teams also keep detailed records describing which team member took each measurement - for consistency and to ensure that everyone who took part receives credit for their contribution.

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Produced by VIEWpoint, a CSSP Brazil project from the Institute for Environmental Analytics, highlighting research and improving the uptake of climate services developed in the partnership, through accessible resources.

Results – a variable Amazon

Research from the RAINFOR network and other Amazon experts discovered that similar forests within the Amazon can have very different ecologies – even between forests in similar climates (Quesada et al. 2012; Sullivan, 2020). For example, the rate at which trees die and new trees appear is twice as fast in the south and the west, than in the east or central Amazon, which have poorer quality soils (Phillips et al. 2004). Forests in the north and east often have higher biomass, allowing trees to survive longer and grow denser and taller.

The Amazon carbon sink

The long-term plots curated by ForestPlots.net demonstrate that intact Amazon forests have been a net absorber of carbon for at least 30 years (Brienen et al. 2015), and that most Amazon nations have not been net emitters of carbon (Phillips et al. 2017). Researchers also found that the rate of tree growth and death has increased since the 1950s, likely caused by the increased carbon dioxide released by human activities (Phillips and Gentry, 1994). The rate of increased growth is now slowing (Brienen et al. 2015) and may reach a limit, likely causing some forests to lose carbon as temperatures rise (Hubau et al. 2020, Sullivan et al. 2020). Furthermore, recent droughts, such as those in 2005 and 2010, temporarily reduced the Amazon carbon store, by killing trees and emitting 1.2-1.5billion tonnes of carbon (Phillips et al. 2009).

CSSP Brazil and ForestPlots.net

Sustaining and growing this global initiative requires long-term funding and deep commitment. As one of several partners that make this possible, CSSP Brazil supports new analyses of Amazon biomass and traits controlling the climate sensitivity of its carbon.

How do Amazon forests compare to those in Africa and Borneo?

ForestPlots.net teams in the Amazon, Africa and Borneo also allowed comparisons across the tropics.

Amazon forests store less carbon per area
(Sullivan et al. 2017)

Forests in Borneo grow up to 50% faster
(Banin et al. 2014)

African forests have more biomass per unit area
(Lewis et al. 2013)

While Amazon tree diversity is the highest in the world
(Sullivan et al. 2017)

Next Steps

Not only have the ground measurements from ForestPlots.net been essential for accurate estimates of the carbon stored by tropical forests, but they have revolutionised our understanding of tropical forests and their relationship to climate change. To contribute, find out more, request access to data, or to set up your own forest plot and join the global community, visit www.forestplots.net.

References

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