

FROM THE GROUND UP

As the planet warms plant growth will likely increase—locking up some of that extra carbon dioxide by converting it into vegetative biomass—but that’s not the whole story. In addition to direct effects of rising temperatures and altered rainfall, more carbon will also flow through trees down to and out of their roots, altering the activities of complex soil communities. A robust understanding of the dynamics of soil microbial and animal communities has only recently emerged, and some studies posit that soil communities may release more greenhouse gases to the atmosphere, creating a positive feedback loop that worsens warming.

ABOVE GROUND

Carbon dioxide accumulating in the atmosphere leads to changes in precipitation and temperature patterns, while making average temperatures increasingly warmer **1**. As plants consume carbon dioxide, trees and other vegetation will likely grow at an accelerated rate, converting CO₂ into biomass as they undergo photosynthesis and add leaves, branches, and roots **2**. But plants also respire from their leaves and roots, releasing some carbon back into the atmosphere **3**.

BELOW GROUND

Leaves, branches and other debris fall from trees to the ground, transferring organic carbon to the soil **4**. Roots also release carbon to the soil through rhizodeposits **5**. Carbon is consumed by soil animals and microbes, including bacteria and fungi, which use it as energy and for growth **6**. These soil organisms release nutrients, including carbon and nitrogen, back to the soil, and trees use them for growth **7**. Carbon is also released directly from the soil into the atmosphere in the form of CO₂ as soil organisms respire. The activities of soil microbes also produce other greenhouse gases such as methane and nitrous oxide **8**. Some carbon is locked up by the soil **9**. The breakdown and release of soil carbon is likely to be directly exacerbated by increased temperatures due to climate change.

