

**AMERIFLUX AND THE NORTH AMERICAN CARBON PROGRAM: TERRESTRIAL
IMPACTS AND FEEDBACKS TO THE ATMOSPHERE**

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The AmeriFlux network aims to quantify land exchange of carbon, water and energy with atmosphere, and understand terrestrial impacts and feedbacks to the atmosphere. The network of 93 sites plays a key role in the NACP that integrates long-term micrometeorological/biological measurements with modeling to map and explain terrestrial processes and feedbacks.

Options for managing terrestrial carbon stocks include maintaining existing C stocks in vegetation and soils, reforestation, and reducing C loss associated with management. An NACP carbon budget for Oregon showed that carbon loss due to forest harvest was twice that from wildfire in the worst fire year. The land-based sink was equivalent to 50% of state fossil fuel emissions in an average year compared to U.S. terrestrial sinks of ~30% of fossil emissions. Oregon is a best case scenario, yet has potential to store 3x current carbon stocks in live biomass if harvest rates are significantly decreased and rotations lengthened to hundreds of years.

In montane forests, contrary to expectations, warmer springs result in less annual carbon uptake because early growth and water use exacerbate drought stress in summer.

In boreal forests, carbon uptake by healthy forests is near neutral because of the harsh environment, yet immense areas are sources due to wildfire and insect-caused mortality. Here, it makes sense to avoid emissions from mortality and permafrost thaw, and the cooling feedback due to changes in albedo after wildfire.

The AmeriFlux and NACP approach to quantifying and diagnosing regional carbon balances is an appropriate scale of detail to inform policy and management actions to reduce carbon emissions and at least temporarily increase carbon storage on the land. Long-term observations from AmeriFlux are needed to examine interactive effects of disturbance and nitrogen deposition, and to test coupled carbon-climate models for realistic estimates of impacts and feedbacks to climate.