

Executive Summary: AS SEATTLE EXPANDS: Carbon Stock Changes in Soil and Biomass from House Lot Development

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Although fossil fuel burning has been the primary driver of dramatic increases in atmospheric CO₂ since the industrial revolution, land use changes currently constitute ~20% of global anthropogenic CO₂ emissions (1.6 ±0.8 Pg C yr⁻¹), mostly from deforestation of tropical forests. In contrast, regrowing forests in the northern temperate and boreal zones have provided a carbon sink of roughly 0.6-2.3 Pg C yr⁻¹. As forests are cleared for suburban development, northern forests may begin to emit more carbon, and thus reduce the overall temperate sink. Within this context, I explored the sources of carbon emissions associated with home development in King County, WA, an area with high forest cover but rapid suburban expansion. In the 18 paired house/forest lots in this study, house lots had 83 Mg C ha⁻¹ less soil C, and between 127 and 281 Mg C ha⁻¹ less aboveground biomass C, than adjacent forested sites. While the fate of forest biomass once it is removed from a house lot is variable, combining soil losses with reasonable estimates of C emissions from forest products yields total emissions from housing development of 120-300 Mg C ha⁻¹ over 90 years. Assuming suburban dwellers drive 30% more than their urban counterparts, it would take 54–133 years for the tailpipe CO₂ emissions of one new household to equal the C loss that results from land conversion for that household. Similarly, if all of the forestland that is projected to be converted to built environments in the greater Seattle area in the next 15 years loses similar amounts of C to the sites in this study, the CO₂ emissions from that conversion would equal ~4% of King County's annual emissions.