

CARBON EMISSIONS OF THE 2022 LEILANI WILDFIRE IN WAIKŌLOA,
HAWAI'I

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Abstract

Wildfires are a natural component in complex Earth systems yet changes to local fire regimes can affect the trajectory of carbon emission trends. In 2022, Waikōloa in Hawai‘i island had a large wildfire that occurred from mid-July to mid-August, referred to as the Leilani wildfire. The aim of this study was to estimate the carbon emissions of the wildfire using a bottom-up approach. Sentinel-2 satellite imagery was referenced and estimated the Leilani wildfire to have burned 57.57 km², inclusive of 5 vegetation classes including dry shrubland (76.6 percent), sparse vegetation (16.74 percent), dry forest (4.02 percent), grasslands (2.3 percent), and developed lands (0.28 percent). The resulting emissions are estimated to range from 0.0104 TgC (0.0393 TgCO₂ -eq.) to 0.0107 TgC (0.0449 TgCO₂ -eq) in a “Moderate” to “Very low” moisture scenario, respectively. Compared to Hawai‘i wildfire emissions from 2002 to 2011, the Leilani wildfire comprised 38 percent of annual average TgC emissions and 42 percent of annual average TgCO₂ -eq. This study highlights the importance of continual effort of fire and land management to maintain terrestrial carbon stocks. Further studies should continue monitoring Hawaiian wildfires and build databases of pre-fire biomasses.

Keywords: Wildfire, Carbon, Hawai‘i, Emissions, Vegetation