Projects and ActivitiesThu Mar 28 02:25:23 HST 2024

Name	Impacts of Rising Mean Annual Temperature on Terrestrial Carbon Cycling in Model Forests
Capability Area: Variability/Changes	- Understanding Climate Variability and Change - Research/Development - Training and Capacity Building, Education, Outreach
ECV	- Surface (e.g., temp, precip, wind) - (e.g., surface water, glaciers and ice caps, land cover, biomass)
Timeframe	- Intra-annual to Decadal
Capability Area: Impacts/Adaptations	- Understanding Climate Impacts and Informing Adaptation - Climate Impacts - Research/Development - Climate Adaptation - Training and Capacity Building, Education, Outreach - Policies and Legislation - Assessment and Evaluation
Sectors	- Agriculture and Fisheries - Ecosystems
Status	- Ongoing
Focus Area	- Marine and Terrestrial Ecosystems
Regions	- Central North Pacific - State Of Hawaii - Global

Description	Carbon storage in the terrestrial biosphere exceeds that in the atmosphere by a factor of four, and represents a dynamic balance among carbon input, allocation, and loss. This balance is being altered by climate change, with important implications for terrestrial carbon storage and, hence, atmospheric CO2 levels and global climate. However, the response of terrestrial carbon cycling to warming remains poorly quantified, especially in the tropics. This is particularly important because tropical forests account for a ~40% of global terrestrial carbon storage and ~35% of global terrestrial productivity and, as such, tropical forests play a very important role in regulating global climate. This study is examining how rising mean annual temperature will impact carbon input, allocation, loss, and storage in native Hawaiian wet forests along a 5.2°C mean annual temperature gradient. Results from the research along this model ecological gradient will enhance capacity to predict how terrestrial ecosystems, in particular tropical forests, will respond to warming over the next century.
Objectives/Outcomes	We are estimating carbon input (net photosynthetic carbon gain, or 'gross primary production' (GPP)), carbon loss (soil respiration and aboveground plant respiration), carbon partitioning (fraction of GPP that goes towards production vs. respiration in foliage, aboveground wood, and belowground), and ecosystem carbon storage (live aboveground and belowground biomass, forest floor, coarse woody debris, and mineral soil organic matter to ~1 m depth). This research is being conducted in nine permanent tropical montane wet forest plots that are arrayed across a 5.2°C mean annual temperature gradient (13.0-18.2°C) in the Hawaii Experimental Tropical Forest (State of Hawaii, DLNR) and the Hakalau Forest National Wildlife Refuge (US Fish and Wildlife Service) on the windward slope of Mauna Kea Volcano, Island of Hawaii.
Lead Agencies	Department of Natural Resources and Environmental Management - University of Hawaii at Manoa, Institute of Pacific Islands Forestry - USDA Forest Service
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Partnering Agencies	USFWS, Hawaii DLNR, Department of Global Ecology - Carnegie Institution, Hawaii EPSCoR, Northern Arizona University, University of Hawaii at Hilo, Kupu – Hawaii Youth Conservation Corps, University of Washington, Gary Braasch Environmental Photography
Required Resources	Leverage of Existing Support The establishment of our model temperature gradient, measurement of C input, allocation, loss and storage over the past four years, and purchase and installation of climate stations, taken together, represent a significant investment (>$1,000,000) to support the research described here. All together, funding for this work has totaled ~$1,100,000, and this research has been supported by the National Science Foundation-Ecosystem Science Cluster ($161,800), the National Science Foundation-Experimental Program to Stimulate Competitive Research (EPSCoR REAP; $25,000), the USDA McIntyre-Stennis Program ($132,265), the USDA Hatch Program ($189,680), the USDA Forest Service, Pacific Southwest Research Station ($420,000), the USDA Forest Service, Northern Research Station ($120,000) and Northern Arizona University ($45,000).

Projected Timelines	08/01/2008 - Ongoing
Url	http://www.ctahr.hawaii.edu/littonc/research.html