

Disturbance structures canopy and understory productivity along an environmental gradient

Max Castorani¹, Shannon Harrer², Robert Miller³, and Dan Reed²

¹University of Virginia

²University of California, Santa Barbara

³University of California Santa Barbara

February 9, 2021

Abstract

Disturbances often disproportionately impact different vegetation layers in forests and other vertically-stratified ecosystems, shaping community structure and ecosystem function. However, disturbance-driven changes may be mediated by environmental conditions that affect habitat quality and species interactions. In a decade-long field experiment, we tested how kelp forest net primary productivity (NPP) responds to repeated canopy loss along a gradient in grazing and substrate suitability. We discovered that habitat quality can mediate the effects of intensified disturbance on canopy and understory NPP. Experimental pulse and press disturbances suppressed total macroalgal NPP, but effects were strongest in high-quality habitats that supported dense kelp canopies that were removed by disturbance. Understory macroalgae partly compensated for canopy NPP losses and this effect magnified with increasing habitat quality. Disturbance-driven increases in understory NPP were still rising after 7–10 years of disturbance, demonstrating the value of long-term experimentation for understanding ecosystem responses to rapidly changing disturbance regimes.

Hosted file

Manuscript.pdf available at <https://authorea.com/users/394688/articles/508059-disturbance-structures-canopy-and-understory-productivity-along-an-environmental-gradient>







