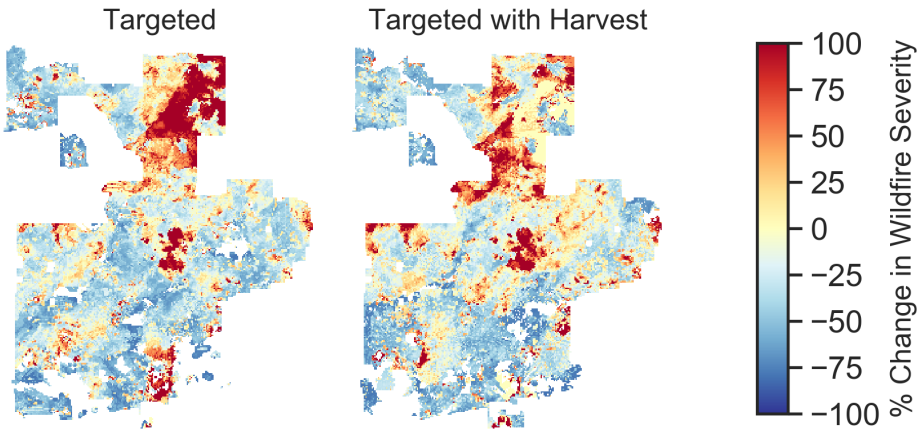
Earth Systems Ecology Lab



Percent change in mean wildfire severity between no-management and treatment scenarios under extreme fire weather conditions.

Targeted Treatments Stabilize Forest Carbon in a Southeastern US Forest Matrix

Extreme weather conditions increase the chance that an ignition becomes a large wildfire. Forest conditions then influence how fire interacts with the forest and the resultant fire effects. In the southeastern US, a matrix of hardwood-cypress swamps and pine flatwoods creates significant spatial heterogeneity, with the swamps only being available to burn during extreme weather conditions and drought. We ran simulations of the Osceola National Forest Collaborative Forest Restoration Project to quantify the effects of treatments (no-management, thinning + burning, thinning + burning + harvest) on fire severity and carbon dynamics under both contemporary and extreme fire weather. Thinning treatments were targeted to buffer the hardwood-cypress swamps.

We found no significant differences in fire severity and consistent carbon stability between the treatment scenarios under contemporary fire weather. However, under extreme weather conditions that were drawn from previous large wildfires, targeted thinning to buffer the swamps and widespread prescribed fire use in the pine flatwoods (targeted scenario) significantly reduced fire severity compared to the no-management scenario (see figure). When we included harvesting 2% of the pine flatwoods per year with the targeted scenario, we found a similar reduction in fire severity (see figure). Under extreme fire weather, the carbon stability, as measured by the range of possible carbon storage, was highest in the targeted scenario and targeted with harvest scenarios. Biomass accumulation across the landscape increased by 6-7.3% over the no-management scenario. This was the result of lower mortality during fires and higher growth rates due to reduced competition in the lower density, fire-maintained pine flatwoods.

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Management Implications

Increasingly severe fire weather poses substantial risk for high-severity wildfire because hardwood-cypress swamps become available to burn.

Managing pine flatwoods to make them less susceptible to stand-replacing fire reduces the impacts of fires that occur under extreme fire weather. Restoring surface fire regimes is an important component of managing high-severity fire risk.

The ability of the system to take-up and store carbon increases when the risk of stand-replacing fire decreases. Carbon stored in a pine flatwoods structure that is maintained by regular burning is more stable than an unmanaged forest condition under extreme fire weather.

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