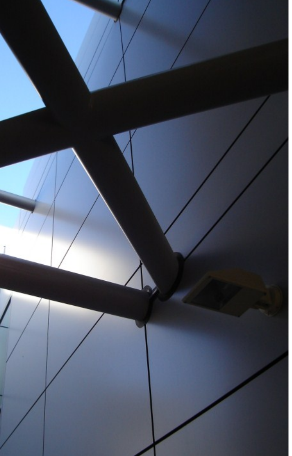

MECHANICAL ENGINEERING

The Department of Mechanical Engineering presents:

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Jesse Sandoval Lozano

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An Investigation of Surface and Crown Fire Dynamics in Shrub Fuels

By

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The focus of this study is on spatially segregated multiple crown fuel matrices that model the crowns of discrete shrubs. The influence of the horizontal crown separation distance between crown fuel matrices on the transition process from surface fires to crown fires and on the rate of spread of surface fires in chaparral fuels is investigated experimentally and numerically. The experiments are carried out in a 1.20 m width × 1.20 m height × 7.4 m length, open-roof wind tunnel to ensure that flame-generated buoyancy effects are not suppressed. The surface fire is initiated in a fuel bed comprised of aspen (*Populus tremuloides Michx*) excelsior that is evenly distributed over an area of 0.8 m width × 2.8 m length to a depth of 0.10 m. Crown fuel matrices comprised of live chamise (*Adenostoma fasciculatum*) held in place by two 0.6 m length × 0.3 m height × 0.8 m width wire mesh baskets, at a height of 0.35 m from the surface of the fuel bed. Crown separation distances (CSD) investigated range from 0.1 m to 0.3 m.

At a CSD of 0.1 m, as the fire front approaches and ignites the downwind crown fuel matrix, the surface fire and upwind crown fires are merged into a single fire. Following ignition of the downwind crown fuel, a single merged fire, comprising the surface and two crown fires, results. At larger crown separation distances of 0.2 m and 0.3 m, the surface and upwind crown fires are segregated, appearing as two distinct fire fronts, with the ignition of the downstream crown fuel matrix occurring earlier in time for the lower CSD case. In addition, a Particle Image Velocimetry system is utilized to investigate the influence of CSD on the flow field between adjacent crown fuel matrices.