MOUnTAIn PIne BeETLeS, MITIGATIoN TREATMENTS AnD FIRE BEHAVIoR IN PONDERoSA PInE FORESTS OF THE BLACK HILLS, SOUTH DAKOTA, USA

C. J. Moran* and M. A. Cochrane
Geographic Information Science Center of Excellence
Department of Biology and Microbiology
South Dakota State University
Brookings, SD 57007
*Corresponding author email: Christopher.Moran@sdstate.edu

ABSTRACT

Ponderosa pine (Pinus ponderosa) forests within the western United States have become more densely populated with trees and characterized by a more continuous fuel complex, primarily due to fire exclusion since European settlement. As a result, intense wildfires and mountain pine beetle (MPB, Dendroctonus ponderosae) infestations are increasing and may be outside the range of historical variability, degrading ecosystem stability and threatening residents’ ways of life. Forest managers at Custer State Park (CSP) have used a variety of silvicultural treatments to reduce this potentially interacting threat of increased wildfire activity and MPB spread, including the use of solar treatments, felling and chunking of MPB-killed ponderosa pines. This study combined field sampling, aerial photography analysis, satellite-derived data, and fire modeling to quantify changes in fuels and potential fire behavior, comparing the treatments’ effect within CSP to the adjacent, untreated Black Elk Wilderness, both of which are currently experiencing a MPB epidemic. Stand level analysis of solar treatments shows possible reductions in passive (individual torching of tree crowns) and active (perpetuation of flames through the canopy) crown fire initiation over time, but surface fire intensity and spread rates are increased. The interaction of treatments on the landscape scale is complex and may promote crown fire initiation at treated and untreated boundaries. Based on this research, land and fire managers will have increased knowledge to aid them in planning additional fuel treatments, coordinating fire suppression efforts, and disseminating quantitative information about the consequences of treatments to the public.