The Ecological and Economic Efficacy of Hillslope Erosion Control Features in Forest Lands after Severe Wildfire[1]

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Abstract: Ecological restoration after natural disturbance, such as large wildfires, may be an exercise of preserving environmental form at the expense of ecosystem function. Fire behavior models consider slope, aspect, elevation, fuels loading, fuels condition, climate, weather, and regional trends when predicting large wildfire behavior and effects. Wildland Urban Interface (WUI) expands as communities spill into forested areas; fire behavior models now include structures and vehicles as fuels inputs in predicting fire spread. Similar modelling inputs may be useful in predicting hillslope erosion due to fire severity and topography. Protection of the built environment "at all costs" during natural disturbance limits the preservation of resiliency within the ecosystem; subsequent ecosystem disturbance response occurs at higher magnitude and frequency. The effect of a century of fire suppression is more frequent and severe wildfires today; erosion and debris flow response to wildfire at the watershed scale may be similarly changing. The California Fires of 2017 saw more fatalities due to flooding and debris flow effects than the actual fires themselves. This presentation summarizes data and experiments from more than fifty years of USDA Forest Service and DOI Bureau of Land Management studies on ecosystem response to wildfire across a variety of spatial and temporal scales and regional characteristics[3]. Post-fire treatments are investigated for meeting targets in budget, ecosystem response, erosion prevention, resource benefit, scaling feasibility and aesthetics. Current Best Management Practices may not recognize appropriate ecological timescales or drivers for ecosystem function; the ecological context of human response to natural disturbance within the built environment may not be appropriately internalized within management plans and emergency response. This summary is provided to promote designing ecological resilience into contingency management plans, especially in areas of the built environment at risk for repeated exposure to disturbance scenarios. Conclusions on response validity are drawn from limited economic data.

Additional Key Words: Wildland urban interface, post-fire erosion, erosion control treatments, water quality, erosion mitigation, debris flow, sediment yield, historical fire regime, resilience, ecological form, ecological function, overland flow, hydrologic modeling, hydrologic regime, succession, values at risk, timescale consideration, natural disaster economics, operational safety and emergency response, best management practice, viewshed preservation.

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