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| Editorial | (iii) | | |
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| Detection of non-linearities in the dependence of burn area on fuel age and climatic variables <i>Frederic Paik Schoenberg, Roger Peng, Zhijun Huang and Philip Rundel</i> | 1–6 | | Evidence from California suggests that the relationships between wildfire burn area and ecological variables are not linear: they appear to have thresholds. Fire risk appears to be nearly constant provided that fuel age and temperature exceed a given threshold, and that fuel moisture and precipitation are sufficiently low. Wildfire risk seems to differ little between conditions that are sufficient for wildfires and those that are extreme. Such an interpretation has obvious implications for the issuance of fire danger and fire hazard warnings. |
| Ponderosa pine mortality following fire in northern Arizona <i>Charles W. McHugh and Thomas E. Kolb</i> | 7–22 | | In three northern Arizona ponderosa pine forests after wildfires and prescribed burn, a logistic regression model using total crown damage by fire (scorch + consumption) and bole char severity as independent variables accurately predicted tree mortality 3 years after fire. Tree mortality after fire decreased as dbh increased on a site with small trees, but the opposite pattern occurred on sites with larger trees. We conclude that tree mortality is strongly influenced by interaction between crown damage and bole char severity, and that differences in resistance to fire among different-sized trees can vary among sites. |
| Fire ecology of Mexican pines and a fire management proposal <i>Dante Arturo Rodríguez-Trejo and Peter Z. Fulé</i> | 23–37 | | Most Mexican pine species appear to be adapted to a predictable, stand-thinning fire regime. Current fire regimes often differ from long-term historical patterns due to a combination of natural and anthropogenic fires. The interaction of fire with other resource uses should be balanced in a holistic ecosystem management approach, while seeking alternative economic options for rural residents. Thoughtful fire planning maximizes ecological and economic benefits from fire and minimizes negative impacts. |
| Assessing canopy fuel stratum characteristics in crown fire prone fuel types of western North America <i>Miguel G. Cruz, Martin E. Alexander and Ronald H. Wakimoto</i> | 39–50 | | Canopy fuel characteristics determine to a certain extent the behavior of crown fires. Linking an extensive forest stand database with foliage weight allometric equations, we determine the distribution of canopy fuel load, canopy bulk density and canopy base height for some fuel types in western North America. Regression models were developed to estimate these quantities from common stand descriptors. |
| Power of the fire—a thermodynamic analysis <i>Ralph M. Nelson, Jr.</i> | 51–65 | | G. M. Byram developed his concepts of power of the fire, P_f , and power of the wind, P_w , using wildfire case studies and thermodynamics. He suggested the P_f/P_w ratio as a possible indicator of erratic wildfire behavior, but his theory for P_f was restricted to the adiabatic rise of warm parcels in a neutrally stable atmosphere. In this paper, Byram's analysis is repeated with the restrictions of adiabatic rise and neutral stability removed. The new P_f is shown to equal about half of Byram's P_f —because of entrainment effects. Atmospheric stability effects become prominent at heights above the fire exceeding 1 km. |

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| <p>Flame characteristics, temperature–time curves, and rate of spread in fires propagating in a bed of <i>Pinus pinaster</i> needles</p> <p>José M. C. Mendes-Lopes, João M. P. Ventura and José M. P. Amaral</p> <p>67–84</p> | <p>An extensive set of experiments was carried out in order to collect data in beds of <i>Pinus pinaster</i> needles to validate surface fire propagation models. The experiments were performed in a dedicated wind tunnel where wind velocity, fuel moisture content and slope were varied. Information on flame geometry (i.e. flame height, flame length and flame angle) and rate of spread was obtained from video recordings. Temperature was measured by six thermocouples at different heights above the fuel bed. The results obtained provide a good database for the assessment of surface fire propagation models.</p> |
| <p>Modeling potential erosion due to the Cerro Grande Fire with a GIS-based implementation of the Revised Universal Soil Loss Equation</p> <p>Jay D. Miller, John W. Nyhan and Stephen R. Yool</p> <p>85–100</p> | <p>A geographic information system (GIS) based implementation of the Revised Universal Soil Loss Equation (RUSLE) was used to model pre- and post-fire soil loss conditions due to the Cerro Grande fire (6–31 May 2000). Spatial data were derived for all RUSLE factors from satellite data, existing databases, and plot-level field data. It is estimated that average post-fire erosion rates with annual average rainfall conditions may increase by more than a factor of 100 in some subwatersheds, depending on the extent and severity of the fire.</p> |
| <p>A review of radiant heat flux models used in bushfire applications</p> <p>A. L. Sullivan, P. F. Ellis and I. K. Knight</p> <p>101–110</p> | <p>Radiant heat flux (RHF) models based on the Stefan-Boltzmann equation of radiative heat transfer require a number of assumptions about the nature of bushfire flame fronts in order to make them practical for wildland fire applications. These assumptions are examined in detail and the common implementation of bushfire flame front as an isothermal rectangular emitting surface with an emissivity of unity (i.e. an ‘opaque box’) is compared with the measurements of RHF emitted by a stationary propane-fuelled artificial bushfire flame front.</p> |
| <p>Wildland firefighter load carriage: effects on transit time and physiological responses during simulated escape to safety zone</p> <p>B. C. Ruby, G. W. Leadbetter III, D. W. Armstrong and S. E. Gaskill</p> <p>111–116</p> | <p>The hypothesis that transit time would be significantly impaired during load carriage was investigated. Data presented demonstrate that load carriage can impair transit time during a simulated escape to safety zone by nearly 25%. These data also demonstrate that transit time is inversely related to aerobic fitness regardless of load carriage and gender and further emphasize the need for rigorous fitness standards for fireline employees.</p> |