**Fire Injury of Conifers and Bark Beetles – Some Useful Literature**

Breece, C.R., T.E. Kolb, B.G. Dickson, J.D. McMillin, and K.M. Clancy. 2008. Prescribed fire effects on bark beetle activity and tree mortality in southwestern ponderosa pine forests. Forest Ecology and Management 255: 119-128.

 <http://www.treesearch.fs.fed.us/pubs/31771>

Bradley, T., and P. Tueller. 2001. Effects of fire on bark beetle presence on Jeffrey pine in the Lake Tahoe Basin. Forest Ecology and Management 142: 205-214.

Butler, B.W., and M.B. Dickinson. 2010. Tree injury and mortality in fires: Developing process-based models. Fire Ecology 6: 55-79.

 <http://www.nrs.fs.fed.us/pubs/35014>

Costello, S.L., J.F. Negrón, and W.R. Jacobi. 2011. Wood-boring insect abundance in fire-injured ponderosa pine. Agricultural and Forest Entomology 13: 373-381.

 <http://www.fs.fed.us/rm/pubs_other/rmrs_2011_costello_s001.pdf>

Covington, W.W., P.Z. Fulé, M.M. Moore, S.C. Hart, T.E. Kolb, J.N. Mast, S.S. Sackett, and M.R. Wagner. 1997. Restoring ecosystem health in ponderosa pine forests in the Southwest. Journal of Forestry 95: 23-29.

 <http://www.treesearch.fs.fed.us/pubs/23289>

Davis, R.S., S. Hood, and B.J. Bentz. 2012. Fire-injured ponderosa pine provides a pulsed resource for bark beetles. Canadian Journal of Forest Research 42: 2022-2036.

 <http://www.usu.edu/beetle/documents/Davis-Hood-%20Bentz2012.pdf>

Fettig, C.J., R.R. Borys, S.R. McKelvey, and C.P. Dabney. 2008. Blacks Mountain Experimental Forest: bark beetle response to differences in forest structure and the application of prescribed fire in interior ponderosa pine. Canadian Journal of Forest Research 38: 924-935. **(fee for article)**

 <http://www.nrcresearchpress.com/doi/abs/10.1139/x07-243>

Fettig, C.J., R. Borys, and C. Dabney. 2010. Effects of fire and fire surrogate treatments on bark beetle-caused mortality in the southern Cascades, California. Forest Science 56: 60-73.

 <http://www.fs.fed.us/psw/publications/fettig/psw_2010_fettig004.pdf>

Fettig, C.J., S.R. McKelvey, D.R. Cluck, S.L. Smith, and W.J. Otrosina. 2010. Effects of prescribed fire and season of burn on direct and indirect levels of tree mortality in ponderosa and Jeffrey pine forests in California, USA. Forest Ecology and Management 260: 207-218.

 <http://www.treesearch.fs.fed.us/pubs/36338>

Filip, G.M., C.L. Schmitt, D.W. Scott, and S.A. Fitzgerald. 2007. Understanding and defining mortality in western conifer forests. Western Journal of Applied Forestry 22: 105-115.

Fowler, J.F., and C.H. Sieg. 2004. Postfire mortality of ponderosa pine and Douglas-fir: A review of methods to predict tree death. Gen. Tech. Rep. RMRS-GTR-132. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 25p.

 <http://www.fs.fed.us/rm/pubs/rmrs_gtr132.html>

Fowler, J.F., C.H. Sieg, and L.L. Wadleigh. 2010. Effectiveness of litter removal to prevent cambial kill-caused mortality in northern Arizona ponderosa pine. Forest Science 56: 166-171.

 <http://www.firescience.gov/projects/04-2-1-112/project/04-2-1-112_effectiveness_of_litter_removal.pdf>

Ganz, D.J., D.L. Dahlsten, and P.J. Shea. 2002. The post-burning response of bark beetles to prescribed burn treatments. p. 143-158, in *Fire, fuel treatments, and ecological restoration*, Omi, P.N., and J.A. Joyce (eds.) U.S. Forest Service Proceedings RMRS-P-29. 475 p.

 <http://www.fs.fed.us/rm/pubs/rmrs_p029.html>

Gutsell, S.L., and E.A. Johnson. 1996. How fire scars are formed: coupling a disturbance process to its ecological effect. Canadian Journal of Forest Research 26: 166-174.

 [http://people.ucalgary.ca/~johnsone/pub/Gutsell&Johnson\_1996.pdf](http://people.ucalgary.ca/~johnsone/pub/Gutsell%26Johnson_1996.pdf)

Hanson, C.T., and M.P. North. 2009. Post-fire survival and flushing in three Sierra Nevada conifers with high initial crown scorch. International Journal of Wildland Fire 18: 857-864. **(fee for article)**

 <http://www.publish.csiro.au/paper/WF08129.htm>

Hare, R.C. 1965. Chemical test for fire damage. Journal of Forestry 63: 939.

Harrington, M.G. 1987. Ponderosa pine mortality from spring, summer, and fall crown scorching. Western Journal of Applied Forestry 2: 14-16.

Harrington, M.G. 1993. Predicting *Pinus* *ponderosa* mortality from dormant season and growing season fire injury. International Journal of Wildland Fire 3: 65-72. (fee for article)

 <http://www.publish.csiro.au/paper/WF9930065.htm>

Hood, S.M. 2008. Delayed tree mortality following fire in western conifers. JFSP Final Report 05-2-1-105. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula, MT. 35 p.

 <http://www.firescience.gov/projects/05-2-1-105/project/05-2-1-105_05-2-1-105_final_report.pdf>

Hood, S., and B. Bentz. 2007. Predicting post-fire Douglas-fir beetle attacks and tree mortality in the northern Rocky Mountains. Canadian Journal of Forest Research 37: 1058-1069. <http://www.treesearch.fs.fed.us/pubs/28675>

Hood, D.M., B. Bentz, K.E. Gibson, K.C. Ryan, and G. Denitto. 2007a. Assessing post-fire Douglas-fir mortality and Douglas-fir beetle attacks in the northern Rocky Mountains. General Technical Report RMRS-GTR-199. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 31 p.

 <http://www.fs.fed.us/rm/pubs/rmrs_gtr199>

Hood, S.M., C.W. McHugh, K.C. Ryan, E. Reinhardt, and S.L. Smith. 2007b. Evaluation of post-fire mortality model for western USA conifers. International Journal of Wildland Fire 16: 679-689. **(fee for article)**

 <http://www.publish.csiro.au/paper/WF06122.htm>

Hood, S.M., D.R. Cluck, S.L. Smith, and K.C. Ryan. 2008. Using bark char codes to predict post-fire cambium mortality. Fire Ecology 4: 57-73.

 <http://treesearch.fs.fed.us/pubs/33786>

Hood, S.M., S.L. Smith, and D.R. Cluck. 2010. Predicting mortality for five California conifers following wildfire. Forest Ecology and Management 260: 750-762.

 <http://www.fs.fed.us/rm/pubs_other/rmrs_2010_hood_s001.pdf>

Jones, J.L., B.W. Webb, B.W. Butler, M.B. Dickinson, D. Jimenez, J. Reardon, and A.S. Bova. 2006. Prediction and measurement of thermally induced cambial tissue necrosis in tree stems. International Journal of Wildland Fire 15: 3-17.

 <http://www.treesearch.fs.fed.us/pubs/14304>

Kelsey, R.G., and G. Joseph. 2003. Ethanol in ponderosa pine as an indicator of physiological injury from fire and its relationship to secondary beetles. Canadian Journal of Forest Research 33: 870-884.

Keyser, T.L., F.W. Smith, L.B. Lentile, and W.D. Shepperd. 2006. Modeling postfire mortality of ponderosa pine following a mixed-severity wildfire in the Black Hills: The role of tree morphology and direct fire effects. Forest Science 52: 530-539.

 <http://www.webpages.uidaho.edu/measurements/pdfs/Keyser%20et%20al%20forest%20science.pdf>

Kobziar, L., J. Moghaddas, and S.L. Stephens. 2006. Tree mortality patterns following prescribed fires in a mixed conifer forest. Canadian Journal of Forest Research 36: 3222-3238.

 <http://www.cnr.berkeley.edu/stephens-lab/Publications/Kobziar%20et%20al.%20FFS%20fire%20mort%20CJFR%2006.pdf>

Kolb, T.E., J.K. Agee, P.Z Fulé, N.G. McDowell, K. Pearson, A. Sala, and R.H. Waring. 2007. Perpetuating old ponderosa pine. Forest Ecology and Management 249: 141-157.

 <http://library.eri.nau.edu/gsdl/collect/erilibra/archives/HASH0123.dir/doc.pdf>

Maloney, P.E., T.F. Smith, C.E. Jensen, J. Innes, D.M. Rizzo, and M.P. North. 2008. Initial tree mortality and insect and pathogen response to fire and thinning restoration treatments in an old-growth mixed-conifer forest of the Sierra Nevada, California. Canadian Journal of Forest Research 38: 3011-3020.

 <http://www.treesearch.fs.fed.us/pubs/33987>

McHugh, C.W., T.E. Kolb, and J.L. Wilson. 2003. Bark beetle attacks on ponderosa pine following fire in northern Arizona. Environmental Entomology 32: 510-522.

 <http://naldc.nal.usda.gov/download/11824/PDF>

Michaletz, S.T., and E.A. Johnson. 2007. How forest fires kill trees: A review of the fundamental biophysical processes. Scandinavian Journal of Forest Research 22: 500-515.

 [http://people.ucalgary.ca/~johnsone/pub/Michaletz&Johnson\_2007.pdf](http://people.ucalgary.ca/~johnsone/pub/Michaletz%26Johnson_2007.pdf)

Michaletz S.T. and E.A. Johnson. 2006. A heat transfer model of crown scorch in forest fires. Canadian Journal of Forest Research 36: 2839-2851. **(fee for article)**

 <http://www.nrcresearchpress.com/toc/cjfr/36/11>

Miller, J.M., and J.E. Peterson. 1927. Preliminary studies on the relation of fire injury to bark-beetle attack in western yellow pine. Journal of Agriculture Research 34: 597-613.

Mutch, L.S., and D.J. Parsons. 1998. Mixed conifer forest mortality and establishment before and after prescribed fire in Sequoia National Park, California. Forest Science 44: 341-355.

 <http://www.fs.fed.us/database/feis/pdfs/Research_Papers/29033_Mutch_1998.pdf>

Perrakis, D.D.B., and J.K. Agee. 2006. Seasonal fire effects on mixed-conifer forest structure and ponderosa pine resin properties. Canadian Journal of Forest Research 36: 238-254.

 <http://www.fs.fed.us/rm/pubs/rmrs_gtr292/2006_perrakis.pdf>

Peterson, D.L. 1984. Predicting fire-caused mortality in four Northern Rocky Mountain conifers. In: Proceedings of the 1983 Convention of the Society of American Foresters, New Forests for Changing World; 1983 October 16-20; Portland, OR. Bethesda, MD: The Society of American Foresters: 276-280.

Peterson, D.L., and M.J. Arbaugh. 1986. Postfire survival in Douglas-fir and lodgepole pine: comparing the effects of crown and bole damage. Canadian Journal of Forest Research 16: 1175-1179. **(fee for article)**

 <http://www.nrcresearchpress.com/doi/abs/10.1139/x86-209?journalCode=cjfr>

Peterson, D.L., and M.J. Arbaugh. 1989. Estimating postfire survival of Douglas-fir in the Cascade Range. Canadian Journal of Forest Research 19: 530-533. **(fee for article)**

 <http://www.nrcresearchpress.com/doi/abs/10.1139/x89-084>

Raymond, C.L., and D.L. Peterson. 2005. Fuel treatments alter the effects of wildfire in a mixed-evergreen forest, Oregon, USA. Canadian Journal of Forest Research 35: 2981-2995.

 <http://www.fs.fed.us/pnw/pubs/journals/pnw_2005_raymond002.pdf>

Regelbrugge, J.C., and S.G. Conard. 1993. Modeling tree mortality following wildfire in *Pinus* *ponderosa* forests in the central Sierra Nevada of California. International Journal of Wildland Fire 3: 139-148.

 <http://www.treesearch.fs.fed.us/pubs/23285>

Ryan, K.C. 1982. Techniques for assessing fire damage to trees. In: Lotan, J.E. (Ed.), Proceedings of the Symposium: Fire, its Field Effects. Jackson, Wyoming. Intermountain Fire Council, Missoula, MT. pp 1-11.

Ryan, K.C., D.L. Peterson, E.D. Reinhardt. 1988. Modeling long-term fire-caused mortality of Douglas-fir. Forest Science 34: 190-199.

 <http://www.fs.fed.us/rm/pubs_other/rmrs_1988_ryan_k001.pdf>

Ryan, K.C., and E.D. Reinhardt. 1988. Predicting post-fire mortality of seven western conifers. Canadian Journal of Forest Research 18: 1291-1297. (fee for article)

 <http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1106&context=barkbeetles&sei-redir=1&referer=http%3A%2F%2Fwww.google.com%2Furl%3Fsa%3Dt%26rct%3Dj%26q%3Dryan%2520and%2520reinhardt%25201988%2520predicting%2520post-fire%2520mortality%26source%3Dweb%26cd%3D1%26sqi%3D2%26ved%3D0CDQQFjAA%26url%3Dhttp%253A%252F%252Fdigitalcommons.usu.edu%252Fcgi%252Fviewcontent.cgi%253Farticle%253D1106%2526context%253Dbarkbeetles%26ei%3DhvdqUeqTNorFyAHLh4GwBw%26usg%3DAFQjCNGElBo9rnZ2_8wMKZFkGu3XEzhaVw%26bvm%3Dbv.45175338%2Cd.aWc#search=%22ryan%20reinhardt%201988%20predicting%20post-fire%20mortality%22>

Ryan, K.C., and W.H. Frandsen. 1991. Basal injury from smoldering fires in mature *Pinus* *ponderosa*. 1991. International Journal of Wildland Fire 1: 107-118. **(fee for article)**

 <http://www.publish.csiro.au/paper/WF9910107.htm>

Ryan, K.C., and G.D. Amman. 1994. Interactions between fire-injured trees and insects in the greater Yellowstone area. In: D.G. Despain, ed. Plants and their environments: proceedings of the first biennial scientific conference on the Greater Yellowstone ecosystem, 16-17 September 1991, Yellowstone National Park, Wyoming. Technical report NPS/NRYELL/NRTR. U.S. Department of the Interior, National Park Service, Natural Resources Publication Office, Denver, CO: 259-271.

 <http://www.usu.edu/beetle/documents/134Ryan-Amman1994.pdf>

Ryan, K.C., and G.D. Amman. 1996. Bark beetle activity and delayed tree mortality in the Greater Yellowstone Area following the 1988 fires. In: The Ecological Implications of Fire in the Greater Yellowstone: Proceedings of the Second Biennial Conference on the Greater Yellowstone Ecosystem. Editor: J. Greenlee. International Association of Wildland Fire. pp 151-158.

 <http://www.fs.fed.us/rm/pubs/rmrs_gtr292/1996_ryan.pdf>

Salman, K.A. 1934. Entomological factors affect salvaging of fire injured trees. Journal of Forestry 32: 1016-1017.

Schwilk, D.W., E.E. Knapp, S.M. Ferrenberg, J.E. Keeley, and A.C. Caprio. 2006. Tree mortality from fire and bark beetles following early and late season prescribed fires in a Sierra Nevada mixed-conifer forest. Forest Ecology and Management 232: 36-45.

 <http://www.treesearch.fs.fed.us/pubs/41753>

Scott, D. W. 2002. Review of the prescribed fire program on Emigrant Creek Ranger District – 2001. Report BMPMSC-02-03. La Grande, OR: U. S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest, Blue Mountains Pest Management Service Center. 40 p.

 <http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_026322.pdf>

Scott, D.W., C.L. Schmitt, and L.H. Spiegel. 2002. Factors affecting survival of fire injured trees: A rating system for determining relative probability of survival of conifers in the Blue and Wallowa Mountains. U.S. Forest Service, Region 6, Blue Mountains Pest Management Service Center, BMPMSC-03-01. 87 p.

 <http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsbdev2_025713.pdf>

Sieg, C.H., J.D. McMillin, J.F. Fowler, K.K. Allen, J.F. Negron, L.L. Wadleigh, J.A. Anhold, and K.E. Gibson. 2006. Best predictors for posfire mortality of ponderosa pine trees in the Intermountain West. Forest Science 52: 718-728.

 <http://www.treesearch.fs.fed.us/pubs/26799>

Six, D.L., and K. Skov. 2009. Response of bark beetles and their natural enemies to fire and fire surrogate treatments in mixed-conifer forests in western Montana. Forest Ecology and Management 258: 761-772.

Smith, S.L., and D.R. Cluck. 2011. Marking guidelines for fire-injured trees in California. U.S. Forest Service, Region 5, Forest Health Protection Report RO-11-01. 15 p.

 <http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5331724.pdf>

Stephens, S.L., and M.A. Finney. 2002. Prescribed fire mortality of Sierra Nevada mixed conifer tree species: effects of crown damage and forest floor combustion. Forest Ecology and Management 162: 261-271.

 <http://nature.berkeley.edu/stephens-lab/Publications/Stephens%20Finney%20mortality%20FEM%2002.pdf>

Swezy, D.M., and J.K. Agee. 1991. Prescribed-fire effects on fine-root and tree mortality in old-growth ponderosa pine. Canadian Journal of Forest Research 21: 626-634. **(fee for article)**

 <http://www.nrcresearchpress.com/doi/pdf/10.1139/x91-086>

Thies, W.G., D.J. Westlind, and M. Loewen. 2005. Season of prescribed burn in ponderosa pine forests in eastern Oregon: impact on pine mortality. International Journal of Wildland Fire 14: 223-231. **(fee for article)**

 <http://www.publish.csiro.au/paper/WF04051.htm>

Thies, W.G., D.J. Westlind, M. Loewen, and G. Brenner. 2006. Prediction of delayed mortality of fire-damaged ponderosa pine following prescribed fires in eastern Oregon, USA. International Journal of Wildland Fire 15: 19-29.

 <http://www.firescience.gov/projects/01B-3-3-16/project/Season_of_Burn_Study_Modeling_Effort.pdf>

Thies, W.G., D.J. Westlind, M. Loewen, and G. Brenner. 2008. A field guide to predict delayed mortality of fire-damaged ponderosa pine:application and validation of the Malheur model. Gen. Tech. Rep. PNW-GTR-769. Portland, OR: U.S. Department of Agriculture, Forest Service, PacificNorthwest Research Station. 16 p.

 <http://www.fs.fed.us/pnw/pubs/pnw_gtr769.pdf>

van Mantgem, P., and M. Schwartz. 2004. An experimental demonstration of stem damage as a predictor of fire-caused mortality for ponderosa pine. Canadian Journal of Forest Research 34: 1343-1347.

 <http://www.des.ucdavis.edu/faculty/mschwartz/Website%20publications/van%20Mantgem%20and%20Schwartz.pdf>

Wagoner, W.W. 1961. Guidelines for estimating the survival of fire-damaged trees in California. Miscellaneous Paper #60. U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station. 11 p.

Wallin, K.F., T.E. Kolb, K.R. Skov, and M.R. Wagner. 2003. Effects of crown scorch on ponderosa pine resistance to bark beetles in northern Arizona. Environmental Entomology 32: 652-661.

<http://www.mpcer.nau.edu/canyon_peaks/Bibliography/WallinEtal.2003.EffectsOfCrownScorchOnPonderosaPineResistanceToBarkBeetles.pdf>

Woolley, T., D.C. Shaw, L.M. Ganio, and S. Fitzgerald. 2012. A review of logistic regression models used to predict post-fire tree mortality of western North American conifers. International Journal of Wildland Fire 21: 1-35.

<http://www.publish.csiro.au/nid/114/paper/WF09039.htm>

Wyant, J.G., P.N. Omi, and R.D. Laven. 1986. Fire induced tree mortality in a Colorado ponderosa pine/Douglas-fir stand. Forest Science 32: 49-59.

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“In a live conifer, only about ten percent of the cells are actually alive: the leaves (three percent) inner bark (phloem and cambium, five percent), and ray cells in sapwood (two percent)”. (J.F. Franklin, H.H. Shugart, and M.E. Harmon 1987. Tree death as an ecological process. Bioscience 37: 550-556.)