Annotated Bibliography

Fuel Treatments and Fire Behavior

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Annotated Bibliography
Fuels and Fire Behavior

This annotated bibliography reviews research on the relationship between fuel loads and fire behavior, primarily in western forests. References which do not provide new information or original research are described only briefly.

This bibliography will be updated as new research materializes. We invite your comments and additions.

Agee, J.K. 1996. The influence of forest structure on fire behavior. In: Proceedings, 17th Annual Forest Vegetation Management Conference, Redding CA. January 16-18, 1996.

Describes fuel structures that affect surface and crown fires. Crown bulk densities were calculated for various ponderosa pine, Douglas-fir, and grand fir stands. Crown fire burns in the 1994 Wenatchee fire were used to test crown bulk density threshholds.

Agee, J.K.; Bahro, B.; Finney, M.A.; Omi, P.N.; Sapsis, D.B.; Skinner, C.N.; van Wagtendonk, J.W.; Weatherspoon, C.P. 2000. The use of shaded fuelbreaks in landscape fire management. For. Ecol. Mgmt., 127: 55-66.

Lists key components that characterize fuelbreaks, evaluates their uses, and discusses alternatives to traditional fuelbreaks.

Anderson, H.E. 1974. Appraising forest fuels: a concept. Res. Note INT-187. Ogden, UT: USDA, Forest Service, Intermountain Forest and Range Exp. Station: 10 p.

Describes fuels and provides definitions for commonly used terms related to fire.

Anderson, H.E.; Brown, J.K. 1988. Fuel characteristics and fire behavior considerations in the wildlands. In: Protecting people and homes from wildfire in the interior west: proceedings of the symposium and workshop. Gen. Tech. Rep. INT-251. Ogden, UT: USDA Forest Service, Intermountain Research Station: 124-130 p.

Explains characteristics of forest fuels, how they are related to flammability, the types of fires most hazardous to wildland homeowners, and methods for reducing fuels.

Anderson, P.J., R.E. Martin, and J.K. Gilless. 1991. Decision analysis in the evaluation of wildfire hazard reduction by prescribed burning in the wildland-urban interface. In Proceedings of the 11th conference on fire and forest meteorology, 291-98. Washington, DC: Society of American Foresters.

Uses decision analysis to determine that a prescribed fire program in Boggs Mountain Demonstration State Forest, near a subdivision, would be cost effective.

Andariese, S.W.; Covington, W.W. 1984. Changes in understory production for three prescribed burns of different ages in ponderosa pine. For. Ecol. Mgmt. 14: 193-192.

Shows that fall prescribed burning on volcanic soils in Arizona ponderosa pine gives variable responses in understory vegetation production after 1-2 years.

Andrews, P.L.; Williams, J.T. 1998. Fire potential evaluation in support of prescribed fire risk assessment. In: Fire in ecosystem management: shifting the paradigm from suppression to prescription. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL: 64-68.

Describes factors for assessing potential fire severity, the risk of escape prescribed fires, and the limitations of current fire behavior prediction systems.

Arno, S.F. and R.D. Ottmar. 1994. Reducing hazard for catastrophic fire. In: Eastside Forest Ecosystem Health Assessment, Vol. IV, Restoration of stressed sites, and processes. Gen. Tech. Rep. PNW-GTR-330, Portland, OR: USDA Forest Service, Pacific Northwest Research Station: 18-19.

Asserts that reducing fuel loads reduces the rate of fire spread and promotes surface fires rather than crown fires.

Bancroft, L.; Nichols, T.; Parsons, D.; Graber, D.; Evison, B.; van Wagtendonk, J. 1985. Evolution of the natural fire management program at Sequoia and Kings Canyon National Parks. In: Proceedings of the symposium and workshop on wilderness fire. Gen. Tech. Rep. INT-182. Ogden, UT: USDA Forest Service, Intermountain Research Station: 174-180.

Describes the country's oldest natural fire management program. The goal of the program is to preserve or restore fire as a natural process where it does not threaten human safety or property.

Barbouletos, C.S.; Morelan, L.Z.; Carroll, F.O. 1998. We will not wait: why prescribed fire must be implemented on the Boise National Forest. In: Pruden, T.L. and L.A. Brennan, eds. Fire in ecosystem management: shifting the paradigm from suppression to prescription. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL: 27-30.

Presents a case for prescribed burning on the Boise National Forest, using data on trends, changes in species composition and historical ranges of variability. Treatments in the Cottonwood and Tiger Creek areas are used to provide evidence that managers can reduce the risk of large crown fires with management.

Bessie, W.C.; Johnson, E.A. 1995. The relative importance of fuels and weather on fire behavior in subalpine forests. Ecology. 76(3): 747-762.

Predicts surface fire intensity and crown fire initiation using 35 years of daily weather data and Rothermel's 1972 and Van Wagner's 1977 fire models. Both surface fire intensity and crown fire initiation are strongly related to the weather components and weakly related to the fuel components, due to much greater variability in weather than fuel.

Biswell, H. H. 1972. Fire ecology in ponderosa pine-grassland. Proceedings in the Tall Timbers Fire Ecology Conference, No. 12. 1972 June 8-9; Lubbock TX. Tall Timbers Research Station: 69-96.

Discusses the fire ecology of ponderosa pine and explains how prescribed burning can be used as a management tool, using examples from California.

Biswell, H.H. 1963. Research in wildland fire ecology in California. In: Proceedings of the second annual tall timbers fire ecology conference. Tallahassee, FL: Tall Timbers Research Station: 63-97.

Describes fire ecology in ponderosa pine and gives two case studies on prescribed burning.

Biswell, H. H.; Kallander, H.R.; Komarek, R.; Vogl, R.J.; Weaver, H. 1973. Ponderosa fire management: a task force evaluation of controlled burning in ponderosa pine forests of central Arizona. Misc. Pub. 2. Tallahassee FL: Tall Timbers Research Station: 49 p.

Argues for control burning in ponderosa pine with case studies, particularly two burns at the Fort Apache and San Carlos Reservations.

Brown, J.K. 1985. The "unnatural fuel buildup" issue. in: Proceedings-symposium and workshop on wilderness fire. Gen. Tech. Rep. INT-182. Ogden, UT: USDA, Forest Service. Intermountain Forest and Range Exp. Station: 127-128.

Describes fuel buildup as a natural process that becomes unnatural when certain kinds and amounts of fuel extend across the landscape. Asserts that mosaics of successional stages offer a more fundamental and reliable basis for determining naturalness than fuel buildup.

Brown, J.K.; Johnston, C.M. 1987. Predicted residues and fire behavior in small-stem lodgepole pine stands. In: Management of small-stem stands of lodgepole pine – workshop proc., Gen. Tech. Rep. INT-237. Ogden, UT: USDA, Forest Service. Intermountain Forest and Range Exp. Station: 151-161.

Describes fuel quantities, potential fire intensity, and expected fire size resulting from various harvest treatments for doghair lodgepole pine. Fireline intensity is predicted using the HAZARD model, which includes slash fuel loading and windspeed. Fire size is predicted through decision analysis, which includes cutting level, method of felling, fuel removal, lopping, and slash age.

Brown, J.K.; Simmerman, D.G. 1986. Appraising fuels and flammability in western aspen: a prescribed fire guide. Gen. Tech. Rep. INT-205. USDA, Forest Service, Intermountain Forest and Range Exp. Station: 48 p.

Explains how to appraise fuels and flammability in aspen forests to choose conditions favorable for a successful burn. Fuel data, windspeeds and fuel moisture contents are put into Rothermel's 1972 fire-spread model to predict fire behavior.

Buckley, A.J. 1992. Fire behavior and fuel reduction burning: Bemm River wildfire, October 1988. Aust. For. 55: 135-147.

Assesses the contributions of previous wildfire and fuel reduction burns, of various ages and coverages, to fire protection within a coastal forest.

Burgan, R.E.; Chase, C.H.; Bradshaw, L.S. 1999. Vegetation greenness and fire danger images. Gen. Tech. Report RMRS-GTR-26-CD. Fort Collins, CO: USDA, Forest Service, Rocky Mountain Forest and Range Exp. Station.

Shows GIF images of four vegetation greenness themes derived from Normalized Difference Vegetation Index (NDVI) data for the years 1989 through 1998 and three fire danger themes for 1996 and 1998.

Busse, M.D.; Simon, S.A.; Riegel, G.M. 2000. Tree-growth and understory responses to low-severity prescribed burning in thinned *Pinus ponderosa* forests of central Oregon. Forest Science 46(2): 258-268.

Evaluates growth of ponderosa pine and associated understory vegetation for a 6 yr period following spring underburning of surface fuels. The low-severity prescribed burning has a relatively minor impact in thinned stands on tree-growth and understory response.

Butler, B.W.; Bartlette, R.A.; Bradshaw, L.S.; Cohen, J.D.; Andrews, P.L.; Putnam, T.; Mangan, R.J. 1998. Fire behavior associated with the 1994 South Canyon fire on Storm King Mountain, Colorado. Res. Pap. RMRS-RP-9. Fort Collins, CO: USDA Forest Service, Rocky Mountain Res. Station: 82 p.

Focuses on factors that contributed to two events: the change in fire behavior from surface fire to a crown fire and the fire behavior that killed 14 firefighters.

Campbell, R.E.; Baker Jr., M.B.; Ffolliot, P.F.; Larson, F.R.; Avery, C.C. 1977. Wildfire effects on a ponderosa pine ecosystems: an Arizona case study. Res. Pap. RM-191. Fort Collins, CO: USDA, Forest Service, Rocky Mountain Forest and Range Experiment Station: 1-12.

Assesses the effects (on vegetation, streamflow, water quality, soil factors and animal life) of a 717 acre wildfire of variable severity in a ponderosa pine forest.

Chang, C.R. 1996. Ecosystem responses to fire and variations in fire regimes. In: Status of the Sierra Nevada: Sierra Nevada Ecosystem Project Final Report to Congress Volume II. Wildland Resources Center Report No. 37. Center for Water and Wildland Resources. University of California, Davis: 1071-1100.

Summarizes the literature on the effects of fire on Sierra Nevada ecosystems.

Cheney, N.P. 1994. The effectiveness of fuel reduction burning for fire management. In: Fire and biodiversity: the effects and effectiveness of fire management. Proceedings of the Conference held Oct. 8-9, 1994, Footscray, Melbourne, Australia.

Discusses general principles related to fire, some specific to Australian forests.

Cissel, J.H.; Swanson, F.J.; Wiesberg, P.J. 1999. Landscape management using historical fire regimes: Blue River, Oregon. Ecol. Appl. 9 (4): 1217-1231.

Uses historical data to describe a theoretical fire management scheme for the Pacific NW.

Cleaves, D.A.; Martinez, J.; Haines, T.K. 2000. Influences on prescribed burning activity and costs in the National Forest System. Gen. Tech. Rep. SRS-37. Asheville, NC: USDA, Forest Service, Southern Research Station. 34 p.

Examines survey results on national forest prescribed burning from 1985 to 1995. Acreage burned and costs for conducting burns are reported for four types of prescribed fire: slash reduction, management-ignited fires; prescribed natural fires, and brush, grass, and rangeland burns. The objectives are to 1) quantify and describe trends in the Forest Service acreage that is burned each year for silvicultural purposes; 2) identify and evaluate physical, managerial, legal, and other barriers to implementing prescribed burning; and 3) compare per-acre costs of different types of prescribed burning in different geographic and administrative regions.

Cohan, D.; Haas, S.; Roussopoulos, P.J. 1983. Decision analysis of silvicultural prescriptions and fuel management practices on an intensively managed commercial forest. For. Sci. 29: 858-870.

Presents case studies that use decision analysis for fuel management practices.

Cohen, J.D. 2000. Preventing disaster – home ignitability in the wildland-urban interface. J. Forestry. March 2000: 15-21.

Demonstrates that home ignitability during wildland fires depends on the characteristics of the home and its immediate surroundings, based on modeling experiments and case studies.

Covington, W.W.; Fule, P.Z.; Moore, M.M.; Hart, S.C.; Kolb, T.E.; Mast, J.N.; Sackett, S.S.; Wagner, M.R. 1997. Restoring ecosystem health in ponderosa pine forests of the Southwest. J. For. 95(4): 23-29.

Evaluates fuel loading, rates of decomposition, nutrient cycling and net primary production from a thinning and thinning plus burning restoration treatment.

Cumming, J.A. 1964. Effectiveness of prescribed burning in reducing wildfire damage during periods of abnormally high fire danger. J. For., August, 1964.

Surveys burned and untreated lands after highly destructive fires in New Jersey in the spring of 1963. Areas prescribed burned within the last 10 years supported 28% less crown fire than the untreated areas. Damage in the untreated areas was markedly more than in previously prescribed-burned areas.

Daniel, T.C. 1988. Social/Political obstacles and opportunities in prescribed fire management. Paper presented at: Effects of fire in management of Southwestern natural resources, Tuscon, AZ, Nov. 14-17, 1988.

Reviews three general "obstacles" to public acceptance of prescribed fire: public misunderstanding of the role of fire in forest ecosystems, the real and perceived risks of prescribed fires and the adverse effects of fire on aesthetic and recreation values.

Davis, L.S.; R.W. Cooper. 1963. How prescribed burning affects wildfire occurrence. J. For., Dec. 1963.

Evaluates the effectiveness of prescribed fires in reducing the number, size, and intensity of wildfires in north Florida and south Georgia. The differences in burn acreage, particularly for the recent and older prescribed burns, are extreme. The number, size, and intensity of wildfires occurring in a 4-yr period increases with time since the last burn.

Deeming, J.E. 1990. Effects of prescribed fire on wildfire occurrence and severity. P 95-104 in Natural and prescribed fire in Pacific Northwest forests. Walstad, J.D. et al. (eds). Oregon State Univ. Press, Corvallis, OR.

Synthesizes the literature on prescribed fire reducing wildfires.

Edminster, C.B.; Olsen, W.K. 1996. Thinning as a tool in restoring and maintaining diverse structure in stands of Southwestern ponderosa pine. In: Conference on Adaptive Ecosystem Restoration and Management: Restoration of Cordilleran Conifer Landscapes

of North America. RM-GTR-278. Fort Collins, CO: USDA, Forest Service, Rocky Mountain Forest and Range Experiment Station: 62-68.

Discusses thinning as a silvicultural tool to modify current stand structure in areas with excessive small trees or lacking large trees.

Erman, D.C.; Jones, R. 1996. Fire frequency analysis of Sierra forests. in Status of the Sierra Nevada: Sierra Nevada Ecosystem Project Final Report to Congress Volume II. Wildland Resources Center Report No. 37. Center for Water and Wildland Resources. University of California, Davis: 1139-1154.

Assesses the pattern and frequency of fire size for seven national forests and Sequoia-Kings Canyon National Parks with frequency analysis, a method used for establishing probabilities of future events from historical data. The notion that fires have become larger and more infrequent is not supported by the data.

Fahnestock, G.R. 1968. Fire hazard from precommercial thinning of ponderosa pine. Res. Note. PNW-57. Portland, OR: USDA, Forest Service, Pacific Northwest Forest and Range Exp. Sta., 16p.

Estimates the amount of slash produced by a thinning operation depending on site, stand age, and stand spacing to rate ponderosa pine thinning slash as a fire hazard.

Fenney, S.R. T.E. Kolb, M.R. Wagner, and W.W. Covington. 1996. Restoration treatments benefit old growth ponderosa pine physiology and insect resistance. Presented at the SAF National Convention, Nov. 9-13, 1996. Albuquerque, NM.

Assesses effects of thinning on tree physiology, such as increasing resin flow.

Ffolliot, P.F.; Warren P.W.; Larson, F.R. 1977. Effects of a prescribed fire in an Arizona ponderosa pine forest. Res. Note RM-336. Fort Collins, CO: USDA, Forest Service, Rocky Mountain Forest and Range Exp. Station: 4 p.

Investigates the effects of a prescribed burn 11 years after the burn. The data describes basal area, forest floor depth, timber density, seedling establishment, and herbage production. The general effect of the fire on the tree stand was a thinning from below.

Ffolliot, P.F.; Guertin, D.P. 1988. Prescribed fire in Arizona ponderosa pine forests: a 24-year case study. In: Effects of fire management of southwestern natural resources. Gen. Tech. Rep. RM-191. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station: 250-254.

Evaluates prescribed fire one month, and 1, 2, 11, and 24 years after the fire. The objective or the fire, to consume 3/4ths of the forest floor depth, was accomplished.

Finney, M.A. 1999. Some effects of fuel treatment patterns on fire growth: a simulation analysis of alternative spatial arrangements. 13 p. http://www.r5.fs.fed.us/hlglg/ProjectFiles/fire/fire1/Fire1.html.

Uses the FARSITE simulation model to simulate fire growth and behavior for artificial and actual landscapes.

Foxx, T.S. 1996. Vegetation succession after the La Mesa fire at Bandelier National Monument. Gen. Tech. Rep. RM-GTR-286. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station: 47-69.

The 1977 La Mesa Fire burned over four areas of known fire history in Bandelier National Monument. Plots in these four areas were examined after the fire four times (1977, 1978, 1985, and 1993) for density and cover of the understory, tree crown damage, and recovery and growth of trees.

Fule, P.Z.; Garcie-Arevalo, A.; Covington, W.W. 2000. Effects of an intense wildfire in a Mexican oak-pine forest. Forest Science 46(1): 52-61.

Looks at oak-pine forest burned by intense wildfire, and a companion unburned area 1 month and 1 yr postfire in La Michilia Biosphere Reserve, Durango, Mexico.

Fule, P.Z.; Garcia-Arevalo, A.; Covington, W.W. 2000. Effects of an intense wildfire in a Mexican oak-pine forest. For. Sci. 46(1): 52-61.

Documents the effects of an intense wildfire in a Mexican oak-pine forest.

Gaines, E.M.; Kallander, H.R.; Wagner, J.A. 1958. Controlled burning in southwestern ponderosa pine: results from the Blue Mountain plots, Fort Apache Indian Reservation. J. For., 58: 323-327.

Sets up plots within burned areas to determine how much fires reduce fuels. A relatively low-intensity, moderate-severity burn in Arizona ponderosa pine reduced surface, ground, and aerial fuels by 57%. Several years later, when the fire killed foliage, branches and trees, the reduction was only 15%.

Gorte, R.W. 1996. Forest fires and forest health. Congressional Research Service, Report for Congress.

Describes fuel management and its potential benefits for controlling wildfires and for reducing fire damages. Discusses the relative roles and responsibilities of the federal and state governments in wildfire protection.

Green, K.; Finney, M.; Campbell, J.; Weinstein, D.; Landrum, V. 1995. FIRE! Using GIS to predict fire behavior. J. For., 93(5): 21-25.

Explains the use of GIS to spatially represent fire behavior under varying assumptions of fuel type, weather condition, and topography. The authors describe a GIS and fire growth model that can be used to integrate ignition risks, land use values, and suppression costs that aid in prescribed natural fire, fire prevention, and suppression.

Hardy, C.C.; Bunnell, D.L. 1999. Coarse-scale spatial data for wildland fire and fuel management [online]. Prescribed fire and fire effects research work unit, Rocky Mountain Research Station (producer). Available: www.fs.fed.us/fire/fuelman.

Maps historic natural fire regimes and current vegetation conditions, and develops an index for use in national-level fire management planning.

Harrington, M.G. 1981. Preliminary burning prescriptions for ponderosa pine fuel reductions in southeastern Arizona. USDA Forest Service Research Note RM-402.

Studies fuel moisture contents to develop mid-summer burning prescriptions.

Harrington, M.G. 1982. Stand, fuel, and potential fire behavior characteristics in an irregular southeastern Arizona ponderosa pine stand. Res. Note RM-418. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Exp. Station. 6 p.

Characterizes differences in stands and fuels between open-structured and dense groups. Total fuel loads were nearly equal in the two groups, with the open groups having greater forest floor weights and the closed groups having more large woody fuels.

Harrington, M.G. 1985. The effects of spring, summer, and fall burning on Gambel oak in a southwestern ponderosa pine stand. For. Sci. 31(1): 156-163.

Suggests prescribed fire reduces the competitive status of oak.

Harrington, M.G. 1996. Prescribed fire applications: restoring ecological structure and process in ponderosa pine forests. In: The Use of Fire in Forest Restoration. Gen. Tech. Rep. INT-GTR-341. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Exp. Station: 41.

Presents typical effects of fire on forest conditions and provides applications for prescribed fire in meeting restoration objectives.

Harrington, M.G.; Sackett, S.S. 1990. Using fire as a management tool in southwestern ponderosa pine. In: Effects of Fire Management of southwestern natural resources. Gen. Tech. Rep. RM-191. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station.: 122-133.

Presents general ideas and prescriptions related to prescribed burning, drawing on existing research and observations. Recommendations include applying fire to reduce fuel hazards, thinning dense sapling thickets, and improving conditions for natural regeneration.

Harrington, M.G.; Sackett, S.S. 1992. Past and present influences on southwestern ponderosa pine old growth. In: Old growth forests in the Southwest and Rocky Mountain regions. GTR RM-213. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station: 44-51.

Discusses management implications of changes in structure, composition, and processes of southwestern ponderosa pine old growth. The authors discuss numerous studies where prescribed fires were used to thin stands.

Helms, J.A. 1979. Positive effects of prescribed burning on wildfire intensities. Fire Mgmt. Notes, 40: 10-13.

Documents two cases in loblolly pine where the fuel reduction from prescribed burning aided wildfire suppression .

Hesseln, H. 2000. The economics of prescribed burning: a research review. Forest Science 46(3):322-334.

Examines key issues of the Federal Wildland Fire Policy from an economic perspective and reviews the economic literature pertaining to prescribed burning.

Hesseln, H.; Rideout, D.B.; Omi, P.N. 1998. Using catastrophe theory to model wildfire behavior and control. Can. J. For. Res. 28: 852-862.

Characterizes a differentiable function that describes the physical relationship between wildfire behavior and controllability. The objectives are to develop a model incorporating environmental factors that predict sudden transitions from controllable to uncontrollable wildfire behavior and *to characterize factors that give rise to uncertainty with respect to wildfire behavior. The authors provide an illustrative example of a cusp catastrophe using simulated fire data.*

Hirsch, S.N. and D.L. Radloff. 1981. A method for making activity-fuel management decisions. Fire Manage. Notes 42(3): 5-9.

Describes a quantitative fuel appraisal process for consistent weighing of fire hazard factors that affect activity-fuel management decisions. The appraisal process evaluates the effect of fuel management alternatives on subsequent fire size and intensity.

Hof, J.; Omi, P.N.; Bevers, M.; Laven, R.D. 2000. A timing-oriented approach to spatial allocation of fire management effort. Forest Science 46(3): 442-451.

Explores spatial optimization approaches to fire management problems by developing a timing-oriented model. A stylized case example demonstrates the model's application and spatial sensitivity with easily interpretable results.

Hollenstein, K.1999. Simulating fuel treatment thinnings and biomass flow from western forests. Oak Ridge National Laboratory. http://bioenergy.ornl.gov/papers/western2/index.html.

Simulates the effect of thinning on a stand or inventory plot using the US Forest Service Forest Vegetation Simulator (FVS). The three objectives of the study are to: 1) examine silvicultural approaches that could be used to perform fuel treatments and evaluate their consequences for the long-term (100 + years) stand structure development; 2) provide a methodological framework for planning and simulating fuel treatments and evaluate their effects; and 3) provide estimates for the long-term flow of biomass and wood products from fuel treatments.

Huff, M.H.; Ottmar, R.D.; Alvarado, E.; Vihnanek, R.E.; Lehmkuhl, J.F.; Hessberg, P.F.; Everett, R.L. 1995. Historical and current forest landscapes in Eastern Oregon and Washington. Part II: Linking vegetation characteristics to potential fire behavior and related smoke production. Gen. Tech. Rep. PNW-GTR-335. Portland, OR: USDA Forest Service PNW Forest and Range Experiment Station.

Compares the potential fire behavior and smoke production of historical and current time periods based on vegetative conditions in forty-nine 5100- to 13,500-hectare watersheds in six river basins. Vegetation composition, structure, and patterns were attributed and mapped from historical and current aerial photographs.

Johnson, E.A.; Wowchuck, D.R. 1993. Wildfires in the Southern Canadian Rocky Mountains and their relationship to mid-tropospheric anomalies. Can. J. For. Res. 23: 1213-1222.

Presents evidence for a large-scale meteorological mechanism controlling the fire frequency in the southern Canadian Rocky Mountains.

Johnson, K.N.; Sessions, J.; Franklin, J.; Gabriel, J. 1998. Integrating wildfire into strategic planning for Sierra Nevada forests. J. For., January 1998: 42-49.

Merges the spatial simulation of forest development on a large landscape, including wildfire occurrence and effects, with the search for management actions that achieve multiple goals. In this analysis, fire behavior can be modified by human intervention through timber harvest, fuel-reduction treatments (including mechanical treatment and prescribed burning), and creation of fuel breaks. The simulated harvest concentrated on reducing shade tolerant trees in the understory and maintaining the presence of large trees across the landscape.

Johnston, M.; Woodward, P. 1985. The effect of fire severity level on post-fire recovery of hazel and raspberry in east-central Alberta. Can J. Bot. 63: 672-677.

Presents the effects of fire on the re-growth of beaked hazel and wild red raspberry in Elk Island National Park, Alberta.

Kalabokidis, K.D.; Omi, P.N. 1998. Reduction of fire hazard through thinning/residue disposal in the urban interface. Int. J. Wildland Fire 8(1): 29-35.

Applies three thinning/slash disposal treatments on two lodgepole pine stands in the wildland-urban interface. The fire model BEHAVE assessed potential fire behavior. BEHAVE results indicate that treatments reduced surface fire behavior parameters and crown fire potential.

Kallander, H.R. 1969. Controlled burning on the Fort Apache Indian Reservation, Arizona. Tall Timbers Fire Ecol. Conf. Proc. 9: 241-249.

Prescribed burning reduces fuel and wildfire size in ponderosa pine forests in east central Arizona. Data supports this hypothesis.

Kilgore, B.M. 1985. The role of fire in wilderness: a state-of-knowledge review. in: Proceedings-national wilderness research conference: issues, state-of-knowledge, future directions. Gen. Tech. Rep. INT-220. Fort Collins, CO: USDS Forest Service: 70-103.

Reviews literature from the United States, Canada, and Australia, summarizing knowledge concerning: fire history, effects of fire, fire behavior, what is "natural," the role of Indian burning, the role of prescribed fires, effects on wildlife, insects and disease, nutrient cycling, and the role of stand replacement fires in wilderness ecosystems.

Kilgore, B.M.; Sando, R.W. 1975. Crown-fire potential in a sequoia forest after prescribed burning. For. Sci. 21: 83-87.

Documents with data that prescribed burning reduces fuel. The Rothermel fire model showed a reduction in crown fire potential.

Klemmedson, J.O. 1976. Effect of thinning and slash burning on nitrogen and carbon in ecosystems of young dense ponderosa pine. For. Sci., 21: 45-53.

Estimates the biomass, nitrogen, and carbon removed in thinning two young dense stands of ponderosa pine in Arizona by sampling loose and piled slash, and pulpwood on 1/3 hectare acres.

Landsberg, J.D., Cochran, P.H., Finck, M.M. and Martin, R.E. 1984. Foliar nitrogen content and tree growth after prescribed fire in ponderosa pine. Res. Note PNW-412. Portland, OR: USDA Forest Service, Pacific Northwest Forest and Range Exp. Station: 15 p.

Shows that prescribed burning in Central Oregon reduced all periodic annual growth increments for trees alive four growing seasons after the burn. Foliar nitrogen concentration was not affected, but total foliar N content was reduced immediately after burning and remained low for the duration of the study.

Lindenmuth Jr., A.W. 1962. Effects on fuels and trees of a large intentional burn in ponderosa pine. J. For., 60: 804-810.

Assesses the feasibility of fire use in forest fuel reduction by intentionally burning approximately 27,000 acres of dense ponderosa pine stands on the Fort Apache Indian Reservation in Arizona. The survey examined the influence of burning on fuels and timber stands. Four categories were used: 1) did not burn, 2) light surface fire, 3) hot surface fire, and 4) crown fire. More crowning and less surface fire occurred in a recently cut unit, probably because of the more open stand and slash created by cutting. Dense stands had a higher percentage of hot surface and crown fires.

Lunan, J.S.; Habeck, J.R. 1973. The effects of fire exclusion on ponderosa pine communities in Glacier National Park. Can. J. For. Res. 3: 574-579.

Show ponderosa pine is not reproducing as well as other conifers and fuel is accumulating in comparison to areas that have burned more recently.

Lundquist, J.E. 1995. Pest interactions and canopy gaps in ponderosa pine stands in the Black Hills, South Dakota, USA. For. Ecol. Mgmt. 74: 37-48.

Examines how interacting diseases, insects, and other disturbance agents alter canopy structure and coarse woody debris composition.

Lundquist, J.E. 1995. Disturbance profile – a measure of small-scale disturbance patterns in ponderosa pine stands. For. Ecol. Mgmt. 74: 49-59.

Compares disturbance profiles in single unharvested, selectively harvested, and thinned stands of ponderosa pine in the Black Hills of South Dakota using spatial statistics.

Lynch, D.L.; Romme, W.H.; Floyd, M.L. 2000. Forest restoration in southwestern ponderosa pine. J. Forestry: Vol. 98 (8).

Describes a field study on the San Juan National Forest focused on restoring degraded ponderosa pine forests to ecological integrity and potential productivity. A secondary focus was to maximize returns from harvesting. Both thinning and prescribed fire were necessary to achieve the ecological objectives.

Mark, C.A.; Bushey, C.L.; Smetanka, W. 1995. Fuel model identification and mapping for fire behavior prediction in the Absaroka-Beartooth Wilderness, Montana and Wyoming. In: Proceedings: Symposium on fire in wilderness and park management. INT-GTR-320. Logan, UT: USDA Forest Service, Intermountain Research Station: 227-229.

Presents a cover-type and mapping methodology. Methodology describes existing conditions to assess risk through fire growth predictions.

Martin, R.E.; Kaufmann, J.B.; Landsberg, J.D. 1989. Use of prescribed fire to reduce wildfire potential. In: Proceedings of the symposium on fire and watershed management. GTR-PSW-109. Albany, CA:USDA Forest Service, Pacific Southwest Research Station: 17-22.

Describes the basic properties of fuels that are important to fire behavior. Assesses the use of prescribed fires to reduce fuels. Argues that prescribed fire reduces the potential for large wildfires and increases our ability to control them.

Martin, R.E.; Landsberg, J.D.; Kaufman, J.B. 1988. Effectiveness of prescribed burning as a fire prevention measure. In: Proceedings, FAO/ECE/ILO/IUFRO Conference on the Use of Prescribed Fire in Fire Prevention. Avignon, France. Mar. 14-18, 1988.

Presents the effects of different prescribed fires on fuel load or biomass in Washington, Oregon, and California.

Martin, R.E.; Sapsis, D.B. 1992. Fire as agents of biodiversity: pyrodiversity promotes biodiversity. In: Proceedings of the Symposium on Biodiversity of Northwestern California, Oct. 28-30, 1991, Santa Rosa, California. Report 29 of the Wildland Resources Center, UC Berkeley.

Discusses the changes in fire regimes due Native American land-use, the problems fire suppression created in removing fires from wildlands, and the resulting reduction in pyrodiversity. Defines pyrodiversity as the variety in fire intervals, seasonality, dimensions, and characteristics. Pyrodiversity produces biological diversity at the micro-site, stand, and landscape level.

Martin, R.E.; Sapsis, D.B. 1994. A synopsis of large or disastrous wildland fires. In: The Biswell Symposium Fire Issues and Solutions in Urban Interface and Wildland Ecosystems. Gen. Tech. Rep. PSW-GTR-158. Albany, CA: USDA Forest Service, Pacific Southwest Research Station: 35-38.

Summarizes the history of large and disastrous fires in the United States and other nations from the prehistoric fire regimes, to the suppression period (1910-1960) to the fire management period (1960 to present).

McKelvey, K.S.; Skinner, C.N.; Chang, C.; Erman, D.C.; Husari, S.J.; Parsons, D.J.; van Wagtendonk, J.W.; Weatherspoon, C.P. 1996. An overview of fire in the Sierra Nevada. In: Status of the Sierra Nevada: Sierra Nevada Ecosystem Project Final Report to Congress Volume II. Wildland Resources Center Report No. 37. Center for Water and Wildland Resources. University of California, Davis: 1033-1040.

Summarizes the work by the fire-subgroup of the SNEP. Discusses historic fire regimes, changes in forest structure due to fire suppression, and recommendations for modifying existing forest structure to minimize severe fires in the future.

McKelvey, K.S.; Busse, K.K. 1996. Twentieth-century fire patterns on forest service lands. in Status of the Sierra Nevada: Sierra Nevada Ecosystem Project Final Report to Congress Volume II. Wildland Resources Center Report No. 37. Center for Water and Wildland Resources. University of California, Davis: 1119-1138.

Analyzes maps of twentieth-century fires on Forest Service lands. Time trends showed no overall trend in acreage, but human-caused fires decreased and lightning fires increased. All extreme fire years occurred during hot, dry years.

Miller, C.; Urban, D.L. 1999. Interactions between forest heterogeneity and surface fire regimes in the southern Sierra Nevada. Can. J. For. Res. 29: 202-212.

Develops a version of a spatially explicit forest gap model for the Sierra Nevada to study the interaction among surface fires, forest dynamics, and climate. The model generates spatially heterogeneous forest conditions and surface fires that respond to this heterogeneity. The model evaluates the influence of surface fire regimes on the spatial pattern of forest structure and composition within forest stands.

Miller, C.; Urban, D.L. 2000. Modeling the effects of fire management alternatives on Sierra Nevada mixed-conifer forests. Ecol. Appl. 10(1): 85-94.

Investigates forest response to changes in the fire regime using a forest gap model developed for forests in the Sierra Nevada, CA. The model integrates climate, fire, and forest dynamics and simulates a spatially heterogeneous fuel bed that is responsive to changes in forest condition. The model is a tool to examine harvesting and prescribed fire.

Moore, E.B.; Smith, G.E.; Little, S. 1955. Wildfire damage reduced on prescribe burned areas in New Jersey. J. For. 53: 339-341.

Surveys a 1,200 acre burn in the South Jersey Pine Region to determine the effect of prescribed burning, using four damage classes.

Morgan, P.; Neuenschwander, L.F.; Swetnam, T.W. 2000. Testimony to the subcommittee on forests and forest health, committee on resources, U.S. House of Representatives.

Articulates the need to cut only small trees and to not apply the same kind of treatment across the landscape. Recommend thinking at the landscape scale.

Mutch, R.W. 1994. Fighting fire with prescribed fire: a return to ecosystem health. J. For., 92(11): 31-33.

Recommends salvage logging before initiating extensive prescribed burning programs because many stands are now excessively dense and contain many dead and dying trees. The management strategy is to reduce fuels and consequently the wildfire hazard. Presents evidence from brush fields in California.

Mutch, R.W.; Arno, S.F.; Brown, J.K.; Carlson, C.E.; Ottmar, R.D.; Peterson, J.L. 1993. Forest health in the Blue Mountains: a management strategy for fire-adapted ecosystems. Gen. Tech. Rep. PNW-310. Portland, OR: USDA Forest Service, Pacific Northwest Forest and Range Exp. Station: 14 p.

Describes forest health in the Blue Mountains and presents a strategy for the management of fire-adapted ecosystems to restore forest health.

Mutch, R.W.; Cook, W.A. 1996. Restoring fire to ecosystems: methods vary with land management. Gen. Tech. Rep. INT-GTR-341. Ogden, UT: USDA, Forest Service, Intermountain Research Station: 9-11.

Reviews prescribed fire accomplishments in the United States and identifies several recommendations for the future use of prescribed fire.

Omi, P.N. 1979. Planning future fuelbreak strategies using mathematical modeling techniques. Envr. Mgmt., 3: 73-80.

Aggregatse major drainage basins within the Angeles National Forest in southern CA into zones of homogeneous wildland fire damage-potential using multivariate statistical techniques. Utilizes mathematical models to examine the policy implications of ongoing and projected fuel management strategies in different National Forest zones.

Omi, P.N. 1988. Prescribed fire monitoring and evaluation activities. In: Effects of fire management of southwestern natural resources. Gen. Tech. Rep. RM-191. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station: 146-151.

Reinforces the importance of monitoring and evaluation activities, reviews a case study of current prescribed fire reporting practices, provides a framework for conducting these activities, and suggests refinements.

Omi, P.N. and K.D. Kalabokidis. 1991. Fire damage on extensively vs. intensively managed forest stands within the North Fork Fire, 1988. Northwest Sci. 65: 149-157.

Compares fuels, fire severity, and fire damage in lodgepole pine stands on national park and national forest lands affected by the Greater Yellowstone fires of 1988. Fire severity and damage were greatest on mature forest sites on national park lands, as opposed to areas with seedling and sapling regeneration in regenerating clearcuts on national forest lands.

Oswald, B.P.; Covington, W.W. 1984. Effect of a prescribed fire on herbage production in southwestern ponderosa pine on sedimentary soils. For. Sci., 30 (1): 22-25.

Measured an area burned by prescription in 1977 and a nearby unburned area in 1974 and 1980 to determine effects of the burn on herbage and forage production.

Parsons, D.J. 1995. Restoring fire to giant sequoia groves: what have we learned in 25 years? Tech eds: Brown, J.K.; Mutch, R.W.; Spoon, C.W.; Wakimoto, R.H. In: Proceedings: Symposium on fire in wilderness and park management. INT-GTR-320. Logan, UT: USDA Forest Service, Intermountain Forest and Range Exp. Station: 256-258.

Discusses the lessons learned from the prescribed burning program (1968-1993) in Kings Canyon National Park.

Paysen, T.E.; Narog, M.G; Cohen, J.D. 1998. The science of prescribed fire: to enable a different kind of control. In: Fire in ecosystem management: shifting the paradigm from suppression to prescription. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL: 31-36

Discusses the need for a paradigm shift from fire suppression to prescription. This requires a shift in emphasis from simply controlling wildfire occurrence and spread to one that includes controlling characteristics of prescribed fire.

Peters, R.L.; Frost, E.; Pace, F. April 1996. Managing for forest ecosystem health: a reassessment of the 'forest health crisis.' Defenders of Wildlife.

Reviews the state of U.S. forests, focusing in the West, using existing scientific literature. Evaluates three techniques used to treat forest health: salvage logging, thinning, and prescribed burning.

Peterson, D.L. 1985. Crown scorch volume and scorch height: estimates of post-fire tree condition. Can. J. For. Res. 15: 596-598.

Compares calculated crown scorch volume based on scorch height and tree dimensions with observed crown scorch volume for four common conifer species of the northern Rocky Mountains. Calculated crown scorch volume is significantly greater than observed crown scorch volume for all species.

Pollet, J.; Omi, P.N. 1999. Effect of thinning and prescribed burning on wildfire severity in ponderosa pine forests. Final Report from Agreement INT-95075-RJVA. Submitted to S.F. Arno, Intermountain Fire Sciences Laboratory.

Tests the effectiveness of fuel treatments in reducing wildfire severity in ponderosa pine forests in four western National Forests. Develops post-facto fire severity and stand structure measurement techniques to conduct field data collection.

Radloff, D.L., and R.F.Yancik. 1983. Decision analysis of prescribed burning. In Proceedings of the 7th conference on fire and forest meteorology, 85-89. Washington, DC: SAF.

Describes two generalized decision models that partially characterize decision processes for the evaluation and execution of prescribed fires.

Randall-Parker, T.; Miller, R. 1999. Effects of prescribed fire in ponderosa pine on key wildlife habitat components: preliminary results and a method for monitoring. Paper presented at the Deadwood Ecology and Management Symposium in Reno, Nevada, Nov 2-4, 1999.

Reports the effects of prescribed fire in ponderosa pine forests on snags, down logs, oaks, and old ponderosa pine trees.

Reinhardt, E.D.; Ryan, K.C. 1998. Analyzing effects of management actions including salvage, fuel treatment, and prescribed fire on fuel dynamics and fire potential. In: Fire in ecosystem management: shifting the paradigm from suppression to prescription. Tall

Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL: 206-209.

Summarizes methods managers use to evaluate fuels and fire potential within forest stands. Using modeling tools, compares alternative management scenarios including thinning from below, prescribed underburning, and no treatment in a case study.

Romme, W.H.; Floyd-Hanna, L.; Hanna, D. 1998. The Westside Pine Project, San Juan National Forest, CO: Post treatment assessment. Final Report. San Juan Ecological Research, Durango, CO 81301.

Presents the results of small-scale experimental restoration treatments in four stands in the San Juan National Forest.

Ronco Jr., F.; Edminster, C.B.; Trujillo, D.P. 1985. Growth of ponderosa pine thinned to different stocking levels in Northern Arizona. Res. Pap. RM-262. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station: 15 p.

Thinned a dense, immature ponderosa pine stand in 1962, 1972, and 1982 to six growing stock levels (30, 60, 80, 100, 120 and 150). Diameter, crown length, and width are negatively correlated with residual stand density. Stand basal area and volume increment are positively related to stand density.

Rothermel, R.C. 1995. Characterizing severe fire behavior. In: Symposium Proceedings: Fire and Wilderness and Park Management. Gen Tech Rep. INT-GTR-320, Ogden, UT: USDA Forest Service, Intermountain Forest and Range Exp. Station: 262-264.

Lists favorable conditions for crown fires and describes wind-drive and plume-dominated fires.

Ryan, K.C.; Noste, N.V. 1985. Evaluating prescribed fires. In: Proceedings of the symposium and workshop on wilderness fire. Gen Tech. Rep. GTR-INT-182. Ogden, UT: USDA Forest Service: 230-238.

Describes a method to classify the ecological severity of a fire. The classification consists of a two-dimensional matrix of flame length classes and depth of char classes.

Ryan, K.C.; Reinhardt, E.D. 1988. Predicting postfire mortality of seven western conifers. Can. J. For. 18: 1291-1297.

Models postfire tree mortality with data from 2356 trees from 43 prescribed fires in Idaho, Montana, Oregon, and Washington.

Sackett, S.S. 1984. Observations on natural regeneration in ponderosa pine following a prescribed fire in Arizona. Res. Note RM-435. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station: 8 p.

Shows that a good seed crop, coupled with a prescribed burn, results in the establishment of many pine seedlings. Favorable germination conditions include a more receptive seedbed, increased nutrient availability, and more favorable soil moisture and temperature conditions.

Sackett, S.S.; Haase, S.M.; Harrington, M.G. 1996. Lessons learned from fire use for restoring southwestern ponderosa pine ecosystems. In: Conference on Adaptive Ecosystem Restoration and Management: Restoration of Cordilleran Conifer Landscapes of North America. Gen. Tech. Rep. RM-GTR-278. Fort Collins, CO: USDA Forest Service,Rocky Mountain Forest and Range Experiment Station: 54-61.

Discusses two sites where prescribed burning improved forest conditions, in particular reducing the amount of forest floor fuels.

Sackett, S.S.; Haase, S.M. 1998. Two case histories for using prescribed fire to restore ponderosa pine ecosystems in northern Arizona. In: Fire in ecosystem management: shifting the paradigm from suppression to prescription. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL: 380-389.

Illustrates with two case histories that using prescribed fire on a frequent basis transforms a dense, stagnated ponderosa pine site into one that now has adequate natural regeneration, manageable fuel levels, increased vertical fuel heights, and substantially higher nutrient levels.

Salazar, L.A., and A. Gonzales-Caban. 1987. Spatial relationships of a wildfire, fuelbreaks, and a recently burned area. West. J. Appl. For. 2: 55-58.

Evaluates the effect of fuelbreaks and recently burned areas on wildfire behavior and growth using the Wheeler fire, which occurred in southern California in chaparral and shrubs.

Sandberg, D.V.; Hardy, C.C.; Ottmar, R.D.; Snell, J.K.S.; Acheson, A.L.; Peterson, J.L.; Seamon, P.; Lahm, P.; Wade, D. 1999. National strategic plan: modeling and data systems for wildland fire and air quality. Gen Tech Rep. PNW-GTR-450. Portland, OR: USDA Forest Service, Pacific Northwest Research Station: 60 p.

Discusses the implementation and development of models and data systems used to manage the air quality impacts of wildland and prescribed fire.

Sapsis, D.; Bahro, B.; Spero, J.; Gabriel, J.; Jones, R.; Greenwood, G. 1996. An assessment of current risks, fuels, and potential fire behavior in the Sierra Nevada. Sierra Nevada Ecosystem Project: Final Report to Congress, vol. III, Assessments and scientific basis for management options. Davis: University of California, Centers for Water and Wildland Resources:

Examines the risk of large fires, extent and pattern of fuel characteristics, and associated extreme fire behavior potential that currently exists for the Sierra Nevada Ecosystem core study area. Uses GIS data to conduct the analysis.

Saveland, J.M. 1987. Using prescribed fire to reduce the risk of large wildfires: a break-even analysis. Fire For. Meteor. Conf. Proc. 9: 119-122.

Evaluates the monetary tradeoffs of investing in a prescribed fire program in natural fuels to reduce the probability of large, costly fires.

Schmidt, W.C.; Wakimoto, R.H. 1988. Cultural practices that can reduce fire hazards to homes in the Interior West. In: Protecting people and homes from wildfire in the interior west: proceedings of the symposium and workshop. Gen. Tech. Rep. INT-251. Fort Collins, CO: USDA Forest Service, Intermountain Research Station: 131-137.

Discusses the most appropriate fuel reduction methods for different vegetation types. Summarizes recommendations from other articles.

Schmoldt, D.L.; Peterson, D.L.; Keane, R.E.; Lenihan, J.M.; McKenzie, D.; Weise, D.R.; Sandberg, D.V. 1999. Assessing the effects of fire disturbance on ecosystems: a scientific agenda for research and management. Gen. Tech Rep. PNW-GTR-455. Portland, OR: USDA Forest Service, Pacific Northwest Research Station; 104 p.

Summarizes the recommendations of fire scientists and resource managers for future fire research and management activities.

Schroeder, M.J.; Buck, C.C. 1970. Fire weather - A guide for application of meteorological information to forest fire control operations. USDA Forest Service, Agriculture Handbook 360: 229 pages.

Discusses the weather elements (temperature, atmospheric moisture, atmospheric stability, general circulation, general winds, convective winds, air masses and fronts, clouds and precipitation, thunderstorms, weather and fuel moisture, and fire climate regions) that affect fire behavior.

Scott, J.H. 1998. Fuel reduction in residential and scenic forests: a comparison of three treatments in a western Montana ponderosa pine stand. Res. Pap. RMRS-RP-5. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station: 19 p.

Evaluates fire behavior in three stands receiving different treatments: 1) minimum impact, basal area (BA) = 100 ft^2/acre, thinned from below; 2) revenue production, BA = 75 ft^2/acre, thinned from above; and 3) forest restoration, BA= 75 ft^2/acre, thinned from below. Uses a model to explore the interaction between post-treatment stand structure and fire behavior. The forest restoration and minimum impact treatments are less prone to initiating crown fires than the untreated stand, because the crown base was raised due to the low thinning. All three treatments reduce the active crown fire potential by reducing crown bulk density.

Scott, J.H.; Wakimoto, R. 2000. Fuel reduction in residential and scenic forests: a comparison of three treatments in a western Montana ponderosa pine stand. http://www.fs.fed.us.rm/ecopartner/scott.htm.

Describes three contrasting thinning treatments (minimum impact, revenue production, and forest restoration) implemented in a 100-year old ponderosa pine/Douglas-fir stand on the Lolo National Forest, western Montana, to reduce fire hazard.

Sessions, J.; Johnson, K.N.; Sapsis, D.; Bahro, B.; Gabriel, J. 1996. Methodology for simulating forest growth, fire effects, timber harvest, and watershed disturbance under different management regimes. Sierra Nevada Ecosystem Project: Final Report to Congress, vol. III, Assessments and scientific basis for management options. Davis: University of California, Centers for Water and Wildland Resources.

Simulates forest structure and composition under different management objectives for the federal forests of the Sierra Nevada emphasizing the interaction of forests, fire, watersheds, and people. Explains the simulation model and compares it to similar efforts.

Smith, D.F., Mrourka, R., Maupin, J. 1983. Underburning to reduce fire hazard and control Ips beetles in green thinning slash. Fire Mgmt. Notes 44: 5-6.

Describes the effectiveness of a prescribed fire in reducing fine fuels, duff, and trees. Monitors beetle infestation levels after the fire.

Smith, T.M. and D.L. Urban. 1988. Scale and resolution of forest structural pattern. Vegetatio 74: 143-150.

Uses a forest simulation model to explore the effects of observational scale on perceived patterns in forest structure.

Stephens, S.C. 1998. Evaluation of the effects of silvicultural and fuels treatments on potential fire behavior in Sierra Nevada mixed-conifer forests. For. Ecol. Mgmt. 105(1): 21-35.

Models fire behavior in a mixed-conifer forest and investigates how silvicultural and fuels treatments affect potential fire behavior. Uses the computer program FARSITE to spatially and temporally model fire growth and behavior. Concludes that combinations of prescribed fire and mechanical treatments can be used to reduce wildfire hazards.

Strauss, D.; Bednar, L.; Mees, R. 1989. Do one percent of forest fires cause ninety-nine percent of the damage? For. Sci. 35(2): 319-328.

Finds the theoretical form of the plot for several commonly used distributions and shows how the results can be used in the analysis of empirical plots from actual fire size distributions. The proportion of forested area burned by 1% of the largest fires range from 80%-96%.

Sweaney, J.N. 1985. Old burns limit size of fires. In: Proceedings-symposium and workshop on wilderness fire. Gen. Tech. Report INT-182. Logan, UT: USDA Forest Service. Intermountain Forest and Range Experiment Station: 389.

Observes three wildfires during the intense 1979 and 1981 fire seasons, in spruce-fir or lodgepole pine forests in Yellowstone National Park, retarded or stopped by old burns.

Swezy, M.D.; Agee, J.K. 1991. Prescribed-fire effects on fine-root and tree mortality in old-growth ponderosa pine. Can. J. For. Res., 21(5): 626-634.

Surveys old-growth ponderosa pine/Douglas fir stands at Crater Lake National Park to investigate potential accelerated mortality of large pines due to prescribed burning.

Taylor, R. 1996. Mt. Trumbull ecosystem restoration project. In: Conference on Adaptive Ecosystem Restoration and Management: Restoration of Cordilleran Conifer Landscapes of North America. RM-GTR-278. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station: 75-79.

Describes a pilot project in ponderosa pine and a "learn by doing" operational-scale adaptive ecosystem restoration experiment.

Tiedemann, A.R.; Klemmedson, J.O.; Bull, E.L 2000. Solution of forest health problems with prescribed fire: are forest productivity and wildlife at risk? For. Ecol. Mgmt. 127: 1-18

Argues for the conservative use of prescribed fire. The range of the effects of fire on resources and values, specifically forest productivity and wildlife, are not yet known.

Truesdell, P.S. 1969. Postulates of the prescribed burning program of the Bureau of Indian Affairs. Proc. Annu. Tall Timbers Fire Ecol. Conf. No. 9. p. 235-240.

Discusses the use of prescribed burning on BIA lands and the objectives of BIA land managers.

Turner, M.R.; Romme, W. 1994. Landscape dynamics in crown fire ecosystems. Landscape Ecology. 9(1): 59-77.

Addresses the implications of landscape heterogeneity for crown fire behavior and the ecological effects of crown fires over large areas. Focuses on the importance of incorporating landscape pattern into models of fire behavior. Reviews case studies demonstrating that, except under extreme burning conditions, fires are likely to respond to variations in fuel availability and moisture conditions across the landscape.

USDA Forest Service. 1995. Initial review of silvicultural treatments and fire effects on Tyee fire. Appendix A, Environmental Assessment for the Bear-Potato Analysis Area of the Tyee Fire, Chelan and Entiat Ranger Districts, Wenatchee National Forest, Wenatchee, WA.

Reviews past silvicultural treatments to see if they had any noticeable results on the fire effects caused by the Tyee Fire. Results suggest that fuels treatment in harvested areas reduced fire effects. It is not clear if treatments influenced fire behavior.

USDA Forest Service. 2000. An agency strategy for fire management – A report from the National Management Review Team.

Examines past reviews, policies, and direction of the fire management program. Develops recommendations to address issues concerning large incident management.

USDA Forest Service. 2000. Protecting people and sustaining resources in fire-adapted ecosystems – A cohesive strategy. The Forest Service management response to the GAO Report GAO/RCED-99-65, April 13, 2000.

Presents the initial strategy of the U.S. Forest Service to address fire risk on national forest lands.

US General Accounting Office. 1999. Western National Forests – A cohesive strategy is needed to address catastrophic wildfire threats. GAO/RCED-99-65. April 1999.

Cites outside experts and several analyses of conditions on national forests of the interior West by agency. Analyses report: increased levels of disease and insect infestations; changes in the composition of tree and other forest plant species (including invasion by nonnative plants); increases in the density of tree stands and undergrowth; and increases in the number of small trees. The Forest Service estimates 39 million acres of tree stands on national forests of the interior West are at high risk of catastrophic fire.

University of California, Sierra Nevada Ecosystem Project Science Team & Special Consultants. 1996. Fire and Fuels. In: Volume 1, Sierra Nevada Ecosystem Project, Final Report to Congress.

Provides an overview of fire in the Sierra Nevada's. Identifies three fire-related problems: 1) too much high-severity fire and the potential for more; 2) too little low- to moderate-severity fire, with associated ecological change; and 3) homes and structures in areas at high risk for fires.

Van Wagner, C.E. 1973. Height of crown scorch in forest fires. Can. J. For. Res. 3: 373-378.

Derives a relationship between fire behavior and crown scorch height from measurements on 13 experimental outdoor fires. Results support that scorch height varies with the 2/3 power of fire-line intensity.

van Wagtendonk, J.W. 1985. Fire suppression effects on fuels and succession in short-fire-interval wilderness ecosystems. In: Proceedings-symposium and workshop on wilderness fire. Gen. Tech. Rep. INT-182. Logan, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station: 119-126.

Develops a computer simulation model of short-fire-interval wilderness ecosystems that combines vegetation, fuel, weather, and lightning to simulate fires that then interact with vegetation and fuel. The model predicts the effects of no-fire, lightning-fire, and suppression scenarios on fuel energy, basal area, and density by species.

van Wagtendonk, J.W. 1996. Use of a deterministic fire growth model to test fuel treatments. In: Status of the Sierra Nevada: Sierra Nevada Ecosystem Project Final Report to Congress Volume II. Wildland Resources Center Report No. 37. Center for Water and Wildland Resources. University of California, Davis: 1155-1166.

Describes the use fire simulation models to obtain information about the relative effectiveness of fuel treatments, including fuel breaks, prescribed burning, biomassing, piling and burning, and cutting and scattering.

van Wagtendonk, J.W.; Botti, S.J. 1984. Modeling behavior of prescribed fires in Yosemite National Park. J. For., 82(8): 479-484.

Tests the National Fire Danger Rating System and the Fire Behavior Prediction System on prescribed fires burning underneath canopies in six fuel types in Yosemite National Park.

Vihanek, R.E. and R.D. Ottmar. 1993. When logged units burn in a wildfire, does slash treatment mitigate effects?: In: 12th Conference on Fire and Forest Meteorology , October 26-28, 1993, Jekyll Island, Georgia. Pp. 709-714.

Reconstructs post-logging fuelbed conditions; determines biomass consumption during treatment and wildfire; estimates smoke emissions produced; and demonstrates differences in soil fire severity and smoke production on untreated and treated logging slash areas of the Shady Beach wildfire in Oregon.

Wagle, R.F.; Eakle, T.W. 1979. A controlled burn reduces the impact of subsequent wildfire in a ponderosa pine vegetation type. For. Sci., 25(1): 123-129.

A controlled burn one year prior to the advent of wildfire effectively reduces the impact of a subsequent wildfire on a ponderosa pine forest overstory, the surface vegetation, and the organic layers of the soil characteristics.

Wakimoto, R.H., R.D. Pfister, and K.D. Kalabokidis. 1988. Evaluation of alternative fire hazard reduction techniques in high-hazard, high-value, and high-use forests. In Proceeding – Future forests of the mountain west: a stand culture symposium. Gen. Tech. Rep. INT-243. Portland, OR: USDA Forest Service, Pacific Northwest Research Station: 401-402.

Determines the relative cost and effectiveness of alternative slash disposal treatments aimed at reducing fire ignition, rate of spread, damage, and resistance to control. Tests six treatments.

Weatherspoon, C.P. 1996. Fire-silviculture relationships in Sierra forests. In: Status of the Sierra Nevada: Sierra Nevada Ecosystem Project Final Report to Congress Volume II. Wildland Resources Center Report No. 37. Center for Water and Wildland Resources. University of California, Davis: 1167-1176.

Shows the relationship between silviculture and fire management for a range of stand structures and fire regimes. Discusses effects of partial cuttings on fire hazard.

Weatherspoon, C.P.; Skinner, C.N. 1995. An assessment of factors associated with damage to tree crowns from the 1987 wildfires in Northern California. For. Sci., 41(3): 430-451.

Examines relationships between the degree of damage caused by the 1987 fires in northern California and prior management. Uses Postfire aerial photography to assess scorch and consumption of tree crowns. Obtained other data from existing records. Assesses three treatments: uncut/treated, partial-cut/treated, and partial-cut/untreated. Uncut stands suffered the least fire damage and partial-cut stands with no slash treatment had the most damage.

Weatherspoon, C.P.; Skinner, C.N. 1996. Landscape-level strategies for forest fuel management. In: Status of the Sierra Nevada: Sierra Nevada Ecosystem Project Final Report to Congress Volume II. Wildland Resources Center Report No. 37. Center for Water and Wildland Resources. University of California, Davis: 1471-1492.

Addresses landscape-level strategies to reduce severe fires in Sierra Nevada forests and restore low- to moderate-severity fires. Reviews past approaches to managing fuels.

Weatherspoon, C.P.; Skinner, C.N. 2000. An ecological comparison of fire and fire surrogates for reducing wildfire hazard and improving forest health. Background paper to the Fire and Fire Surrogates study. http://ffs.psw.fs.fed.us/discussion.html.

Describes the need for restorative management and outlines a study to investigate the ecological consequences and tradeoffs of silvicultural cuttings, mechanical fuel treatments and prescribed fire.

Weaver, H. 1955. Fire as an enemy, friend, and tool in forest management. J. For., 53: 499-504.

Presents an overview of the role of fire in forest management.

Weaver, H. 1957. Effects of prescribed burning in ponderosa pine. J. For., 55: 133-138.

Shows that prescribed burning applied in conjunction with spot burning and slash burning significantly reduces wildfire damage.

Weaver, H. 1957. Effects of prescribed burning in second growth ponderosa pine. J. For., 55: 823-826.

Describes prescribed burning and stand improvement treatments used to reduce fire hazard in second growth ponderosa pine stands in southern Oregon.

Weaver, H. 1967. Fire and its relationship to ponderosa pine. In: Proceedings of the Tall Timbers Fire Ecology Conference. Tall Timbers Research Station, Tallahassee, FL: 7: 127-149.

Summarizes results of prescribed burning on the Colville and Fort Apache Indian Reservations in terms of Daubenmire's habitat types or associations.

Webb, D.R.; Henderson, R.L. 1985. Gila Wilderness prescribed fire program. In: Proceedings-symposium and workshop on wilderness fire. Gen. Tech. Report INT-182. Ogden, UT: USDA Forest Service, Intermountain Research Station: 413-414.

Documents the natural ignition prescribed fire program in the Gila National Forest. From 1975 to 1985 112 fires were allowed to burn across 11,093 acres.

Weir, J.M.H.; Chapman, J.K.; Johnson, E.A. 1995. Wildland fire management and the fire regime in the southern Canadian Rockies. In: Proceedings: symposium on fire in wilderness and park management. Gen. Tech. Rep. INT-GTR-320. Ogden, UT: USDA Forest Service, Intermountain Research Station: 275-280.

Addresses prescribed burning practices within the subalpine forests of the southern Canadian Rockies. An analysis of fire frequency suggests that stand age does not significantly alter the probability of a stand burning, as has been suggested in other literature.

Weise, D.R.; Hartford, R.A.; Mahaffey, L. 1998. Assessing live fuel moisture for fire management applications. In: Fire in ecosystem management: shifting the paradigm from suppression to prescription. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL: 49-56.

Examines live fuel moisture for shrubs and trees in southern California, Arizona, and Colorado. Estimated sample sizes vary considerably.

Wienk, C.; Sieg, C.H.; McPherson, G. The role of prescribed burning, overstory reduction, and soil seed banks in restoring ponderosa pine stands in the Black Hills, SD. Abstract.

Assesses the effect of prescribed burning and overstory reduction on understory vegetation and seed banks.

Wilson, J.S.; Baker, P.J. 1998. Mitigating fire risk to late-successional forest reserves on the east slope of the Washington Cascade Range, USA. Forest Ecol. & Mgmt.110 (1-3):59-75.

Simulates, over five decades, seven landscape-scale silvicultural regimes ranging from no treatment to intensive thinning with prescribed burning. A growth model projects future stand conditions and mimic silvicultural manipulations. A fire-risk model evaluates projected stand conditions.

Wilson, C.C.; Dell, J.D. 1971. The fuels buildup in American forests: a plan of action. J. For., 69: 471-475.

Describes the problem of fuel buildup, evaluates what can be done about it with our present knowledge, and outlines high-priority research topics.

Wood, D.B. 1982. Fuel management's potential for reducing frequency of large fires in the northern Rockies. J. For., 80: 96: 105-107.

Examines the influence of fuel hazards on the frequency and severity of large fires in the northern Rocky Mountains using national forest fire records.

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