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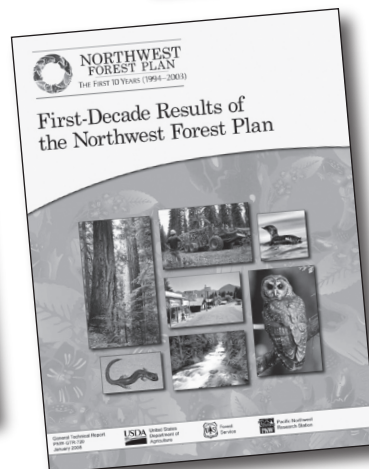
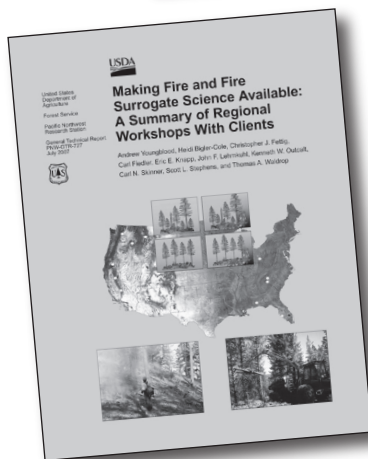
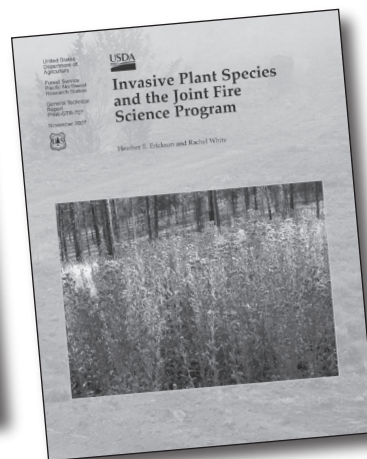
Forest Service

Pacific Northwest
Research Station



Recent Publications of the Pacific Northwest Research Station

First and Second Quarters, 2008



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Treesearch is an online system for locating and delivering publications by Research and Development scientists in the USDA Forest Service. Publications in the collection include research monographs published by the agency as well as papers written by our scientists but published by other organizations in their journals, conference proceedings, or books. Research results behind these publications have been peer-reviewed to ensure the best quality of science.

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The screenshot shows the Treesearch website interface. At the top, it says "USDA FOREST SERVICE" and "Forest Service National Links". The main heading is "Research & Development Treesearch". On the left, there is a navigation menu with options like "Treesearch Home", "About Treesearch", "Contact Us", "Research & Development", and "Help". Below the menu, it lists various research stations: Forest Products Lab, International Institute of Tropical Forestry, Northern, Pacific Northwest, Pacific Southwest, Rocky Mountain, and Southern. The main content area features a search box with the placeholder "(enter query)" and a "Search" button. Below the search box, there are sections for "USDA FS Research Publications" and "Search for on-line publications". The "Search for on-line publications" section includes input fields for "Keywords:", "Author:", and "Title:", along with a date filter for "Filter by date Starting: 1998 Through: 2008". To the right, there is a "Search for Station Series Publications" section with dropdown menus for "Any" and "Any". Below the search section, there is a "20 Most Recently Added Publications By Station" section with a list of stations and their publication counts. At the bottom, there are links for "Disclaimers", "FOIA", "Privacy Policy", "Quality of Information", and "Print This Page".

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Bibliographies

07-497

- ▶ Pacific Northwest Research Station, 2007.
Recent publications of the Pacific Northwest Research Station, fourth quarter, 2007. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 14 p.
<http://www.fs.fed.us/pnw/pubs/4q07.pdf>

Biometrics

07-025

- ▶ Flewelling, J.W.; Marshall, D.D. 2008.
Calibration and modification for the Pacific Northwest of the New Zealand Douglas-fir silvicultural growth model. Gen. Tech. Rep. PNW-GTR-754. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 42 p.

This paper describes a growth model for young plantations of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) growing in the Pacific Northwest. The overall model has three major components. The first is a yield model for diameter and height distributions describing stands prior to pruning or precommercial thinning. The second component is an annual per-acre net increment model adapted from a recent model for Douglas-fir plantations in New Zealand; thinning and pruning are features of

the model. The third component is growth equations for cohorts of individual trees; the results from this component are adjusted to match those from the second component. Fitting data are from Stand Management Cooperative experiments, with top heights generally below 75 ft. An intended use of the model is the evaluation of pruning regimes, in conjunction with the ORGANON model for growth at older ages, and TREEVAL model for clear-wood recovery and economic evaluation.

Keywords: Growth and yield, diameter distribution, pruning, thinning, *Pseudotsuga menziesii*.

<http://www.treesearch.fs.fed.us/pubs/30415>

Economics

07-355

- ▶ Daniels, J.M. 2008.
United States trade in wood products, 1978–2005. Gen. Tech. Rep. PNW-GTR-738. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 124 p.

Tables summarize volume and values of United States trade in wood products from 1978 to 2005. Import and export data are shown for 21 commodities aggregated from over 1,700 wood products. Data were obtained from an earlier report by Chmelik and others and the U.S. Department of Commerce, Bureau of the Census. Trade in each commodity is delineated by trading partner and shipments

through each of four regional aggregations of U.S. customs districts. Data show that the United States is a net importer of wood products and Canada is the dominant supplier.

Keywords: Wood products, imports, exports, customs districts, trading partners, wood products trade, wood products trade statistics.

<http://www.treesearch.fs.fed.us/pubs/30184>

08-034

► Haynes, R.W. 2008.

Emergent lessons from a century of experience with Pacific Northwest timber markets. Gen. Tech. Rep. PNW-GTR-747. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 45 p.

Timber markets in the United States are areas where timber prices tend to be uniform because of the continuous interactions of buyers and sellers. These markets are highly competitive, volatile, and change relentlessly. This paper looks at how market interactions in the Pacific Northwest have responded to changes in underlying determinants of market behavior and government actions that have influenced supply or demand. Several messages emerge from timber markets about price reporting and changing definitions of price, long-term price trends, timber as an investment, impacts of market intervention, relations among different markets, and implications for future stewardship. The enduring message is that landowners and managers respond to price signals arising from market interactions, and their actions create the forests inherited by future generations.

Keywords: Timber markets, stumpage prices.

<http://www.treesearch.fs.fed.us/pubs/29851>

08-066

► Kling, D. 2008.

Stumpage prices and volumes sold for individual Western national forests: 1984–2007. Res. Note PNW-RN-558. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 57 p.

Sold prices for national forest stumpage provide geographically specific price references for timber. This report presents “sold” price series for western national forests from 1984 through the first 3 months of 2007. Selected trends in stumpage prices and sold volumes as well as issues related to species aggregation in the data are also discussed.

Keywords: Stumpage prices, national forests, intermountain, northern, Pacific Southwest, Pacific Northwest.

<http://www.treesearch.fs.fed.us/pubs/30183>

08-055

► McLain, R.J.; Alexander, S.J.; Jones, E.T. 2008.

Incorporating understanding of informal economic activity in natural resource and economic development policy. Gen. Tech. Rep. PNW-GTR-755. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 53 p.

This report synthesizes the literature on the role of informal economic activity in the United States postindustrial economy. Informal economic activity is expanding in the United States and is likely to continue in the foreseeable future. The formal and informal economic sectors are inextricably intertwined, with individuals and households combining elements of both sectors to construct their livelihoods. Although the informal economy is often thought of as the domain of economically marginal individuals and households, virtually everyone participates in the informal economy to some extent. However, the literature highlights how factors such as social status and household position in the formal economy affect whether participation in informal economic activity is exploitative or empowering. The nontimber forest products sector serves as a case study of why it is important to consider

informal economic activity when developing natural resource and economic development policy. We recommend steps policymakers can take to identify and encourage positive aspects of the informal economic activity. We also highlight several areas of research to improve understandings of the role of informal economic activity in postindustrial societies.

Keywords: Informal economy, livelihood strategies, nontimber forest products, natural resource policy, rural development policy.

<http://www.treesearch.fs.fed.us/pubs/30182>

08-094

- ▶ Warren, D.D. 2008.

Production, prices, employment, and trade in Northwest forest industries, all quarters of 2006. Resour. Bull. PNW-RB-255. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 163 p.

Provides current information on lumber and plywood production and prices; employment in the forest industries; international trade in logs, lumber, and plywood; volume and average prices of stumpage sold by public agencies; and other related items.

Keywords: Forestry business economics, lumber prices, plywood prices, timber volume, stumpage prices, employment (forest products industries), marketing (forest products), imports and exports (forest products).

<http://www.treesearch.fs.fed.us/pubs/29524>

08-170

- ▶ Warren, D.D. 2008.

Production, prices, employment, and trade in Northwest forest industries, all quarters of 2007. Resour. Bull. PNW-RB-256. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 163 p.

Provides current information on lumber and plywood production and prices; employment in

the forest industries; international trade in logs, lumber, and plywood; volume and average prices of stumpage sold by public agencies; and other related items.

Keywords: Forestry business economics, lumber prices, plywood prices, timber volume, stumpage prices, employment (forest products industries), marketing (forest products), imports and exports (forest products).

<http://www.treesearch.fs.fed.us/pubs/30416>

Ecosystem Structure and Function

07-248

- ▶ Jovan, S. 2008.

Lichen bioindication of biodiversity, air quality, and climate: baseline results from monitoring in Washington, Oregon, and California. Gen. Tech. Rep. PNW-GTR-737. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 115 p.

Lichens are highly valued ecological indicators known for their sensitivity to a wide variety of environmental stressors like air quality and climate change. This report summarizes baseline results from the U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis (FIA) Lichen Community Indicator covering the first full cycle of data collection (1998–2001, 2003) for Washington, Oregon, and California. During this period, FIA conducted 972 surveys of epiphytic macrolichen communities for monitoring both spatial and long-term temporal trends in forest health. Major research findings are presented with emphasis on lichen biodiversity as well as bioindication of air quality and climate. Considerable effort is devoted to mapping geographic patterns and defining lichen indicator species suitable for estimating air quality and climate.

Keywords: Acidophytes, air quality, California, climate change, cyanolichens, forest health, gradient analysis, indicator species, neutrophytes, nitrophytes, nonmetric multidimensional scaling, ordination, Pacific Northwest, pollution.

<http://www.treesearch.fs.fed.us/pubs/29523>

07-357

- Lorenz, T.J.; Aubry, C.; Shoal, R. 2008.

A review of the literature on seed fate in whitebark pine and the life history traits of Clark's nutcracker and pine squirrels. Gen. Tech. Rep. PNW-GTR-742. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 62 p.

Whitebark pine is a critical component of subalpine ecosystems in western North America, where it contributes to biodiversity and ecosystem function and in some communities is considered a keystone species. Whitebark pine is undergoing rangewide population declines attributed to the combined effects of mountain pine beetle, white pine blister rust, and fire suppression. The restoration and maintenance of whitebark pine populations require an understanding of all aspects of seed fate. In this paper, we review the literature on seed dispersal in whitebark pine. Clark's nutcracker, pine squirrels, and scatter-hoarding rodents are all known to influence whitebark pine seed fate and ultimately affect the ability of whitebark pine populations to regenerate. We also provide a general overview of the natural histories of the most influential species involved with whitebark pine seed fate: Clark's nutcracker and the pine squirrel.

Keywords: Whitebark pine, seed dispersal, Clark's nutcracker, pine squirrels, scatter-hoarding.

<http://www.treesearch.fs.fed.us/pubs/29647>

06-314

- Schuller, R. 2006.

High Peak/Moon Creek Research Natural Area: guidebook supplement 30. Gen. Tech. Rep. PNW-GTR-673. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 25 p.

This guidebook describes the High Peak/Moon Creek Research Natural Area, a 617.5-ha (1,526-ac) tract of coniferous forest containing stands dominated by 100- to 150-year-old Douglas-fir, a small old-growth (500+ years) Douglas-fir stand, and riparian vegetation within the western hemlock zone of the Coast Range in western Oregon.

Keywords: Research natural area, fire-initiated Douglas-fir forest, old-growth forest, Oregon Coast Range.

<http://www.treesearch.fs.fed.us/pubs/25143>

Fire

07-356

- González-Cabán, A.; Haynes, R.W.; McCaffrey, S.; Mercer, E.; Watson, A., tech. eds. 2007.

Fire social science research—selected highlights. Gen. Tech. Rep. PNW-GTR-736. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 65 p.

Forest Service Research and Development has a long-standing component of social fire science that since 2000 has expanded significantly. Much of this new work focuses on research that will increase understanding of the social and economic issues connected with wildland fire and fuels management. This information can enhance the ability of agencies and communities to meet land management objectives in an effective and efficient manner that is well informed by public needs and preferences. This research will improve fire and fuels management decisions by contributing to a broader understanding of key public values and concerns about fire and fuels management—before, during, and after fire and fuels treatments; social and economic effects of different fire and fuels management decisions; external and internal barriers to effective fire management; and effect of different existing and proposed policies on management options and decision space. The research will also provide guidelines and tools for effective and efficient communication, both external and internal; improving safety, reliability, and ability to meet management objectives; working with communities and other partners to achieve fire and fuels management goals; and assessing tradeoffs in economic, ecological, and quality-of-life values of different decision options.

Keywords: Values, perceptions, suppression, communities, trust, economics, sociology, anthropology, psychology.

<http://www.treesearch.fs.fed.us/pubs/29163>

08-125

► Thompson, J. 2008.

Forests at risk: integrating risk science into fuel management strategies. Science Findings 102. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

The threat from wildland fire continues to grow across many regions of the Western United States. Drought, urbanization, and a buildup of fuels over the last century have contributed to increasing wildfire risk to property and highly valued natural resources. Fuel treatments, including thinning overly dense forests to reduce fuel and lower fire risk, have become a priority for land managers. Planning fuel treatments on public lands is a complicated problem. Treatments must address multiple management objectives that are often conflicting and burdened with regulatory constraints.

Researchers at the Western Wildland Environmental Threat Assessment Center are building tools to streamline the fuel treatment planning process, and applying concepts from the risk sciences to better measure the potential benefits of landscape fuel treatment designs. The risk-based approach combines information about fire spread, fire intensity, and change in resource value into a single measure that can be used to communicate the potential benefits of fuel reduction. These risk-analysis methods are being incorporated into the Fireshed Assessment process, in which multiple stakeholders can propose management options and see how those options affect fire risk in real time. This collaborative approach to planning is being embraced by land managers across the country.

Keywords: Fire, fuel management, Arc Fuels.

<http://www.treearch.fs.fed.us/pubs/29841>

08-133

► Thompson, J. 2008.

Burn and they will come! The Western Regional Birds and Burns Study examines bird responses to prescribed fire. Science Findings 103. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

Although prescribed fire is increasingly being used in ponderosa pine forests as a management tool to reduce the risk of future high-severity wildfire, its effects on wildlife habitat have rarely been examined. The Birds and Burns Network was created to assist managers in planning prescribed fire projects that will reduce fuels and enhance bird habitat. Researchers have established a network of study sites across eight Western States to analyze changes in fuels, downed wood, forest structure, bird habitat, and populations of birds within 1 to 2 years of prescribed fires. Additionally, studies conducted on the Birds and Burns Network evaluate some of the ecological tradeoffs associated with managing for wildland fire, prescribed fire, or fire exclusion.

Researchers have documented varied responses to the burns. For example, migratory songbird populations tended to decline during the year of the burn, whereas residents generally had positive or neutral responses. Overall, many bird species that initially responded negatively, rebounded to postfire levels the following year, suggesting that the influence of prescribed fire on these birds may be short term. The density of standing dead trees, which are a critical component of cavity-nesting bird habitat, increased after the burns, whereas large downed logs were reduced. These findings should help managers identify potential resolutions for conflicts that arise from prescribed burning in western dry forests.

Keywords: Prescribed fire, birds, Burns and Birds Study.

<http://www.treearch.fs.fed.us/pubs/29888>

07-195

- Youngblood, A.; Bigler-Cole, H.; Fettig, C.J.; Fiedler, C.; Knapp, E.E.; Lehmkuhl, J.F.; Outcalt, K.W.; Skinner, C.N.; Stephens, S.L.; Waldrop, T.A. 2007.

Making fire and fire surrogate science available: a summary of regional workshops with clients.

Gen. Tech. Rep. PNW-GTR-727. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 59 p.

Operational-scale experiments that evaluate the consequences of fire and mechanical “surrogates” for natural disturbance events are essential to better understand strategies for reducing the incidence and severity of wildfire. The national Fire and Fire Surrogate (FFS) study was initiated in 1999 to establish an integrated network of long-term studies designed to evaluate the consequences of using fire and fire surrogate treatments for fuel reduction and forest restoration. Beginning in 2005, four regional workshops were conducted with selected clients to identify effective and efficient means of communicating FFS study findings to users. We used participatory evaluation to design the workshops, collect responses to focused questions and impressions, and summarize the results. We asked four overarching questions: (1) Who needs fuel reduction information? (2) What information do they need? (3) Why do they need it? (4) How can it best be delivered to them? Participants identified key users of FFS science and technology, specific pieces of information that users most desired, and how this information might be applied to resolve fuel reduction and restoration issues. They offered recommendations for improving overall science delivery and specific ideas for improving delivery of FFS study results and information. User groups identified by workshop participants and recommendations for science delivery are then combined in a matrix to form the foundation of a strategic plan for conducting science delivery of FFS study

results and information. These potential users, their information needs, and preferred science delivery processes likely have wide applicability to other fire science research.

Keywords: Fire and Fire Surrogate study, fuel reduction treatments, forest restoration treatments, science delivery, communication plans, participatory management.

<http://www.treesearch.fs.fed.us/pubs/27927>

Forest Management

08-031

- Aukema, J.E.; Carey, A.B. 2008.

Effects of variable-density thinning on understory diversity and heterogeneity in young Douglas-fir forests.

Res. Pap. PNW-RP-575. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 20 p.

Nine years after variable-density thinning (VDT) on the Forest Ecosystem Study, we examined low understory vegetation in 60 plots of eight stands (four pairs of VDT and control). We compared native, exotic, ruderal, and nonforest species richness among the stands. We used clustering, ordination, and indicator species analysis to look for distinctive patches of plant associations. Native, exotic, ruderal, and nonforest plant species diversity were higher in VDT stands compared to control stands for both forests. Differentiation of the understory into multiple distinct vegetation patches was not definitive, but there were trends toward greater heterogeneity in VDT stands.

Keywords: Biodiversity, forest management, indicator species, ordination, plant communities.

<http://www.treesearch.fs.fed.us/pubs/29853>

07-322

- Bluhm, A.A.; Garber, S.M.; Hibbs, D.E. 2007.

Taper equation and volume tables for plantation-grown red alder. Gen. Tech. Rep. PNW-GTR-735. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 74 p.

A taper equation and associated tables are presented for red alder (*Alnus rubra* Bong.) trees grown in plantations. The data were gathered from variable-density experimental plantations throughout the Pacific Northwest. Diameter inside bark along the stem was fitted to a variable exponent model form by using generalized nonlinear least squares and a first-order continuous autoregressive process. A number of parameterizations of the exponent were examined in a preliminary analysis, and the most appropriate form was determined. This was achieved by examining alternative models across geographic locations and silvicultural treatments on the basis of their ability to behave well outside the range of the modeling data by using an independent evaluation data set from across the region and a model validation procedure. Incorporating three easily measured tree variables—diameter at breast height, total tree height, and crown ratio—provided the best fit among location and treatment. This taper equation can be used to estimate diameter inside bark anywhere along the stem, inside bark volume of the entire stem to any top height diameter, and merchantable height and volume between any two points along the stem (i.e., individual log volumes). The flexibility of the model allows for accurate volume predictions across a range of operational stand conditions and management activities and is therefore an improvement over previously published red alder volume and taper equations.

Keywords: *Alnus rubra*, red alder, taper equation, bark thickness, stem profile, volume tables.

<http://www.treearch.fs.fed.us/pubs/28915>

05-279

- Carey, A.B. 2007.

AIMing for healthy forests: active, intentional management for multiple values. Gen. Tech. Rep. PNW-GTR-721. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 447 p.

This book is meant to provide an overview of collaborative management, forest ecology, and conservation at a professional or postgraduate/continuing education level. The focus is on active, intentional management (AIM) of forest ecosystems: taking AIM so as to provide general sustainability and achieve the full range of social, economic, and environmental goals that society has for its forests. Management is active when it uses the full range of tools available for landscape, watershed, and local ecosystems management. The focus is also intentionality—developing management systems that purposefully set out to address the values of a pluralistic public, reconcile various conservation philosophies, and integrate multiple scientific disciplines.

Keywords: Healthy forests, active, intentional management, AIM, conservation.

<http://www.treearch.fs.fed.us/pubs/29208>

08-024

- Gould, P.J.; Harrington, C.A. 2008.

Evaluation of landscape alternatives for managing oak at Tenalquot Prairie, Washington. Gen. Tech. Rep. PNW-GTR-745. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 45 p.

In recent years, interest has increased in restoring Oregon white oak (*Quercus garryana* Dougl. ex Hook.) and prairie landscapes in the Pacific Northwest, especially where elements of historical plant communities are intact. We evaluated the effect of alternative management scenarios on the extent and condition of Oregon white oak, the extent of prairie, and the harvest and standing volumes of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) within a 2934-ha portion of Fort Lewis, Washington (named the Tenalquot Planning Area for the purpose of the

project). A landscape-level analysis of the scenarios was completed using a geographic information system, a forest growth model (ORGANON), and landscape visualization software (EnVision). The scenarios ranged from no active management to restoration of the historical extent of oak and prairies within the planning area. The results indicate that the window of opportunity for restoring oak and prairie landscapes in the Puget Sound lowlands and other regions is small, and aggressive management is needed to maintain or enhance these landscapes. The project demonstrates the value of landscape-level analyses and the use of new technologies for conveying the results of alternative management scenarios.

Keywords: *Quercus garryana*, forest growth models, Puget Sound, Douglas-fir, restoration.

<http://www.treesearch.fs.fed.us/pubs/29850>

07-078

- ▶ Miner, C.; Jacobs, R.; Dykstra, D.; Bittner, B., eds. 2007.

Proceedings: international conference on transfer of forest science knowledge and technology. Gen. Tech. Rep. PNW-GTR-726. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 255 p.

This proceedings compiles papers presented by extensionists, natural resource specialists, scientists, technology transfer specialists, and others at an international conference that examined knowledge and technology transfer theories, methods, and case studies. Theory topics included adult education, applied science, extension, diffusion of innovations, social marketing, technology transfer, and others. Descriptions of methods and case studies collectively covered a wide range of current approaches that include combined digital media, engagement of users and communication specialists in the full cycle of research, integrated forestry applications, Internet-based systems, science writing, training, video conferencing, Web-based encyclopedias, and others. Innovations transferred were best management practices for water quality, forest reforestation practices, a land management system, portable timber bridges, reduced impact

logging, silvicultural practices, urban forestry, and many others. Innovation users included forest-land owners; land managers; logging industry; natural resource professionals; policymakers; public; rural and urban communities—and those in the interface between these two; and others. Technology transfer and related efforts took place in countries throughout the world.

Keywords: Technology transfer, communication, education, forest research, forest management, knowledge management.

<http://www.treesearch.fs.fed.us/pubs/28422>

07-157

- ▶ Rapp, V. 2008.

Northwest Forest Plan—the first 10 years (1994–2003): First-decade results of the Northwest Forest Plan. Gen. Tech. Rep. PNW-GTR-720. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 42 p.

The Northwest Forest Plan (the Plan) was developed in 1994 to resolve debates over old-growth forests and endangered species on federal forests in the range of the northern spotted owl. In 2005, federal agencies reviewed the first 10 years under the Plan to learn what worked and what did not, what changed, and what new information or surprises might influence these forests in the future. I highlight the monitoring results and new science from that review. Following are some of the key findings. Nearly all existing older forest habitat on federal land was protected from timber harvest. Older forest on federal land had a net increase of over 1 million acres in the first 10 years of the Plan. Despite protection of northern spotted owl habitat on federal land, spotted owl populations declined at a greater rate than expected in the northern half of their range, likely because of barred owl competition, climate, and the changing condition of historical habitat. Watershed condition improved slightly, because of reduced harvest in riparian areas, tree growth, and increased emphasis on restoration. Federal timber harvest in the Plan area averaged only 54 percent of Plan goals. In spite of mitigation measures, some local communities near federal

lands had job losses and other adverse effects. State, federal, and tribal governments worked together on forest issues better than they ever had before. Increased collaboration with communities changed how the agencies get work done.

Keywords: Northwest Forest Plan, northern spotted owl, old growth, forest policy, biodiversity.

<http://www.treesearch.fs.fed.us/pubs/29319>

08-161

- Sands, Y. 2008.

Pacific Northwest Oak Communities. [Brochure.] Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 2 p.

Summary of current threats to native oak tree communities of the Pacific Northwest. These threats include conifer encroachment, invasive plants, and land use changes. Included are examples of oak community biodiversity, advice to landowners on ways to maintain and restore oak communities, and pertinent organizations and publications.

Keywords: Oak communities, biodiversity, conifer encroachment, Pacific Northwest.

<http://www.fs.fed.us/pnw/pubs/oak-communities-brochure.pdf>

06-252

- Thompson, J. 2006.

Knock on wood: Is wood production sustainable in The Pacific Northwest? Science Findings 84. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

The Pacific Northwest is one of the world's major timber-producing regions, and its capacity to produce wood on a sustained-yield basis is widely recognized. Nonetheless, there has been increasing public interest in assuring that forests are being sustainably managed, as well as a desire by landowners to demonstrate their commitment to responsible stewardship. Scientists from several universities and

the PNW Research Station recently completed an initiative to synthesize existing research on wood production in the region. The initiative was guided by the needs of forest landowners and managers representing forest industry, small private forests, and state forest lands. They concluded that forest fragmentation and land use change, stagnating timber prices, and unfavorable public opinion regarding the scenic quality of intensive forest management were among the largest challenges to sustainable wood production in the region. New technologies and products in wood manufacturing, sustainable harvest levels, niche market opportunities, and underutilized tree species were identified as opportunities for landowners and managers interested in sustainable forestry.

Keywords: Wood, timber, sustained yield.

<http://www.treesearch.fs.fed.us/pubs/22879>

08-013

- Thompson, J. 2007.

Move over, Douglas-fir: Oregon white oaks need room to grow. Science Findings 98. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

Oregon white oak savanna and woodland habitat in the Pacific Northwest has declined to less than 10 percent of its former range, and much of what remains is of poor quality. In addition to urbanization and agricultural development, habitat is being lost to conifers that have invaded oak areas, which were once maintained through frequent burning by Native Americans. The conifers eventually overtop and kill the shade-intolerant oaks. Many landowners, conservation groups, and public agencies are interested in restoring the cultural legacy and biodiversity associated with oak habitat. The Oak Studies Group has shown that the complete removal of overtopping conifers—as opposed to partial removal—is the best way to increase stem growth, promote new branches, and bolster acorn production. An updated growth model predicts that many oaks will die unless released from overtopping conifers. Researchers have found that the best acorn producing trees have wide crowns and few competitors, and grow in moist, well-drained soils.

When planting oak seedlings, the group stresses the importance of initial seedling size and postplanting treatments to control weeds and prevent animal browsing.

Keywords: *Quercus garryana*, conifer invasion, acorns, savanna, overtopping, releasing oaks, regeneration.

<http://www.treesearch.fs.fed.us/pubs/29136>

harvest on peak flows in the Pacific Northwest, as represented by the data reported here, are relatively minor in comparison to other anthropogenic changes to streams and watersheds.

Keywords: Peak flow, forest harvest, channel morphology, Pacific Northwest.

<http://www.treesearch.fs.fed.us/pubs/30179>

Geomorphology and Hydrology

08-076

- Grant, G.E.; Lewis, S.L.; Swanson, F.J.; Cissel, J.H.; McDonnell, J.J. 2008.

Effects of forest practices on peak flows and consequent channel response: a state-of-science report for western Oregon and Washington.

Gen. Tech. Rep. PNW-GTR-760. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p.

This is a state-of-the-science synthesis of the effects of forest harvest activities on peak flows and channel morphology in the Pacific Northwest, with a specific focus on western Oregon and Washington. We develop a database of relevant studies reporting peak flow data across rain-, transient-, and snow-dominated hydrologic zones, and provide a quantitative comparison of changes in peak flow across both a range of flows and forest practices. Increases in peak flows generally diminish with decreasing intensity of percentage of watershed harvested and lengthening recurrence intervals of flow. Watersheds located in the rain-dominated zone appear to be less sensitive to peak flow changes than those in the transient snow zone; insufficient data limit interpretations for the snow zone. Where present, peak flow effects on channel morphology should be confined to stream reaches where channel gradients are less than approximately 0.02 and streambeds are composed of gravel and finer material. We provide guidance as to how managers might evaluate the potential risk of peak flow increases based on factors such as presence of roads, watershed drainage efficiency, and specific management treatments employed. The magnitude of effects of forest

07-544

- Thompson, J. 2007.

Running dry: Where will the West get its water? Science Findings 97. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

Late summer streamflow in western and central Oregon and northern California is almost exclusively due to immense groundwater storage in the Cascade Range. The volume of water stored in permeable lava flows in the Cascades is seven times that stored as snow. Nonetheless, until recently, virtually all examinations of streamflow trends under future climates in the West have focused on the anticipated loss of snowpack. This has painted an incomplete picture of the looming water resource crisis that is expected because of global warming.

Researchers at the PNW Research Station have recently completed an analysis showing that variation in geology across the West is going to influence regional sensitivity to global warming. Regions sourced by groundwater will continue to have streamflow, in contrast to areas sourced exclusively by snowpack. Paradoxically, regions sourced from groundwater will lose a greater total amount of late summer water, simply because they have more water available to lose. Under future climates, high-elevation Forest Service lands will be critical sources of fresh water, though not all forests will be equally affected. The Willamette, Deschutes, Umpqua, and Lassen National Forests will provide the most significant water resources.

Keywords: Climate change, groundwater, Cascade Range, Sierra Nevada, snowpack, streamflow.

<http://www.treesearch.fs.fed.us/pubs/28879>

Harvesting

07-307

- ▶ Miller, R.E.; Smith, J.; Adams, P.W.; Anderson, H.W. 2007.

Growth of Douglas-fir near equipment trails used for commercial thinning in the Oregon Coast Range. Res. Pap. PNW-RP-574. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 33 p.

Soil disturbance is a visually apparent result of using heavy equipment to harvest trees. Subsequent consequences for growth of remaining trees, however, are variable and seldom quantified. We measured tree growth 7 and 11 years after thinning of trees in four stands of coast Douglas-fir (*Pseudotsuga menziesii* var. *menziesii* (Mirb.) Franco) where soil disturbance was limited by using planned skid trails, usually on dry soils. The three younger stands had responded to nitrogen fertilizer in the 4 years before thinning, but only one stand showed continued response in the subsequent 7- or 11-year period after thinning. The most consistent pattern observed was greater growth of residual trees located next to skid trails. The older stand also showed greater growth in trees located next to skid trails, whereas tillage of skid trails failed to benefit growth of nearby residual trees for the first 7 years after tillage. We conclude that traffic that compacted soil only on one side of residual trees did not reduce growth of nearby trees.

Keywords: Commercial thinning, coast Douglas-fir, equipment trails, tree growth, mitigation.

<http://www.treesearch.fs.fed.us/pubs/29139>

Invasive Plants and Animals

07-024

- ▶ Erickson, H.E.; White, R. 2007.

Invasive plant species and the Joint Fire Science Program. Gen. Tech. Rep. PNW-GTR-707. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 18 p.

Invasive nonnative plants may be responsible for serious, long-term ecological impacts, including altering fire behavior and fire regimes. Therefore, knowing how to successfully manage invasive plants and their impacts on natural resources is crucial. We present a summary of research on invasive plants and fire that has been generated through the Joint Fire Science Program—focusing specifically on ecology of species invasions, the interactions between fire and invasives, and the responses of invasives to different management practices. Selected findings include (1) prescribed fire may increase invasive species in some ecosystems; (2) fuel treatments that leave some overstory canopy, minimize exposure of bare ground, and target sites that already host species capable of resprouting may be less likely to promote invasives; and (3) postfire seeding should be approached with caution, as it can increase invasives.

Keywords: Invasive plants, fire management, cheatgrass, fuel treatments, postfire seeding, fire regimes, exotic species.

<http://www.treesearch.fs.fed.us/pubs/28912>

Land Use

07-015

- ▶ Kline, J.D.; Azuma, D.L. 2007.

Evaluating forest land development effects on private forestry in eastern Oregon. Res. Pap. PNW-RP-572. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 18 p.

Research suggests that forest land development can reduce the productivity of remaining forest land because private forest owners reduce their

investments in forest management. We developed empirical models describing forest stocking, thinning, harvest, and postharvest tree planting in eastern Oregon, as functions of stand and site characteristics, ownership, and building densities. The models are based on USDA Forest Service Forest Inventory and Analysis data gathered in eastern Oregon in 1987 and 1998, and data describing building densities gathered by the Oregon Department of Forestry from aerial photographs taken over the same period. We used the models to examine the potential effects of population growth and development, as described by increasing building densities, on the likelihood that private forest owners maintain forest stocking, precommercially thin, harvest, and plant trees following harvest. Empirical results suggest that population growth and development have had no measurable effect on these activities in eastern Oregon during the period examined. Any development effects on private forest management and investment so far are likely to be fairly localized.

Keywords: Wildland-urban interface, nonindustrial private forest owners, urbanization.

<http://www.treesearch.fs.fed.us/pubs/26619>

07-220

- ▶ White, E.M.; Mazza, R. 2008.

A closer look at forests on the edge: future development on private forests in three states.

Gen. Tech. Rep. PNW-GTR-758. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 20 p.

Privately owned forests provide many public benefits, including clean water and air, wildlife habitat, and recreational opportunities. By 2030, 44.2 million acres of rural private forest land across the conterminous United States are projected to experience substantial increases in residential development. As housing density increases, the public benefits provided by private forests can be permanently altered. We examine factors behind projected patterns of residential development and conversion of private forest land by 2030 in northwestern Washington, southern Maine, and

northwestern Georgia. Some key factors affecting the extent of future residential housing include (1) population growth from migration into an area; (2) historical settlement patterns, topography, and land ownership; and (3) land use planning and zoning.

Keywords: Private forests, residential development, Washington, Maine, Georgia.

<http://www.treesearch.fs.fed.us/pubs/30181>

Monitoring

07-514

- ▶ Bryant, M.D.; McDonald, Trent; Aho, R.; Wright, B.E.; Stahl, M.B. 2008.

A protocol using coho salmon to monitor Tongass National Forest Land and Resource Management Plan standards and guidelines for fish habitat.

Gen. Tech. Rep. PNW-GTR-743. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 80 p.

We describe a protocol to monitor the effectiveness of the Tongass Land Management Plan (TLMP) management standards for maintaining fish habitat. The protocol uses juvenile coho salmon (*Oncorhynchus kisutch*) in small tributary streams in forested watersheds. We used a 3-year pilot study to develop detailed methods to estimate juvenile salmonid populations, measure habitat, and quantitatively determine trends in juvenile coho salmon abundance over 10 years. Coho salmon have been shown to be sensitive to habitat alterations, and we use coho salmon parr as the primary indicator in the protocol. A priori criteria for type I and type II error rates, effect size, and sample sizes for the protocol were derived with estimates of variance computed from the 3-year pilot study. The protocol is designed to detect trends in abundance of coho salmon parr, as well as coho salmon fry and Dolly Varden (*Salvelinus malma*), in small streams managed according to TLMP standards and guidelines and to compare these to trends in unmanaged (old-growth) watersheds. Trends are adjusted to account for statistically significant habitat covariates. This information provides an important element in monitoring land management practices in the Tongass National

Forest. The methods we describe may have application to monitoring protocols elsewhere for fish populations and land management practices.

Keywords: Monitoring, coho salmon, Tongass National Forest, watershed management.

<http://www.treesearch.fs.fed.us/pubs/29923>

Plant Ecology

07-095

► Johnson, C.G., Jr. 2007.

Rangeland exclosures of northeastern Oregon: stories they tell (1936–2004). Gen. Tech. Rep. PNW-GTR-724. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 33 p.

Rangeland exclosures installed primarily in the 1960s, but with some from the 1940s, were resampled for changes in plant community structure and composition periodically from 1977 to 2004 on the Malheur, Umatilla, and Wallowa-Whitman National Forests in northeastern Oregon. They allow one to compare vegetation with all-ungulate exclusion (known historically as game exclosures), all-livestock exclusion (known historically as stock exclosures), and with no exclusion (known as open areas). Thirteen upland rangeland exclosures in northeastern Oregon were selected and are presented with plant community trend data and possible causes of changes over time. Key findings are that moderate grazing by native ungulates afforded by the livestock exclosures generally stimulated bunchgrasses to retain dominance and vitality; native bunchgrasses can replace invasive rhizomatous plants given a reduction in disturbance over time; shrubs increased without ungulate use in shrubland communities; and invasive annuals that established following severe disturbances to the grassland community diminished with aggressive competition from perennial bunchgrasses.

Keywords: Exclosure, northeastern Oregon, plant community, plant association, trend.

<http://www.treesearch.fs.fed.us/pubs/28421>

06-090

► Wells, A.F. 2006.

Deep canyon and subalpine riparian and wetland plant associations of the Malheur, Umatilla, and Wallowa-Whitman National Forests. Gen. Tech. Rep. PNW-GTR-682. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 277 p.

This guide presents a classification of the deep canyon and subalpine riparian and wetland vegetation types of the Malheur, Umatilla, and Wallowa-Whitman National Forests. A primary goal of the deep canyon and subalpine riparian and wetland classification was a seamless linkage with the midmontane northeastern Oregon riparian and wetland classification provided by Crowe and Clausnitzer in 1997. The classification is based on potential natural vegetation and follows directly from the plant association concept for riparian zones. The 95 vegetation types classified across the three national forests were organized into 16 vegetation series, and included some 45 vegetation types not previously classified for northeastern Oregon subalpine and deep canyon riparian and wetland environments. The riparian and wetland vegetation types developed for this guide were compared floristically and environmentally to riparian and wetland classifications in neighboring geographic regions. For each vegetation type, a section was included describing the occurrence(s) of the same or floristically similar vegetation types found in riparian and wetland classifications developed for neighboring geographic regions. Lastly, this guide was designed to be used in conjunction with the midmontane guide to provide a comprehensive look at the riparian and wetland vegetation of northeastern Oregon.

Keywords: Riparian, wetland, classification, northeastern Oregon, potential natural vegetation, plant association, plant community, Hells Canyon, Wallowa Mountains, Elkhorn Mountains, Strawberry Mountains, Wenaha-Tucannon Wilderness.

<http://www.treesearch.fs.fed.us/pubs/24936>

Recreation

08-049

- Cerveny, L.K.; Ryan, C.M. 2008.

Agency capacity for recreation science and management: the case of the U.S. Forest Service. Gen. Tech. Rep. PNW-GTR-757. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 78 p.

This report examines the capacity of natural resource agencies to generate scientific knowledge and information for use by resource managers in planning and decisionmaking. This exploratory study focused on recreation in the U.S. Department of Agriculture, Forest Service. A semistructured, open-ended interview guide elicited insights from 58 managers and 28 researchers about recreation issues, information exchange, and research-management interactions. Data were coded and analyzed using Atlas.ti[®], a qualitative analysis software program. Results indicate that recreation managers seek information to address user conflicts and manage diverse activities across sites and landscapes. Managers do not always turn to the research community when looking for scientific information and are uncertain about the proper channels for communication. Managers consult a variety of information sources and aggregate various types of scientific information for use in planning and management. Managers desire greater and more diverse interactions with researchers to promote knowledge exchange useful for addressing recreation problems. Barriers to interaction include organizational differences between management and research, researcher responsiveness, relevance of information to manager needs, and the lack of formal interaction opportunities. Several structural processes were suggested to facilitate opportunities for greater interaction and information exchange.

Keywords: Organizational capacity, natural resources, recreation, science integration.

<http://www.treesearch.fs.fed.us/pubs/30383>

07-434

- Farnum, J.O.; Kruger, L.E., eds. 2008.

Place-based planning: innovations and applications from four western forests. Gen. Tech. Rep. PNW-GTR-741. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 44 p.

Place-based planning is an emergent method of public lands planning that aims to redefine the scale at which planning occurs, using place meanings and place values to guide planning processes. Despite the approach's growing popularity, there exist few published accounts of place-based approaches. To provide practitioners and researchers with such examples, the current compilation outlines the historical background, planning rationale, and public involvement processes from four National Forest System areas: The Beaverhead-Deerlodge National Forest in Montana; the Willamette National Forest in Oregon; the Chugach National Forest in Alaska; and the Grand Mesa, Uncompahgre, and Gunnison National Forests in Colorado. These examples include assessments of the successes and challenges encountered in each approach.

Keywords: Collaboration, forest planning, place attachment, place-based planning, public values, sense of place.

<http://www.treesearch.fs.fed.us/pubs/29949>

07-057

- Kruger, L.E.; Hall, T.E.; Stiefel, M.C., tech. eds. 2008.

Understanding concepts of place in recreation research and management. Gen. Tech. Rep. PNW-GTR-744. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 204 p.

Over a 3-day weekend in the spring of 2004 a group of scientists interested in extending understanding of place as applied in recreation research and management convened a working session in Portland, Oregon. The purpose of the gathering was to clarify their understanding of place-related concepts, approaches to the study of people-place

relations, and the application of that understanding in recreation management for the purpose of integrating perspectives from different disciplines, discussing approaches to understanding and measuring sense of place, and other questions around the study and application of place-related concepts. Topics that generated the most discussion included how social processes influence place meanings, how place meanings are shared and negotiated within social groups, and when and how place meanings and attachments focus, reduce, or avert conflict in natural resource planning and management. This collection of papers is a result of that meeting.

Keywords: Place, sense of place, place attachment, recreation management.

<http://www.treesearch.fs.fed.us/pubs/29924>

07-535

- ▶ White, E.M.; Wilson, J.B. 2008.

National visitor use monitoring implementation in Alaska. Gen. Tech. Rep. PNW-GTR-740. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 52 p.

The USDA Forest Service implemented the National Visitor Use Monitoring (NVUM) program across the entire National Forest System (NFS) in calendar year 2000. The primary objective of the NVUM program is to develop reliable estimates of recreation use on NFS lands via a nationally consistent, statistically valid sampling approach. Secondary objectives of NVUM are to characterize recreation visits, collect data in support of regional economic analyses, and gauge national forest visitor satisfaction. We document and review the round 1 NVUM implementation in the USDA Forest Service Alaska Region (R-10) with examination of the R-10 prework, sample day implementation, survey completion rates, sampling at cabins, boat docks, and air carriers; and the NVUM expansion weights assigned to survey cases. Several opportunities to improve the implementation of the standard NVUM protocols in R-10 are identified.

Keywords: National Visitor Use Monitoring, Region 10, recreation visitor sampling.

<http://www.treesearch.fs.fed.us/pubs/29322>

Resource Inventory

08-048

- ▶ Fried, J.S.; Zhou, X. 2008.

Forest inventory-based estimation of carbon stocks and flux in California forests in 1990.

Gen. Tech. Rep. PNW-GTR-750. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 25 p.

Estimates of forest carbon stores and flux for California circa 1990 were modeled from forest inventory data in support of California's legislatively mandated greenhouse gas inventory. Reliable estimates of live-tree carbon stores and flux on timberlands outside of national forest could be calculated from periodic inventory data collected in the 1980s and 1990s; however, estimation of circa 1990 flux on national forests and forests other than timberland was problematic owing to a combination of changing inventory protocols and definitions and the lack of remeasurement data on those land categories. We estimate annual carbon flux on the 7.97 million acres of timberlands outside of national forests (which account for 24 percent of California's forest area and 28 percent of its live tree above-ground biomass) at 2.9 terragrams per year.

Keywords: Forest carbon flux assessment, biomass, carbon stocks, carbon dioxide, Forest Inventory and Analysis.

<http://www.treesearch.fs.fed.us/pubs/29648>

Silviculture

08-012

- ▶ Curtis, R.O. 2008.

True fir spacing trials—10-year results. Gen.

Tech. Rep. PNW-GTR-749. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 36 p.

Eighteen precommercial thinning trials were established in true fir-hemlock stands in the Olympic Mountains and the west side of the Cascade Range during the period 1987 through 1994. This paper updates a previous report, with results for the first 10 years after establishment.

Results are given for (1) all trees, (2) the largest 80 per acre of any species, and (3) those noble fir (*Abies procera* Rehd.) and Pacific silver fir (*Abies amabilis* Dougl. ex Forbes) included in the largest 80 per acre. Diameter growth of all species increased with increase in spacing. Height growth of Pacific silver fir decreased with increase in spacing. The largest 80 trees per acre of all species showed some increase in diameter and basal area growth with increased spacing, while height growth declined slightly and volume growth was nearly constant. Over time, these installations will provide a unique source of information on early development of managed stands of these species, for which little information is now available.

Keywords: True firs, *Abies procera*, *Abies amabilis*, precommercial thinning, spacing, noble fir, Pacific silver fir.

<http://www.treesearch.fs.fed.us/pubs/29852>

08-053

► Deal, R.L., tech. ed. 2008.

Integrated restoration of forested ecosystems to achieve multiresource benefits: proceedings of the 2007 national silviculture workshop. Gen. Tech. Rep. PNW-GTR-733. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 306 p.

A primary mission of the U.S. Department of Agriculture Forest Service is multiple resource management, and one of the emerging themes is forest restoration. The National Silviculture Workshop, a biennial event co-sponsored by the Forest Service, was held May 7–10, 2007, in Ketchikan, Alaska, with the theme of “Integrated Restoration of Forested Ecosystems to Achieve Multiresource Benefits.” This proceedings presents a compilation of state-of-the-art silvicultural research and forestry management papers that demonstrates integrated restoration to yield multiple resource benefits. These papers highlight national perspectives on ecosystem services, forest restoration and climate change, and regional perspectives on forest restoration and silvicultural practices to achieve multiple resource benefits from researchers and forest practitioners

working in a broad array of forest types in the United States.

Keywords: Forest restoration, ecosystem services, climate change, silviculture.

<http://www.treesearch.fs.fed.us/pubs/29399>

08-102

► Devine, W.D.; Harrington, C.A. 2008.

Influence of four tree shelter types on microclimate and seedling performance of Oregon white oak and western redcedar. Res. Pap. PNW-RP-576. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 35 p.

Four types of tree shelters were evaluated in southwestern Washington for their effects on seedling microenvironment and performance of two tree species. Shelter types were fine-mesh fabric shelters, solid-walled white shelters with and without vent holes, and solid-walled blue unvented shelters. Summer mean and daily maximum air temperatures were increased by 0.8 °C and 3.6 °C, respectively, in solid-walled tree shelters. Shelter color and shelter venting did not influence air temperatures. Tree shelters only affected vapor pressure deficit late in the growing season. Midday photosynthetically active radiation within shelters ranged from 54 percent of full sun in fine-mesh fabric shelters to 15 percent of full sun in blue solid-walled shelters. In the first year after planting, height and diameter growth of western redcedar (*Thuja plicata* Donn ex D. Don) were significantly increased by all shelter types, with blue solid-walled shelters resulting in the greatest height growth. However, in blue solid-walled shelters, photosynthesis and stem diameter growth of Oregon white oak (*Quercus garryana* Dougl. ex Hook.) seedlings were significantly less than for unsheltered seedlings.

Keywords: Tree shelter, microclimate, photosynthesis, *Thuja plicata*, *Quercus garryana*.

<http://www.treesearch.fs.fed.us/pubs/30417>

Social Sciences

08-023

- Charnley, S.; Fischer, A.P.; Jones, E.T. 2008.

Traditional and local ecological knowledge about forest biodiversity in the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-751. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 52 p.

This paper synthesizes the existing literature about traditional and local ecological knowledge relating to biodiversity in Pacific Northwest forests in order to assess what is needed to apply this knowledge to forest biodiversity conservation efforts. We address four topics: (1) views and values people have relating to biodiversity, (2) the resource use and management practices of local forest users and their effects on biodiversity, (3) methods and models for integrating traditional and local ecological knowledge into biodiversity conservation on public and private lands, and (4) challenges to applying traditional and local ecological knowledge for biodiversity conservation. We focus on the ecological knowledge of three groups who inhabit the region: American Indians, family forest owners, and commercial nontimber forest product (NTFP) harvesters.

Keywords: Traditional ecological knowledge, forest management, biodiversity conservation, American Indians, family forest owners, nontimber forest product harvesters, Pacific Northwest.

<http://www.treesearch.fs.fed.us/pubs/29926>

08-002

- Dillingham, C.; Poe, M.R.; Grinspoon, E.; Stuart, C.; Moseley, C.; Mazza, R.; Charnley, S.; Meierotto, L.; Donoghue, E.; Toth, N. 2008.

Northwest Forest Plan—the first 10 years (1994–2003): Socioeconomic monitoring of the Okanogan-Wenatchee National Forest and five local communities. Gen. Tech. Rep. PNW-GTR-761. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 109 p.

This report examines socioeconomic changes that occurred between 1990 and 2003 associated with implementation of the Northwest Forest Plan (the Plan) in and around lands managed by the Okanogan-Wenatchee National Forest in Washington state. Our findings are based on quantitative data from the U.S. census, the USDA Forest Service and other federal databases, historical documents, and interviews with Forest Service employees and members of five case study communities: Naches Valley, Cashmere, Entiat, Twisp, and the Upper Okanogan Valley. We explore how the Plan affected the flow of socioeconomic benefits associated with the Okanogan-Wenatchee National Forest, such as the production of forest commodities and forest-based recreation, agency jobs, procurement contract work for ecosystem management activities, grants for community economic assistance, payments to county governments, and opportunities for collaborative forest management. The greatest socioeconomic change was the sharp decline in timber harvest activities, a change that had been underway prior to the Plan. This decline not only affected timber industry jobs in local communities, but also resulted in declining agency budgets and staff reductions. Communities' responses differed. Communities with greater economic diversity were able to absorb the changes in forest management, whereas communities more heavily dependent on timber experienced an additional destabilizing effect.

Keywords: Socioeconomic monitoring, Northwest Forest Plan, Okanogan-Wenatchee National Forest, Naches Valley, Cashmere, Entiat, Twisp, Upper Okanogan Valley.

<http://www.treesearch.fs.fed.us/pubs/30458>

08-052

- Maleki, S. 2008.

Counting all that matters: recognizing the value of ecosystem services. Science Update 16. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 12 p.

Broadly defined, ecosystem services are the benefits healthy ecosystems provide to humans. Clean air, clean water, and flood control are just a few examples. Although the term is relatively new, the ecosystem services concept has long been a focus of natural resource and environmental economists. As the U.S. population increases and the forests and grasslands that provide ecosystem services are threatened by development, there is growing interest among natural resource agencies, conservation groups, private landowners, and others to explore the ecosystem services concept as a way to address human impacts on the environment and more effectively communicate the importance of ecosystems. This issue highlights the efforts of Pacific Northwest (PNW) Research Station scientists to develop approaches for implementing an ecosystem services program for the region. Applying the ecosystem services concept to specific issues in Forest Service policy, management, and research presents many challenges and opportunities. An important role for PNW research is providing information that can help increase public awareness and understanding of how public lands contribute to human well-being by providing ecological goods and services. Scientists at PNW are working on ways to evaluate various ecosystem services and use existing information, methods, and tools to support ecosystem services research. Models enabling managers to quantitatively evaluate how different forest management options affect ecosystem services are also being developed.

Keywords: Ecosystem services, Pacific Northwest.

<http://www.treesearch.fs.fed.us/pubs/29556>

07-159

- McCool, S.F.; Clark, R.N.; Stankey, G.H., eds. 2008.

Water and people: challenges at the interface of symbolic and utilitarian values. Gen. Tech. Rep. PNW-GTR-729. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 246 p.

The demand for water is rapidly increasing, but the uses to which that water is put and the values society places on water are changing dramatically. Water is the source of life, the sustenance for living, the resource needed for manufacturing, mining, agriculture; the element required to grow our lawns, to water our landscaping, to shower us with refreshment; it is the place where we play; it provides the snow for our winter recreation, and it provides the habitat for much of our wildlife. Water in contemporary American society is more than a simple physical entity, its symbolic values, and noninstrumental uses are growing in significance. As with many Native American cultures, water is as much a symbol as it is something to extract and use in the production of commercial products. This book is about the issues associated with these symbolic values and uses of water: the challenges they present—in our language, in our allocation mechanisms, in our communication—the conflicts raised; and the potential for resolving the difficult, contentious and complex issues concerning the use of water for various purposes. It is as much about framing the questions about symbolic values of water as it is anything else.

Keywords: Water, recreation, symbolism, uses and value.

<http://www.treesearch.fs.fed.us/pubs/29321>

Soil

08-050

- Erickson, H.E.; White, R. 2008.

Soils under fire: soils research and the Joint Fire Science Program. Gen. Tech. Rep. PNW-GTR-759. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 17 p.

Soils are fundamental to a healthy and functioning ecosystem. Therefore, forest land managers can greatly benefit from a more thorough understanding of the ecological impacts of fire and fuel management activities on the vital services soils provide. We present a summary of new research on fire effects and soils made possible through the Joint Fire Science Program and highlight management implications where applicable. Some responses were consistent across sites, whereas others were unique and may not easily be extrapolated to other sites. Selected findings include (1) postfire soil water repellency is most likely to occur in areas of high burn severity and is closely related to surface vegetation; (2) although wildfire has the potential to decrease the amount of carbon stored in soils, major changes in land use, such as conversion from forest to grasslands, present a much greater threat to carbon storage; (3) prescribed fires, which tend to burn less severely than wildfires and oftentimes have minor effects on soils, may nonetheless decrease species richness of certain types of fungi; and (4) early season prescribed burns tend to have less impact than late season burns on soil organisms, soil carbon, and other soil properties.

Keywords: Soils, fire effects, prescribed fire, wildfire, soil carbon, soil organisms, water repellency, nutrients, forest restoration.

<http://www.treesearch.fs.fed.us/pubs/29927>

07-109

- Geist, J.M.; Hazard, J.W.; Seidel, K.W. 2008.

Juvenile tree growth on some volcanic ash soils disturbed by prior forest harvest. Res. Pap. PNW-RP-573. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 22 p.

The effects of mechanical disturbance from traditional ground-based logging and site preparation on volcanic ash soil and associated tree growth were investigated by using two study approaches in a retrospective study. This research was conducted on volcanic ash soils within previously harvested units in the Blue Mountains of northeast Oregon and southwest Washington. We assessed soil and tree attributes and their association with higher and lower levels of soil disturbance. In the first study approach, we used larger measurement plots linked to a portion of some randomly established monitoring transects in 10 harvest units. Sets of higher and lower disturbance plots were chosen and positioned in each unit based on predetermined soil bulk densities along the midlines of the plots. The second approach involved soil disturbance in five harvest units. Therein we mainly used visual cues to identify portions having higher and lower levels of soil disturbance. Smaller plots were purposely assigned and positioned within some of those conditions. Plot sampling of soils and trees followed, and the results reflected significant differences in soil disturbance.

Keywords: Volcanic ash soils, soil disturbance, soil displacement, soil compaction, soil productivity, logging, harvest impacts, site preparation, juvenile forest growth, forest regeneration.

<http://www.treesearch.fs.fed.us/pubs/29522>

Wood Utilization

07-253

- Becker, D.R.; Larson, D.; Lowell, E.C.; Rummer, R.B. 2007.

User guide for HCR Estimator 2.0: software to calculate cost and revenue thresholds for harvesting small-diameter ponderosa pine. Gen. Tech. Rep. PNW-GTR-748. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p.

The HCR (Harvest Cost-Revenue) Estimator is engineering and financial analysis software used to evaluate stand-level financial thresholds for harvesting small-diameter ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.) in the Southwest United States. The Windows-based program helps contractors and planners to identify costs associated with tree selection, residual handling, transportation of raw materials, and equipment used. Costs are compared against total financial return for regionally based market opportunities to arrive at potential net profit. Information is used to identify per-acre cost thresholds, for contract appraisal, and for prioritizing project planning for wildfire fuel reduction treatments and forest restoration efforts.

Keywords: Financial analysis software, simulation, harvest costs, market values, small-diameter ponderosa pine utilization (Southwest).

<http://www.treesearch.fs.fed.us/pubs/29925>

06-530

- Nicholls, D.; Roos, J. 2006.

Red alder kitchen cabinets—How does application of commercial stains influence customer choice? Res. Note PNW-RN-556.

Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 12 p.

A better understanding of consumer reaction and preferences for red alder (*Alnus rubra* Bong.) secondary products will help Alaska producers in entering new markets. In this study, red alder kitchen cabinets were commercially stained to six different levels and displayed at home shows in Portland, Oregon, and Anchorage, Alaska. The stains simulated the appearance of six commercial species. Respondents indicated their preferred cabinet doors, under the assumption of remodeling their kitchen. Brighter shades of stain were generally more popular than the three darkest shades. There were no statistically significant differences in preferences between male and female respondents. The influence of market location was found to be highly significant for unstained and for maple stained cabinets. These results indicate a strong potential for red alder to be commercially stained to a wide range of appearances, targeting different demographic groups.

Keywords: Red alder, cabinets, commercial stain, consumer preference, Alaska forest products.

<http://www.treesearch.fs.fed.us/pubs/25363>

Journals and Other Publications

The following publications were not published by the Pacific Northwest Research Station, although the work was supported by the Station. These publications may be viewed online at the USDA Research and Development Treearch Web site listed under each article. If you would like a hard copy, you may print the articles from this Web site. For more information about Treearch, see page 3 of this report.

You may also obtain hard copies through university libraries or from the publisher; some outlets may charge for these services. Forestry libraries in the Northwest receive proceedings volumes and subscribe to the journals in which PNW authors publish. Some forestry libraries in the Northwest are:

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(To request article only)

University of Alaska Library

3211 Providence Drive
Anchorage, AK 99508
(Visit or request article from the
Interlibrary Loan section)

Aquatic/Riparian Systems

- ▶ Bisson, P.A.; Beechie, T.J.; Pess, G.R. 2007.
Reconciling fisheries with conservation in watersheds: tools for informed decisions. American Fisheries Society Symposium. 49: 1865–1880.
Keywords: Watersheds, freshwater fisheries, conservation, landscape analysis.
<http://www.treearch.fs.fed.us/pubs/29603>

Biometrics

- ▶ Gould, P.J.; Marshall, D.D.; Harrington, C.A. 2008.
Prediction of growth and mortality of Oregon white oak in the Pacific Northwest. Western Journal of Applied Forestry. 23(1): 26–33
Keywords: *Quercus garryana*, Garry oak, ORGANON, modeling, Washington, Oregon.
<http://www.treearch.fs.fed.us/pubs/29814>

- ▶ Temesgen, H.; Monleon, V.J.; Hann, D.W. 2008.
Analysis and comparison of nonlinear tree height prediction strategies for Douglas-fir forest. Canadian Journal of Forest Research. 38: 553–565.
Keywords: Mixed-effects model, calibration.
<http://www.treearch.fs.fed.us/pubs/29636>

Economics

- ▶ White, E.M.; Stynes, D.J. 2008.
National forest visitor spending averages and the influence of trip-type and recreation activity. Journal of Forestry. January-February: 17–24.
Keywords: Recreation spending, National Visitor Use Monitoring, economic impact.
<http://www.treesearch.fs.fed.us/pubs/30456>

Ecosystem Structure and Function

- ▶ Bisson, P.A. 2007.
The role of watersheds in reconciling fisheries with conservation. In: American Fisheries Society Symposium. 1839–1841.
Keywords: Watersheds, freshwater fisheries.
<http://www.treesearch.fs.fed.us/pubs/29604>

Fire

- ▶ Campbell, J.; Donato, D.; Azuma, D.; Law, B. 2007.
Pyrogenic carbon emission from a large wildfire in Oregon, United States. Journal of Geophysical Research, Vol. 112, GO40 14, doi: 10.1029/2007JG00045
Keywords: Biscuit Fire, carbon emissions.
<http://www.treesearch.fs.fed.us/pubs/30434>
- ▶ Champ, P.; Donovan, G.; Barth, C. 2008.
Wildfire risk and home purchase decisions. Rural Connections. 2(3): 6–7.
Keywords: Fire, wildland-urban interface, education.
<http://www.treesearch.fs.fed.us/pubs/30435>

- ▶ Haight, R.G.; Fried, J.S. 2007.
Deploying wildland fire suppression resources with a scenario-based standard response model. INFOR. 45(1): 31–39.
Keywords: California Fire Economics Simulator, fire suppression, integer programming, linear programming, wildfire management.
<http://www.treesearch.fs.fed.us/pubs/29619>

- ▶ McKenzie, D.; Raymond, C.; Kellogg, L.B. [and others]. 2007.
Mapping fuels at multiple scales: landscape application of the Fuel Characteristic Classification System. Canadian Journal of Forest Research. (37): 2421–2437.
Keywords: Fuel Characteristic Classification System, fuelbed mapping.
<http://www.treesearch.fs.fed.us/pubs/29413>

- ▶ Ottmar, R.D.; Sandberg, D.V.; Riccardi, C.L. [and others]. 2007.
An overview of the Fuel Characteristic Classification System—quantifying, classifying, and creating fuelbeds for resource planning. Canadian Journal of Forest Research. 37: 2383–2393.
Keywords: FCCS, fuel characteristics, fuelbeds, fire potential.
<http://www.treesearch.fs.fed.us/pubs/29460>

- ▶ Riccardi, C.L.; Ottmar, R.D.; Sandberg, D.V. [and others]. 2007.
The fuelbed: a key element of the Fuel Characteristic Classification System. Canadian Journal of Forest Research. 37: 2394–2412.
Keywords: FCCS, fuel characteristics, fuelbeds, fire potential.
<http://www.treesearch.fs.fed.us/pubs/29403>

- ▶ Riccardi, C.L.; Prichard, S.J.; Sandberg, D.V. [and others]. 2007.

Quantifying physical characteristics of wildland fuels using the Fuel Characteristic Classification System. Canadian Journal of Forest Research. 37: 2413–2420.

Keywords: FCCS, fuel characteristics, fuelbeds, fire potential.

<http://www.treeseearch.fs.fed.us/pubs/29290>

- ▶ Sandberg, D.V.; Riccardi, C.L.; Schaaf, M.D. 2007.
- Fire potential rating for wildland fuelbeds using the Fuel Characteristic Classification System.** Canadian Journal of Forest Research. 37: 2456–2463.

Keywords: FCCS, fire potential, fire spread, crown fire, fuel consumption, smoldering.

<http://www.treeseearch.fs.fed.us/pubs/29292>

- ▶ Sandberg, D.V.; Riccardi, C.L.; Schaaf, M.D. 2007.
- Reformulation of Rothermel’s wildland fire behavior model for heterogeneous fuelbeds.** Canadian Journal of Forest Research. 37: 2438–2455.

Keywords: FCCS, Rothermal fire spread model.

<http://www.treeseearch.fs.fed.us/pubs/29408>

- ▶ Schaaf, M.D.; Sandberg, D.V.; Riccardi, C.L. [and others]. 2007.

A conceptual framework for ranking crown fire potential in wildland fuelbeds. Canadian Journal of Forest Research. 37: 2464–2478.

Keywords: FCCS, Rothermal fire spread model, crown fire, torching potential.

<http://www.treeseearch.fs.fed.us/pubs/29406>

- ▶ Toman, E.; Shindler, B.; Absher, J.; McCaffrey, S. 2008.

Postfire communications: the influence of site visits on local support. Journal of Forestry. 106(1): 25–30.

Keywords: Postfire planning, agency outreach, communication, social acceptability.

<http://www.treeseearch.fs.fed.us/pubs/30444>

- ▶ Yokelson, R.J.; Urbanski, S.P.; Atlas, E.L. [and others]. 2007.

Emissions from forest fires near Mexico City. Atmospheric Chemistry and Physics. 7: 5569–5584.

Keywords: Wildfire, emissions, nitric oxide, nitrogen dioxide, ammonia, hydrogen cyanide.

<http://www.treeseearch.fs.fed.us/pubs/29631>

Fish

- ▶ McDonald, L.L.; Bilby, R.; Bisson, P.A. [and others]. 2007.

Research, monitoring and evaluation of Fish and Wildlife Restoration projects in the Columbia River Basin: lessons learned and suggestions for large-scale monitoring programs. Fisheries. 32(12): 582–590.

Keywords: Salmon, Columbia River Basin, long-term monitoring.

<http://www.treeseearch.fs.fed.us/pubs/29623>

Forest Management

- ▶ Curran, M.; Maynard, D.; Heninger, R.; Terry, T.; Howes, S.; Stone, D.; Niemann, T.; Miller, R. 2008.

Elements and rationale for a common approach to assess and report soil disturbance. The Forestry Chronicles. 83(6): 852–866.

Keywords: Soil disturbance, forest productivity, hydrologic function, monitoring, soil compaction, soil displacement, soil erosion.

<http://www.treeseearch.fs.fed.us/pubs/30436>

- ▶ Devine, W.D.; Harrington, C.A.; Peter, D.H. 2007.
Oak woodland restoration: understory response to removal of encroaching conifers. *Ecological Restoration*. 25(4): 247–255.

Keywords: *Quercus garryana*, Oregon white oak, restoration, understory, microclimate.

<http://www.treeseearch.fs.fed.us/pubs/29606>

- ▶ Monserud, R.A.; Yang, Y.; Huang, S. [and others]. 2008.
Potential change in lodgepole pine site index and distribution under climatic change in Alberta. *Canadian Journal of Forest Research*. 38: 343–352.

Keywords: Climate change, lodgepole pine, productivity, dryness index, growing degree days.

<http://www.treeseearch.fs.fed.us/pubs/29812>

Genetics

- ▶ Rukavina, H.; Hughes, H.; Johnson, R. 2008.
Variation in saltgrass growth and time of fall dormancy related to geographical and climatic factors. *Journal of American Society of Horticultural Science*. 133(1): 127–132.
- Keywords:* Turfgrass breeding, phenotypic variability, cold hardiness, warm-season turfgrass.
- <http://www.treeseearch.fs.fed.us/pubs/29634>

Geomorphology and Hydrology

- ▶ Wondzell, S.M.; Gooseff, M.N.; McGlynn, B.L. 2007.
Flow velocity and the hydrologic behavior of streams during baseflow. *Geophysical Research Letters*. 34(L24404): 5.
- Keywords:* Streamflow velocity, stream discharge.
- <http://www.treeseearch.fs.fed.us/pubs/29629>

- ▶ Woodsmith, R.D.; Vache, K.B.; McDonnell, J.J. [and others]. 2007.

The Entiat Experimental Forest: a unique opportunity to examine hydrologic response to wildfire. In: Furniss, M.J.; Clifton, C.; Ronnenberg, K.L., eds. *Advancing the fundamental sciences: proceedings of the forest service national earth sciences conference*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 205–216.

Keywords: Watershed hydrology, fire effects, runoff modeling.

<http://www.treeseearch.fs.fed.us/pubs/29630>

Invertebrates

- ▶ Halaj, J.; Halpern, C.B.; Yi, H. 2008.
Responses of litter-dwelling spiders and carabid beetles to varying levels and patterns of green-tree retention. *Forest Ecology and Management*. (225): 887–900.
- Keywords:* Arthropod community structure, carabid beetles, forest litter, spiders, variable-retention harvest.
- <http://www.treeseearch.fs.fed.us/pubs/29620>

- ▶ Lundquist, J.E.; Zogas, K.P.; Snyder, C.L.; Schulz, B.K. 2008
Alaska biological control program directed at amber-marked birch leaf miner. *Western Forester*. January/February: 53(1).
- Keywords:* Nonnative invasive insects, Alaska, biological control, parasitoid wasps, entomopathogenic fungus, beneficial nematodes.
- <http://www.treeseearch.fs.fed.us/pubs/30440>

- ▶ Schultz, M.E.; De Santo, T.L. 2006.

Comparison of terrestrial invertebrate biomass and richness in young mixed red alder-conifer, young conifer, and old conifer stands of southeast Alaska. Northwest Science. 80(2): 120–132.

Keywords: Red alder, arthropods, invertebrates.

<http://www.treesearch.fs.fed.us/pubs/30443>

Land Use

- ▶ White, E.M.; Stein, S.M.; Alig, R.J. 2007.

National forests on the edge: development pressures on America's National Forest System.

In: Laband, D.N., ed. Proceedings, emerging issues along urban-rural interfaces II: linking land-use science and society. Auburn, AL: Auburn University: 241–244.

Keywords: Land use change, national forests, housing density, amenity migration.

<http://www.treesearch.fs.fed.us/pubs/30429>

Landscape Ecology

- ▶ Kellogg, L.-K.B.; McKenzie, D.; Peterson, D.L.; Hessel, A.E. 2008.

Spatial models for inferring topographic controls on historical low-severity fire in the eastern Cascade Range of Washington, USA. Landscape Ecology. 23: 227–240.

Keywords: Fire synchrony, topographic controls, spatial models, fire history.

<http://www.treesearch.fs.fed.us/pubs/30439>

- ▶ Malanson, G.P.; Butler, D.R.; Fagre, D.B. [and others]. 2007.

Alpine treeline of western North America and global climate change: linking organism-to-landscape dynamics. Physical Geography. 28(5): 378–396.

Keywords: Climate change, ecotone, landscape, scale, treeline.

<http://www.treesearch.fs.fed.us/pubs/29622>

Plant Ecology

- ▶ Bond, B.J.; Czarnomski, N.M.; Cooper C.; Day, M.E.; Greenwood, M.S. 2008.

Developmental decline in height growth in Douglas-fir. Tree Physiology. 27: 441–453.

Keywords: Age-related growth decline, grafting, *Pseudotsuga menziesii*.

<http://www.treesearch.fs.fed.us/pubs/30431>

- ▶ Goldstein, G.; Meinzer, F.C.; Bucci, S.J. [and others]. 2008.

Water economy of Neotropical savanna trees: six paradigms revisited. Tree Physiology. 28: 395–404.

Keywords: Cerrado, plant functional groups, stomata, transpiration.

<http://www.treesearch.fs.fed.us/pubs/29632>

- ▶ Kozovits, A.R.; Bustamante, M.M.C.; Garofalo, C.R. [and others]. 2007.

Nutrient resorption and patterns of litter production and decomposition in a Neotropical savanna. Functional Ecology. (21): 1034–1043.

Keywords: Cerrado, fertilization, nitrogen and phosphorus resorption, N:P ratio.

<http://www.treesearch.fs.fed.us/pubs/29621>

- ▶ Meinzer, F.C.; Bond, B.J.; Karanian, J.A. 2008.

Biophysical constraints on leaf expansion in a tall conifer. Tree Physiology. 28: 197–206.

Keywords: Douglas-fir, extensibility, osmotic adjustment, phenology, *Pseudotsuga menziesii*, tree height, turgor.

<http://www.treesearch.fs.fed.us/pubs/29811>

- ▶ Scholz, F.G.; Bucci, S.J.; Goldstein, G. [and others]. 2008.

Temporal dynamics of stem expansion and contraction in savanna trees: withdrawal and recharge of stored water. *Tree Physiology*. 28: 469–480.

Keywords: Capacitance, Cerrado, plant-water relations, sap flow.

<http://www.treesearch.fs.fed.us/pubs/29635>

- ▶ Warren, J.M.; Brooks, J.R.; Meinzer, F.C.; Eberhart, J.L. 2008.

Hydraulic redistribution of water from *Pinus ponderosa* trees to seedlings: evidence for an ectomycorrhizal pathway. *New Phytologist*. 178: 382–394.

Keywords: Common mycorrhizal network, ectomycorrhizal fungi, hydraulic lift, water transport.

<http://www.treesearch.fs.fed.us/pubs/30445>

- ▶ Brown, R.N.K.; Rosenberger, R.S.; Kline, S.D. [and others]. 2008.

Visitor preferences for managing wilderness recreation after wildfire. *Journal of Forestry*. Jan/Feb: 9–16.

Keywords: Wildland fire, recreation, wilderness management, public forest values.

<http://www.treesearch.fs.fed.us/pubs/30432>

Regional Assessments

- ▶ Patterson, T.M.; Niccolucci, V.; Marchettini, N. 2007.

Adaptive environmental management of tourism in the province of Siena, Italy, using the ecological footprint. *Journal of Environmental Management*. doi:10.1016/j.jenvman.2006.04.017

Keywords: Adaptive management, tourism, environmental assessment, ecological footprint.

<http://www.treesearch.fs.fed.us/pubs/30428>

Remote Sensing

- ▶ Andersen, H.-E.; McGaughey, R.J.; Reutebuch, S.E. 2008.

Assessing the influence of flight parameters, interferometric processing, slope and canopy density on the accuracy of X-band IFSAR-derived forest canopy height models. *International Journal of Remote Sensing*. 29(5): 1495–1510.

Keywords: IFSAR, forest canopy surface structure.

<http://www.treesearch.fs.fed.us/pubs/29944>

Resource Inventory

- ▶ Azuma, D.L.; Overhulser, D.L. 2008.

Effects of a western spruce budworm outbreak on private lands in eastern Oregon, 1980–1994. *Western Journal of Applied Forestry*. 23(1): 19–25.

Keywords: Forest inventory, defoliation, growth effects, stand structure.

<http://www.treesearch.fs.fed.us/pubs/30328>

Silviculture

- ▶ Poage, N.J. 2008.

Long-term basal area and diameter growth responses of western hemlock-Sitka spruce stands in southeast Alaska to a range of thinning intensities. In: *Integrated restoration of forested ecosystems to achieve multiresource benefits: proceedings of the 2007 national silviculture workshop*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 271–280.

Keywords: *Picea sitchensis*, southeast Alaska, thinning, Tongass, *Tsuga heterophylla*, young stand growth.

<http://www.treesearch.fs.fed.us/pubs/29813>

► Roberts, S.D.; Harrington, C.A.; 2008.
Individual tree growth response to variable density thinning in coastal Pacific Northwest forests. *Forest Ecology and Management*. 255(7): 2771–2781.
Keywords: Variable-density thinning, basal area growth, competition indices, canopy gaps, skid trails, edge effects.
<http://www.treesearch.fs.fed.us/pubs/30441>

Social Sciences

► Daugherty, P.J.; Fried, J.S. 2007.
Jointly optimizing selection of fuel treatments and siting of forest biomass-based energy production facilities for landscape-scale fire hazard reduction. *INFOR*. 45(1): 17–30.
Keywords: Biomass assessment, fire hazard reduction.
<http://www.treesearch.fs.fed.us/pubs/29479>

► Hummel, S.; Donovan, G.H.; Spies, T.A. [and others]. 2008.
Conserving biodiversity using risk management: hoax or hope? *Frontiers in Ecology and the Environment*. 6. DOI: 10.1890/070111.
Keywords: Biodiversity, risk management.
<http://www.treesearch.fs.fed.us/pubs/29633>

Soil

► Helgerson, O.; Miller, R.; 2008.
Keeping your forest soils healthy and productive. EB2019. Washington State University Extension.
Keywords: Soil management, soil nutrients, water quality and quantity, organic matter, soil texture, soil structure, root diseases, root pests.
<http://www.treesearch.fs.fed.us/pubs/30437>

► Homann, P.S.; Bormann, B.T.; Boyle, J.R.; Darbyshire, R. L.; Bigley, R. 2008.
Soil C and N minimum detectable changes and treatment differences in a multi-treatment forest experiment. *Forest Ecology and Management*. 255: 1724–1734.
Keywords: Soil nitrogen, soil carbon, minimum detectable change, minimum detectable difference, change detection.
<http://www.treesearch.fs.fed.us/pubs/30438>

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Long-term effects of stump removal to control root rot on forest soil bulk density, soil carbon and nitrogen content. *Forest Ecology and Management*. 255(3–4): 720–727.
Keywords: Soil nitrogen, soil carbon, laminated root rot, *Phellinus weirii*, soil bulk density, Douglas-fir.
<http://www.treesearch.fs.fed.us/pubs/30457>

Wildlife

► Forsman, E.; Swingle, J. 2007.
Use of arboreal nests of tree voles (*Arborimus* spp.) by amphibians. *Herpetological Conservation and Biology*. 2(2): 113–118.
Keywords: *Aneides ferreus*, *Aneides lugubris*, arboreality, *Arborimus*, *Dicamptodon ensatus*, *Pseudacris regilla*, tree vole.
<http://www.treesearch.fs.fed.us/pubs/29637>

Wood Utilization

► Gorman, T.M.; Green, D.W.; Cisternas, A.G. [and others]. 2007.
Structural lumber from suppressed-growth ponderosa pine from northern Arizona. *Forest Products Journal*. 57(12): 42–47.
Keywords: Suppressed growth, ponderosa pine, structural lumber.
<http://www.treesearch.fs.fed.us/pubs/29618>

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