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Forest Service

Pacific Northwest
Research Station

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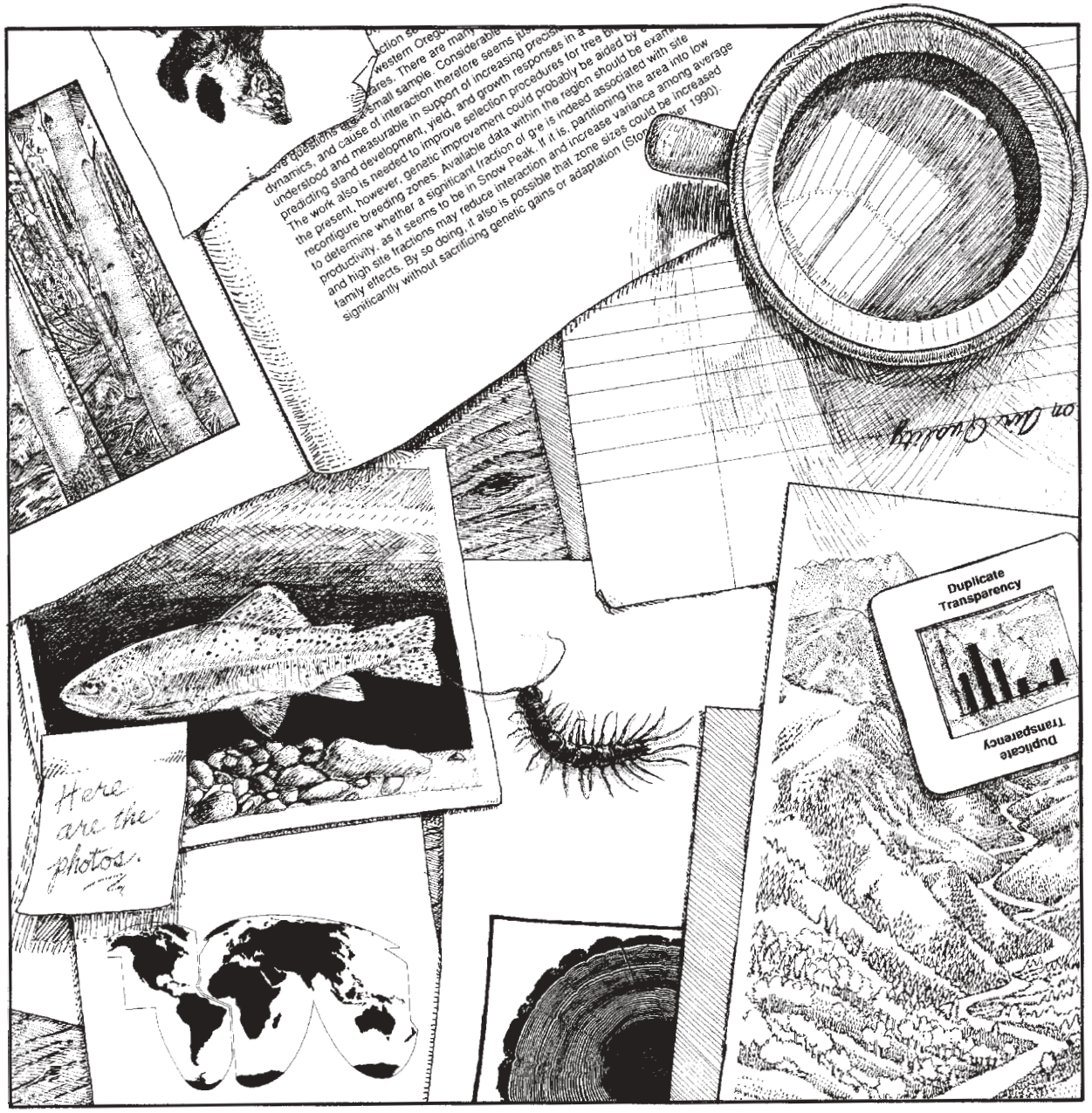

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January 2004

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Bibliographies

03-212

Pacific Northwest Research Station
2003. Recent publications of the Pacific Northwest Research Station, third quarter 2003. Portland, OR: U.S. Department of Agriculture, Forest Service. 20 p.

Keywords: Bibliographies (forestry).

Economics

03-141

Fight, R.D.; Zhang, X.; Hartsough, B.R.
2003. Users guide for STHARVEST: software to estimate the cost of harvesting small timber. Gen. Tech. Rep. PNW-GTR-582. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 12 p.

The STHARVEST computer application is Windows-based, public-domain software used to estimate costs for harvesting small-diameter stands or the small-diameter component of a mixed-size stand. The equipment production rates were developed from existing studies. Equipment cost rates were based on November 1998 prices for new equipment and wage rates for the Pacific Northwest. There are four ground-based and two cable harvesting systems. Harvesting costs can be estimated for both clearcutting and partial cutting for an average tree size ranging from 1 to 80 or 150 cubic feet depending on the system selected. Cost estimates are in U.S. dollars per 100 cubic feet or per green ton.

Keywords: Cost (logging), logging economics, timber management planning, software, simulation.

03-151

Nicholls, D.L.; Brackley, A.M.; Allen, T.
2003. Moisture distributions in western hemlock lumber from trees harvested near Sitka, Alaska. Res. Note PNW-RN-530. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 8 p.

Western hemlock (*Tsuga heterophylla*) can be characterized by localized regions of high-moisture-content wood, often referred to as wet pockets, and uneven drying conditions may occur when lumber of higher and lower moisture content is mixed together in a dry kiln. The primary objective of this preliminary study was to characterize the frequency and extent of wet pockets (wetwood) in western hemlock lumber sawn from trees harvested near Sitka, Alaska. Nine western hemlock logs were sampled from three trees, ranging in diameter from approximately 10 to 18 inches. Forty-five boards were processed, yielding 225 samples. Sample moisture content ranged from 31.4 percent to 149.7 percent (as a percentage of oven-dry wood weight), with a standard deviation of 30.6 percent. There was no significant moisture variation among sample heights for the three western hemlock trees included in this study. Average moisture content at a given height ranged from about 70 to 85 percent. Moisture contents of approximately 50 percent were not uncommon for pith-centered samples, whereas most samples more than 5 inches from the pith were typically at least 100-percent moisture content. There was considerable variation in overall moisture content among trees, ranging from about 69 to more than 85 percent. Moisture content variation among butt logs was also considerable, ranging from about 58 to 95 percent.

Keywords: Western hemlock, Tsuga heterophylla*, lumber, drying, sawmill, moisture content, Alaska.*

03-273

Warren, D.D.

2003. Production, prices, employment, and trade in Northwest forest industries, all quarters 2001. Resour. Bull. PNW-RB-239. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 171 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).

Ecosystem Structure and Function

03-144

Pacific Northwest Research Station

2003. Bonanza Creek Experimental Forest and Caribou-Poker Creeks Research Watershed [Brochure]. Portland, OR: U.S. Department of Agriculture, Forest Service. [Irregular pagination].

Bonanza Creek Experimental Forest and Caribou-Poker Creeks Research Watershed are located in the boreal forest of interior Alaska. Research focuses on basic ecological processes, hydrology, the changing boreal carbon cycle, disturbance regimes, and climate change in the boreal forest region. The Tanana River runs through the 12,486-acre Bonanza Creek Experimental Forest, which is about 20 miles southwest of Fairbanks. The 25,000-acre Caribou-Poker Creeks Research Watershed is 30 miles north of Fairbanks. Much research at both sites is done under the auspices of the Long-Term Ecological Research Program based at the University of Alaska Fairbanks. Access is restricted to both sites.

Keywords: Bonanza Creek, Caribou-Poker Creeks, experimental forest, research watershed, long-term ecological research.

Fire

03-152

Antos, J.A.; Halpern, C.B.; Miller, R.E. [and others]

2003. Temporal and spatial changes in soil carbon and nitrogen after clearcutting and burning of an old-growth Douglas-fir forest. Res. Pap. PNW-RP-552. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 19 p.

We used 135 permanent plots nested within 15 blocks to quantify changes in concentration and spatial variation of carbon (C) and nitrogen (N) in the mineral soil (0- to 10-centimeters depth) after logging and broadcast burning of an old-growth, Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) forest. Before harvest, surface soils averaged total C of 7.2 percent, total N of 0.19 percent, extractable NH_4^+-N of 5.2 µg/g, extractable NO_3^--N of 0.19 µg/g, and pH of 5.3. Samples collected 9 months after burning showed a 26-percent decline in concentrations of total C, but a 5-percent increase in concentration of total N. Concentrations of extractable mineral N (NH_4^+-N + NO_3^--N) increased to five times initial levels but returned to preharvest levels 1 year later. The coefficient of variation in extractable mineral N more than doubled after burning. Two and three years after burning, extractable N showed a significant and increasingly strong negative relation with plant biomass suggesting that N concentration was measurably reduced by plant uptake. Most variation in soil C and N before harvest occurred at small spatial scales (within and among 2- by 2-m plots); logging and broadcast burning had little effect on this pattern.

Keywords: Broadcast burning, soil carbon, soil nitrogen, soil variability, coast Douglas-fir, clearcutting.

03-027

Ferguson, S.A.; McKay, S.J.; Nagel, D.E. [and others]

2003. Assessing values of air quality and visibility at risk from wildland fires. Res. Pap. PNW-RP-550. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 59 p.

To assess values of air quality and visibility at risk from wildland fire in the United States, we generated a 40-year database that includes twice-daily values of wind, mixing height, and a ventilation index that is a product of wind and mixing height. The database provides the first, nationally consistent map of surface wind and ventilation index. In addition, it is the longest climate record of mixing height in the country. We built the database into an interactive ventilation climate information system that allows users to assess risk based on frequency patterns of poor, marginal, fair, and good ventilation conditions.

Keywords: Ventilation climate information system, ventilation index, air quality, visibility, mixing height, windspeed, wind direction.

Forest Management

02-331

Pacific Northwest Research Station

2003. Wind River Experimental Forest [Brochure]. Portland, OR: U.S. Department of Agriculture, Forest Service. [Irregular pagination].

The Wind River Experimental Forest, known as the cradle of forest research in the Pacific Northwest, is a major center for ecological and silvicultural research in west-side Pacific Northwest forests. The experimental forest is in the south-central area of the Gifford Pinchot National Forest in the state of Washington. This brochure describes current and past research associated with the forest, along with general information on the forest's location, environment, forest types, plant and animal species, and geology. The forest also is noted for the Wind River Canopy Crane Research Facility, established in 1994 and operated by three partners, including the Pacific Northwest Research Station.

Keywords: Wind River Experimental Forest, experimental forest, canopy crane.

03-142

Rapp, V.

2003. New findings about old-growth forests. Science Update 4. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 12 p.

Old-growth forests have structural complexity that leads to ecological complexity—which makes possible the famous biodiversity of the Pacific Northwest old-growth forests. By using new techniques, scientists are learning much about canopy complexity and development in old-growth forests. Old-growth forests developed along multiple pathways, and scientists are learning that the journey matters. Heterogeneity in the pathways to old-growth forests accounts for many of the differences among old-growth forests. The new findings suggest we may need to change our strategies for conserving and restoring old-growth values. As we recognize greater complexity in forests, we can consider greater complexity in our cultural responses to forests as well.

Keywords: Old-growth forests, canopy complexity, pathways, forest ecology.

Mycology

02-234

Pilz, D.; Norvell, L.; Danell, E.; Molina, R. 2003. Ecology and management of commercially harvested chanterelle mushrooms. Gen. Tech. Rep. PNW-GTR-576. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 83 p.

During the last two decades, the chanterelle mushroom harvest from Pacific Northwest forests has become a multimillion dollar industry, yet managers, harvesters, and scientists lack a current synthesis of information about chanterelles. We describe the global context of our commercial chanterelle harvest by discussing chanterelles around the world, their international markets, our current understanding of the organism, reasons for declining production in parts of Europe, and efforts to cultivate chanterelles. Shifting focus back to chanterelles of the Pacific Northwest, we describe our species, regional forest management issues, recent studies, and future research and monitoring needed to sustain this prized resource.

Keywords: Chanterelle mushrooms, forest management, nontimber forest products, Cantharellus, Craterellus, Gomphus, Polyozellus.

Natural Resource Policy

03-245

Houston, L.L.; Watanabe, M.; Kline, J.D.; Alig, R.J. 2003. Past and future water use in Pacific Coast States. Gen. Tech. Rep. PNW-GTR-588. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 37 p.

We examine socioeconomic factors affecting water demand and expected trends in these factors. Based on these trends, we identify past, current, and projected withdrawal of surface water for various uses in Pacific Coast States (California, Idaho, Oregon, and Washington), including public, domestic, commercial, industrial, thermoelectric, livestock, and irrigation. Additionally, we identify projected demands for nonconsumptive instream recreational uses of water, such as boating, swimming, and fishing, which can compete with consumptive uses. Allocating limited water resources across multiple users will present water resource managers and policymakers with distinct challenges as water demands increase. To illustrate these challenges, we present a case study of issues in the Klamath Basin of northern California and southern Oregon. The case study provides an example of the issues involved in allocating scarce water among diverse users and uses, and the difficulties policymakers face when attempting to design water allocation policies that require tradeoffs among economic, ecological, and societal values.

Keywords: Water quality, water quantity, demand, recreation, Klamath Basin.

Rural Communities

02-212

McCool, S.F.; Kruger, L.E. 2003. Human migration and natural resources: implications for land managers and challenges for researchers. Gen. Tech. Rep. PNW-GTR-580. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 19 p.

Rural areas of the Pacific Northwest experienced a dramatic growth in population during the late 1980s to early 1990s. This growth was fueled by both push and pull factors, including environmental and natural resource-based amenities. Such growth has not only stressed the capacity of rural counties and communities to cope with change but also has raised important questions about interactions between people and natural resources. This paper explores four fundamental components of this interaction: (1) the drivers of population growth; (2) the consequences of population growth, primarily for management of natural resources; (3) the potential changes in the social and psychological links between people and natural resources that may accompany rapid migration; and (4) the best way to measure and assess the consequences of population growth in rural

areas. Some fundamental propositions within each of these components are presented. We use examples from Kittitas County, Washington, to illustrate our discussion.

Keywords: Human migration, population growth, natural resource management, environmental amenities, social and environmental change, population dynamics.

Soil

03-064

Landsberg, J.D.; Miller, R.E.; Anderson, H.W.; Tepp, J.S.

2003. Bulk density and soil resistance to penetration as affected by commercial thinning in northeastern Washington. Res. Pap. PNW-RP-551. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 35 p.

Bulk density and soil resistance to penetration were measured in ten 3- to 11-ha operational units in overstocked, mixed-conifer stands in northeastern Washington. Resistance was measured with a recording penetrometer to the 33-cm depth (13 in) at 10 stations in each of 8 to 17, 30.5-m-long, randomly located transects in each unit. Subsequently, different combinations of felling and yarding equipment were used to thin eight units; no combination was replicated. Two units remained as nonharvested controls. Soil measurements were repeated after harvest. Most trails were designated, others were supplemental, especially where designated trails were spaced at 40 m (130 ft) (center to center). Trails occupied 6 to 57 percent of the area of harvested units. In the 15- to 25-cm depth, average resistance to penetration on trails increased by 500 kPa or more in six of the eight units. Drier soil in the after-harvest sampling on the flat terrain may have contributed to increased resistance. Bulk density on trails after harvest (fall 1999) averaged 3 to 14 percent greater than that in nontrail portions. Area and severity of soil compaction were less on steep terrain than on flat terrain, probably because soil textures were sandier. Whether compaction was sufficiently severe to hinder root penetration or reduce tree growth is unknown. The absence of replication precluded statistical testing for differences among the several combinations of harvesting equipment and trail spacing.

Keywords: Soil strength, penetration resistance, cone, penetrometer, bulk density, commercial thinning, northeastern Washington, ashy soils, yarding equipment, soil disturbance.

Wildlife

03-137

Mazza, R.

2003. Hunter demand for deer on Prince of Wales Island, Alaska: an analysis of influencing factors. Gen. Tech. Rep. PNW-GTR-581. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 21 p.

Overall hunter demand for deer on Prince of Wales Island, Alaska, has not changed significantly in the past 10 years, although demand has increased in five communities on the island. These five communities each experienced a decline in household median income between 1989 and 1999. In communities with a smaller percentage of Native Alaskans, deer was a larger component of their subsistence harvest. The cash-based market economy on Prince of Wales Island is in transition as the dependence on logging and commercial fishing declines. The subsistence economy in Alaska has traditionally provided security to residents during lulls or downturns in the market economy. Overall employment opportunities in southeast Alaska are projected to decline between 2000 and 2010. An area of projected growth, however, is in tourism and recreation-based employment, from which residents on the island may be able to benefit. Change in employment opportunities may change demand for deer.

Keywords: Hunting, subsistence, southeast Alaska, Prince of Wales Island, Sitka black-tailed deer.

Publications Available Elsewhere

The following publications are available through interlibrary loan, by writing to the locations indicated, or by using the form indicated. Many journal articles are available on our Web site at http://www.fs.fed.us/pnw/publications/nonstation.shtml.

Atmosphere

Gedalof, Z.; Mantua, N.J.; Peterson, D.L.
2002. A multi-century perspective of variability in the Pacific Decadal Oscillation: new insights from tree rings and coral. Geophysical Research Letters. 29(24): 57-1–57-4.

Annual growth increments from trees and coral heads provide an opportunity to develop proxy records of climatic variability that extend back in time well beyond the earliest instrumental periods and in regions where records have not been kept. This paper combines five published proxy records of North Pacific climatic variability that correlate well with the Pacific Decadal Oscillation (PDO) index. The records suggest that the PDO may not have been an important organizing structure in the North Pacific climate system over much of the 19th century, possibly indicating changes in the spatial pattern of sea-level pressure and consequent surface climate patterns of variability over the Americas.

Keywords: Climatic variability, North Pacific, Pacific Decadal Oscillation, paleoclimate.

(See Seattle order form.)

Economics

Fight, R.D.
2002. Financial analysis of thinning small diameter trees on the Colville National Forest. In: Baumgartner, D.M.; Johnson, L.R.; DePuit, E.J., eds., comps. Small diameter timber: resource management, manufacturing, and markets—symposium proceedings. MISC0509. Pullman, WA: Washington State University, Cooperative Extension: 139-141.

An ongoing set of research studies on the Colville National Forest provide the background for this financial analysis of thinning small-diameter trees. This analysis was based on data from eight timber sale units that were thinned with a common silvicultural prescription. For purposes of this analysis, additional prescriptions were simulated. A variety of harvesting systems were used on four units on steep ground and four units on gentle ground in order to do cost studies on the different systems. Harvesting costs were simulated for two ground-based systems and one cable system. A regression equation was developed from the 120 simulated scenarios to demonstrate the relative importance of tree size, harvest volume per acre, and harvesting system on the expected net return. All three of these variables were highly significant.

Keywords: Small timber, financial analysis, thinning.

(See Portland order form.)

Loomis, J.B.; Quattlebaum, K.; Brown, T.C.; Alexander, S.J.

2003. Expanding institutional arrangements for acquiring water for environmental purposes: transactions evidence for the Western United States. Water Resources Development. 19(1): 21-28.

Market purchases of water rights for environmental purposes in the Western United States have involved purchases of at least 88,850 acre-feet of water at a cost of $54 million in the past 5 years. Annual water leasing has been even more active, with 1.72 million acre-feet leased in the Western United States at a cost of $52 million. The most frequent reasons for these government agency transactions are for wildlife, recreation, and fisheries. The average price paid for a water right is $609 per acre-foot and $30 per acre-foot for water leased. As evidenced by the ability of government agencies to purchase water in voluntary transactions, environmental uses of water are economically competitive with many agricultural crops in the West.

Keywords: Water valuation, transactions evidence.

(See Corvallis order form 2.)

Ecosystem Structure and Function

Bashan, Y.; Li, C.Y.; Lebsky, V.K. [and others]

2002. Primary colonization of volcanic rocks by plants in arid Baja California, Mexico. Plant Biology. 4: 392-402.

In an arid region of Baja California, Sur, Mexico, field observations, combined with chemical and physical analyses, mineral analysis, and scanning electron microscopy of unweathered and weathered volcanic rocks, revealed the presence of rock-colonizing plants (most are tree-shaped cacti, possibly rock weathering) growing in volcanic rocks without benefit of soil. Many are at the seedling stage. At least four cactus species and one tree were capable of cracking, growing in, and colonizing cliffs and rocks formed from ancient lava flows and, consequently, forming soil for succession by other plant species. This study shows that plant colonization of volcanic rocks may assist soil formation, which eventually leads to accumulation of soil, water, and nutrients in a desert terrestrial ecosystem that otherwise lacks these essential plant-growth variables.

Keywords: Rock colonization, rock weathering, soil formation, rock-weathering cacti.

(See Corvallis order form 1.)

Bormann, B.T.; Keller, C.K.; Wang, D. [and others]

2002. Lessons from the sandbox: Is unexplained nitrogen real? Ecosystems. 5: 727-733.

Large nitrogen accumulations in experimental pine ecosystems were reevaluated to explore possible sources of uncertainty and to evaluate mesocosm methods. Large nitrogen accumulations and methods used were reaffirmed, suggesting a need for more intensive study of the phenomenon.

Keywords: Unexplained nitrogen accumulation, lysimeters, mesocosms, ecosystem budget, mass balance, nitrogen.

(See Corvallis order form 1.)

Gierasimiuk, J.; Strzelczyk, E.; Rózycki, H.; Li, C-Y

2001. Studies on fast and slow growing bacteria occurring in the root-free soil, rhizosphere, and mycorrhizosphere of nursery seedlings and 70-year old trees of Scots pine (*Pinus sylvestris* L.)—nutritional requirements and physiological properties. Folia Forestalia Polonica. 43: 115-126.

Studies were carried out on the nutritional and physiological properties of the fast- and slow-growing bacteria from the root-free soil, the rhizosphere and the mycorrhizosphere of seedlings and old trees of Scots pine (*Pinus sylvestris* L.). Among the fast- and slow-growing bacteria, different nutritional groups were

predominant (B, AG, Y, A). The differences in frequency of occurrence of bacterial strains having the following physiological properties—hydrolytic activity, acidification of glucose, reduction of methylene blue, nitrate to nitrite reduction, and ammonification—were observed.

Keywords: Scots pine, Pinus sylvestris*, fast-growing bacteria, slow-growing bacteria, nutritional groups, physiological properties.*

(See Corvallis order form 1.)

Martin, T.A.; Brown, K.J.; Kuèera, J. [and others]
2001. Control of transpiration in a 220-year-old *Abies amabilis* forest. Forest Ecology and Management. 152: 211-224.

We measured sap flow at the branch and tree levels, and calculated tree transpiration at the stand level, in a 220-year-old *Abies amabilis* forest. Maximum tree sap flow rates normalized by leaf area were similar to those previously measured in a younger *A. amabilis* forest, but dominant trees in the old-growth stand transpired approximately three times more per day than dominant trees in the younger forest. The difference was attributed primarily to leaf area: dominant trees in the old-growth stand had approximately three times more leaf area than those in the younger stand. Daily stand transpiration ranged from less than 0.4 millimeter (mm) to greater than 3.3 mm depending on radiation and vapor pressure deficit.

Keywords: Transpiration, Pacific silver fir, Abies amabilis*, sap flow, leaf area.*

(See Corvallis order form 2.)

Reynolds, K.M.
2001. EMDS: using a logic framework to assess forest ecosystem sustainability. Journal of Forestry. 99(6): 26-30.

More and more, bioregional assessments are being viewed as essential components of ecosystem management. But forestry professionals and others have identified several challenges posed by this new brand of regional-scale analysis. This article summarizes key challenges facing assessments in general, describes use of a logic-based modeling framework with an example of evaluating forest ecosystem sustainability in particular, and discusses ways in which logic-based modeling can help address the challenges of bioregional assessment.

Keywords: Assessment, logic-based modeling, sustainability.

(See Corvallis order form 2.)

Spies, T.A.; Hibbs, D.E.; Ohmann, J.L. [and others]
2002. The ecological basis of forest ecosystem management in the Oregon Coast Range. In: Hobbs, S.D.; Hayes, J.P.; Johnson, R.L. [and others], eds. Forest and stream management in the Oregon Coast Range. Corvallis, OR: Oregon State University Press: 31-67. Chapter 3.

We discuss 12 major ecological themes (regional environment, ecosystem types and patterns, vegetation in geologic history, deciduous forests, riparian zones, productivity, disturbance, tree death and decomposition, forest development, human influences, road effects, and aquatic-terrestrial links) that we believe form the foundation of ecologically based forest management in the Coast Range of Oregon. These are divided into three general categories: (1) ecosystem patterns and history, (2) disturbance and vegetation development, and (3) landscape interactions. We conclude with a discussion of how an understanding of natural processes can contribute to reaching ecosystem goals. We draw primarily on information developed in the Coast Range but include information from other parts of Oregon and other regions where appropriate.

Keywords: Ecosystem management, disturbance, landscapes, succession.

(Available in bookstores and libraries.)

Fish

Gende, S.M.; Edwards, R.T.; Willson, M.F.; Wipfli, M.S.
2002. Pacific salmon in aquatic and terrestrial ecosystems. BioScience. 52(10): 917-928.

Because of increased interest in salmon, growing indications of their ecological importance, and recent calls for management to consider the role of salmon in aquatic and terrestrial ecosystems, we review what is understood about salmon as key elements of ecological systems. First, we expand on previous reviews of salmon to include recent research that has amplified and modified earlier ideas about the contribution of salmon to ecosystem processes. In doing so, we first describe the composition, magnitude, and distribution of marine inputs to freshwater and terrestrial systems via salmon. We utilize an expanding group of studies pertaining to stream nutrient budgets and salmon physiology to construct a schematic that illustrates salmon-derived products and the pathways by which they enter (and are retained in) aquatic and terrestrial food webs. We then consider the variation associated with salmonid ecosystems and how this may influence the ecological response to the salmon input. We consider how this variation in ecosystem response may influence management and conservation efforts. We conclude with some beneficial research directions.

Keywords: Salmon, Oncorhynchus*, consumers, ecosystem, productivity.*

(See Juneau order form.)

Reeves, G.H.; Burnett, K.M.; Gregory, S.V.
2002. Fish and aquatic ecosystems of the Oregon Coast Range. In: Hobbs, S.D.; Hayes, J.P.; Johnson, G.H. [and others], eds. Forest and stream management in the Oregon Coast Range. Corvallis, OR: Oregon State University Press: 68-98. Chapter 4.

This chapter reviews the ecology and life history of anadromous salmon and trout in the Oregon Coast Range and the impacts of land management activities on their freshwater habitat. Options for managing aquatic ecosystems in a dynamic context are presented.

Keywords: Oregon Coast Range, anadromous salmon, anadromous trout, aquatic ecosystems.

(Available from bookstores and libraries.)

Zimmerman, C.E.; Reeves, G.H.
2002. Identification of steelhead and resident rainbow trout progeny in the Deschutes River, Oregon, revealed with otolith microchemistry. Transactions of the American Fisheries Society. 131: 986-993.

The distribution of the progeny of steelhead and resident rainbow trout (*Oncorhynchus mykiss*) in mainstem and intermittent tributary rearing habitats was compared in the Deschutes River, Oregon. Mainstem rearing habitats were almost exclusively used by the progeny of resident rainbow trout, and the lower portions of tributaries exhibiting intermittency and high water temperatures were used exclusively by steelhead progeny. The upper portion of one tributary contained only progeny of resident rainbow trout upstream of a barrier to steelhead migration suggesting that resident populations were present in the headwaters of that stream. Growth was greater in tributary habitats owing to warmer water temperatures. Intermittent tributaries provide important spawning and rearing habitat for steelhead in spite of the risks associated with spawning in streams characterized by harsh environmental conditions. Differential habitat use by steelhead and resident rainbow trout may play an important role in the segregation of the two life history forms in the Deschutes River.

Keywords: Steelhead, rainbow trout, interactions.

(See Corvallis order form 2.)

Forest Management

Baumgartner, D.M.; Johnson, L.R,; DePuit, E.J. 2002. Small diameter timber: resource management, manufacturing, and markets—symposium proceedings. MISC0509. Pullman, WA: Washington State University, Cooperative Extension. 268 p.

This publication is a compilation of papers and abstracts presented at a 2002 symposium in Spokane, Washington. The symposium and its contributed papers focused on the complex challenges of managing densely stocked stands of small-diameter trees and the national significance of the small-diameter timber resource. New developments in ecology, management, harvesting systems, manufactured products, and market issues were presented by over 60 representatives of research, management, industry, and private sectors.

Keywords: Small-diameter timber, CROP stands, forest management, manufacturing and markets.

(Copies of this compilation can be purchased from Bulletin Office, Washington State University, P.O. Box 645912, Pullman, WA 99164. You can contact them at (509) 335-2857 or visit their Web page at http://pubs.wsu.edu.)

Harrington, C.A.; Kern, C. 2002. Will Garry oak respond to release from overtopping conifers? In: Burton, P.J., ed. Garry oak ecosystem restoration: progress and prognosis. Proceedings of the 3rd annual meeting of the British Columbia chapter of the Society for Ecological Restoration. Victoria, BC: University of Victoria: 39-46.

Garry oak (*Quercus garryana*) woodlands provide unique habitat for many Pacific Northwest species, but these habitats are rapidly disappearing as conifers invade oak stands or land use changes to urban or agricultural. Many former savannas or oak woodlands on the Fort Lewis Military Reservation (near Tacoma, WA) have been invaded by, and are currently overtopped by, Douglas-fir (*Pseudotsuga menziesii*). The shade-intolerant oak has probably survived in these stands owing to past thinning activities; however, as the Douglas-fir continue to increase in height, we expect most of the oaks will not survive for long. This study's primary objectives are to determine if overtopped oaks will respond to release treatments, and if so, what pretreatment tree and stand characteristics can be used to predict response to release. The study uses three levels of release in each of four stands overtopped by Douglas-fir. The treatments were applied prior to the 2001 growing season. Baseline data are available for trees and understory vegetation. First-year results are available for acorn production, epicormic branching, and microclimate variables. Based on results from thinning in eastern oak forests and the fact that we did not observe any mortality or appearance of stressed foliage for the first year, we suspect most oak trees will respond positively to release, but an increase in growth rate may not be measurable for several years.

Keywords: Garry oak, Quercus garryanna*, restoration, forest management, acorn production, epicormic branches, understory vegetation.*

(See Olympia order form.)

Monserud, R.A.; Haynes, R.W.; Johnson, A.C. 2003. Compatible forest management. Dordrecht, The Netherlands: Kluwer Academic Publishers. 517 p.

Public debate has stimulated interest in finding greater compatibility among forest management regimes. The debate has often portrayed management choices as tradeoffs between biophysical and socioeconomic components of ecosystems. Here we focus on specific management strategies and emphasize broad goals such as biodiversity, wood production, and habitat conservation while maintaining other values from forest lands desired by the public. We examine the following proposition: Commodity production (timber, nontimber forest products) and the other forest values (biodiversity, fish and wildlife habitat) can be simultaneously produced for the same area in a socially acceptable manner. Based on recent research in the Pacific Northwest, we show there are alternatives for managing forest ecosystems that avoid the divisive

arena of “either-or” choices. Much of the work discussed in this book addresses two aspects of the compatibility issue. First, how are various forest management practices related to an array of associated goods and services? Second, how do different approaches to forest management affect relatively large and complex ecosystems?

Keywords: Forest management, societal values, wood production, tradeoffs, compatibility.

(Available from bookstores and libraries.)

Genetics

Cronn, R.; Cedroni, M.; Haselkorn, T. [and others].
2002. PCR-mediated recombination in amplification products derived from polyploid cotton. Theoretical and Applied Genetics. 104: 482-489.

Polymerase chain reaction (PCR) combination describes a process of in vitro chimera formation from nonidentical templates. The key requirement of this process is the inclusion of two partially homologous templates in one reaction, a condition met when amplifying any locus from polyploid organisms and members of multigene families from diploid organisms. Because polyploids possess two or more divergent genomes in a common nucleus, intergenic chimeras can form during the PCR amplification of any gene. Here we report a high frequency of PCR-induced recombination for four low-copy genes from allotetraploid cotton (*Gossypium hirsutum*). Amplification products from these genes range in length form 860 to 5,050 bp. Intergenomic recombinants were formed frequently, accounting for 23 of the 74 amplicons evaluated, with the frequency of recombination in individual reactions ranging from 0 to approximately 89 percent. Inspection of the putative recombination zones failed to reveal sequence-specific attributes that promote recombination. The high levels of observed in vitro recombination indicate that the tacit assumption of exclusive amplification of target templates may often be violated, particularly from polyploid genomes. This conclusion has profound implications for population and evolutionary genetic studies, where unrecognized artifactually recombinant molecules may bias results or alter interpretations.

Keywords: Cotton, Gossypium*, polyploidy, WA sequencing, phylogeny.*

(See Corvallis order form 1.)

Gartner, B.; Johnson, R.; Grotta, A. [and others]
2002. Impact of Swiss needle cast on wood quality of Douglas-fir. In: Filip, G., ed. Swiss needle cast cooperative: annual report 2002. Corvallis, OR: Oregon State University, College of Forestry: 44-49.

Three 5-acre plots were sprayed with Bravo fungicide for 5 years and compared with three adjacent unsprayed plots. Plots where Swiss needle cast (SNC) was controlled with fungicide had wider growth rings, a larger proportion of earlywood, higher sapwood moisture content, and wider cell walls in the earlywood. Comparisons between two progeny trials with differing levels of disease also demonstrated that SNC increases the proportion of latewood. Groupings of families (tolerant, average, intolerant) maintained their wood property ranking regardless of the disease severity at each site.

Keywords: Swiss needle cast, wood quality, genetics.

(See Corvallis order form 1.)

Johnson, G.R.
2002. Genetic variation in tolerance of Douglas-fir to Swiss needle cast as assessed by symptom expression. Silvae Genetica. 51: 2-3.

The incidence of Swiss needle cast on Douglas-fir has increased significantly in recent years on the Oregon coast. Genetic variation in foliage traits was assessed in two series of progeny trials to determine whether these “crown health” indicators were under genetic control and correlated with resistance or tolerance; tolerance being continued growth in the presence of high disease pressure. Foliage traits generally had lower heritabilities than growth traits and were

usually correlated with diameter growth. Foliage traits of crown density and color appeared to be reasonable indicators of disease tolerance. In the absence of basal-area data, screening of foliage traits can help screen for families that show tolerance to the disease.

Keywords: Phaeocryptopus gaeumannii*,* Pseudotsuga menziesii*, genetic gain.*

(See Corvallis order form 1.)

Johnson, R.; Temel, F.; Jayawickrama, K. 2002. Genetic studies involving Swiss needle cast. In: Filip, G., ed. Swiss needle cast cooperative: annual report 2002. Corvallis, OR: Oregon State University, College of Forestry: 38-43.

The analyses of three studies are presented. Families sampled across the Siuslaw National Forest showed differences in foliage health traits, but very little of the variation could be explained by environmental conditions at parent tree locations. Five Nehalem progeny trials were measured for diameter at breast height. The best families continued to have reasonable basal area increments, implying that genetic improvement can produce stock that could offset the 30-percent volume growth reduction predicted in moderately impacted Swiss needle cast areas. A third study suggested that Douglas-fir families do not appear to increase first-year needle production in response to needle loss, and families may differ in the amount of foliage they produce for a given branch diameter.

Keywords: Swiss needle cast, Douglas-fir, Pseudotsuga menziesii*.*

(See Corvallis order form 1.)

Maguire, D.; Kanaskie, A.; Mainwaring, D. [and others] 2002. Growth impact study: growth trends during the second 2-year period following establishment of permanent plots. In: Filip, G., ed. Swiss needle cast cooperative: annual report 2002. Corvallis, OR: Oregon State University, College of Forestry: 28-32.

Permanent plots that have been monitored for Swiss needle cast (SNC) severity (needle retention) and growth were remeasured for a second 2-year growth period. The plots with extreme needle retention scores had moderated with time. Foliage retention continued to have a significant effect on volume growth. Volume growth of SNC-impacted sites compared to volume growth on sites with the highest foliage retention revealed relative growth losses of approximately 52 percent in severely impacted stands and an average loss of 21 percent overall. Results are consistent with previous growth estimates from the retrospective work and first 2-year increments from these plots.

Keywords: Swiss needle cast, growth modeling.

(See Corvallis order form 2.)

Wendel, J.F.; Cronn, R.C.; Johnston, J.S.; Price, H.J. 2002. Feast and famine in plant genomes. Genetica. 115: 37-47.

Plant genomes vary over several orders of magnitude in size, even among closely related species, yet the origin, genesis, and significance of this variation are not clear. Because DNA content varies over a sevenfold range among diploid species in the cotton genus (*Gossypium*) and its allies, this group offers opportunities for exploring patterns and mechanisms of genome size evolution. For example, the question has been raised whether plant genomes have a “one-way ticket to genomic obesity” as a consequence of retroelement accumulation. Few empirical studies directly address this possibility, although it is consistent with recent insights gleaned from evolutionary genomic investigations. We used a phylogenetic approach to evaluate the directionality of genome size evolution among *Gossypium* species and their relatives in the cotton tribe (Gossypieae, Malvaceae). Our results suggest that both DNA content increase and decrease have occurred repeatedly during evolution. In contrast to a model of unidirectional genome size change, the frequency of inferred genome size contraction exceeded that of expansion. In conjunction with other evidence, this finding highlights the

dynamic nature of plant genome size evolution and suggests that poorly understood genomic contraction mechanisms operate on a more extensive scale than previously recognized. Moreover, the research sets the stage for fine-scale analysis of the evolutionary dynamics and directionality of change for the full spectrum of genomic constituents.

Keywords: Cotton, Gossypium*, DNA content, genome evolution, Malvaceae, molecular evolution, 2C values.*

(See Corvallis order form 2.)

Geomorphology and Hydrology

Buffington, J.M.; Lisle, T.E.; Woodsmith, R.D.; Hilton, S.

2002. Controls on the size and occurrence of pools in coarse-grained forest rivers. River Research and Applications. 18: 507-531.

Controls on pool formation are examined in gravel- and cobble-bed rivers in forest mountain drainage basins of northern California, southern Oregon, and southeastern Alaska. We demonstrate that the majority of pools at our study sites are formed by flow obstructions and that pool geometry and frequency largely depend on obstruction characteristics (size, type, and frequency). The effectiveness of obstructions to induce scour also, however, depends on channel characteristics, such as channel gradient, width-depth ratio, relative submergence (ratio of flow depth to grain size), and the caliber and rate of bed material supply. Moreover, different reach-scale channel types impose different characteristic physical processes and boundary conditions that further control the occurrence of pools within a watershed. Our findings indicate that effective management of pools and associated aquatic habitat requires consideration of a variety of factors, each of which may be more or less important depending on channel type and location within a watershed. Consequently, strategies for managing pools that are based solely on single-factor, regional target values (e.g., a certain number of wood pieces or pools per stream length) are likely to be ineffective because they do not account for the variety of local and watershed controls on pool scour and, therefore, may be of limited value for proactive management of complex ecosystems.

Keywords: Pool scour, flow obstructions, wood debris, forest channels, resource management, mountain drainage basins.

(See Wenatchee order form.)

Invertebrates

Hastings, F.L.; Holsten, E.H.; Shea, P.J.; Werner, R.A.

2001. Carbaryl: a review of its use against bark beetles in coniferous forests of North America. Environmental Entomology. 30(5): 803-810.

We reviewed the application of carbaryl (1-naphthyl N-methylcarbamate) against bark beetles (Scolytidae) in forest trees (Pinaceae) of North America. Our objective was to encapsulate carbaryl's 30-year history of successes and limitations against these beetles and to present appropriate safety and environmental information that relates to this use.

Keywords: Carbaryl, bark beetles, environmental safety, acetylcholinesterase, Scolytidae, Pinaceae.

(See Anchorage order form.)

Perkins, D.L.; Roberts, D.W.

2003. Predictive models of whitebark pine mortality from mountain pine beetle. Forest Ecology and Management. 174: 495-510.

Stand-level and tree-level data collected from whitebark pine (*Pinus albicaulis* Engelm.) stands in central Idaho were used to develop statistical models to estimate the probability of attack and mortality of whitebark pine caused by mountain pine beetle (*Dendroctonus ponderosae* Hopkins) (Coleoptera: Scolytidae). Logistic regression models were calibrated from reconstructed preepidemic stand conditions and post-epidemic mortality levels resulting from a widespread mountain pine beetle outbreak that occurred from 1909 to 1940. Basal area and stand density index were significant predictors

of stand attack. Tree diameter, basal area per 0.04 hectare, trees per 0.04 hectare, and number of stems in a tree cluster were significant predictors of individual tree attack. The models may be used to estimate anticipated cumulative mortality in currently or potentially infested whitebark pine stands. Predictor variables selected by the models corroborate the susceptible host characteristics identified in other mountain pine beetle-caused pine mortality systems. This work presents evidence of the generality of host susceptibility characteristics across pine species and over elevation gradients.

Keywords: Whitebark pine, mountain pine beetle, Dendroctonus ponderosae*.*

(See La Grande order form.)

Wickman, B.E.; Torgersen, T.R.; Furniss, M.M.
2002. Photographic images and history of forest insect investigations on the Pacific slope, 1903-1953. Part 2. Oregon and Washington. American Entomologist. 48(3): 178-185.

This historical narrative describes the work, travels, and duty stations of the earliest forest entomologists in the U.S. Department of Agriculture in Oregon and Washington. Augmented by 15 photographs taken by these pioneering entomologists and photographers, this article documents the insect outbreaks that affected decisions about where entomological units should be located and who would be hired by the newly formed Division of Insect Investigations. The professionals in the new division, in the Bureau of Entomology, were hired to deal with expansive infestations of mountain pine beetle, western hemlock looper, beetle damage to the trees killed in the Tillamook Burn and historical windstorms, and defoliating insects like the Douglas-fir tussock moth and western spruce budworm. The location and organization of the photographic files documenting the investigations of the entomologists of the time are described.

Keywords: Entomology, insect outbreaks.

(See La Grande order form.)

Land Use

Alig, R.J.; Adams, D.M.; McCarl, B.A.
2002. Projecting impacts of global climate change on the US forest and agricultural sectors and carbon budgets. Forest Ecology and Management. 169: 3-14.

A multiperiod, regional, mathematical programming model is used to evaluate the potential economic impacts of global climatic change scenarios on the U.S. forest and agricultural sectors, including impacts on forest carbon inventories. Four scenarios of the biological response of forests to climate change (reflected by changes in forest growth rates) are drawn from a national assessment of climate change and are based on combinations of global circulation and ecological process models. These scenarios are simulated in the linked forest and agricultural sector model, and results are summarized to characterize broad impacts of climate change on the sectors. We find that less cropland is projected to be converted to forests, forest inventories generally increase, and that aggregate economic impacts (across all consumers and producers in the sector) are relatively small. Producers' income is most at risk, and impacts of global change on the two sectors differ over the 100-year projection period. The forest sector is found to have adjustment mechanisms that mitigate climate change impacts, including interregional migration of production, substitution in consumption, and altered stand management.

Keywords: Land use, forest sector, economics.

(See Corvallis order form 1.)

Alig, R.J.; Butler, B.J.
2001. Land use and forest cover projections for the United States: 1997-2050. In: Forestry at the great divide: Proceedings, Society of American Foresters 2001 national convention. Bethesda, MD: Society of American Foresters: 93-115.

Findings from the 2000 RPA assessment indicate that approximately 20 to 25 million acres of U.S. forest land could be converted to urban and developed uses over the next 50 years if

historical trends largely continue. Such land use conversions would further fragment forests, reduce opportunities for storage of carbon in forests, and also impact provision of other goods and services. The U.S. population is projected to grow by more than another 120 million people by 2050, with relatively fast growth rates in the key timber supply regions of the South and Pacific Northwest. In addition to a projected reduction of 4 percent in U.S. private timberland, forest cover dynamics are projected to significantly change the composition of forests, especially in the Eastern United States. The largest projected forest cover changes result from intensification of forestry practices in the Southern United States, where the area of pine plantations is projected to increase by more than 50 percent over the next 50 years. Although areas of softwoods are projected to increase across many regions of the country, especially on forest lands, hardwoods will remain the dominant forest type on private lands. Projected area changes for forest cover types differ notably by region, and land use and land cover dynamics will directly or indirectly contribute to sustainability of forest resources. In addition to changes in the biological composition of forests, changing landowner demographics including increasing numbers of owners and changing management objectives also will impact the forests.

Keywords: Land use change, RPA assessment, population growth.

(See Corvallis order form 1.)

Foster, D.; Swanson, F.; Aber, J. [and others]
2003. The importance of land-use legacies to ecology and conservation. BioScience. 53(1): 77-88.

We outline some of the critical aspects of land use legacies that pertain to ecological study, conservation biology, and natural resource management policy. We draw especially from the experience of long-term ecological research because this network of sites is in an opportune position to apply multiple approaches and comparative studies to the investigation of the long-term consequences of human history.

Keywords: Land use, soil, ecosystem management.

(See Corvallis order form 1.)

Kline, J.D.
2002. Integrating land use change into landscape-level ecological assessments. In: Johnson, R.J. Conserving farm and forest in a changing rural landscape: current and potential contributions of economics: Proceedings of a conference. University Park, PA: The Pennsylvania State University, The Northeast Regional Center for Rural Development: 6.

This paper provides an overview of the relatively recent adaptation of land use modeling methods toward spatial specificity desired in integrated research between economists and ecologists. The particular challenges presented by data, modeling, and econometric issues are highlighted. This is followed by discussion of a spatially explicit land use model developed as part of a multidisciplinary landscape-level analysis of socioeconomic and ecological processes in Oregon's Coast Range.

Keywords: Spatial land use and landscape models, forest and urban interface, ecological economics.

(See Corvallis order form 1.)

Landscape Ecology

Spies, T.A.; Reeves, G.H.; Burnett, K.M. [and others]
2002. Assessing the ecological consequences of forest policies in a multiownership province in Oregon. In: Liu, J.; Taylor, W.W. Integrating landscape ecology into natural resource management. New York: Cambridge University Press: 179-207. Chapter 7.

Advances in landscape ecology, ecosystem management, geographic information systems, and remote sensing have led us from the stand to landscape and broader scales in natural resources planning management. As science and management have expanded to these scales, they frequently encompass multiownership landscapes. In this chapter, we present a case study to demonstrate the importance of taking a multiownership view of landscapes and describe the approach we are developing to assess the effects of different forest management policies on ecological components of a province (e.g., a subregion) in coastal Oregon.

Keywords: Landscape pattern, geographic information system, landscape planning.

(Available from bookstores and libraries.)

Mycology

Grubisha, L.C.; Trappe, J.M.; Molina, R.; Spatafora, J.W.
2002. Biology of the ectomycorrhizal genus *Rhizopogon*. VI. Re-examination of infrageneric relationships inferred from phylogenetic analyses of ITS sequence. Mycologia. 94(4): 607-619.

Rhizopogon section *Rhizopogon* is not monophyletic and comprised three clades, two of which are characterized by possessing several long indels. *Rhizopogon* sections *Amylopogon* and *Villosuli* formed well-supported clades, but species concepts within these sections were unresolved with respect to certain species. This is the first molecular phylogenetic study to investigate infrageneric relationships with *Rhizopogon*. Taxonomic revisions are presented.

Keywords: Mycorrhiza, fungus taxonomy.

(See Corvallis order form 1.)

Nouhra, E.; Castellano, M.A.; Trappe, J.M.
2002. Nats truffle and truffle-like fungi 9: *Gastroboletus molinai* sp. nov. (Boletaceae, Basidiomycota), with a revised key to the species of *Gastroboletus*. Mycotaxon. 83: 409-414.

A new sequestrate species in the Boletaceae, *Gastroboletus molinai*, is described from Butte County, California. A revised key to all *Gastroboletus* species is presented.

Keywords: Ectomycorrhizal fungi, hypogeous fungi, taxonomy.

(See Corvallis order form 2.)

Plant Ecology

Epstein, H.E.; Walker, M.D.; Chapin, F.S., III; Starfield, A.M.
2000. A transient, nutrient-based model of arctic plant community response to climatic warming. Ecological Applications. 10(3): 824-841.

We developed a nutrient-based, plant community and ecosystem model (ArcVeg) designed to simulate the transient effects of increased temperatures on the biomass and community composition of a variety of arctic ecosystems. The model is currently parameterized for upland, mesic ecosystems in high Arctic, low Arctic, treeline, and boreal forest climate zones. A unique feature of ArcVeg is that it incorporates up to 18 plant functional types including a variety of forbs, graminoids, shrubs, and nonvascular plants that are distinguished by a set of five parameters. Timing and rate of growth, as well as nutrient use, are particularly important in defining competitive interactions in the model and in explaining coexistence in complex

communities. Simulations of climatic warming suggest an increase in total biomass for high and low Arctic zones over 200 years and an increase in shrub biomass at the expense of other plant functional types. The initial community response to warming was a function of the initial dominance structure, whereas the long-term response reflected adaptations of plant functional types of the new environment. Warming resulted in the formation of novel, stable plant communities after 200 simulation years that were not typical of current zonal vegetation types in the Arctic of northwestern North America.

Keywords: Arctic, climate change, dynamic vegetation modeling, moist acidic tundra, nitrogen, plant functional types, transient dynamics, tussock tundra.

(See Fairbanks order form.)

Lipow, S.R.; Bernhardt, P.; Vance, N.
2002. Comparative rates of pollination and fruit set in widely separated populations of a rare orchid (*Cypripedium fasciculatum*). International Journal of Plant Science. 163(5): 775-782.

The rare orchid, *Cypripedium fasciculatum,* offers no reward to the small wasps that pollinate its flowers. Nonrewarding species typically suffer from low rates of pollination and fruit set, yet they appear frequently in Orchidaceae. To better understand the dynamics of pollination and fruit set in nonrewarding orchids and to evaluate whether a conservation strategy for *C. fasciculatum* should include managing for pollinator service, we evaluated factors influencing reproductive success in three widely varied, separated populations. The percentage of open-pollinated flowers maturing fruit differed greatly among populations, equaling 69 percent in Oregon, 29 percent in Idaho, and 18 percent in Colorado. These values are greater than is typical for a nonrewarding orchid. Thus, managing for pollinator service may be unnecessary, especially in the Oregon populations.

Keywords: Orchidaceae, self-compatible, pollen limitation, pollen tube, fruit set.

(See Corvallis order form 2.)

McWilliams, W.H.; O'Brien, R.A.; Reese, G.C.; Waddell, K.L.
2002. Distribution and abundance of oaks in North America. In: McShea, W.J.; Healy, W.M., eds. Oak forest ecosystems: ecology and management for wildlife. Baltimore, MD: The Johns Hopkins University Press: 13-33. Chapter 2.

This chapter describes the distribution, abundance, and significance of the oak genus, *Quercus* L., in North America. Because of the large number of oak species and the myriad of communities of which oaks are major associates, the analysis considers oaks in three broad regions: the East, the interior West, and the Pacific Coast.

Keywords: Oak, Quercus*.*

(Available in bookstores and libraries.)

Seastedt, T.R.; Walker, M.D.; Bryant, D.M.
2001. Controls on decomposition processes in alpine tundra. In: Bowman, W.D.; Seastedt, T.R., eds. Structure and function of an alpine ecosystem: Niwot Ridge, Colorado. New York: Oxford University Press: 222-236. Chapter 11.

This chapter discusses substrate qualities, biotic processes, the general pattern of decomposition, and the effects of climate and microclimate on decomposition rates in alpine ecosystems. The authors compare patterns of decomposition in alpine and arctic regions and propose future research.

Keywords: Alpine, arctic, decomposition, soil.

(Available in bookstores and libraries.)

Plant Pathology

Ferguson, B.A.; Dreisbach, T.A.; Parks, C.G [and others]

2003. Coarse-scale population structure of pathogenic *Armillaria* species in a mixed-conifer forest in the Blue Mountains of northeast Oregon. Canadian Journal of Forest Research. 33(4): 612-623.

The population structure of pathogenic *Armillaria* species was determined on a relatively dry, mixed-conifer landscape in the Blue Mountains of northeast Oregon. Sampling of recently dead and symptomatic trees produced 112 isolates of *Armillaria* from six conifer species. Species identifications using a PCR-based diagnostic and diploid-diploid pairings produced identical results: 108 of the isolates were *A. ostoyae* and 4 were North American Biological Species X (NABS-X). Genet identity was determined by using somatic compatibility pairings among the putatively diploid field isolates. Five genets of *A. ostoyae* and one of NABS-X were identified. *Armillaria ostoyae* genet sizes were approximately 20, 95, 195, 260, and 965 hectares; cumulative colonization of the study area was 9.5 percent. The maximum distance between isolate collection points within the largest *A. ostoyae* genet was approximately 3810 meters. Use of three growth rate estimates for *A. ostoyae* resulted in age calculations for the five genets ranging from 900 to 8650 years. Isolate collection points and putative genet boundaries were mapped in a GIS system by using digital orthophotoquads as background imagery. Results are discussed in relation to possible mechanisms that influenced the establishment, expansion, and expression of these genets, the genetic structure and stability of *Armillaria*, and the implications for forest management on this and similarly diseased landscapes.

Keywords: Armillaria, *Blue Mountains, northeastern Oregon.*

(See La Grande order form.)

Remote Sensing

Andersen, H-E.; Reutebuch, S.E.; Schreuder, G.F.

2001. Automated individual tree measurement through morphological analysis of a LIDAR-based canopy surface model. In: Precision forestry: Proceedings of the first international precision forestry cooperative symposium. Seattle, WA: University of Washington, College of Forest Resources: 11-22. Chapter 1.

An algorithm for automated individual tree measurement was developed that is driven by a morphological analysis of a high-resolution LIDAR-based canopy surface model. Binary and grayscale mathematical morphology were used to relate structure within a three-dimensional forest canopy to the location of individual tree crown apexes, which in turn were used to extract LIDAR measurements of individual tree position and height. The algorithm identified individual tree crown apexes in a mature forest with closed canopy within 2 meters with a user's accuracy of 89 percent and a producer's accuracy of 83 percent.

Keywords: Remote sensing, precision forestry, tree measurements.

(See Seattle order form.)

Silviculture

Bishaw, B.; DeBell, D.S.; Harrington, C.A.

2003. Patterns of survival, damage, and growth for western white pine in a 16-year-old spacing trial in western Washington. Western Journal of Applied Forestry. 18(1): 35-43.

The influence of initial stand density on early growth and development of western white pine was assessed at an experimental site in the southern Cascades of Washington. Initial square spacings ranged from 2 to 6 meters and were replicated three times. Sixteen years after planting, survival averaged 80 percent; most mortality was associated with blister rust, but the fate of new infections and mortality diminished substantially between ages 11 and 16; 71 percent of the planted trees were free of blister rust

at age 16. Trees averaged 8.4 meters (m) in height and 12.7 centimeters (cm) diameter at breast height. Periodic annual growth from 11 to 16 years in the three wider spacings averaged 0.7 m in height and 1.0 cm in diameter. Antler rubbing by elk caused substantial damage to stems, but wounds on most trees were healed and overgrown in 2 to 4 years. Early growth rates in this trial were much greater than those attained in older, natural stands and in progeny tests and other young silvicultural trials planted elsewhere. We believe rust-resistant stock of western white pine merits greater consideration for planting in the Douglas-fir region; managers, however, must plan early pruning for blister rust control.

Keywords: White pine, Pinus monticola, *spacing, growth and yield, blister rust, pathology.*

(See Olympia order form.)

DeBell, D.S.; Singleton, R.; Harrington, C.A.; Gartner, B.L.
2002. Wood density and fiber length in young *Populus* stems: relation to clone, age, growth rate, and pruning. Wood and Fiber Science. 34(4): 529-539.

Cross-sectional disks were cut at two stem heights (1.5 and 3.0 meters [m]) from 9-year-old trees of three *Populus* clones growing in an intensively cultured plantation in western Washington. Branches of half of the trees had been pruned to 1.8 m at age 1½. Ring width, wood density, and fiber length were measured for each ring. Pruning had no effect on mean ring width or wood properties, averaged over the entire disk or on rings produced during the second through the fourth years. Averaged over all trees, wood density of the 1.5-m sample was 0.37 gram per cubic centimeter during the first 3 years, decreased somewhat at age 4 or 5, and then increased to an average of 0.45 gram per cubic centimeter at age 9. Fiber length increased from 0.57 millimeter at age 1 to nearly 1.0 millimeters at age 9. Averaged over all disks at 1.5 m, clones differed significantly in ring width, wood density, and fiber length. Mean values for the two wood properties at 3.0 m were slightly lower than those at 1.5 m and did not significantly differ among clones. Correlations between ring width and wood density or fiber length or between wood properties were low, and generally nonsignificant or inconsistent.

Keywords: Wood density, fiber length, Populus*, short rotations.*

(See Olympia order form.)

Piatek, K.B.; Harrington, C.A.; DeBell, D.S.
2003. Site preparation effects on 20 year survival and growth of Douglas-fir (*Pseudotsuga menziesii*) and on selected soil properties. Western Journal of Applied Forestry. 18(1): 44-51.

Long-term effects of site preparation on tree performance and soil nutrients are not well known. We compared the effects of five site preparation treatments on survival and growth of Douglas-fir 3, 10, and 20 years after planting, and soil bulk density, carbon, nitrogen, phosphorus, and organic matter concentrations at 0- to 20-centimeter soil depth 21 years after planting. The site preparation treatments were imposed following logging of three harvest units of old-growth forest on a volcanic soil in southwestern Washington; the units were logged to leave 17, 38, and 53 trees per hectare of woody residue. The site preparation treatments were hand pile and burn, machine pile and burn, scarification, broadcast burn, and control. Mean survival ranged from 86 percent at age 3 to 70 percent at age 20, and average tree heights at 3, 10, and 20 years were 0.6, 4.1, and 11.7 meters. The scarification treatment had the best growth; at age 20 its average tree was 21 percent taller, 26 percent larger in diameter, and 83 percent

greater in volume than the control. The hand-pile-and-burn treatment did not differ from the control in tree growth, and the other two treatments were intermediate in their growth response. Average soil bulk density was 0.74 gram per cubic centimeter, organic matter concentration was 118 grams per kilogram, and carbon, nitrogen, and phosphorus concentrations were 49, 1.6, and 0.7 grams per kilogram with no significant treatment effects.

Keywords: Douglas-fir, site preparation, long-term site productivity, soil nutrients, coarse woody debris.

(See Olympia order form.)

Special Forest Products

Pilz, D.

2002. Resource assessment of non-wood forest products: experience and biometric principles [Book review]. Forest Science. 48(2): 624-625.

The author reviews a 2001 book in the nonwood forest products series published by the Food and Agriculture Organization of the United Nations. The authors of the book are Jennifer L.G. Wong, Kirsti Thornber, and Nell Baker.

Keywords: Special forest products, nontimber forest products.

(See Corvallis order form 2.)

Schroeder, R.

2002. Contemporary subsistence use of nontimber forest products in Alaska. In: Jones, R.T.; McLain, R.J.; Weigand, J., eds. Nontimber forest products in the United States. Lawrence, KS: University Press of Kansas: 300-326. Chapter 22.

This chapter describes some salient geographical and demographic characteristics and the legal sidebars unique to Alaska that are relevant to plant use in Alaska's forests. Most of the chapter describes some of the plant species known to have subsistence value in Alaska based on both early and recent ethnographic work and outlines the cultural importance of these uses. It presents estimates of the magnitude of subsistence plant harvests for the south-central and southeast regions of the state, where the Chugach and Tongass National Forests are located. Some special plant uses also are discussed. The chapter concludes with a discussion of issues related to developing policy to direct possible commercial collection of nontimber forest products.

Keywords: Nontimber forest products, Alaska, ethnobotany.

(Available in bookstores and libraries.)

Wildlife

Brillinger, D.R.; Preisler, H.K.; Ager, A.A.; Kie, J.G.

2001. The use of potential functions in modelling animal movement. In: Saleh, A.K.M.E., ed. Data analysis from statistical foundations. Huntington, NY: Nova Science Publishers, Inc.: 369-386.

Potential functions are a physical science concept often used in modeling the motion of particles and planets. In this paper, potential function-based models are considered for the movement of free-ranging elk in a large, fenced experimental forest. Equations of motion are set down and the parameters involved are estimated nonparametrically. The question of whether a potential function is plausible for describing the elk motion is considered. The conclusion is that it is not possible to reject this hypothesis for the data set and estimates considered.

Keywords: Animal movement, diffusion models, elk, force field, nonparametric regression, potential functions, stochastic differential.

(Available in bookstores and libraries.)

Olsen, J.; Marcot, B.G.; Trost, S.
2002. Do southern boobooks *Ninox novaeseelandiae* duet? In: Newton, I.; Kavanagh, R.; Olsen, J.; Taylor, I., eds. Ecology and conservation of owls. Collingwood, Australia: CSIRO Publishing: 320-328. Chapter 29.

A number of writers state that duetting occurs between male and female southern boobooks (*Ninox novaeseelandiae*), but a 1998 study cast doubt on the claims. By using a simple classification system of simultaneous vocalizations, we suggest that southern boobooks engage in pair contact calling and territorial dueling. Based on our collective experience and descriptions of calling behaviors of three pairs of southern boobooks that we observed over 529 nights in or near Aranda Bushland in Canberra, we could find no evidence that southern boobooks engage in duetting.

Keywords: Owls, owl vocalization, duetting, antiphony.

(Available in bookstores and libraries.)

Wood Utilization

Green, D.W.; McDonald, K.A.; Hennon, P.E. [and others]
2002. Flexural properties of salvaged dead yellow-cedar from southeast Alaska. Forest Products Journal. 52(1): 81-88.

A decline and mortality problem is affecting yellow-cedar trees on more than one-half million acres in southeastern Alaska. Because of the high decay resistance of yellow-cedar, dead snags may remain standing for 100 years or more. Currently, this wood is primarily used for firewood. The results of this study indicate that the flexural properties of wood from dead yellow-cedar snags are little affected by how long the trees have been dead. Living yellow-cedar trees are sometimes infected with “black stain,” which remains in trees after they die. Black stain does not reduce the flexural properties of wood from either live or dead trees. Thus, utilization options for wood from dead cedar snags can be broadened to higher value uses consistent with those for wood from live cedar trees.

Keywords: Yellow-cedar, snags, salvage, recovery.

(See Juneau order form.)

The following articles were published by the Pacific Southwest Research Station as part of a proceedings. If you would like a copy of the individual article, fill out the form for the laboratory indicated. To order a copy of the complete proceedings, PSW-GTR-181, send an email to Richard Schneider at rschneider@fs.fed.us; contact him at Rocky Mountain Research Station, 240 West Prospect, Fort Collins, CO 80526; or call him at (970) 498-1392. The entire publication also is available on the Web at http://www.fs.fed.us/psw/publications/documents/gtr-181.

Aubry, K.B.; Raley, C.M.

2002. The pileated woodpecker as a keystone habitat modifier in the Pacific Northwest. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 257-274.

We propose that the pileated woodpecker (*Dryocopus pileatus*) is a keystone habitat modifier in the Pacific Northwest. It is the largest woodpecker in this region and the only species that forages primarily by excavating; only pileateds are capable of creating large cavities in hard snags and decadent live trees. A wide array of species, including many that are of management concern in the Pacific Northwest, use old pileated nest and roost cavities. In addition, pileated woodpeckers provide foraging opportunities for other species, accelerate decay processes and nutrient cycling, and may facilitate inoculation of heart-rot fungi and mediate insect outbreaks. Because of the potential keystone role of these woodpeckers in Pacific Northwest forests, we feel that their habitat warrants special attention in forest management plans and monitoring activities.

Keywords: Pileated woodpecker, Dryocopus pileatus*, keystone species, ecosystem function, forest management.*

(See Olympia order form.)

Bate, L.J.; Garton, E.O.; Wisdom, M.J.

2002. Sampling methods for snags and large trees important to wildlife. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 811-815.

We developed efficient and accurate methods for sampling snags and large trees important to wildlife. These methods were described in detail in a recent USDA Forest Service publication, PNW-GTR-425, which included spreadsheets, macros, and instructions needed to conduct all surveys and analyses to estimate snag and large tree densities and distributions on a landscape. Methods described in PNW-GTR-425 focus on optimizing sampling effort by choosing a plot size appropriate for the specific forest conditions encountered. Two methods are available for density analysis. Method one requires sampling until a desired precision is obtained for a density estimate. Method two is designed to test for differences in observed snag density versus a management plan's targeted density. After collecting a minimum of 60 samples under method two, one may test for a significant difference between the observed and targeted densities. In addition, data can be used to calculate a distribution index.

Keywords: Wildlife, snag sampling, snag management, forest management, wildlife management, monitoring.

(See La Grande order form.)

Bate, L.J.; Torgersen, T.R.; Garton, E.O.; Wisdom, M.J.
2002. Accuracy and efficiency of methods to sample logs for wildlife research and management. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 817-822.

We evaluated performance (accuracy and efficiency) of the line-intercept and strip-plot methods of estimating the density, length, percentage of cover, and weight of logs important to wildlife. To conduct the evaluation, we sampled 17 coniferous stands in northeastern Oregon and northwestern Montana. These stands contained a gradient of log conditions based on seral stage, physiography, disturbance regime, and history of timber management. A complete count of logs in these stands was used to evaluate the precision, bias, and efficiency of each sampling method. Preliminary results indicated that both methods were relatively unbiased and precise. The strip-plot method, however, was more efficient in estimating density, but neither method was clearly more efficient in estimating length, percentage of cover, or weight.

Keywords: Logs, wildlife, log sampling, log management, fire management, coarse woody debris, fallen trees, wildlife management.

(See La Grande order form.)

Berg, N.H.; Azuma, D.; Carlson, A.
2002. Effects of wildfire on in-channel woody debris in the eastern Sierra Nevada, California. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 49-63.

Changes in debris frequency, mobility, volume, aggregation, and carbon loading after a 1994 wildfire in the eastern Sierra Nevada were quantified by before-and-after comparative measurements at Badenaugh Creek in northern California, and by comparing selected attributes to a nearby “reference” stream. Fifty-seven percent of wood volume, and 25 percent of the pieces, were consumed by the fire. The fire reduced aquatic carbon loading from about 2½ times to 1½ times terrestrial loading after the fire. Although more pieces moved 10 years after the fire at Badenaugh Creek than in the control stream, the size and number of debris jams both immediately and 1 year after the fire were appreciably reduced from prefire levels, probably because fewer pieces were available to form aggregates. Decisions on the disposition of postfire debris must consider the interaction between fire intensity, channel width, and the size of the remaining wood. If few pieces of channel-spanning length remain after a fire, they may pose relatively little downstream danger.

Keywords: In-channel woody debris, aquatic carbon, postfire woody debris.

(See Portland order form.)

Bull, E.L.
2002. The value of coarse woody debris to vertebrates in the Pacific Northwest. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 171-178.

Many species of birds, mammals, amphibians, and reptiles use standing and down dead wood. Woodpeckers depend on decayed wood for the excavation of nest and roost cavities in standing trees. Both avian and mammalian secondary cavity nesters then claim the abandoned cavities for their nesting or roosting. Many of

the woodpeckers and secondary cavity nesters forage on forest insects, including bark beetles and defoliators. Factors that affect the types and extent of vertebrate use of dead wood include the physical orientation, size, decay state, tree species, and overall abundance.

Keywords: Coarse woody debris, cavity nesters.

(See La Grande order form.)

Korol, J.J.; Hemstrom, M.A.; Hann, W.J.; Gravenmier, R.A.
2002. Snags and down wood in the Interior Columbia Basin Ecosystem Management Project. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 649-663.

Snags and down wood are major ecosystem and wildlife habitat components of the interior Columbia basin ecosystem. Their natural abundance and distribution have been altered by decades of land conversion, fire suppression, and timber and firewood harvest. An analysis of changes that have occurred was a required element of the interior Columbia basin environmental impact statement (EIS). Members of the science advisory group of the Interior Columbia Basin Ecosystem Management Project modeled snag and down wood abundance at the landscape level for the project analysis area. We constructed 10 density tables for combinations of three potential vegetation groups, two temporal regimes, two fire regimes, and two public land management characterization classes. Snags and down wood were divided into two size classes, large and small. Forest stands were placed into one of four categories: early seral, midseral, late-seral single strata, and late-seral multistrata. We defined five categories of snag and down wood abundance: none, rare, uncommon, common, and abundant. Each size class/abundance category combination had its own unique density range. We combined computer simulations with geographic information data layers to project historical and current snag and down wood densities. We also made 100-year projections of trends based on the three public land management alternatives described in the supplemental draft EIS. Our models for the basin as a whole showed small and large snag abundances currently below the historical levels, and small and large down wood amounts currently greater than historical levels. The 100-year simulations projected small snag amounts returning to historical levels, large snag amounts increasing above current levels but not returning to historical amounts, and the small and large down wood amounts generally decreasing from current levels, but remaining above historical levels.

Keywords: Snags, down wood, interior Columbia River basin.

(See Portland order form.)

Marcot, B.G.
2002. An ecological functional basis for managing wood decay elements for wildlife. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 895-910.

The traditional approach to managing decaying wood for wildlife has been to list species associated with snags, down wood, and other wood decay elements, and then to provide the kinds, sizes, and amounts of wood decay elements assumed necessary to meet their needs. An expanded approach more consistent with the spirit of ecosystem management also would describe those species' key ecological functions (KEFs). The ecosystem is influenced by KEFs through trophic relations, species interactions, soil aeration, primary cavity and burrow excavation, and dispersal of fungi, lichens, seeds, fruits, plants, and invertebrates. Such "functional webs" can be described for wildlife species associated with various wood decay elements (snags, down wood, litter, duff, mistletoe brooms, dead parts of live trees, hollow living trees, natural tree cavities,

bark crevices, and live remnant or legacy trees) in Washington and Oregon. Information on species' KEFs also is part of the the DecAID wood decay management advisory model. The challenge is posed for management to think functionally beyond simple species-habitat relations, as to the broader role of wood decay in supporting functional webs.

Keywords: Snag, down wood, wildlife tree, key ecological functions, functional web, litter, duff, mistletoe broom, legacy tree, live remnant tree, natural tree cavities.

(See Portland order form.)

Marcot, B.G.; Mellen, K.; Livingston, S.A.; Ogden, C.
2002. The DecAID advisory model: wildlife component. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 561-590.

The wildlife component of DecAID is based on a thorough review, analysis, and synthesis of the empirical literature on wildlife-dead wood relations. We developed the wildlife component by compiling data on snag and log size, snag density, and amounts of down wood related to individual species or groups of wildlife species as presented in the literature, for various habitats and types of wildlife use (breeding, feeding, roosting). The wildlife use data are arranged in three cumulative species richness curves representing means and plus or minus one standard error. One can consult the curves to determine (1) which species or groups are provided for snag or down wood at three statistical levels and (2) the amounts and sizes of snags and down wood needed to achieve a specified wildlife objective of providing for specified species or some percentage of species, at a specified statistical level. Other components of the DecAID model can then be consulted to determine hazards or mitigation for risks of fire, and contribution of insects and disease to the dead wood component, and to provide for fungi and nonpest invertebrates associated with snags and down wood.

Keywords: Snag model, down wood model, coarse woody debris, snag management, down wood management, primary cavity excavators, secondary cavity users.

(See Portland order form.)

Mellen, K.; Marcot, B.G.; Ohmann, J.L. [and others]
2002. DecAID: a decaying wood advisory model for Oregon and Washington. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 527-533.

DecAID is a knowledge-based advisory model that provides guidance to managers in determining the size, amount, and distribution of dead and decaying wood (dead and partially dead trees, and down wood) necessary to maintain wildlife habitat and ecosystem functions. The intent of the model is to update and replace existing snag-wildlife models. Whereas the relation of dead and decaying wood to wildlife habitat is a major component of the model, DecAID also will provide expert advice on prescribing and interpreting conditions of dead wood for wild and prescribed fire and fuels, pest and nonpest insects, pathogens and nonpathogenic fungi, and the use of inventory data to describe current managed and natural levels of dead wood. The model also produces a list of ecosystem functions performed by species associated with dead and decaying wood. Advice on the distribution of dead wood at the stand and landscape scales is provided in the model.

Keywords: Snag model, down wood model, wood decay, wildlife tree.

(See Portland order form.)

Ohmann, J.L.; Waddell, K.L.

2002. Regional patterns of dead wood in forested habitats of Oregon and Washington. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 535-560.

Dead trees are important elements of productive and biologically diverse forests, yet little is known about how amounts and characteristics of dead wood differ across broad regions. This paper presents results of a preliminary analysis of data on snags and down wood from over 16,000 field plots across 20 million hectares of upland forest of all ownerships in Oregon and Washington. Current patterns of down wood abundance in wildlife habitat types, alliances, and successional stages are described. Amounts of dead wood within and outside federal wilderness areas are compared. Uses of information on regional patterns of variation in dead wood in forest management, planning, and policymaking are discussed.

Keywords: Forest structure, vegetation types, disturbance processes, succession, coarse woody debris—terrestrial, landscape pattern, wildlife management.

(See Corvallis order form 2.)

Wright, P.; Harmon, M.; Swanson, F.

2002. Assessing the effect of fire regime on coarse woody debris. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 621-634.

This paper describes how coarse woody debris (CWD) responds to disturbances and manipulations, how levels of CWD differ through time, and how these changes can be tracked. To examine the effect of fire regime on CWD amounts, data from two fire regimes on the west-central side of the Oregon Cascade Range were compared. A combination of field work and modeling to address the following questions was used: Do the CWD levels differ between the two fire regimes? How have CWD levels been affected by fire severity and frequency? How do the factors that control CWD differ between fire regimes?

Keywords: Coarse woody debris, fire, forest management, disturbance/fire.

(See Corvallis order form 2.)

Youngblood, A.; Wickman, B.E.

2002. The role of disturbance in creating dead wood: insect defoliation and tree mortality in northeastern Oregon. In: Laudenslayer, W.F., Jr.; Shea, P.J.; Valentine, B.E. [and others], tech. coords. Proceedings of the symposium on the ecology and management of dead wood in Western forests. Gen. Tech. Rep. PSW-GTR-181. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 155-168.

In northeastern Oregon, conifer defoliation by insects occurs over large temporal and spatial scales and often leads to tree mortality. We document the current composition and stand structure in mixed-conifer stands after two such disturbances: stands 23 years after defoliation by Douglas-fir tussock moth and stands 12 years after defoliation by western spruce budworm. Our assessment of these areas includes the density of snags, the density and size of down logs, and the change in associated vegetation. Our work suggests that similar patterns of stand dynamics can result from defoliation events with vastly differing durations. We believe this work provides valuable insights into the role of large insect outbreaks and the dynamics of dead wood in these mixed-conifer stands.

Keywords: Stand structure, log density, snag density, log volume, tree mortality, Douglas-fir tussock moth, western spruce budworm.

(See La Grande order form.)

The following articles were published by the Rocky Mountain Research Station as part of a proceedings. If you would like a copy of the individual article, fill out the form for the laboratory indicated. To order a copy of the complete proceedings, RMRS-P-25, send an email to Richard Schneider at rschneider@fs.fed.us; contact him at Rocky Mountain Research Station, 240 West Prospect, Fort Collins, CO 80526; or call him at (970) 498-1392. The entire publication also is available on the Web at http://www.fs.fed.us/rm/pubs/rmrs_p025.html.

Barrett, T.M.; Schurr, F.G.; O'Hara, K.L.

2002. Classifying stand structure: a comparison of SVS images with plot visits and FVS-generated metrics. In: Crookston, N.L.; Havis, R.N., comps. Second Forest Vegetation Simulator conference. Proc. RMRS-P-25. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 31-37.

The Forest Vegetation Simulator (FVS) is frequently linked with the Stand Visualization System (SVS) to provide computer-generated images of future forest structure for inclusion in research articles, forest planning documents, and public presentations. A small pilot study in the Sierra Nevada focused on whether survey responses for classification attributes (stand size, age, and canopy density) differed between SVS images and site visits. The survey, conducted in fall 2002, used groups of forest visitors who toured seven 0.10-acre plots within a variety of stand structures. Results showed these visitors interpreted tree size, age, and canopy density differently during the field visit to plots than while viewing SVS images. Responses from both field visits and image viewing also differed from commonly used metric output in the FVS program. Altering plot size for the images and adding snags substantially affected responses.

Keywords: Forest structure, forest classification, landscape visualization.

(See Portland order form.)

Christensen, G.A.; Fight, R.D.; Barbour, R.J.

2002. Simulating fire hazard reduction, wood flows, and economics of fuel treatments with FVS, FEEMA, and FIA data. In: Crookston, N.L.; Havis, R.N., comps. Second Forest Vegetation Simulator conference. Proc. RMRS-P-25. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 91-96.

This paper demonstrates protocols to analyze and illustrate trends in the long-term effects of repeated fire hazard reduction entries at broad state-level scales. The objectives of this analysis are to determine the effectiveness of two stand treatment options designed to immediately reduce and maintain lower wildfire hazards. Long-term effects of fire hazard reduction are reported for the stocking, size, and species mix of trees and logs that might be removed for wood products. We developed methods that use readily available tools to provide this information and relate it to treatment effectiveness in reducing fire hazard over time. The scope of the project covers all forested areas of Montana and New Mexico. Analysis is based on data collected for both states by the Forest Inventory and Analysis Program of the USDA Forest Service. The primary tools for this analysis are the Forest Vegetation Simulator, the Fire and Fuels Extension model, and the Financial Evaluation of Ecosystem Management Activities model. Model output from over a thousand plots is summarized by using macros written for Microsoft Excel, SAS statistical software, and Microsoft Access. These protocols can be used to simulate a variety of broad-scale management options by using stand-level data that are readily available.

Keywords: Fire hazard reduction treatments, forest inventory modeling, silviculture, wood utilization.

(See Portland order form.)

Gregg, T.F.; Hummel, S.S.

2002. Assessing sampling uncertainty in FVS projections using a bootstrap resampling method. In: Crookston, N.L.; Havis, R.N., comps. Second Forest Vegetation Simulator conference. Proc. RMRS-P-25. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 164-167.

The Forest Vegetation Simulator (FVS) lets users project changes in forest stands associated with different initial conditions and silvicultural treatments. Our objective is to develop tools that help model users estimate the precision of FVS projections. A technique called bootstrap resampling (bootstrapping) allows us to approximate the sampling distribution of any variable simulated by FVS. To use the technique, the original FVS tree list is sampled repeatedly, with replacement, to build hundreds of bootstrapped tree lists. These bootstrapped tree lists are then used to make several hundred FVS projections. Each projection is thus based on a resample of the original tree list. The resulting empirical distribution provides information on the sampling uncertainty associated with the original tree list, which is important for making statistical inferences about FVS model outcome. This paper introduces a new bootstrapping program, FVSBoot, and describes its purpose and value.

Keywords: FVS projections, bootstrap resampling, modeling.

(See Portland order form.)

Hummel, S.; Calkin, D.; Barbour, R.J.

2002. Landscape analysis with FVS and optimization techniques: efficient management planning for the Gotchen Late Successional Reserve. In: Crookston, N.L.; Havis, R.N., comps. Second Forest Vegetation Simulator conference. Proc. RMRS-P-25. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 78-82.

We combine simulation and optimization techniques to test hypotheses about variable-density management in a 15,000-acre forest reserve. The Forest Vegetation Simulator (FVS) and integer optimization techniques together help identify tradeoffs between two landscape goals: maintaining late-successional forest and reducing the threat of wildfire. The FVS model allows us to evaluate the contribution of stand-level treatments to each landscape goal, whereas optimization identifies efficient solutions that allow us to test for complementary or competitive relations between two goals over time and space. The methods we discuss in this paper are adaptable to forested areas of various sizes and with different resource goals. To illustrate the value and innovation of our approach, an example demonstrates how uncertainty in FVS simulations might affect landscape solutions. This example is the pilot application of a new FVS bootstrap model. Our preliminary results indicate that we should change the definition of late-successional forest used for our final analysis.

Keywords: Landscape analysis, optimization techniques, Forest Vegetation Simulator.

(See Portland order form.)

McGaughey, R.J.

2002. Creating visual simulations of fuel conditions predicted by the Fire and Fuels Extension to the Forest Vegetation Simulator. In: Crookston, N.L.; Havis, R.N., comps. Second Forest Vegetation Simulator conference. Proc. RMRS-P-25. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 8-13.

The Fire and Fuels Extension (FFE) to the Forest Vegetation Simulator (FVS) software can help managers assess the risk, behavior, and impact of fire in forest ecosystems. Unlike software currently linked to FVS, the FFE reports surface fuel characteristics including the weight of woody material in various size classes. This paper describes the development of calibrated log models, models of individual pieces of coarse woody debris that represent specific weights of fuels in various sizes. Such models are used to represent surface fuels in visual simulations. The paper presents motivations for the study along with a description of the procedures used to measure and photograph logs and an overview of the process for creating the calibrated log models.

Keywords: Fuel modeling, visualization, visual simulations, fire effects.

(See Seattle order form.)

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