

***College of Forestry and the
Oregon Forest Research Laboratory***

2004 Annual Bibliography





From the Director Greetings.

Oregon State's Forest Research Laboratory is supported by the State Legislature and forest landowners for the purpose of developing and providing knowledge that will help achieve the fullest utilization of Oregon's forest resources for economic, social, and environment values. This bibliography recaps the research efforts and findings of our scientists.

Scientific progress requires a continuous effort of asking critical questions, proposing probable theories, conducting research, gathering data, drawing conclusions, and then publishing the results in order to expand the body of knowledge available to other scientists. Such published results provide a benchmark for other scientists to confirm, disprove, expand upon, develop new questions from, or use to support related research findings.

This annotated bibliography lists and describes the publications of our scientists between January 1, 2004, and December 31, 2004. The publications are arranged by the major program areas studied by our scientists. The studies highlighted in these publications were supported by grants from public agencies and private industries, donors, Oregon appropriations, and Oregon Harvest Tax. Many of these publications are available from the Forestry Communications Group, http://www.cof.orst.edu/pubs_products.php, or directly from the authors as reprints.

This bibliography provides a brief highlight into the broad depth and range of research being conducted by our scientists. The knowledge they obtain is critical for a full understanding of the forest-related issues important to Oregon, the nation, and the world. I hope that you, as another scientist, a policy-maker, a landowner, a forest-related business person, or a concerned citizen, will find the information useful and recognize that we are dedicated to providing knowledge that will have significant and positive effects on the practice of forestry and the management of all forest resources.

Hal Salwasser

Research results find application in many areas as Oregon Forest Research Laboratory scientists and their cooperators publish their findings. Papers published between January 1, 2004 and December 31, 2004 are grouped here according to the Oregon Forest Research Laboratory's five program areas:

- Forest Regeneration
- Forest Ecology, Culture, and Productivity
- Integrated Protection of Forests and Watersheds
- Evaluation of Forest Uses, Practices, and Policies
- Wood Processing and Product Performance

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Forest Regeneration

Anekonda, T, C Jones, BN Smith, and LD Hansen. 2004. Differences in physiology and growth between coastal and inland varieties of Douglas-fir seedlings in a common garden. *Thermochimica Acta* 422: 75–79.

For tree geneticists and physiologists, silviculturists, and forest managers. Seedlings of a coastal and an interior variety of Douglas-fir and their F₂ hybrids were grown in nursery beds in a common garden in a coastal climate. Growth traits, bud burst, carbon isotope ratios, and respiration traits differed between varieties. The isotope ratios of the progeny were similar to those of the interior variety, but the respiration traits resembled those of the coastal variety. Only respiratory heat rate and height growth differed between families within varieties. The slower growing interior variety, which was more stressed in the coastal climate, had greater carbon isotope discrimination.

Badre, TH, PL Marshall, VM LeMay, H Temesgen, and A-A Zumrawi. 2004. Regeneration imputation models for complex stands of southeastern British Columbia. *Forestry Chronicle* 80: 271–278.

For silviculturists, growth-and-yield modelers, and forest managers. Tabular and most similar neighbor (MSN) imputation techniques to predict natural regeneration in complex stands were compared. Both approaches provided good estimates of regeneration. The tabular technique was easier to use. The MSN method was a better predictor, however, and mimicked conditions that were not found in the sampled population.

Gilmore, DW, and CA Berger. 2004. White spruce basal area as a predictor of seed rain during an exceptional seed year in northwestern Alberta. *Northwest Science* 78: 75–78.

For forest managers and geneticists. The objective of this study was to develop an equation to predict

white spruce seed rain from basal area during an exceptionally good seed year. The data were collected in 1999, 2000, and 2001 from three boreal forest cover types (white spruce; mixed white spruce-quaking aspen-balsam poplar; and quaking aspen-balsam poplar) in northwestern Alberta. Seed rain was significantly correlated with white spruce basal area only on 1999, when seed rain was 10 times greater than in 2000 and nearly 60 times greater than in 2001; therefore, only data from that year were used to develop the equation.

Howe, GT, SN Aitken, DB Neale, KD Jermstad, NC Wheeler, and THH Chen. 2004. From genotype to phenotype: Unraveling the complexities of cold adaptation in forest trees. *Canadian Journal of Botany* 81: 1247–1266.

For tree geneticists and biotechnologists. The genetic traits associated with the complex processes involved in cold adaptation in temperate and boreal trees appear to be under strong natural selection, but within-population levels of genetic variations are high. Phenological traits have the highest heritabilities. Cold adaptation traits seem to be controlled largely by multiple genes with small effects; interactions between loci and environment are common. The authors suggest that markers should be developed for cold adaptation candidate genes. Multilocus, multiallelic analyses can then be used to discover genotype-phenotype relationships. It may ultimately be possible to use such techniques to predict genotype performance in breeding programs and to increase understanding of evolutionary ecology of forest trees.

Jacobs, DF, R Rose, DL Haase, and PO Alzugaray. 2004. Fertilization at planting impairs root system development and drought avoidance of Douglas-fir (*Pseudotsuga menziesii*) seedlings. *Annals of Forest Science* 61: 643–652.

For reforestation researchers, field forestry personnel, and silviculturists. Seedlings of Douglas-fir (1 + 1 bareroot) were planted in a drought-prone clearcut in the Oregon Coast Range. Seedlings were divided into two initial root-volume classes and either fertilized or not fertilized in the planting hole. Summer predawn xylem water potential values were consistently lower in fertilized seedlings in both root-volume classes, and root development by several measures was less in fertilized seedlings. Because root volume growth was positively correlated with predawn xylem water potential, field fertilization practices should take into account the probable drought level of the site.

Johnson, GR. 2005. Common families across test series—how many do we need? *Forest Genetics* 11(2): 103–112.

For forest geneticists. Many forest tree-breeding programs include common families in different series of trials in order to allow adjustment for site variation in comparing families planted on different sites. The author modeled the situation in which common families are used to directly estimate site effects, which are then used to adjust family means. Computer simulation indicated that four common families in each series of progeny trials generally provide a stable comparison across sites. Five or six could be used if a low heritability trait was being tested or if severe genotype-by-environment interaction seemed to be likely.

Keller, EA, TS Anekonda, BN Smith, LD Hansen, JB St. Clair, and RS Criddle. 2004. Stress and respiration traits differ among four geographically distinct *Pinus ponderosa* seed sources. *Thermochimica Acta* 422: 69–74.

For seed physiologists and tree geneticists. Seedlings of ponderosa pine (*Pinus ponderosa* var. *ponderosa*) obtained from four geographically distinct seed sources (Willamette and Deschutes in Oregon, Mendocino and Eldorado in California) were grown for 2 years in a common garden near Corvallis, Oregon. Respiratory heat and CO₂ of elongating shoot tips, measured at five temperatures from 15 °C to 35 °C, did not differ among seed sources at a given temperature. The Deschutes plants, which came from the coldest, driest, and most variable climate, had the highest Arrhenius

temperature coefficients of heat and CO₂ rates. Mendocino plants, from a coastal site, were more stressed in the interior common garden site, as evidenced by greater fractionation of carbon isotope ratios. The persistence of significant differences in respiratory and photosynthetic properties in the common garden shows that these processes are genetically adapted to the native climate of the seed source.

Krueger, JA, and KJ Puettmann. 2004. Growth and injury patterns of eastern white pine (*Pinus strobus* L.) seedlings as affected by hardwood overstory density and weeding treatments. *Northern Journal of Applied Forestry* 21: 61–68.

For silviculturists and forestland managers. Vegetation surrounding white pine (*Pinus strobus*) seedlings underplanted under a range of overstory densities in a hardwood stand in Minnesota was weeded monthly or annually or left unweeded over 4 years. Removing herbaceous weeds did not improve seedling growth in any conditions. Weeding woody vegetation benefited diameter growth only in areas with relatively open overstory. It also improved height growth in areas with denser overstory. Both overstory removal and weed control increased incidence of seedling injuries such as rust infection or insect damage. Improving growing conditions, whether by overstory removal or weeding, improves seedling growth rates but must be balanced with the potential for more seedling injuries under more open growing conditions.

Lee, C-S, H-J Cho, and H Yi. 2004. Stand dynamics of introduced black locust (*Robinia pseudoacacia* L.) plantation under different disturbance regimes in Korea. *Forest Ecology and Management* 189: 281–293.

For silviculturists and vegetation management specialists. Black locust was heavily used in the 1960s for reforestation of deforested mountains in South Korea. Distribution of the species tended to be positively correlated with human population size, density, or both. Black locust has invaded lowland, but not upland, vegetation. Native oaks usually succeed black locust, but sprouts and suckers of black locust in areas disturbed by humans often interrupt such succession. The authors recommend incorporating their observed

correlation between disturbance regimes and black locust occurrence into management plans to control black locust.

- Lee, CS, JH Kim, H Yi, and YH You. 2004. Seedling establishment and regeneration of Korean red pine (*Pinus densiflora* S. et Z.) forests in Korea in relation to soil moisture. *Forest Ecology and Management* 199: 423–432.

For silviculturists. The authors investigated the effects of light and water availability on seed production, dispersal, and germination and on seedling establishment, survival, water potential, and relative water content of Korean red pine. Seed production and viability were comparable from year to year. Dispersal diminished exponentially from the edge of the stand studied. Germination rates were 90% with irrigation and <40% without. Seedling survival ranged from 8% in the canopy gap treatment (70% of light intercepted) to 90% in an open-ground, irrigated setting. Water stress was considered the primary factor in mortality.

- MacDonald, GB, ML Cherry, and DJ Thompson. 2004. Effect of harvest intensity on development of natural regeneration and shrubs in an Ontario boreal mixedwood stand. *Forest Ecology and Management* 189: 2007–2022.

For silviculturists. In order to test the hypothesis that partial cutting inhibits development of hardwoods and other competitors and favors conifers, an upper boreal mixedwood stand in northeastern Ontario was harvested to achieve four nominal basal area (BA) reductions (0, 36, 68, and 100%). Photosynthetically active radiation (PAR) transmittance was linearly and positively related to initial BA reduction 1, 3, and 5 years after harvest, but the relationship became weaker over the 4 years. Level of BA reduction accounted for 31% of variation in conifer sampling diameter growth, 61% of variation in hardwood regeneration height growth, and 21% of variation in shrub height growth, but did not account for significant variation in height growth of conifer advance regeneration. In view of their results, the authors recommend against partial cutting to promote conifer advance regeneration. They recommend removing the entire overstory if conifer sapling stock is adequate or if maximizing growth of

hardwoods is an object. Other factors possibly affecting advance regeneration require further study.

- Meilan, R. 2004. Molecular biology of forest trees, pp. 229–236 in *Encyclopedia of Forest Sciences*, J Burley, ed-in-chief, J Evans and J Youngquist, eds. Elsevier, London.

For biotechnologists and forest tree geneticists. The author briefly explains transformation (inserting a gene into the genome of an individual cell) and regeneration (causing that cell to differentiate into a whole organism) as they pertain to plants and introduces recombinant DNA techniques. He then describes “platforms” for the study of tree biology, including marker-aided selection, gene-tagging methods, poplar genome sequence and information, transformation to confirm gene functionality, and high-throughput analyses used to assess gene expression and chemical characterization. Finally, he discusses recent progress in applied biotechnology, public concern about its use, and safeguards necessary for commercialization of transgenic trees, including flowering control, engineering reproductive sterility, and ensuring transgene stability.

- Newton, M, and P Balandier. 2004. Synthesis: Social and economic considerations in forest vegetation management, pp. n.a., in *Proceedings, Fourth International Conference in Forest Vegetation Management, June 17–22, 2002, Nancy, France*. www.ifvmc.org/ifvmc4-social.html

For silviculturists, economists, and social scientists. The authors summarize and synthesize related papers presented by speakers at an international conference on forest vegetation management. The topics covered include perceptions as drivers of public opinion, alternatives to herbicides as vegetation management tools, environmental consequences of forest vegetation management, and economics of forest vegetation management.

- St Clair, JB, NL Mandel, and KJS Jayawickrama. 2004. Early realized genetic gains for coastal Douglas-fir in the northern Oregon Cascades. *Western Journal of Applied Forestry* 19: 195–201.

For tree geneticists and silviculturists. In block-plot realized genetic gain trials for coastal Douglas-fir,

realized genetic gains in height, diameter, and stem volume were similar 5 years after planting to those predicted from progeny tests. Thirty to 50 replicates were shown to be necessary if statistically significant differences between improved and unimproved populations are to be detectable.

Wender, BW, CA Harrington, and JC Tappeiner, II. 2004. Flower and fruit production of understory shrubs in western Washington and Oregon. *Northwest Science* 78: 124–140.

For plant reproductive biologists and ecologists. The relationships between reproductive output and plant size and age, site factors, and overstory density were examined in nine understory shrub species: vine maple, Oregon grape, California hazelnut, salal, oceanspray,

Indian plum, red elderberry, and evergreen and red huckleberry. In Washington, at least 50 shrubs or (in the case of rhizomatous species) microplots were sampled for each of eight species. The most useful predictor of flower or fruit abundance in all cases was plant size; plant age, closely correlated with plant size, also was a good predictor. In some species, site and overstory competition variables contributed to explaining flower or fruit abundance. In Oregon, the responses of five species to four levels of thinning were observed for 2–4 years (~15 shrubs or microplots/treatment/year) on two sites. Thinning increased the probability and abundance of flowering and fruiting in two species and did not affect one species. The response of the remaining two species was positive but not consistent.

Forest Ecology, Culture, and Productivity

Akay, AE, and J Sessions. 2004. Harvesting: Roading and transport operations, pp. 259–269 in *Encyclopedia of Forest Sciences*, J Burley, ed-in-chief, J Evans and J Youngquist, eds. Elsevier, London.

For harvest managers and forest engineers. Forest roads should be located and designed to minimize costs of construction and maintenance while satisfying geometric design specifications and controlling environmental impacts. Road location involves office planning, field reconnaissance, selection of final alignment, and on-the-ground layout. Road design must serve to control construction, maintenance, and transportation costs while taking into account vehicle performance and environmental impacts. The primary geometric design considerations are stopping sight distance, middle ordinate distance, vehicle off-tracking requirements, road gradient, and horizontal and vertical curves. Construction operations include clearing and grubbing, building earthwork, surfacing, drainage, and seeding and mulching. Maintenance is needed for the road surface, the roadway drainage, and ditches and culverts. Many aspects of construction and maintenance can be handled so as to protect the environment. Wetlands and stream crossing require special planning and design considerations.

Akay AE, O Erdas, and J Sessions. 2004. Determining productivity of mechanized harvesting machines. *Pakistan Journal of Applied Science* 4:100–105.

For researchers in forest engineering and forest operations. The factors affecting the productivity of mechanized harvesting machines are presented in the context of evaluating their application in developing countries.

Andersson, A, J Keskitalo, A Sjödin, R Bhalerao, F Sterky, K Wissel, K Tandre, H Aspeborg, R Moyle, Y Ohmiya, R Bhalerao, AM Brunner, P Gustafsson,

J Karlsson, J Lundeberg, O Nilsson, G Sandberg, SH Strauss, B Sundberg, M Uhlen, S Jansson, and P Nilsson. 2004. A transcriptional timetable of autumn senescence. *Genome Biology* 5(4): R24.1–R24.13.

For tree geneticists and biotechnologists. This database catalogs changes in gene expression that occur as leaves begin to senesce. The authors created a DNA microarray consisting of 13,490 clones. Using the microarray, they studied transcript abundance in leaves of a free-growing aspen tree (*Populus tremula*) in northern Sweden during natural autumn senescence. A major shift in gene expressions, from photosynthetic competence to energy generation by mitochondrial respiration, fatty acid oxidation, and mobilization of nutrients, was observed. Transcriptional activity increased before signs of senescence were visible.

Aubry, KB, CB Halpern, and DA Maguire. 2004. Ecological effects of variable retention harvests in the northwestern United States: the DEMO study. *Forests Snow and Landscape Research* 78: 119–137.

For silviculturists and forest ecologists. Although trees are routinely retained in harvest units on federal lands in the northwestern US, the ecological benefits ensuing from this management practice are uncertain. The large-scale, long-term experiments necessary to determine such benefits are rarely done because they are expensive and time-consuming. The Demonstration of Ecosystem Management Options (DEMO) study, mandated by the US Congress in 1993, includes six 13-ha harvest treatments replicated at six locations in mature Douglas-fir forests. The levels and patterns of retention in the treatments provide strong contrasts. Preharvest data were collected 1994–1996, the treatments were harvested in 1997–1998, and the initial postharvest data were collected in 2001.

Ecological responses were measured and public perceptions of visual quality were assessed. The most valuable information will come in the future as the stands mature.

Bachelet, D, RP Neilson, JM Lenihan, and RJ Drapek. 2004. Regional differences in the carbon source-sink potential of natural vegetation in the U.S.A. *Environmental Management* 33 (Suppl. 1): S23–S43.

For ecologists and those interested in carbon sequestration. Variability in carbon (C) storage from 1895–1994 was simulated in six regions of the United States. Simulated variations in C fluxes were largest in the Midwest and showed the smallest amplitudes in the Northeast. The Southeast alternated by decade between being a C source and a C sink in response to climatic variation. In the 1930s, drought depleted soil C and created a large C source in the Midwest and the Great Plains. In western regions, large yearly C fluxes are released from fire-prone areas, reducing temporal variation in C stock; these areas are impacted by prolonged drought and regional increase in rain caused by climate shifts. Under two warm climate scenarios, the Northeast and Southeast are projected to become primarily sources and the two westernmost regions to become sinks during the 21st century.

Berger, AL, KJ Puettmann, and GE Host. 2004. Harvesting impacts on soil and understory vegetation: the influence of season of harvest and within-site disturbance patterns on clear-cut aspen stands in Minnesota. *Canadian Journal of Forest Research* 34: 2159–2168.

For silviculturists, forest planners, and land managers. Soil disturbance and effects on understory vegetation resulting from harvesting aspen were characterized along a disturbance gradient (from high to low): landings, skid trails, and areas off skid trails. Soil disturbance and vegetation composition differed off skid trails from those on landings and skid trails, where they were similar. Sites that were more diverse and less disturbed before harvest (winter-harvested sites) were less altered than less diverse, more disturbed sites (summer-harvested sites). The

authors suggest that harvest layout should maintain a spatially connected network of remnant forest patches containing interior forest species, and amount and level of disturbances during harvest should be limited, in order to facilitate recovery of understory vegetation.

Boisvenue, C, H Temesgen, and P Marshall. 2004. Selecting a small tree height growth model for mixed-species stands in the southern interior of British Columbia, Canada. *Forest Ecology and Management* 202: 301–312.

For silviculturists and forest mensurationists. The authors compared several small tree height-growth models with respect to how well they fit data from major tree species in the interior cedar hemlock and interior Douglas-fir zones (BC Biogeoclimatic Ecosystem classification). The best predictor of small tree height growth for both conifers and hardwoods was a nonlinear model that incorporated transformations and combinations of slope, aspect, current height, and basal area of larger trees. This model was to be incorporated into an adaptation (PrognosisBC) of the Forest Vegetation Simulator, which is US-based, for British Columbia.

Bottomley, PJ, AE Taylor, SA Boyle, SK McMahon, JJ Rich, K Cromack, Jr, and DD Myrold. 2004. Responses of nitrification and ammonia oxidizing bacteria to reciprocal transfers of soil between adjacent coniferous forest and meadow vegetation in the Cascade Mountains of Oregon. *Microbial Ecology* 48: 500–508.

For microbial ecologists, silviculturists, and soil scientists. Soil cores were transferred between forest and meadow sites in order to study the effect of disturbance, vegetation, and roots on nitrification and the community composition of ammonia-oxidizing bacteria. Nitrification responded within 1 year to the transfers, but little change was observed in the composition of the ammonia-oxidizing bacteria.

Brunner, AM, and O Nilsson. 2004. Revisiting tree maturation and floral initiation in the poplar functional genomics era. *New Phytologist* 164: 43–51.

For tree geneticists and biotechnologists. The genome sequence of *Populus trichocarpa* was recently released. Researchers now have a new tool set to study developmental processes related to the perennial and tree life strategies. Most of what is known about regulation of the floral transition comes from research on the annual *Arabidopsis thaliana*. The authors compare flowering in *Arabidopsis* and trees and discuss how recent findings in the *Arabidopsis* system can be used in conjunction with those in the *Populus* system to elucidate the regulatory mechanisms for tree maturation and floral initiation.

Brunner, AM, VB Busov, and SH Strauss. 2004. Poplar genome sequence: functional genomics in an ecologically dominant plant species. *Trends in Plant Science* 9: 49–56.

For tree geneticists and biotechnologists. Poplars (*Populus* spp.) are widely used model organisms for tree molecular biology and biotechnology, in addition to providing a range of ecological services and wood products. The genome has been sequenced to approximately 6x depth, and many characteristics make poplars especially useful in research, including facile transformation, vegetative propagation, rapid growth, relatively small genome, and extensive expressed sequence tags. The authors discuss how these characteristics, coupled with the high genetic and ecological diversity, are allowing researchers to probe the genetics controlling ontogeny, adaptation, and physiology.

Brunner, AM, IA Yakovlev, and SH Strauss. 2004. Validating internal controls for quantitative plant gene expression studies. pp. n.a. *BMC Plant Biology* 4(14): doi:10.1186/1471-2229-4-14.

For molecular plant biologists. In order to measure gene expression accurately by real-time reverse transcription PCR (RT-PCR), a valid reference must be used to normalize the data. The authors describe a simple method to define and to evaluate measures of gene expression stability statistically and graphically from analysis of variance and linear regression. In analyzing RT-PCR to study 10 poplar housekeeping genes, they found that the genes differed widely in expression stability, depending on tissue, devel-

opmental stage, and environmental conditions. They conclude that the best reference gene for a given set of conditions should allow very small but biologically significant changes in gene expression to be detected.

Campbell, JL, O Sun, and BE Law. 2004. Supply side controls on soil respiration among Oregon forests. *Global Change Biology* 10: 1857–1869.

For ecologists and silviculturists. Annual soil respiration rates were compared with net primary production (NPP) and the allocation of carbon to various ecosystem pools in three forest types with different climates. Across the 36 plots, which also included three replicates of four age classes, annual soil respiration was moderately correlated with belowground NPP, but not with aboveground NPP. In spite of the different climatic conditions, soil respiration per unit live fine root biomass was similar in all forests. Trends among age classes within forest type were inconsistent and did not necessarily reflect cross-site trends. The results are consistent with a strong influence on soil respiration of carbohydrate supply to the rhizosphere. Belowground carbon allocation may affect some regional patterns of soil respiration more than abiotic constraints on subsequent metabolism.

Castellano, MA, JM Trappe, and DL Luoma. 2004. Sequester fungi, pp. 197–213 in *Biodiversity of Fungi: Inventory and Monitoring Methods*, GM Mueller, GF Bills, and MS Foster, eds. Elsevier Academic Press, New York.

For fungal taxonomists, mycorrhiza researchers, and ecologists. Most sequester fungi (truffles and their allies) fruit belowground, so sampling for these highly diverse organisms poses special challenges. The options are presented here, including various plot sizes and configurations and use of time-constraint methods.

Chen, J, KT Paw U, SL Uslin, TH Suchanek, BJ Bond, KD Brosofske, and M Falk. 2004. Net ecosystem exchanges of carbon, water, and energy in young and old-growth Douglas-fir forests. *Ecosystems* 7: 534–544.

For ecologists and silviculturists. Understanding net ecosystem exchange (NEE) of carbon (C) and water in different ages and types of ecosystem is key to estimating the cumulative carbon budget at larger scales. The authors used eddy-covariance to measure NEE of C, water, and energy in forests dominated by Douglas-fir in the Wind River Valley, Washington. They measured in a 40-year-old stand in 1998, a 20-year-old stand in 1999, and a 450-year-old stand in both years. During the warm, dry summers, all stands were net carbon sinks. For individual years, the 450-year stand was a C source in 1998, but a sink in 1999. As expected, the most C was assimilated and the least water was lost through evapotranspiration in the 40-year-old stand.

Claridge, AW, and JM Trappe. 2004. Managing habitat for mycophagous (fungus-feeding) mammals: a burning issue?, pp. 938–946 in *Conservation of Australia's Forest Fauna*, 2nd Edition, D Lunney, ed. Royal Zoological Society of New South Wales, Mosman, NSW, Australia.

For foresters, ecologists, and mycologists. Some proponents of frequent prescribed burning in Australia have suggested that burning promotes fruiting of truffle-like fungi used as a major food source by many small mammals. Field experiments and knowledge of fungal morphogenesis and ecology provide strong evidence that, in contrast, prescribed burning either has little effect on fungal fruiting or may suppress it for a year or two postfire.

Cohen, WB, and SN Goward. 2004. Landsat's role in ecological applications of remote sensing. *BioScience* 54: 535–545.

For ecologists and others interested in remote sensing. In recent decades, explicit spatial and temporal ecological studies have mushroomed, thanks to technological advances in remote sensing, geographic information systems (GIS), and modeling. Remote sensing allows modeling of biogeochemical cycles and characterization of land cover, forest structure and fragmentation, and biophysical attributes of vegetation. Data acquired by Landsat sensors are the most pivotal remotely sensed data in spatial and temporal scaling. The authors review

some thirty years of Landsat data collection and the contributions of Landsat to ecology.

Colgan III, W, and JM Trappe. 2004. NATS truffle and truffle-like fungi 10: *Pachyphloeus thysellii* sp. nov. (Pezizaceae, Pezizomycotina). *Mycotaxon* 90: 281–284.

For fungal taxonomists and ecologists. This new truffle species was discovered during field research on biomass production of fungi in relation to forest thinning at Fort Lewis, Washington. Morphologically it is most closely related to a species from southern Europe.

Compton, JE, LS Watrud, LA Porteous, and S DeGroot. 2004. Response of soil microbial biomass and community composition to chronic nitrogen additions at Harvard Forest. *Forest Ecology and Management* 196: 143–158.

For soil ecologists and microbiologists. Soil microbial response to increases in ecosystem nitrogen (N) availability may feed back on ecosystem carbon (C) and N dynamics. Soil microbial biomass, composition, and substrate utilization were measured in pine and hardwood stands at the Harvard Forest Chronic N Amendment Study. DNA community profiles were used to assess functional and structural genes for important N cycling processes. Added N decreased microbial biomass C in the O horizon in both stands and utilization of N-containing substrates in pine soils. Fungal counts were not clearly related to added N. Microbial community DNA profiles, however, were greatly influenced by N addition.

Conradie, I, WD Greene, JF Cox, and GE Murphy. 2004. Value recovery with harvesters in southeastern USA pine stands. *Forest Products Journal* 54(12): 80–84.

For logging planners and managers and forest engineers. Even though a cut-to-length harvest system is thought by many to produce more values from cut stems, it is rarely used in southeastern forests. The authors used optimization software to calculate the optimal recoverable value and compared that value with actual recovered value at three harvest sites. Actual recoveries ranged from 90% to 94% of

the optimal recoverable value. Value loss resulted from cutting fewer but longer logs than optimal, harvester measuring errors, and cutting logs that did not meet product specifications.

Cornell, JL, and L Kellogg. 2004. *Practical Methodology for Operational Layout of Commercial Skyline Thinning Systems*. Research Contribution 45, Forest Research Laboratory, Oregon State University, Corvallis.

For logging operators and harvest planners. On-the-ground harvest unit layout, especially in skyline-thinning operations, is critical to meeting multiple resource objectives of the land manager and maintaining the economic viability of the timber-harvesting operator. This phase of an operation can optimize the layout and harvesting of a sale or unit. This publication is an overview of practical methodology aspects for the layout of skyline thinning operations and provides a general outline of the components of the overall planning process of skyline thinning operations.

Curtis, RO, and DD Marshall. 2004. Douglas-fir growth and yield: Research 1909–1960. *Western Journal of Applied Forestry* 19: 66–68.

For silviculturists and forest historians. The authors of this article call *The Yield of Douglas-fir in the Pacific Northwest*, (USDA Bulletin 201, 1961) "...perhaps the most influential single research publication ever produced in the Northwest". It was the culmination of more than 50 years of research, set the pattern for research in other species in the region, and, with its earlier versions (1930, 1949, 1961), greatly influenced owners to move to planned long-term management. This article traces the history and evolution of growth-and-yield research over 5 decades, including the principal figures and research stations involved.

D'Amato, AW, and KJ Puettmann. 2004. The relative dominance hypothesis explains interaction dynamics in mixed species *Alnus rubra*/*Pseudotsuga menziesii* stands. *Journal of Ecology* 92: 450–463.

For silviculturists and ecologists. Previous studies of the importance of neighborhood competition as a de-

terminant of plant growth have produced inconsistent results. The authors proposed and tested the hypothesis that the importance of neighborhood interactions is determined by the relative dominance of a particular species. The best predictors of growth of the dominant (taller) species and neighborhood interaction indices of subordinate species were interaction indices that reflected the size of a tree relative to the population. On the basis of their findings, they suggest that the size structure of plant populations may explain the spatial scale of plant interactions, and the relative dominance hypothesis may help to elucidate the mechanism of plant competition.

DiFazio, SP, GT Slavov, J Burczyk, S Leonardi, and SH Strauss. 2004. Gene flow from tree plantations and implications for transgenic risk assessment, pp. 405–422 in *Plantation Forest Biotechnology for the 21st Century*, C Walter and M Carson, eds. Research Signpost, Kerala, India.

For tree geneticists and biotechnologists. The ability to measure and predict gene flow is critical in assessing the impacts of transgenic forest plantings on surrounding populations and ecosystems. Integrating gene flow estimates with ecological and demographic data in spatially explicit simulation models permits projections of transgene dispersal. The authors discuss several methods of measuring gene flow and how to choose a method. They then present a case study of gene flow in poplar, in which they combine a variety of data from a large-scale, long-term study into a spatial simulation model. Their results indicate that studies of long-distance, rather than local, gene dispersal are most critical. The model allows analysis of many scenarios of ecological conditions and transgenic movements.

Domec, JC, JM Warren, FC Meinzer, JR Brooks, and R Coulombe. 2004. Native root xylem embolism and stomatal closure in stands of Douglas-fir and ponderosa pine: mitigation by hydraulic redistribution. *Oecologia* 141: 7–16.

For tree physiologists. Water moves passively from moist to dry soil by way of roots. The authors investigated how this hydraulic redistribution affected root hydraulic functioning during drought in young and

old-growth Douglas-fir and ponderosa pine trees on four sites. As the dry season progressed, root embolism increased to 55% loss of conductivity in the young Douglas-fir trees and 75% in the young ponderosa pine, whereas loss of conductivity never exceeded 30 or 40% in old growth of the respective species. Hydraulic redistribution maintained soil water potentials at levels that reduced loss of shallow root functions in the old-growth trees of both species. In the young ponderosa pine stand, where there was little hydraulic redistribution, root function was seriously impaired and did not recover well when rains returned. In both species, root xylem embolism appeared to act with stomata to limit water loss. Hydraulic redistribution seems to be important in maintaining shallow root function and preventing total stomatal closure during dry periods.

Filip, GM, CG Parks, FA Baker, and SE Daniels. 2004. Artificial inoculation of decay fungi into Douglas-fir with rifle or shotgun to produce wildlife trees in western Oregon. *Western Journal of Applied Forestry* 19: 211–215.

For silviculturists and wildlife biologists. Snags provide important nesting habitat for cavity-nesting birds. Douglas-fir trees, either live or killed by topping, were inoculated with either *Phellinus pini* or *Fomitopsis cajanderi* delivered by rifle (as inoculated dowels) or shotgun (as inoculated sawdust) or were treated with sterile dowels or sawdust. After 5 years, mortality of topped trees was 100%, and at least half had sap rot. Nearly 50% showed evidence of wildlife activity. Sap rot incidence or wildlife did not differ among the shooting or fungal treatments. None of the live inoculated trees showed external evidence of decay or wildlife use. Destructive sampling of live, shot trees showed decay in both sterile and viable inoculum. Topping appears to be a faster way to create wildlife habitat than shooting live trees.

Garber, SM, and DA Maguire. 2004. Stand productivity and development in two mixed-species spacing trials in the Central Oregon Cascades. *Forest Science* 50: 92–105.

For silviculturists and forest managers. The effects of species composition and initial spacing on stand

growth, yield, and structural development were studied in two trials, one using *Pinus contorta* and *P. ponderosa* and the other using *Abies grandis* and *P. ponderosa*. As spacing increased, standing volume and periodic annual increment decreased in both trials. Early growth rates in mixed plots were fastest in the least shade-tolerant species and slowest with the most shade-tolerant. Initial differences in volume growth rates decreased with time in mixed-species plots. Mixing *P. contorta* and *P. ponderosa* did not produce yield benefits, but mixing *A. grandis* and *P. ponderosa* did seem to benefit yield at all spacings. Spacing and species composition are important influences in stand production and development.

Gartner, BL, JR Moore, and BA Gardiner. 2004. Gas in stems: abundance and potential consequences for tree biomechanics. *Tree Physiology* 24: 1239–1250.

For ecophysiologists. A survey of many species showed that sapwood typically contains about 20% gas content by volume. A modeling exercise showed that the gas may increase the stem's mechanical stability by providing a wider stem diameter, thereby making the tree better able to withstand bending.

Gerson, EA, and RG Kelsey. 2004. Piperidine alkaloids in North American *Pinus* taxa: implications for chemosystematics. *Biochemical Systematics and Ecology* 32: 63–74.

For plant systematists and natural products chemists. Piperidine alkaloids were extracted from 10 taxa of *Pinus* growing in the southwestern United States and Mexico. Eight contained alkaloids, one contained only a trace, and one yielded no alkaloids. On the basis of the alkaloid profiles, *P. leiophylla* var. *chihuahuana* was deemed to be appropriately classified as a variety of *P. leiophylla*, the designation of *P. discolor* as a separate species was supported, and it is suggested that *P. ponderosa arizonica* might be a species distinct from *P. ponderosa*. Water stress did not alter alkaloid composition.

Gonda, HE, DA Maguire, GO Cortés, and SD Tesch. 2004. Stand-level height-diameter equations for young ponderosa pine plantations in Neuquén,

Patagonia, Argentina: Evaluating applications of equations developed in the western United States. *Western Journal of Applied Forestry* 19: 202–210.

For biometricians and forest mensurationists. Ponderosa pine is the most widely planted species in northern Patagonia, a region that shares several climatic and geographical characteristics with the Pacific Northwest. The authors tested two linear and two nonlinear height-diameter models commonly used in the western United States for 127 plots in young ponderosa pine plantations in Patagonia. The models did not differ in any important way, but one of the nonlinear models had certain advantages. Biases may occur if missing heights within a plot are estimated by regional, rather than plot-level, equations. The height of trees in Patagonia was generally overestimated when coefficients derived from trees in the Pacific Northwest were used in the two nonlinear models.

Groover, A, JR Fontana, C Ma, R Martienssen, SH Strauss, and R Meilan. 2004. Gene and enhancer trap tagging of vascular-expressed genes in poplar trees. *Plant Physiology* 134: 1742–1741.

For forest geneticists and biotechnologists. Using transformation by *Agrobacterium tumefaciens*, the authors inserted gene and enhancer trap vectors carrying the B-glucuronidase reporter gene into the poplar genome. About 40% of the genes expressed in leaves were expressed only in the veins. The genes governing development and function of stem secondary vascular tissues overlapped significantly with those genes governing primary vascular tissue in other organs. This system eliminates the need for rounds of sexual recombination. Plant biologists can use this system to reference the poplar genome sequence directly and to identify novel genes.

Grotta, AT, BL Gartner, and SR Radosevich. 2004. Influence of species proportion and timing of establishment on stem quality in mixed red alder plantations. *Canadian Journal of Forest Research* 34: 863–873.

For forest managers, silviculturists, and wood products manufacturers. Red alder (*Alnus rubra*) and

Douglas fir (*Pseudotsuga menziesii*) were planted in a range of proportions in mixed plantations in Oregon. In some plantations the species were planted simultaneously; in others, red alder was planted 5 years after Douglas-fir. Simultaneous planting slowed growth of Douglas-fir and resulted in low crown bases and a great deal of stem defect in red alder. When red alder was planted later, alder stem form was not affected and height to crown base of Douglas-fir decreased as the proportion of red alder increased. Height to crown base of Douglas-fir was increased when Douglas-fir density was doubled but was not affected when red alder was used to double stand density. Lumber from either species grown in mixed stands may be inferior or have lower product recovery because of growth characteristics resulting from mixed species.

Hagar, J, S Howlin, and L Ganio. 2004. Short-term response of songbirds to experimental thinning of young Douglas-fir forests in the Oregon Cascades. *Forest Ecology and Management* 299: 333–347.

For wildlife biologists, ornithologists, and silviculturists. Commercial thinning could be used to increase structural diversity of managed conifer stands, but managers prescribing thinning need to know how wildlife might respond to thinning regimens. The authors studied how songbirds respond to three intensities and patterns of thinning in 40-year-old stands dominated by Douglas-fir. Thinning increased species richness and diversity of breeding songbirds. Density increased in four species and decreased in five species after thinning, but thinning did not exclude any species. The authors suggest that a variety of thinning intensities and patterns should be used to maximize avian and stand structural diversity in young, conifer-dominated stands.

Hann, DW, and ML Hanus. 2004. Evaluation of non-spatial approaches and equation forms used to predict tree crown recession. *Canadian Journal of Forest Research* 34: 1993–2003.

For silviculturists and forest mensurationists. The authors modeled tree crown recession (ΔHCB) in Douglas-fir, using two nonspatial approaches. The allometric method estimates ΔHCB from the differ-

ence in the height to crown base (*HCB*) predicted by a static *HCB* equation at the beginning and the end of the growth period. The incremental method predicts ΔHCB from an equation developed from permanent plot data. They tested two allometric and six incremental equation forms, as well as three ways to determine the end-of-growth-period tree and plot attributes for the allometric method. The best incremental equation form was superior to the best allometric equation forms in explaining variation. The best incremental form modified a previously developed nonlinear logistic equation by using measured stand age instead of measured tree age, but this form can be applied only to data from even-aged stands. The second best incremental equation, which can be applied to data from both even-aged and uneven-aged stands, uses tree growth effective age instead of measured tree age in the nonlinear equation.

Harmon, ME, K Bible, MG Ryan, DC Shaw, H Chen, J Klopatek, and X Li. 2004. Production, respiration, and overall carbon balance in an old-growth *Pseudotsuga*—*Tsuga* forest ecosystem. *Ecosystems* 7: 498–512.

For ecologists and ecophysiologicalists. Carbon (C) stores, growth, mortality, litterfall, respiration, and decomposition were measured in an old-growth stand in Wind River Experimental Forest, Washington. These measurements were used to estimate gross and net primary production, autotrophic and heterotrophic respiration, and net ecosystem production. Total mean C stores were 61,990 g/m², with 39,800 g/m² stored as live C and 22,092 g/m² in the detritus and mineral soil. Total mean net primary production was 597 g C/m²/year. Mean gross primary production was estimated to be 1,906 g C/m²/yr from a mean autotrophic respiration of 1,309 g C/m²/year. Mean heterotrophic respiration was 577 g C/m²/year. The long-term net ecosystem production indicated that this stand might be a small sink, although eddy-flux measurements at the same site indicated that it is a larger sink. The authors believe that temporal differences between the sets of measurements is the most likely explanation for the discrepancy.

Holub, S, and K Lajtha. 2004. The fate and retention of organic and inorganic ¹⁵N-nitrogen in an old-growth forest soil in western Oregon. *Ecosystems* 7: 368–380.

For ecologists, ecophysiologicalists, and soil scientists. Because very little atmospheric nitrogen (N) is deposited on forests in the Pacific Northwest, studies there can give some indication of the function of the N cycle in other regions before heavy deposition of inorganic N began. The fate of N added to *in situ* soil cores as ammonium, organic N, tannin-complexed organic N, and the N₂-fixing lichen *Lobaria oregana* was traced. Total ¹⁵N recovery was consistent from the first to the last sampling dates, ranging from 74% to 109% for all N additions. The largest N-retention pool was the litter/organic horizon. Microbial biomass initially contained nearly all the added ammonium N in the litter/organic horizon and also was important in retention of N from the other forms of N addition. When organic matter was complexed with tannin, the cycling of N seemed to slow, but the ultimate distribution of added organic N was not significantly affected. Retention of added N was affected little by season.

Homann, PS, SM Remillard, ME Harmon, and BT Bormann. 2004. Carbon storage in coarse and fine fractions of Pacific Northwest old-growth forest soils. *Soil Science Society of America Journal* 68: 2023–2030.

For soil scientists and ecologists. Although soil is a major carbon (C) pool, estimates of soil C pools and their controlling variables present considerable uncertainty. This study set out to determine the importance of the coarse fraction (>2 mm) in whole soil C pools in old-growth coniferous forests in the Pacific Northwest. Seven of the 18 forests sampled had C in the coarse fraction, averaging 23% of the whole-soil C. After soil disaggregation, an average of 20% of the whole-soil C remained in the coarse fraction. The whole-soil C pool in the surface 100 cm of mineral soil was positively related to available water capacity, annual precipitation, and coarse woody debris, similar to results obtained with the fine fraction. Including the coarse fraction affects the quantifica-

tion of soil C pools in many old-growth forests in the Pacific Northwest, although it does not change our understanding of the roles of climate and soil texture in controlling soil C.

Irvine, J, BE Law, M Kurpius, PM Anthoni, D Moore, and P Schwarz. 2004. Age-related changes in ecosystem structure and function and the effects on carbon and water exchange in ponderosa pine. *Tree Physiology* 24: 753–763.

For ecologists, ecophysicologists, and tree physiologists. Even though structure and productivity change as forests age, annual rates of water loss sometimes are not affected. The authors studied tree transpiration, leaf specific conductance, gross ecosystem production, and stand and leaf area indexes in young (~25 years), mature (~90 years), and old (~250 years) stands of ponderosa pine in a drought-prone region of central Oregon. When water was readily available, the difference in leaf specific conductance (KL) between the youngest and the oldest trees was nearly six-fold; transpiration per unit leaf area was also highest in the young trees. When water became limiting, KL declined much more in young trees (5X) than in mature (~2X) or old (<30%) trees. Gross ecosystem production was 69–85% higher and water use efficiency was 55–65% higher in the mature and old stands than in the young stands.

Jones, JA, and DA Post. 2004. Seasonal and successional streamflow response to forest cutting and regrowth in the northwest and eastern United States. *Water Resources Research* 40(5):W05203, doi 10.1029/2003WR002952.

For forest hydrologists and forest managers. The authors analyzed daily observations of climate and streamflow at 14 treated/control basin pairs where forests had been regrowing after removal in the 1930–2002 period. One to 5 years after forest removal, maximum daily increases were higher in conifer sites than at deciduous sites. Spring streamflow surpluses were observable up to 35 years after forest removal in conifer basins; in eastern deciduous forest basins, however, deficits appeared in winter and spring after 10–15 years. Changes in both relative

and absolute streamflow 1–5 and 15–25 years after forest removal were positively related to the age of the forest when it was cut.

Joseph, G, and R Kelsey. 2004. Ethanol synthesis and aerobic respiration in the laboratory by leader segments of Douglas-fir seedlings from winter and spring. *Journal of Experimental Botany* 55: 1095–1103.

For tree physiologists and silviculturists. Stem segments from terminal leaders of Douglas-fir had higher constitutive ethanol concentrations in May, when cambial cells were actively metabolizing, than in December, when cambial cells were dormant. Various alterations of incubation conditions induced ethanol production, especially in December. The authors conclude that changes in cambium physiology and phenology that can influence the induction of fermentation and ethanol production need to be considered when comparing fermentation among species, seasons, or ages.

Jumpponen, A, AW Claridge, JM Trappe, T Lebel, and DL Claridge. 2004. Ecological relationships among hypogeous fungi and trees: inferences from association analysis integrated with habitat modeling. *Mycologia* 96: 510–525.

For researchers in forest mycology and ecology. Association analyses by contingency tables and generalized linear modeling were compared to infer relationships among hypogeous (belowground-fruiting) ectomycorrhizal fungi. Both methods produced similar results: some species formed positively associated groups, indicating similar habitat preferences, whereas others were negatively associated.

Kelliher, FM, DJ Ross, BE Law, DD Baldocchi, and NJ Rodda. 2004. Limitations to carbon mineralization in litter and mineral soil of young and old ponderosa pine forests. *Forest Ecology and Management* 191: 201–213

For soil scientists. In the ponderosa pine forests of central Oregon, summer drought is a usual occurrence. Forests there regenerate naturally after clearcutting. Factors limiting mineralization were

compared in old and regenerating stands. The stands were similar in mass of litter and dead fine roots and in net mineral nitrogen (N) and CO₂ carbon (C) mineralization rates. Concentrations of total N, extractable organic N, extractable C, and microbial C and N were significantly higher in young stand-litter, likely because of litterfall from the understory in the young stand and the lack of understory in the old. Wetting increased net mineral N production in field-moist soils and also increased litter and soil microbial respiration rates. The availability of water appeared to be much more limiting to mineralization of litter and soil carbon than a lack of available C or N substrates.

Kellogg, L, and B Spong. 2004. *Production and Costs of Cut-to-length Thinning: Experience from the Willamette Young Stand Project*. Research Contribution 47, Forest Research Laboratory, Oregon State University, Corvallis.

For harvest planners, forest managers, and forest engineers. Young (40- to 50-year-old) Douglas-fir stands in the Willamette National Forest in the Cascade Mountains of Oregon were commercially thinned to achieve vegetation- and wildlife-related objectives. Harvesting and forwarding production and costs were compared among three mechanized thinning treatments: light thin [(115 residual trees per acre (tpa)), light thin with 0.5-ac openings (92 residual tpa), and heavy thin (53 residual tpa) stands. Using data from detailed time studies, the authors developed two regression equations to predict delay-free harvest cycle and forwarding cycle times. Delay information was gathered from both shift-level and detailed time studies. Total costs for each treatment were obtained by combining costs for harvesting, forwarding, and moving equipment for the entire operation. Harvesting and forwarding costs did not differ significantly between light and heavy treatments, but were higher in the light-thin-with-openings treatment. Total thinning costs ranged from \$28.08 to \$34.62/100 ft³.

Kerns, BK, and JL Ohmann. 2004. Evaluation and prediction of shrub cover in coastal Oregon forests (USA). *Ecological Indicators* 4: 83–98.

For plant ecologists and forestland managers. The authors developed multiple linear regression and regression tree models for total and deciduous shrub cover in the Oregon coastal province, using data from regional forest inventories and research and mapped climatic and topographic information. In both types of models, forest structure variables were most important in explaining total and deciduous shrub cover. Tree models performed similarly to or better than MLR models; their performance appears to be greatly improved by response variable transformation. Tree models provided a more explicit understanding of relationships. They also provided thresholds for anticipating shifts in shrub cover that are useful to forest managers. There are several possible reasons why both types of models lack strong predictive power.

Kramer, MG, P Sollins, and RS Sletten. 2004. Soil carbon dynamics across a windthrow disturbance sequence in southeast Alaska. *Ecology* 85:2230–2244.

For ecologists and soil scientists. Windthrow may redistribute and mix mineral and organic soil horizons in shallow mountain forest soils. The authors examined the patterns of soil carbon (C) in watersheds along a windthrow disturbance sequence. Light-fraction C pools were similar in all watersheds, but BH horizon heavy-fraction C pools and soil C stocks decreased markedly as disturbance increased. Mobile organic C accumulated in mineral horizons primarily by sorption to mineral particles, especially in the thicker illuvial horizons. Mobile organic C also may have become immobilized through flocculation of metal-bearing organic acids in the thicker illuvial horizons. In watersheds where windthrow had produced more intense soil mixing, levels of strongly humified soil organic matter were lower, and more of the organic matter was partially decomposed and particulate.

Krankina, ON, ME Harmon, WB Cohen, DR Oetter, O Zyrina, and MV Duane. 2004. Carbon stores, sinks, and sources in forests of northwestern Russia: Can we reconcile forest inventories with remote sensing results? *Climatic Change* 67: 257–272.

For forest ecologists and those interested in carbon cycling. Carbon (C) stocks and fluxes in large forest regions are primarily estimated from forest inventories and remote sensing data. Estimates of total C and of mean C sinks in live forest mass in the St. Petersburg region for the early 1990s, as obtained from Landsat imagery and from forest inventory data, were consistent. Nineteen percent of the forest area was a net C source. Minor increases in harvest or declines in biomass growth could reverse the weak average net C sink in total ecosystem biomass.

Laliberte, AS, and WJ Ripple. 2004. Range contractions of North American carnivores and ungulates. *BioScience* 54: 123–138.

For wildlife biologists and conservation biologists. Large-scale range contractions and expansions of 43 carnivores and ungulates in Canada, the United States, and Mexico were examined. For 17 species, range had contracted over more than 20% of their historic range. Species richness also declined markedly, with the temperate grasslands and broadleaf-mixed forest biomes losing the highest number of species, on average. The contractions were widespread and resulted from Euroamerican settlement and subsequent development.

Landsberg, JJ, and RH Waring. 2004. Top-down models and flux measurements are complementary methods of estimating carbon sequestration by forest canopies: illustrations using the 3-PG model, pp. 37–50 in *Forests at the Land-Atmosphere Interface*, M Mencuccini, J Grace, J Moncrieff, and KG McNaughton, eds. Oxford University Press.

For scientists interested in combining micrometeorological techniques with physiologically based growth models to estimate the carbon storage by plantations. Micrometeorological measurement of surface fluxes and biomass inventories are two of the most important methods for estimating the carbon balance of forests. Values obtained by the two methods must be consistent. The authors show how a simple process-based model (3-PG) can be used to bridge the gap between the two types of measurements. Several ecosystem models with flux measurements

are compared and discussed. The model was used to simulate growth of a stand in Scotland for which net ecosystem exchange measurements were available; the assumptions that had to be made to estimate net ecosystem exchange from the model are discussed.

Latta, G, and CA Montgomery. 2004. Minimizing the cost to stand level management for older forest structure in western Oregon. *Western Journal of Applied Forestry* 19: 221–231.

For forest managers and policy makers, conservationists, and economists. Because old-growth forest is thought to have declined dramatically in area in the Pacific Northwest, repeated thinning that leaves many fewer trees than the usual commercial thin has been proposed as a management strategy to stimulate development of older forest structure. A random search heuristic and an individual tree simulation model (ORGANON) were used to develop cost-effective management regimes for softwood forest stands in western Oregon that would meet older forest structural criteria, as defined by the Oregon Department of Forestry, for 30 years before clearcut harvest. These regimes achieve old forest structure at minimum reduction in the value of the forest for timber production. The opportunity cost for such management, estimated for each of a wide range of stand types, was positively correlated with site quality, stand age, and stocking.

Law, BE, and S Verma. 2004. Introduction, pp. 1–5 in *Handbook of Micrometeorology. A Guide for Surface Flux Measurements and Analysis*, X Lee, W Massman, and B Law, eds. Kluwer Academic Publishers, Boston.

For atmospheric scientists, micrometeorologists, and ecosystem scientists. This chapter introduces a book comprising nine chapters developed by invited participants in a 2002 workshop hosted by AmeriFlux. The papers summarize and expand on the principal topics of the workshop: averaging and detrending, coordinate rotation, low and high frequency corrections, flux corrections for cross contamination, time series analysis, post-field data quality control, and advection and modeling.

Law, BE, D Turner, J Campbell, OJ Sun, S Van Tuyl, WD Ritts, and WB Cohen. 2004. Disturbance and climate effects on carbon stocks and fluxes across western Oregon USA. *Global Change Biology* 10: 1429–1444.

For ecophysiologicals, ecosystem modelers, and biometricians. Using simulations based on field and remote-sensing observations and a process model, the authors produced a carbon (C) budget for the forest area of Oregon and determined the relative influence of climate and disturbance on C stocks and fluxes among the ecoregions included. Simulated annual net ecosystem production (NEP) for the whole region was 13.8 Tg C. The highest mean NEP was in the Coast Range ecoregion; the lowest was in the East Cascades ecoregion. Ecoregions varied widely in mean C stocks and in above- and below-ground partitioning. Total C stock was 2765 Tg C. Wildfires in 2002 caused a much larger flux of C to that atmosphere than had been the case during the late 1990s. Harvest removed ~5.5 Tg C annually from the study area over the 1995–2000 period. Net biome production on the land indicates that the study area was a sink, compensating for ~52% of the state's fossil carbon dioxide emissions in 2000.

Lee, K-S, WB Cohen, RE Kennedy, TK Maieresperger, and ST Gower. 2004. Hyperspectral versus multispectral data for estimating leaf area index in four different biomes. *Remote Sensing of Environment* 91: 508–520.

For ecophysiologicals and biometricians. Field measurements of leaf area index (LAI) in four biomes (row-crop agriculture, tallgrass prairie, mixed hardwood-conifer forest, and boreal conifer forest) were taken at the same general time and grain size by both Landsat ETM+ and AVIRIS (airborne visible/infrared imaging spectrometer) imagery. LAI was predicted better by models with selected subsets of individual AVIRIS channels than by broadband datasets. Stronger models were obtained in general when based on actual, rather than simulated, ETM+ data. There appeared to be no inherent advantage to MODIS spectral properties over those of ETM+ in estimating LAI.

Lee, X, W Massman, and B Law, eds. 2004. *Handbook of Micrometeorology. A Guide for Surface Flux Measurements and Analysis*, Kluwer Academic Publishers, Boston.

For atmospheric scientists and micrometeorologists. Studies of surface-air flux are a critical component of micrometeorology, the study of near-ground atmospheric processes at a relatively small scale. Micrometeorological methods are key to the studies carried out by FLUXNET, the consortium of the international networks of flux sites, but assumptions on which the methods are based have been restrictive and deficient. A uniform theoretical framework has also been lacking. In 2002, AmeriFlux hosted a workshop to discuss standardization of flux diagnostics and analysis. The workshop participants developed papers, presented in this book, on the topics perceived to be the most relevant to observation and diagnostics of surface flux.

Lehmkuhl, JF, LE Gould, E Cazares, and DR Hosford. 2004. Truffle abundance and mycophagy by northern flying squirrels in eastern Washington forests. *Forest Ecology and Management* 200: 39–65.

For wildlife biologists and mycologists. Little is known about truffle abundance and rodent mycophagy in dry interior montane forests. The authors sampled four stands each in dry open ponderosa pine forest, mesic young mixed conifer forest, and mesic mature mixed conifer forest at low elevations in the eastern Cascade Range. They sampled the soil for hypogeous sporocarps during two spring seasons and collected fecal pellets from live-trapped flying squirrels over four fall seasons. Twenty-two species were collected in all, 19 of which were Basidiomycotina. Eleven species contributed >90% of the truffle biomass in each cover type. Cover types differed in truffle assemblages, richness, and biomass. Fall squirrel diets were about 78% fungi from 23 genera and 22% plant material. Cover type did not affect composition, richness, evenness, or fungus: plant material ratio in the diet. More truffle genera were detected in fall fecal samples than in spring soil samples. Although managing low-elevation dry forest to obtain stable fire regimes might reduce truffle diversity at the stand scale, it might increase

diversity and persistence long-term on the beta and landscape scale.

Lesser, MR, M Cherry, and WH Parker. 2004. Investigation of limestone ecotypes of white spruce based on a provenance test series. *Canadian Journal of Forest Research* 34: 1119–1127.

For silviculturists. The authors examined the evidence for limestone ecotypes in white spruce (*Picea glauca* (Moench) Voss) by remeasuring a series of provenance trials in Ontario. Test sites and provenances differed significantly, but there were no significant interactions that would support the existence of limestone ecotypes. In contrast, an earlier field study showed a strong interaction between test site and provenance bedrock type. Because of the design of the remeasured provenance trials and the way the provenances were classified, the results of this study do not disprove the existence of limestone ecotypes.

Lipow, SR, K Vance-Borland, JB St Clair, J Henderson, and C McCain. 2004. Gap analysis of conserved genetic resources for forest trees. *Conservation Biology* 18: 412–423.

For forest geneticists, conservation biologists, and ecologists. The authors developed a gap analysis approach to evaluate whether eight species of conifers in western Oregon and Washington had adequate genetic resources conserved *in situ* in protected areas. They found that in most of the study region genetic resources were well protected *in situ*, with the exception of noble fir in the Willapa Hills of southwest Washington. A possible *in situ* gap for Douglas-fir in the southern Puget lowlands was compensated for by extensive *ex situ* resources in the area. Their method was effective in evaluating the genetic resources of forest trees across a large region.

Luoma, DL, JL Eberhardt, R Molina, and MP Amaranthus. 2004. Response of ectomycorrhizal fungus sporocarp production to varying levels and patterns of green-tree retention. 2004. *Forest Ecology and Management* 202: 337–354.

For mycologists and silviculturists. Ectomycorrhizal fungi are good indicators of disturbance effects on below-ground ecosystems. The authors examined the effects of green-tree retention regimes on epigeous (mushroom) and hypogeous (truffle) production in the spring and fall fruiting seasons. Two patterns (aggregated and dispersed) and four levels (100, 75, 40, and 15%) of retention in three locations were used. The number of taxa was reduced least in the 75%-aggregate retention treatment and most in the 15%-dispersed treatment. Sporocarp production declined in all treatments after treatment. Sporocarp production was nearly eliminated from the 15%-aggregate treatment and significantly reduced in the 15%-dispersed treatment. The 40%-dispersed treatment showed no treatment effect on the fall crop. The authors conclude that combining dispersed and aggregated retention should be useful when maintaining sporocarp production is a management goal. The combination would ameliorate the effects of clearcutting and may maintain higher sporocarp production in the aggregates.

Ma, C, SH Strauss, and R Meilan. 2004. Agrobacterium-mediated transformation of the genome-sequenced poplar clone, Nisqually-1 (*Populus trichocarpa*). *Plant Molecular Biology Reporter* 22: 311–312.

For forest biotechnologists. The complete DNA sequence of the Nisqually-1 poplar clone has been released by the US Department of Energy. An efficient means of transformation and regeneration is required in order to improve the usefulness of this sequence in genomics research. The authors grew leaf disc and stem explants with a strain of *Agrobacterium tumefaciens* that contained a plasmid vector having genes for neomycin phosphotransferase (*NPTII*) and β -glucuronidase (*GUS*) and examined factors that affect transformation rate. The level of thidiazuron in the culture influenced transformation efficiency. The *GUS* gene was expressed in leaf, stem, and root tissue of transgenic plants, and both selectable and marker and reporter genes were found in all lines with β -glucosidase activity. The protocol, which had a 6% efficiency, allowed recovery of transgenic plants in 6 months.

Mainwaring, D, and DA Maguire. 2004. The effect of local stand structure on growth and growth efficiency in heterogenous stands of ponderosa pine and lodgepole pine in central Oregon. *Canadian Journal of Forest Research* 34: 2217–2229.

For silviculturists and forestland managers. Basal area and height growth of individual trees in uneven-aged stands of ponderosa and lodgepole pine in central Oregon were analyzed. Distance-dependent variables improved growth prediction when added to models that had had only distance-independent variables. Small trees negatively affected the growth of larger trees. Volume growth efficiency of lodgepole pine decreased with increasing levels of spatial occupancy; efficiency of ponderosa pine, however, was greatest when crown base sapwood and crown projection areas were highest. The final models distinguished between the effects of relative height, which was positive, and increasing tree size, which was negative.

Marshall, H, and GE Murphy. 2004. Economic evaluation of implementing improved stem scanning systems on mechanical harvester/processors. *New Zealand Journal of Forest Science* 34(2): 158–174.

For logging planners and forest engineers. Mechanical harvesters and processors increase productivity and safety but are less efficient than motor manual log bucking systems in extracting the maximum value from a tree. The authors evaluated three procedures in terms of productivity, cost and value recovery for scanning and bucking Douglas-fir and ponderosa pine: conventional operation, with changes and decisions made by the machine operator, automatic full scan before optimization and bucking, and partial scanning of a portion of the stem, with qualities and dimensions forecast before optimal bucking. New value improvement for the automated scanning procedure ranged from -7% to 8% over the conventional procedure. The best net value improvement was obtained with the full-scan procedure. Breakeven costs for new equipment for scanning, forecasting, and optimization ranged from \$0 to over \$2 million US, depending on several factors.

McDowell, NG, DR Bowling, BJ Bond, J Irvine, BE Law, P Anthoni, and JR Ehleringer. 2004. Response of the carbon isotopic content of ecosystem, leaf, and soil respiration to meteorological and physiological driving factors in a *Pinus ponderosa* ecosystem. *Global Biogeochemical Cycles* 18, GB1013, doi:10.1029/2003GB002049.

For ecophysiologicals, soil ecologists, and tree physiologists. The objective of this research was to determine whether meteorological and physiological driving factors were related to ecosystem-respired $\delta^{13}\text{C}$ ($\delta^{13}\text{C}_R$), including soil-respired $\delta^{13}\text{C}$ ($\delta^{13}\text{C}_{R\text{-soil}}$) and foliage-respired $\delta^{13}\text{C}$ ($\delta^{13}\text{C}_{R\text{-foliage}}$) over 2 weeks in a 250-year-old ponderosa pine forest in central Oregon. Stomatal conductance (G_s) and net ecosystem CO_2 exchange were negatively correlated with atmospheric vapor pressure deficit (vpd). There was a negative correlation, with a 2-day time lag, between $\delta^{13}\text{C}_R$ and G_s , but $\delta^{13}\text{C}_R$ was not correlated with other variables measured. The significant driving parameters for $\delta^{13}\text{C}_{R\text{-soil}}$ and $\delta^{13}\text{C}_{R\text{-foliage}}$ were different, possibly because of different controls over the isotopic content of tissue-specific respiratory fluxes. Because the strong meteorological controls of G_s and net ecosystem CO_2 exchange were associated with similar variation in $\delta^{13}\text{C}_{R\text{-soil}}$, but only minor variation on $\delta^{13}\text{C}_R$, the authors conclude that $\delta^{13}\text{C}_R$ is controlled by the time-dependent interaction between canopy and belowground processes.

McDowell, NG, DR Bowling, A Schauer, J Irvine, BJ Bond, BE Law, and JR Ehrlinger. 2004. Associations between carbon isotope ratios of ecosystem respiration, water availability, and canopy conductance. *Global Change Biology* 10: 1767–1784.

For ecophysiologicals and tree physiologists. The authors tested whether canopy conductance regulates the stable carbon isotope signature ($\delta^{13}\text{C}_R$) of ecosystem respiration in a semiarid old-growth ponderosa pine forest in Oregon. For comparison, they also evaluated $\delta^{13}\text{C}_R$ in a wet young plantation of Douglas-fir near the coast. At both sites, variability in $\delta^{13}\text{C}_R$ was highest when rainfall was abundant and lowest during summer drought. The $\delta^{13}\text{C}_R$ was consistently more positive in the pine forest than in the Douglas-fir forest. In the Douglas-fir forest,

soil water content and vapor pressure deficit were the most important governors of $\delta^{13}\text{C}_R$, whereas $\delta^{13}\text{C}_R$ in the pine forest was relatively insensitive to these factors. Canopy-gas exchange appeared to be weakly coupled to $\delta^{13}\text{C}_R$ on the dry site even when trees had groundwater access. The $\delta^{13}\text{C}_R$ and soil temperature were strongly correlated with soil temperature during drought on both sites. The authors conclude that their data support their original hypothesis that canopy-level physiology is a critical regulator of $\delta^{13}\text{C}_R$, but belowground respiration may become more important during dry periods.

Meilan, R, D Ellis, G Pilate, AM Brunner, and J Skinner. 2004. Accomplishments and challenges in genetic engineering of forest trees, pp. 36–51 in *The Bioengineered Forest: Challenges to Science and Society*, SG Strauss and HD Bradshaw, eds. Resources for the Future, Washington, DC.

For forest geneticists and biotechnologists. The use of transgenes in long-lived perennial crops, such as trees, has been achieved many times but still presents several challenges. Transgenes can be readily introduced into trees, but tissue culture techniques still do not allow growing trees from single cells. Furthermore, transgenes cannot yet be introgressed into superior genotypes because of the long growth period of trees and the lack of suitable breeding lines. Other challenges include stability of gene expression over the years or decades of a rotation; somatic clonal variation; and transgenic containment and genetically engineered sterility, including social, political, and ethical, as well as scientific, considerations. The author discusses recent research in and the relative importance of each of these areas.

Moore, GW, BJ Bond, JA Jones, N Phillips, and FC Meinzer. 2004. Structural and compositional controls on transpiration in 40- and 450-year-old riparian forests in western Oregon, USA. *Tree Physiology* 24: 481–491.

For ecophysicologists, tree physiologists, and silviculturists. The authors studied how tree age, species composition, and sapwood basal area affect stand-level transpiration on two adjacent watersheds, one with a young, mature conifer forest and the other

with an old-growth forest. Transpiration, sap flux density, and total stand sapwood area were greater in the young stand. Sap flux density was higher in young red alder than in young Douglas-fir and in old Douglas-fir than in old western hemlock trees. The greatest influences on stand differences in water use were tree age, sapwood basal area, and species composition, in that order. The authors estimated that vegetation in the riparian area of the young stand used 3.27X more water over the measurement period. Their reports support the suggestion that forest management changes site water balance.

Murphy, G, H Marshall, and MC Bolding. 2004. Adaptive control of bucking on harvesters to meet order book constraints. *Forest Products Journal* 54(12): 114–121.

For logging planners and forest engineers. Sensors and computers on modern harvesters can optimally buck each harvested stem to maximize its value. Basing optimal bucking on marking prices likely will not give sufficiently high yields to meet order book constraints. The authors developed an adaptive control heuristic and tested it on three virtual and one real-world stand in which the location and detailed description of every stem were known. Using the heuristic improved compliance with order book target proportions in all four stands. Improvement ranged from 17% to 22% when preharvest inventory data were used and 19% to 22% when stem information was gathered during the harvesting process.

Nalle, DJ, CA Montgomery, JL Arthur, S Polasky, and NH Schumaker. 2004. Modeling joint production of wildlife and timber. *Journal of Environmental Economics and Management* 48: 997–1017.

For researchers in forest economics, wildlife population simulation modeling, and forest management. The authors demonstrate a method for spatial modeling of optimal forest management for timber production and selected wildlife populations. The model integrates an economic model of softwood log markets with a biological wildlife population model. The case study is set in the Cascade Range of western Oregon and models two wildlife populations (great

horned owl, which prefers old forest and can travel long distances, and porcupine, which prefers young forest and has limited dispersal capability) over 100 years. The case study demonstrates potential inefficiency of current management with widely divergent public and private ownership objectives, in comparison to a scenario in which ownerships are ignored and landscape is managed optimally for timber and the wildlife species.

Neilson, RP. 2004. Projecting potential landscape dynamics: issues and challenges, pp. 42–46 in Proceedings: Views from the Ridge--Consideration for Planning at the Landscape Scale. USDA Forest Service, General Technical Report PNW-GTR-596, Pacific Northwest Research Station, Portland OR.

For forest planners, resource managers, and landscape ecologists. Natural resource science and management has shifted recently from a site-based, single-issue perspective to a landscape perspective that recognizes the complexity, multiplicity, and interrelatedness of natural resources. The author discusses his personal views of the challenges involved in predicting possible trajectories of complex landscapes over very large spatial extents from small-scale processes. He restricts his comments to the process-based approach to ecosystem modeling, as empirically based models cannot accept changing climate as input.

North, M, J Chen, B Oakley, B Song, M Rudnicki, A Gray, and J Innes. 2004. Forest stand structure and pattern of old-growth western hemlock/Douglas-fir and mixed-conifer forests. *Forest Science* 50: 299–311.

For ecologists, silviculturists and forestland managers. Competition for light resulting from fire suppression should result in few gaps and higher stem density of shade-tolerant species. Species composition, structure, spatial pattern, and environmental factors were compared between two old-growth forests: western hemlock/Douglas-fir at the Wind River Canopy Crane Research facility in the Pacific Northwest and mixed conifer at the Teakettle Experimental Forest in the southern Sierra Nevada. It was hypothesized that fire suppression at Teakettle

would bring tree composition and distribution to resemble the continuous canopy cover at Wind River, but such was not the case. Although fire suppression increased stem density at Teakettle, it did not fill gaps, stratify the canopy by shade tolerance, or otherwise produce patterns similar to those at Wind River. A minimum canopy cover needed for tree establishment may not have been present at Teakettle. Reducing canopy cover to release regeneration should be used cautiously as a management technique in the Southern Sierra Nevada.

Olson, GS, EM Glenn, RG Anthony, ED Forsman, PJ Loschl, WJ Ripple, and JA Reed. 2004. Modeling demographic performance of northern spotted owls relative to forest habitat in Oregon. *Journal of Wildlife Management* 68: 1039–1053.

For ecologists, forestland managers, and avian biologists. Little is known about how habitat affects the demographic performance of northern spotted owls. The authors developed models to relate owl survival and productivity to forest composition and landscape patterns, as well as age, sex, presence of barred owls, and climate. Survival was affected by the amount of late and midseral forests within 1,500 m of nests and by precipitation during the nesting season. Reproductive rates were affected by amount of edge between late and midseral forests and other habitat classes, parent ages, amount of precipitation during nesting season, and presence of barred owls.

Parker, GG, ME Harmon, MA Lefsky, J Chen, R Van Pelt, SB Weis, SC Thomas, WE Winner, DC Shaw, and JF Franklin. 2004. Three-dimensional structure of an old-growth *Pseudotsuga-Tsuga* canopy and its implications for radiation balance, microclimate, and gas exchange. *Ecosystems* 7: 440–453.

For ecologists and ecophysiologicalists. The authors determined the vertical distribution of foliage, crowns, external surface area, wood biomass, and canopy volume of an old-growth Douglas-fir/western hemlock forest in the central Cascades of southern Washington. They also estimated spatial variation of certain structural aspects and of microclimate. Large-stem crowns dominated the structure and

much of the spatial variation. Canopy surfaces in vertical profile generally were at a maximum in the lower to middle third of the canopy. The height of that maximum and the value of the stand leaf area index varied according to method. The deep narrow crowns and numerous gaps render the outer canopy surface very complex. The surface area of the outer canopy is 12 times that of the ground and includes a large, very porous volume that provides several qualitatively distinct environments. The authors discuss the implications of structural characteristics of old growth forests and the complexity they generate in terms of ecosystem function.

Pendall, E, S Bridgham, PJ Hanson, B Hungate, DW Kicklighter, DW Johnson, BE Law, Y Luo, JP Me-gonigal, M Olsrud, MG Ryan, P Thornton, and S Wan. 2004. Belowground process responses to elevated CO₂ and temperature: A discussion of observations, measurement methods, and models. *New Phytologist* 162: 311–322.

For soil scientists and ecologists. Atmospheric carbon dioxide (CO₂) and temperatures are rising, probably affecting ecosystem carbon (C) cycling, as well as climate. Processes occurring underground regulate storage of large amounts of C and may be quite sensitive to elevated CO₂ and temperature. They therefore are key in the global C cycle. Different components of the belowground ecosystem respond distinctively to environmental change. Increased C supply from elevated CO₂, increased respiration and decomposition rates from warming, and indirect effects on availability of soil moisture and nutrients may alter underground processes and affect long-term net C storage. The authors synthesize what is currently known about such belowground responses and feedbacks, discuss methodological challenges, and present approaches to integrating models and measurements.

Perry, DA, HA Jing, A Youngblood, and DR Oetter. 2004. Forest structure and fire susceptibility in volcanic landscapes of the eastern high Cascades, Oregon. *Conservation Biology* 18: 913–926.

For conservation biologists, land managers, and ecologists. Managers designing multidimensional

forest health initiatives need to understand better how forest structure is related to susceptibility to wildfires outside the range of natural variability and how much treatment may be needed to reduce susceptibility to an acceptable level. Working within the ponderosa pine zone, the authors found that, on average, 86% of trees >5 cm in breast height were <101 years old, and young tree density was negatively correlated with that of old trees. Age classes differed significantly in species composition. Modeling predicted that crown kill would be >70% on 5 of 14 plots and 50% on another 5 plots, but thinning trees <20 cm dbh and burning to reduce logging slash would prevent torching even under extreme conditions. The amount of thinning required to prevent active crown fire was highly variable among plots. Landsat Thematic Mapper might be useful for rapid risk assessment.

Pilz, D. 2004. The Biscuit Fire Brewer's Spruces. *Conifer Quarterly* 21(3): 6–11.

For conifer enthusiasts. This article is a tale of symbolically replanting Brewer's Spruce seedlings into an area of the Kalmiopsis Wilderness-Siskiyou National forest burned by the 2002 Biscuit Fire.

Pilz, D, NS Weber, MC Carter, CG Parks, and R Molina. 2004. Productivity and diversity of morel mushrooms in healthy, burned, and insect-damaged forests of northeastern Oregon. *Forest Ecology and Management* 198: 367–386.

For mycologists, forest managers, and mushroom harvesters. Morels are an important commercial crop. Using thinning and prescribed fire to recreate conditions present in forests before wide-scale fire suppression presents opportunities to promote morel crops, but our understanding of morel diversity, ecology, and productivity precludes taking full advantage of such opportunities. This paper reports the first unbiased landscape-level estimates of morel mushroom productivity and describes several morel species, yet to be validly named, on the basis of genetic and morphological analysis. Three of five putative species at the study sites fruited only on burned soils in the first spring after a wildfire, and two fruited either on unburned soils or in the sec-

ond year after a fire. In general, forests burned by wildfire were more productive than those disturbed by insect damage; healthy forests were the least productive.

Puente, ME, CY Li, and Y Bashan. 2004. Microbial populations and activities in the rhizoplane of rock-weathering desert plants. II. Growth promoting of cactus seedlings. *Plant Biology* 6: 643–650.

For forest and microbial ecologists. In order to assess growth promotion of cactus seedlings by four bacterial species isolated from the rhizoplane of cacti growing in bare lava, bacteria were inoculated onto cacti seedlings placed in ground rocks. The bacteria fixed nitrogen and weathered the rocks, mobilizing useful minerals. Inoculation promoted survival and growth of cactus and helped supply essential minerals for at least 12 months.

Puente, ME, Y Bashan, CY Li, and VK Lebsky. 2004. Microbial populations and activities in the rhizoplane of rock-weathering desert plants. I. Root colonization and weathering of igneous rocks. *Plant Biology* 6: 629–642.

For forest ecologists and microbiologists. To determine bacteria and fungi in the rhizoplane of desert plants, such as cacti and wild fig trees, growing in rocks, root samples were observed by bright-field and fluorescence microscopy and emission scanning electron microscopy. The dominant bacterial groups colonizing the rhizoplane were fluorescent pseudomonads and bacilli. Some of the microorganisms fixed in vitro N_2 and produced volatile and nonvolatile organic acids, which could be involved in chemical weathering of rocks.

Ripple, WJ, and RL Beschta. 2004. Wolves and the ecology of fear: Can predation risk structure ecosystems? *BioScience* 54: 755–766.

For ecologists and wildlife biologists. Wolves (*Canis lupus*), major predators of large herbivores, disappeared from Yellowstone National Park in the mid-1920s and were reintroduced in 1995. The authors examined the trophic cascades of carnivore-herbivore interactions on woody browse species and ecological responses, involving riparian functions,

beaver (*Castor canadensis*) populations, and food webs. Risk of predation may profoundly affect the structure of ecosystems and native biodiversity. Additional research is needed to understand how lethal and nonlethal effects of predation interact in structuring ecosystems.

Ripple, WJ, and RL Beschta. 2004. Wolves, elk, willows, and trophic cascades in the upper Gallatin Range of Southwestern Montana, USA. *Forest Ecology and Management* 200: 161–181.

For ecologists, wildlife biologists, and land managers. From the mid-1920s to the mid-1990s, wolves (*Canis lupus*) were absent from the upper Gallatin winter range of elk (*Cervus elaphus*) in Montana. The authors found that willow (*Salix* spp.) had been browsed to the point of suppression when wolves were gone, but browsing intensity diminished in some areas after their return. To examine whether browsing levels reflect terrain that influences predation risk for elk, the authors measured browsing intensities and heights of Booth willow (*S. boothii*) along the Gallatin River and a tributary. In narrow regions of the Gallatin Valley, where predation risk is high, willows were relatively tall. Willows in more open or upland areas, where predation risks are low, generally remained short. The authors discuss alternative mechanisms but conclude that changes in willow communities as wolves were removed and then reintroduced were consistent with a top-down trophic cascade model. They suggest that wolf recovery may be a management option in efforts to restore riparian plant communities and sustain biodiversity.

Rock, J, KJ Puettmann, HA Gockel, and A Schulte. 2004. Spatial aspects of the influence of silver birch (*Betula pendula* L.) on growth and quality of young oaks (*Quercus* spp.) in central Germany. *Forestry* 77: 235–247.

For silviculturists and forestland managers. The authors investigated how interference by silver birch (*Betula pendula* L.) influences oaks in clusters. On one site, oaks were smaller and birch exerted no consistent interference on height or diameter at breast height. On the second site, where the oaks

were larger, the birch had a negative influence. Interference did not affect crown type. Oak crown centers shifted away from birch, and proportion of trees with good stem form increased with distance from birch. Foresters may be able to determine when to remove the influence of overtopping birch by monitoring crown shift.

Salwasser, H. 2004. Future forests: environmental and social contexts for forest biotechnologies, pp. 3–11 in *The Bioengineered Forest: Challenges to Science and Society*, SG Strauss and HD Bradshaw, eds. Resources for the Future, Washington, DC.

For forest biotechnologists and policymakers. Forests provide many social, cultural, ecological, and material benefits, but forests are diminishing in area overall while human populations are growing. The author discusses what will be required for sustainable management so that forests can continue to provide the values and services that we have come to expect.

Santiago, LS, G Goldstein, FC Meinzer, JB Fisher, K Machado, D Woodruff, and T Jones. 2004. Leaf photosynthetic traits scale with hydraulic conductivity and wood density in Panamanian forest canopy trees. *Oecologia* 140: 543–550.

For plant physiologists and wood anatomists. Water transport capacity, wood density, and wood anatomy were studied with respect to their relationship to leaf photosynthetic traits in 20 species of canopy trees. Allocation to photosynthetic potential appeared to be proportional to maximum water capacity. As water transport efficiency varied, efficient use of water appeared to be traded off against efficient use of nitrogen in photosynthesis. Wood density may constrain physiological functions to specific operating ranges. The results thus link photosynthetic allocation with branch hydraulics and indicate that tree hydraulic architecture can provide insight into comparisons of leaf level measurements among species.

Sarr, DA, and DE Hibbs. 2005. Woody plant distributions in western Oregon riparian forests: insights for restoration and management, pp. 119–127 in KL Mergenthaler, JE Williams, and ES Jules, eds.

***Proceedings of the Second Conference on Klamath-Siskiyou Ecology, May 29–31, 2003, Cave Junction, Oregon.* Siskiyou Field Institute, Cave Junction, Oregon.**

For silviculturists and plant ecologists. Diverse species composition, steep environmental gradients, and lack of understanding of regional variation in riparian vegetation make riparian restoration in the Klamath-Siskiyou region challenging. The authors conducted a riparian inventory extending from the eastern Siskiyou Mountains to the Coast Range of northwest Oregon. Four watersheds were included. Species sorted independently along the gradients and were associated with specific climatic, topographic, and disturbance settings. The authors propose strategies for riparian restoration based on the observed complex patterns of response of species to environmental variation and life history strategies.

Sarr, D, K Puettmann, R Pabst, M Cornett, and L Arguiello. 2004. Restoration ecology: New perspectives and opportunities for forestry. *Journal of Forestry* 102(5): 20–24.

For restoration and forest ecologists and forest managers. Restoration ecology has become increasingly important in land management. The authors discuss the relationship and opportunities for exchange between restoration ecology and forestry. They present two case studies, one conducted in California and one in Minnesota, that demonstrate how concepts of restoration ecology can contribute to the field of forestry. They conclude that forestry can gain conceptual breadth, new techniques for research and management, and new jobs from implementing restoration ecology.

Schwarz, PA, BE Law, M Williams, J Irvine, M Kurpius, and D Moore. 2004. Climatic versus biotic constraints on carbon and water fluxes in seasonally drought-affected ponderosa pine ecosystems. *Global Biogeochemical Cycles* 18:GB4007, doi:10.1029/2004GB002234.

For plant physiologists and ecologists. Climatic and biotic controls on gross primary production (GPP) and water vapor fluxes were studied over 4 years

in young, mature, and old stands of ponderosa pine in eastern Oregon that are seasonally affected by drought. Climatic variation exerted the least effect on GPP at the old stand and the greatest at the mature stand. Interannual variation in leaf area influenced fluxes in the young stand more than did climate. The old stand also had the lowest interannual variation of net ecosystem exchange (NEE). In landscapes with a high frequency of younger stands, climatic variation and leaf area change between years likely will produce large interannual variation in GPP and NEE.

Skov, K, TE Kolb, and KF Wallin. 2004. Tree size and drought affect ponderosa pine physiological response to thinning and burning treatments. *Forest Science* 50: 81–91.

For silviculturists and forestland managers. The responses of trees established pre- and post-EuroAmerican settlement to three levels of thinning and burning were examined. The treatments were unthinned/unburned (control), light thinning and burning, and heavy thinning and burning. The study took place over two years that differed in precipitation. Predawn water potential of both pre- and post-settlement trees were consistently higher in both thinning treatments than in the control. Net photosynthetic rate and stomatal conductance increased in the thinned treatment only when soil water availability was lowest; increases were greater in post-settlement trees. Thinning did not affect foliar nitrogen.

Slavov, GT, and P Zhelev. 2004. Allozyme variation, differentiation, and inbreeding in populations of *Pinus mugo* in Bulgaria. *Canadian Journal of Forest Research* 34: 2611–2617.

For tree geneticists. Ten polymorphic allozyme loci were used to assess genetic variation in 17 populations of *Pinus mugo*. Polymorphism and gene diversity were comparable to mean values for gymnosperms, but somewhat lower than in pines with large, continuous ranges. There was no differentiation among populations or isolation by distance. All loci in all populations showed moderate levels of inbreeding. This nonequilibrium population structure

may occur because the growth form and reproductive biology of the species promote near-neighbor pollinations. More information about the genetic variation of adaptive traits is needed.

Slavov, GT, GT Howe, I Yakolev, KJ Edwards, KV Krutovskii, GA Tuskan, JE Carlson, SH Strauss, and WT Adams. 2004. Highly variable SST markers in Douglas-fir Mendelian inheritance and map locations. *Theoretical and Applied Genetics* 108: 873–800.

For tree geneticists and biotechnologists. The authors developed 22 highly variable SSR markers in Douglas-fir and confirmed their Mendelian inheritance. Twenty markers were mapped to 10 linkage groups. Fifteen single-locus markers were considered to be the most suitable for DNA fingerprinting and parental analysis because they were highly polymorphic and had unambiguous phenotypes.

Smith, JE, D McKay, CG Niwa, WG Thies, G Brenner, and JW Spatafora. 2004. Short-term effects of seasonal prescribed burning on the ectomycorrhizal fungal community and fine root biomass in ponderosa pine stands in the Blue Mountains of Oregon. *Canadian Journal of Forest Research* 34: 2477–2491.

For researchers and managers in forest ecology and soils. In order to determine the effects of seasonal prescribed fire on the belowground ectomycorrhizal community and live fine root biomass, ectomycorrhizae were sampled from four replications of three treatments (fall underburning, spring underburning, and a unburned control) before and after underburning. Live root biomass following spring underburning was similar to the unburned treatment, whereas live root biomass was largely removed to a depth of 10 cm by fall underburning. The successful reintroduction of fire to the ecosystem to achieve the desired future condition of large-tree ponderosa pine retention with low fuel loads may require more than underburning in a single season.

Smith, TG, and CC Maguire. 2004. Small-mammal relationships with down wood and antelope bitterbrush in ponderosa pine forests of central

Oregon. *Forest Science* 50: 711–728.

For ecologists and mammalogists. Little is known about the interactions between down wood or antelope brittle brush (*Purshia tridentata*) with small mammal populations in the ponderosa pine forests of central Oregon. The authors estimated population density, survival, and reproductive status of yellow-pine chipmunks (*Tamias amoenus*), golden-mantled ground squirrels (*Spermophilus lateralis*), and deer mice (*Peromyscus maniculatus*) under three down-wood and shrub cover conditions on ponderosa pine/antelope bitterbrush forests. Ground squirrel survival was more than four times higher on units with high down-wood volume, and higher down-wood volume also was associated with increased ground squirrel density. Chipmunk densities were 57% higher on units with higher total shrub cover, and increases in both total shrub and live bitterbrush cover were associated with increased chipmunk density. Neither down-wood volume or shrub cover affected deer mouse populations significantly. Management activities influencing down wood or bitterbrush likely will also change the composition of small mammal communities.

Spears, JDH, and K Lajtha. 2004. The imprint of coarse woody debris on soil chemistry in the Western Oregon Cascades. *Biogeochemistry* 71: 163–175.

For biogeochemists, soil ecologists, and those interested in nutrient recycling. As coarse woody debris (CWD) turns into dissolved organic matter (DOM), it may create a spatially defined chemical imprint on the soil. DOM is carbon-rich and acidic, and many soil processes are associated with it. The potential imprint of CWD was investigated by sampling leachates, soil solutions, and soil under CWD in different states of decay; control samples were taken from under the forest floor without CWD. Leachates from CWD had lower pH and higher levels of polyphenols and DOC than controls; chemical fractions of the DOC, however, were similar in CWD and control leachates. Soil under CWD had lower pH, more exchangeable acidity, and more exchangeable aluminum and iron than control soils. Differences between control soils and those under CWD disappeared at depths >5 cm, and soils under the most highly de-

cayed CWD were not affected by its presence. CWD exerted only a slight effect on soil chemistry, which was limited to surface mineral soils.

Sterky, F, RR Bhalerao, P Unneberg, B Segerman, P Nilsson, AM Brunner, L Charbonnel-Campaa, JJ Lindvall, K Tandre, SH Strauss, B Sundberg, P Gustafsson, M Uhlen, RP Bhalerao, O Nilsson, G Sandberg, J Karlsson, J Lundeberg, and S Jansson. 2004. A *Populus* EST resource for plant functional genomics. *Proceedings of the National Academy of Sciences* 101: 13,951–13,956.

For tree geneticists and biotechnologists. The authors analyzed 102,019 expressed sequence tags (ESTs) of *Populus*, the internationally accepted model for molecular tree biology. The ESTs clustered into 11,885 clusters and 12,759 singletons. They also provided more than 400 full clone sequences. These will provide a basis for future annotation of the *Populus* genome sequence. The coding content of the perennial *Populus* genome is very similar to that of the annual *Arabidopsis thaliana*, indicating that differences in gene regulation are primarily responsible for differences in their life forms. Because their genomes are so similar, information on the functional genome of each genus will be valuable for studies of the other.

Strauss, SH. 2004. GE trees: the buzz is not from chain-saws. *TimberWest* (May/June): 50.

For timber producers and members of the public. Although genetically engineered (GE) trees have been widely used in some countries, such as Chile, Brazil, and China, consumers in Europe, Japan, and, to some extent, the United States and elsewhere, are concerned that the plants produced by biotechnology are dangerous. The author explains the current practices of biotechnology, presents the concerns of those opposed to its use, and discusses precautions being implemented to meet those concerns and allow bioengineered trees to help meet the wood products needs of the future.

Strauss, SH, and AM Brunner. 2004. Tree biotechnology in the 21st century: Transforming trees in the light of comparative genomics, pp. 76–97 in *The Bioen-*

***gineered Forest: Challenges to Science and Society*, SG Strauss and HD Bradshaw, eds. Resources for the Future, Washington, DC.**

For tree geneticists and biotechnologists. Genetic engineering allows isolation, modification, and reinsertion of genes and effective trait modifications within the same or among different species. Genetic engineering complements traditional breeding programs for trees, particularly in enabling deployment of novel, dominant "domestication" alleles that increase productivity or product quality in intensively managed situations while presenting very little threat to wild populations. Both technical and biosocial constraints present obstacles to genetic engineering in trees, and research is the most critical need if genetically engineered products are to be commercially available in the next 10 to 20 years.

Strauss, SH, and FM Martin. 2004. Poplar genomics comes of age. *New Phytologist* 164: 1–4.

For tree geneticists and biotechnologists. In this commentary, the authors describe the increase in value of poplars as a model for molecular tree biology over the past decade. The genome sequence soon to be released will provide a catalog of all genes and their regulatory environments. The field is now moving into detailed studies over a wide range of topics, including developmental processes, adaptation to biotic and abiotic stresses, and metabolism. Poplars have extensive populations in the wild and a diversity of uses, and the precise genetic dissection of the genus that is becoming possible therefore has important, often direct, implications for ecology, conservation, breeding and biotechnology.

Strauss, SH, AM Brunner, VB Busov, C Ma, and R Meilan. 2004. Ten lessons from 15 years of transgenic *Populus* research. *Forestry* 77: 455–465.

For forest biologists and breeders. In the experience of the authors with transgenic poplars in both the laboratory and the field, transformation has proven to be extremely useful in biotechnology and functional genomic research. They discuss 10 points they have learned from their experience and conclude that transformation in this organism is extremely re-

liable. Biosafety can be improved by several means, given the needed time, commitment, and partnerships.

Sun, OJ, J Campbell, BE Law, and V Wolf. 2004. Dynamics of carbon storage in soils and detritus across chronosequences of different forest types in the Pacific Northwest, USA. *Global Change Biology* 10: 1470–1481.

For forest ecologists and biogeochemists. The objectives of this study were to determine (1) the influence of climate and forest type on variation of carbon (C) stocks and fluxes in soils and detrital pools and (2) solid and detrital C accumulation and turnover after stand-replacing disturbance. Carbon in soils and detritus (forest floor and woody debris) was determined in chronosequences in stands that ranged in age from <13 to >600 years and represented the range of forest types in the Pacific Northwest. Soil C (to 100 cm depth) ranged from 36 ± 10 kg C/m² in coastal Sitka spruce/western hemlock forests to 7 ± 10 kg C/m² in semiarid ponderosa pine forest, with forests across the Cascade Mountains having values between 10 and 25 kg C/m². Soil and detritus C turned over fastest on mesic sites of Douglas-fir/western hemlock forests in the Cascade Mountains. The relative contribution of soil and detritus C to total ecosystem C decreased as a negative exponential function of stand age in all forest types. Solid C storage reached the asymptote between 150–200 years.

Suzuki, N and BC McComb. 2004. Associations of small mammals and amphibians with beaver-occupied streams in the Oregon Coast Range. *Northwest Science* 78: 286–293.

For wildlife biologists and ecologists. Beavers cause disturbances near streams that may influence habitat of small mammals and amphibians. Beaver-occupied and unoccupied reaches of five streams in the Oregon Coast Range were examined with respect to vegetation structure and capture rates of small mammals and amphibians. Occupied reaches had less percent cover by stinking currant and all shrubs combined and greater cover by elderberry, grasses, and sedges than did unoccupied reaches. Captures

of individual species of small mammals and amphibians were the same in occupied and unoccupied reaches, but species typical of early successional stages or ponds were captured more frequently in occupied reaches. Capture rates of five species of small mammals were more variable in occupied reaches. The authors suggest that this high variability is associated with the more diverse vegetative and physical characteristics of occupied reaches.

Swanston, C, PS Homann, BA Caldwell, DD Myrold, L Ganio, and P Sollins. 2004. Long-term effects of elevated nitrogen on forest soil organic matter stability. *Biogeochemistry* 70: 229–252.

For forest ecologists and biogeochemists. This study addressed how nitrogen (N) addition may change decomposition rate in five organic matter pools: organic horizons (Oe+a), whole mineral soil (WS), and the light fraction (LF), heavy fraction (HF), and a physically recombined fraction (RF) of the mineral soil. Respiration, mineralized N, and active microbial biomass were measured after a 300-day incubation. Cumulative respiration was 15% lower in samples with elevated N. Respiration was twice as high in the Oe+A as in the LF and 35% higher in the WS than in the RF. Nitrogen treatments were similar in mineralized N, as were the LF and HF. Net N mineralized decreased with higher C:N ration in the LF, but increased in the HF. Active microbial biomass the WS and RF decreased towards the end of the incubation, corresponding with decreasing respiration and increasing nitrate. Elevated N had a stabilizing effect on organic matter in both whole soil and soil fractions in the long term.

Temesgen, H, and KV Gadow. 2004. Generalized height-diameter models for major tree species in complex stands of interior British Columbia, Canada. *European Journal of Forest Research* 123: 45–51.

For researchers in growth-and-yield modeling. Two sets of tree height and diameter functions were evaluated for their predictive abilities for major tree species in British Columbia. The first set estimated height as a function of individual tree diameter; the second set estimated height as a function of individual tree diameter and stand-level attributes. For

all species, the inclusion of the relative position of a tree and stand density in the base height-diameter models increased the accuracy of prediction.

Tollefson, JE, FJ Swanson, and JH Cissel. 2004. Fire severity in intermittent stream drainages, western Cascade Range, Oregon. *Northwest Science* 78: 186–191.

For ecologists and forestland managers. Postfire live canopy cover in streamside and upland zones on southeast and southwest facing slopes of 33 watersheds was estimated from aerial photographs. Canopy cover was essentially the same in streamside and upland areas. Severity data from aerial photographs and from field data were highly correlated. Fire severity may differ along streams of different sizes, contributing to structural diversity on the landscape scale.

Trappe, JM. 2004. Habitat and host associations of *Craterellus tubaeformis* in northwestern Oregon. *Mycologia* 96: 498–509.

Understanding the ecological characteristics of the winter chanterelle (*Craterellus tubaeformis*) is key to its conservation and requires knowledge of its habitat and host associations. The authors surveyed forest types in northwestern Oregon for mycorrhizal associates. They found that stand age and the presence of well-decayed coarse woody debris (CWD) were significantly related to chanterelle occurrence, especially in stands <100 years old, but not to standing crop biomass. Probability of occurrence and crop biomass were not related to slope, elevation, or aspect. The occurrence of chanterelles in the area was highly correlated with the presence of western hemlock (*Tsuga heterophylla*), and their mycorrhizal association was confirmed. This species can also form mycorrhizae with Douglas-fir and Sitka spruce (*Picea sitchensis*), but rarely does so unless hemlock is also present. Genetic differences in chanterelle populations suggest that there may be several species in eastern and western North America and Europe.

Trappe, JM. 2004. The ways of herbaria: a cautionary note for users of herbarium collections. *Inoculum* 55(3): 3–4.

For taxonomic, ecologic and molecular researchers. Organism names on collections in herbaria are often incorrect. Taxonomists, ecologists and molecular biologists should confirm the identity of herbarium materials used in their research to avoid wrongly designating the species reported in their publications.

Treuhaft, RN, BE Law, and GP Asner. 2004. Forest attributes from radar interferometric structure and its fusion with optical remote sensing. *BioScience* 54: 561–571.

For forest ecologists and researchers in remote sensing. Changes in forest vegetation structure can substantially impact the carbon cycle and other ecological processes, thereby affecting carbon storage and climate. InSAR (interferometric synthetic aperture radar) adds a vertical dimension to two-dimensional remote sensing and complements the capabilities of lidar (light detection and ranging), allowing global, three-dimensional remote sensing of forest structure that can improve assessment of forest structure and associated biophysical quantities, such as biomass. Future InSAR experiments, recent airborne and spaceborne demonstrations, and information provided by ecologists about structure will suggest ways to measure global vegetation structure from space.

Turner, DP, M Guzy, MA Lefsky, WD Ritts, S van Tuyl, and BE Law. 2004. Monitoring forest carbon sequestration with remote sensing and carbon cycle modeling. *Environmental Management* 33 (4):457–466.

For researchers interested in landscape ecology and carbon flux. Carbon (C) flux associated with forest harvesting, as well as with the biological processes of net primary production and heterotrophic respiration, was analyzed for two study areas in western Oregon. The approach employed Landsat satellite imagery and the Biome-BGC ecosystem process model. The Coast Range and West Cascades sites differed significantly in terms of the rate that C was being sequestered on the landscape. The Coast Range site was mostly private land managed for timber production. Much of this area was in young, productive age classes, and simulations indicate

these are a C sink. Mean annual harvest was greater than mean annual net ecosystem production. Relatively little of the site on the west Cascades had been harvested, and the area was accumulating C.

Turner, DP, SV Ollinger, and JS Kimball. 2004. Integrating remote sensing and ecosystem process models for landscape- to regional-scale analysis of the carbon cycle. *BioScience* 54: 573–584.

For researchers interested in monitoring forest productivity and carbon sequestration. This paper reviews recent developments in remote sensing and ecosystem modeling related to analysis of the carbon cycle. Satellite capabilities with respect to mapping vegetation type, biomass, stand age, phenology, leaf area index, and net ecosystem production are discussed. Simulating modeling is described as a means to synthesize satellite data, distributed meteorological data, and our best understand of biophysical processes.

Turner, DP, S Ollinger, ML Smith, O Krankina, and M Gregory. 2004. Scaling net primary production to a MODIS footprint in support of Earth Observing System product validation. *International Journal of Remote Sensing* 25: 1961–1979.

For researchers interested in mapping and monitoring net primary production. Net primary production (NPP) is beginning to be estimated based on imagery from Earth orbiting satellites. This paper compares three approaches to using ground-based measurements of NPP to produce NPP data layers for the purposes of validating the satellite-derived NPP estimates. A notable benefit of a scaling approach based on ecosystem process models is that the biophysical mechanisms associated with the variations in NPP are treated.

Unsworth, MH, N Phillips, T Link, BJ Bond, M Falk, ME Harmon, TM Hinckley, D Marks, and KT Paw U. 2004. Components and controls of water flux in an old-growth Douglas-fir—western hemlock ecosystem. *Ecosystems* 7: 468–481.

For tree physiologists and ecophysicologists. Rates of sap flow in dominant trees, changes in soil moisture,

and evaporation from coarse woody debris were measured in an old-growth Douglas-fir/western hemlock ecosystem during dry summer periods at Wind River, Washington. In order to examine the factors controlling the components of ecosystem water loss, the measurements were compared with eddy-covariance measurements of water-vapor fluxes above the forest (Ee) and at the forest floor (Eu). Transpiration accounted for about 70% of (Ee-Eu). The data suggest that water partitioning between understory and overstory changed over the season.

Valachovic, YS, BA Caldwell, K Cromack, Jr, and RP Griffiths. 2004. Leaf litter chemistry controls on decomposition of Pacific Northwest trees and woody shrubs. *Canadian Journal of Forest Research* 34: 2131–2147.

For soil scientists and forest ecologists. Initial leaf litter chemistry of 16 conifers, hardwoods, and shrubs common in the Pacific Northwest was determined and correlated with first-year decomposition rates. Species differed significantly in litter chemistry and decomposition rates. For all species combined, 30 of the 36 variables tested were strongly correlated with first-year decay rate; acid-unhydrolyzable proanthocyanidins, lignocellulose index, and acid-unhydrolyzable residue were most highly correlated with decay rate. No one variable was a universal predictor of decay rate for each of the 16 species, although phenolic components were more frequently significant. Including measurements of reactive and residual phenolic fractions and acid-hydrolysable lignin improved on traditional proximate leaf litter analyses.

Vance, NC, P Bernhardt, and RM Edens. 2004. Pollination and seed production in *Xerophyllum tenax* (Melanthiaceae) in the Cascade Range of central Oregon. *American Journal of Botany* 91: 2060–2068.

For plant taxonomists and pollination and plant reproductive biologists. Because of the flower structure of *Xerophyllum tenax*, self-pollination is inevitable. Controlled hand-pollination experiments were used to compare the pollination system with reproductive success. Ovaries of flowers from unbaggged inflorescences were visited by several kinds

of insects and produced normal capsules and mature seeds, whereas ovaries of flowers from which insects had been excluded produced small capsules and undeveloped or no seeds. Flowers showed an early-acting self-incompatibility system in which germinating pollen tubes failed to reach the ovary. After cross-pollination by hand, pollen tubes penetrated to the ovary. Insect cross-pollination also resulted in penetration of pollen tubes to the ovary. The self-incompatibility system in this species resembles that in some species of *Trillium*, a closely related species.

Wagner, RG, M Newton, EC Cole, JH Miller, and BD Shiver. 2004. The role of herbicides for enhancing forest productivity and conserving land for biodiversity in North America. *Wildlife Society Bulletin* 32: 1028–1041.

For forest managers and wildlife biologists. Herbicides are often used in modern forest management to increase reforestation success and timber yield. The use of herbicides, however, is often viewed as conflicting with conservation of biodiversity. In the 23 studies examined in this paper, wood volume yield of major commercial species generally increased 30–300% with effective, usually herbicide-based, management of competing vegetation over a wide range of site conditions. Properly used herbicides appear to have only short-term negative effects on wildlife. Using herbicides to increase yields from intensively managed plantation will be crucial in meeting growing demand for wood, as well as demands for wildlife habitat and biodiversity conservation.

Waldien, DL, MM Cooley, J Weikel, JP Hayes, CC Maguire, T Manning, and TJ Maier. 2004. Incidental captures of birds in small-mammal traps: a cautionary note for interdisciplinary studies. *Wildlife Society Bulletin* 32: 1260–1268.

For wildlife biologists and ecologists. The incidence of birds captured in small-mammal traps was assessed for eight research projects in Massachusetts, Oregon, and Washington. During 703,138 total trap-nights, 867 birds, representing 17 species, were captured. Four species (song sparrow, spotted towhee, and Steller's and gray jays) accounted for

86% of the captures; over half the captures were of ground-foraging species. Capture rates of birds were relatively high in Tomahawk and Sherman traps in two studies; captures were negligible in pitfall and Ugglan traps in four studies. The great variability in avian capture rates within trap types across studies makes it difficult to predict when and where avian capture would be likely. When a study includes both birds and small mammals, researchers should take into account potential negative effects on small-mammal trapping on the avian component.

Walter, ST and CC Maguire. 2004. Conifer response to three silvicultural treatments in the Oregon Coast Range foothills. *Canadian Journal of Forest Research* 34: 1967–1978.

For silviculturists. Three silvicultural treatments (group-selection cut, two-story regeneration harvest, and clearcut) were applied to 30 stands of Douglas-fir, 85–125 years old. Ten years after treatment, there was no difference in tree basal area, diameter, or height growth, or in crown width or fullness among treatments. Live crown ratio was largest in clearcuts, and the highest proportion of trees with epicormic branching was found in two-story stands. Mortality of residual green trees was highest in clearcuts and lowest in group-selection stands.

Waring, RH. 2004. Tree physiology: Stress, pp.1628–1632 in *Encyclopedia of Forest Sciences*, J Burley ed-in-chief, J Evans and J Youngquist, eds. Elsevier, London.

For those interested in how physiologists measure and predict the susceptibility of trees to pathogen and insect attack. Trees must adapt to stress if they are to survive, but adaptation can limit growth and competitiveness in more favorable environments, and surviving one stress can increase adaptability to another. The author analyzes the mechanisms by which trees withstand stress from radiation, drought and flooding, temperature extremes, mechanical forces, toxic compounds, and nutritional deficiencies. Using an integrative physiological process model to illustrate how seasonal climate variation causes stress, he compares the performance of *Pinus ponderosa* and *Eucalyptus globulus* in a nonnative

environment. Biochemical and structural indices of stress are discussed.

Whitlock, C, CN Skinner, PJ Bartlein, T Minckley, and JA Mohr. 2004. Comparison of charcoal and tree-ring records of recent fires in the eastern Klamath Mountains, California, USA. *Canadian Journal of Forest Research* 34: 2110–2121.

For fire ecologists and historians. Fire histories are determined from tree-ring records, which go back a few hundred years, and lake-sediment cores, which go back several thousand years. Tree-ring and lake sediment data from four watersheds in the Klamath Mountains over the last 300 years allowed comparison of the two approaches in a regime of frequent low- to moderate-severity fires, rather than in the high-severity fires studied previously. Sediment cores from small lakes provided charcoal data; tree-ring records were obtained from fire-scar chronologies at several sites within each watershed. The approaches complemented and supplemented each other. The tree ring records showed fires that were not evident in the sediment cores; the charcoal data showed variations in fuel loading and burning at broader spatial scales. The sediment records showed regional burning in the late 19th and early 20th centuries; both data sets showed that fires declined in the late 20th century.

Wimberly, MC, and JL Ohmann. 2004. A multi-scale assessment of human and environmental constraints on forest land cover change on the Oregon (USA) Coast Range. *Landscape Ecology* 19: 631–646.

For landscape and forest ecologists and land managers. The objective of the study was to increase understanding of human influences on the abundance and pattern of forest habitat. Integration of forest survey data and maps of a 25,000-km² landscape from 1936 with satellite imagery and GIS data from the same area in 1996 showed that the total area of closed canopy forest over the 30 years changed little. Large-conifer forests decreased from 42% to 17% of the landscape over the 30 years, however, while small-conifer forests increased from 21% to 39%. The proportion of land in private ownership was the strongest predictor of

changes in the proportion of large-conifer forest at the subbasin, watershed, and subwatershed scales; contributions by other variables were minor. Different management regimes on private and public ownerships apparently have led to distinctive pathways of landscape change that are consistent across spatial scales.

Winner, WE, SC Thomas, JA Berry, BJ Bond, CE Cooper, TM Hinckley, JR Ehleringer, JE Fessenden, B Lamb, S McCarthy, NG McDowell, N Phillips, and M Williams. 2004. Canopy carbon gain and water use: analysis of old-growth conifers in the Pacific Northwest. *Ecosystems* 7: 482–497.

For tree physiologists and ecophysiologists. Leaf-level physiological processes (photosynthesis, respiration, stomatal conductance, water potential, stable carbon (C) isotope values, and biogenic hydrocarbon emissions) were analyzed for Douglas-fir, western hemlock, and western red cedar in an old-growth forest at the Wind River Canopy Crane Research Facility. Photosynthesis was consistently highest in Douglas-fir and lowest in western red cedar and showed pronounced vertical gradients. Net photosynthesis and stomatal conductance depended strongly on vapor-pressure deficit in Douglas-fir and declined during drought. Foliar respiration was lowest in western red cedar and similar in the other two species. Water use efficiency varied with species and tree height. Leaf water potential was most negative in Douglas-fir and similar for the other species. Estimated gross primary productivity, as modeled from the physiological measurements, was about 22 Mg C/m²/year. More refined estimates of stand level C balance and long-term predictions of changes in C balance will require physiological studies.

Woodruff, DR, BJ Bond, and FC Meinzer. 2004. Does turgor limit growth in tall trees? *Plant, Cell and Environment* 27: 229–236.

For tree physiologists and silviculturists. The gravitational component of water potential can significantly reduce water potential near the tops of tall trees unless there is osmotic adjustment. The authors investigated how leaf-tissue water relations

and shoot growth characteristics vary with respect to height in young and old Douglas-fir trees. Turgor decreased as height increased. Branch elongation, leaf dimensions, and leaf mass/area showed vertical trends indicating that turgor limitation on shoot growth increased with increasing height. No osmotic adjustment was observed in May, and in July it was insufficient to compensate fully for the gravitational component of water potential. The potential constraints on turgor imposed by this component superimposed on phenologically driven changes in leaf water relations may not be distinguishable from those associated with soil water deficits.

Yano, Y, K Lathja, P Sollins, and BA Caldwell. 2004. Chemical and seasonal controls on the dynamics of dissolved organic matter in a coniferous old-growth stand in the Pacific Northwest, USA. *Biogeochemistry* 71: 197–223.

For biogeochemists and those interested in nutrient cycling. Soil organic matter (SOM), the largest pool of terrestrial carbon (C), is formed and lost as dissolved organic matter (DOM) is retained or released. Little is known, however, about how the DOM source affects its chemical composition or how that composition affects its retention. Production of dissolved organic carbon (DOC) and dissolved organic nitrogen (DON) was often greater in the shallow mineral soil than in the O horizon, in contrast to reports for other sites. The DOM in the O and mineral soil horizons may have different origins, as suggested by a shift in chemical composition. The hydrophobic and hydrophilic acid fractions dominated the soil solution at all depths in the field, and increases and decreases in these fractions explained much of the net production and removal of total DOC. More of the free amino fraction was lost to deep soil water at this site than at others, suggesting that less labile DON was retained. Total DOM retained in mineral soil possibly can be estimated by certain field-measured parameters.

Young, AL, and M Newton. 2004. Long overlooked historical information on Agent Orange and TCDD following massive applications of 2,4,5-T-containing herbicides, Eglin Air Force Base, Florida.

Environmental Science & Pollution Research 11: 209–221.

For toxicologists and environmental scientists. The aerial spray systems for military herbicides used in support of the war in Vietnam were tested in grids on the Eglin Air Force Base. The test site was established in 1961; because most of the vegetation had been removed, ground-based residues and high solar exposure of initial residues could be followed. The soils, fauna, flora, and aquatic ecosystems of the test areas were studied from 1969 through 1984. Less than 1% of TCDD in soil when sampling began was there after 10 years. TCDD was detected in 16 of 45 species examined; these species all lived in close contact with contaminated soil. Field studies of more than 50 generations of the beach mouse showed minimal effects of exposure to TCDD-contaminated soil on health and reproduction. Although great amounts of herbicides and TCDD were applied to the site, no long-term adverse ecological effects were found.

Young, AL, JP Giesy, P Jones, M Newton, JE Guilmartin, Jr, and PF Cecil, Sr. 2004. Editorial: Assessment of potential exposure to Agent Orange and its as-

sociated TCDD. *Environmental Science & Pollution Research 11: 347–348.*

Young, AL, JP Giesy, PD Jones, and M Newton. 2004. Environmental fate and bioavailability of Agent Orange and its associated dioxin during the Vietnam war. *Environmental Science & Pollution Research 11: 359–371.*

For toxicologists and environmental scientists. These articles and the associated "Authors' Perspective" editorial address concerns about the likelihood of troops having been exposed to the herbicide Agent Orange and its contaminant TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) during the Vietnam War. This article reviews the scientific literature on the environmental fate of Agent Orange. It addresses an aspect of the exposure model envisioned by the Committee on the Assessment of Wartime Exposure to Herbicides in Vietnam of the National Academy of Sciences' Institute of Medicine, but not addressed in their final report. On the basis of their review, the authors conclude that ground troops in Vietnam who had only incidental contact with the herbicide most likely were not exposed to TCDD. TCDD biogrades photochemically, is not very bioavailable, and dissipates rapidly in the environment. In addition, little reached the forest floor after aerial spraying.

Integrated Protection of Forests and Watersheds

Beschta, RL, JJ Rhodes, JB Kauffman, RE Gresswell, GW, Minshall, JR Karr, DA Perry, FR Hauer, and CA Frissell. 2004. Postfire management on forested public lands of the western United States. *Conservation Biology* 18: 957–967.

For conservation biologists, ecologists, and forest managers. Forest land management after fire may influence forest and aquatic systems for decades or longer. On the basis of their experience and the published literature, the authors suggest that retaining large trees, rehabilitating firelines and roads and, in some instances, planting native species are promising approaches to restoration after fire. On the other hand, seeding exotic species, livestock grazing, placing structures in or near streams, removing large trees, ground-based logging, and road construction would generally interfere with ecosystem recovery. The need persists to increase our understanding of the effects of postfire treatments in the context of societal and ecological goals.

Carroll, GD, SH Schoenholtz, BW Young, and ED Dibble. 2004. Effectiveness of forestry streamside management zones in the sand-clay hills of Mississippi: Early indications. *Water Air Soil Pollution: Focus* 4: 275–296.

For riparian biologists and ecologists. Monitoring compliance with initiatives to promote forestry best management practices (BMPs) in the southern states over the last 10 years indicates that acceptance has been very high. Whether BMPs have protected water quality and aquatic habitat effectively has not been as well documented. In order to determine effectiveness of streamside management zones (SMZs), three treatments (undisturbed reference, clearcut with an SMZ, or clearcut with no SMZ) were evaluated in low-order streams in a part of north central Mississippi where forest management is intensive. Water quality parameters,

mineral soil exposure and net deposition/erosion within riparian zones, stream habitat indicators, and aquatic macroinvertebrate communities were comparable between streams receiving SMZs and undisturbed reference streams during the first year after treatment. Streams without an SMZ had significantly higher streamwater temperature, lower habitat stability rating, and higher density of macroinvertebrates, providing additional evidence of SMZ effectiveness.

Chung, W, and J Sessions. 2004. Uphill and downhill gradeability of log trucks with short log trailers. *Western Journal of Applied Forestry* 19: 88–94.

For forest engineers, harvest planners, and researchers in forest engineering. With the introduction of mechanized harvester and forwarder systems that produce short logs, log trucks pulling short log trailers are becoming more common on steep forest roads. The authors derive equations to predict uphill and downhill gradeability of log trucks with short wood trailers. The equations can be used in road design and equipment performance evaluation.

Chung, W, J Sessions, and HR Heinemann. 2004. An application of a heuristic network algorithm to cable logging layout design. *International Journal of Forest Engineering* 15(1): 11–24.

For harvest planners and forest engineers. The authors used a heuristic network algorithm to optimize cable logging layouts and developed a computerized model to implement the method. The model includes logging feasibility and cost analysis modules. A case study successfully applying the model to generate harvesting plans indicates that the method is best used for preplanning.

Dodds, KJ, and DW Ross. 2004. Douglas-fir beetle lipid levels in relation to tree physical characteristics.

Journal of the Entomological Society of British Columbia 101: 13–20.

For forest entomologists. No significant differences ($P > 0.05$) in brood adult lipid levels in relation to bole position, phloem thickness, or bark thickness were found. Douglas-fir beetle does not appear to benefit, in the form of increased lipid levels, from oviposition at different bole positions.

Dodds, KJ, DW Ross, C Randall, and GE Daterman. 2004. Landscape level validation of a Douglas-fir beetle stand hazard-rating system using geographical information systems. *Western Journal of Applied Forestry* 19: 77–81.

For forest entomologists and forest managers. The authors validated a hazard-rating system for Douglas-fir beetle (*Dendroctonus pseudotsugae*), using a geographical information system (GIS) to combine aerial detection survey maps and historical infestation data. Infested acreage and tree mortality were highest in moderate- and high-hazard stands, even though their total area was less than that in other hazard classes. As beetle populations became epidemic, tree mortality and infested area were greater in high-hazard areas. Their methods provide a novel way to validate a forest insect hazard-rating system.

El-Hajj, Z, K Kavanagh, C Rose, and Z Kanaan-Atallah. 2004. Nitrogen and carbon dynamics of a foliar biotrophic fungal parasite in fertilized Douglas-fir. *New Phytologist* 163: 139–146.

For forest pathologists and silviculturists. Nitrogen (N) fertilizer isotopically enriched with ^{15}N was applied to 10-year-old Douglas-fir trees naturally infected with Swiss needle cast disease. Fertilization increased foliar N, resulting in increased % N, % C, and fruiting in the fungal parasite and increasing disease severity. Needle $\delta^{15}\text{N}$ increased in needles associated with pseudothecia at the same time as pseudothecial $\delta^{15}\text{N}$ declined. Thus, the parasite responded to the nutritional status of the host, and the disease became more severe as N available in the tree needles increased.

Everest, FH, DJ Stouder, C Kakoyannis, L Houston, G Stankey, J Kline, and R Alig. 2004. *A Review of Scientific Information on Issues Related to the Use and Management of Water Resources in the Pacific Northwest*. General Technical Report PNW-GTR-595, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For water resource managers and policymakers. Fresh water is provided abundantly by forested watersheds in the Pacific Northwest. Industrial, municipal, agricultural, and recreational activities in the region depend on adequate and sustainable supplies of fresh water, and future development depends on conservation and expansion water resources in the region. The authors review and synthesize the current knowledge about and condition of water resources in the Pacific Northwest.

Filip, GM, and LM Ganio. 2004. Early thinning in mixed-species plantations of Douglas-fir, hemlock, and true fir affected by *Armillaria* root disease in west central Oregon and Washington: 20-year results. *Western Journal of Applied Forestry* 19: 25–33.

For forest pathologists and silviculturists. The effects of precommercial thinning on root disease caused by *Armillaria* was studied in four plantations (Douglas-fir and noble fir, Douglas-fir and western hemlock, Douglas-fir alone, and Shasta red fir and mountain hemlock) in the Cascade Range. After 20 years, crop tree quadratic mean diameter growth and basal area/acre growth were significantly greater in thinned than unthinned plots, but crop tree mortality was not affected by thinning.

Fitzgerald, SA. 2004. Improving fire resiliency of Pacific Northwest forests. *Western Forester* 49: 1–5.

For forestland managers. The author discusses fire ecology, including historical aspects, and the fire behavior triangle (weather, topography, and fuel, and their complex interactions). He points out that managers can influence only the fuel component of the triangle. In the last decade, the number of fires that are “uncharacteristic” has increased, primarily

because fuels have increased and forest structure and composition have changed, due largely to changes in fire regime and increased fire suppression. He discusses several treatments to improve fire resiliency, including thinning, pruning, prescribed fire, and mowing shrubs.

Freer, J, H McMillan, JJ McDonnell, and K Beven. 2004. Constraining dynamic TOPMODEL responses for imprecise water table information using fuzzy rule based performance measures. *Journal of Hydrology* 291: 254–277.

For hydrologists and hydrology modelers. Rainfall runoff and water table information were used to calibrate dynamic TOPMODEL for application to the Maimai M8 catchment in New Zealand. Spatial representation of the model structure was improved by using different parametric representations of hillslope and valley bottom landscape units. Distribution of water table elevations was calculated for each time step at each location and used to derive fuzzy estimates of the water table depth for the whole time series. The rainfall–runoff data could be estimated by many combinations of parameter values. Using the fuzzy water table elevations to constrain the model responses reduced the number of behavioral parameter sets. Improvements to the model structure for the two landscape units were required, especially for the hillslope location.

Gresswell, RE, DS Bateman, GW Lienkaemper, and TJ Guy. 2004. Geospatial techniques for developing a sampling frame of watersheds across a region, pp. 515–528 in *GIS/Spatial Analyses in Fishery and Aquatic Sciences*, T Nishida, PJ Kailola, and CE Hollingworth, eds. Fishery and Aquatic GIS Research Group, Saitama, Japan.

For managers and researchers in fisheries science. The authors describe geospatial tools used to identify a probability-based sampling design for coastal cutthroat trout in western Oregon.

Hansen, E. 2004. *Phytophthora* in the world's forests, pp 10–12 in *Proceedings of the 2nd Conference on Klamath-Siskiyou Ecology*, KL Mergenthaler, JE Wil-

liams, and ES Jules, eds. May 29–31 2003, Cave Junction, OR. Siskiyou Field Institute, Cave Junction OR.

For forest pathologists. The seventy species of the pathogenic genus *Phytophthora*, while more closely related to kelps and brown algae than to true fungi, behave like the latter in many ways. Fifteen species of the genus are found in Oregon forests, three of which cause major, ecosystem-changing damage to Port-Orford-cedar (*P. lateralis*), oak (*P. ramorum*, the sudden oak death pathogen), and golden chinquapin (*P. cambivora*). Other species have similar dramatic adverse effects on forests in other parts of the world. Epidemics are set off by such factors as invasion of new, susceptible plant communities, global warming and changing rainfall patterns, human-assisted dispersal, and hybridization.

Hjerdt, KN, JJ McDonnell, J Seibert and A Rodhe. 2004. A new topographic index to quantify downslope controls on local drainage. *Water Resources Research* 40, W05062, doi:10.1029/2004WR003130.

For hydrologists and watershed managers. The topographic $\ln(\alpha/\tan\beta)$ index is widely used to quantify topography, an important control on hydrological processes. This index, however, uses only a small amount of the information available in a digital elevation model. In particular, it does not consider the effect of downslope topography on local drainage, which could be important in controlling hydraulic gradients. The authors propose a new index for estimating hydraulic gradient, which involves calculating how far downhill a parcel of water must move to lose a certain amount of potential energy, and demonstrate its use in hydrological, geomorphological, and biogeochemical applications.

Ice, GG, DG Neary, and PW Adams. 2004. Effects of wildfire on soils and watershed processes. *Journal of Forestry* 102(6): 16–20.

For soil and watershed scientists and watershed managers. Wildfire, especially when severe, can alter forest soils markedly in many ways, such as removing plant matter and litter and decaying debris, affecting nutrient cycling and availability, increasing soil water repellency, and changing soil moisture,

structure, and infiltration. Water quality is negatively impacted by factors such as overland runoff, in-channel debris torrents, and increasing temperatures and nutrient concentrations. The authors describe several classes of soil burn severity and discuss how intensity of fire affects soil. They also treat watershed processes altered by fire, other water resource effects of fire, and the role of forest management in dealing with wildfire effects on watersheds.

Ice, GG, PW Adams, RL Beschta, HA Froelich, and G Brown. 2004. Forest management to meet water quality and fisheries objectives: Watershed studies and assessment tools in the Pacific Northwest, pp. 239–261 in *A Century of Forest and Wildland Watershed Lessons*, GG Ice and JD Stednick, eds. Society of American Foresters, Bethesda MD.

For forestland managers, fishery biologists, and hydrologists. The authors summarize the history and evolution of forest management in the Pacific Northwest since harvest began in the region. As results of watershed research, stream management zones have been instituted to protect water quality; road practices have been changed to reduce erosion and sediment delivery to streams; and silvicultural chemicals are now applied so as to reduce drift, with no-spray buffers along streams. Assessment techniques have been developed to evaluate management alternatives, and management practices address specific watershed hazards and in-stream risks. The authors call for increased quantitative and qualitative monitoring of water and further development of assessment tools.

Jules, ES, MJ Kauffman, AL Carroll, and WD Ritts. 2004. Assessing the landscape spread of the fatal Port Orford cedar root disease, pp. 13–20 in *Proceedings of the 2nd Conference on Klamath-Siskiyou Ecology*, KL Mergenthaler, JE Williams, and ES Jules, eds. May 29–31 2003, Cave Junction OR. Siskiyou Field Institute, Cave Junction OR.

For forest pathologists. *Phytophthora lateralis* began to infect Port Orford cedar in Oregon in 1952 and has now spread to most of the cedar's natural range. All infections were in roaded areas. The authors found that three factors increase the risk of infec-

tion: more water, higher host density, and shorter distance from road surface to the first potentially infected host. Vehicular and foot traffic both disperse the pathogen, but vehicular traffic does so over much longer distances. The number of infections in the study area had been grossly underestimated in previous surveys.

Karr, JR, JJ Rhodes, GW Minshall, FR Hauer, RL Beschta, CA Frissell, and DA Perry. 2004. The effects of postfire salvage logging on aquatic ecosystems in the American West. *BioScience* 54: 1029–1033.

For riparian biologists, policymakers, and conservationists. Postfire salvage logging, a practice encouraged by recent changes in forest policies, regulations, and laws, often delays natural recovery. Focusing on aquatic ecosystems, the authors highlight several ways in which postfire logging adversely affects natural recovery, degrades aquatic conditions, reduces the distribution and abundance of native aquatic species, and disrupts economic benefits for human communities that depend on aquatic resources. They offer 10 policy recommendations as guidelines for management of public lands so as to protect and enhance restoration of aquatic resources after wildfire. Their recommendations include allowing natural recovery to occur with minimal intervention, retaining old or large trees, protecting soils and ecologically sensitive areas, avoiding the creation of new roads and landings or placing structures in streams, limiting reseeding and replanting, prefire conservation and restoration of watersheds, continuing research, monitoring, and assessment, and educating the public.

Kattelman, R, and GG Ice. 2004. Dry/cold, wet/warm, and transient snow: regional differences in forest snow hydrology, pp. 187–200 in *A Century of Forest and Wildland Watershed Lessons*, GG Ice and JD Stednick, eds. Society of American Foresters, Bethesda MD.

For hydrologists. Climate affects snowpack accumulation and melt and, therefore, hydrological response to timber harvest. In forest stands, snow accumulation and melt also are affected by the presence or absence of the canopy. In openings,

more snow accumulates and evapotranspiration is reduced. Under the canopy, snow intercepted by the canopy may melt and pass through the snowpack, and spring melting may be delayed by shade. Forest management to use these characteristics to optimize water yield have less effect as runoff increases. Water supplies in the West, which depend heavily on snowmelt, may be seriously affected by global climate change if regional warming changes the dominant form of winter precipitation from snow to rain or rain on snow.

Keim, RF, and AE Skaugset. 2004. A linear system model of dynamic throughfall rates beneath forest canopies. *Water Resources Research* 40, W05208, doi 10.1029/2003WR002875.

For hydrologists and watershed researchers and managers. The model described in this paper uses only data of time-varying rainfall and storm total throughfall to predict time-varying throughfall rates. Mean efficiency of prediction for two forest stands in the Pacific Northwest was slightly higher when calibrated to 48 storms (0.84) than when calibrated to all storms simultaneously (0.82). Median mean hydraulic residence times of precipitation in the canopy ranged from 8 to 30 minutes averaged across all storms. Model predictions and performance were about the same for transfer functions whether they were based on published equations or on exponential or gamma distributions. The model was not affected by characteristics of rainstorms, giving similar calibrated models of water transfer for all sizes and intensities of storm.

Keim, RF, AB Price, TS Hardin, AE Skaugset, DS Bateman, RE Gresswell, and SD Tesch. 2004. *An Annotated Bibliography of Selected Guides for Stream Habitat Improvement in the Pacific Northwest*. Research Contribution 44, Forest Research Laboratory, Oregon State University, Corvallis.

For forestland managers, ecologists, and conservationists. Interest in stream habitat improvement in the Pacific Northwest is widespread among land managers, governmental and nongovernmental organizations, and the lay public. Several guides to stream habitat improvement have been written

but may not be easily accessible to people from diverse backgrounds. This annotated bibliography reviews 11 guides to stream habitat improvement so that readers can find literature appropriate to their needs. All reviews begin with summaries of the contents, stated audiences, and goals of each guide. Reviews also include subjective comments on the strengths and weaknesses of each guide. Finally, this bibliography includes recommendations of guides and combinations of guides judged most useful for a range of purposes.

Keim, RF, AE Skaugset, TE Link, and A Iroumé. 2004. A stochastic model of throughfall for extreme events. *Hydrology and Earth System Sciences* 8: 23–24.

For hydrologists and watershed researchers and managers. Forest canopies intercept precipitation before it reaches the ground, reducing its amount and intensity, but modification of extreme events by the presence of a canopy is poorly understood. The authors extrapolated measured rainfall and throughfall to expected throughfall during extreme events, using a stochastic model that coupled a stochastic model of rainfall with stochastic models of evaporation and precipitation transfer through canopies. Extreme-event intensities were reduced 5–30% by the canopy, depending on duration and return interval. Evaporative losses may have been more important in frequent events, but water transfer through the canopy was probably more important in the rarest events.

Kelsey, RG, and DK Manter. 2004. Effect of Swiss needle cast on Douglas-fir ethanol and monoterpene concentrations, oleoresin flow, and host selection by the Douglas-fir beetle. *Forest Ecology and Management* 190: 241–243.

For forest pathologists, phytochemists, and entomologists. Because stressed trees have often been linked with insect activity, the authors investigated whether infection of Douglas-fir by Swiss needle cast (SNC, *Phaeocryptopus gaeumannii*) influenced activity of the Douglas-fir beetle, *Dendroctonus pseudotsugae*. They also examined factors that influence beetle attraction and host susceptibility. SNC

reduced woody tissue ethanol concentrations, resin flow, and beetle attraction. The number of attacks was not reduced and galleries went deeper and for longer distances into the tree, but no eggs, larvae or adults were found in excavated galleries. Although there have been no beetle outbreaks associated with SNC, the weakened oleoresin defense systems of SNC-infected trees might make them susceptible to an outbreak if other events led to increased beetle population densities.

Kimberling, DN. 2004. Lessons from history: Predicting successes and risks of intentional introductions for arthropod biological control. *Biological Invasions* 6: 301–318.

For forest entomologists and managers. Controlling nonnative invasive species with nonnative biological control agents is one approach to their management. The outcome of introducing control agents, however, is difficult to predict. The author compiled a database of 13 life history traits and 8 descriptive variables for 87 nonnative insect biological control species in the continental United States. Logistic regression models showed the most important life history traits to be host specificity, whether the agent was a predator or a parasitoid, and the number of generations/year. For the 37 cases for which there was information about nontarget effects, the important traits included sex ratio of progeny and the presence of native natural enemies. Such meta-analysis of historical data can help in developing guidelines for nonnative control agents and predicting ecological outcomes of introducing a range of nonnative species into new environments.

Mankowski, ME, and JJ Morrell. 2004. Yeasts associated with the infrabuccal pocket and colonies of the carpenter ant *Camponotus vicinus*. *Mycologia* 96: 226–231.

For wood preservationists, mycologists, and forest entomologists. After numerous yeast-like bodies were detected in the infrabuccal pockets of carpenter ants (*Camponotus vicinus*) by scanning electron microscopy, the authors looked at yeast associations with carpenter ants in six colonies in Benton County, Oregon. Cultures were made from infrabuc-

cal pocket contents, interior galleries of the colonies, and detritus and soils surrounding the colonies. Yeasts cultured from carpenter ant nest material and material around the nest were different from yeasts cultured from the infrabuccal pocket. The yeast *Debaryomyces polymorphus*, which has been isolated from other ant species, was obtained more frequently from the infrabuccal pocket than from other material.

McDonnell, JJ. 2004. HP today and HP tomorrow. *Hydrological Processes* 14: 2739–2741.

For hydrologists and prospective authors. As he leaves the editorship of the "HP today and HP tomorrow" section of *Hydrological Processes*, the author reflects on the 5 years he served in that capacity. He discusses invited commentaries, scientific briefings, and other components of the section and thanks those who have assisted him in diverse ways.

McDonnell, JJ. 2004. Subsurface stormflow and lateral water transfers, pp. 322–328 in *Vegetation, Water, Humans and the Climate: A New Perspective on an Interactive System*, P Kabat, M Claussen, PA Dirmeyer, JHC Gash, L Bravo de Guenni, M Meybeck, RA Pielke, Sr, CJ Vörösmarty, RWA Hutjes, and S Lütke-meier, eds. Springer-Verlag, Berlin.

For hydrologists, climatologists, and ecologists. In this contribution to a chapter on "Responses of hydrological processes to environmental change at small catchment scales", the author first discusses processes governing rapid, shallow subsurface stormflow, including transmissivity feedback, lateral pipe flow, shallow interflow, and pressure wave translatory flow. He then treats separation of event water from subsurface stormflow in the storm hydrograph, modeling lateral flow at the catchment scale, and relationships between subsurface flow and catchment-scale nutrient dynamics. Finally, he sets out critical research needs for the future.

McDonnell, JJ, and R Woods. 2004. On the need for catchment classification. *Journal of Hydrology* 299: 2–3.

For hydrologists. In this editorial, the authors point out that the ability of hydrologists to describe catch-

ment heterogeneity is growing faster than their ability to use the knowledge effectively. They propose adopting a broad-scale classification system for catchment hydrology similar to those used in other disciplines, such as chemistry and biology, to help meet the challenge of dealing with the tremendous variability in natural hydrological systems worldwide. Such a classification scheme would provide an important organizing principle to complement the concept of the hydrological cycle and the principle of mass conservation. It would also provide a common language for discussion of hydrological discussions, among other benefits.

McGlynn, B, JJ McDonnell, J Seibert, and C Kendall. 2004. Scale effects on runoff timing, flow source, and groundwater-streamflow relations. *Water Resources Research* 40. W07504, doi:10.1029/2003WR002494.

For hydrologists and watershed managers. How catchment size and landscape organization affect runoff generation is not well understood. The authors used hydrometric and tracer data obtained in a highly organized landscape to study the role of catchment sizes on dynamics of riparian and hillslope runoff. Riparian zone groundwater levels and runoff were strongly correlated at the headwaters, but water tables and runoff were not correlated in the valley bottom of the larger catchments. Catchment size was not related to new water contribution to runoff in two storms analyzed in detail, lag times of tracer responses increased with catchment size. Hillslope and valley bottoms contributed directly to event runoff if the area was already wet or the storm was large. Analysis of the organization and distribution of landscape features can provide structure for investigation of runoff and transport of solutes.

McHale, CP Cirimo, MJ Mitchell, and JJ McDonnell. 2004. Wetland nitrogen dynamics in an Adirondack forested watershed. *Hydrological Processes* 18: 1853–1870.

For hydrologists and wetland ecologists. In order to increase understanding of the interactions between streams and wetlands and the hydrogeochemical processes involved in those interactions, the authors

measured changes in stream nitrogen (N) from the beginning of March to the end of July in a riparian wetland and a beaver meadow. Changes in groundwater N were also measured in the riparian wetland. Groundwater N as NH_4^+ , NO_3^- , and DON (dissolved organic N) was much higher within the wetland than at its perimeter; changes of N species in streamwater between the inlet and the outlet of the stream were less marked. Wetland groundwater contributed little to stream flow. Nitrate dominated surface water N during the spring, whereas DON was dominant during the summer. In-stream N transformation affected surface water N chemistry more than did groundwater transformations because they affected a much greater volume of water.

Meinzer, FC, DR Woodruff, and DC Shaw. 2004. Integrated responses of hydraulic architecture, water, and carbon relations of western hemlock to dwarf mistletoe infection. *Plant, Cell and Environment* 27: 937–946.

For forest pathologists and plant physiologists. Dwarf mistletoe (*Arceuthobium* spp.) is a highly destructive hemiparasitic pathogen of commercially important conifers worldwide. Its effects on host physiology, however, are not well understood. This study examined water and carbon relations from the leaf to the whole-tree scale in large western hemlock trees that were either heavily infected or not infected with hemlock dwarf mistletoe (*A. tsugense*). Adjustments in hydraulic architecture of infected trees maintained leaf-specific conductivity and contributed to homeostasis of water transport efficiency and transpiration, even though specific hydraulic conductivity was about half that of uninfected trees. Maximum whole-tree water use, photosynthetic rates, and leaf nitrogen were substantially lower in infected trees than in uninfected.

Murphy, G, and J Firth. 2004. Soil disturbance impacts on early growth and management of radiata pine trees in New Zealand. *Western Journal of Applied Forestry* 19: 109–116.

For silviculturists and forestland managers. Trials to examine the effect of degree of skid trail usage on growth and early management of the next crop of

radiata pine (*Pinus radiata*) were set up in Esk and Ngaumu Forests in New Zealand. Measurements taken until the trees were 14 (Ngaumu) or 16 (Esk) years old showed that resistance to soil penetration was greatest on heavily disturbed areas, whereas weed competition was greatest on undisturbed areas. Disturbance levels were not reflected in tree malformation, and mortality was increased only in heavily disturbed areas in Ngaumu. Height and diameter growth were fastest on minor skid trails; trees grew poorly in both completely undisturbed and the most heavily disturbed sites. Fewer trees were selected for low pruning and more were selected for precommercial thinning in heavily disturbed areas.

Murphy, G, JG Firth, and MF Skinner. 2004. Long-term impacts of forest harvesting relating soil disturbance on log product yields and economic potential in a New Zealand forest. *Silva Fennica* 38: 279–289.

For logging planners and forest economists. The authors examined the effect of soil disturbance resulting from forest harvesting on productivity, log product yields, and economic potential of second-rotation *Pinus radiata*. Twenty-one years after harvest, average tree volume was 8% lower in plots where litter had been removed and the topsoil compacted and 42% lower in plots where topsoil had been removed and the subsoil compacted than it was in controls. Degree of compaction had a significant effect only where topsoil had been removed. Per-tree economic potential was reduced up to 60%, largely because of altered log product yield distribution. Projections to the end of the rotation at age 28 indicated that the impacts of soil disturbance at that time are likely to be similar to those observed at age 21.

Oetter, DR, LR Ashkenas, SV Gregory, and PJ Minear. 2004. GIS methodology for characterizing historical conditions of the Willamette River flood plain, Oregon. *Transactions in GIS* 8: 367–383.

For ecologists, hydrologists, and historians. Conservation and restoration of the historical Willamette River flood plain, both to protect against flooding and to provide wildlife habitat, has recently become

of interest. The authors developed a Geographic Information System (GIS) from maps and photos that characterized changes in river channel and flood plain conditions from pre-European settlement to the modern time. They also assessed riparian and flood-plain vegetation with the GIS. Channel complexity and connectedness has been greatly diminished over the period studied. Seventy-two percent of the flood-plain forest present in 1850 had been converted to agricultural and urban land uses by 1995. Selected variables were made available for development of a spatial model that can be used to identify the best locations for flood-plain restoration.

Pokojska-Burdziej, A, E Strzelczyk, H Dahm, and CY Li. 2004. Effect of endophytic bacterium *Pseudomonas fulva* on growth of pine seedlings (*Pinus sylvestris*), formation of mycorrhizae and protection against pathogens. *Phytopathologia Polonica* 32: 33-47.

For forest ecologists and forest pathologists. *Pseudomonas fulva* is a bacterial endophyte isolated from interior tissue of nonmycorrhizal suberized roots of Scots pine (*Pinus sylvestris*). In order to determine its effect on seedling growth, formation of mycorrhizae, and protection against fungal root pathogens, the bacterium was inoculated on pine seedlings growing in pots of sandy soil. Inoculation significantly stimulated growth and increased the number of mycorrhizal roots. Inoculation also protected the seedlings from infection by *Rhizoctonia solani*.

Ross, DW, GE Daterman, and AS Munson. 2004. Evaluation of the antiaggregation pheromone, 3-methylcyclohex-2-en-1-one (MCH), to protect live spruce from spruce beetle (Coleoptera: Scolytidae) infestation in southern Utah. *Journal of the Entomological Society of British Columbia* 101: 45–46.

For forest entomologists. Commercially available diffusion releasers of MCH were tested for protecting live trees from spruce beetle infestation in an area with a high spruce beetle population in southern Utah. MCH was not effective in preventing host-tree infestation.

Schoenholtz, SH. 2004. Hydrology: Impacts of forest management on water quality, pp. 377–388 in

Encyclopedia of Forest Sciences, J Burley, ed-in-chief, J Evans and J Youngquist, eds. Elsevier Ltd., Oxford, UK.

For students, managers, and researchers of forest management effects on water quality. This chapter provides a synthesis of our current thinking regarding (1) the concept of water quality, (2) the role of forested watersheds in providing water of relatively high quality, and (3) commonly evaluated water quality parameters and potential effects of forest practices on these parameters.

Sniezko, RA, LJ Elliott, DJ Goheen, K Casavan, EM Hansen, C Frank, and P Angwin. 2004. Genetic resistance in Port-Orford-cedar to the non-native root rot pathogen *Phytophthora lateralis*: a tool to aid in restoration in infested riparian areas, pp. 27–32 in KL Mergenthaler, JE Williams, and ES Jules, eds. *Proceedings of the Second Conference on Klamath-Siskiyou Ecology*, May 29–31, 2003, Cave Junction, Oregon. Siskiyou Field Institute, Cave Junction OR.

For forest pathologists and geneticists. Although *Phytophthora lateralis* is spreading and killing native Port-Orford-cedar in northwestern California and southwestern Oregon, it is not expected to cause its extinction or decrease its range-wide genetic diversity. It can, however, reduce the frequency of trees providing large structural elements to riparian ecosystem function. Naturally resistant trees are so scattered that restoration in the most severely diseased areas will require human assistance. Orchards have been established for several areas that will produce genetically diverse, adapted disease-resistant seedlings than could be used in restoration. In early tests, survival of resistant seedlings could be >50%, compared with 5% in seedlings from the most susceptible families.

Temel, F, GR Johnson, and JK Stone. 2004. The relationship between Swiss needle cast symptom severity and level of *Phaeocryptopus gaeumannii* colonization in coastal Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*). *Forest Pathology* 34: 383–394.

For forest pathologists. Two open-pollinated families of Douglas-fir were included in each of three groups on the basis of severity of Swiss needle cast symptoms: mild, moderate, and severe disease. Although the trees in the different groups had about the same amount of fungus in their needles, the trees in the mild symptom group were greener and retained a higher proportion of needles. Average needle retention decreased with increased amount of pathogen DNA in the mildly affected families, increased with decreased amount of DNA in the severely affected families, and showed no relationship in the moderately affected group. Because the groups did not differ in amount of pathogen DNA in the needles, tolerance rather than resistance seemed to account for the differences in symptom severity. Tolerance could be assessed by visual scoring of average needle retention over the past four growing seasons.

Torgersen, CE, RE Gresswell, and DS Bateman. 2004. Pattern detection in stream networks: quantifying spatial variability in fish distribution, pp. 405–420 in *GIS/Spatial Analyses in Fishery and Aquatic Sciences*, T Nishida, PJ Kailola, and CE Hollingworth, eds. Fishery and Aquatic GIS Research Group, Saitama, Japan.

For managers and researchers in fisheries science. The distribution of coastal cutthroat trout was highly autocorrelated and exhibited a spherical semivariogram with a defined nugget, sill, and range. Wavelet analysis of the mainstem longitudinal profile revealed periodicity in trout distribution at three nested spatial scales corresponding ostensibly to landscape disturbances and the spacing of tributary junctions.

Uchida, T, Y Asano, T Mizuyama, and JJ McDonnell. 2004. Role of upslope soil pore pressure on lateral subsurface storm flow dynamics. *Water Resources Research* 40, W12401, doi:10.1029/2003WR002139.

For hydrologists and hydrological modelers. In order to develop hillslope hydrologic models further, hydrologists need new understanding from the field, especially about how upslope soil pore pressure and

water table dynamics are linked to timing and volume of subsurface storm flow. In two steep, unchanneled hillslopes in Japan, one having soil with high hydraulic conductivity and the other having soil with low conductivity, pore pressures close to the slope base were related only weakly to subsurface storm flow dynamics, regardless of soil hydraulic conductivity. Hillslope discharge during storm flow was strongly related to the cross-sectional area of the upslope saturated area. This relationship persisted between storms on the highly permeable slope, but not on the low permeability slope. Thus, soil matrix permeability greatly influences the linkage between upslope pore pressure and subsurface storm flow dynamics.

Vaché, KB, JJ McDonnell, and J Bolte. 2004. On the use of multiple criteria for *a posteriori* model rejection: Soft data to characterize model performance. *Geophysical Research Letters* 31, L21504, doi:10.1029/2004GL020843.

For hydrologists and hydrological modelers. Evaluation of land surface hydrologic models is commonly based on how well measured discharge corresponds to modeled. This strategy has significant shortcomings, as illustrated by this study. Including time source hydrograph separates improved characterization of parameter uncertainty. In one case, it resulted in model rejection.

Wagener, T, M Sivapalan, JJ McDonnell, P Kumar, and R Hooper. 2004. Predictions in Ungauged Basins (PUB)—A catalyst for multi-disciplinary hydrology. *EOS* 85(44): 451, 457.

For hydrologists. The International Association of Hydrological Sciences (IAHS) has undertaken an initiative known as the IAHS Decade on Predictions in Ungauged Basins (PUB). Hydrologists increasingly are called on to develop sustainable management policies that will secure water supplies, decrease flood risk, and sustain biodiversity. Although numerous models addressing this need have been developed, stream gauging is fundamental to their predictive ability. The complex problems involved in predicting response of ungauged basins will require multidisciplinary collaboration and synthesis. The PUB Science Plan includes

research programs integrating hydrologic subdisciplines that will focus on six key questions. Several workshops and symposia are planned. Progress will be assessed quantitatively in terms of increased predictive capability. The US-based Consortium of Universities for the Advancement of Hydrological Science has many links with PUB.

Weiler, M, and H Fluhler. 2004. Inferring flowtypes from dye patterns in macroporous soils. *Geoderma* 120: 137–153.

For hydrologists. The authors conducted dye tracer experiments at different irrigation rates and initial soil moisture conditions on three hillslope sites. They used image analysis of photographs of vertical and horizontal soil sections to discriminate between stained and unstained areas and to determine three classes of dye concentration in stained areas. After analyzing the vertical sections by conventional approaches, they developed a new approach to classify flow into five types. Two occur only in the soil matrix, and three are related to the amount of water flow between macropores and the soil matrix. Macropore distribution was classified from horizontal sections. The interaction between macropores and soil matrix was quantified on the basis of the statistical description of the spatial relationship between macropores and stained areas. The authors feel their approach will be broadly applicable in comparing soil infiltration regimes.

Weiler, M, and J McDonnell. 2004. Virtual experiments: a new approach for improving process conceptualization in hillslope hydrology. *Journal of Hydrology* 285: 3–18.

For hydrologists and hydrological modelers. Virtual experiments are defined as “numerical experiments with a model driven by collective field intelligence” in which modeler and experimentalist cooperate in development and analysis of results. In order to provide a useful tool for hypothesis testing, a virtual experiment model should include all experimentally important controls in hillslope hydrology while remaining simple and using as few “tunable parameters” as possible. The authors present a series of virtual experiments examining interactions among

water flow pathways, source, and mixing at the hillslope scale. The results of their virtual model experiments with a hillslope model showed how drainable porosity and variability in soil depth exert first order control on flow and transport. Virtual experiments can be used effectively, in combination with previous experimental results and conceptualizations, to isolate and examine the influence of certain controls over a range of rainfall and wetness conditions.

Weiler, M, and JJ McDonnell. 2004. Soil development and properties: Water storage and soil movement, pp. 1253–1260 in *Encyclopedia of Forest Sciences*, J Burley, ed-in-chief, J Evans and J Youngquist, eds. Elsevier, Amsterdam.

For hydrologists and hydrological modelers. The properties of forest soils often differ from those under other land uses. After reviewing some basic definitions and physical processes affecting water movement and storage in the soil, the authors discuss the main processes governing movement of water through soil on the plot, hillslope, and catchment scales. Important issues affecting water storage and movement, in particular harvesting and for-

est management and fire, are considered. Defining the first-order controls at a particular site requires critical thinking about the processes dominating in that location.

Woodsmith, RD, KB Vache, JJ McDonnell, and JD Helvey. 2004. Entiat Experimental Forest: Catchment-scale runoff data before and after a 1970 wildfire. *Water Resources Research* 40, W11701, doi:10.1029/2004WR003296.

For hydrologists and water resource managers. The Entiat Experimental Forest in central Washington provides a hydrologic record of site-specific data from 10 years before and more than 7 years after a wildfire. The data, which can be used in assessing hydrological response and in formulating, calibrating, and testing models, are available on the Internet. Available data include daily discharge, air and water temperature, humidity, precipitation, 10-m DEMs, watershed boundaries, and gauge locations. New instruments being installed on the forest will provide data on recovery from the fire in terms of water quantity, quality, and flow patterns.

Evaluation of Forest Uses, Practices, and Policies

Adams, DM, and GS Latta. 2004. Effects of a forest health thinning program on land and timber values in eastern Oregon. *Journal of Forestry* 102(8): 9–13.

For forest economists and forestland managers. Merchantable timber generated by thinning undertaken on public lands under the Healthy Forests restoration act could affect local sawtimber markets and the value of private forestlands. The authors modeled the effects of two thinning programs, subsidy and nonsubsidy, in national forests on land and timber values. Values could increase or decrease, depending on ownership, regional industry output, the timing of private harvests, and long-term sawtimber prices. Trends in other western regions may be similar to those in eastern Oregon.

Adams, PA. 2004. Mugging which burn victim? The salvage controversy. *Western Forester* 49: 5–7.

For policymakers and forest planners. Timber salvage after fire is a controversial and pressing issue in the Pacific Northwest, although it is of less concern in other parts of the United States. The author reviews the evolution of the salvage issue, including the Salvage Rider of 1995, the 1995 "Beschta Report", the 2003 "Sessions Report", and other aspects of the controversy surrounding salvage logging on the Biscuit fire. Because the national Society of American Foresters seemed unlikely to draft a position paper on salvage harvest, the Oregon SAF Policy committee drafted a state position in 2003, which was adopted by the OSAF Executive committee and by the members.

Alig, R. 2004. Global climate change, carbon, and forestry: Decision-making in a complex world, pp. 101–116 in *Climate Change, Carbon, and Forestry in Northwestern North America: Proceedings of a Workshop*, DL Peterson, JL Innes, and K O'Brian, eds. November 14–15, 2001, Orcas Island, Washington. General Technical Report PNW-GTR-614,

USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

For forestland managers and policy makers. Greenhouse gas emissions, which are widely thought to be bringing about global climate change, can be reduced by use of a variety of sinks and sources. The decisions needed in order to mitigate greenhouse gas emissions are complex and require a basis of scientific information. Over the last 10 years, we have learned a great deal about how climate, ecological effects, economic impact, and social concerns are linked. The effects of dynamic interactions among climate, ecological, and socioeconomic systems on natural resources should be considered in future decisions about adaptation and mitigation choices, as should unintended consequences of policies. Science can provide useful information about environmental, social, and economic costs and benefits of actions and guidance in integrating responses to climate change into sustainable development.

Alig, R. 2004. Land use and land cover dynamics: Changes in landscapes across space and time, pp. 67–73 in *Proceedings: Views from the Ridge—Consideration for Planning at the Landscape Scale*. General Technical Report PNW-GTR-596, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For landscape ecologists, natural resource managers, planners, and policymakers. Demographic, economic, and other forces are increasing pressure and conflicts about land uses and changing land uses within the larger landscape. Forested systems are particularly affected as demand for wood products increases simultaneously with ecological, conservation, and recreational demands. The author discusses how the use of land, particularly forested land, in the United States has been changing over the last two centuries. He includes socioeconomic trends, types of land

use and land cover dynamics, and assessments of land base changes in the analysis. He then addresses future directions of land use and their implications for policy development.

Alig, RJ, and AJ Plantinga. 2004. Future forestland area: Impacts from population growth and other factors that affect land values. *Journal of Forestry* 102(8): 19–24.

For forest economists and forestland managers. Patterns of land use and cover change rapidly in response to economic and political factors and are associated with many current environmental concerns. The authors examine historical trends in land use and cover, project major land uses by region, and discuss the implications of changing land values. In recent decades, more than 3 million acres net shifted in or out of nonfederal forests each year, with gross changes being 10 times greater. Although the United States added 3.6 million acres to nonfederal forestlands overall, forest lands in the Southeast, the Pacific Northwest west of the crest of the Cascades, the Pacific Southwest, and the Rocky Mountains decreased. Forest area is lost primarily to urban and developed uses as population increases; this trend is expected to continue, especially in the South and the Pacific Northwest. The authors discuss the implications of land use changes on forestland areas and values.

Alig, RJ, and BJ Butler. 2004. Projecting large-scale area changes in land use and land cover for terrestrial carbon analysis. *Environmental Management* 33: 443–456.

For ecologists, land managers, and those interested in carbon sequestration. Over the past 50 years, the area of planted pine in the southern United States has increased more than 10-fold. As timber is harvested, other forest types are converted to planted pine; conversely, harvested pine plantations often revert to other forest types. In order to help policy analysts concerned with global climate change, the authors modeled changes in land use and land cover as a basis for projecting future changes in planted pine area. Baseline projections indicate that planted pine area in the region will increase about 5.6 million ha net over the next 50 years, notably increasing sequestered

carbon. Studies of landowner behavior are needed to help in designing incentives to change land use in such a way as to mitigate climate change.

Alig, RJ, and BJ Butler. 2004. *Area changes for forest cover types in the United States, 1952 to 1997, with projections to 2050.* General Technical Report PNW-GTR-613, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For forestland managers and timber supply planners. Many forces, both natural and anthropogenic, have shaped forests in the United States, producing a diversity of forest cover types. This study describes projected changes in forest cover by area on timberland areas of the United States. The projections differ by region, owner, and forest cover type. For example, relatively small changes in common cover types are projected in the North, but projected changes in some regions and ownerships in the South are fairly large. Lands dominated by softwoods are projected to increase in area in many regions, especially on forest industrial lands, but hardwoods are expected to continue to dominate private lands.

Anderson, RC, and EN Hansen. 2004. Determining consumer preferences for ecolabeled forest products: An experimental approach. *Journal of Forestry* 102(4): 28–32.

For wood products marketers and economists. The authors measured consumer behavior with respect to ecolabeled forest products. When virtually identical ecolabeled and unlabeled plywood was offered for sale at a home building store, the ecolabeled product was associated with increased sales if the price of the two products was comparable. If the price of the ecolabeled product was higher, sales decreased. The sample size and design were limited in this study, so the results are not applicable to the general population.

Anderson, RC, and EN Hansen. 2004. The impact of environmental certification on preferences for wood furniture: a conjoint analysis approach. *Forest Products Journal* 54(3): 42–50.

For forest products marketers and manufacturers. Two hundred and sixty-five students in an international business class were surveyed to determine

the relative importance of five attributes of wood CD racks in their product preference and to determine demographic and psychographic variables associated with those whose primary concern was environmental certification. Overall, environmental certification was considered a favorable attribute, but other attributes were more important. Willingness to pay more for certified forest products was highest among those who considered environmental certification as the most important attribute (20.8% of the sample). The authors discuss marketing implications of their findings.

Arthur, JL, J Camm, RG Haight, CA Montgomery, and S Polasky. 2004. Weighing conservation objectives: maximum expected coverage versus endangered species protection. *Ecological Applications* 14: 1936–1945.

For researchers in forest economics, conservation biology, optimal nature reserve design. To help decision makers choose sites for biological reserves, the authors developed a model that incorporates multiple conservation objectives, uncertainty about what species occur in a proposed nature reserve, and the cost of designating a reserve. Using data for 403 terrestrial vertebrates in 147 sites in western Oregon, they demonstrate methodology for assessing trade-offs between nature reserve design maximizing expected number of species covered and nature reserve design optimizing the probability of coverage for a small set of target species.

Barbour, RJ, D Maguire, and R Singleton. 2004. Evaluating forest products as part of landscape planning, pp. 161–170 in *Methods for Integrated Modeling of Landscape Change. Interior Northwest Landscape Analysis System (INLAS)*, JL Hayes, AA Ager, and RJ Barbour, eds. General Technical Report PNW-GTR-610, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For timber managers and forest planners. The probability that a given piece of forestland will be harvested is a function of how accessible it is, physically and administratively; how much implementing the treatment will cost; and what the value of the harvested material is. The authors describe the concept

of combining these attributes to develop a utilization index that shows where on a landscape timber harvest might be used most effectively to alter stand structure. The same technique theoretically could be applied to many nontimber forest products as well.

Bergmann, S, and JC Bliss. 2004. Foundations of cross-boundary cooperation: Fire management at the public-private interface. *Society and Natural Resources* 17: 377–393.

For social scientists, fire managers, and agency land managers. Based upon field research in the John Day Valley of Eastern Oregon, this article identifies key influences on cooperation between private landowners and the USDA Forest Service. Such cooperation is vital to the success of most conservation efforts where land ownership is mixed. Public and private land managers, ranchers, forest industry representatives, environmental activists, community leaders and others completed in-depth interviews. Five themes were found to affect cross-boundary cooperation: land tenure, power, ideology, uncertainty, and trust.

Bettinger, P, and M Lennette. 2004. *Landscape Management Policy Simulator (LAMPS), Version 1.1. USER GUIDE*. Research Contribution 43, Forest Research Laboratory, Oregon State University, Corvallis.

For forest planners, managers, and policymakers. The Landscape Management Policy Simulator (LAMPS) model, version 1.1, is a spatial simulation model developed to provide forest landscape planning simulations for the Coastal Landscape Analysis and Modeling Study (CLAMS). It is designed to help policymakers, managers, and planners think through alternative management scenarios and their potential effects on the ecological and economic resources of Oregon's Coast Range forests. LAMPS simulates changes to landscape structure over time, incorporating the management intentions of the four major landowner groups and vegetation dynamics. Socio-economic and ecological information is used to track and allocate activities across the landscape. LAMPS projects, with relatively high resolution, forest conditions across broad areas, all ownership groups, and a planning horizon of 100 yr. This user guide pro-

vides instructions on how to use LAMPS for forest landscape simulations of alternative forest policies for the Coast Range of Oregon.

Bettinger, P, D Graetz, A Ager, and J Sessions. 2004. The SAFED forest landscape planning model, pp. 41–63 in *Methods for Integrated Modeling of Landscape Change. Interior Northwest Landscape Analysis System (INLAS)*, JL Hayes, AA Ager, and RJ Barbour, eds. General Technical Report PNW-GTR-610, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For researchers in forest and landscape planning. In this book chapter, the authors describe the Simulation and Analysis of Forests with Episodic Disturbances (SAFED) model. The SAFED model is a multiscale, hybrid simulation/optimization model that addresses both optimization of silvicultural prescriptions at the stand level and the spatial scheduling of these prescriptions on large landscapes to meet multiobjective goals.

Beuter, JH, and RJ Alig. 2004. Forestland values. *Journal of Forestry* 102(8): 4–8.

For planners, policymakers, and forest economists. This article introduces an issue of *Journal of Forestry* devoted to discussion of forestland values. The authors discuss the complex issues affecting forestland valuation and forest sustainability, describing who cares about forestland value and what determines that value, anomalies in valuing forestland, and challenges associated with forest valuation. They then introduce each of the six other articles in the issue that discuss different aspects of forest valuation.

Brunson, MW, and BA Shindler. 2004. Geographic variation in social acceptability of wildland fuels management in the western United States. *Society and Natural Resources* 17: 661–678.

For forestland managers and social scientists. Currently, natural resource managers must consider the social acceptability of the practices to be followed and the conditions that will result. This is especially true of controversial issues such as reduction of wildland fuel hazards on federal lands in the western US. In this study, citizens surveyed in four areas

with high fire risk differed by location in what they knew about fire and fuel issues and in their judgment of acceptable management practices. Differences were associated with individual beliefs and with local social and environmental factors. Fuels management policies and information strategies should therefore not be “one size fits all”.

Butler, BJ, JJ Swenson, and RJ Alig. 2004. Forest fragmentation in the Pacific Northwest: Quantification and correlations. *Forest Ecology and Management* 189: 363–373.

For forest ecologists and land-use planners. A commonly accepted method for quantifying forest fragmentation is lacking. Focusing their analysis on fragmentation caused by human land-use decisions, the authors developed a forest fragmentation index comprising forested area, percentage edge, and interspersion and examined the correlation between the index and socioeconomic and physical variables. Their model explained 80% of the variance of the fragmentation index across the region. Population density, income, and percentage agriculture were positively correlated with the index; distance to highway, percentage federal land, slope, and a dummy variable indicating land in Oregon were negatively correlated. Separate regression models for the three components of the index gave results similar to the composite index. Separate models for western Oregon and western Washington differed only slightly from the regional model.

Canavan, SJ, and DW Hann. 2004. The two-stage method for measurement error characterization. *Forest Science* 50: 743–756.

For biometricians and forest mensurationists. Even though any study in which actual measurements are used involves measurement error (ME), such error often is not acknowledged or dealt with. ME can severely affect model parameters and estimates from models. Existing correction methods require knowing the distribution of the errors. The authors present a new method, the two-stage error distribution method, for modeling error distributions and compare this method with traditional methods. Their method characterized ME distribution much better

than traditional methods when a high percentage of errors were identical and worked as well as the most accurate traditional methods in other cases. It probably will also characterize asymmetric distributions better than traditional methods. The authors propose it be used for future error modeling.

Chavez, DJ, JF Tynon, and N Knap. 2004. Reducing crime and violence on public lands: Case studies in the USDA Forest Service. *Journal of Park and Recreation Administration* 22(3): 22–38.

For researchers and practitioners in forest recreation. Case studies uncovered information about specific actions taken to manage crime and violent acts and resulted in the identification of key characteristics of success in law enforcement. These characteristics are not “business as usual” for law enforcement; they go beyond the cooperative agreements that already exist.

Creighton, J, and J Sulzmann. 2004. *Saving Eden Creek: A Play about People and Forests*. V Simon-Brown, project coordinator. EM 8858-E, Extension and Experiment Station Communications, Oregon State University, Corvallis.

Simon-Brown, V. 2004. *Saving Eden Creek Program Guide*. EM 8858, Extension and Experiment Station Communications, Oregon State University, Corvallis.

For high school, general public and natural resource professionals. This original one-act play explores several aspects of the relationships of the relationships of people with forests and their attitudes toward this resource. It is accompanied by a program guide to be handed out to audience members.

Finegan, B, D Delgado, JP Hayes, and S Gretzinger. 2004. El monitoreo ecológico como herramienta de manejo forestal sostenible: consideraciones básicas y una propuesta metodológica, con énfasis en Bosques de Alto Valor para la Conservación certificados dentro del marco del FSC (Ecological monitoring as a tool in sustainable forest management: general considerations and a proposed methodology emphasizing high conservation value forests and FSC certification; in Spanish). *Recursos Naturales y Ambiente* 42:29–42.

For forest managers, forest ecologists, natural resource specialists and forest certification teams in Central and South America. An overview of approaches for ecological monitoring in tropical forests with an emphasis on monitoring for certification is presented. This paper reviews a more detailed monitoring plan described in another publication.

Finegan, B, JP Hayes, D Delgado, and S Gretzinger. 2004. *El Monitoreo Ecológico del Manejo Forestal en el Trópico Húmedo: Una Guía para Operadores Forestales y Certificadores con Énfasis en bosques de Alto Valor para la Conservación. (Ecological Monitoring for Forest Management in Tropical Rainforests: A Guide for Forest Managers and Certifiers with Emphasis on High Conservation Value Forests; in Spanish)*. WWF Centroamérica, Costa Rica.

For forest managers and forest certification teams in Central and South America. An approach is presented for ecological monitoring in tropical forests, with an emphasis on monitoring for certification. Monitoring fundamentals, methodologies for monitoring, a decision tree for determining which approaches are appropriate, techniques for using monitoring data in adaptive management, and results of field trials using the approach are presented.

Franklin, JF and KN Johnson. 2004. Forests face new threat: Global market challenges. *Issues in Science and Technology*. 20(4): 41–48.

For forest products manufacturers and marketers and forest planners. For the past century, forest policymakers in the United States have assumed that timber would become increasingly scarce. Today, however, timber is in surplus and global competition is increasing, diminishing the place of the United States in the global wood products industry. Capital investments have shifted to the Southern Hemisphere in response to high productivity of timber plantations there and other competitive advantages. Keeping forestlands in timber may become too unprofitable for many landowners, with far-reaching societal and ecological effects. The authors argue that the new economic and social situations require major revision of forest management policies. Their suggested responses to the challenges facing the wood products industry include

reducing the costs of managing private forests, creating markets for forest goods and services, purchasing land and conservation easements with public funds, controlling land use by zoning regulations, creating or maintaining a viable domestic forest industry, and increasing local community involvement in the stewardship of public lands.

Garber-Yonts, B, J Kerkvliet, and R Johnson. 2004. Public values for biodiversity conservation policies in the Oregon Coast Range. *Forest Science* 50: 589–602.

For policymakers, conservationists, and social scientists. An economic model was used to estimate Oregonians' willingness to pay (WTP) for changes in levels of biodiversity protection under four conservation programs: salmon and aquatic habitat conservation, forest age-class management, endangered species protection, and large-scale conservation reserves. Willingness to pay differed substantially across conservation programs and regional populations. The highest WTP was to increase the amount of forest with old-growth characteristics. There was positive WTP for at least intermediate levels of biodiversity conservation in all regions, but respondents were also quite averse to policy changes. Resistance to policy changes substantially offset WTP for increases in all four conservation patterns.

Garman, SL. 2004. Design and evaluation of a forest landscape change model for western Oregon. *Ecological Modelling* 175: 319–337.

For landscape ecologists and ecological modelers. LandMod, a spatially explicit, stochastic forest landscape model, was designed to simulate forest dynamics at time frames ≥ 500 years and spatial extents $\geq 18,000$ ha and a grain ≤ 1 ha. The model was parameterized for the three forest types dominant in the west-central Cascades of Oregon. Performance was assessed by comparing predictions from LandMod with those obtained from the PNWGap model and with field observations. LandMod provided reasonable prediction, with the majority of critical errors $< 15\%$. Prediction errors resulted from underprediction of canopy-stem size in old-growth stands and of mean size of subdominant species and from simplified

light calculations. LandMod can be used to provide assessments of land-use strategies and research assessments of landscape pattern-process interactions requiring explicate consideration of forest structure.

Guild, LS, WB Cohen, and JB Kauffman. 2004. Detection of deforestation and land conversion in Rondonia, Brazil using change detection techniques. *International Journal of Remote Sensing* 25: 731–750.

For land use planners and those interested in remote sensing. This study compared techniques for detecting changes in land use, in particular for identifying deforestation and cattle pasture formation near Jamari, Rondonia, Brazil. The study was carried out during a time of early colonization and expansion of agricultural activities. Landsat Thematic Mapper data obtained between 1984 and 2002 and covering 94,370 ha were examined. The contrasts among forest, cleared areas, and regrowth were enhanced by using the tasseled cap (TC) transformation. Change components were identified by principal components of TC images stacked in a composite multi-date TC. Consecutive TC image pairs also were differenced and stacked into a composite multi-date differenced image. The best accuracy was obtained with the multi-date TC composite classification. By 1992, 11% of the area was deforested and 7% was lost to flooding by a dam; in 1984, only 5% of the area had been cleared. Because the technique is able to detect land under sustained clearing, discrimination of pasture versus cultivation was improved.

Hailu, YG, and RS Rosenberger. 2004. Modeling migration effects on agricultural lands: A growth equilibrium model. *Agricultural and Resource Economics Review* 33: 50–60.

For economists and land use planners and modelers. Interactions among intertemporal patterns of changes in population, employment, and agricultural land densities in West Virginia from 1990–1999 were examined by estimations from a system-of-equations model. Jobs followed people, and commuters gained the new jobs. At the same time, agricultural land was being lost, particularly in counties with less productive or fragmented agricultural land. Populations change was elastic, but employment and

agricultural land density changes were not. In high growth or potential growth areas, growth management combined with programs to retain agricultural land may preserve agricultural land most effectively.

Jackson, B, M Habecker, M Kroenke, M Reichenbach, S Traaholt, V Simon-Brown, and B Hubbard. 2004. Members evaluate their Association of Natural Resource Extension Professionals (ANREP). *Journal of Extension* 42(6). Available at www.joe.org/joe/2004december/rb1.shtml. Last accessed June 15, 2005.

For extension educators and natural resource professionals. Members of ANREP were asked to complete a survey that would provide guidance to the Association in strategic planning. Respondents were satisfied overall with the services, networking opportunities, and professional development available to members. Members felt that the leadership could increase communication about new programs and encourage members to become committee members. Survey methods and questions may be useful to other Extension-related organizations in their own strategic planning.

Kennedy, RSH, and TA Spies. 2004. Forest cover changes in the Oregon Coast Range from 1939 to 1993. *Forest Ecology and Management* 200: 129–147.

For ecologists, forest land managers, and land use planners. Many policy and ecological questions require understanding changes in forest vegetation types over time in relation to forest management and environmental conditions. The authors assessed how ownership and environment influenced forest vegetation from 1939 to 1993 in the Oregon Coast Range. Older conifer cover declined from 36% to 15% of the landscape over this period, whereas younger conifer stands increased from 21% to 44% of the landscape. Suburb and hardwood cover was found lower on slopes and closer to streams and declined from 31% to 25% of the landscape by the end of the period. Ownership was very important in affecting the presence of large and very large conifer cover or shrub and hardwood cover by 1993, though it had not been

in 1939, whereas the influence of environment decreased considerably over time.

Kline, JD, RJ Alig, and B Garber-Yonts. 2004. Forestland social values and open space preservation. *Journal of Forestry* 102 (8): 39–45.

For conservation land planners, policymakers and decision makers. Although the area of forestland remained fairly stable during the last half of the twentieth century, both public and private forestlands are being lost to development and the remaining lands are shared among more people. Nonmarket (social) values of forestlands benefit society as a whole but generally are not accounted for in market values. Public and private efforts have developed to preserve forestlands as open space. The authors discuss these efforts and their economic bases and rationale in the context of market values.

Kline, JD, DL Azuma, and RJ Alig. 2004. Population growth, urban expansion, and private forestry in western Oregon. *Forest Science* 50: 33–43.

For planners, nonindustrial forest owners and managers, ecologists, and social scientists. As the population of the United States grows and more people live in the "wildland/urban interface", private and other forestlands are threatened as economic and ecological resources. The authors developed empirical models describing forest stocking, thinning, harvest, and tree planting in western Oregon as functions of stand and site characteristics, ownership, and building density and used them to explore the potential impacts of population growth and urban expansion on the management practices of private forest owners. Population growth and expansion were correlated with reductions in forest management and investments. Such reductions have both ecological and economic implications and may also affect wildfire risk in populated areas.

Kumagai, Y, JC Bliss, SE Daniels, and MS Carroll. 2004. Research on causal attribution of wildfire: an exploratory multiple-methods approach. *Society and Natural Resources* 17: 113–127.

For forest planners and managers, wildfire researchers, and social scientists. Victims of wildfire often

blame others, especially corporations or government agencies, for their losses, even though actions by property owners themselves, such as clearing areas around buildings, have been shown to be the best way to protect property from wildfire damage. In this study, residents of communities on the western slope of the Sierra Nevada were surveyed about their perception of the causes of wildfire damage through mail and field interviews. People who had experienced wildfire were more likely to attribute damage to other people's actions than were people who had not. Those who felt some sense of control or who had interacted with firefighters in a positive manner were less likely to attribute damage to other people's actions. The multiple-methods approach has the potential to reveal more about the complex social dynamics associated with reaction to wildfire than a single-method approach.

Kumagai, Y, SE Daniels, MS Carroll, JC Bliss, and JA Edwards. 2004. Causal reasoning processes of people affected by wildfire: Implications for agency-community interactions and communication strategies. *Western Journal of Applied Forestry* 19: 184–194.

For forest planners and managers, social scientists, and those involved with communicating with the public about wildfire prevention, control, and education. Fire managers often do not understand why those suffering losses in wildfires often blame them for the damage, even though wildfire damage results from complex interactions among natural and human factors. Attribution theory can provide some understanding of the mechanisms underlying the blaming process. Using quantitative and qualitative analyses of surveys of people living in fire-prone areas and of people in the same area who actually experienced a wildfire, the authors found that those who had experienced wildfire tended to attribute damage to factors other than their own action or inaction. The authors discuss the implications of this tendency and make recommendations for future fire education and communication.

Newton, M, and AL Young. 2004. The story of 2,4,5-T: A case study of science and societal concern. *Environmental Science and Pollution Research* 11: 207–208.

For silviculturists and social scientists. In this editorial, the authors summarize the history of the use of phenoxy acids, 2,4,5-T in particular, as herbicides in agricultural, rangeland, and forestland management. They emphasize the political, social, and media issues arising after use of the herbicide in Vietnam and after allegations of association of its use with miscarriages, which have resulted in its falling into disuse in spite of its environmental and economic advantages.

Rickenbach, MG, JC Bliss, and AS Reed. 2004. Collaboratives, cooperation, and private forest ownership: Implications for voluntary protection of biological diversity. *Small-scale Forest Economics, Management, and Policy* 3(1): 69–83.

For social scientists, conservationists, forest owners, and those who work with forest owners. Programs for conserving biological diversity usually require cooperation among many owners having diverse individual management objectives for their properties. Thirty-seven nonindustrial private forest owners, watershed council members, and public employees in two areas of coastal Oregon were interviewed and three scenarios were developed from efforts to restore coho salmon in the region. Consideration of ownership patterns, the structure of collaboration, and issues of representation affected access to critical habitat features.

Sessions, J, P Bettinger, R Buckman, M Newton, and J Hamann. 2004. Hastening the return of complex forests following fire: The consequences of delay. *Journal of Forestry* 102(3): 38–45.

For researchers in forest policy, forest management, and forest operations. In 2002, the Biscuit fire burned more than 400,000 acres in southern Oregon. The authors describe the management opportunities to restore complex forests after catastrophic fire, using the 2002 Biscuit Fire in southwest Oregon as a case study. They examined the costs of post-fire management delay in terms of restoration of the area to structurally complex conifer-dominated forests, capture of some economic value to offset restoration costs, and reducing insect epidemics and future fires. The time-sensitive nature of cost-effective restoration opportunities is discussed. They

point out that delay in making decisions and implementing restoration will lessen or eliminate the possibility of economic recovery and put off the return of the area to complex forest, possibly for decades.

Shelby, B, JA Tokarczyk, and RL Johnson. 2004. Timber harvest and forest neighbors: The urban fringe research project at Oregon State University. *Journal of Forestry* 102(1): 8–13.

For land-use planners, harvest planners, and sociologists. The expansion of urban and suburban populations into forests has increased the complexity and costs of harvesting activities, as well as public disputes and potential legal actions. Residents of neighborhoods bordering the Oregon State University research forest near Corvallis were surveyed before a proposed harvest. The residents preferred specific harvest treatments and also were concerned about buffers, safety, length of harvest activities, forest regrowth, recreation, and aesthetics.

Shindler, B. 2004. Landscape-level management: It's all about context, p. 61 in *Proceedings: Views from the Ridge--Consideration for Planning at the Landscape Scale*. General Technical Report PNW-GTR-596, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For forest planners and social scientists. Although forest managers and planners are now working at the landscape scale, members of the public often are not clear about the concept of landscape-level management. Better understanding of how citizens view landscape requires interaction with the public, outreach activities and simulations, and addressing questions about risk and uncertainty.

Simon-Brown, V. 2004. Intelligent consumption: Addressing consumer responsibilities for natural resources. *Journal of Extension* 42(5): <http://www.joe.org/joe/2004october/a1.shtml>. Last accessed June 17, 2005.

For extension educators and natural resource professionals. Consumers, as well as producers, are responsible for careful use of natural resources. The author discusses the roles of values and ethics in making intelligent consumer decisions and how Sustainable Living

workshops can help consumers define, examine, and apply their own values and beliefs about sustainability.

Spies, TA. 2004. Landscape assessment in a multiownership province, pp. 33–37 in *Proceedings: Views from the Ridge--Consideration for Planning at the Landscape Scale*, General Technical Report PNW-GTR-596, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For landscape ecologists, policymakers, and natural resource managers. Multiownership landscapes pose complex management and scientific challenges affecting their aggregate ecological conditions. The Coastal Landscape Analysis and Modeling Study (CLAMS) is an interdisciplinary research program designed to assess effects of forest policies on the ecological and socioeconomic conditions of the Coast Range province. The author describes the general approach of CLAMS, gives an example of a simulation of changes in forest landscape over time, discusses potential ecological consequences of different management policies among ownerships, and identifies some of the challenges entailed in development of integrated regional models.

Steel, B, P List, D Lach, and B Shindler. 2004. The role of scientists in the environmental policy process: a case study from the American west. *Environmental Science and Policy* 7: 1–13.

For policymakers, natural resource managers, and social scientists. Many groups have been calling for more involvement of scientists and inclusion of scientific information in complex decisions about environmental policy. Not all agree, however, that increasing involvement of scientists will generate better policy. The authors surveyed scientists, natural resource managers, interest groups, and the public in the Pacific Northwest about what they thought the role of scientists and science in the formulation of public policy should be. The groups differed significantly in what they considered to constitute science. Many respondents would prefer research scientists to work closely with managers or to become directly involved in scientific advocacy and decision making. Scientists were more doubtful than members of other group that they could provide scientific answers and

were reluctant to become directly involved in policy making.

Sulzman, EW. 2004. Games in an introductory soil science course: a novel approach for increasing student involvement with course material. *Journal of Natural Resources and Life Sciences Education* 33: 98–101.

For instructors of any course. Games used in the college classroom improved student enthusiasm for the subject matter. Further, those who took the optional recitation with games scored significantly higher (7.5%) on the final exam for the corequisite lecture course than those who did not take the optional recitation, despite the fact that the overall mean GPA of the two groups was similar ($P = 0.30$).

Thompson, JR, M Anderson, and KN Johnson. 2004. Ecosystem management across ownerships: The potential for collision with antitrust laws. *Conservation Biology* 18: 1475–1481.

For ecosystem managers and researchers. Cross-boundary ecosystem management is increasingly being advocated to address large-scale ecological issues on forested landscapes. Antitrust laws limit the forest industry's ability to participate in regional ecosystem planning, however, because they restrict the ability of competing firms to coordinate activities and share information. This paper explores the real and perceived threats of antitrust litigation to successful ecosystem management and also explores potential solutions to this problem.

Toman, E, B Shindler, and M Reed. Prescribed fire: the influence of site visits on citizen attitudes. *Journal of Environmental Education* 35(3): 13–17.

For forestland managers and policymakers. A subset of respondents to a mail questionnaire about public perceptions of prescribed fire was invited to visit sites treated with prescribed fire and control sites and answer on-site survey questions. Responses to mail and on-site questionnaires did not differ significantly, with responses showing moderate to strong acceptance of prescribed fire. Although not significantly different, the percentage of participants worried about threats to property and forests increased from 25% to 43%, but the percentage of

respondents trusting the forest service to implement and effective prescribed fire program increased from 43% to 53% after the site visits. There were also no significant differences in support for prescribed fire, with all participants supporting at least some use of prescribed fire. The authors discuss how field visits can be improved as an outreach method.

Wing, M, D Solmie, and L Kellogg. 2004. Comparing Digital Range Finders for Forestry Applications. *Journal of Forestry* 102(4): 16–20.

For forest operations planners, forest engineers, surveyors. The costs of digital measurement tools are now within the reach of many organizations. The authors found significant differences in reliability and accuracy of five commercially available digital range finders. Digital range finders have many advantages over traditional techniques, but users should define their needs clearly before choosing a specific instrument.

Wondzell, SM, and PJ Howell. 2004. Developing a decision-support model for assessing condition and prioritizing the restoration of aquatic habitat in the interior Columbia Basin, pp. 73–81 in *Methods for Integrated Modeling of Landscape Change. Interior Northwest Landscape Analysis System (INLAS)*, JL Hayes, AA Ager, and RJ Barbour, eds. General Technical Report PNW-GTR-610, USDA Forest Service, Pacific NW Research Station, Portland OR.

For riparian and restoration biologists, ecological modelers, and policymakers. The Interior Northwest Landscape Analysis System (INLAS) is a multidisciplinary effort to develop analytical tools that can be used to examine the effects of policy or management options on ecological and socioeconomic systems. The tools being developed in the Aquatics Module will assess the biophysical characteristics of streams and watersheds, landscape-scale processes, including natural disturbances, and alternative management scenarios with respect to mid-scale aquatic habitat. The authors plan to apply these analytical tools to the Upper Grand Ronde River subbasin as a demonstration area. The tools being developed are intended to help natural resources specialists and managers determine what management strategies are most likely to be compatible with guidelines for aquatic species and their habitat and management objectives for other resources.

Wood Processing and Product Performance

Ahmed, AA, SA El-Moghazy, MA El-Shanawany, HF Adbel-Ghani, J Karchesy, G Sturtz, K Dalley, and P Pare. 2004. Polyol monoterpenes and sesquiterpene lactones from the Pacific Northwest plant *Artemisia suksdorfii*. *Journal of Natural Products* 67: 1705–1710.

For researchers in forest products utilization and wood chemistry. Many biologically active compounds have been isolated from members of the genus *Artemisia*. Many are sesquiterpenes and monoterpenes. Twelve new terpenoid natural products were isolated and identified in this native perennial of the coastal Pacific Northwest forests. Their characterization is described in detail.

Ahmed, AA, TA Hussein, AA Mahnoud, MA Farag, PW Paré, M Wojcinska, J Karchesy, and T Mabry. 2004. Nor-*ent*-kaurane diterpenes and hydroxylactones from *Antennaria geyeri* and *Anaphalis margaritacea*. *Phytochemistry* 65: 2539–2543.

For phytochemists and pharmacologists. Members of the aster genera *Antennaria* and *Anaphalis* have been used traditionally by Native Americans to treat coughs, respiratory problems, and other maladies. The authors isolated and characterized the structure of a nor-*ent*-kaurane diterpene and a known diterpene, scopoletin, and sitosterol-3-*O*- β -glucopyranoside from *Antennaria geyeri* (pinewood pussytoes) and two hydroxylactones from *Anaphalis margaritacea* (pearly everlasting). They showed both diterpenes to have bacteriostatic and bactericidal activity.

Barragan-Huerta, BE, J Peralta-Cruz, RF Gonzalez-Laredo, and J Karchesy. 2004. Neocandenate, an isoflavin-cinnamylphenol quinone pigment from *Dalbergia congestiflora*. *Phytochemistry* 65: 925–928.

For plant and natural products chemists. The authors isolated and characterized a purple pigment, neo-

candenate, from campinceran, a tree endemic to Mexico. The compound has an isoflavin-cinnamyl phenol quinone methide structure.

Bermek, H, I Gülseren, K Li, H Jung, and C Tamerler. 2004. The effect of fungal morphology on lignolytic enzyme production by a recently isolated wood-degrading fungus *Trichophyton rubrum* LSK-27. *World Journal of Microbiology and Biotechnology* 20: 345–349.

For fungal biochemists and morphologists and wood preservationists. Growth conditions affect fungal growth, morphology, and metabolite and enzyme production. Little is known, however, about how culture parameters affect morphology and production of lignolytic enzymes in wood-degrading fungi. *Trichophyton rubrum* in submerged cultures appeared to produce manganese peroxidase efficiently. Growing the organism in baffled or unbaffled shake flasks with working volume/total volume ratio of 10%, 25%, or 50% produced differences in morphology. Manganese peroxidase and laccase appeared earlier and at higher levels when the fungus was cultivated in baffled flasks at 25% WV/TV. Oxygen conditions affected morphology of the cultures, and manganese peroxidase production was best under oxygen-rich conditions.

Bermek, H, H Yacizi, H Öztürk, C Tamerler, H Jung, K Li, KM Brown, H Ding, and F Xu. 2004. Purification and characterization of manganese peroxidase from wood-degrading fungus *Trichophyton rubrum* LSK-27. *Enzyme and Microbial Technology* 35: 87–92.

For fungal biochemists and wood preservationists. Lignin, one of the most important carbon sources and contributor to the global carbon cycle, can be degraded selectively in nature only by white-rot fungi. Manganese peroxidases, one of three lignolytic enzymes

produced by these fungi, may have important industrial applications, in addition to their ecological role. Their role in degrading lignin is not well understood, however. Furthermore, their properties may vary, depending on the specific fungus. The authors purified a manganese peroxidase from *Trichophyton rubrum* to homogeneity, characterized it, and compared its properties to those of manganese peroxidases from other white-rot fungi. This manganese peroxidase had an unusually high *pI* and stability in the presence of high concentrations of H₂O₂ and was heat stable at rather high temperature.

Bischoff, TA, CJ Kelley, J Karchesy, M Laurantos, P Nguyen-Dinh, and AG Arefi. 2004. Antimalarial activity of lactucin and lactucopicrin: sesquiterpene lactones isolate from *Cichorium intybus* L. *Journal of Ethnopharmacology* 95: 455–457.

For pharmacologists, ethnobotanists, and phytochemists. Before the wars in Afghanistan, folklore described using aqueous root extracts of *Cichorium intybus* (L.) as a remedy for malaria. The light sensitive sesquiterpene lactones lactucin and lactucopicrin were isolated and shown to have antimalarial activity by bioassay against *Plasmodium falciparum*.

Cao, X, EN Hansen, M Xu, and B Xu. 2005. China's furniture industry today. *Forest Products Journal* 54(11): 14–23.

For furniture manufacturers and marketers. China, the third largest furniture-producing country in the world, has some 50,000 small to medium, privately owned furniture manufacturing companies, located mainly in four regions along the east coast. The authors discuss industry demographics, domestic and global markets, wood imports, and the future of the industry. Domestic furniture markets are growing rapidly, absorbing more than 70% of gross output during 1997–2003. Exports increased nearly 600% over the same period, and China became the number 1 exporter to the United States in 2000. Most exported furniture is sold more cheaply than local products, and an anti-dumping petition was filed in the United States in 2003. Chinese forest product imports have also been increasingly rapidly, leading to concerns about impacts on global forests. Growth

is projected to continue to grow but to face limitations by raw material supply and competition from other countries.

Craig, AM, JJ Karchesy, LL Blythe, MP González-Hernández, and LR Swan. 2004. Toxicity studies on western juniper oil (*Juniperus occidentalis*) and Port-Orford-cedar oil (*Chamaecyparis lawsoniana*) extracts utilizing local lymph node and acute dermal irritation assays. *Toxicology Letters* 154(3): 217–224.

For pharmacologists and phytochemists. Possible dermal toxic effects of essential oil extracts of western juniper and Port-Orford-cedar were evaluated in mice and rabbits. According to a local lymph node assay, mice did not respond to Port-Orford-cedar oil extract at concentrations up to 50% and responded to western juniper oil extract only at a 50% concentration. In rabbits, 100% Port-Orford-cedar oil extract produced irritation in an acute dermal irritation study, which was reduced approximate 5-fold when the extract was diluted 1:1 with olive oil. Western juniper oil extract was somewhat less irritating than Port-Orford-cedar oil extract. Irritation decreased with decreasing dilution. Animals bedded on wood shavings probably are not in contact with essential oils at a level that will elicit a hypersensitivity response.

DeBell, DS, R Singleton, BL Gartner, and DD Marshall. 2004. Wood density of young-growth western hemlock: relation to ring age, radial growth, stand density, and site quality. *Canadian Journal of Forest Research* 34: 2433–2442.

For those interested in wood quality and silviculturists. Growth and wood density traits of individual rings of breast-high stem sections of western hemlock were determined and related to age and growth rate. Rapid growth influenced whole ring density negatively at young ages, but the effect lessened with age and was insignificant after age 30. Ring density was highest near the pith, declined until age 10, and increased gradually from age 25 throughout 38; density was stable from ages 10–25 and after age 38. At young ages, ring width was negatively related to earlywood and latewood density and

latewood proportion, but the effect disappeared for all but latewood proportion by age 21–25. Neither stand density nor site class appeared to affect residual differences in wood density. Growing young hemlock in intensively managed stand generally increases their usual uniformity in wood density.

Eiden, CMT, RJ Leichti, TH Miller, and M Clauson. 2004. Dynamic analysis of heavy timber structures with friction dampers, pp. 475–480 in *Proceedings of the 8th World Conference on Timber Engineering, Vol. 2. June 14–17, 2004, Lahti, Finland. Finnish Association of Civil Engineers, Helsinki.*

For engineers and wood scientists. A computational study was performed to evaluate the effect of a passive damper system in a heavy timber frame structural system. For the two-story building system and static loading, the beam column connections were adequate to control the performance of the building within allowable drift limits. The addition of dampers did not improve performance with respect to displacement or member forces.

Ellingwood, BR, and DV Rosowsky. 2004. Fragility assessment of structural systems in light-frame residential construction subjected to natural hazards, pp. 119 in *Proceedings of Building on the Past: Securing the Future: Structures Congress 2004, May 22–26, 2004, Nashville, Tennessee, USA, GE Blandford, ed. American Society of Civil Engineering.*

For structural and timber engineers. The authors reviewed the performance of residential buildings during recent hurricanes and earthquakes to identify performance goals and structural and nonstructural limit states. They developed a fragility analysis methodology to assess how light-frame wood construction responds to windstorms and earthquakes and demonstrated the analysis for selected building configurations and construction. A connection was established between limit state probabilities and the wind and earthquake hazards stipulated in *ASCE Standard 7*.

Ellingwood, BR, DV Rosowsky, L Yu, and JH Kim. 2004. Fragility assessment of light-frame wood

construction subjected to wind and earthquake hazards. *Journal of Structural Engineering* 130: 1921–1930.

For structural and timber engineers. The authors reviewed the performance of residential buildings during recent hurricanes and earthquakes to identify performance goals and structural and nonstructural limit states. They developed a fragility analysis methodology to assess how light-frame wood construction responds to windstorms and earthquakes and demonstrated the analysis for selected building configurations and construction. A connection was established between limit state probabilities and the wind and earthquake hazards stipulated in *ASCE Standard 7*.

Gaibler, D, W Rochefort, J Wilson, and S Kelley. 2004. Blends of cellulose ester/phenolic polymers—chemical and thermal properties of blends with polyvinyl phenol. *Cellulose* 11(2): 225–237.

For those interested in biobased thermoplastic polymers. Cellulose esters (CEs) are renewable, biobased thermoplastic polymers, the properties of which can be varied by controlling the ester substituents. The objective of this study was to examine ways in which to improve the strength and thermal properties and increase the usefulness of CEs. Blends of CE and (poly)vinyl phenol (PVP) containing a latent formaldehyde source as a cross-linker were prepared and thermally cross-linked. Semi-interpenetrating polymer networks formed in blends containing 50% PVP and high levels of formaldehyde.

Geng, X, H Jung, and K Li. 2004. Degradation of wood and pulp by three fungi, *Pycnoporus cinnabarinus*, *Trichophyton rubrum* LKY-7, and *Trichophyton rubrum* LSK-27, pp. 139–159 in *Lignocellulose Biodegradation*, BC Saha and K Hayashi, eds. ACS Symposium Series 889. American Chemical Society, Washington, DC.

For pulp and paper technologists and manufacturers. The ability of three white-rot fungi to degrade pine, yellow poplar, and sweet gum was tested and changes in functional groups after degradation of pine flour were analyzed. Inoculation of pine blocks

with *Pycnoporus cinnabarinus*, *Trichophyton rubrum* LKY-7, and *Trichophyton rubrum* LSK-27 resulted in weight loss of 87.6% with *P. cinnabarinus*, 20.8% with *T. rubrum* LSK-27, and 3.1% with *T. rubrum* LKY-7 after 3 months. Degradation of yellow polar and sweet gum by *P. cinnabarinus* was much lower than with pine and statistically the same as by *T. rubrum* LSK-27; both degraded the hardwoods much more efficiently than did *T. rubrum* LKY-7. Degraded pine flour showed increased content of condensed phenolic OH groups and carboxylic acid groups, decreased guaiacyl phenolic OH content, and little change in aliphatic OH group content. Similar trends were noted in unbleached softwood kraft pulp degraded by *P. cinnabarinus*, indicating that structural alterations of lignin caused by pulping did not materially affect degradation.

Geng, X, K Li, and F Xu. Investigation of hydroxamic acids as laccase-mediators for pulp bleaching. *Applied Microbiology and Biotechnology* 64: 493–496.

For pulp and paper technologists and manufacturers. Lignin-degrading enzymes, such as laccase, that are produced by wood-rotting fungi have potential for providing more environmentally friendly ways to bleach pulp in paper manufacture. Laccase is readily available and uses atmospheric oxygen as an electron acceptor, but it cannot degrade kraft pulp well without a mediator. Many laccase mediators and laccase/mediator systems have been investigated, but none has proven sufficiently effective to warrant commercialization. In this study, several hydroxamic acids were synthesized and their usefulness as laccase mediators was tested in comparison with N-hydroxyacetanilide (NHA), a relatively effective mediator. N(4-cyanophenyl)acetohydroxamic acid (NCPA) gave the highest brightness and lowest kappa number of hardwood kraft pulp of all the compounds studied. Laccase/7-cyano-4-hydroxy-2H-1,4-benzoxazin-3-one was also an effective system. Pulp consistency, laccase dosage, NCP dosage, incubation time, and oxygen pressure affected bleaching efficacy of a laccase/NCPA system.

Geng, Y, K Li, and J Simonsen. 2004. Effects of a new compatibilizer system on the flexural

properties of wood-polyethylene composites. *Journal of Applied Polymer Science* 91: 3667–3672.

For researchers in wood-plastic composites. This paper describes a novel coupling agent (compatibilizer) system composed of a paper wet-strength agent (Kymene 557H) as the wood-binding domain and stearic anhydride as the polyethylene(PE)-binding domain. This compatibilizer system increased the modulus of rupture (MOR) of the wood-PE composite by about 33% and the modulus of elasticity (MOE) by about 40% over similar composites without a stabilizer. This MOR was slightly lower and the MOR was slightly higher than that of the commercially used compatibilizer.

Gupta, R, C Basta, and SM Kent. 2004. Effect of knots on longitudinal shear strength of Douglas-fir using shear blocks. *Forest Products Journal* 54(11): 77–83.

For wood scientists and technologists. Knots in lumber can negatively affect many aspects of wood strength, but little is known about their effect on shear strength. The effect of knots on the parallel-to-grain shear strength of wood was investigated in shear block specimens, 40 with knots and 40 matched clear specimens. The mean shear strength of clear and knotted specimens did not differ significantly. Orientation of knots relative to the shear plane did not affect the results.

Gupta, R, TH Miller, and D Dung. 2004. Practical solution to wood truss assembly design problems. *Practice Periodical on Structural Design and Construction* 9: 54–60.

For structural and timber engineers. The authors analyzed an actual metal-plate-connected wood truss assembly, using a system design procedure to investigate some of the behavioral issues that may be present in an actual, complex roof-truss assembly. The study demonstrated that various 'system'-related issues (e.g., interaction of sub-assemblies, boundary conditions) strongly influence the behavior of an assembly, which may not be considered in conventional design.

Gupta, R, TH Miller, and MH Redlinger. 2004. Behavior of metal-plate-connected wood truss joints under wind and impact loads. *Forest Products Journal* 54(3): 76–84.

For structural and timber engineers. The objective of this research was to understand the behavior of metal-plate-connected (MPC) wood truss heel and tension splice joints subjected to dynamic loads that simulated hurricane wind and impact loads. It is suggested that the static tests of MPC joints may be conducted in 1 minute to failure, like lumber, instead of 10 minutes to failure, as recommended by the current standard.

Gupta, R, TH Miller, and SMW Freilinger. 2004. Short-term cyclic performance of metal-plate-connected wood truss joints. *Structural Engineering and Mechanics: an International Journal* 17: 627–639.

For structural and timber engineers. The objective of this research was to evaluate the performance of metal-plate-connected truss joints subjected to cyclic loading conditions that simulated seismic events in the lives of the joints. The current duration of load factor of 1.6 for earthquake loading is adequate for these joints.

Herzog, B, B Goodell, R Lopez-Anido, L Muszyński, DJ Gardner, W Halteman, and Y Qian. 2004. The effect of creosote and copper naphthenate preservative systems on the adhesive bondlines of FRP/glulam composite beams. *Forest Products Journal* 54(10): 82–90.

For wood preservationists and wood composite manufacturers and researchers. Even if a glulam beam has been strengthened with fiber-reinforced polymers (FRPs), preservative treatment is still needed. The authors investigated the effects of treating FRP-wood composites with creosote or copper naphthenate preservatives. Creosote treatment adversely affected shear strength under both wet and ambient testing conditions of a pultruded FRP composite that included E-glass fiber bonded with urethane. Both preservatives decreased the shear strength of an FRP incorporating carbon fiber and a vinyl ester matrix. In accelerated aging tests, creosote treatment

increased delamination of pultruded FRP composite sheets and of a continuously laminated composite incorporating E-glass fiber bonded with epoxy from the glulam material.

Herzog, B, B Goodell, R Lopez-Anido, L Muszyński, DJ Gardner, and C Tascioglu. 2004. Effect of creosote or copper naphthenate preservative treatments on properties of FRP composite materials used for wood reinforcement. *Journal of Advanced Materials, SAMPE* 36(4): 11–17.

For wood preservationists, wood composite manufacturers and researchers, and structural engineers. Wooden construction elements exposed to exterior environments are normally treated with preservative to protect them from biodeterioration. This need extends to FRP (fiber-reinforced polymer)-wood composites. In this study, the effects of undiluted creosote or 1% copper naphthenate in a mineral spirits carrier on mechanical properties were investigated. Interlaminar shear strength of an FRP made of E-glass fiber bonded with epoxy and fabricated by continuous lamination was adversely affected by creosote treatment. Both treatments adversely affected longitudinal tensile strength of a pultruded FRP composite flat sheet of E-glass fiber bonded with urethane. These properties were not affected by preservative treatment in E-glass fiber bonded with vinyl ester or carbon fiber bonded with vinyl ester and fabricated by the Seemann composites resin infusion (SCRIMP) process. Treatment did not affect longitudinal elastic modulus in any FRP tested. Treatment with copper naphthenate apparently improved the longitudinal tensile strength of E-glass/epoxy composite.

Hovgaard, A, and E Hansen. 2004. Innovativeness in the forest products industry. *Forest Products Journal* 54(1): 26–33.

For forest products marketers and planners. Contributions of innovation to company success have rarely been studied with respect to the forest products industry. Seventeen small forest products companies in Alaska and Oregon participated in interviews about their concepts of innovativeness. The respon-

dents identified seven concepts of innovation, the most common being a unique product or process. Of the seven concepts identified, six correspond with product, process, or business systems innovation, a division prevalent in the literature. The seventh concept was "a way of thinking". The respondents practiced six steps of product development, but their processes were not consistent or structured.

Kent, SM, RJ Leichti, DV Rosowsky, and JJ Morrell. 2004. Biodeterioration effects of nailed connections, pp. 583–588 in *Proceedings, 8th World Conference on Timber Engineering, Vol 2. June 14–17, 2004, Lahti, Finland. Finnish Association of Civil Engineers, Helsinki.*

For engineers and wood scientists. The effect of wood decay on the change in nail connections was examined for a single brown rot fungus and one combination of sheathing and framing materials. The nailed connection retained static capacity up to a high level of sheathing decay, and then capacity was lost. Sheathing condition controlled the connection behavior.

Kent, SM, RJ Leichti, DV Rosowsky, and JJ Morrell. 2004. Effects of wood decay by *Postia placenta* on the lateral capacity of nailed oriented strand-board sheathing and Douglas-fir framing members. *Wood and Fiber Science* 36: 560–572.

For wood preservationists and wood and structural engineers. In order to determine how wood decay affects the single shear strength of oriented strand-board sheathing nailed to Douglas-fir framing members, samples of nailed connections were exposed for increasing intervals to the brown rot fungus, *Postia placenta*. Their strength and stiffness were tested. Portions of the sheathing and the framing members were then tested for dowel bearing strength and weight loss. The nailed connection retained static capacity up to a high level of sheathing decay, and then capacity was lost. Sheathing condition controlled the connection behavior. If the dowel-bearing capacity of the wood materials can be determined, yield models currently used in designing nailed connections also can predict nominal design values for nailed connections damaged by decay.

Langlois, J, R Gupta, and TH Miller. 2004. Effects of reference displacement and damage accumulation in wood shear walls. *Journal of Structural Engineering* 130: 470–479.

For structural and timber engineers. The objectives of this study were (1) to evaluate the effect of reference displacement on wall behavior under fully reversed cyclic loading using the CUREE test protocol and (2) to assess damage accumulation for the imposed drift levels. The reference displacement could influence wall strength by up to 15%; there was little or no effect on stiffness and area under the backbone curve. Visible damage was minimal at drifts as high as 1%.

Leichti, R, R Scott, and T Miller. 2004. Lateral resistance of log walls and foundation anchorage. *Wood Design Focus* 14: 3–7.

For engineers and code officials. The lateral resistance of foundation anchorage in log buildings was evaluated. Testing included friction tests and tests of common anchorage used in modern log buildings. Construction and design details influenced lateral force resistance and stiffness. Anchorage was adequate to meet design requirements.

Li, K, and X Geng. 2004. Investigation of formaldehyde-free wood adhesives from kraft lignin and a polyaminoamide-epichlorohydrin resin. *Journal of Adhesion Science and Technology* 18: 427–439.

For wood composites manufacturers and researchers in wood adhesives. Mixing alkaline kraft lignin and a polyaminoamide-epichlorohydrin (PAE) resin produces a formaldehyde-free wood adhesive. A 3:1 lignin/PAE ratio gave the highest shear strength and water resistance of the ratios tested in wood composites bonded with the adhesive. As press time and temperature increased, the shear strength of the composites increased and then plateaued. Composites bonded with the lignin-PAE adhesives did not delaminate and retained high strength even after treatment with boiling water. The adhesives retained their adhesion ability when stored for 2 days at room temperature.

- Li, K, X Geng, J Simonsen, and J Karchesy. 2004. Novel wood adhesives from condensed tannins and polyethylenimine. *International Journal of Adhesion and Adhesives* 24: 327–333.

For wood composites manufacturers and researchers in wood adhesives. The authors describe a novel adhesive system that is formaldehyde-free and utilizes wood tannins, a renewable resource. The adhesive system, a mixture of procyanidin-type condensed tannin and polyethylenimine, performed as well as currently used commercial adhesives. The effects of several variables in manufacture of the adhesive on shear strength and water resistance of wood composites bonded with the adhesive system are described.

- Li, K-C, S Peshkova, and XL Geng. 2004. Investigation of soy protein-KymeneReg. adhesive systems for wood composites. *Journal of the American Oil Chemists Society* 81(5): 487–491.

For wood products manufacturers and researchers. Soya protein isolate and a commercial wet-strength agent for paper, KymeneReg.557h, were mixed and tested as a new, environmentally friendly adhesive system for wood composites. Shear strengths of composites bonded with these preparations were comparable to or higher than those of composites bonded with phenol formaldehyde resins. In addition, their water resistance was high, and strength remained relatively high even after a boiling-water test.

- Li, X, Y Geng, J Simonsen, and K Li. 2004. Application of ionic liquids for electrostatic control in wood. *Holzforschung* 58: 280–285.

For wood products manufacturers and researchers. Wood does not have anti-electrostatic ability, which is desirable for wood products in many uses. Five ionic liquids were either brushed on or used as a soak for maple and pine veneers. Surface and volume resistivity of the specimens was measured in accordance with ASTM standards. All five ionic liquids were effective in providing antielectrostatic properties, especially with pine. Cost and long-term effectiveness may present some problems.

- Lippke, B, J Wilson, J Perez-Garcia, J Bowyer, and J Meil. 2004. CORRIM: Life-cycle environmental performance of renewable building materials. *Forest Products Journal* 54(6): 8–19.

For structural engineers, wood products manufacturers, and builders. CORRIM (the Consortium for Research on Renewable industrial Materials) was formed by 15 research institutions in 1996. Two years later, CORRIM published a research plan and protocol to develop a life-cycle assessment, including a complete life-cycle inventory (LCI) for residential structures and other uses of wood. This article summarizes the findings of CORRIM's Phase I research. The report provides an explanation of the LCI data, the methods used in the analyses, and examples of how LI data can be used. Alternative scenarios are analyzed, and the implications of substituting nonwood products for wood in construction are discussed. Opportunities for environmental improvements during the life cycle of building materials are discussed.

- Liu, Y, and K Li. 2004. Modification of soy protein for wood adhesives using mussel protein as a model: the influence of a mercapto group. *Macromolecular Rapid Communications* 25: 1835–1838.

For wood composites manufacturers and researchers in wood adhesives. Commonly used wood adhesives used in forming wood composites are petroleum bases and contain formaldehyde, a human carcinogen. Mussels secrete adhesive proteins that are strong and water resistant, but they are expensive and not readily available. Soy protein, which is inexpensive and readily available, can be made into a strong, water-resistant adhesive by introduction of a DOPA-like compound. Because one of the muscle proteins contains a large amount of sulfur, the authors tested whether increasing the content of a free mercapto group into the soy protein would have a similar effect. Wood adhesion was significantly increased by introduction of the mercapto group, with wood strength and water resistance depending on the level of the mercapto group in the modified soy protein isolates.

- Milota, M. 2004. Solid wood processing: Drying, pp. 1293–1302 in *Encyclopedia of Forest Sciences*, J

Burley, ed-in-chief, J Evans and J Youngquist, eds. Elsevier, London.

For wood products manufacturers and builders.

After reviewing the history of wood drying and the reasons for drying wood, the author explains how water moves in wood. He then discusses drying with respect to lumber, including quality considerations, air drying, and kiln drying; veneer; and particles. The article also treats measurement of moisture content; energy and environmental considerations associated with drying; and other drying technologies, such as dehumidification, solar, and vacuum kilns.

Morrell, JJ. 2004. Incidence of treated wood in a wood recycling stream in western Oregon. *Forest Products Journal* 54(2): 1–4.

For wood preservationists and recyclers. Wood recycling programs have been becoming more common, but little is known about how much preservative-treated wood is entering the waste stream through recycling. At a recycling center in Oregon, treated wood was present at 38 of 41 sampling times, contributing 0.98% of the waste stream on average. The most common treatment was chromated copper arsenate, which contributed up to 2% of the material at any given time. If the wood sampled were used for hog fuel, the levels of arsenic, copper, and chromium in the ash would exceed current State of Oregon limits for land application. Because the waste stream is a small part of the waste being burned, however, the overall concentrations in the ash would likely be considerably less. If the proportion of treated wood in the recycling stream, and therefore the proportion of contaminants, increased, disposal of ash could be a problem.

Morrell, JJ, and J Huffman. 2004. Copper, chromium, and arsenic levels in soils surrounding posts treated with chromated copper arsenate (CCA). *Wood and Fiber Science* 36: 119–138.

For wood preservationists. The authors determined the copper, chromium, and arsenic in soil around CCA-treated posts and under CCA-treated stakes. Metal levels in soil next to the wood were elevated, but levels decreased with distance from the stake

or depth. Soil contamination by CCA from treated wood appears to be minimal, even after 45 years.

Morrell, JJ, SM Kent, W Wang, RJ Leichti, and DV Rosowsky. 2004. Effects of fungal attack on composite performance in wood frame structures. pp. n.a., *Proceedings, 38th International Wood Composites Symposium and Technical Workshop, Vol. 38. Washington State University, Pullman.*

For engineers and wood scientists. The effects of decay and moisture were studied with respect to the strength of oriented strand board and plywood. The effect of moisture on the bending strength of these panel products was as serious as the effect of moisture plus decay.

Murphy, G, and R Franich. 2004. Early experience with aroma tagging and electronic nose technology for log tracking. *Forest Products Journal* 54(2): 28–35.

For logging managers and wood products manufacturers. More than 5 billion logs move from forest to customer each year worldwide. Many in the forest industry would like to be able to track the movement of logs from stand to mill or even to final product, ideally at the level of individual logs. The authors describe their early experience in using aroma tagging and electronic nose technology to track logs from time they leave the forest until they emerge from the kilns. They conclude that the technology in its current state has the greatest prospect of success in tracking the chain of custody of logs from the forest to the mill door. As new technologies are developed, tracking individual logs may become possible.

Neese, JL, JE Reeb, and JW Funck. 2004. Relating traditional surface roughness measures to gluebond quality in plywood. *Forest Products Journal* 54(1): 67–73.

For plywood manufacturers and adhesive specialists. Undesirable surface characteristics, such as roughness, in veneer can lessen performance of plywood glue-bond. Manufacturers typically increase the adhesive spread rate and press pressure with rough veneer, but it is not known whether this practice is

actually effective. The authors determined how well seven traditional measures of surface roughness and lathe check information were related to load at failure and percent wood failure of plywood made from Douglas-fir veneer. Regressing all loose-side roughness measures against percent wood failure provided the only statistically significant relationship. Samples primarily failed on the loose side of the veneer across all roughness categories.

Oberdorfer, G, RJ Leichti, and JJ Morrell. 2004. Deformation of wood-based material during supercritical carbon dioxide treatment. *Wood and Fiber Science* 36: 511–519.

For wood scientists, wood preservationists, and wood products manufacturers. Deformation of several wood-based composites treated with supercritical carbon dioxide was examined at a range of pressurization and venting rates. Oriented strandboard, medium-density fiberboard, and solid Douglas-fir heartwood showed minimal deformation, which disappeared after pressure was released. The greater deformation of laminated veneer lumber with Douglas-fir veneers resulted in permanent veneer separations. There appears to be little risk of damage to some engineered wood products during supercritical treatment with carbon dioxide.

Punches, J. 2004. Tree growth, forest management, and their implications for wood quality. Publication PNW 576, Extension and Experiment Station Communications, Oregon State University, Corvallis. Available at eesc.orst.edu/agcomwebfile/edmat/pnw576.pdf.

For silviculturists, forest managers, and small woodlot owners. This publication explains the biological process of tree growth and crown effects on rate and type of wood production. It discusses definitions and predictors of wood quality, suggests ways in which foresters can influence wood quality, and outlines impacts of common silvicultural activities. Given this information, foresters can consider wood quality as a management objective, and manufacturers can understand the challenges faced by foresters and limitations of their wood raw materials.

Rhatigan, R, C Freitag, S El-Kasmi, and JJ Morrell. 2004. Preservative treatment of Scots pine and Norway spruce. *Forest Products Journal* 54(10): 91–94.

For wood preservationists and researchers in wood composites. The authors assessed the treatability of Scots pine (*Pinus sylvestrus*) and Norway spruce (*Picea abies*) with oil-borne copper-8-quinolinolate or with water-borne chromated copper arsenate, ammoniacal copper zinc arsenate, or ammoniacal copper quaternary in commercial treatment facilities. Both species required incising in order for treatment to meet the standards of the American Wood-Preservers' Association for dimension lumber. Ammonia improved treatment. Determining suitable schedules for treating Norway spruce successfully with oil-borne copper-8-quinolinolate will require further research.

Rogers, J, X Geng, and K Li. 2004. Soy-based adhesives with 1,3-dichloro-2-propanol as a curing agent. *Wood and Fiber Science* 36: 186–194.

For wood adhesive chemists. Because formaldehyde can adversely affect human health, formaldehyde-free wood adhesives are in demand. The authors investigated formaldehyde-free wood adhesives made of soy protein (SP) and a crosslinking agent, 1, 3-dichloro-2-propanol (DCP). The shear strength of wood composites glued with such adhesives depended on the ratio of SP/DCP (w:w) and the reaction conditions under which the adhesive was prepared. Pressing time affected shear strength of the composite little or not at all. The adhesive could be stored at room temperature for 1 or 2 days without affecting shear strength, but shear strength decreased significantly after similar storage for 5 days. Wood composites bonded with a SP-DCP adhesive did not delaminate after soaking with water and drying or after treatment with boiling water. The authors discuss the crosslinking reactions between SP and DCP in detail.

Rosowsky, DV, and JH Kim. 2004. Incorporating non-structural finish effects and construction quality issues into a performance-based framework for

wood shearwall selection, pp. n.a. in *Building on the Past: Securing the Future, Proceedings of the 2004 Structures Congress, May 22–26, 2004, Nashville TN*, GE Blandford (ed). American Society of Civil Engineers, Reston, VA. [CD-ROM]

For structural wood products engineers and researchers. Shearwall performance was assessed through analysis of peak displacements under seismic loading. The authors examine construction quality issues and the contributions of nonstructural finish materials to the seismic performance of wood frame shearwalls and describe possible procedures for incorporating such information into a performance-based shearwall selection.

Rosowsky, DV, and KH Lee. 2004. Reliability of wood members designed using current standards, pp. n.a. in *Building on the Past: Securing the Future, Proceedings of the 2004 Structures Congress, May 22–26, 2004, Nashville TN*, GE Blandford (ed). American Society of Civil Engineers, Reston, VA. [CD-ROM]

For structural wood products engineers and researchers. As part of a larger study assessing the reliability of wood members designed according to current LFRD design procedures, the authors examined the range of computed reliability indices from simple flexural members. Only the flexural limit state was considered. Regional variation in load statistics significantly influenced the range of computed reliability indices.

Rosowsky, DV, and G Yu. 2004. Partial factor approach to repetitive-member system factors. *Journal of Structural Engineering* 130: 1829–1841.

For structural wood products engineers and researchers. Although design specifications now used for wood allow using a repetitive-member factor to account for load-sharing or redistribution, the factors are based on a simple, rather than a rigorous or comprehensive, model. This study investigated load sharing and system effects in light-frame wall systems with an objective of developing system factors useful in designing individual wall members. The new framework presented in this paper accounts for system effects in parallel-member wood systems on the basis of partial system factors.

Saputra, H, J Simonsen, and K Li. 2004. Effect of extractive on the flexural properties of wood/plastic composites. *Composite Interfaces* 11: 515–524.

For wood composite manufacturers and researchers. Extractives were removed from pine and Douglas-fir wood flour with acetone/water, dioxane/water, or benzene/ethanol. Extraction changed the surface composition of the wood flour but affected neither the percent crystallinity of the wood-polypropylene(PP) composites nor PP spherulite size or shape. Removing extractive from pine flour greatly increased the strength of pine flour-PP composites. Composites made of Douglas-fir flour and PP also were stronger when extractives were removed, except for the dioxane/water treatment. Stiffness also differed between extracted and unextracted wood-PP composites, except for the dioxane/water-extracted Douglas-fir.

Simonsen, J, CM Freitag, A Silva, and JJ Morrell. 2004. Wood/plastic ratio: Effect on performance of borate biocides against a brown rot fungus. *Holz-forschung* 58: 205–208.

For wood preservationists and wood-plastic composite researchers. Biodegradation of wood plastic composites (WPCs) by the brown rot fungus *Gloeophyllum trabeum* was studied as a function of wood: plastic ratio and the presence of borate biocides. WPCs generally lost less weight than solid wood, even when only the wood component was taken into account. Weight loss was greater in WPCs with greater wood content. Borates reduced weight loss greatly at all wood:plastic ratios; sodium/calcium borate was slightly more effective than zinc borate in preventing weight loss. Mechanical properties were not well correlated with weight losses; moisture sorption may have masked any changes.

Taylor, AM, CM Freitag, and JJ Morrell. 2004. Ability of bleach and other biocide treatments to remove and prevent mold growth on Douglas-fir lumber. *Forest Products Journal* 54(4): 45–49.

For wood preservationists. Washing with bleach is commonly recommended for removing mold and mold-caused discoloration from wood and other

building materials. Data on the effectiveness of this method, however, are limited. In this study, sapwood Douglas-fir boards that were heavily colonized with mold and sapstain fungi were wiped with either bleach solution or water; unwiped boards were a no-wash control. Replicates from the wash treatments were treated with three biocides. The treatments tested did not sterilize the wood or improve its visual appearance after 1 month. Increasing bleach concentrations to as high as 20% did not affect wood appearance or completely eliminate fungi.

van de Lindt, JW, JN Huart, and DV Rosowsky. 2004. Wood shearwall reliability inherent in AF&PA/ASCE 10, pp. n.a. in *Building on the Past: Securing the Future, Proceedings of the 2004 Structures Congress, May 22–26, 2004, Nashville TN, GE Blandford (ed). American Society of Civil Engineers, Reston, VA.*

For structural wood products engineers and researchers. Light-frame wood structures resist lateral loads primary through their wood shearwalls, the design standard for which is AF&PA.ASCE 16. The paper presents preliminary results of an assessment of the reliability of wood shearwalls subjected to wind and earthquake forces. Performance of 12 different shearwalls, each designed to this standard, was examined. The results should provide information as to how reliable shearwalls are when designed according to the current standard.

Wagner, ER, and EN Hansen. 2004. A method for identifying and assessing key customer group needs. *Industrial Marketing Management* 33: 643–655.

For forest products marketers and manufacturers. The authors introduce a new concept, competition factors, in the methodology described in this paper for identifying the product attributes used by key customer groups and weighing their importance. Competition factors consider how substitute products influence specific product attributes considered by a customer group, allowing detection of previously hidden customer needs. This technique is a valuable tool for market-oriented businesses. The technique is illustrated with examples from the wood products industry and architects.

Wagner, ER, and EN Hansen. 2004. Environmental attributes of wood products: Context and relevance for U.S. architects. *Forest Products Journal* 54(1): 19–25.

For architects, construction planners, and wood products manufacturers. Architects often are involved in specifying construction materials. Twelve hundred owners of architectural offices were surveyed about their environmental concerns, their design criteria with respect to wood products, and the effectiveness of certain environmental practices of wood products manufacturers. The study defined three product groups: structural, appearance, and engineered wood products. Environmental sustainability was of medium importance as a design attribute in all product groups. The most effective environmental action was third-party environmental certification, and additional environmentally oriented advertising might be beneficial. Such advertising should stress both an environmental feature and a quality or appearance feature (which changes with product group).

Wang, W, and JJ Morrell. 2004. Water sorption characteristics of two wood-plastic composites. *Forest Products Journal* 54(12): 209–212.

For wood products manufacturers and researchers. In order to determine the rates of moisture uptake in Trex and Strandex, deck sections made of these wood-plastic composites were immersed in water for up to 215 days. The moisture content of sections cut at various distances from the ends and surfaces indicated that moisture increases overall were relatively slow, especially in Strandex. Nevertheless, the outer 5 mm of the products were sufficiently moist to allow fungal attack. The findings are consistent with previous studies of decay patterns.

Wang, X, RJ Ross, BK Brashaw, J Panches, JR Erickson, JW Forsman, and RF Pellerin. 2004. Diameter effect on stress-wave evaluation of modulus of elasticity of logs. *Wood and Fiber Science* 36: 368–377.

For wood products researchers and engineers. The authors investigated how log diameter affected

stress-wave evaluation of modulus of elasticity (MOE) of logs and related stress-wave MOE to log diameter for static MOE prediction to develop a new stress-wave model. Small-diameter logs of jack pine (*Pinus banksiana* Lamb.), red pine (*Pinus resinosa* Ait.), Douglas-fir (*Pseudotsuga menziesii*), and ponderosa pine (*Pinus ponderosa* Dougl. ex Laws) were evaluated nondestructively. The longitudinal stress-wave technique appeared sensitive to size and geometrical imperfections of logs. The deviation between stress-wave MOE and static MOE increased with increasing log diameter. Log diameter contributed significantly to MOE prediction when used with the fundamental wave equation. The newly developed model relating static MOE to stress-wave speed, log density, and log diameter predicted MOE during stress-wave evaluation of logs better than did the fundamental wave equation. This could allow levels of accuracy previously considered unattainable for predicting static bending properties of logs with the longitudinal stress-wave technique.

Xiao, Y, and JJ Morrell. 2004. Production of protoplasts from cultures of *Ophiostoma picea*. *Journal of Wood Science* 50: 445–449.

For mycologists and researchers in wood decay. Species of *Ophiostoma* are among the most important fungi causing discoloration of lumber, estimated conservatively to cost ~\$10 million dollars annually. Biocontrol offers an alternative to lumber drying or chemical treatment, but more fundamental research on

microbial interactions between biocontrol agents and their targets is needed. Certain genetic transformations of test fungi would facilitate such research, but they require the generation of fungal protoplasts or other methods for eliminating the fungal cell wall. The authors describe a method to produce viable protoplasts from germinating conidia (germlings) of *Ophiostoma picea*. Using germlings 20 hours old and osmotic stabilizers based on MgSO₄ significantly improved release of protoplasts. Higher concentrations of lytic enzymes and longer incubation times increased protoplast release rates but also had adverse effects.

Zhang, C, K Li, and J Simonsen. 2004. Improvement of interfacial adhesion between wood and polypropylene in wood-polypropylene composites. *Journal of Adhesion Science and Technology* 18: 1603–1612.

For wood composites researchers and manufacturers. A free radical grafting reaction was used to synthesize N-vinylformamide-grafted polypropylene (VFPP). VFPP and polymeric methylene diphenyl diisocyanate (PMDI), singly or in combination, were effective compatibilizers and increased the strength and stiffness of wood-polypropylene (PP) composites. The effect was greater when they were used together, and the combination improved the adhesion between wood and PP greatly while reducing the water absorption of the composites. It is proposed that PMDI is a wood-binding domain and VFPP is a PP-binding domain.