

2002-2003

Biennial Bibliography

*College of Forestry
and the Oregon Forest Research Laboratory*





From the Director

Thank you for taking an interest in our work. The Forest Research Laboratory at Oregon State University is Oregon's legislatively established and supported center for forestry-related research. Our mission is to conduct research that provides new knowledge for enhancing the values of Oregon's Living Legacy—28 million acres of forested land.

The science-based knowledge we produce is made available by diverse means to provide help in solving some of the state's most pressing economic, environmental, and social concerns. Our research program is closely linked to an outstanding Forestry Extension program that delivers on-the-ground educational assistance throughout Oregon. Additionally, our Outreach Education program helps promote research results through short courses, workshops, field tours, and conferences.

One of the most important and wide-ranging ways we share our research is through publication in a variety of written media. The following bibliography lists and briefly describes papers published by our scientists between July 1, 2002 and December 31, 2003. In order to provide more timely access, future bibliographies will appear annually on a calendar-year basis, rather than biennially, as they have in the past.

The publications are arranged in sections according to our five major program areas. The published findings represent efforts supported by grants from public and private agencies, state-mandated studies of emerging issues and needs, and unsponsored research reflecting the interests and expertise of individual scientists.

Many of these publications are available from the Forestry Communications Group (see following page) or can be viewed at http://fcg.cof.orst.edu/structur/pubs_view.php. Reprints not available from these sources may be requested directly from the author(s).

This annotated bibliography is a testament to the productivity and continuous efforts of FRL scientists. Forests and forestry are global, so the work done here has implications around the world. I hope you will be impressed by the quality of work being produced, the breadth of subjects, and the usefulness of this knowledge in helping protect, sustain, and optimize the values of our forests.

A handwritten signature in black ink, reading "Hal Salwasser". The signature is fluid and cursive, with a long horizontal line extending from the end.

Research results find application in many areas as Oregon Forest Research Laboratory scientists and their cooperators publish their findings. Papers published between July 1, 2002 and December 31, 2003 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, TS, MC Lomas, WT Adams, KL Kavanagh, and SN Aitken. 2002. Genetic variation in drought hardiness of coastal Douglas-fir seedlings from British Columbia. *Canadian Journal of Forest Research* 32: 1701–1716.

For silviculturists, geneticists, and forest scientists. Thirty-nine full-sib families of coastal Douglas-fir were studied to determine genetic variation in drought-hardiness traits and their correlations with growth potential and recovery traits. Three moisture regimes were used: well-watered (control), mild drought, and moderate drought for the second season, and well-watered (control), severe drought, and recovery from moderate drought in the third. Xylem cavitation in the growth ring was 3–4X greater in moderate to severe drought than in the control. Hydraulic conductivity in xylem of seedlings in severe drought was 40% lower than in controls. Foliage damage in severe drought was 33% greater than in moderate or mild drought. Drought-hardy families potentially could be identified at the seedling stage. Hardiness traits showed a strong intercorrelation and may be controlled by the same genes. Genetic correlations were not as strong among hardiness traits in different years. Although injury was low, drought reduced growth the following year. Drought hardiness affected growth potential very little under the favorable moisture regime.

Berger, C, and DW Gilmore. 2003. Germination and survival of spruce seedlings following fire in northwestern Alberta. *Northern Journal of Applied Forestry* 20: 45–47.

For forest managers and silviculturists. The authors sought to determine germination by month and over-winter survival of spruce seedlings following a prescribed burn. Seventy percent of all germination occurred in June, and June seedlings had greater overwinter survival than July or August seedlings. Depressed microsites had the highest germination

and overwinter survival. The second spring, after the prescribed burn, new germinants dropped dramatically to only three.

Binkley, D, R Senock, and K Cromack, Jr. 2003. Phosphorus limitation on nitrogen fixation by *Facaltaria* seedlings. *Forest Ecology and Management* 186: 171–176.

For silviculturists and tree physiologists. The availability of phosphorus (P) in the soil often limits the growth of nitrogen-fixing trees and therefore may also limit nitrogen (N) fixation rates. Using soils from plantations of either *Facaltaria moluccana* (which fixes N) or *Eucalyptus saligna* (which does not), the authors tested whether adding N and P fertilizer affected growth rates and nitrogen fixation. Adding N did not affect seedling mass, but adding P increased mass by 75% and more than doubled N fixation. Soil source had no effect. The authors used a new method for acetylene reduction assays that may allow nondestructive repeated sampling of nitrogen fixation.

Bishaw, B, DS DeBell, and CA Harrington. 2003. Patterns of survival, damage, and growth for western white pine in a 16-year-old spacing trial in western Washington. *Western Journal of Applied Forestry* 18: 35–43.

For silviculturists. White pine blister disease has severely limited the survival of young western white pine (*Pinus monticola*) in plantations. The authors established a spacing trial of this species in the early 1980s in the southern Cascades of Washington. The seedlings they used had been raised from seeds from trees certified as rust resistant. Survival averaged 80% 16 years after planting. Although most mortality was associated with the rust, new infections and mortality diminished markedly between ages 11 and 16, and 71% of the planted trees were free of rust at age 16. Antler rub damage from elk was substantial, but was overgrown on most trees in 2–4 years.

Rub damage appeared to be related to stem diameter, rather than to spacing. Early growth rates were much greater than those in older natural stands or in other trials. Rust-resistant stock of western white pine might be appropriate for planting in the Douglas-fir region.

Brandeis, TJ, M Newton, and EC Cole. 2002. Biotic injuries on conifer seedlings planted in forest understory environments. *New Forests* 24: 1–14.

For silviculturists. The authors investigated how partial overstory retention, understory vegetation management, and protective Vexar tubing affected the frequency and severity of biotic injuries in a two-storied stand underplanted with western redcedar, Douglas-fir, grand fir, and western hemlock. The most prevalent source of damage was browsing; deer browsed over 74% of Douglas-fir and over 36% of western redcedar seedlings at least once over the 4 years of the study. Neither the spatial pattern of thinning nor the density of residual overstory affected browsing frequency. Spraying subplots may have increased browsing frequency slightly, but the resulting reduction of the adjacent understory vegetation increased the volume of all seedlings by 13%. Tubing did not substantially affect seedling survival, browsing frequency, or fourth-year volume. Greater overstory retention reduced frequency of second flushing. Chafing by deer and girdling by rodents and other small mammals began once seedlings surpassed 1 m in height. Essentially all grand fir seedlings were infected by a foliar fungus.

Chan, SS, SR Radosevich, and AT Grotta. 2003. Effects of contrasting light and soil moisture availability on the growth and biomass allocation of Douglas-fir and red alder. *Canadian Journal of Forest Research* 33: 106–117.

For silviculturists, ecologists, and forest scientists. The authors examined allocation of growth and biomass in seedlings of Douglas-fir [*Pseudotsuga menziesii* (Mirb.) Franco] and red alder (*Alnus rubra* Bong.) under different light and water conditions over 3 years. In every case, alder growth was greater than that of Douglas-fir. The largest differences in size were at full sunlight and soil moisture at field capacity. Douglas-

fir allocated more biomass to roots under full light and limited water and under limited light and water. Red alder allocated more biomass to the stem under limited water and light and allocated more biomass to aboveground components under full light and limited water. Unlike Douglas-fir, red alder growth responded negatively to water limitation. Foliar plasticity to light was greater in the red alder. The results suggest that red alder and Douglas-fir can coexist under full light and limiting water situations, and Douglas-fir can survive better in the understory.

Cole, E, A Youngblood, M Newton, C Collet, and H Frochet. 2003. Effect of competing vegetation on juvenile white spruce (*Picea glauca* (Moench) Voss) growth in Alaska. *Annals of Forest Science* 60: 573–583.

For site managers and silviculturists. The effect of competing vegetation on survival and juvenile growth of white spruce was studied on three units in south-central Alaska and three units in interior Alaska. Treatments included herbicide site preparation and release, and minimization of competition for 5 years (weed-free). By ages 10–11, spruce height and basal diameter in all units were significantly greater in the weed-free treatment than in untreated plots. The efficacy of particular treatments on vegetation in a unit affected results from the other treatments at the different units. For all units, regression analysis showed that diameter decreased significantly at year 10 or 11 as competitive cover and overtopping increased.

Hibbs, D, B Withrow-Robinson, D Brown, and R Fletcher. 2003. Hybrid poplar in the Willamette Valley. *Western Journal of Applied Forestry* 18: 281–285.

For pulp and fiber source producers and poplar tree farmers. The authors studied management and growth of hybrid poplar (*Populus* spp.) in the Willamette Valley of western Oregon on poorly drained soils without irrigation. Growth rates were very good. Simple no-till methods were as effective as ripping and tilling for plantation establishment. Poplar growth was good with some herbicides but reduced with two commonly used in site preparation. The good growth appeared to be associated with deep, extensive root development.

Howe, GT, SN Aitken, DB Neale, JD Jermstad, NC Wheeler, TH Chen, and Y Castonguay. 2003. From genotype to phenotype: Unraveling the complexities of cold adaptation in forest trees. *Canadian Journal of Botany* 81: 1247–1266.

For geneticists and silviculturists. Temperate and boreal trees adapt to winter cold through complex genetic, physiological, and developmental processes. There are steep genetic clines for cold adaptation traits in relation to environmental gradients, and population differentiation is generally stronger for cold adaptation traits. Even though these traits appear to be under strong natural selection, genetic variation within populations is high. Genetic control of cold adaptation traits appears to be complex. The authors therefore suggest that research should focus on identifying and developing markers for cold adaptation candidate genes and then uncovering relationships between phenotype and genotype by multi-locus, multiallelic techniques. Such methods may ultimately allow prediction of the performance of genotypes in breeding programs and enhance understanding of the evolutionary ecology of forest trees.

Jacobs, DF, RW Rose, and DL Haase. 2003. Development of Douglas-fir seedling root architecture in response to localized nutrient supply. *Canadian Journal of Forest Research* 33: 118–125.

For forest scientists, forest researchers, plant nutritionists, reforestation professionals and forest managers. Various rates of controlled-release fertilizer were applied as a single layer beneath the root system of seedlings of Douglas-fir planted in pots. Roots were harvested 3 and 6 months later from areas above, directly in, and below the fertilizer layer. Higher rates of fertilizer were detrimental to root penetration. Applications of controlled-release fertilizer (CRF) both increased growth and decreased root penetration, depending on fertilizer rate and time since application. This finding demonstrates the need for understanding CRF technology in order to maximize seedling growth and minimize adverse effects.

Jacobs, DF, R Rose, DL Haase, and PD Morgan. 2003. Influence of nursery soil amendments on water relations, root architectural development, and

field performance of Douglas-fir transplants. *New Forests* 26(3): 263–277.

For nursery personnel and plant physiologists and developmental biologists. Manure, peat, and vermiculite were incorporated into seedling rearing medium at low and high rates under two soil moisture regimes. Xylem water potential, growth of the whole plant, development of root architecture, and field performance of Douglas-fir seedlings were assessed with and without fertilization. Fertilization increased height growth initially but was associated with decreased height and diameter growth after two seasons. Soil amendments neither dramatically improved nor negatively affected the seedling traits measured. Their use may be justified by reduced disease incidence and improved soil properties.

Jayawickrama, KJS. 2003. Genetic improvement and development of western hemlock in Oregon and Washington: Review and future prospects. *Silvae Genetica* 52: 26–35.

For geneticists, forest scientists, and forest managers. Western hemlock has been genetically improved in the USA since 1972. Because of the fear of Swiss needle cast disease in Douglas-fir, support for continued improvement has been growing. In 1992, a cooperative second-generation program was started on the foundation of several first-generation programs in Oregon, Washington, and British Columbia. The best crosses (based on height growth) were planted at nine sites. An intensively managed 18-year-old hemlock forest can produce 4.7 million seedlings/ha/year. Cuttings can be taken from second-generation forests beginning in 2003. Oregon and Washington foresters currently plant about 9.3 million western hemlock seedlings annually, and about 52% come from the managed forests. The improved stock can easily be spread by using rooted cuttings, which will eventually produce their own seed. The second-generation cutting should gain 22.4% over the base population at age 15. Western hemlock could probably be selected for other wood properties as well.

Ketchum, JS, and R Rose. 2003. Preventing establishment of exotic shrubs (*Cytisus scoparius* (L.) Link. and *Cytisus striatus* (Hill)) with soil active herbi-

cides (hexazinone, sulfometuron, and metsulfuron). *New Forests* 25: 83–92.

For silviculturists, vegetation control biologists, logging site managers, and land managers. A greenhouse study to evaluate the potential for commonly used forestry herbicides to control germination success of Scotch broom and Portuguese broom was conducted. Three herbicides, hexazinone, sulfometuron, and metsulfuron, were evaluated. Results suggest that preemergence treatments with hexazinone may prevent broom establishment; sulfometuron and metsulfuron were not as effective.

Lipow, SR, GR Johnson, JB St. Clair, and KJ Jayawickrama. 2003. The role of tree improvement programs for *ex situ* gene conservation of coastal Douglas-fir in the Pacific Northwest. *Forest Genetics* 10: 113–120.

For forest geneticists and silviculturists. First-generation tree improvement programs for coastal Douglas-fir in the Pacific Northwest include over 4 million progeny from 33,928 selections planted on 999 test sites. Second-generation programs have incorporated nearly 2,000 of those selections. The first-generation tests provide a repository for potentially important low-frequency alleles and for variation in quantitative traits not now under selection. This genetic variation can be more easily detected in genetic tests and more rapidly integrated in tree improvement programs than it can in large *in situ* populations. In order to retain the valuable genetic resources within first-generation genetic tests for a longer time, the authors developed a method for creating genetic resource outplantings.

Martinez-Ghersa, MA, CA Worster, and SR Radosevich. 2003. Concerns a weed scientist might have about herbicide-tolerant crops: A revisitation. *Weed Technology* 17: 202–210.

For biotechnology researchers, ethicists, farmers, reforestation professionals, weed scientists, and general public. The authors review questions asked about herbicide-tolerant crops (HTCs) over a decade ago. A symposium was sponsored by the Weed Science Society of America when the technology was just emerging. HTCs have now become commonplace. The symposium asked

many questions, most focusing on the possible risks associated with using HTCs. Knowledge still is insufficient to answer most of these questions, and there is no evidence that HTCs have lowered production costs or enhanced yields. Finally, many ethical issues still have not been resolved.

McDowell, SCL, and DP Turner. 2002. Reproductive effort in invasive and non-invasive *Rubus*. *Oecologia* 133: 102–111.

For forest scientists and environmental scientists. The authors studied reproduction in two closely related species of *Rubus*, one of which is invasive, by removing flower buds. They quantified the physiological costs and the total amount of resources allocated to reproduction. The invasive species (*R. discolor*) showed no reproduction-associated change in water stress, nitrogen concentration ([N]), ¹³C, or photosynthesis (A). The noninvasive species (*R. ursinus*) exhibited significant water stress and reduced leaf [N] due to reproduction. These factors reduced diurnal A, water-use efficiency, and photosynthetic capacity, especially during fruiting. Estimates of total gross photosynthesis (A_{gross}) showed a greater decline in the noninvasive species. The invasive species allocated more resources directly to flowers and fruit but had a significantly lower reproductive effort, indicating it may minimize the trade-off of photosynthesis for reproduction.

Meilan R, K-H Han, C Ma, SP DiFazio, JA Eaton, EA Hoiem, BJ Stanton, RP Crockett, ML Taylor, RR James, JS Skinner, L Jouanin, G Pilate, and SH Strauss. 2002. The CP4 transgene provides high levels of tolerance to Roundup® herbicide in field-grown hybrid poplars. *Canadian Journal of Forest Research* 32: 967–976.

For geneticists, plant physiologists, and researchers. The authors tested two genes for imparting tolerance to glyphosate (the active ingredient in Roundup®), CP4 and GOX, together in hybrid poplars in field studies over 2 years. Ten percent of the transgenic lines produced showed no foliar damage or reduced growth after being sprayed with glyphosate at concentrations above normal commercial rates. GOX was suspected to cause undesirable side effects, so several lines were produced with only CP4 inserted. The lines trans-

formed with CP4 alone grew significantly better than those containing both genes and were damaged less by glyphosate.

Radosevich, SR, MM Stubbs, and CM Ghera. 2003. Plant invasions—Process and patterns. *Weed Science* 51: 254–259.

For weed scientists and ecologists. The authors looked at ways to empirically study and accurately predict plant invasions by analyzing the invasion process. Invasive plant species are aggressive, with traits such as small seed size, short juvenile period, ability to escape native predators, persistent seed bank, and young reproductive age. Ecosystem factors are equally important. Disturbed or spatially open ecosystems seem to be particularly vulnerable. Soil, climate, and land use are extrinsic factors responsible for floristic growth and persistence of invasive species. DNA analysis and landscape relationships are also important to determine whether a population will spread.

Rose, R, and JS Ketchum. 2002. Interaction of vegetation control and fertilization on conifer species across the Pacific Northwest. *Canadian Journal of Forest Research* 32: 136–152.

For forestry professionals. An experiment evaluating three levels of vegetation competition control, each with two fertilization treatments with complete slow-release fertilizer, was installed at five sites. Two of these sites were planted with Douglas-fir in the Oregon Coast Range, one with ponderosa pine in eastern Washington, one with western hemlock in the coastal hemlock zone in Oregon, and one with coastal redwood in Northern California. Response to fertilization was less than from weed control and impacted growth for only the first year, whereas weed control continued to influence growth the entire 4 years of the study.

Rose, R, and JS Ketchum. 2002. The effect of hexazinone, sulfometuron, metsulfuron, and atrazine on the germination success of selected *Ceanothus* and *Rubus* species. *Western Journal of Applied Forestry* 17: 194–201.

For forest scientists and silviculturists. The authors studied the effects of four pre-emergent herbicides

on germination of five seral woody competitors in the Pacific Northwest: *Ceanothus integerrimus*, *C. velutinus*, *Rubus parviflorus*, *R. ursinus*, and *R. spectabilis*. The herbicides were applied at six rates, and seeds were checked for germination and development of true leaves over 9 weeks. Hexazinone reduced germination and growth of both *Ceanothus* species and *R. parviflorus* except at low rates of application and of *R. ursinus* at higher rates. Sulfometuron had a small influence on seed survival but drastically reduced dry weight of plantlets of all species. Metsulfuron and atrazine also decreased the dry weight of seedlings in a dose-dependent manner. Atrazine reduced survival rate of both *Ceanothus* species, and metsulfuron reduced the survival rate of *C. velutinus*.

Rose, R, JS Ketchum, C Collet, and H Frochet. 2003. Interaction of initial seedling diameter, fertilization and weed control on Douglas-fir growth over the first four years after planting. *Annals of Forest Science* 60: 625–635.

For silviculturists and nursery personnel. The authors evaluated the practices of planting larger stock, applying fertilizer, and controlling weeds longer that are often used to increase growth rate in plantations. They tested two sizes of planting stock, fertilizer application at planting and in the next year, and controlling weeds for 2 or 3 years. All treatments influenced growth additively, and there were no significant interactions among treatment levels. Planting larger initial stock gave the greatest stem volume gains in the fourth year. Gains from fertilizer application were short-lived. The extra year of weed control did not affect volume growth in years 3 or 4 or fourth-year stem volume.

Rosner, LS, and JT Harrington. 2003. Optimizing acid scarification and stratification combinations for russet buffaloberry seeds. *Native Plants Journal* 4(2): 81–86.

For vegetation restorationists and those interested in native plant propagation. Acid scarification, cold moist stratification, or both are generally recommended as pretreatments in germinating seeds of russet buffaloberry (*Shepherdia canadensis*). The authors tested combinations of sulfuric acid scarification time (0 or

5 minutes) and stratification times (0, 9, 14 weeks). Stratification was more effective than scarification if only one treatment was used. The optimal combination of treatments was soaking in acid for 5 minutes and stratification for 14 weeks. A test to find the most effective duration of scarification for different seed lots is proposed.

Simard, SW, MD Jones, DM Durall, GD Hope, RJ Stathers, NS Sorensen, and BJ Zimonick. 2003. Chemical and mechanical site preparation: Effects of *Pinus contorta* growth, physiology, and micro-site quality on grassy, steep forest sites in British Columbia. *Canadian Journal of Forest Research* 33: 1495–1515.

For silviculturists and forest scientists. To investigate interference mechanisms and appropriate site-preparation methods that might lessen the effects of pinegrass (*Calamagrostis rubescens* Buckl.) on conifers, the authors prepared two types of sites in British Columbia and monitored them for 9 years. One type was treated with glyphosate to remove only the pinegrass. On the other site, both pinegrass and the forest floor were excavated. Survival of pine (*Pinus contorta* Dougl. ex Loud.) in the first 2 years was >97%, compared with 78% in controls. Growth was greater in the chemically treated patches than the excavated for the first 6 years because removing the forest floor also removed or altered elements key to conifer growth. Soil temperature was increased and frost was reduced the most on sites that received a larger area of treatment.

Steinfeld, D, MP Amaranthus, and E Cazares. 2003. Survival of ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.) seedlings outplanted with *Rhizopogon mycorrhizae* inoculated with spores at the nursery. *Journal of Arboriculture* 29: 197–207.

For nursery and forest regeneration specialists and mycologists. Although ectomycorrhizal fungi repeatedly have

been shown to affect conifer seedling performance positively after outplanting, much less is known on how well ectomycorrhizal fungi establish under nursery conditions followed by outplanting. *Rhizopogon rubescens* was inoculated onto the roots of plug-1 ponderosa pine seedling grown in fumigated and unfumigated bareroot nursery beds. Survival of inoculated seedlings after outplanting on two harsh, dry sites was significantly higher than that of uninoculated seedlings on both sites. Fumigation did not affect field survival, and neither inoculation nor fumigation affected seedling height before or after outplanting. Foliar phosphorus content was tested at one site and was higher in inoculated seedlings.

Vargas-Hernandez, JJ, WT Adams, and DG Joyce. 2003. Quantitative genetic structure of stem form and branching traits in Douglas-fir seedlings and implications for early selection. *Silvae Genetica* 52: 36–44.

For silviculturists and forest scientists. The relationship of stem growth to stem form and branching was studied in 2-year-old seedlings of open-pollinated (OP) and full-sib (FS) families of coastal Douglas-fir in two replicated nursery regimes. The nursery results were compared with a study of older trees from the OP family in the field. Heritability of all traits studied except forking was moderate to strong. Field and nursery trees had similar genetic relationships among traits. Nursery-field correlations were consistent among nursery regimes but not usually strong enough to be useful for early testing purposes. Exceptions were number of whorls with steep-angled branches (WSAB), branch length, and branch angle in older branched trees. Early selection for traits should result in a predicted 40–50% gain over those selected at an older age. Early selection for stem growth potential alone could have unfavorable impacts on WSAB and stem sinuosity. Branching traits, therefore, should also be used as selection criteria.

Forest Ecology, Culture, and Productivity

Alig, RJ, DM Adams, and BA McCarl. 2002. Projecting impacts of global climate change on the US forest and agriculture sectors and carbon budgets. *Forest Ecology and Management* 169: 3–14.

For ecosystem modelers, forest scientists, global climate change analysts, and atmospheric scientists. Analyses of four scenarios of the biological response of forests to climate change, drawn from a national assessment, provide information about the economic effects to the forest and agricultural sectors and the U.S. carbon budget. Projected changes in climate generally lead to increased timber inventories in future years, lower timber prices, and timber producers' income that is most at risk. Adjustment mechanisms to mitigate climate change impacts include interregional migration of production, substitution in consumption, and altered stand management.

Arnett, EB. 2003. Advancing science and partnerships for the conservation of bats and their habitats. *Wildlife Society Bulletin* 31: 2–5.

For conservation biologists, natural resource managers, and wildlife biologists. Bats make up nearly 25% of mammalian species, occupy diverse ecological niches, and often provide major economic benefits. Loss of bat habitat and declining populations have become a concern in recent years, and the need for information about their biology and ecology on which to base management and policy decisions has increased substantially. This article introduced the papers in a special section of the *Bulletin* that focused on advancing science and partnerships for conservation of bats and their habitats.

Arnett, EB, and JB Hauffler. 2003. A customer-based framework for funding priority research on bats and their habitats. *Wildlife Society Bulletin* 31: 98–103.

For natural resource managers and wildlife researchers. The Northwest Bat Cooperative (NWBC) aligns

governmental agencies with private organizations to facilitate research projects by backing them with planning and resources. The NWBC could be used as a guide for research cooperatives studying other wildlife species.

Aubry, KB, JP Hayes, BL Biswell, and BG Marcot. 2003. The ecological role of tree-dwelling mammals in western coniferous forests, pp. 405–443 in *Mammal Community Dynamics: Management and Conservation in the Coniferous Forests of Western North America*, CJ Zabel and RG Anthony, eds. Cambridge University Press, NY.

For wildlife biologists, ecologists, and forestland managers. Focusing on only a few vertebrate species or attainment of certain vegetative conditions in managing forests is too simplistic and is unlikely to result in long-term sustainability. Management decisions in western coniferous forests might produce better results if managers consider the ecological roles of mammals and the webs to which they belong. Comparing the ecological functions that will be affected by different management structures will allow managers to choose the plan that is most likely to support ecosystem integrity over the long term.

Bachelet, D, RP Neilson, T Hickler, RJ Drapek, JM Lenihan, MT Sykes, B Smith, S Sitch, and K Thonicke. 2003. Simulating past and future dynamics of natural ecosystems in the United States. *Global Biogeochemical Cycles* 17(2): 14-1–14-21.

For ecosystem modelers and forest scientists. Two climate change scenarios, one warmer than the other, were used in DGVMs (Dynamic Global Vegetation Models) to simulate natural ecosystems as the second phase of the Vegetation/Ecosystem Modeling and Analysis Project. Both DGVMs included sulfate aerosols and assumed a gradual CO₂ increase. They simulated reduced southwestern desert areas, westward expansion of eastern deciduous forests, and

expansion of forests in the western part of the Pacific Northwest and in north-central California. Both predicted an increase in total biomass burnt in the next century. The two scenarios simulated different carbon results. Similarities were due to climate forcing; differences were due to structural differences between the models and sensitivity to CO₂. Results are compared with data and a spatial index derived from the Palmer Drought Severity Index.

- Becerra, A, G Daniele, L Dominguez, E Nouhra, and T Horton. 2002. Ectomycorrhizae between *Alnus acuminata* HBK and *Naucoria escharoides* (Fr.: Fr.) Kummer from Argentina. *Mycorrhiza* 12(2): 61–66.

For mycologists and silviculturists. The authors sampled naturally occurring ectomycorrhizal roots under sporocarps of *Naucoria escharoides* in natural forest plots at two sites. They describe the morphology of the ectomycorrhizae, the first detailed description from field specimens. They also found the internal transcribed spacer region of the nuclear rDNA, as determined by PCR/RFLP, to be the same in sporocarps and mycorrhizae.

- Bergen, KM, SG Conard, RA Houghton, ES Kasischke, VI Kharuk, ON Krankina, KJ Ranson, HH Shugart, AI Sukhinin, and RF Treyfeld. 2003. NASA and Russian scientists observe land-cover and land-use change and carbon in Russian forests. *Journal of Forestry* 101(4): 34–41.

For forest ecologists and forest resource analysts. Project teams of the NASA Land-Cover Land-Use Change Program started cooperating with Russian organizations in 1997 to discover the land-cover and land-use trends of the past, present, and future in Russian boreal forests. Selected results include information on forest dynamics, fire and fire behavior, carbon budgets, and new remote sensing analysis methods. Our knowledge of the influence of land-cover and land-use change around the world is growing because of this and other collaborations with international organizations and other networks.

- Beschta, RL. 2003. Cottonwoods, elk, and wolves in the Lamar Valley of Yellowstone National Park. *Ecological Applications* 13: 1295–1309.

For ecologists and wildlife biologists. The diameter at breast height (dbh) of 700 narrowleaf cottonwood (*Populus angustifolia*) and black cottonwood (*P. trichocarpa*) trees growing in the Lamar Valley (Yellowstone National Park) was measured. Almost no trees of either species measured between 5–29 cm dbh; most were between 30–110 cm. Establishment date for the narrowleaf cottonwoods were estimated from relationships between age and diameter. These relationships and the dbh data indicated that there has been very little cottonwood recruitment over approximately the last 60 years. Fire history, flow regimes, channel migration, and factors affecting stand development did not appear to be related to the lack of recruitment, but the beginning of the period coincided with the elimination of wolves from the park. Loss of this predator allowed elk to browse riparian plants freely.

- Bond, B. 2003. Hydrology and ecology meet—and the meeting is good. *Hydrological Processes* 17: 2087–2089.

For hydrologists and ecologists. In this commentary article, the author discusses growth and development of the “hybrid” field, ecohydrology, which studies interactions between the hydrological cycle and ecosystems. She describes a 10-week seminar series organized at Oregon State University on “Perspectives on Ecohydrology.” Participants discussed the new ideas and opportunities offered by the ecohydrology paradigm, including biodiversity, intra/inter-event interactions, dimensionality of fluxes, and establishing basin-scale focus. Participants concluded that the hybrid field has great potential for synergism, so long as hydrologists and ecologists continue and expand communication with each other.

- Bowling, DR, NG McDowell, BJ Bond, BE Law, and JR Ehleringer. 2002. ¹³C content of ecosystem respiration is linked to precipitation and vapor pressure deficit. *Oecologia* 131: 113–124.

For ecosystem scientists. Researchers measured the ¹³C content of CO₂ respired at night in three ecosystems along a moisture gradient in Oregon and related the variation in ¹³C within each ecosystem to variation in atmospheric vapor pressure deficit (VPD). The isotopic composition of respired CO₂ was highly

correlated with VPD that occurred 3–6 days earlier. Results indicate that recently fixed carbon cycles rapidly through ecosystems, and a large proportion of total ecosystem respiration is derived from recently fixed carbon.

- Brimmer, A, SR Kenny, K Hosaka, JM Trappe, MA Castellano, JW Spatafora, and W Colgan III. 2002. Monophyly of the Mesophelliaceae. *Inoculum* 53(3): 22.

For researchers in forest fungus taxonomy and ecology. This family of truffle-like fungi, important in the diet of forest mammals in Australia, produces fruiting bodies totally different from any other fungi. Its relationship to other fungi has been a mystery. Now DNA analysis shows it to be related to the family Hysterangiaceae, another truffle-like but world-wide and common genus.

- Brooks, JR, PJ Schulte, BJ Bond, R Coulombe, JC Domec, TM Hinckley, N McDowell, and N Phillips. 2003. Does foliage on the same branch compete for the same water? Experiments on Douglas-fir trees. *Trees—Structure and Function* 17: 101–108.

For forest scientists, tree physiologists, and silviculturists. The gas-exchange responses of sunlit foliage on a branch were monitored after transpiration of competing foliage on the branch was reduced by bagging and shading. Responses were compared to these in several control branches. Several age classes of Douglas-fir trees were included. Contrary to their expectation, stomatal conductance (g_s) on sunlit foliage did not increase in any age tree when transpiring leaf area was reduced, and diurnal changes in water potential, midday stomatal closure, and photosynthesis did not differ temporally or in size between treated and untreated branches. Hydraulic conductance measurements of branch junctions indicate that xylem within branches is only partially interconnected. Sunlit foliage on a partially shaded branch apparently has no advantage with respect to water status over foliage on a branch in full sun.

- Brunner, AM, B Goldfarb, VB Busov, and SH Strauss. 2003. Controlling maturation and flowering for

forest tree domestication, pp. 9–44 in *Transgenic Plants: Current Innovations and Future Trends*, CN Stewart, ed. Horizon Scientific Press, Wymondham, England.

For tree geneticists, biotechnologists, and physiologists. Maturation in trees involves numerous programmed developmental and physiological changes occurring over decades. These changes are well described, but little is known about their control mechanisms or how to alter maturation state. If ability to flower could be blocked, use of genetically engineered trees in plantations could be ecologically and socially acceptable. If flowering could be made to occur earlier, breeding methods now considered impractical in trees would become feasible. Modifying cambial maturation could be used to improve wood quality. For many reasons, *Populus* promises to be very useful in elucidating the control mechanisms of maturation and applying that knowledge successfully.

- Busing, RT, and T Fujimori. 2002. Dynamics of composition and structure in an old *Sequoia sempervirens* forest. *Journal of Vegetation Science* 13: 785–792.

For forest scientists and forest ecologists. Over three decades (1972–2001), the dynamics of an old (>1100 years) *Sequoia sempervirens* forest in northern California were studied with long-term plot data (1.44 ha) and recent transect data. Changes in the composition and structure of the tree stratum were minor. *Sequoia* mortality and ingrowth were low, and a broad distribution of stem diameters was maintained throughout the period. *Sequoia* regeneration was higher at gap edges. These factors indicate that *Sequoia* will remain a dominant species in the study forest.

- Busov, VB, R Meilan, DW Pearce, C Ma, SB Rood, and SH Strauss. 2003. Activation tagging of a dominant gibberellin catabolism gene (GA 2-oxidase) from poplar that regulates tree stature. *Plant Physiology* 132: 1283–1291.

For tree geneticists, biotechnologists, and physiologists. A dwarf transgenic hybrid poplar (*Populus tremula* × *P. albae*) was identified. The dwarfing was caused by overexpression of the major gibberellin catabolic

enzyme and was reversible if gibberellic acid was applied to the shoot apex. Producing semidwarf trees by transgenic approaches could be quite beneficial, economically and environmentally.

- Campbell, MM, AM Brunner, HM Jones, and S Strauss. 2003. Forestry's Fertile Crescent: The application of biotechnology to forest trees. *Plant Biotechnology Journal* 1: 141–154.

For tree geneticists and biotechnologists. Domestication of crop plants began some 10,000 years ago in the Fertile Crescent of the Middle East, but it is only in the last 50 years that forest trees have been domesticated to increase fiber production. Biotechnology could greatly speed up enhancement of desirable traits in forest trees. The authors review progress in applying biotechnology to trees and discuss the potential for such applications in the future.

- Castellano, MA, and JM Trappe. 2002. Monophyly, paraphyly, and generic characterization: Between a rock and a hard place. *Inoculum* 53(3): 23.

For researchers in forest fungus taxonomy and ecology. DNA analysis has become an important tool in understanding relationships among the fungi. It has produced many surprising results that overturn classical concepts of families and genera. The implications to fungal nomenclature are discussed with special reference to potential changes of fungal names.

- Castellano, MA, E Cazares, B Fondrick, and T Dreisbach. 2003. *Handbook to Additional Fungal Species of Special Concern in the Northwest Forest Plan*. General Technical Report PNW-GTR-572, USDA Forest Service, Portland OR.

For forest managers and mycologists. The main purpose of this handbook is to help facilitate the survey, collection, and handling of potential ROD-listed fungal species by USDA Forest Service and USDI Bureau of Land Management employees. Each species is represented by a condensed description, a set of distinguishing features, and information on substrate, habitat, and seasonality. The authors also present a list of known sites within the range of the northern spotted owl, a distribution map, and additional refer-

ences to introduce the available literature on particular species.

- Cazares, E, MA Castellano, MP Amaranthus, and JM Trappe. 2002. Corner's playground revisited. *Inoculum* 53(3): 23.

For researchers in forest fungus taxonomy and ecology. EJH Corner, an accomplished British mycologist confined to Singapore during World War II, spent much time collecting fungi on the island. The authors recollected and redescribed many of the truffle-like fungi he originally discovered there. They comment on their relationships to other species from Australasia.

- Chen, H, and W Hicks. 2003. High asymbiotic N₂ fixation rates in woody roots after six years of decomposition: Controls and implications. *Basic and Applied Ecology* 4: 479–486.

For ecologists, forest scientists, and those interested in nutrient recycling. Using acetylene reduction (AR) rates as a measure, the authors determined asymbiotic N₂ fixation associated with decomposing woody roots at three sites in Oregon. Rates were highest at the HJ Andrews site in the Cascades, followed by the wettest site, at Cascade Head, and the driest, at Pringle Falls. Mean AR rates increased and mass loss decreased with increasing root size. Root species was not a factor in AR. Decomposing roots fixed at least four times more N₂ than other asymbiotic sources of N₂ fixation. Dead roots can potentially provide a significant amount of nitrogen to forests.

- Cherubini, P, BL Gartner, R Tognetti, OU Braker, W Schoch, and JL Innes. 2003. Identification, measurement and interpretation of tree rings in woody species from Mediterranean climates. *Biological Reviews* 78: 119–148.

For forest scientists and forest ecologists. The authors reviewed the literature dealing with the effects of Mediterranean climate, vegetation, phenology, and ecophysiology on tree ring formation. Studies of tree rings in Mediterranean regions were scarce. The review found, however, that tree rings are sometimes not formed because of great spatio-temporal variability of

Mediterranean environmental conditions. In addition, clear seasonality may be lacking, and vegetation activity may not be always associated with regular dormancy periods. Difficulties encountered in dating five species by tree-ring morphology are described, and the authors propose a classification of tree-ring formation in Mediterranean climates. Mediterranean tree rings can be dated and used in dendrochronology, but sampling sites, species, and sample trees should be selected with great care.

- Cliff, JB, PJ Bottomley, DJ Gaspar, and DD Myrold. 2002. Exploration of inorganic C and N assimilation by soil microbes with time of flight secondary ion mass spectrometry. *Applied and Environmental Microbiology* 68: 4067–4073.

For researchers in soil nitrogen cycling. A novel application of secondary ion mass spectrometry was used to detect assimilation of ^{13}C (carbon) and ^{15}N (nitrogen) by microorganisms at very small (sub-mm) spatial scales. Fungal hyphae grown on slides contained more ^{15}N in regions influenced by N-rich manure than in regions influenced by N-deficient straw. TOF-SIMS is able to locate N-assimilating microorganisms in soil and quantify the ^{15}N content of cells that have assimilated ^{15}N -labeled mineral N. It seems promising as a tool with which to explore the factors controlling microsite heterogeneities in soil.

- Cliff, JB, PJ Bottomley, R Haggerty, and DD Myrold. 2002. Modeling the effects of diffusion limitations on nitrogen-15 isotope dilution experiments in soil aggregates. *Soil Science Society of America Journal* 66: 1868–1877.

For researchers in soil nitrogen cycling. The authors examined the effects of mass transfer limitations on isotope dilution, using spherical diffusion-reaction models. The transport and reaction equations of NH_4^+ assumed Fickian diffusion, linear, equilibrium adsorption, zero-order production of natural abundance ^{15}N , and either pseudo-first-order or zero-order consumption of NH_4^+ . Pseudo-first-order consumption rate calculations were sensitive to the adsorption coefficient, but not other transport parameters. Zero-order consumption and production rates were consistently underestimated. Aggregate size

and effective diffusivity affected the error frequency. When the applied label was allowed to diffuse for 24 hours, errors decreased by a factor of about three in the largest aggregate size class.

- Cohen, WB, TA Spies, RJ Alig, DR Oetter, TK Maier-sperger, and M Fiorella. 2002. Characterizing 23 years (1972–95) of stand replacement disturbance in western Oregon forests with Landsat imagery. *Ecosystems* 5: 122–137.

For landscape ecologists and silviculturists. Patterns of stand replacement disturbances, such as clearcutting and wildfire, greatly affect forest ecosystems in western Oregon. The authors contrasted relative amounts of wildfire and harvest in three major provinces in the region over 23 years. They also compared harvest statistics in the principal land ownerships. Nearly 20% of the area was clearcut during the study period, and wildfire affected 0.7%. Harvest rates of private industrial landowners, which dominated the Coast Range province, were about 2.5X greater than those by public owners. Public ownerships, which dominated the Klamath mountains and Western Cascades province, had less cutting and more wildfire. Private industrial owners had larger individual harvest units that tended to run together over time, whereas public and private nonindustrial owners tended to cut in relatively small, spatially dispersed units. Rates of harvest by all landowners peaked in the late 1980s and early 1990s and dropped to near the low levels of the 1970s by the mid-1990s.

- Cohen, WB, TK Maier-sperger, ST Gower, and DP Turner. 2003. An improved strategy for regression of biophysical variables and Landsat ETM+ data. *Remote Sensing of Environment* 84: 561–571.

For researchers interested in applications of remote sensing in ecology. The authors compared three regression models and their ability to predict LAI for an agroecosystem and live tree canopy cover in a needleleaf evergreen boreal forest. CCA was used to integrate multiple dates and SVIs in each of the models. All the models gave the same coefficients of determination and intercepts but different slopes. The lowest root mean square error (RMSE) was in the traditional

approach, and the inverse method had the highest RMSE. Variance of the traditional approach was lower than that of the observed data set, whereas the variance of the inverse method was inflated. The reduced major axis (RMA) method had an intermediate set of predictions for both RMSE and variance.

Compton, JE, MR Church, ST Larned, and WE Hogsett. 2003. Nitrogen export from forested watersheds in the Oregon Coast Range: The role of N₂-fixing red alder. *Ecosystems* 6: 773–785.

For soil scientists, plant and landscape ecologists, and silviculturists. The authors examined the water chemistry of 26 small streams in the Coast Range of Oregon in order to elucidate how red alder influences nutrient cycling in Pacific Northwest forests. Red alder comprised 94% of basal area of broadleaf cover. Concentrations of nitrate and dissolved organic nitrogen were positively related to broadleaf cover, more strongly within entire watersheds than within the riparian area alone. Annual export of nitrogen varied greatly among watersheds. Nitrate leaching appeared to increase cation losses. Their results support the idea that a single plant species can exert strong control of ecosystem function, in that leaching from red alder stands was a major control on nitrogen export from the watersheds.

Cushing, JB, N Nadkarni, R Dial, and B Bond. 2003. How trees and forests inform biodiversity and ecosystem informatics. *Computing in Science and Engineering* 5(3): 32–43.

For researchers interested in informatics. The authors present informatics tools and data infrastructure techniques developed as part of the Canopy Database Project. The project combines the skills of computer scientists and ecologists. The tools developed are useful for helping many researchers integrate their data.

Davidson, EA, K Savage, P Bolstad, DA Clark, PS Curtis, DS Ellsworth, PJ Hanson, BE Law, Y Luo, KS Pregitzer, JC Randolph, and D Zak. 2002. Belowground carbon allocation in forest ecosystems estimated from annual litterfall and IRGA-based chamber measurements of soil respiration. *Agricultural and Forest Meteorology* 113: 39–51.

For researchers in forest soil processes. The allocation of carbon (C) to underground plant structures is a very important contributor to C flux in terrestrial ecosystems, but so far has not been well quantified. Previous work has indicated that the difference between annual rates of soil respiration and litter fall aboveground could be used to estimate belowground C allocation. The authors analyzed new soil respiration and litterfall data, including data from the Ameriflux network. In general their results agreed with those of earlier work. Analysis of data from mature forests indicated that total belowground C allocation is generally much greater than litterfall. The method, however, has many limitations. The authors discuss these limitations and the most appropriate situations for its use.

Deal, RL, JC Tappeiner, and PE Hennon. 2002. Developing silvicultural systems based on partial cutting in western hemlock-Sitka spruce stands of southeast Alaska. *Forestry* 75: 425–431.

For forest ecologists, forest managers, and forest resource researchers. Seventy-three plots in 18 stands that were harvested 12–96 years ago in southeast Alaska were evaluated to determine the effects of partial cutting on species composition, stand structure and growth, tree size distribution, and tree disease and mortality. Partially cut stands were diverse and highly complex, similar to uncut stands. Sitka spruce was maintained in mixed hemlock-spruce stands over a wide range of cutting intensities. There were no significant changes in tree species composition, stand growth, hemlock dwarf mistletoe infection and incidence of tree wounding, or mortality rates with partial cuts. Inclusion of partial cutting in silvicultural systems could lead to a sustainable timber resource, maintaining stand structure diversity and old growth characteristics.

Dean, TJ, SD Roberts, DW Gilmore, DA Maguire, JN Long, KL O'Hara, and RS Seymour. 2002. An evaluation of the uniform stress hypothesis based on stem geometry in selected North American conifers. *Trees—Structure and Function* 16: 559–568.

For silviculturists and forest scientists. In order to test the uniform stress hypothesis, the authors com-

pared stem taper in 6 conifer species to the taper expected if stems develop to distribute bending stress uniformly. They used a model with two fitted coefficients, δ and ϕ . Seven of the 12 fitted values for δ were significantly deviant, 8 were within 10%, and 11 were within 15% of the hypothesized value of 0.333. When the values were fitted by relative height, large portions of the stems were within 10% of 0.333. Only *Pseudotsuga menziesii* clearly did not fit into the uniform-stress hypothesis. For many of the fitted values, ϕ was inversely related to the modulus of elasticity (E) of green wood. Extraordinary values appeared to be accounted for by growing conditions. E decreased and ϕ increased with increasing height, suggesting some regulation of bending curvature by adjustments in cross-sectional area. The results suggest that diameter can be predicted from bending moment with a simple power function when E is relatively constant.

Domec, JC, and BL Gartner. 2002. How do water transport and water storage differ in coniferous earlywood and latewood? *Journal of Experimental Botany* 53: 2369–2379.

For silviculturists, tree physiologists, and wood scientists. The authors measured the specific conductivity (k_s) and vulnerability of xylem to embolism on a single growth ring and in a subset of earlywood and latewood samples within the same ring to determine the water transport behavior of earlywood and latewood in the trunk of 21-year-old Douglas-fir. Earlywood had 90% of the total flow and 11 times the k_s of latewood. Similar to all parts of the wood, earlywood suffered a 50% loss of conductivity at -2.2 MPa (P-50). At high trunk water potential, latewood was more vulnerable to embolism than earlywood. Field estimates of trunk water potential indicated that latewood lost 42% of k_s , and earlywood lost 16%. At field trunk water capacity, higher vulnerability to embolism was associated with greater water storage capacity. Air seeding through latewood may occur directly through pores and seal off at lower pressure than earlywood pores.

Domec, JC, and BL Gartner. 2003. Relationship between growth rates and xylem hydraulic char-

acteristics in young, mature, and old-growth ponderosa pine trees. *Plant, Cell and Environment* 26: 471–483.

For silviculturists, tree physiologists, and wood scientists. The authors sought to quantify the effects of tree age and stem position on specific conductivity (k_s), vulnerability to embolism, and water storage capacity in trunks of young, mature, and old-growth ponderosa pine. They also sought to determine relationships between hydraulic characteristics and radial and height growth rates. Trees of all heights and ages had 25–60% higher k_s in outer sapwood than inner sapwood. In mature trees only, embolism started at a lower water potential in the inner sapwood than in the outer. Trees of all ages had similar capacitances at the top. Increasing k_s or vulnerability to embolism increased capacitances sharply. Hydraulic characteristics were correlated with height, but not diameter, growth rate. High k_s was related to the slowest yearly increase in sapwood area and a small percentage of latewood. Height growth rate was associated with high vulnerability to embolism and high capacitance.

Dunham, SM, A Kretzer, and ME Pfreder. 2003. Characterization of Pacific golden chanterelle (*Cantharellus formosus*) genet size using co-dominant satellite markers. *Molecular Ecology* 12: 1607–1618.

For mycologists and molecular geneticists. Genet size of the Pacific golden chanterelle was determined in old-growth and in recently thinned and unthinned young second-growth stands dominated by Douglas-fir. Their results indicate that a cryptic chanterelle species may be included in fruit-body collections thought to be of *C. formosus*. Both genetic types had small genets; variance in genet size was high. The five loci studied may not have fully resolved genets. Genet size did not seem to be affected by treatment.

Dunham, SM, TE O'Dell, and R Molina. 2003. Analysis of nrDNA sequences and microsatellite allele frequencies reveals a cryptic chanterelle species *Cantharellus cascadiensis* sp. nov. from the American Pacific Northwest. *Mycological Research* 107: 1163–1177.

For mycological systematists and geneticists. In the past, the yellow chanterelles in the Pacific Northwest have been called *Cantharellus cibarius*. The length variability of the nrDNA internal transcribed spacer, however, suggests that the *C. cibarius*-like morphology in fact covers a species complex. Researchers recently have identified the chanterelle most frequently harvested in the Pacific Northwest as *C. formosus* on the basis of morphological and genetic data. The authors describe a new species of yellow chanterelle, *C. cascadenensis* sp. nov., characterized by three genetic and one morphological data set, from the central Cascade Mountains of Oregon. This species, *C. cibarius* var. *roseocanus*, and the European *C. cibarius* appear to be more closely related to white chanterelles (*C. subalbidus*) than to *C. formosus*, as indicated by phylogenetic analyses of the nrDNA large subunit and ITS regions. Microsatellite data indicated that *C. formosus*, *C. subalbidus*, and *C. cascadenensis* sp. nov. do not interbreed when they occur together, demonstrating that they are biological species. The two yellow species cooccurring in the Pacific Northwest can be separated when fresh by stipe shape and pileus color.

Emmingham, WH. 2002. Development of ecosystem management in the Pacific Northwest. *Plant Biosystems* 136(2): 167–176.

For ecologists and forestland managers. Ecosystem management has influenced forestry practices differently on federal and private forests. Federal forest managers in western Oregon manage stands for structural complexity and landscapes to approximate natural disturbances. Management of private forestlands is influenced by state and federal regulations and incentives. Within the limits of the regulations, large industrial owners still manage so as to maximize timber production, with some adopting habitat conservation plans. Small private owners may balance ecological requirements, aesthetic preferences, and forest-derived income. Green certification is chosen by some. The differences in management practices among ownerships can complement each other. Because the details of ecosystem management vary by forest type and management objectives, other regions likely may require ecosystem management practices different from those used in the Pacific Northwest.

Erickson, JL, and MJ Adams. 2003. A comparison of bat activity at low and high elevations in the Black Hills of western Washington. *Northwest Science* 77: 126–130.

For zoologists. Differences in activity patterns and community structure of bats were compared between low (<150 m) and high (>575 m) elevation sites in the Capitol State Forest, Washington. Feeding and total bat activity were higher at the low elevation sites. Activity of the nonmyotis group was similar at high and low elevations, whereas activity of the myotis group was lower at higher elevations. Different activity levels could result from different insect availability, climatic conditions, and morphology of the bat species.

Erickson, JL, and SD West. 2003. Associations of bats with local structure and landscape features of forested stands in western Oregon and Washington. *Biological Conservation* 109: 95–102.

For ecologists and forest scientists. The authors examined the association of both local structure and landscape context with bat activity in 48 forested stands in western Oregon and Washington, using ultrasonic detectors on at least six occasions for each of two field seasons. Bat activity was negatively associated with tree density and positively associated with the standard deviation of tree density and the density of newly created snags, accounting for 46% of the total variance in bat activity among stands. Management of forest-dwelling bats should focus primarily on the effects of structural attributes at the stand level on feeding and roosting opportunities.

Falge, E, D Baldocchi, J Tenhunen, M Aubinet, P Bakwin, P Berbigier, C Bernhofer, G Burba, R Clement, KJ Davis, JA Elbers, AH Goldstein, A Grelle, A Granier, J Goumardsson, D Hollinger, AS Kowalski, G Katul, BE Law, Y Malhi, T Meyers, RK Monson, JW Munger, W Oechel, KT Paw, K Pilegaard, U Rannik, C Rebmann, A Suyker, R Valentini, K Wilson, and S Wofsy. 2002. Seasonality of ecosystem respiration and gross primary production as derived from FLUXNET measurements. *Agricultural and Forest Meteorology* 113: 53–74.

For ecologists, ecosystem modelers, and forest scientists. Using FLUXNET data, the authors analyzed seasonal patterns of gross primary productivity (F-GPP) and ecosystem respiration (F-RE) of several different types of ecosystems. Based on generalized seasonal patterns, classifications of ecosystems into vegetation functional types can be evaluated for use in global productivity and climate change models. Boreal forests and managed grasslands and crops showed the greatest seasonal variability. In the temperate coniferous forests, seasonal patterns of F-GPP and F-RE were in phase. Temperate deciduous and boreal coniferous forests had the greatest imbalance between respiratory and assimilatory fluxes early in the growing season. Annual F-GPP was the lowest in the boreal climate zone.

Falge, E, J Tenhunen, D Baldocchi, M Aubinet, P Bakwin, P Berbigier, C Bernhofer, JM Bonnefond, G Burba, R Clement, KJ Davis, JA Elbers, M Falk, AH Goldstein, A Grelle, A Granier, T Grundwald, J Gudmundsson, D Hollinger, IA Janssens, P Keronen, AS Kowalski, G Katul, BE Law, Y Malhi, T Meyers, RK Monson, E Moors, JW Munger, W Oechel, KTP U, K Pilegaard, U Rannik, C Rebmann, A Suyker, H Thorgeirsson, G Tirone, A Turnipseed, K Wilson, and S Wofsy. 2002. Phase and amplitude of ecosystem carbon release and uptake potentials as derived from FLUXNET measurements. *Agricultural and Forest Meteorology* 113: 75–95.

For ecosystem modelers and forest scientists. The authors analyzed seasonal patterns of net ecosystems carbon exchange (F-NEE) using eddy covariance data of the FLUXNET data base. Seasonal uptake and release capacities were in phase in temperate coniferous forests. Release in temperate deciduous and boreal coniferous forest was delayed relative to uptake. The authors created four groupings each for maximum nighttime release (F-max) and maximum daytime uptake (F-min). The seasonal amplitudes of F-max and F-min were largest for managed grasslands and crops. This analysis drew largely on data from Northern Hemisphere temperate and boreal forest ecosystems. For regional or global estimates of carbon sequestration potentials, investigations of eddy covariance

should expand in other systems. The results of this study are potentially important in validating global carbon cycle modeling.

Garber, SM, and DA Maguire. 2003. Modeling stem taper of three central Oregon species using nonlinear mixed effects models and autoregressive error structures. *Forest Ecology and Management* 179: 507–522.

For tree growth modelers and mensurationists. The authors developed variable exponent taper models for *Abies grandis*, *Pinus ponderosa*, and *Pinus contorta* in the central Oregon Cascades. When two random effects were included, autocorrelation was only partially reduced. They incorporated a first-order continuous autoregressive error process into the models in order to give valid tests of significance on model parameter estimates. The model was effective for several species mixes and a range of spacings. Volumes estimated for *P. ponderosa* were similar to those from previously developed equations for the east slope of the Cascades, but estimates differed from east side results for both *A. grandis* and *P. contorta*. Using site-specific volume and taper equations is important when assessing tree response to silvicultural treatments.

Garman, SL, JH Cissel, and JH Mayo. 2003. *Accelerating Development of Late-successional Conditions in Young Managed Douglas-fir Stands: A Simulation Study*. General Technical Report PNW-GTR-557, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For silviculturists and modelers. Using the ZELIG>PNW (3.0) model, the authors evaluated how experimental thinning treatments affected development of late successional attributes and extracted merchantable volume in young Douglas-fir stands in the central Cascades of Oregon. Simulations started with a 40-year-old managed stand and simulated 64 thinning treatments for four rotation intervals. An additional 64 experimental thinning treatments were evaluated under stand conditions of selected treatment in a subsequent harvest rotation. In general, results confirmed previous recommendations and showed the potential for a range of thinning treatments to attain late-successional conditions.

The time required to attain such conditions under the different treatments would be about the same, but merchantable volume and long-term stand conditions would differ among treatments.

- Gartner, BL. 2002. Sapwood and inner bark quantities in relation to leaf area and wood density in Douglas-fir. *IAWA Journal* 23: 267–285.

For silviculturists and wood scientists. A wide variety of 34-year-old Douglas-fir trees were studied in order to understand the design criteria for sapwood quantity. Cumulative leaf area had a unique distribution among factors studied, increasing from the tip to the base of the crown and then remaining constant. The ratio of leaf area to sapwood area varied greatly. Sapwood width was fairly constant from tip to stem. This suggests that sapwood quantity is related to radial gas diffusion and causes lethal buildup of CO₂ or depletion of O₂ at the sapwood-heartwood boundary. More research on actual radial gas diffusion in green wood is needed.

- Gartner, BL, J Roy, and R Huc. 2003. Effects of tension wood on specific conductivity and vulnerability to embolism of *Quercus ilex* seedlings grown at two atmospheric CO₂ concentrations. *Tree Physiology* 23: 387–395.

For silviculturists and wood scientists. Seedlings of *Quercus ilex* L. were grown at normal and elevated CO₂ for 16–17 months. Within each group, seedlings were grown upright or inclined to increase the production of tension wood (TW) and determine whether this causes a decrease in hydraulic function. The stem base, but not the stem tip, formed large amounts of TW in both CO₂ environments. Specific conductivity (k_s) and vulnerability to embolism were not affected by stem inclination or the amount of TW. Samples with more TW had higher vessel frequency and wood density, similar average vessel lumen area and vessel lumen fraction, and more vessels in the smallest diameter class than samples with less TW. Vessel frequency, lumen fraction, and wood density were similar in samples under both CO₂ levels, but vessel lumen area was larger in elevated CO₂. The k_s values were lowest at the stem and increased to the tip. Wood density followed an opposite trend.

- Grubisha, L, JM Trappe, R Molina, and J Spatafora. 2002. Biology of the ectomycorrhizal genus *Rhizopogon*. VI. Re-examination of infrageneric relationships inferred from phylogenetic analysis of ITS sequences. *Mycologia* 94: 607–619.

For researchers in forest fungus taxonomy and ecology. DNA analyses of this large genus of mycorrhizal, truffle-like fungi showed that groupings earlier recognized within the genus are largely correct. Nonetheless, the analyses supported raising several sections of the genus to subgenus level and transferring many species from one subgenus to another. This further refines taxonomy of the genus, which is important in forest nursery inoculation and as food for native mammals.

- Hallet, JG, MA O'Connell, and CG Maguire. 2003. Ecological relationships of terrestrial small mammals in western coniferous forests, pp. 120–154 in *Mammal Community Dynamics: Management and Conservation in the Coniferous Forests of Western North America*, CJ Zabel and RG Anthony, eds. Cambridge University Press, NY.

For ecologists, small mammal biologists, and conservationists. Understanding the distribution, abundance, and ecological influences of small mammals in western forest ecosystems is relevant to both economic and conservation concerns. Emphasizing the small mammal species inhabiting the forest floor, the authors review the taxa and diversity of forest small mammals, population studies, their ecological roles, their patterns of species richness and abundance, their habitat associations, and their responses to forest management. They also suggest directions for future research.

- Hann, DW, and ML Hanus. 2002. *Enhanced Diameter-Growth-Rate Equations for Undamaged and Damaged Trees in Southwest Oregon*. Research Contribution 39, Forest Research Laboratory, Oregon State University, Corvallis.

For silviculturalists and forest managers. Using weighted nonlinear regression, the authors developed equations for predicting 5-year diameter-growth rate of eight conifer and nine hardwood tree species in Oregon.

These equations for damaged and undamaged trees are being incorporated into ORGANON, a model for predicting the development of stands for southwest Oregon. The different effects of specific damaging agents that impact 5-year diameter-growth rate significantly are explored.

Hann, DW, and ML Hanus. 2002. *Enhanced Height-Growth-Rate Equations for Undamaged and Damaged Trees in Southwest Oregon*. Research Contribution 41, Forest Research Laboratory, Oregon State University, Corvallis.

For silviculturalists and forest managers. Researchers developed equations for predicting the 5-year height-growth rate of six conifer species from southwest Oregon. These equations are being incorporated into ORGANON, a model for predicting the development of stands. They extend the previous model to older stands and to stands with a heavier component of hardwood tree species. These equations include a full characterization of stand development and prediction of the presence and frequency of agents damaging trees within the stand and their subsequent impact on tree attributes such as total height, height to crown base, and diameter-growth, height-growth, and mortality rates.

Hann, DW, DD Marshall, and ML Hanus. 2003. *Equations for Predicting Height-To-Crown-Base, 5-Year Diameter-Growth Rate, 5-Year Height-Growth Rate, 5-Year Mortality Rate, and Maximum Size-Density Trajectory for Douglas-Fir and Western Hemlock In the Coastal Region of the Pacific Northwest*. Research Contribution 40, Forest Research Laboratory, Oregon State University, Corvallis.

For forest researchers, forest managers, and silviculturalists. Using existing permanent research plot data, researchers developed equations for predicting height-to-crown-base, 5-year diameter-growth rate, 5-year height-growth rate, 5-year mortality rate, and the maximum size-density trajectory for Douglas-fir and western hemlock in the coastal region of the Pacific Northwest. The strengths and weaknesses of the existing data sets and the modeling and analytical approaches tested during development of these equa-

tions are presented to aid future modelers, and alternative modeling approaches are explored.

Hansen, K, and JM Trappe. 2002. Terfeziaceae E. Fisch, in *Notes on Ascomycete Systematics*, Eriksson, OE, HO Baral, RS Currah, K Hansen, CP Kurtzman, T Laessøe, and G Rambold, eds. *Mycotax* 8:33–34.

For researchers in forest fungus taxonomy and ecology. The two genera formerly placed in this truffle family, *Mattitolomyces* and *Terfezia*, were shown by DNA analysis to belong in the family Tuberaceae within the order Pezizales. Hence, the family name Terfeziaceae can be discarded.

Hayes, JP, and JC Hagar. 2002. Ecology and management of wildlife and their habitats in the Oregon Coast Range, pp. 99–134 in *Forest and Stream Management in the Oregon Coast Range*, SD Hobbs, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells, eds. Oregon State University Press, Corvallis.

For wildlife biologists, ecologists, and forest managers. More than 200 species of wildlife (defined by the authors as terrestrial vertebrates) live in the Oregon Coast Range. This diversity is possible largely because the Coast Range provides a broad range of natural habitats. Recently, the influence of land management on biodiversity has been receiving increased attention on aesthetic, ethical, and utilitarian grounds. Land management activities affect the availability of suitable habitat, which is a key influence on the abundance, distribution, and diversity of wildlife. The authors discuss habitat components at the stand level, the special concerns with riparian areas, and the role of landscape structure with respect to wildlife presence and abundance.

Hayes, JP. 2003. Habitat ecology and conservation of bats in western coniferous forests, pp. 81–119 in *Mammal Community Dynamics: Management and Conservation in the Coniferous Forests of Western North America*, CJ Zabel and RG Anthony, eds. Cambridge University Press, NY.

For ecologists, wildlife biologists, and conservationists. Six species of bats that are regularly associated with west-

ern forests and another 13 species that occur in both forested and nonforested areas of the region may be affected by forest management. The author reviews the current status of knowledge about bat ecology, including roosting ecology, activity areas, riparian and aquatic habitat, influence of stand area and structure. He notes information gaps and proposes some directions for future research, and then discusses the implications of forest management for bat habitat and conservation.

Hayes, JP, JM Weikel, and MMP Huso. 2003. Response of birds to thinning young Douglas-fir forests. *Ecological Applications* 13: 1222–1232.

For forest biologists, forest managers, and ornithologists. By increasing structural complexity, thinning forest stands may improve habitat for birds and other vertebrates. The authors investigated the effects of thinning intensity on diurnal breeding bird populations in western Oregon over 7 years. Detections of nine species decreased in thinned stands, relative to controls; eight species increased; and five appeared unaffected by thinning. In about half of the responsive species, response was greatest in the more heavily thinned stands. The authors conclude that thinning dense conifer stands in areas dominated by young stands increases habitat suitability for some species, but that some areas should be left unthinned for the sake of species adversely impacted by thinning.

Hibbard, KA, DS Schimel, S Archer, DS Ojima, and W Parton. 2003. Grassland to woodland transitions: Integrating changes in landscape structure and biogeochemistry. *Ecological Applications* 13: 911–926.

For forest and grassland scientists, modelers, landscape ecologists, and biogeochemists. As grazing and fire regimes have changed under human influence over the last century, woody vegetation has been replacing grasses in many drylands. The authors linked a process-based ecosystem model to a transition matrix model in order to evaluate the size of changes in plant and soil carbon and nitrogen pools in a subtropical landscape transitioning from grassland to thorn woodland in Texas. The model included conditions before Euro-American settlement, followed by heavy

grazing and elimination of fire, beginning in the mid-1800s, and displacement of grassland communities by woody vegetation. Their results indicate that grazing and fire suppression would have reduced soil organic carbon mass by 17–18% by the 1990s. In current woodlands, soil and plant carbon stocks were estimated to be up to 10X higher than they would have been in the grasslands they replaced. From these and other results, the authors conclude that woodland development has increased carbon stocks in the ecosystems significantly in a relative short period.

Hicks, WT, and ME Harmon. 2002. Diffusion and seasonal dynamics of O₂ in woody debris from the Pacific Northwest, USA. *Plant and Soil* 243: 67–79.

For forest ecologists. Little is known about oxygen (O₂) levels and diffusion rates in decomposing logs. Using both laboratory and field studies, the authors studied how O₂ diffusion differed with moisture and density in decayed and sound wood. They also predicted seasonal changes in O₂ concentration in Douglas-fir and western hemlock logs in an old-growth Douglas fir forest in the Pacific Northwest and compared them with observed changes. In laboratory measurements, the O₂ diffusion coefficient increased exponentially with increased air-filled pore space and decreased density. The two species in the field did not differ in O₂ concentrations. Seasonal O₂ levels were not consistently related to log moisture, respiration, or air temperature. Their results indicate that laboratory measurements of oxygen diffusion may underestimate field oxygen concentrations, perhaps because of cracks and other passages in decayed logs. Oxygen probably does not limit decomposition in terrestrial decayed wood, and anaerobic conditions in logs may not be as common as has been thought.

Hicks, WT, ME Harmon, and DD Myrold. 2003. Substrate controls on nitrogen fixation and respiration in woody debris of the Pacific Northwest, USA. *Forest Ecology and Management* 176: 25–35.

For ecologists and forest scientists. The authors studied how nitrogen fixation and respiration in woody debris are affected by wood species, tissue, and degree of decay at three sites in the Pacific Northwest. Nitro-

gen fixation and respiration rates were highest in moderately decayed wood. The warmer, wetter coastal site had higher actual nitrogen fixation and similar potential rates than the two interior sites. Bark had the highest fixation and respiration rates, followed by sapwood and heartwood, in all the species studied. Most of the patterns in this study can be explained by microbial colonization and abundance, resource quality, and climate.

Hobbie, EA, NS Weber, JM Trappe, and GJ van Klinken. 2002. Using radiocarbon to determine the mycorrhizal status of fungi. *New Phytologist* 156: 129–136.

For forest researchers, microbiologists, and scientists. ^{14}C content was measured by accelerator mass spectrometry in sporocarps, needles, and litter from Woods Creek, Oregon, along with archived sporocarps. ^{14}C content of known mycorrhizal fungi resembled that of current-year needles with an average age of incorporated C of 0–2 years, whereas saprotrophic genera were composed of C at least 10 years old. ^{14}C could distinguish known mycorrhizal saprotrophic fungi. ^{13}C measurements should be interpreted cautiously on species of unknown status. ^{14}C results for needles and mycorrhizal fungi suggested that C sources other than atmospheric CO_2 may contribute small amounts of C.

Hobbs, SD, and TA Spies. 2002. Introduction, pp. 1–6 in *Forest and Stream Management in the Oregon Coast Range*, SD Hobbs, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells, eds. Oregon State University Press, Corvallis.

For resource managers, specialists, technicians, and policymakers. Key principles related to the ecology and management of forest and stream resources in the Oregon Coast Range are described.

Hobbs, SD, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells, eds. 2002. *Forest and Stream Management in the Oregon Coast Range*. Oregon State University Press, Corvallis.

For resource managers, specialists, technicians, and policymakers. This book summarizes 12 years of research conducted by scientists affiliated with the Coastal Oregon Productivity Enhancement (COPE) Program. It provides new science-based information about the ecology and management of multiple resources in the Oregon Coast Range.

Horton, TR. 2002. Molecular approaches to ectomycorrhizal diversity studies: Variation in ITS at a local scale. *Plant and Soil* 244: 29–39.

For forest scientists, microbiologists, and ecologists. Sporocarps were collected across a 7-km region of the Oregon Dunes National Recreation Area. ITS-RFLP data are presented for 3–18 sporocarps from each of 44 ectomycorrhizal species in 18 genera. Thirty-eight species yielded a single RFLP, and no two had the same RFLP type. Polymorphic types were observed in six species. Three species had two types with one dominating, and three species had three types with none dominating. These results suggest that ITS-RFLP data from single samples are robust for characterizing most of the species at this scale, but additional analysis should be used.

Hudak, AT, MA Lefsky, WB Cohen, and M Berterretche. 2002. Integration of lidar and Landsat ETM plus data for estimating and mapping forest canopy height. *Remote Sensing of Environment* 82: 397–416.

For forest scientists and forest managers. The authors attempted to integrate lidar and Landsat data to improve the measurement, mapping, and monitoring of forest structural attributes. They used five aspatial and spatial methods for predicting canopy height. The aspatial regression model results preserved actual vegetation pattern; however, taller canopies were underestimated and shorter canopies were overestimated. Spatial models produced less biased results but reproduced vegetation patterns poorly. Kriged or cokriged regression residuals were preferable to either the aspatial or spatial models alone. Sample points at 250-m intervals proved most optimal.

- Irvine, J, and BE Law. 2002. Contrasting soil respiration in young and old-growth ponderosa pine forests. *Global Change Biology* 8: 1183–1194.

For forest scientists and forest researchers. Three years of specific measurements were taken to determine diel, seasonal, and interannual patterns of soil efflux in an old-growth (250 years old) and a recently regenerating (14 years old) ponderosa pine forest in central Oregon. Interannual variability may be due to soil moisture availability in the deeper soil horizons on the old-growth site and the quantity of summer rainfall at the recently regenerating site. Diel mean soil temperature and soil water potential accounted for 80% of the variance of diel mean soil efflux. Strong linkages between above- and belowground processes are suggested by seasonal patterns of soil efflux at both sites.

- Irvine, J, BE Law, and FR Meinzer. 2002. Water limitations to carbon exchange in old-growth and young ponderosa pine stands. *Tree Physiology* 22: 189–196.

For tree physiologists and ecologists. To study how seasonal water deficit influences net ecosystem exchange of carbon, the authors measured seasonal transpiration; canopy conductance; soil water, temperature, and respiration; and net ecosystem exchange of carbon in an old-growth and a recently regenerating stand of ponderosa pine in Oregon. Both stands had moderately cold wet winters and hot dry summers. The seasonal minimum of soil water, reached in August, was the same at both sites. Transpiration rates were similar in both stands between April and June, but drought stress then began to increase in trees in the recently regenerating stand. Predawn water potential of trees in the young stand also declined from June through August, whereas that of trees at the old-growth site remained greater than -0.8 MPa. Soil water limitations appeared to limit soil respiration and assimilation at the recently regenerating site, but not at the old-growth site. Net daytime ecosystem carbon exchange showed no pronounced seasonal pattern at either site between April and November.

- Ishii, H, and N McDowell. 2002. Age-related development of crown structure in coastal Douglas-

- fir trees. *Forest Ecology and Management* 169: 257–270.

For silviculturists, forest ecologists, and forest scientists. The authors present a conceptual model of crown development in Douglas-fir trees, developed by comparing crown structure among 20-, 40-, and 450-year-old trees. The model examines patterns of branch volume, branch density, branch diameter, branch death, and the relationship between mean branch volume and branch density. Included in the model are the exponential or general logistic growth curve, which describes branch volume, and the branch self-pruning line/curve, which is derived from the relationship between mean branch volume and branch density after the onset of branch death. The national distribution of branch volume shifted toward the upper crown as trees grew older.

- Keeley, BW, MB Fenton, and E Arnett. 2003. A North American partnership for advancing research, education, and management for the conservation of bats and their habitats. *Wildlife Society Bulletin* 31: 80–86.

For conservation biologists, natural resource managers, and wildlife biologists. Conservation of and information about North American bats and their habitats is needed across the continent. Continent partnerships have successfully promoted the conservation of other forms of wildlife. The authors discuss the development, mission and strategic goals, and funding of the North American Bat Conservation Partnership (NABCP). They also recommend priorities in research, education and management to provide a framework for coordinating bat conservation continent-wide.

- Kellogg, LD, GV Milota, and B Stringham. 2002. Timber harvesting to enhance multiple resources, pp. 135–171 in *Forest and Stream Management in the Oregon Coast Range*, SD Hobbs, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells, eds. Oregon State University Press, Corvallis.

For logging planners and forestland managers. Forestland managers can use timber harvesting to significantly

alter the vegetation structure and species composition of a stand or to place large woody debris in streams. Such measures can enhance wildlife and fish habitat or other resource values and help to maintain forest health. In order to minimize environmental damage, equipment and harvesting methods should be chosen carefully for appropriateness to each site. To provide resource specialists with basic knowledge of forest operations and harvesting systems, the authors give an overview of harvesting systems used in the Oregon Coast Range and describe the harvest planning process. They then discuss timber harvesting in detail in terms of even-age and uneven-age silviculture and riparian area management.

Kennedy, RE, and WB Cohen. 2003. Automated designation of tie-points for image-to-image coregistration. *International Journal of Remote Sensing* 24: 3467–3490.

For remote sensing scientists. For image-to-image registration, common points in both images (image tie-points, or ITPs) must be identified. The authors designed and tested software that identifies ITPs by an automated, area-based technique. The software was robust to several confounding conditions. Higher levels of image geometric distortion adversely affected robustness. Over 1600 tests, approximately 8 seconds was required to identify each ITP. In spite of criticisms of correlation-based techniques such as this one, the authors feel that they may be useful in many situations.

Kramer, MG, P Sollins, RS Sletten, and PK Swart. 2003. N isotope fractionation and measures of organic matter alteration during decomposition. *Ecology* 84: 2021–2025.

For forest ecologists and those interested in nutrient cycling. Because soil organic matter (SOM) is diverse in its initial chemical composition and stable isotope values, changes that occur in SOM as it decays and is stabilized are hard to study. The authors used solid-state ^{13}C Cross Polarization Magic Angle Spin nuclear magnetic resonance to study stable isotope ratios with respect to SOM composition in organic and mineral horizon soil samples from an unpolluted ecosystem in southeast Alaska. Their results indicate

that humification of SOM and the stabilization of soil C was due to microbial changes of organic compounds, rather than to accumulation of recalcitrant compounds. On the basis of the strong relation they found between ^{15}N and SOM composition, they suggest that the degree of SOM humification may be associated with $\delta^{15}\text{N}$ values that are higher than those in fresh litter or other material.

Kratz, TK, LA Deegan, ME Harmon, and WK Lauenroth. 2003. Ecological variability in space and time: Insights gained from the US LTER program. *BioScience* 53: 57–67.

For forest ecologists and researchers. Research from the Long Term Ecological Research (LTER) Network provides answers to questions formerly unanswerable and increases our understanding of ecological phenomena. The authors present examples of this research ranging widely in spatial scale. Often long-term observations are necessary to discover important ecological relationships, as shown by the authors' examples and the LTER experience.

Kretzer, AM, DL Luoma, R Molina, and JW Spatafora. 2003. Taxonomy of the *Rhizopogon vinicolor* species complex based on analysis of ITS sequences and microsatellite. *Mycologia* 95: 480–487.

For mycological systematists and geneticists. The authors used sequence data from the internal-transcribed spacer region of the nuclear ribosomal repeat and genotypic data from five microsatellite loci to reevaluate species concepts in the *Rhizopogon vinicolor* species complex. Both types of analysis separated collections of this species complex into two distinct clades, suggesting that the five-member complex actually is two biological species.

Kumar, S, KJS Jayawickrama, J Lee, and M Lausberg. 2002. Direct and indirect measures of stiffness and strength show high heritability in a wind-pollinated radiate pine progeny test in New Zealand. *Silvae Genetica* 51: 256–261.

For silviculturists and forest researchers. The authors sampled 72 first-generation open-pollinated (OP) families grown in a 12-year-old radiate pine progeny test to evaluate the effectiveness of several destructive

and nondestructive measures of stiffness. By collecting indirect information, stiffness and strength on clearwood sticks, destructive information on felled trees, and surrogate (density) information such as diameter, branching cluster frequency, and straightness, they found that destructive and surrogate information were the best indirect traits for selection of stiffness and strength. Density appeared to be a better predictor of strength than of stiffness. Genetic gain from indirect selection of parents was 78–80% of that from direct selection. Narrow-sense heritability estimates and genetic correlations for properties and traits are provided.

Kurpius, MR, M McKay, and AH Goldstein. 2002. Annual ozone deposition to a Sierra Nevada ponderosa pine plantation. *Atmospheric Environment* 36: 4503–4515.

For atmospheric scientists and ecologists. The ozone concentration and ecosystem scale fluxes above a ponderosa pine plantation in northern California were measured continuously from June 1999 to June 2000. While maintaining some activity all year, the trees were most active during the summer. Cumulative ozone flux was 127 mmol/m² over the whole year. There were high levels of cumulative ozone deposition in non-summer seasons, indicating significant damage may occur during times when ozone concentrations are not at their highest. Ozone flux had a closer relation to ozone deposition velocity ($O_3 V_d$) than to ozone concentration. Controlling variables had a dynamic relationship to $O_3 V_d$ and changed mostly with water status and phenology. Ozone exposure metrics such as SUM0 were found to be poor predictors of ozone uptake if periods of ecosystem stress were not excited.

Kurpius, MR, and AH Goldstein. 2003. Gas-phase chemistry dominates O_3 loss to a forest, implying a source of aerosols and hydroxyl radicals to the atmosphere. *Geophysical Research Letters* 30: art. no. 1371.

For atmospheric scientists, ecologists, and forest scientists. The authors partitioned the total measured ecosystem daytime ozone (O_3) deposition to a ponderosa pine forest. The three major loss pathways are stomatal

uptake, non-stomatal surface deposition, and gas-phase chemistry. Total summer O_3 flux was mainly by gas-phase chemistry; during the winter, stomatal uptake was dominant. Gas-phase chemistry O_3 loss depended exponentially on temperature. Hydroxyl radical formation and secondary aerosol growth result from O_3 reacting with biogenically emitted hydrocarbons, with important implications for atmospheric chemistry and climate.

Kurpius, MR, JA Panek, NT Nikolov, M McKay, and AH Goldstein. 2003. Partitioning of water flux in a Sierra Nevada ponderosa pine plantation. *Agricultural and Forest Meteorology* 117 (3–4):173–192.

For tree physiologists. The cold, wet winters and hot, dry summers characteristic of the west side of the Sierra Nevada influence how ponderosa pine trees in the region partition water between transpiration and evaporation. The authors measured water fluxes continually in a young ponderosa pine ecosystem for 1 full year and modeled water fluxes at the site with a biophysical model, FORFLUX. In summer and fall, water fluxes were partitioned equally between transpiration and soil evaporation; in winter and spring, transpiration was dominant. In the dry season, canopy conductance and transpiration were high in early morning and mid- to late afternoon and depressed in midday. The authors suggest that the trees maximize stomatal conductance and carbon fixation throughout the day during warm, moist periods and in the morning in dry periods. Model estimates were close to measured/calculated values during the dry period but misestimated transpiration and evaporation during the wet period.

Laliberte, AS, and WJ Ripple. 2003. Automated wildlife counts from remotely sensed imagery. *Wildlife Society Bulletin* 31(2): 362–371.

For wildlife and conservation biologists. The authors assessed the accuracy of counting wildlife from remotely sensed images, using a public domain image-analysis program. They assessed aerial photos from hand-held cameras, images from mapping cameras, and a high-resolution (1 m) satellite image. Count error for the aerial photos ranged from 2.8 to 10.2%.

If spectral and area attributes were combined, single animals could be separated from groups of 2 or more. The test with the satellite image was satisfactory, and 61-cm-resolution satellite imagery also should be suitable. Using image analysis for counting wildlife is easy and reliable, saves time, and is less labor intensive than manual counts.

Landgren, C, R Fletcher, M Bondi, D Barney, and R Mahoney. 2003. *Growing Christmas Trees in the Pacific Northwest*. Pacific Northwest Extension Publication 6, Oregon State University, Corvallis.

For current and prospective Christmas tree producers in Oregon, Washington, and Idaho. The authors present a primer on growing Christmas trees in the Pacific Northwest. The potential Christmas tree grower must take many risks and opportunities into consideration. A tree farmer can be more successful if he or she knows the basic tasks required and follows through with them. A calendar organizes tasks by month. Production characteristics of common Christmas trees in the region are outlined. Common management and decision-making options are discussed, including laws the grower should be aware of.

Landsberg, JJ, RH Waring, and NC Coops. 2003. Performance of the forest productivity model 3-PG applied to a wide range of forest types. *Forest Ecology and Management* 172: 199–214.

For forest scientists, forest researchers, and forest managers The authors outlined the 3-PG model and described its calibration procedures. The model can fit a wide range of forest growth data sets from experimental and commercial plantings with useful accuracy. The authors tested the ability of the model to predict stand growth at sites representing three levels of severity that had not been fitted to the data. The 3-PG model can be used with confidence to predict growth in areas where trees have not been grown and to explore the effects of environmental conditions on tree growth and productivity.

Larsen, EJ, and WJ Ripple. 2003. Aspen age structure in the northern Yellowstone ecosystem: USA. *Forest Ecology and Management* 179: 469–482.

For plant ecologists. The authors compared aspen age structure for elk winter range in Yellowstone National park with age structure for winter range in two surrounding national forests. Ages were determined from increment cores taken from three diameter size classes and three habitat types. The age structure in Yellowstone differed significantly from that in either national forest; the national forest age structures were not different from each other. Since 1930, new overstory stems were recruited in stands in Yellowstone only in areas of reduced browsing pressure, whereas in the national forests new stems were recruited in all habitat types. The authors propose that the patterns observed are best explained by changes in elk browsing patterns resulting from difference in predation risk.

Law, BE, E Falge, L Gu, DD Baldocchi, P Bakwin, P Berbigier, K Davis, AJ Dolman, M Falk, JD Fuentes, A Goldstein, A Granier, A Grelle, D Hollinger, IA Janssens, P Jarvis, NO Jensen, G Katul, Y Mahli, Matteucci, T Meyers, R Monson, W Munger, W Oechel, R Olson, K Pilegaard, KT Paw, H Thorgeirsson, R Valentini, S Verman, T Vesala, K Wilson, and S Wofsy. 2002. Environmental controls over carbon dioxide and water vapor exchange of terrestrial vegetation. *Agricultural and Forest Meteorology* 113: 97–120.

For ecologists and forest researchers. This article examined a subset of FLUXNET sites. Net carbon uptake was larger under diffuse than under direct radiation. The slope of the relation between monthly gross ecosystem production and evapotranspiration was similar among biomes other than tundra. The ratio of annual ecosystem respiration to gross photosynthesis was about 0.83, with grasslands having lower values. Ecosystem respiration and mean annual temperature were weakly correlated across biomes. Mean annual temperature and site water balance explained much of the variation in gross photosynthesis. Leaf area index over the long-term is limited by water availability. Inter-annual climate changes can limit carbon uptake.

Law, BE, A Lindroth, T Meyers, J Moncrieff, R Monson, W Oechel, J Tenhunen, R Valentini, S Verma, T Vesala, and S Wofsy. 2002. Energy partitioning

between latent and sensible heat flux during the warm season at FLUXNET sites. *Water Resources Research* 38: art. no. 1294

For forest researchers, physiologists, and ecologists. The Bowen ratio [β (B) = sensible heat flux (H)/latent heat flux (LE)] during the warm season was investigated at 27 sites over 66 site-years within FLUXNET. Variability in flux partitioning characteristics was large, but some patterns were detectable. Deciduous forest sites and the agricultural site had the lowest surface resistance to water vapor transport (R_c) and B (0.25–0.50). Coniferous forests had a larger R_c and B (0.50–1.00 and larger), but R_c and climatological resistance (R_i) varied from year to year. Mediterranean climate sites usually had the highest net radiation, R_c , R_i , and B . Grasslands had the largest year-to-year variability, depending mostly on differences in soil water content and R_c .

Law, BE, OJ Sun, J Campbell, S Van Tuyl, and PE Thornton. 2003. Changes in carbon storage and fluxes in a chronosequence of ponderosa pine. *Global Change Biology* 9: 510–524.

For forest managers, ecologists, physiologists, and silviculturists. The authors estimated carbon storage in vegetation and soil pools, net primary productivity (NPP), and net ecosystem productivity (NEP) and examined variation in these ponderosa pine stands of different ages. NEP was lowest in stands in the initiation age class (9–23 years), followed by old (190–316 years), young (56–89 years), and mature (95–106 years) stands, in order. Similar trends were seen in NPP without as large a decline in the old stands. Total ecosystem carbon storage and the ratio of ecosystem carbon in aboveground wood mass increased up to 150–200 years. Forest inventory data indicate that a majority of stands are reaching maximum carbon storage and net carbon uptake.

Lefsky, MA, WB Cohen, DJ Harding, GG Parker, SA Acker, and ST Gower. 2002. Lidar remote sensing of above-ground biomass in three biomes. *Global Ecology and Biogeography* 11: 393–399.

For silviculturists, ecologists, and forest scientists. Remote sensing is expected to help in estimating carbon

stored in forests. Lidar-measured canopy structure and coincident field measurements of above-ground biomass are compared at sites in the temperate deciduous, temperate coniferous, and boreal coniferous biomes. Canopy height, canopy cover, and a variety of canopy-density-weighted heights were estimated. Mean canopy height followed the expected order, and nearly all the canopy structure indices were significantly correlated with above-ground biomass. The exception was canopy cover for temperate deciduous plots. The authors found that a single equation can be used to relate canopy structure to above-ground biomass with no statistically significant bias in predictions for any site.

Lloyd, J, O Shibistova, N Tchepakova, O Kolle, A Arneeth, D Zolotoukhine, JM Styles, and E-D Schulze. 2002. Seasonal and annual variations in the photosynthetic productivity and carbon balance of a central Siberian pine forest. *Tellus B* 54: 590–610.

For researchers in micrometeorology and plant-atmosphere exchange. Eddy covariance and auxiliary measurements were used to assess seasonal and annual carbon uptake in a Siberian pine forest. The forest was a small source of CO_2 during the snow season. Photosynthesis commenced as soon as the temperatures were above freezing, increasing slowly until August and declining markedly in September. The September decline may be part of the cold hardening process. Photosynthetic rate depended mostly on the incoming photon irradiance. In both 1999 and 2000 the forest was a CO_2 sink, at about 13 mol C/m²a. These data, along with estimates of net primary productivity, indicate the sink was associated 20% with increasing plant biomass and 80% with increase in the litter and soil organic carbon pools.

Lobell, DB, GP Asner, BE Law, and RN Treuhaft. 2002. View angle effects on canopy reflectance and spectral mixture analysis of coniferous forests using AVIRIS. *International Journal of Remote Sensing* 23: 2247–2262.

For landscape ecologists and remote sensing scientists. Vegetation reflectance depends on sun and sensor

geometry. Although this dependence can provide information about canopy properties, it can also lead to unmodeled systematic error in single-angle remote sensing. The authors investigated angular variability of reflectance measurement from the NASA Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) and how that variability impacts spectral mixture analysis (SMA). Reflectance measurements from AVIRIS can be significantly affected by view angle, but resulting variability in vegetation cover estimates appears to be low.

Loescher, HW, SF Oberbauer, HL Gholz, and DB Clark. 2003. Environmental controls on net ecosystem-level carbon exchange and productivity in a Central American tropical wet forest. *Global Change Biology* 9: 396–412.

For ecologists and atmospheric scientists. Net ecosystem exchange (NEE) of carbon was estimated from measurements made over 3 years from a 42-m tower in a tropical wet old-growth forest in Costa Rica with the eddy-covariance technique. There was no relationship between NEE and friction velocity (u^*) when all the 30-minute averages were used, but a nighttime linear relationship was found. Mean daytime NEE was $-18 \text{ } \mu\text{mol CO}_2/\text{m}^2\text{s}$; mean nighttime NEE was between 4.6 and $7.05 \text{ } \mu\text{mol CO}_2/\text{m}^2\text{s}$, depending on the method of analysis. Interannual differences in NEE were apparent, but not seasonal differences. Fifty-one percent of variation was due to irradiance and 20% to temperature and vapor pressure deficit together. Hourly nighttime NEE was weakly related to canopy air temperature. The forest was a small carbon source in 1998 and a moderate and strong sink in 1999 and 2000, respectively. The change seems to be due to the dissipation of warm-phase El Niño effects.

Luo, TX, RP Neilson, HQ Tian, CJ Vorosmarty, HZ Zhu, and SR Liu. 2002. A model for seasonality and distribution of leaf area index of forests and its application to China. *Journal of Vegetation Science* 13: 817–830.

For forest scientists, researchers, and ecologists. The authors constructed a phenological model of leaf area index (LAI) of forests, based on biological principles of leaf growth. Even when maximum LAI was >6 ,

the model predicted maximum LAI satisfactorily. This may solve the saturation problem in satellite detection of high forest LAI where the relationship between NDVI and LAI reaches an asymptote near a projected LAI value of 5 or 6. Patterns were usually consistent with satellite NDVI changes. The only exception was monsoon and rain forests in south China, where satellite detection is extremely difficult. The authors' maximum LAI values were generally consistent with global literature data, and they believe that forest LAI in China is most often >6 .

Luoma, DL, JM Trappe, AW Claridge, KM Jacobs, and E Cazares. 2003. Relationships among fungi and small mammals in forested ecosystems, pp. 343–373 in *Mammal Community Dynamics: Management and Conservation in the Coniferous Forests of Western North America*, CJ Zabel and RG Anthony, eds. Cambridge University Press, NY.

For ecologists, mycologists, and small mammal biologists. Fungal fruitbodies, especially those of ectomycorrhizal fungi, are an important food source for small mammals. Drawing on information from western North America and from Australia, the authors present historical reports of mycophagy, discuss web-of-life relationships and mycophagy, present case studies, and draw parallels between the northern and southern hemisphere. The nutritional value of hypogeous sporocarps is discussed. Effects of disturbance on small mammal mycophagy are treated in some detail, and the authors suggest directions for future research.

Manning, T, CC Maguire, KM Jacobs, and DL Luoma. 2003. Additional habitat, diet and range information for the white-footed vole (*Arborimus albipes*). *American Midland Naturalist* 150(1): 115–122.

For wildlife biologists and forest managers. Thirteen white-footed voles were captured in the southern Cascade Range of Western Oregon, which is a range extension for the species. Vole encounters were correlated more strongly with basal area of red alder and percent cover of hazel than with distance to water. Analysis of fecal samples documented that the voles were eating hazel pollen from unopened catkins and also gave the first record of mycophagy from the

species. The association with hazel supports previous suggestions that the voles are semi-arboreal.

Marshall, H, and G Murphy. 2003. Factors affecting the accuracy of weighbridge systems. *International Journal of Forest Engineering* 14: 67–79.

For logging operations managers and log scalers. Because decreasing log size is making individual scaling of logs both time-consuming and expensive, truck scaling, including the use of weighbridges, is becoming increasingly popular. The authors used interviews with weighbridge operators, suppliers, and New Zealand government weights and measures staff and experiments on a small set of weighbridges to identify and, when possible, quantify the most important factors affecting weighbridge accuracy. Variation arises from mechanical, environmental, truck, human, and system-related factors. The combined sources of variation could be as much as 4% of payload weight.

Martin, KJ, and BC McComb. 2003. Amphibian habitat associations at patch and landscape scales in the central Oregon Coast Range. *Journal of Wildlife Management* 64: 672–683.

For ecologists and wildlife biologists. The authors wanted to clarify multiscale habitat associations with respect to amphibians. They compared capture rates of 5 species (26–79 captures) in 7 vegetation patch types and 4 species in 11 patch types to expected capture rates. In 8 species, capture rates were higher in conifer and mixed large sawtimber than in other patch types. Percent area of these patch types was associated with capture rates of 5 species and pattern metrics, with capture rates of 4 species. Because most species were associated with unique habitats, managing across species would be difficult. Amphibian abundance and distribution seem to be strongly associated with mature forest area, patch richness, pattern, and composition.

Martin, KJ, NJ Ritchie, and DD Myrold. 2003. Nodulation potential of soils from red alder stands covering a wide age range. *Plant and Soil* 254: 187–192.

For researchers in symbiotic nitrogen fixation. Populations of *Frankia* in soils from red alder stands in the

Oregon Coast Range were studied using a plant bioassay. Variations in *Frankia* populations were found but did not correlate strongly with any site or soil characteristics except soil nitrate concentration.

McDowell, NG, JR Brooks, S Fitzgerald, and BJ Bond. 2003. Carbon isotope discrimination and growth response of old *Pinus ponderosa* trees to stand density reductions. *Plant, Cell and Environment* 26: 631–644.

For researchers in forest science and forest managers. To find out whether old-growth ponderosa pine trees can respond to thinning, the authors compared ring width and carbon isotopes in annual rings of old-growth and control trees. Carbon isotope discrimination (Δ) increased by 0.89% by the sixth year after thinning. The unthinned trees had no change in Δ . Basal Area Increment (BAI) doubled or tripled after thinning, peaking 1 year after Δ peaked. Stomatal conductance (g_s) increased by 25% and photosynthesis increased by 15%. Pre-dawn leaf water potential was on average 0.11 MPa less negative in the thinned stands. The results suggest that water availability and g_s affect significantly the carbon assimilation and growth of old trees.

McDowell, NG, N Phillips, C Lunch, BJ Bond, and MG Ryan. 2002. An investigation of hydraulic limitation and compensation in large, old Douglas-fir trees. *Tree Physiology* 22: 763–774.

For tree physiologists. The authors compared Douglas-fir trees in stands grouped by height and approximate age to test the hydraulic limitation hypothesis. As tree height decreased, so did carbon isotope discrimination (Δ). Hydraulic conductance decreased as height increased, especially from 15 m to 32 m. Photosynthesis (A) and stomatal conductance (g_s) did not decrease with height during summer drought, but hydraulic conductance (k_l) and growth efficiency did decrease. There may be temporal changes in the response of gas exchange to height-related changes in k_l , as indicated by the differences between the trend in g_s and A and that in k_l and D . They also could be the result of measurement inadequacies. Sensitivity analyses showed that k_l would have been reduced by

over 70% in 60-m trees compared with the 15-m trees, but the actual decrease was 44%.

- McGraw, R, N Duncan, and E Cazares. 2002. Dietary components of the blue-gray tailedropper slug (*Prophysaon coeruleum*) and the papillose tailedropper slug (*Prophysaon dubium*) based on fecal analysis. *The Veliger* 45: 261–264.

For forestland managers, ecologists, and malacologists.

The blue-gray tailedropper (*Prophysaon coeruleum*) and the papillose tailedropper (*P. dubium*) are listed as Survey and Manage species in the Northwest Forest Plan, in part because little is known about their natural history and ecology. Field observations of the two species suggested that they are mycophagous. Examination of their fecal pellets showed that both species consume mushrooms and truffles, roots and other vascular plant tissue, lichens, and imperfect fungi. Fungi were the most common items found in samples from both species. Most of the fungal spores were from hypogeous mycorrhizal taxa. Root tissue may have been consumed incidentally to feeding on fungal hyphae. Slugs may be important vectors of fungal spores and hyphae in the forest.

- Meinzer, FC, SA James, G Goldstein, and D Woodruff. 2003. Whole-tree water transport scales with sapwood capacities in tropical forest canopy trees. *Plant, Cell and Environment* 26: 1147–1155.

For tree physiologists and tropical forest scientists. Sapwood capacitance was calculated for four tropical forest canopy trees representing a range of wood density, tree size, architecture, and taxonomy and used to scale whole-tree water transport properties. Capacitance was strongly correlated with minimum branch water potential, soil-to-branch hydraulic conductance, daily utilization of stored water, and axial and radial movement of deuterated water used as a tracer. Several of the transport properties scaled with sapwood capacitance in a species-independent manner, indicating that this simple variable related to a property of water transport tissue could reveal convergence in plant function at several levels of biological organization.

- Miller, DA, EB Arnett, and MJ Lacki. 2003. Habitat management for forest-roosting bats of North

America: A critical review of habitat studies. *Wildlife Society Bulletin* 31: 30–44.

For conservation biologists, natural resource managers, and wildlife biologists. Land managers often are asked to consider habitat needs of bats in their planning. The authors reviewed peer-reviewed manuscripts appearing from 1960 through 2001. They found that data about bat habitat were limited in many aspects. They make several recommendations for improving the quality of studies on bat habitat and suggest the development of cooperative research efforts.

- Mintie, AT, RS Heichen, K Cromack, Jr, DD Myrold, and PJ Bottomley. 2003. Ammonia-oxidizing bacteria along meadow-to-forest transects in the Oregon Cascade mountains. *Applied and Environmental Microbiology* 69: 3129–3136.

For researchers in soil microbial ecology. This study combines classic measures of nitrification potential and modern molecular approaches to studying the composition of the ammonia oxidizer community in soils. Although nitrification activities in soils from adjacent meadows and forests at the HJ Andrews Experimental Forest were markedly different, the composition of the ammonia-oxidizing communities was fairly similar. All ammonia oxidizers were members of the Nitrospira. Novel strains were isolated in pure culture.

- Myrold, DD, and K Huss-Danell. 2003. Alder and lupine enhance nitrogen cycling in a degraded forest soil in northern Sweden. *Plant and Soil* 254: 47–56.

For researchers in symbiotic nitrogen fixation. Natural variations in $\delta^{15}\text{N}$ were used to evaluate the inputs of N from N_2 -fixation from alders and lupines planted on a depauperate site in northern Sweden. The presence of N_2 -fixing plants increases measures of soil nitrogen availability.

- Neilson, RP. 2003. The importance of precipitation seasonality in controlling vegetation distribution, pp. 47–71 in *Changing Precipitation Regimes and Terrestrial Ecosystems*, JF Weltzin and GR McPherson, eds. University of Arizona Press, Tucson.

For plant ecologists and biogeographers. After summarizing the broad patterns of climate and vegetation distribution in North America, the author develops and examines hypotheses about the importance of precipitation seasonality in controlling the distribution of vegetation, using several regions of the conterminous United States as case studies. He examines scenarios of climate of vegetation change and discusses current uncertainties and future directions.

- Nouhra, E, MA Castellano, and JM Trappe. 2002. NATS Truffle and truffle-like fungi 9: *Gastroboletus molinai* sp. nov. (Boletaceae, Basidiomycota), with a revised key to the species of *Gastroboletus*. *Mycotaxon* 83: 409–414.

For researchers in forest fungus taxonomy and ecology. The fungal genus *Gastroboletus* is more abundant in Oregon and California than anywhere else in the world. This new species, named in honor of its collector, Dr. Randy Molina, is another restricted to those states. As mycorrhizal fungi derived from the mushroom genus *Boletus*, they are particularly interesting in what they reveal about evolution of fleshy fungi.

- O'Connell, KEB, ST Gower, and JM Norman. 2003. Comparison of net primary production and light-use dynamics of two boreal black spruce forest communities. *Ecosystems* 6: 236–247.

For ecologists and forest scientists. The authors compared net primary production (NPP) and light-use efficiency (LUE) of two black spruce communities: open-canopy overstory with sphagnum ground cover (BSSP) and closed-canopy overstory with feathermoss ground cover (BSFM). They also quantified the contribution of vegetation layers to total NPP and LUE in a mature black spruce stand in Saskatchewan, Canada. Total NPP and ecosystem LUE were significantly greater in the BSFM community. The communities differed in the contribution of the vegetation layers to NPP and LUE. The authors conclude that (1) accurate estimation of NPP and LUE in boreal black spruce ecosystems requires measurement of all vegetation components and (2) the accuracy of LUE models is increased by community specific LUE coefficients.

- O'Connell, KEB, ST Gower, and JM Norman. 2003. Net ecosystem production of two contrasting boreal black spruce forest communities. *Ecosystems* 6: 248–260.

For ecologists and forest scientists. The carbon (C) budget of a closed-canopy black spruce forest with feathermoss ground cover (BSFM) on moderately drained soils was contrasted with that of a similarly aged open-canopy black spruce forest with sphagnum ground cover (BSSP) on poorly drained soils. Total C content did not differ significantly, and both forests were C sources to the atmosphere. Annual heterotrophic respiration and flux were greater and net ecosystem production was more negative in the BSFM forest. A lower decomposition rate was indicated in the BSSP forest. Small differences in edaphic conditions apparently influence ecosystem C accumulation.

- Parmenter, AW, A Hansen, RE Kennedy, W Cohen, U Langner, and R Lawrence. 2003. Land use and land cover change in the Greater Yellowstone Ecosystem: 1975–1995. *Ecological Applications* 13: 687–703.

For forest ecosystem modelers, ecologists, wildlife biologists, and forest scientists. The authors quantified the trajectories and rates of change in land cover and use across the Greater Yellowstone Ecosystem from 1975 to 1995. Spectral and geographic variables were used in classification tree regression analysis (CART) to form functions that created maps using data from 1995, 1985, and 1975. The greatest changes among the maps were increases in burned, urban, and mixed conifer-herbaceous classes and decreases in woody deciduous, mixed woody deciduous-herbaceous, and conifer habitats. The most variance in the use and cover classes was explained by elevation and vegetative indices derived from the satellite imagery. Accuracy ranged from 94% at the coarsest level of detail to 74% at the finest. The expansion of mixed conifer classes may increase fire risk to rural homes. Plant and animal species that specialize on woody deciduous habitat are probably adversely affected by reduction in this habitat, as well as by the increase in rural homes.

- Phillips, N, BJ Bond, NG McDowell, MG Ryan, and A Schauer. 2003. Leaf area compounds height-related hydraulic costs of water transport in Oregon white oak trees. *Functional Ecology* 17: 832–840.

For tree physiologists and silviculturists. In contrast to most tree species, the leaf to sapwood area ratio in Oregon white oak (*Quercus garryana*) increases with tree size. The authors investigated whether leaf-specific hydraulic conductance, crown water flux per leaf area, and carbon isotope discrimination were reduced in larger white oak trees with greater leaf area. Water flux and carbon isotopic discrimination were lower in 25-m trees than in 10-m trees. The results extend and support the hypothesis that tree-water flux is hydraulically limited and show that these limitations may not be reflected by reduced crown leaf area in larger trees.

- Phillips, NG, MG Ryan, BJ Bond, NG McDowell, TM Hinckley, and J Čermák. 2003. Reliance on stored water increases with tree size in three species in the Pacific Northwest. *Tree Physiology* 23: 237–245.

For tree physiologists. The amount of water used in daily transpiration that comes from storage (“capacitance”) versus soil was measured in small and large trees of three species (Douglas-fir, Oregon white oak, and ponderosa pine). In all species, more water was stored and used in the larger trees. Utilization of stored water may help offset hydraulic limitations resulting from large size. The authors conclude that water storage is significant in the water and carbon economy of tall trees and old forests.

- Pilz, D, L Norvell, E Danell, and R Molina. 2003. *Ecology and Management of Commercially Harvested Chanterelle Mushrooms*. General Technical Report PNW-GTR-576, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For forest managers, policymakers, mushroom harvesters, mushroom enthusiasts, and research mycologists. This synthesis publication discusses chanterelle genera and species around the world, their international markets, our current understanding of the organisms, reasons for declining production in parts of Europe, and efforts to cultivate them. Focusing on Pacific

Northwest chanterelles, the booklet describes our local species, regional forest management issues, recent studies, and future research and monitoring needed to sustain this prized resource.

- Poage, NJ, and JC Tappeiner. 2002. Long-term patterns of diameter and basal area growth of old-growth Douglas-fir trees in western Oregon. *Canadian Journal of Forest Research* 32: 1232–1243.

For silviculturists and forest scientists. This study of 505 recently cut old-growth trees at 28 locations in western Oregon indicates that rapid early and sustained growth of old Douglas-fir trees is extremely important to the attainment of large diameters at 100–300 years. Diameters of trees at the cut age had a strong, positive linear relationship to their diameters and basal area growth rates at age 50 years. The average periodic basal area increments were significantly greater in the large trees when young and remained higher than those of the small trees. Site factors and establishment class had little influence on tree growth, supporting the hypothesis that large-diameter old-growth Douglas-fir developed at low stand densities.

- Pruyn, ML, ME Harmon, and BL Gartner. 2003. Stem respiratory potential in six softwood and four hardwood tree species in the central Cascades of Oregon. *Oecologia* 137: 10–21.

For tree physiologists and forest scientists. Tissue-level respiration (respiratory potential) of mature and old-growth trees of 10 species having different sapwood thickness was measured by an increment-core-based method under controlled temperature in the laboratory. Measurements of bark (dead and live), sapwood, and heartwood thickness were used to predict sapwood volume from stem diameter for four of the species. Respiratory potential was scaled to the main-bole level by using these predictions. Core measurement showed that sapwood respiratory potentials in the lower bole were 50% higher in species with narrow sapwood than in those with wide sapwood. This was not the case for inner bark or within-crown sapwood respiratory potential. Species with about 20% of the main bole alive had potential respiration up to 3X greater than species having >40% alive. The authors

suggest that the live bole is less metabolically active in species having large volumes of sapwood.

- Puettmann, KJ, and AW D'Amato. 2002. Selecting plot sizes when quantifying growing conditions in understories. *Northern Journal of Applied Forestry* 19: 137–140.

For silviculturists, forest researchers, and ecologists. Plot sizes are important when the influence of overstory trees on growing conditions of understory seedlings is measured. Using different plot sizes, the authors measured overstory cover (using a “cone” approach) and basal area at four sites and related these measures to plot size. Diffuse noninterceptance had a greater range of values when the cone opening was smaller. Cone data and 2-year seedling height were related linearly. This correlation showed that the best plot size differs, depending on the site, although stand characteristics do not obviously explain these differences.

- Pypker, TG, and AL Fredeen. 2002. Ecosystem CO₂ flux over two growing seasons for a sub-boreal clearcut 5 and 6 years after harvest. *Agricultural and Forest Meteorology* 114: 15–30.

For ecologists and forest scientists. Two approaches, a Bowen ratio energy balance method and a component flux model, were used to measure ecosystem-level growing season CO₂ fluxes in a 6-year-old vegetated sub-boreal clearcut. Measurements were taken in 2000 from May 24 to Sep 20 and compared to measurements from 1999 from June 27 to Sep 3. Results indicated the clearcut was a source of CO₂ in 2000 and a sink in 1999. The clearcut had photosynthetic uptake was about equal in both years, but soil surface CO₂ efflux was higher in 2000. This young forest appeared to be a net source of CO₂.

- Pypker, TG, and AL Fredeen. 2003. Belowground CO₂ efflux from cut blocks of varying ages in sub-boreal British Columbia. *Forest Ecology and Management* 172: 249–259.

For forest managers, forest scientists, and ecologists. From May to October 2000, instantaneous measures of belowground CO₂, temperature, and moisture were taken in a mature stand and seven vegetated cut

blocks in sub-boreal forests of Central British Columbia. Blocks were from 0 to 10 years post-harvest. Instantaneous belowground CO₂ flux was lowest in spring and highest in summer. Cumulative flux was highest in the 2-year-old cut block, lowest in the 0-year-old cut block, and positively correlated with soil temperature and biomass present. A few sites had a significant relationship between soil moisture and instantaneous belowground CO₂ fluxes. Mean soil temperature was not a good predictor of cumulative belowground CO₂ flux between sites. Plant biomass, rather than soil temperature, soil moisture, or cut block age, appears to be the principal factor affecting belowground CO₂ flux in the study.

- Randerson, JT, FS Chapin, JW Harden, JC Neff, and ME Harmon. 2002. Net ecosystem production: A comprehensive measure of net carbon accumulation by ecosystems. *Ecological Applications* 12: 937–947.

For ecologists, biogeochemists, and planetary scientists. Net ecosystem production (NEP) is generally defined as the net carbon accumulation by ecosystems. The authors agree that all the carbon fluxes from an ecosystem, not just the balance between ecosystem respiration and gross primary production, must be considered in calculating NEP. Net biome productivity (NBP) is the same as NEP at regional or global scales. NEP estimates made at many scales can be compared directly by using the authors' conceptual framework.

- Rich, JJ, RS Heichen, PJ Bottomley, K Cromack, Jr, and DD Myrold. 2003. Community composition and functioning of denitrifying bacteria from adjacent meadow and forest soils. *Applied and Environmental Microbiology* 69: 5974–5982.

For soil ecologists, microbiologists, and community ecologists. Measuring denitrifying enzyme activity as a proxy for function and using nosZ as a marker for denitrifying bacteria, the authors examined spatial gradients and community composition, their relation to ecological properties, and phylogenetic relationships among denitrifiers in adjacent meadow and forest soils. The meadow and forest soils exhibited marked differences in functional and structural communities. There were 47 unique denitrifying genotypes. Community com-

position was influenced by process rates and vegetation types. Both composition of the denitrifying community and environmental factors may contribute to variability of denitrification rates.

- Ripple, WJ, and RL Beschta. 2003. Wolf reintroduction, predation risk, and cottonwood recovery in Yellowstone National Park. *Forest Ecology and Management* 184: 299–313.

For forest ecologists, forest managers, and wildlife and conservation biologists. Wolves were reintroduced into Yellowstone National Park (YNP) in the winter of 1995–1996 after an absence of about 70 years. The authors examined the potential influence of interaction between wolves and elk on growth of young riparian cottonwoods (*Populus* spp.) and associated woody plants in YNP. Comparing heights of woody plants in photographs taken before 1998 with heights in 2001–2002 photos, they found that height increased on six of the eight sites in the study area. They measured browsing intensity and cottonwood height on sites with relatively high and relatively low risk of predation by wolves. In general, browsing intensities were lower and plants were taller on sites where elk were at high risk of predation than they were where predation risk was relatively low. The study proves rare empirical evidence of the indirect effects of a top carnivore in a terrestrial food chain that supports theories on predation risk effects and top-down control. Reintroduction of wolves into YNP may help ensure the restoration of riparian species and preservation of biodiversity.

- Ronald, P, and SH Strauss. 2003. Moving the debate on genetically engineered crops forward. *American Society of Plant Biologists Newsletter* 30(3): pp. n.a.

For plant biologists, molecular geneticists, and agricultural technologists. The development of genetically engineered organisms (GEOs) in crop species has turned plant breeding into a very controversial area. Responding to an earlier Perspectives column in the *Newsletter*, the authors present arguments against seven “scientific myths” that they feel are impeding discussion and progress in research on and use of genetically engineered crops. They call on the Society to encourage evaluation of GEO crops or classes of

crops on a scientific basis so that GEOs can be used to improve sustainability in agricultural systems.

- Rothe, A, K Cromack, SC Resh, E Makineci, and Y Son. 2002. Soil carbon and nitrogen changes under Douglas-fir with and without red alder. *Soil Science Society of America Journal* 66: 1988–1995.

For ecologists, forest scientists, and silviculturists. To investigate the influence of red alder (RA) on carbon (C) and nitrogen (N) pools, the authors sampled three plots consisting of only Douglas-fir (DF) and three plots with a 25% RA/75% DF mix in 1980 and 1999. The experimental design allowed both home-series and spatial-series analysis. The N pool grew with an average accretion of 8.7 g/m²/year. Resin N mineralization in mixed plots was 10 times greater than in the pure DF plots. Foliar N concentration of DF was not influenced. In order to detect changes in the soil N pool, plot pairing was necessary and only large effects could be determined with statistical significance. Total soil N accretion in mixed plots was 28% greater than the minimum detectable difference after 19 years. Carbon differences, however, would not be detectable for another 30 years.

- Rothe, A, J Ewald, and DE Hibbs. 2003. Do admixed broadleaves improve foliar nutrient status of conifer tree crops? *Forest Ecology and Management* 172: 327–338.

For silviculturists, forest scientists, and ecologists. The authors looked at eight broadleaf and conifer mixed stands in Germany and Oregon to see if the nutritional status of the conifers would improve among the broadleaf trees. Needles from 20–30 trees at each site and needle mass, N, P, K, Ca, and Mg were analyzed. Measurements were compared based on the basal area of the deciduous trees within an 8-m circle of the measured tree. The conifers showed no improvement in foliar nutrition as a function of proximity to broadleaves, which agreed with other studies. Broadleaf admixtures apparently provide little nutritional benefit to admixed conifer.

- Schowalter, TD, and LM Ganio. 2003. Diel, seasonal and disturbance-induced variation in invertebrate

assemblages, pp. 315–328 in *Arthropods of Tropical Forests: Spatio-temporal Dynamics and Resource Use in the Canopy*, Y Basset, V Novotny, SE Miller, and RL Kitching, eds. Cambridge University Press, Cambridge, UK.

For invertebrate ecologists. The authors sampled canopy invertebrate assemblages and leaf area missing in representative early and late successional tree species. At the Luquillo Experimental Forest Long Term Ecological Research Programme site in Puerto Rico, they sampled during day and night, in wet and dry seasons, and in plots that had incurred light or severe hurricane damage. At the Fort Sherman canopy crane in Panama, they sampled during wet and dry seasons. Many species and functional groups differed in abundance among tree species, as expected, and leaf area missing varied significantly both seasonally and annually. Unexpectedly, diel and seasonal patterns of abundance did not show differences in any species. Predators and detritivores were more abundant during drought, and predators also increased after hurricanes. The authors discuss interaction among tree species, years, and various invertebrate species and functional groups.

Schowalter, TD, YL Zhang, and JJ Rykken. 2003. Litter invertebrate responses to variable density thinning in western Washington forest. *Ecological Applications* 13: 1204–1211.

For ecologists, silviculturists, and entomologists. Seven and eight years after variable density thinning of the Douglas-fir forest overstory, pitfall traps were placed in four thinned and four unthinned units in each of two sites having different management histories. Peak abundance for most species was in summer. Initial structure of the thinning treatment affected the way in which the invertebrates were affected. Only 2 of 29 taxa responded significantly to thinning. Three spider species were identified as potential indicators of thinning treatment. Species assemblages in treated units were significantly different from those in control units and from each other, but combined taxa and function group did not so differ. Previous management practices strongly influenced the effect of variable density thinning on litter invertebrates.

Schwarz, PA, TJ Fahey, and CE McCulloch. 2003. Factors controlling spatial variation of tree species abundance in a forested landscape. *Ecology* 84: 1862–1878.

For forest ecologists. The authors investigated whether biological factors, such as disturbance and competition, within a local neighborhood (neighborhood factors) might influence spatial patterns of tree species in forests. They measured tree abundance patterns and environmental and disturbance factors expected to regulate the patterns in the Hubbard Brook Experimental Forest in New Hampshire. Their models of environmental and disturbance effects explained 26–62% of variation in abundance among the seven tree species that contribute 90% of the total basal area in the Forest. The abundance patterns of six of the seven species suggested that factors other than environment and disturbance influence spatial patterns. The data were consistent with regulation by seed dispersal distance and root sprouting. The authors argue that neighborhood factors significantly influence patterns of tree species in forests.

Shatford, J, D Hibbs, and L Norris. 2003. Identifying plant communities resistant to conifer establishment along utility rights-of-way in Washington and Oregon, U.S. *Journal of Arboriculture* 29(3): 172–176.

For arboriculturists and utility planners. The authors sampled vegetation in 1376 plots in electrical rights of way at three sites to determine percent cover of all woody species and density of tree stems. Douglas-fir seedlings were not randomly distributed among community types. They also occurred less frequently in communities occupied by dense vegetation, including some low-growing communities, such as are desirable under utility lines.

Skinner, JS, R Meilan, CP Ma, and SH Strauss. 2003. The *Populus* PTD promoter imparts floral-predominant expression and enables high levels of floral-organ ablation in *Populus*, *Nicotiana* and *Arabidopsis*. *Molecular Breeding* 12: 119–132.

For molecular geneticists, biotechnologists, tree geneticists, and plant breeders. The *Populus* PTD gene was tested

for its ability to genetically engineer reproductive sterility. Using the promoter resulted in sterile plants with otherwise normal growth at high frequency in *Arabidopsis*, tobacco, and poplar. Test of biomass production in greenhouse-grown tobacco confirmed strong oral specificity of the promoter. Using this gene may allow transgene confinement without decreasing yield.

Smithwick, EAH, ME Harmon, SM Remillard, SA Acker, and JF Franklin. 2002. Potential upper bounds of carbon stores in forests of the Pacific Northwest. *Ecological Applications* 12: 1303–1317.

For forest researchers and forest ecologists. The authors put an upper bound (or limit) on carbon (C) storage in the Pacific Northwest (PNW) of the United States using field data from old-growth forests, which are near steady-state conditions. The upper bounds were higher than current estimates of C stores, presumably because of both natural and anthropogenic disturbances. This finding indicates a potentially substantial and economically significant role of C sequestration in the region. Coastal Oregon stands stored more C, on average, than stands in eastern Oregon and coastal Washington. Similarly, Oregon Cascades stands stored more, on average, than Washington Cascades stands. A maximum of 338 Mg C/ha (total ecosystem C₁₀₀) could be stored in PNW forests in addition to current stores.

Smithwick, EAH, ME Harmon, and JB Domingo. 2003. Modeling multiscale effects of light limitations and edge-induced mortality on carbon stores in forest landscapes. *Landscape Ecology* 18: 701–721.

For landscape ecologists and those interested in carbon cycles. Usually spatial interactions are not considered in analysis of carbon (C) dynamics at broad scales, the assumption being that C dynamics can be modeled within homogenous patches and then added to predict dynamics on a broad scale. The authors used a forest process model, light and wind processes, and artificial forest landscapes with spatial structures ranging from the patch to the landscape to check for possible emergent behaviors resulting from pattern-process inter-

action. Unexpectedly, emergent behaviors were found at all levels, rather than ending as one moved from the patch to the landscape level. Their magnitude depended on the level of spatial interaction and the type and intensity of the processes included in the simulation. They conclude that using an additive approach may not capture some C dynamics at broad scales in fragmented landscapes, although spatial interactions in some cases may be small enough to ignore.

Spears, JDH, SM Holub, ME Harmon, and K Lathja. 2003. The influence of decomposing logs on soil biology and nutrient cycling in an old-growth mixed coniferous forest in Oregon, U.S.A. *Canadian Journal of Forest Research* 33: 2193–2201.

For soil biologists, ecologists, silviculturists, and those interested in nutrient cycling. The authors compared nutrients in leachates of coarse woody debris (CWD) with leachates from the forest floor in the central Cascade Range in Oregon. They also compared CWD leachates over a decay chronosequence and among CWD of four species. They found few differences among CWD and forest floor leachates or among species and found no differences in nitrogen, phosphorus, microbial biomass, Biolog plate assays, or enzyme activity in soils. Differences were largest during the middle decay classes. Their results suggest that either CWD has no long-term effect and does not contribute much organic matter to the soil or its effect is so prolonged that no spatial effect can be detected.

Spies, TA, DE Hibbs, JL Ohmann, GH Reeves, RJ Pabst, FJ Swanson, C Whitlock, JA Jones, BC Wemple, LA Parendes, and BA Schrader. 2002. The ecological basis of forest ecosystem management in the Oregon Coast Range, pp. 31–67 in *Forest and Stream Management in the Oregon Coast Range*, SD Hobbs, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells, eds. Oregon State University Press, Corvallis.

For forest ecologists and forestland managers. The authors discuss twelve major ecological themes that they believe underlie ecologically based forest management in the Oregon Coast Range. The themes are grouped into three categories: ecosystem patterns and history, disturbance and vegetation development, and

landscape interactions. In concluding, they discuss how understanding natural processes can contribute to reaching ecosystem goals. Their aim is to help define the ecological constraints on the output of social and economic values in the Oregon Coast Range.

Strauss, SH. 2003. Genetic technologies: Genomics, genetic engineering, and domestication of crops. *Science* 300: 61–62.

For plant geneticists, forest scientists, policy makers, and researchers. Genomics allows use of recombinant DNA techniques to domesticate crops in ways similar to conventional breeding. Genomics-guided transgenes will be based increasingly on nature or homologous genes from related species, rather than on exogenous genes. The future seems to hold great promise for genomics-guided transgene modifications in agriculture. The process needs to be tried in the field, but regulations are becoming increasingly strict in many parts of the world. This impedes the delivery of benefits from the genomics revolution to the public. The author proposes some ways to facilitate field testing.

Strauss, SH. 2003. Democratization is more than lower prices—Response. *Science* 301: 167–167.

Strauss, SH. 2003. Risks of genetically engineered crops—Response. *Science* 301: 1846–1847.

For scientists and policymakers interested in genetic engineering of crops. The author responds to two letters written to *Science* commenting on his contribution to the journal's Policy Forum (*Science* 300: 61–62) about regulation of genetically engineered crops.

Strauss, SH. 2003. Regulating biotechnology as though gene function mattered. *BioScience* 53: 453–454.

For geneticists, genetic engineers, and ecologists. Evaluation of genetically engineered crops on a per-crop basis is costly to society. The author discusses an article by Jim Hancock in the same issue of *BioScience*, proposing that some crops should be exempted from requirements for most kinds of environmental studies. Hancock sorts transgenic crops into biologically rational groups, recognizing some genes that

should be highly restricted or forbidden and some that are quite safe. Breeders are important in providing species variation, and genetic engineers must work extremely hard to move agronomic traits further than breeders can. Tree breeders know that natural selection provides a safeguard for undesirable traits. Gene flow matters, but the challenge is to decide how little gene flow is little enough.

Stuart-Smith, AK, and JP Hayes. 2003. Influence of residual tree density on nest predation of artificial and natural songbird nests. *Forest Ecology and Management* 183: 159–176.

For forest managers and ecologists. Nest success and nest predation were measured in natural and artificial nests in burned and unburned stands varying in residual tree density in British Columbia. In one year of the 2-year study, predation increased slightly in the logged stands. There was no increased predation in the burned stands. Overall, nest predation was not related to residual tree density, suggesting that management practices that retain trees after timber harvest do not create “ecological traps” for songbirds.

Styles, JM, J Lloyd, D Zolotoukhine, KA Lawton, N Tchebakova, RJ Francey, A Arneeth, D Salamakho, O Kolle, and E-D Schulze. 2002. Estimates of regional surface carbon dioxide exchange and carbon and oxygen isotope discrimination during photosynthesis from concentration profiles in the atmospheric boundary layer. *Tellus B* 54: 768–783.

For researchers in boundary layer meteorology and plant-atmosphere exchange. An atmospheric boundary layer budget was used to infer regional surface fluxes of CO₂ and isotopic discrimination from aircraft concentration profiles. The two methods agreed within 10%. When corrected for air loss out of the integrating column, the methods agreed within 35% of each other. ¹³C values for discrimination complied with the expected range, but ¹⁸O values for discrimination varied considerably.

Styles, JM, MR Raupach, GD Farquhar, O Kolle, KA Lawton, WA Brand, RA Werner, A Jordan, E-D Schulze, O Shibistova, and J Lloyd. 2002. Soil and canopy CO₂, ¹³CO₂, H₂O and sensible heat

flux partitions in a forest canopy inferred from concentration measurements. *Tellus B* 54: 655–676.

For researchers in micrometeorology and plant-atmosphere exchange. A multi-layer canopy model coupled to a Lagrangian transport model was applied to a coniferous forest in Siberia. Concentration profiles within the canopy were assimilated and parameters within the canopy model were optimized in order to infer the source distribution within the canopy of CO₂, water vapor, heat, and carbon and oxygen isotopes of CO₂. Low temperatures that occur during snow melt caused depressed stomatal conductance and maximum photosynthetic capacity. Radiation penetrated further because of leaf clumping and penumbra, contrary to theoretical predictions. Important stability effects were seen in the morning and the evening. Limits to the inversion were little vertical structure in the concentration profiles and codependence of canopy parameters.

Suzuki, N, and JP Hayes. 2003. Effects of thinning on small mammals in Oregon coastal forests. *Journal of Wildlife Management* 67(2): 352–371.

For ecologists and forest managers. The authors looked at the poorly understood effects of thinning densely stocked Douglas-fir forests of the Pacific Northwest on forest-floor small mammals. Two pitfall-trapping studies were conducted in the Oregon Coast Range. The experimental study, which dealt with stands for the first 2 years after thinning, found captures increased for 4 of 12 species examined and decreased for 1. The retrospective study, which dealt with previously thinned (7–24 years before the study) and unthinned stands, looked at 9 species and found captures increased for 5 and decreased for none in thinned stands, compared with unthinned stands. More small mammals were captured in total in the previously thinned stands. Thinning had no significant negative effects on the species examined, and several species were positively affected by thinning.

Swanston, CW, BA Caldwell, PS Homann, L Ganio, and P Sollins. 2002. Carbon dynamics during a long-term incubation of separate and recombined density fractions from seven forest soils. *Soil Biology and Biochemistry* 34: 1121–1130.

For forest scientists and ecologists. The authors determined soil respiration and shifts in microbial biomass in light fractions (LF), heavy fractions (HF), whole soils (WS), and physically recombined light and heavy fractions (RF) of mineral soils from forests in Washington and Oregon. The summed fraction (SF) was calculated from the incubation results of LF and HF. Carbon (C) concentration had the pattern LF>RF>HF. Cumulative respiration of physical fractions showed the same pattern when considered per gram of substrate, but LF values per gram of initial C were not different from those of HF. Recalcitrance of HF may be similar to that of LF. Respiration of the SF was not different from that of the WS, whether expressed per gram of substrate or per gram of initial C. The HF accounted for 35% of the total respiration within the SF. Lower respiration in the RF, compared with the WS and the SF, may be due to an antagonistic interaction between different microbial communities that degrade LF and HF and alteration of normal spatial relations of the fractions in the laboratory. The density-separation technique seems to isolate soil organic matter fractions effectively.

Tappeiner, JC, II, WH Emmingham, and DE Hibbs. Silviculture of Oregon of Oregon Coast Range Forests, pp. 172–190 in *Forest and Stream Management in the Oregon Coast Range*, SD Hobbs, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells, eds. Oregon State University Press, Corvallis.

For silviculturists and forestland managers. Silviculture includes reforestation after disturbances and thinning stands in order to increase diversity or vigor, with the objectives of producing wood, growing large trees, and enhancing habitat for plant and animals, often simultaneously. Putting silvicultural principles into practice requires much site-specific evaluation. The authors review the biological and ecological basis of practical silviculture in the Oregon Coast Range and discuss how silviculture can be used to ensure regeneration after major disturbances, to manage forest for wood products and other values, to develop structural complexity, and to manage riparian zones. They also treat the silviculture of alder and cottonwood plantations.

Tchebakova, NM, O Kolle, D Zolotoukhine, A Ar-neth, JM Styles, NN Vygodskaya, E-D Schulze, O Shibistova, and J Lloyd. 2002. Inter-annual and seasonal variations of energy and water vapour fluxes above a *Pinus sylvestris* forest in the Siberian middle taiga. *Tellus B* 54: 537–551.

For researchers in micrometeorology and plant-atmosphere exchange. Seasonal and annual fluxes of water vapour and energy in a Siberian pine forest were assessed from 1998 to 2000. Surface energy exchange characteristics were distinctly seasonal. In the early spring, 80% of the net radiation was partitioned for sensible heat. When photosynthesis began, evaporation rates increased and Bowen ratios (β) decreased. During the summer, sensible heat fluxes usually exceeded latent heat fluxes, keeping β above 2. Daily evaporation was, on average, 1.25 mm/d, and precipitation was 230 mm for the growing period. Only about 35% of the equilibrium evaporation rate was represented. Usually there was a positive hydro-logical balance of 40 mm, but evaporation always exceeded precipitation by 20–40 mm in at least one calendar month during the summer. Growing season surface conductances of dry or cool months varied between 0.15 and 0.20 mol/m²s and 0.30 and 0.35 mol/m²s in moist and warm months.

Thornton, PE, BE Law, HL Gholz, KL Clark, E Falge, DS Ellsworth, AH Golstein, RK Monson, D Hollinger, M Falk, J Chen, and JP Sparks. 2002. Modeling and measuring the effects of disturbance history and climate on carbon and water budgets in evergreen needleleaf forests. *Agricultural and Forest Meteorology* 113: 185–222.

For ecologists and forest scientists. The authors evaluated the effects of disturbance history, climate, and changes in atmospheric carbon dioxide (CO₂) concentration and nitrogen deposition (N-dep) on carbon and water fluxes in seven North American evergreen forests. As modeled by the ecosystem process model Biome-BGC, net ecosystem carbon exchange (NEE) is mostly a function of disturbance history and is also affected by site climate, vegetation ecophysiology, and changing atmospheric CO₂ and N-dep. Fluxes after a disturbance can vary greatly in size and timing. The modeled effects of increasing atmospher-

ic CO₂ on NEE are usually limited by N availability. Rates of carbon sequestration over the past 200 years were a function of the rate of change in CO₂ concentration for old sites with low rates of N-dep. The model was effective at estimating between-site variation in leaf area index, but not as effective with variation of evapotranspiration between- and within-site. The model does have some biases.

Trappe, JM, L Dominguez, M Castellano, E Cazares, T Lebel, and AW Claridge. 2002. Hypogeous fungi and the Gondwanan connection. *Inoculum* 53(3): 56.

For researchers in forest fungus taxonomy and ecology. Field and laboratory research on truffle-like fungi in the Southern Hemisphere shows strong relationships between families and genera of Australia, New Zealand, and South America. The authors hypothesize that many of these fungi evolved when those land masses were part of the supercontinent Gondwana, before separation by continental drift.

Trappe, JM, and AW Claridge. 2003. Australasian sequestrate (truffle-like) fungi. 15. New species from tree line in the Australian Alps. *Australasian Mycologist* 22: 27–38.

For mycologists. Eighteen species of hypogeous fungi were found at tree lines in the Australian Alps. Six of these were new and are described in this paper. They are all probably in ectomycorrhizal association with *Eucalyptus niphophila*, the dominant tree species in the area. Five of the six are known from lower elevations.

Treuhaft, RN, GP Asner, BE Law, and S Van Tuyl. 2002. Forest leaf area density profiles from the quantitative fusion of radar and hyperspectral data. *Journal of Geophysical Research—Atmospheres* 107: art. no. 4568.

For ecosystem modelers and ecologists. The authors combined data from NASA Airborne Synthetic Aperture Radar (AIRSAR) and NASA Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) for three forest plots in Central Oregon. Leaf area density (LAD) was extracted from the radar and hyperspectral data that were gathered. LAD data were represented as a function of height. The remotely

sensed data were compared with field measurements and checked for accuracy. The two types of data were usually within $0.02 \text{ m}^2/\text{m}^3$ and always within the 1–2 standard error range. With further development in processes and models, LAD effectiveness will improve.

Treuhaft, RN, GP Asner, and BE Law. 2003. Structure-based forest biomass from fusion of radar and hyperspectral observations. *Geophysical Research Letters* 30: art. no. 1472.

For ecologists and forest scientists. Remotely sensed profiles of canopy leaf area density were used to estimate forest biomass of 11 structurally diverse stands in Central Oregon. The field and remotely sensed measurements of biomass were in agreement, yielding a level of 25 tons/ha, 16% of the average stand biomass, which was significant with >99.5% confidence. This opens up the possibility of a set of model functions that will enable global, structure-based biomass remote sensing.

Turner DP, ST Gower, M Gregory, and TK Maier-sperger. 2002. Effects of spatial variability in light use efficiency on satellite-based NPP monitoring. *Remote Sensing of Environment* 80: 397–405.

For ecologists and remote sensing scientists. Light use efficiency (LUE) algorithms, which potentially can be used to monitor global net primary production (NPP) using satellite-borne sensors, may introduce error because they are applied at coarse spatial resolution that may subsume significant heterogeneity in vegetation LUE. The authors examine the effects of spatial heterogeneity on an LUE algorithm over a 25-km^2 area of corn and soybean. Their results suggest several approaches to account for land cover heterogeneity when LUE algorithms are implemented at coarse resolution.

Turner, DP, M Guzy, MA Lefsky, S VanTuyl, O Sun, C Daly, and BE Law. 2003. Effects of land use and fine scale environmental heterogeneity on net ecosystem production over a temperate coniferous forest landscape. *Tellus B* 55: 657–668.

For ecologists and carbon cycle modelers. The authors present an approach to mapping net ecosystem pro-

duction (NEP) at the landscape scale, using remote sensing, ground measurements, and ecosystem modeling. Most areas in the study were carbon sinks, with an average annual NEP for the study area of $230 \text{ g C}/\text{m}^2$. The NEP was strongly positive because harvesting in the area had been reduced over a decade. Interannually, NEP varied by a factor of two, 38% less than for a single point.

Turner, DP, WD Ritts, WB Cohen, ST Gower, MS Zhao, SW Running, SC Wofsy, S Urbanski, AL Dunn, and JW Munger. 2003. Scaling gross primary production (GPP) over boreal and deciduous forest landscapes in support of MODIS GPP product validation. *Remote Sensing of Environment* 88: 256–270.

For landscape ecologists, silviculturists, and those interested in remote sensing. The 2001 gross primary production (GPP) product of the Moderate Resolution Imaging Radiometer (used by the NASA Earth Observing System to monitor seasonality of terrestrial vegetation) was compared with scaled GPP estimates from ground measurements at two forested sites. The GPP phenology from MODIS started earlier at the hardwood forest site than the scaled GPP indicated, and the MODIS summertime GPP was generally lower than the scaled values. The phenologies generally agreed at the boreal forest site, but the midsummer MODIS GPP was generally higher than the ground-based values. Ground-based GPP scaling could improve the parameterization of light-use efficiency in satellite-based algorithms for monitoring GPP.

Turner, DP, S Urbanski, D Bremer, SC Wofsy, T Meyers, ST Gower, and M Gregory. 2003. A cross-biome comparison of light use efficiency for gross primary production. *Global Change Biology* 9: 383–395.

For ecologists. The authors describe differences among four biomes in maximum light use efficiency (LUE) and in environmental controls on LUE. All the sites had a hyperbolic relationship of gross primary production (GPP) and absorbed photosynthetically active radiation (APAR) except the tallgrass prairie, which was linear. The agricultural field had higher values of light use efficiency (ϵ_g) than the boreal for-

est. Higher APAR was associated with lower ϵ_g . Maximum daily temperature and vapor pressure deficit did not correlate well with ϵ_g . Decline in ϵ_g was detected at the end of the growing season at the agricultural site and in August during a soil drought at the tall-grass prairie.

Turner, MG, SL Collins, AE Lugo, JJ Magnuson, TS Rupp, and FJ Swanson. 2003. Disturbance dynamics and ecological response: The contribution of long-term ecological research. *Bioscience* 53: 46–56.

For ecologists and those interested in disturbance dynamics. To illustrate the importance of long-term ecological research in understanding disturbance dynamics, the authors present three case studies from Long Term Ecological Research (LTER) network sites: a temperate lake invaded by exotic species, a tropical forest hit by a hurricane, and a fire-influenced temperate grassland. The LTER network encompasses ecosystems affected by a wide range of disturbances, allows measurement of ecosystem disturbances against a long-term baseline, allows slow or rare events to be observed, facilitates multiple research approaches, provides a focus for modeling disturbance dynamics, and contributes to management of resources.

Venterea, RT, GM Lovett, PM Groffman, and PA Schwarz. 2003. Landscape patterns of net nitrification in a northern hardwood-conifer forest. *Soil Science Society of America Journal* 67: 527–539.

For ecosystem modelers and forest scientists. Net nitrification rates (NR) and nitrate (NO_3^-) concentrations were taken at 100 plots across a 3160-ha hardwood-conifer forest in central New Hampshire. Their associations with physiographic features and vegetation abundances were investigated. Both measures varied by a factor of 150. NO_3^- production was greater at higher plot elevations or more southerly aspects, with more sugar maple and striped maple, and with fewer conifers. These factors explained 52% of the variance in NR in regression models. Landscape patterns were affected by higher soil water contents, nitrogen (N) mineralization rates, total N concentrations in higher elevation plots, and higher N mineralization and respiration rates in more south-facing plots. Soil C/N ratios and landscape explained an

additional 10% of variance. Wide variation in NO_3^- results from a combination of multiple biotic and abiotic factors. The study provides a quantitative basis for estimates of how changes in vegetation and climate may influence N cycling.

Vesely, DG, and WC McComb. 2002. Salamander abundance and amphibian species richness in riparian buffer strips in the Oregon Coast Range. *Forest Science* 48: 291–297.

For ecologists, zoologists, and forest scientists. The authors researched total salamander abundance, amphibian species richness, and sampling proportions for five salamander species in 17 managed stands and 12 unlogged forests near streams to determine the effectiveness of riparian buffer strips. The results showed that four of the five species, along with total salamander abundance and amphibian species richness, were affected by forest practices. Riparian buffer strips are helpful for several salamander species, but state forest practices regulations do not currently provide for riparian zones that are wide enough to prevent local declines in the diversity of amphibian communities.

Wagai, R, and P Sollins. 2002. Biodegradation and regeneration of water-soluble carbon in a forest soil: Leaching column study. *Biology and Fertility of Soils* 35: 18–26.

For soil scientists and soil microbiologists. The authors hypothesized that water-soluble carbon (C) provides a major substrate for soil microbes. The dissolved organic C was constant in leachates collected every 2 weeks over 20 weeks. The pool of water-extractable carbon declined by 31–40% over the 20 weeks. The presence of tree seedlings decreased the amount and biodegradability of leachates and extracts. Leachable C did not appear to provide significant substrate for heterotrophic soil respiration in the system, but the role of water-extractable C as a substrate was unclear.

Waldien, DL, JP Hayes, and BE Wright. 2003. Use of conifer stumps in clearcuts by bats and other vertebrates. *Northwest Science* 77(1): 64–71.

For forest managers, vertebrate biologists, and ecologists. Use of conifer stumps by vertebrates was monitored

in four stands in the Oregon Cascades. Vertebrate use of stumps was low. The highest use was in relatively large Douglas-fir stumps located in open areas. Ten species of vertebrates used bark crevices. Bats using stumps were primarily long-eared myotis. Maintaining present and future availability of snags should be the focus of management of bat roost structures.

- Waring, RH, and N McDowell. 2002. Use of physiological process model with forestry yield tables to set limits on annual carbon balances. *Tree Physiology* 22: 179–188.

For tree physiologists and those studying carbon balance. The authors used a process-based model, yield tables, and local weather station to set limits on annual carbon (C) fluxes for forest of different ages. When constrained to match stand dynamics, the model can provide reasonable annual estimates of gross photosynthesis for a specified climate. With additional assumptions and estimates, maximum net annual ecosystem exchange can also be predicted.

- Waring, RH, NC Coops, JL Ohmann, and DA Sarr. 2002. Interpreting woody plant richness from seasonal ratios of photosynthesis. *Ecology* 83: 2964–2970.

For ecologists and forest scientists. A satellite-driven process model provided the data to predict gross photosynthesis and the most constraining environmental variable and, thereby, explain the wide variation of species richness in Oregon forests. Species richness was highest on sites where 60–70% of light was intercepted by vegetation. Evergreen and deciduous forest photosynthesis peaked in the spring and summer. Seasonal ratio of gross photosynthesis varied from <1 to >5. Mild, moist spring weather conditions and summer drought yielded the highest species richness.

- Weisberg, PJ, and FJ Swanson. 2003. Regional synchronicity in fire regimes of western Oregon and Washington, USA. *Forest Ecology and Management* 172: 17–28.

For forest historians and forest ecologists. Temporal patterns of area burned at 25-year intervals over 600 years were studied to understand the implications of fire history on forest dynamics over stand to regional

scales. The patterns were derived from 10 tree-ring-based fire history studies located west of the crest of the Cascade Range in the Pacific Northwest. Anthropogenic change, climate, and the degree of stand/fuel development appear to have interacted in their influence on temporal variation in fire regimes. Patterns of temporal variation in area burned among the 10 studies reveal the roughly synchronous nature of fire in the region, which has important implications for our understanding of landscape dynamics before settlement.

- Well, R, J Augustin, K Meyer, and DD Myrold. 2003. Comparison of field and laboratory measurement of denitrification and N₂O production in the saturated zone of hydromorphic soils. *Soil Biology and Biochemistry* 35: 783–799.

For researchers in soil nitrogen cycling. The authors tested a new method for measuring in situ denitrification under field conditions in many water-saturated subsoils with a range of biochemical properties. The in situ denitrification rates ranged from 1–2800 µgN/kg/d, compared with 1–1700 µgN/kg/d in the laboratory. Both the laboratory and field results are considered valid, and both were ineffective at determining the proportion of N₂O in the total denitrification output.

- Whitbeck, KL, MA Castellano, JW Spatafora, E Cazares, and JM Trappe. 2002. Systematics of the genus *Gymnomyces* (Russulales, Basidiomycota). *Inoculum* 53(3): 59.

For researchers in forest fungus taxonomy and ecology. Analysis of DNA from species in this genus of truffle-like fungi indicated that different species of *Gymnomyces* apparently are derived from several different sources in their ancestral mushroom genus *Russula*. In addition, there may be fewer phylogenetic species than previously thought.

- Wilson, K, A Goldstein, E Falge, M Aubinet, D Baldocchi, P Berbigier, C Bernhofer, R Ceulemans, H Dolman, C Field, A Grelle, A Ibrom, BE Law, A Kowalski, T Meyers, J Moncrieff, R Monson, W Oechel, J Tenhunen, R Valentini, and S Verma. 2002. Energy balance closure at FLUXNET

sites. *Agricultural and Forest Meteorology* 113: 223–243.

For environmental scientists and ecologists. The authors did a comprehensive evaluation of energy balance closure across 22 sites and 50 site-years in FLUXNET, using statistical regression of turbulent energy fluxes and solving for the energy balance ratio. Most sites lacked closure; the mean imbalance was about 20%. The imbalance was apparent in all measured climates and vegetation types. Closure was better with turbulent intensity (friction velocity) and worst at night. Either fluxes of sensible and latent heat were underestimated, available energy was overestimated, or both. While it is not known what error caused the imbalance, circumstantial evidence indicates a link between the imbalance and CO₂ fluxes.

Wilson, KB, DD Baldocchi, M Aubinet, P Berbigier, C Bernhofer, H Dolman, E Falge, C Field, A Goldstein, A Granier, A Grelle, T Halldor, D Hollinger, G Katul, BE Law, A Lindroth, T Meyers, J Moncrieff, R Monson, W Oechel, J Tenhunen, R Valentini, S Verma, T Vesala, and S Wofsy. 2002. Energy partitioning between latent and sensible heat flux during the warm season at FLUXNET sites. *Water Resources Research* 38: art. no. 1294

For forest researchers and ecologists. The Bowen ratio [β (B) = sensible heat flux (H)/latent heat flux (LE)] during the warm season was investigated at 27 sites over 66 site-years within FLUXNET. Variability in flux partitioning characteristics was large, but some patterns were detectable. Deciduous forest sites and the agricultural site had the lowest surface resistance to water vapor transport (R-c) and B (0.25–0.50). Coniferous forests had a larger R-c and B (0.50–1.00 and larger), but R-c and climatological resistance (R-i) varied from year to year. Mediterranean climate sites usually had the highest net radiation, R-c, R-i, and B. Grasslands had the largest year-to-year variability, depending mostly on differences in soil water content and R-c.

Wirth, TA, and DA Pyke. 2003. Restoring forbs for sage grouse habitat: Fire, microsites, and establishment methods. *Restoration Ecology* 11: 370–377.

For wildlife biologists and restoration biologists. The availability of certain preferred and nutritious forb species may limit sage grouse productivity. The authors determined the suitability of three species of forbs for revegetation projects to improve grouse habitat. They determined emergence, survival, and reproduction of *Crepis modocensis*, *C. occidentalis*, and *Astragalus purshii*. They used combinations of two methods each of establishment (seeding or transplanting), site preparation (burned or not), and microsite (mound or interspace) in an *Artemisia tridentata* vegetation association in south central Oregon. Emergence of seeded *Astragalus* was lower than that of either seeded *Crepis* species (each 38%). Emergence of *Crepis* was highest in mounds in unburned areas. Seedling survival was higher in burned areas and in mounds, however, so plant establishment was better in burned mounds. Fire improved survival of emergent *A. purshii* seedlings and transplants of all three species. *Crepis* may be a good revegetation option for improving sage grouse habitat in the region, but *Astragalus* requires more research.

Yatskov, M, ME Harmon, and ON Krankina. 2003. A chronosequence of wood decomposition in the boreal forests of Russia. *Canadian Journal of Forest Research* 33: 1211–1226.

For forest ecologists and carbon cycle researchers. The authors determined specific density of decay classes and decomposition rates of coarse woody debris from three hardwood and nine conifer species in Russian boreal forests. Species differed in annual decomposition rates; rates were highest in *Betula pendula* and lowest in *Pinus koraiensis* and *P. siberica*. Decomposition rates on the sampled sites were not correlated with temperature and precipitation, consistent with other studies in the boreal region.

Integrated Protection of Forests and Watersheds

Acker, SA, SV Gregory, G Lienkaemper, WA McKee, FJ Swanson, and SD Miller. 2003. Composition, complexity, and tree mortality in riparian forests in the central western Cascades of Oregon. *Forest Ecology and Management* 173: 293–298.

For riparian ecologists, ecologists, and silviculturists. The authors compared tree composition, stand complexity, and patterns of tree mortality over time in mature and old-growth stands along low- and middle-order streams in the western Cascade Range of Oregon. Recruitment of large wood resulting from tree mortality into stream channels was also assessed. Hardwoods, *Thuja plicata*, or both were abundant in stands on mid-order streams. These streams also had high stand complexity, as did the upland old-growth stand. In 1996, six of the seven stands studied had exceptionally high tree mortality. This was the year in which the largest flood during the study took place, but mortality was due primarily to flooding in only one stand, on an unconstrained reach of a mid-order stream. This stand yielded a much higher estimated recruitment of wood than the other stands on mid-order streams.

Adams, JM, G Piovesan, S Strauss, and S Brown. 2002. The case for genetic engineering of native and landscape trees against introduced pests and diseases. *Conservation Biology* 16: 874–879.

For plant geneticists, forest scientists, and researchers. Introduced pests and diseases have devastated many native forest and familiar landscape trees of the northern temperate zone and are expected to continue devastating more trees. Cautious transfer of resistance genes from the original host species in the source region of the pest or disease may undo the damage. Though there are some problems with the method, with further work this approach may have advantages over other techniques such as introgression, including requiring fewer tree generations and introducing fewer unnecessary genes of nonnative trees.

Adams, PW. 2002. Assessment and monitoring considerations, pp. 123–131 in *National Coastal Ecosystem Restoration Manual*. ORESU-H-02-002, Sea Grant Communications, Oregon State University, Corvallis.

For landowners, watershed council members, and natural resource professionals. The author explains the assessment and monitoring of watershed features and functions, including important considerations in comparisons, sampling, and analysis of resource conditions and management effects.

Adams, PW. 2002. Forests and clean drinking water: Images, rhetoric and reality. *Western Forester* 47(5): 4–5.

For watershed managers and the general public. The author discusses how simple images and rhetoric can distort perceptions and limit understanding of the relationships between forests and the quality and quantity of drinking water supplies. Simple riparian buffer zones and other improved activities can greatly limit the adverse effects of logging and roads. People should look at the entire watershed. People are concerned about the 1% of the Eagle Creek basin that is affected by logging, but the municipal intakes that are only a mile or two from a major freeway are a far greater influence on water purity.

Adams, PW, and D Godwin. 2002. Watershed hydrology, pp. II-2.1 to II-2.17 in *Watershed Stewardship—A Learning Guide*. EM 8714 (revised), Oregon State University Extension Service, Corvallis.

For landowners, watershed council members, and natural resource professionals. The authors introduce the key features and functions of watersheds, including the hydrologic cycle, the role of extreme events, and some important land use influences.

Arha, K, H Salwasser, and G Achterman. 2003. *The Oregon Plan for Salmon and Watersheds: A Per-*

spective. INR Policy Paper 2003-03, Institute for Natural Resources, Oregon State University, Corvallis.

For policymakers, elected representatives, and natural resource managers. The Oregon Plan is a state-led strategy for restoring and conserving native salmonids and the watersheds within which they spend all or parts of their lives. It encompasses all native salmonids and all watersheds in the state. This paper is a perspective on the Oregon Plan and what it offers for state leadership in species conservation. The perspective focuses more on governance matters and less on implementation through voluntary actions.

Bishaw, B, W Rogers, and W Emmingham. 2002. *Riparian Forest Buffers on Agricultural Lands in the Oregon Coast Range: Beaver Creek Riparian Project as a Case Study.* Research Contribution 38, Forest Research Laboratory, Oregon State University, Corvallis.

For forest and riparian managers and ecologists. The Beaver Creek Riparian Buffer Project was established to develop better information about how to establish riparian buffers on coastal pastureland near Newport, Oregon. Intensive site preparation, continued vegetation management, and both fencing and tubing of tree seedlings were necessary to gain survival and protect seedlings from small rodents, beaver, and cattle. When cattle were fenced out, the banks of the streams were protected within a year. Treatments that planted a single row of trees along the bank had significant shading 4–7 years after planting. When six rows were planted, more pasture was taken up, but significant shading occurred 2–6 years after planting.

Bond, BJ, JA Jones, G Moore, N Phillips, D Post, and JJ McDonnell. 2002. The zone of vegetation influence on baseflow revealed by diel patterns of streamflow and vegetation water use in a headwater basin. *Hydrological Processes* 16: 1671–1677.

For tree physiologists and hydrologists. The study compared the temporal dynamics of transpiration and streamflow over half-hour time increments through a summer in a small headwater basin. Researchers concluded that diel (24-hour) patterns in streamflow

could be attributed to water use by vegetation. The time lag between peak transpiration and minimum streamflow ranged between about 3 hours in the early summer to more than 8 hours in the late summer. Only a small fraction of vegetation in the basin (1–3%) impacted streamflow on this time scale.

Bonin, HL, RP Griffiths, and BA Caldwell. 2003. Nutrient and microbiological characteristics of fine benthic organic matter in sediment settling ponds. *Freshwater Biology* 48: 1117–1126.

For forest scientists, ecosystem managers, and researchers. Fine benthic organic matter (FBOM) was collected from settling ponds in catchments in the Pacific Northwest that contained either old-growth forests or stands harvested 30 years earlier and replanted. Forest harvest influenced the chemical characteristics of FBOM. C:N ratios were significantly higher and mineralizable N, extractable ammonium, and labile polysaccharides were all significantly lower in FBOM from old-growth catchment sediment than in FBOM from catchments containing harvested stands. Stream FBOM from harvested basins also appeared more biodegradable than stream FBOM from old-growth basins. Most variables differed seasonally in both the logged and unlogged catchments, indicating that past timber harvest influenced both composition of and seasonal fluctuations in FBOM. Comparisons of the patterns show that settling pond sediments are a valued surrogate for mountain stream sediments.

Brasier, CM, DEL Cooke, JM Duncan, and EM Hansen. 2003. Multiple new phenotypic taxa from trees and riparian ecosystems in *Phytophthora gonapodyides*-*P. megasperma* ITAS Clade 6, which tend to be high-temperature tolerant and either inbreeding or sterile. *Mycological Research* 107: 277–290.

For forest pathologists. The authors grouped *Phytophthora* isolates that are associated with *Phytophthora* major ITS Clade 6 into eleven taxa on the basis of phenotype. Three were described morphospecies; four had been identified but not described, and four taxa were previously unknown. The authors discuss the lineages of the isolates. Clade 6 taxa are strongly associated with forest and riparian ecosystems

and tolerate high temperatures. Unlike most *Phytophthora* clades, they are predominantly inbreeding or sterile.

- Burns, D, N Plummer, JJ McDonnell, E Busenburg, G Casile, C Kendall, R Hooper, J Freer, N Peters, K Beven, and P Schlosser. 2003. The geochemical evolution of riparian groundwater in a forested piedmont catchment. *Journal of Ground Water* 41: 913–925.

For hydrologists and watershed researchers. The authors studied the principal weathering reactions and their rates in riparian ground water at the Panola Mountain Research Watershed near Atlanta, Georgia. They measured chlorofluorocarbons and tritium/helium-3 in samples from 19 shallow wells in the riparian aquifer and 1 borehole in granite to determine the apparent age of the water. Concentrations of SiO_2 , Na^+ , and Ca^{2+} were higher downvalley. The age of the water ranged from 0 to 27 years. Changes in ground water chemistry were due mostly to the weathering of plagioclase to kaolinite. Others factors were less significant. The plagioclase weathering rate appears similar to the rate calculated in a previous study. The rate in this study is 3–4 times slower than in other published laboratory studies.

- Chapin, DM, RL Beschta, and HW Shen. 2002. Relationships between flood frequencies and riparian plant communities in the upper Klamath Basin, Oregon. *Journal of the American Water Resources Association* 38: 603–617.

For plant ecologists and riparian biologists. The authors investigated how plant communities depend on infrequent flooding. Plant communities were sampled along established cross-sections and channel and floodplain elevations were determined, as were water surface elevations associated with specific discharges. At seven of the nine sites, an average peak flow frequency of 4.6 years was required to sustain riparian plant communities. Return periods >25 years were needed at the other two. Riparian plant communities appear to depend strongly on flooding.

- Clarke, S, and K Burnett. 2003. Comparison of digital elevation models for aquatic data development.

- Photogrammetric Engineering and Remote Sensing* 69: 1367–1375.

For stream and hydrologic modelers and those interested in photogrammetry and remote sensing. The 30-m digital elevation models (DEMs) often used in analyzing aquatic systems have several limitations that may interfere with accurate stream modeling, delineation of hydrologic units, and slope classification. The Coast Landscape Analysis and Modeling study (CLAMS) generated streams, hydrologic units, and slope classes from 10-m drainage-enforced DEMs and from 30-m DEMs. Drainage enforcement was more effective in improving spatial accuracy of streams and hydrologic unit boundaries than was increased resolution. Level 2 DEMs generally provided more accurate delineation of streams and HU boundaries than Level 1. Slopes were better classified by the 10-m DEMs. Because of these findings, 10-m drainage-enforced DEMs have been produced for the Coast Range Province of Oregon.

- Cloke, HL, J-P Renaud, AJ Claxton, JJ McDonnell, MG Anderson, JR Blake, and PD Bates. 2003. The effect of model configuration on modelled hillslope-riparian interactions. *Journal of Hydrology* 279: 167–181.

For hydrologists and riparian researchers. The authors investigated how model setup decisions are linked to the consequential behavior of hydrological processes, using a two-dimensional finite-element model. They determined that model setup decisions can determine whether given hillslope processes are present or absent, as well as the size and direction of flux where the hillslope and riparian area meet. Not exploring these consequences for given applications can give rise to misleading inferences about processes.

- Ferguson, BA, TA Dreisbach, CG Parks, GM Filip, and CL Schmitt. 2003. Coarse-scale population structure of pathogenic *Armillaria* species in a mixed-conifer forest in the Blue Mountains of northeast Oregon. *Canadian Journal of Forest Research* 33: 612–623.

For silviculturists, forest scientists, and researchers. Sampling of recently dead or live symptomatic conifer

fers over 16,100 ha of a mixed-conifer forest in the Blue Mountains of northeast Oregon produced 112 isolates of *Armillaria* from six tree species. One hundred and eight of the isolates were *Armillaria ostoyae* (Romagn.) Herink, and four were North American Biological Species X (NABS X). *Armillaria ostoyae* genet sizes were approximately 20, 95, 195, 260, and 965 ha, and cumulative colonization of the study area was at least 9.5%. Estimates of *A. ostoyae* spread rate in conifer forests gave age estimates for the genet ranging from 1,900 to 8,650 years. The authors discuss possible mechanisms influencing these genets, the genetic structure and stability of the pathogen, and implications for disease management.

Filip, GM, LM Ganio, PT Oester, RR Mason, and BE Wickman. 2002. Ten-year effect of fertilization on tree growth and mortality associated with *Armillaria* root disease, fir engravers, dwarf mistletoe, and western spruce budworm in northeastern Oregon. *Western Journal of Applied Forestry* 17: 122–128.

For silviculturists, forest managers, and forest scientists. Four randomly selected 4-ha plots in a mixed-conifer forest in northeastern Oregon received one of three fertilizer treatments or no treatment. After 10 years, fertilizer had no significant effects on mortality, diameter growth, vigor, or live crown ratio in grand fir and western larch or dwarf mistletoe in larch. Fir mortality was associated with a variety of insects and diseases, and larch mortality, vigor, and diameter were associated with dwarf mistletoe. The authors discuss possible reasons why fertilization in this experiment did not have the same effects as fertilization in smaller studies.

Filip, GM, SA Fitzgerald, L Yang-Erve, G Laflamme, JA Berube, and G Bussieres. 2003. Fire and *Armillaria*: effects on viability and dynamics in Eastern Oregon, pp. 787–84 in *Root and Butt Rot of Forest Trees*. Proceedings of the IUFRO Working Party 7.02.01, Quebec City, Canada, 16–21 September 2001. Information Report LAU-X-126, Laurentian Forestry Centre, Canadian Forest Service, Quebec.

For forest pathologists and silviculturists. The authors examined the effects of prescribed burning and time

since burning, soil depth, and the presence of an antagonistic fungus, *Trichoderma harzianum*, on viability of *Armillaria ostoyae* colonizing stem segments of red alder. The stem segments were buried 8 cm or 30 cm deep in plots that were either burned or not burned. The antagonistic fungus was buried with half of the *Armillaria*-infected segments. One day after burning in the fall, recovery of *A. ostoyae* was reduced significantly at the shallower depth, but not at the deeper. The presence of *T. harzianum* did not affect *Armillaria* recovery immediately but did appear to decrease recovery after several months. Season of burning might also affect *Armillaria* recovery.

Freer, J, JJ McDonnell, KJ Beven, NE Peters, DA Burns, RP Hooper, B Aulenbach, and C Kendall. 2002. The role of bedrock topography on subsurface storm flow. *Water Resources Research* 38(12): 5-1–5-16.

For forest hydrologists and forest scientists. The authors conducted a detailed study of subsurface flow and water table response coupled with digital terrain analysis (DTA) of surface and subsurface features at the hillslope scale in Panola Mountain Research Watershed (PMRW), Georgia. Timing, peak flow, recession characteristics, and total flow volume of subsurface storm flow contributions of macropore and matrix flow in different sections along an artificial trench face varied greatly. Where the bedrock surface acts as a relatively impermeable boundary, local bedrock topography may be highly significant at the hillslope scale.

Han, H-S, TW Steele, and LD Kellogg. 2003. DamQuick: A new method for rapidly assessing residual stand damage during partial timber harvests. *Western Journal of Applied Forestry* 18: 81–87.

For logging and forestland managers. Partial timber harvest prescriptions are becoming more frequent. The authors developed and tested a method, DamQuick, to assess residual stand damage after partial harvesting. The method assesses damage near the extraction corridors and scales the plot measures to yield stand level estimates. The method was easy to implement and provided mean estimates statistically similar to actual stand damage.

Hansen, EM, PW Resser, W Sutton, LM Winton, and N Osterbauer. 2003. First report of A1 mating type of *Phytophthora ramorum* in North America. *Plant Disease* 87: 1267.

For forest pathologists and mycological geneticists. *Phytophthora ramorum* was isolated from *Viburnum* and *Pieris* spp. from a nursery in Clackamas County and from *Camellia* sp. from a nursery in Jackson County, Oregon. The microsatellite alleles of the Clackamas County isolates and European tester isolates were identical, whereas those of the Jackson County isolates were identical to those of Oregon forest tester isolates. Thus, the infestations in the two counties apparently originated separately. The Clackamas County isolates, which were of A1 mating type, were received from a Canadian nursery. The Jackson County isolates, which were of A2 mating type, reportedly originated from a California nursery.

Harrington, CA, B Bishaw, and DS DeBell. 2003. Patterns of survival, damage, and growth for western white pine in a 16-year-old spacing trial in western Washington. *Western Journal of Applied Forestry* 18: 35–43.

For forest managers, forest scientists, and silviculturists. The authors planted western white pine trees that were resistant to white pine blister rust in the early 1980s to determine the effects of spacing on growth. The planting was in the southern Cascades of Washington. Spacing ranged from 2 to 6 m. In the sixteenth year after planting, the survival rate was about 80%, and 71% of the trees were free of the disease. Annual growth averaged 0.7 m in height and 1.0 cm in diameter for the 11th to 16th year. There was damage due to antler rubbing, but this was not associated with tree spacing. Early growth rates were higher in the planted stands than in natural stands.

Houston, LL, M Watanabe, JD Kline, and RJ Alig. 2003. Past and future water use in Pacific Coast States. General Technical Report PNW-GTR-588, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For hydrologists and water resource managers and planners. On the basis of expected trends in socioeconomic

factors affecting water demand, the authors identified past, current, and projected withdrawal of surface water in Pacific Coast states of the USA. They also identified projected demands for recreational uses that may compete with consumptive uses. To illustrate the challenges facing water resource managers and policymakers in designing water allocation policies, they present a case study of water use issues in the Klamath Basin.

Johnson, GR, BL Gartner, D Maguire, and A Kanaskie. 2003. Influence of Bravo fungicide applications on wood density and moisture content of Swiss needle cast affected Douglas-fir trees. *Forest Ecology and Management* 186: 339–348.

For forest pathologists, wood quality control managers, and wood anatomists. Wood from trees that had not been sprayed with Bravo (and were therefore more affected by Swiss needle cast) had narrower growth rings, sapwood, and tracheid cell wall thickness and lower sapwood moisture content than did wood from trees in adjacent plots that had been sprayed for the 5 years before the test. The relationships between earlywood density and earlywood width also were altered in unsprayed trees, and their latewood proportion and overall wood density were higher.

Kasahara, T, and SM Wondzell. 2003. Geomorphic controls on hyporheic exchange flow in mountain streams. *Water Resources Research* 39(1): 3-1–3-14.

For hydrologists. The influence of stream size and channel constraint was examined at four stream reaches. Hyporheic exchange flows were simulated, using MODFLOW and MODPATH, to estimate relative effects of channel morphology on the extent of and flow in the hyporheic zone and residence time of stream water in the zone. Stream size, and sometimes channel constraint, affected the way in which channel morphology controlled exchange flows. Hyporheic exchange in the second-order sites was driven by pool-step sequences. Pool-riffle sequences and a channel split created exchange flows with short residence times, whereas a secondary channel created exchange flows with long residence times. The fifth-order site was bedrock-constrained and so had

relatively little exchange flow. Models of groundwater flow were helpful in examining the morphologic features that controlled hyporheic exchange flow. Channel morphologic features visible on the surface controlled the development of the hyporheic zone in the streams.

- Keim, RF, and AE Skaugset. 2002. Physical aquatic habitat I. Errors associated with measurement and estimation of residual pool volumes. *North American Journal of Fisheries Management* 22: 145–150.

For forest engineers, forest scientists, and forest managers. Researchers used precise, digital terrain models of a third-order mountain stream in Oregon to identify the sensitivity of measurements to error and the consequences of those errors in calculating the volumes of residual pools. Researchers found that reach-level measurements of residual pool volume may be more appropriate than measurements of individual pools as metrics in monitoring schemes that use low-precision measurement techniques.

- Keim, RF, AE Skaugset, and DS Bateman. 2002. Physical aquatic habitat II. Pools and cover affected by large woody debris in three western Oregon streams. *Northern American Journal of Fisheries Management* 22: 151–164.

For forest managers, forest engineers, and forest scientists. Large woody debris (LWD), mostly from large conifers and red alder (*Alnus rubra*), is important in affecting stream channel morphology and aquatic habitat. Researchers added LWD (primarily red alder) to three third-order streams in the Oregon Coast Range and used digital terrain models to evaluate physical habitat for salmonids over 3 years. The results from this study indicate that relatively small LWD from red alder can modify physical aquatic habitat effectively.

- Keim, RF, and AE Skaugset. 2003. Modelling effects of forest canopies on slope stability. *Hydrological Processes* 17: 1457–1467.

For researchers in hillslope and forest hydrology. Field measurements of rainfall and throughfall in two

forest stands showed high rainfall intensities attenuated by canopies. Modeling responses of soil water in an idealized hillslope to rainfall and throughfall indicated that the intensity attenuation effect may be sufficient to prevent loss of slope stability during large rainstorms. These findings suggest new mechanisms of how forests affect landslide initiation in steep terrain.

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

For entomologists, wildfire ecologists, and forest scientists. The authors measured ethanol and water in phloem and sapwood of *Pinus ponderosa* 16 days after a fire. Severely scorched trees had 15 times more phloem ethanol and 53 times more sapwood ethanol than trees with zero scorch. Ethanol concentrations in phloem and sapwood were related, as were sapwood ethanol values at breast height and tree base. Ethanol accumulated in trees killed in the fire but declined as surviving trees recovered from their injuries. Scorched trees attracted beetles more than undamaged trees, indicating ethanol was being released to the atmosphere. This pattern was stronger in September than in May. Sapwood ethanol in trees with heavy and severe crown scorch was the strongest predictor of second-year mortality.

- Mankowski, ME, and JJ Morrell. 2003. Incidence of *Apocephalus horridus* in colonies of *Camponotus vicinus* and the effect of antibiotic/antimycotic mixtures on fly emergence (Diptera: Phoridae; Hymenoptera: Formicidae). *Sociobiology* 42: 477–484.

For insect pathologists and parasitologists and wood preservationists. Ant-decapitating flies (*Apocephalus horridus*) parasitize carpenter ants (*Camponotus vicinus*). The authors found flies in three of eight ant colonies sampled in western Oregon, parasitizing from 1 to 15% of the workers. Medium-sized workers were more likely to be parasitized than larger ants. Adding propiconazole and tetracycline to a glucose diet increased ant decapitation, whereas exposing workers to a temperature of 39 °C for 48 hours decreased

decapitation, apparently affecting development of the parasites.

Manter, DK. 2002. Energy dissipation and photoinhibition in Douglas-fir needles with a fungal-mediated reduction in photosynthetic rates. *Journal of Phytopathology* 150: 674–679.

For ecologists and forest scientists. The authors compared the dissipation of absorbed light and potential for photooxidative damage in Douglas-fir seedlings, either healthy or infected with *Phaeocryptopus gaeumannii*. The infection reduced net CO₂ assimilation rates significantly but did not impact chloroplast pigments significantly. Maximum thermal dissipation from needles was the same in both types of seedlings. The infected needles absorbed excess light according to two experiments, one showing decline in photosystem II (PSII) efficiency and the other showing a lower photochemical utilization. PSII efficiency was largely attributable to photooxidative damage, as suggested by an increase in minimum fluorescence. The findings indicate an explanation for the greater pathogenicity of *P. gaeumannii* in sun-exposed foliage.

Manter, DK, and KL Kavanagh. 2003. Stomatal regulation in Douglas-fir following a fungal-mediated chronic reduction in leaf area. *Trees—Structure and Function* 17: 485–491.

For forest pathologists and tree physiologists. The authors investigated stomatal regulation in Douglas-fir infected with Swiss needle cast (SNC) to determine the potential impacts of stomatal occlusion and defoliation on tree productivity. Stomatal conductance was correlated negatively with fungal colonization and positively with leaf specific hydraulic conductance. When fungus reduced maximum stomatal conductance below the potential maximum, stomatal sensitivity was lower than expected. Losses in productivity resulting from blockage of stomata and needle loss are compounded by additional losses in leaf specific hydraulic conductance and reduced stomatal conductance in still-functioning stomata.

Manter, DK, BJ Bond, KL Kavanagh, JK Stone, and GM Filip. 2003. Modelling the impacts of the foliar pathogen, *Phaeocryptopus gaeumannii*, on

Douglas-fir physiology: Net canopy carbon assimilation, needle abscission and growth. *Ecological Modelling* 164:211–226.

For forest pathologists and physiologists. A model of stomatal conductance and photosynthesis was parameterized and applied to Douglas-fir trees either infected or not infected with Swiss needle cast (*Phaeocryptopus gaeumannii*). Carbon assimilation (A_{net}) was highest in the summer and at or below 0 in the winter, but *P. gaeumannii* reduced A_{net} in infected trees. Total carbon budgets were negative in foliage with pseudothecia in at least 25% of stomata. The whole canopy maintained a positive carbon budget because of the current-year needles that were not affected by the disease. When the older, more heavily diseased foliage is abscised shortly after becoming a carbon sink, there is a mitigating effect on the whole-canopy A_{net} .

Manter, DK, LM Winton, GM Filip, and JK Stone. 2003. Assessment of Swiss needle cast disease: Temporal and spatial investigations of fungal colonization and symptom severity. *Journal of Phytopathology* 151: 344–351.

For ecologists, forest scientists, and mycologists. The authors studied the differences in fungal colonization and symptom development between north- and south-facing tree plots at three plantations in the Oregon Coast Range twice a year in 1998 and 1999. Fungal colonization was closely associated with symptom severity. The three measures of fungal colonization (ergosterol content, pseudothecia density, and quantitative PCR) were highly correlated; the ergosterol-pseudothecia relationship was the only one that differed between plots. Trees growing on warmer slopes had greater levels of colonization at low to moderate levels of infection, and plots with a larger amount of solar radiation had more needle abscission.

McDonnell, JJ. 2003. Where does water go when it rains? Moving beyond the variable source area concept of rainfall-runoff response. *Hydrological Processes* 17: 1869–1875.

For rainfall-runoff modelers, hydrologists, and riparian researchers. While tremendous advances have been

made in rainfall-runoff modeling, the best models still rely on the old concept of variable source area (VSA). The author presents some new ways of viewing the catchment rainfall-runoff processes that reflect new data. A catchment can be viewed as a series of cryptic reservoirs that have coupled unsaturated and saturated zones, explicit dimensions and porosities, and connect vertically and laterally in time and space in linear and non-linear ways. This flexible model structure, called a box model, better incorporates soft data and virtual experiments. Also, it may alleviate the search for scale-invariant processes.

McGlynn, BL, JJ McDonnell, and DD Bramer. 2002. A review of the evolving perceptual model of hillslope flowpaths at the Maimai catchments, New Zealand. *Journal of Hydrology* 257: 1–26.

Since the late 1970s, many studies of hillslope flows have been carried out at the Maimai catchments. The many approaches and multiple experiments have provided alternative, sometimes conflicting, interpretations of subsurface water flow that have contributed to development of a detailed perceptual model of hillslope hydrology and catchment behavior in steep, humid catchments. The authors review data sets collected in the catchments and relate them to advances in understanding of subsurface flow.

McGlynn, BL, and JJ McDonnell. 2003. Role of discrete landscape units in controlling catchment dissolved organic carbon dynamics. *Water Resources Research* 39(4): 3-1–3-18.

For hydrologists, forest scientists, and riparian researchers. The authors investigated the relationship of storm dissolved-organic-carbon (DOC) dynamics, catchment landscape units, and catchment scale to clarify the controls on DOC export dynamics at the Maimai watersheds in New Zealand. The proportion of hillslope runoff was smaller on the rising than on the falling limb of the hydrograph. The proportion of riparian runoff was larger on the rising than on the falling limb of the hydrograph. There was a disconnection of hillslope and riparian areas early in the storm and a reconnection once the hillslope soil moisture deficits were satisfied. Thus, the first-order catchment controls on stream DOC concentrations

and mass export likely are the relative timing of riparian and hillslope source contributions and the connections and disconnections of dominant runoff areas.

McGlynn, B, J McDonnell, M Stewart, and J Seibert. 2003. On the relationships between catchment scale and streamwater mean residence time. *Hydrological Processes* 17: 175–181.

For hydrologists, forest scientists, and riparian researchers. The authors used tritium (^3H) to determine the relationship between landscape characteristics and streamwater mean residence time (MRT) at the Maimai catchments in New Zealand, a relatively simple hydrological system. Young waters (<3 years old) could be estimated because of high precision analysis, near-natural atmospheric ^3H levels, and well-characterized rainfall ^3H inputs. MRT did not correlate with catchment size but was correlated with the median sub-catchment size of the sampled watersheds. Landscape organization appears to be a first-order control on MRT.

McHale, MR, JJ McDonnell, MJ Mitchell, and CP Cirimo. 2002. A field-based study of soil water and groundwater nitrate release in an Adirondack forested watershed. *Water Resources Research* 38(4): 2-1–2-16.

For hydrologists, forest scientists, and riparian researchers. A combination of isotopic, chemical, and hydrometric data were used to study sources of stream water NO_3^- and the mechanisms delivering NO_3^- to the stream in a watershed in the Adirondack Mountains. During six monitored storms, soil water and till groundwater dominated stream base flow and storm flow, with near-stream groundwater and event water generally contributing little to streamflow. Stream water NO_3^- was highest when till groundwater contribution peaked. The authors propose that soil water and till groundwater mix primarily in hillslope hollows and most stream water NO_3^- comes from till groundwater during both base flow and storms.

Minshew, H, PW Adams, JH Huddleston, and D Godwin. 2002. Watershed soils, erosion, and conservation, pp. II-4.1 to II-4.39 in *Watershed*

Stewardship—A Learning Guide. EM 8714 (revised). Oregon State University Extension Service, Corvallis.

For landowners, watershed council members, and natural resource professionals. The authors introduce the key characteristics and functions of soils and erosion processes in watersheds and some basic erosion control and watershed enhancement practices.

Nakamura, F, and FJ Swanson. 2003. Dynamics of wood in rivers in the context of ecological disturbance, pp. 279–297 in *The Ecology and Management of Wood in World Rivers*, SV Gregory, KL Boyer, and AM Gurnell, eds. American Fisheries Society Symposium 37, American Fisheries Society, Bethesda MD.

For ecologists and geomorphologists. The dynamics of wood in rivers can produce many kinds of ecosystem disturbance. The authors discuss such disturbances in a variety of stream types.

Progar, RA, and AR Moldenke. 2002. Insect production from temporary and perennially flowing headwater streams in western Oregon. *Journal of Freshwater Ecology* 17: 391–407.

For ecologists and entomologists. The authors researched the effect of stream flow on emergent aquatic insect fauna at three sites in the conifer forests of western Oregon, using emergence traps. Total density and biomass of aquatic insects were higher in temporary streams, but taxonomic richness was higher in perennial streams. The results suggest that the absence of vertebrate predators permits the arthropod populations in temporary streams to thrive. The streams are a potential source of colonization and have an important place in the terrestrial food web.

Ross, DW, GE Daterman, and KE Gibson. 2002. Elution rate and spacing of antiaggregation pheromone dispensers for protecting live trees from *Dendroctonus pseudotsugae* (Coleoptera: Scolytidae). *Journal of Economic Entomology* 95: 778–781.

For research forest entomologists, forest health specialists, and natural resource managers. The antiaggregation

pheromone 3-methylcyclohex-2-en-1-one (MCH) is highly effective in preventing the infestation of high-risk trees by Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins. Results of this study indicate that MCH dispensers eluting 6 mg/d (3X the current standard rate) and spaced 15 m apart (3X existing standard distance) can effectively prevent Douglas-fir beetle infestations.

Rosso, PH, and EM Hansen. 2003. Predicting Swiss needle cast disease distribution and severity in young Douglas-fir plantations in coastal Oregon. *Phytopathology* 93: 790–798.

For forest pathologists and plantation managers. Swiss needle cast occurrence was surveyed from Astoria to Coos Bay, Oregon, to establish the relationship between disease distribution and environment. The relationship between disease severity and climate, topography, soil, and forest stand characteristics was studied with multiple linear regression and regression tree. Most of the variability in disease severity was explained by fog occurrence, precipitation, temperature, elevation, and slope aspect. A disease prediction map was constructed from the resulting regression model. If summer temperatures are relatively low, disease severity appears to increase with warmer, wetter conditions. The model is suitable for hypothesis testing and for helping in disease management and research.

Seibert, J, and JJ McDonnell. 2002. On the dialog between experimentalist and modeler in catchment hydrology: Use of soft data for multi-criteria model calibration. *Water Resources Research* 38 (11): 23-11–23-14.

For hydrologists, catchment modelers, and forest engineers. The authors suggest a new modeling method in which soft data are utilized through fuzzy measures of model simulation and parameter value acceptability. They developed a three-box lumped conceptual model for the Maimai research catchment in New Zealand. The three-box model fit the parameter values of runoff ($R_{\text{eff}} = 0.93$) very well, but it did not fit other criteria, such as new water contributions to peak runoff. Soft data lowered the R_{eff} values but improved overall performance. Soft data multicriteria calibration reduced the parameter uncertainty by 60% and

increased model performance. The model developed represents more real catchment behavior, even though model efficiencies are lower.

Seibert, J, K Bishop, A Rodhe, and JJ McDonnell. 2003. Groundwater dynamics along a hillslope: A test of the steady state hypothesis. *Water Resources Research* 39(1): 2-1–2-9.

For forest scientists and forest engineers. The authors investigated the usual assumption that the relation between groundwater levels and runoff can be described as a succession of steady-state conditions by studying groundwater level data from two opposing hillslopes along a stream reach in a Swedish till catchment. Groundwater levels closer than 40 m to the stream followed the dynamics of the runoff. Farther away than 40 m, the correlation of groundwater levels and the dynamics of the runoff were low. Groundwater levels at equal distances from the stream showed similar patterns, the correlation increasing with more distance. This indicates that there is an identifiable groundwater pattern modeled, but the steady-state model was not valid for the test site.

Sherlock, MD, JJ McDonnell, DS Curry, and AT Zumbuhl. 2002. Physical controls on septic leachate movement in the unsaturated zone at the hillslope scale. *Hydrological Processes* 16: 2559–2575.

For hydrologists. The authors sought to characterize water flux within the vadose zone, understand the physical controls on the flux, and predict how this ultimately will affect subsurface water quality in a residential leach field in New York State. Unsaturated hydraulic conductivity curves were derived from matric potential measurements. A strong upward flux of soil water occurred between rainstorms. Low matric potentials were rapidly converted to near-saturated and saturated conditions after rainfall began. This led to steep vertical gradients through the near-surface horizons of the hillslope. The lateral hydraulic gradients were typically 10 times smaller than the vertical, and flux through the vadose zone was mostly vertical and short-lived. Soil water remained in the vadose zone for a long time. Water movement through macropores did not occur on this hillslope.

Sherlock, MD, and JJ McDonnell. 2003. A new tool for hillslope hydrologists: Spatially distributed groundwater level and soilwater content measured using electromagnetic induction. *Hydrological Processes* 17: 1965–1977.

For hydrologists. Terrain electrical conductivity measurements (EC) derived from multiple electromagnetic induction (EMI) frequencies were compared with a distributed grid of water-table depth and soil-moisture measurements in a highly instrumented hillslope. EC measurements from a low frequency EMI meter could explain over 80% of the variation in water table depth across the hillslope. EC measurements with a high frequency meter explained over 70% of soil-moisture variance. EMI technology may allow collection of many soil- and groundwater depth measurements with reasonable accuracy.

Skaugset, AE, GH Reeves, and RF Keim. 2002. Landslides, surface erosion, and forest operations in the Oregon Coast Range, pp. 213–241 in *Forest and Stream Management in the Oregon Coast Range*, SD Hobbs, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells, eds. Oregon State University Press, Corvallis.

For hydrologists and forest operations managers. Forest management activities, especially timber harvest, accelerate the natural process of erosion in the forms of landslides from clearcuts and surface erosion and landslides from forest roads. Concern about salmonid species has focused attention on aquatic habitat in streams draining managed forests. The authors describe the physical setting of the Oregon Coast range, discuss landslides and surface erosion in unmanaged and managed Coast Range forests, and treat prevention and mitigation of accelerated erosion in a managed Coast Range forest, with special attention to best management practices (BMPs). They point out that BMPs in recent decades have reduced erosion resulting from forest management. New data indicate that debris flow from harvest units brings large woody debris into streams, improving the aquatic habitat. Developing management strategies that mimic natural timing, quantities, and composition of large woody debris might be a realistic approach to managing debris flows.

Theis, WG, and EM Goheen. 2002. Major forest diseases of the Oregon Coast Range and their management, pp. 191–212 in *Forest and Stream Management in the Oregon Coast Range*, SD Hobbs, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells, eds. Oregon State University Press, Corvallis.

For forest pathologists and forest managers. Although many pathogens occur in coastal forests and are major disturbance agents, only a few appear to exert critical effects on the forest ecosystem or on productivity. The authors discuss the basic biology of and management strategies to deal with several important root diseases, mistletoe, white pine blister rust, Swiss needle cast, and common stem decays. They propose a decision ladder for use in including disease management in management scenarios and suggest several areas in which research is needed.

Thomas, SR, WA Dunstan, B Dell, JM Trappe, and N Malajczuk. 2003. *Pisolithus hypogaeus* sp nov.: A hypogeous representative of the genus *Pisolithus* from western Australia. *Mycotaxon* 87: 405–410

For mycologists. *Pisolithus hypogaeus* is associated with eucalyptus ectomycorrhizal hosts in coastal southwestern Australia. It is the first record of a species in this genus with a hypogeous habit. The authors describe the relationship of this species to others in the genus.

Uhlenbrook, S, J McDonnell, and C Leibundgut. 2003. Preface: Runoff generation and implications for river basin modeling. *Hydrological Processes* 17: 197–198.

For hydrologists and hydrological modelers. The authors introduce an issue of *Hydrological Processes* that consisted of the papers presented at an October 2000 workshop titled *Runoff Generation and Implications for River Basin Modelling*. The workshop aimed to bridge the gap between field-based experimental research and hydrological basin modeling and to help define the key state variables controlling runoff generation from headwater catchments to larger basins. They summarize the questions discussed for process research, modeling studies, and regionalization and

scaling. Some questions were answered, but many challenge the researchers to continue searching.

Vanderbilt, KL, K Lajtha, and FJ Swanson. 2003. Biogeochemistry of unpolluted forested watersheds in the Oregon Cascades: Temporal patterns of precipitation and stream nitrogen fluxes. *Biogeochemistry* 62: 87–117.

For ecologists, hydrologists, and forest scientists. The authors analyzed input and output of organic and inorganic nitrogen (N) in both precipitation and stream water on six watersheds in the central Cascades. Total bulk N deposition averaged 1.6–2.0 kg N/ha/year. Streamwater N export was <1 kg N/ha/year. From greatest to least, dissolved organic N (DON), particulate organic N (PON), $\text{NH}_4\text{-N}$, and $\text{NO}_3\text{-N}$ were the predominant forms of N exported from all watersheds. DON may be related to regional precipitation; total annual stream discharge was a positive predictor of annual DON output in all watersheds. Annual discharge did not universally predict the other forms of N exported. Only DON had consistent seasonal concentration patterns in all watersheds, with its greatest concentration in November–December. Multiple biotic controls on nitrate and ammonium concentrations in streams may obscure temporal flux patterns of dissolved inorganic nitrogen. Using several watersheds from a single climatic zone is important in a study of this sort.

Wallin, KF, TE Kolb, KR Skov, and MR Wagner. 2003. Effects of crown scorch on ponderosa pine resistance to bark beetles in northern Arizona. *Environmental Entomology* 32: 652–661.

For forest entomologists, forest managers, and tree physiologists. A naturally regenerated stand of *Pinus ponderosa* was thinned and prescribed burned, and crown scorch of 40 trees was estimated. Undamaged foliage had a higher net photosynthetic rate in heavily and severely scorched trees than in trees with less scorching, especially in the dry season. Constitutive resin volume was negatively related to intensity of crown scorch in September, although it had not differed among scorch classes in June. Induced resin production, however, decreased with increasing scorch intensity in both months. The proportion of success-

ful colonization by bark beetles (*Ips* spp. and *Dendroctonus* spp.) was low all season. Intensity of crown scorch was generally positively related to colonization attempts in both pheromone and non-pheromone treatments.

- Weiler, M, and F Naef. 2003. Simulating surface and subsurface initiation of macropore flow. *Journal of Hydrology* 273: 139–154.

For hydrologists and modelers. The authors simulated the water flux into macropores at four field sites and examined the role of macropore drainage area (MDA) on macropore flow initiation. Individual macropore MDAs were used to calculate the total relative MDA. Macropore density primarily controlled for the total MDA, and surface microtopography strongly influenced its probability distribution. Most macropores did not receive much water. The simulated probability distribution of subsurface initiation was more symmetrical and less variable than that derived for surface initiation. Because the amount of water supplied to each macropore varies, the percolation depth and transport of solutes in macroporous soils are altered. Models of infiltration in macroporous soils should consider these factors.

- Weiler, M, BL McGlynn, KJ McGuire, and JJ McDonnell. 2003. How does rainfall become runoff? A combined tracer and runoff transfer function approach. *Water Resources Research* 39 (11): 4-1–4-13.

For hydrologists. Hydrographs provide hydrological data that integrate the variety of ways in which terrestrial runoff is generated with upstream routing. In the last 2 decades, tracers have supplanted graphical separation as a more objective way to separate stream-flow components. This paper describes a new method for isotope hydrograph separation, the transfer function hydrograph separation model (TRANSEP), and illustrates its use with data from two rainfalls at a catchment at Maimai, New Zealand.

- Wigington, PJ, SM Griffith, JA Field, JE Baham, WR Horwath, J Owen, JH Davis, SC Rain, and JJ

- Steiner. 2003. Nitrate removal effectiveness of a riparian buffer along a small agricultural stream in Western Oregon. *Journal of Environmental Quality* 32: 162–170.

For agriculturists and riparian managers. To determine the ability of vegetation in riparian zones to reduce nitrate in water, the authors examined two riparian zones with similar soils and hydrology but different vegetation. Drainage water from perennial ryegrass (*Lolium perenne* L.) fields in the Willamette Valley ran into the streams. An uncultivated riparian zone made up of grasses and herbaceous vegetation can reduce $\text{NO}_3\text{-N}$ of shallow ground water significantly. Estimates of shallow ground water flow based on Darcy's law explain that very little of the streamflow can be accounted for in this way. Therefore, the potential for removal of $\text{NO}_3\text{-N}$ was not fully realized. Effective water quality management relies largely on sound agricultural practices.

- Wing, MG, and A Skaugset. 2002. Relationships of channel characteristics, land ownership, and land use patterns to large woody debris in western Oregon streams. *Canadian Journal of Fisheries and Aquatic Sciences* 59: 796–807.

For ecologists, hydrologists and land managers. The authors examined the relationship of channel and aquatic habitat to the abundance of large woody debris (LWD) in 3,703 stream reaches drawn from diverse ownerships, land uses, and land cover types. If all land uses and covers were included, LWD abundance was related to patterns of ownership and land use, but the factors decreased in importance when nonforested land uses were not included. Volume, frequency, and size of LWD decreased as channel size increased in forested streams. Stand age and forest distribution were related primarily to LWD size, rather than volume or abundance. In forested areas, the geomorphology of stream reaches may be the most important factor related to LWD. Land managers may want to concentrate on increasing LWD in larger streams.

Evaluation of Forest Uses, Practices, and Policy

Adams, DM. 2003. Market and resource impacts of a Canadian lumber tariff. *Journal of Forestry* 101(2): 48–52.

For forest economists and forest policy analysts. A recent import tariff on Canadian softwood lumber has found support. Estimates of the traditional market impacts and resource tradeoffs indicate that gross revenue of US lumber producers and private timber sellers will rise, increasing costs to US lumber consumers. Timber harvest will decrease in Canada but increase on private lands in the US. As a result, softwood inventories will decline.

Adams, DM, and GS Latta. 2003. *Private Timber Harvest Potential in Eastern Oregon*. Research Contribution 42, Forest Research Laboratory, Oregon State University, Corvallis.

For forest economists, policy analysts, and forest managers. The authors developed projections of future harvest potentials in eastern Oregon. Even-flow and market-based projections of future harvest potential on industrial lands over the next 50 years are approximately half of average harvests over the past 40 years. For NIPF lands, the even-flow projection is 20% higher than the historical harvest average; the market-based projection indicates potential for a substantial but short-lived increase in near-term harvest. Inventories on industrial lands rise under both projections, while NIPF inventories remain fairly stable. Continued loss of land from NIPF to other owners and uses has limited influence on the market-based NIPF harvest projection until after 2050. A simulated policy of expanded riparian protection zones reduces harvest on both ownerships roughly in proportion to the area removed from the harvestable land base. A simulated requirement to retain 30% more residual volume in partially cut stands reduces harvest by 5% on combined private ownerships and increases total inventory by 13% after 50 years.

Adams, PW. 2002. Taking a stand: SAF position statements. *Western Forester* 47(1): 4.

For members of the Society of American Foresters. Society of American Foresters (SAF) position statements can be a powerful tool. The statements can be developed at the national, state, division, or chapter level. Usually the members vote on a position statement, and, at the national level, the executive committee must approve them by a two-thirds majority. Once a statement is developed and issued, it can be used in newspapers, voter pamphlets, or a variety of other media to communicate the message.

Ahn, S, AJ Plantinga, and RJ Alig. 2002. Determinants of projections of land use in the South Central United States. *Southern Journal of Applied Forestry* 26: 78–84.

For economists and land-use planners. The authors used an econometric land model in examining historical trends and projecting future uses of land for agriculture, forestry, and urbanization. If population increases but stumpage prices do not over the next 50 years, urban and related land uses are expected to increase, primarily because of conversion of private timberland. If both population and stumpage prices increase, both urban/other and private timberland are projected to increase, whereas agricultural lands will decrease.

Alexander, SJ, D Pilz, NS Weber, E Brown, and VA Rockwell. 2002. Mushrooms, trees, and money: Value estimates of commercial mushrooms and timber in the Pacific Northwest. *Environmental Management* 30: 129–141.

For land-use decision makers and forest resource researchers. Four case studies provided much-needed information on the joint production of trees and three species of wild edible mushrooms in different forests of the Pacific Northwest. The values for timber and for

mushrooms are site- and species-specific and range from having the same soil expectation value (SEV) to the timber having a value 200 times higher. Production economic choices for timber and wild mushrooms are influenced by their relative values, which in turn are affected by changes in forest management, yields for mushrooms and trees, and costs.

Bergen, KM, SG Conard, RA Houghton, ES Kasischke, VI Kharuk, ON Krankina, KJ Ranson, HH Shugart, AI Sukhinin, and RF Treyfeld. 2003. NASA and Russian scientists observe land-cover and land-use change and carbon in Russian forests. *Journal of Forestry* 101(4): 34–41.

For land managers, land-use policy makers, and forest resource researchers. Several project teams of the NASA Land-Cover Land-Use Change Program have been working with Russian organizations to quantify and understand past, present, and future land-cover and land-use trends in Russian boreal forests. Results of the research are discussed in four categories: forest dynamics, fire and fire behavior, carbon budgets, and new remote sensing analysis methods. The research has yielded several positive effects, including new collaborations making it possible to further knowledge about the influences of land-cover and land-use changes worldwide.

Bettinger, P, and J Sessions. 2003. Spatial forest planning—To adopt, or not to adopt? *Journal of Forestry* 101(2): 24–29.

For land-use policy decision makers and land managers. Habitat fragmentation, size of harvest units, cumulative effects of management activities, and other forest management issues are prompting a new planning approach focusing on the spatial juxtaposition of forest activities. This approach involves mathematical programming to incorporate all goals into a forest plan. Spatial forest planning is encouraged by factors such as regulatory and voluntary guidelines on the patterns of harvest units and wildlife habitat, the desirability of efficient forestland use in meeting various goals, and the need to coordinate activities across several ownerships in landscape-level plans. It is discouraged by such factors as technological, financial, and

personnel hurdles and insufficient data with which to inform the models.

Bettinger, P, DL Johnson, and KN Johnson. 2003. Spatial forest plan development with ecological and economic goals. *Ecological Modelling* 169: 215–236.

For modelers and forest planners and managers. Desired spatial and temporal future conditions are becoming important factors in current forest planning goals. Using a heuristic technique, the authors developed a spatial forest plan in which habitat for northern spotted owls could be maintained within a certain radius of a nest at the same time that thinning and group selection harvest were used to facilitate development of mid- to late-successional forest conditions. Restraining nesting, roosting, and foraging (NRF) habitat levels to a minimum of 40% decreased net present value by nearly 24% and increased average NRF value by 11% over 100 years. Constraining habitat levels to a minimum of 80% decreased net present value by nearly 70% and increased average NRF by 29%. This planning process allows examination of management options from both economic and ecological viewpoints.

Bliss, JC. 2003. Sustaining family forests in rural landscapes: Rationale, challenges, and an illustration from Oregon, U.S.A. *Small-scale Forest Economics, Management, and Policy* 1(2): 1–8.

For natural resource professionals. This article synthesizes research on the economic, social, and ecological roles of family forestlands and makes an argument for sustaining a mixed-ownership landscape.

Bliss, JC, and AJ Martin. 2003. Nonindustrial private forests, pp. 221–240 in *Introduction to Forest Ecosystem Science and Management*, 3rd ed, R Young and R Giese, eds. John Wiley & Sons, Inc., Hoboken, NJ.

For forestry students. This chapter in an introductory college text surveys the field of nonindustrial private forestry.

Davidson, RA, H Liu, IK Sarpong, P Sparks, and DV Rosowsky. 2003. Electric power distribution sys-

tem performance in Carolina hurricanes. *Natural Hazards Review* 4: 36–45.

For power company researchers and engineers. The authors investigated power distribution systems in North and South Carolina during five recent hurricanes. Maximum gust, wind speed, rainfall, and land cover type were all investigated for their relationship to power disruption. The results show the effect of the storm on equipment, how many outages occurred, and the number of customers affected. Also, the geographic distribution, duration, and causes of outages are explored.

Edwards, KK, and JC Bliss. 2003. It's a neighborhood now: Practicing forestry at the urban fringe. *Journal of Forestry* 101(3): 6–11.

For forestry professionals. A case study of one watershed at the urban fringe is presented with lessons drawn for forest managers at the urban-wildland interface. Stakeholders did not prefer residential development to actively managed forests. The standards for communications and management that residents held were higher for corporate and public forest managers than for individual private managers. Active opposition to forest management was reduced when management intentions were effectively communicated and neighbors' concerns were consistently acknowledged.

Elwood, NE, EN Hansen, and P Oester. 2003. Management plans and Oregon's NIPF owners: A survey of attitudes and practices. *Western Journal of Applied Forestry* 18: 127–132.

For forest resource researchers and forestry policy analysts. The authors surveyed nonindustrial private forest (NIPF) owners in Oregon to determine their demographics and their attitudes toward management planning. Respondents tended to be older and owned an average of 208 forested acres on the west side of the Cascades and 675 forested acres on the east side. Less than a third of owners had management plans, and respondents never cited timber production as the most important ownership objective. Perceived obstacles to developing a plan highlight potential educational opportunities.

Emmingham, WH. 2002. Development of ecosystem management in the Pacific Northwest. *Plant Biosystems* 136: 167–175.

For ecosystem modelers and forest resource researchers. Ecosystem management influences forestry practices differently on federal and private lands. In western Oregon, most federal land is reserved for noncommodity use. Federal forest managers manage stands to enhance structural complexity and species diversity and manage landscapes to imitate natural disturbance. Large industrial owners focus on timber production within legal limits. Some have implemented Habitat Conservation Plans that increase landscape planning and diversity. Managers of small private forests are more likely to define sustainable forestry in terms of balancing ecological requirements defined by laws or requirement for green certification against their aesthetic preferences and need to derive income. At a landscape level, these differences are sometimes complementary, providing for different wildlife species.

Emmingham, WH. 2002. Status of uneven-aged management in the Pacific Northwest, USA. *Forestry* 75: 433–436.

For forest managers and forest ecosystem analysts. Classical uneven-aged methods for forest management developed in Europe have not been widely adopted in the Pacific Northwest. Instead, foresters are implementing ecosystem management, including practices such as green tree retention, variable retention thinning, heavy thinning with underplanting, and protection of riparian buffers. Managed uneven-aged forests will not necessarily develop from these practices. European experience with uneven-aged management would benefit forestry in the Pacific Northwest if managers start with tested basic principles and modify practices based on research and adaptive management.

Emmingham, WL, P Oester, M Bennett, F Kukulka, K Conrad, and A Michel. 2002. Comparing short-term financial aspects of four management options in Oregon: implications for uneven-aged management. *Forestry* 75: 489–494.

For forest owners and general public. Four theoretical management scenarios were set up to compare the projected 10-year value of timber from the perspective of the typical private family forest owner: hold for 10 years, thin for even-age, partial cut for uneven-age, and clearcut now. The hold option consistently gave the highest net asset value (NAV) for timber and land. The thin option was within 2% less, the partial-cut option averaged about 3% less, and the clearcut option ranged from 8% to 17% less than holding. Pine stands of eastern Oregon showed similar trends, but all other options were within ~6% of the hold option.

Foster, D, F Swanson, J Aber, I Burkner, N Brokaw, D Tilman, and A Knapp. 2003. The importance of land-use legacies to ecology and conservation. *BioScience* 53: 77.

For ecologists, conservationists, and natural resource policy makers. Even after a given land use has ceased, it may continue to influence ecosystem structure and function for decades, or even much longer. Recognizing these land-use legacies increases our understanding of modern conditions and reduces mistakes in planning for the future. The authors consider diverse ecological phenomena and examine terrestrial and aquatic ecosystems in order to demonstrate how widespread and important historical land-use influences are in environmental science and management.

Helvoigt, TL, DM Adams, and AL Ayre. 2003. Employment transitions in Oregon's wood products sector during the 1990s. *Journal of Forestry* 101(4): 42–46.

For forest industry professionals, employment analysts, and economists. Only 51% of workers who lost jobs in the wood products sector in Oregon during the 1990s were employed in Oregon by 1998. Almost half of those who stayed switched to the service or wholesale-retail trade sectors. As a group, these workers took a pay cut, and their median wage was less than the median wage for all Oregon workers. The 30% who found employment in Oregon's northwestern region made 29% more than those who stayed in the southwestern or eastern portions of the state.

Hobbs, SD, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells. 2002. Moving toward sustainability, pp. 242–259 in *Forest and Stream Management in the Oregon Coast Range*, SD Hobbs, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells, eds. Oregon State University Press, Corvallis.

For resource managers, specialists, technicians, and policymakers. Factors affecting sustainable management of forest and stream resources in the Oregon Coast Range are discussed, including integrated resource management, sustainability, and biological diversity; changing realities in the Oregon Coast Range; and challenges facing policymakers.

Huppert, DD, RL Johnson, J Leahy, and K Bell. 2003. Interactions between human communities and estuaries in the Pacific Northwest: Trends and implication for management. *Estuaries* 26: 994–1009.

For social scientists, land managers, policy makers, demographers, and economists. The authors examined the demographics and economies of communities crucial to the management of estuaries, as well as public perceptions, attitudes, and values relating to estuarine ecosystems. They found that such communities are growing more slowly and have an older population than the rest of the states in which they are located. Tourism, recreation, and retirement are increasingly important relative to the extractive natural resource industries that traditionally have provided the basis of the local economies. The authors conclude that public attitudes and values in the communities in the future will favor stronger environmental protection.

Johnson, RL, and G Stankey. 2002. Forest and stream management in the Oregon Coast Range: Socioeconomic and policy interactions, pp. 7–30 in *Forest and Stream Management in the Oregon Coast Range*, SD Hobbs, JP Hayes, RL Johnson, GH Reeves, TA Spies, JC Tappeiner II, and GE Wells, eds. Oregon State University Press, Corvallis.

For forest managers, forest economists, and social scientists. The sociopolitical landscape of the Pacific Northwest is changing, and the changes are expected

to deeply impact forest management on the Oregon coast in the current century. The authors discuss three key dimensions of these changes: how forest resources are conceived of, social acceptability of forest management practices, and the relationships between political power and organizational authority.

Joslin, L. 2003. Wilderness information and education in the Three Sisters Wilderness. *International Journal of Wilderness* 9(1): 28–29.

For wilderness managers and wilderness management students. To assess how RE Manning's emerging principles of wilderness information and education reflect in the work of the Central Oregon Wilderness Education Partnership (COWEP) through the Deschutes National Forest, two institutions of higher education, individual citizen volunteers, and student interns promote wilderness experience and resource protection in the Three Sisters Wilderness of Oregon.

Juslin, H, and E Hansen. 2003. *Strategic Marketing in the Global Forest Industries, Updated Edition*, Authors Academic Press, Corvallis, Oregon.

For forest marketing teachers, professionals, and students. This textbook focuses on the marketing of forest products. To facilitate the move from the theoretical to the practical, a unique planning and modeling approach is taken. Specific illustrations from companies are used to illustrate key concepts, and there is an emphasis on marketing globally in the forest industry.

Karna, J, E Hansen, and H Juslin. 2002. Environmental activity and forest certification in marketing of forest products—a case study in Europe. *Silva Fennica* 37: 253–267.

For forest products marketers. The authors surveyed forest industries and their industrial customers in Finland, Sweden, Germany, and England with respect to environmental emphasis and the role of timber certification in marketing. Most companies have begun to include environmental issues in their marketing decisions and see forest certification as necessary in marketing forest products. The environmental activity of the companies had more explanatory power

than other factors, such as country or industry sector, in the importance of forest certification in marketing.

Karna, J, E Hansen, and H Juslin. 2003. Social responsibility in environmental marketing planning. *European Journal of Marketing* 37: 848–872.

For forest products marketers and planners. The authors describe environmental marketing and discuss how companies in Europe incorporate social responsibility in their environmental marketing planning. Corporate social responsibility is defined and the value-based dimensions are explored.

Kline, J, BJ Butler, and RJ Alig. 2002. Tree planting in the south: What does the future hold? *Southern Journal of Applied Forestry* 26: 99–107.

For natural resource analyst and forest sector researchers. The authors developed models of historical tree planting in the southern United States and used the models to compare historical with recent planting trends and to project tree planting 50 years in the future. Industrial tree planting was projected to rise gradually with anticipated increasing industrial harvest, whereas nonindustrial private tree planting was projected to decline gradually in view of rising planting costs and less public assistance for tree planting.

Kline, JD, DL Azuma, and A Moses. 2003. Modeling the spatially dynamic distribution of humans in the Oregon (USA) Coast Range. *Landscape Ecology* 18: 347–361.

For human ecologists, sociologists, land managers, and policymakers. Delineating discrete land use categories when analyzing land use change may be not be appropriate when the social, economic, and ecological processes being analyzed respond to humans living in the area. The authors characterize how humans are distributed and the dynamics of that distribution in the forest landscape of the Coast Range in western Oregon. They develop an empirical model describing the spatial distribution and rate of change in historic building densities and use it to project changes in building densities and spatial distribution of buildings. The resulting maps are used as inputs into a

landscape-level analysis of social, economic, and ecological processes.

- Lach, D, P List, B Steel, and B Shindler. 2003. Advocacy and credibility of ecological scientists in resource decisionmaking: A regional study. *BioScience* 53: 170–178.

For all interested in the conduct and communication of science. To explore the extent to which scientists should act as policy advocates, the authors surveyed four groups: scientists, resource managers, representatives of interest groups, and members of the involved public. All groups except the scientists thought an integrative role for scientists was the best. Scientists preferred an interpretive role. Scientists were concerned that more active involvement in decision making could hurt their credibility, especially among their peers. The other groups considered a scientist credible if he or she delivered practical results that they could use.

- Laliberte, AS, and WJ Ripple. 2003. Wildlife encounters by Lewis and Clark: A spatial analysis of interactions between Native Americans and wildlife. *Bioscience* 53: 994–1003.

For conservation and restoration biologists and environmental historians. The authors used the entries in the journals of the Lewis and Clark expedition to assess the influence of humans on wildlife distribution and abundance before Euro-American settlement. Species diversity was lower and large mammals were less abundant in areas with denser human population. Overhunting before Euro-American settlement, especially as facilitated by introduction of horses, may explain why some species present in the archeological record are absent in the historic. Humans may influence wildlife considerably even when population densities are relatively low. This influence is often underestimated when trying to restore conditions to the state before Euro-American settlement.

- Lichtenstein, ME, and CA Montgomery. 2003. Biodiversity and timber in the Coast Range of Oregon: Inside the production possibility frontier. *Land Economics* 79: 56–73.

For researchers and analysts in forest and resource economics, conservation biology, and forest policy. Tradeoffs between biodiversity and timber production are modeled in three watersheds in the Coast Range of Oregon. Cost-effective management is compared to current management under the current configuration of landowners and policies. The first increment in biodiversity above maximum timber value level is the most costly. However, biodiversity protection can be increased at relatively little loss of timber production over much of the feasible range for biodiversity. Current management strategies appeared to be very inefficient.

- Marshall, DD, GP Johnson, and DW Hann. 2003. Crown profile equations for stand-grown western hemlock trees in northwestern Oregon. *Canadian Journal of Forest Research* 33: 2059–2066.

For silviculturists, growth-and-yield modelers, and forest mensurationists. The authors developed crown profile equations for western hemlock in northwest Oregon. Their model divided the crown into upper and lower portions where the crown width was largest. When LCW was known, the model explained about 86% of variation in crown width, but when LCE was predicted from a model the model explained only 66%. The model is adjustable for other populations of western hemlock.

- McCune, B, SD Berryman, JH Cissel, and AI Gitelman. 2003. Use of a smoother to forecast occurrence of epiphytic lichens under alternative forest management plans. *Ecological Applications* 13: 1110–1123.

For forest managers, lichenologists, and modelers. The authors forecast how frequently epiphytic lichen species would appear in a forest landscape, using two habitat model types: logistic regression and an ecological neighborhood model, SpOcc (Species Occurrence Modeler). They modeled two plans for the Blue River watershed in the Cascade Range of Oregon, one a literal application of standard prescriptions in the Northwest Forest Plan, and the other simulating natural disturbance regimes more closely. Both models successfully predicted occurrence of *Lobaria*

oregana on the basis of elevation and forest structural class. *Lobaria* was infrequent at elevations about 1000 m and in young, even-aged stands, but was very similar in frequency in most of the other structural classes. Differences in elevation and clearcutting affected lichen occurrence much more than retention levels or, for mature and old-growth stands, structural class. The strongest models gave similar results for 20 lichen species. The authors recommend use of the SpOcc model, which has several advantages.

McIver, JD, PW Adams, JA Doyal, ES Drews, BR Hartsough, LD Kellogg, CG Niwa, R Ottmar, R Peck, M Taratoot, T Torgersen, and A Youngblood. 2003. Environmental effects and economics of mechanized logging for fuel reduction in northeastern Oregon mixed-conifer stands. *Western Journal of Applied Forestry* 18: 238–249.

For forest managers, logging planners, fire reduction specialists, economists, and ecologists. Two log extraction systems were used in mixed conifer stands in eastern Oregon to reduce fuel while protecting residual large-diameter western larch, Engelmann spruce, Douglas-fir and lodgepole pine. The systems used a single-grip harvester with either a forwarder or a skyline yarding system. Reduction in fuel, stem density, and basal area were similar for the two systems and lowered fire risk. Thirty-two percent of seedlings and trees examined showed damage after harvest, with more damage to residual large trees. Light displacement of soil, which occurred in 5–43% of the harvested area, resulted in a short-term increase in soil microarthropods. Compaction, which occurred on 1.4% of the soil area, decreased abundance of litter microarthropods for at least 1 year. Revenue was similar in the two systems, but skyline yarding costs were much higher.

Molina, R, D McKenzie, R Leshner, J Ford, J Alegria, and R Cutler. 2003. Strategic survey framework for the Northwest Forest Plan survey and manage program. General Technical Report PNW-GTR-573, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For forest planners, managers, and policy analysts. The authors describe a process for assessing informa-

tion needs for all Northwest Forest Plan survey and manage species, setting up and conducting strategic surveys, and analyzing the information so obtained for use in the Plan annual species review and in adaptive management. The steps outlined provide guidance for developing priority information, evaluating and selecting approaches to information gathering, implementing annual work plans, and managing, reporting, and transferring information to the annual species review.

Montgomery, CA. 2002. Compatibility of timber and conservation: Tracing the tradeoff frontier, pp. 225–232 in *Congruent Management of Multiple Resources: Proceedings from the Wood Compatibility Initiative Workshop*, AC Johnson, RW Haynes, RA Monserud, eds. General Technical Report PNW-GTR-563, USDA Forest Service, Pacific Northwest Research Station, Portland OR.

For researchers and analysts in forest and resource economics, conservation biology, and forest policy. The economic approach to modeling compatibility of multiple forest land uses is described. Two case studies are used to illustrate the approach.

Montgomery, CA. 2002. Ranking the benefits of biodiversity: An exploration of relative value. *Journal of Environmental Management* 65: 313–326.

For researchers and analysts in forest and resource economics, conservation biology, and forest policy. A survey to explore public attitudes about the multi-dimensional benefits associated with biodiversity was administered. A sample of the US population were asked to rank hypothetical species presented in choice sets of three species. Ecological benefits outranked aesthetic, symbolic, recreational, and commodity-related benefits as a reason to protect wildlife species from extinction.

Morrell, PD, and JJ Morrell. 2003. Cognitive impact of a grade school field trip. *Journal of Elementary Science Education* 15: 27–36.

For elementary educators. Oregon Wood Magic is designed to provide accurate information about forestry, and especially about wood products, to third- and

fourth-graders. The program combines classroom lesson plans with a 3-hour field trip to the Wood Science and Engineering department at Oregon State University. Student participants were tested before, within a week after, and 3 months after their field trip to find out how much they learned and retained. Their teachers were asked to rate the usefulness of the lesson plans and the educational value and appropriateness of the activities and demonstrations for the students. Students acquired significant new information and retained it even after 3 months. Almost all teachers used at least some lesson plans, and teachers rated the field trip activities very highly.

Reichenbach, M, and V Simon-Brown. 2002. Linking strategic thinking and project planning: The Oregon State University Extension Forestry experience. *Journal of Extension* 40(4): pp. n.a. Available at (<http://www.joe.org/joe/2002august/iw1.shtml>), last accessed 2/25/05.

For forestry educators and extension foresters. Oregon State University's Extension foresters have used a group-project planning process since the late 1980s. In 1998, the group-project planning process was linked to a new strategic thinking process. This enhancement allowed projects to be categorized, prioritized, and implemented based on estimates of time needed to complete them and time committed to each goal. Foresters gave the strategic planning process a 6.76 on a scale of 1–10, with individual parts scoring higher. The process links projects to strategic goals; allows regional, national, and international issues and trends to influence group projects selected for implementation; improves working relationships; and allows new ideas to emerge.

Rickenbach, MG, and AS Reed. 2002. Cross-boundary cooperation in a watershed context: The sentiments of private forest landowners. *Environmental Management* 30: 584–594.

For sociologists, psychologists, and watershed managers. Fifty qualitative, in-depth interviews were conducted to determine why nonindustrial private forest landowners do or do not participate in watershed councils, Oregon's local, voluntary, collaborative forums created to encourage cross-boundary management. Those

deciding to participate in the councils especially cited stewardship ethic, property rights amid uncertainty, and action orientation. These results relate to social-psychological reasons for cooperation: perceived consensus, group identity, and legitimacy of authority. The findings are helpful where cross-boundary coordination and management are goals.

Schillinger, RR, DM Adams, GS Latta, and AK Van Nalts. 2003. An analysis of future private timber supply potential in western Oregon. *Western Journal of Applied Forestry* 18: 166–174.

For forest managers and economists. Using volume-flow and market-based models, the authors projected potential timber supply in western Oregon. Their results indicate that forest industry owners in the area could continue to cut at recent levels, and levels of harvest by nonindustrial private forest (NIPF) owners could rise to near historical peaks. Industrial management would tend to plantations with thinning and early density control, whereas NIPF management would continue to rely on natural regeneration and increase commercial thinning. Extending the minimum age of clearcut harvest would cause prices to rise sharply and harvest to decline in the near term, but depress prices and increase harvest in the long term for both types of owners. Owners would lose both income and land value because of lower prices and restrictions on harvest timing.

Sessions, J, R Buckman, M Newton, and J Hamann. 2003. *The Biscuit Fire: Management Options for Forest Regeneration, Fire and Insect Risk Reduction and Timber Salvage*. College of Forestry, Oregon State University, Corvallis.

For forest managers, economists, and ecologists. At the request of the Douglas County Board of Commissioners, the authors examined post-fire restoration considerations for the more than 400,000 acres burned by the Biscuit fire in southern Oregon. They examined forest regeneration, fire and insect reduction, and timber salvage with respect to the effects of 1-year, 3-year, and 5-year delays in active management. They conclude that delay will increase risk of fire and insect damage; adversely affect riparian habitat, habitat suitable for wildlife that depend on

old growth, and conditions suitable for conifer regeneration; and result in a rapid decline in economic value of fire-killed timber.

Shelby, B, J Thompson, M Brunson, and R Johnson. 2003. Changes in scenic quality after harvest—A decade of ratings for six silviculture treatments. *Journal of Forestry* 101(2): 30–35.

For forest engineers and silviculturists. The authors examined the scenic quality of six forested sites for 11 years. Five forests had been cut in different ways; the sixth was an old-growth forest. Average ratings over time were examined with regression analysis. At the beginning of the study, there was a large variation of scenic quality, but at the end of the study all the forests were closer in rating. Scenic quality increased over the 10 years in all except the patch-cut forest.

Shindler, B, and E Toman. 2003. Fuel reduction strategies in forest communities: A longitudinal analysis of public support. *Journal of Forestry* 101(6): 8–15.

For public relations officers, policy makers, and fire managers. The authors surveyed the same people in 1996 and 2000 regarding their attitudes about fire management programs on federal lands in eastern Oregon and Washington. They found three major changes over the four years: more people considered smoke a problem; citizens considered USDA Forest Service information programs less reliable than other sources; and the relationship between the Forest Service and local residents apparently had deteriorated. Those responding continued to be in favor of prescribed fire and mechanized thinning to reduce fuel in local forests.

Simon-Brown, V. 2002. Choosing your group's structure, mission, and goals, pp. 17–29 in *National Coastal Ecosystem Restoration Manual*, S Ridlington, ed. ORESU-H-02-002, Sea Grant Publications, Oregon State University, Corvallis.

For forestry educators, watershed councils, and general public. A successful group has clear organizational structure, roles, responsibilities, mission, and goals. A group should begin by acknowledging and evaluat-

ing what they already have. The author discusses six typical organization structures, from the formal to the very informal. Vision expresses the ideal future; mission is the responsibilities of the organization; goals are specific straightforward statements of expectations. Each member of a group has distinct roles and responsibilities, which are divided into content and process roles. A successful group will discuss its hurdles and recognize its achievements.

Simon-Brown, V. 2002. Effective meetings management, pp. 31–43 in *National Coastal Ecosystem Restoration Manual*, S Ridlington, ed. ORESU-H-02-002, Sea Grant Publications, Oregon State University, Corvallis.

For forestry educators, meeting facilitators, and general public. This chapter highlights the crucial pieces necessary to conduct effective meetings, especially in a public environment, where tensions can sometimes be high. Meetings must be fair, open, and honest—the fair-open-honest triangle. Eleven specific ways to improve meetings focus on good organization, prior agreement on ground rules, sensitivity to others, and good record-keeping. In an effective meeting, people have clear roles with specific responsibilities. One effective idea that helps to document agreements and keep people focused is wall notes.

Simon-Brown, V, FD Conway, and P Corcoran. 2002. Process pitfalls: It's not the science, it's the people! *Quarterly Newsletter of Association of Leadership Educators* 11(4): 6–10.

For watershed council members, leadership educators, and general public. Watershed councils are very important to riparian restoration, but they have an inherently difficult design. The authors argue that this design is not a flaw. The challenge is to work through important issues. Several problems that have been encountered are described and some possible solutions presented. Members should make sure decision-making processes are stated clearly in writing. The members must be able to evaluate the group in an open environment. Some concepts must be defined ahead of time, such as consensus. Conflict must be constructive and attack the problem, not the people. Success occurs when people can work together effectively.

Simon-Brown, V, B Withrow-Robinson, M Engle, S Reed, and S Broussard. 2003. Art as catalyst for conversation. *Women in Natural Resources* 24(1): 25–30.

For forest policy makers, forestry educators, and forest managers. The authors developed an annual exhibition titled “Seeing the Forest: Art about Forests & Forestry” to connect with sectors of the public that traditionally have not been reached by extension foresters. The program was fundamentally educational and sought to engage the public in dialogue. All types of art have been included in the shows, and the viewer feedback is as varied as the art itself. Over three-quarters of the viewers surveyed said the show increased their understanding of the complexity of forest issues.

Spies, TA and KN Johnson. 2003. The importance of scale in assessing the compatibility of forest commodities and biodiversity, pp. 211–235 in *Compatible Forest Management*, RA Monserud, RW Haynes, and AD Johnson, eds. Kluwer, Dordrecht, The Netherlands.

For ecologists, economists, and forest planners and managers. Scale affects how compatibility of biodiversity and commodities are measured and perceived. The authors identify major components of scale and discuss how scale affects how ecological condition is perceived. They also look at how small-scale management actions scale up to regions with respect to timber production and biodiversity.

Stanfield, BJ, JC Bliss, and TA Spies. 2002. Land ownership and landscape structure: A spatial analysis of sixty-six Oregon Coast Range watersheds. *Landscape Ecology* 17: 685–697.

For landscape ecologists. This paper explores relationships between ownership diversity and forest habitat diversity in 66 watersheds. As land ownership became increasingly diverse, so did forest cover. Larger land ownership patches meant larger forest patches. As connectivity of land ownership increased, so did connectivity of forest cover. In the watersheds studied, between 29% and 40% of forest cover structure variability could be explained by land ownership structure. The USDA Forest Service and the USDI

Bureau of Land Management were associated with mature forest cover, and private industry most often had young forest cover. Nonindustrial private forest owners had many different types of cover.

Stankey, GH. 2003. Adaptive management at the regional scale: breakthrough innovation or mission impossible? A report on an American experience, pp. 159–177 in *Proceedings of the 2002 Fenner Conference on the Environment: Agriculture for the Australian Environment*, BP Wilson and A Curtis, eds. Johnstone Centre, Charles Sturt University, Albury, Australia.

For forest managers. The 1993 Northwest Forest Plan established 10 adaptive management areas. The long-term strategy for their management recognized that experience and knowledge gained over time would challenge the assumptions that underlay the establishment of the areas. The author presents a literature review, interviews with program administrators and university cooperators, and reviews of plans, proposals, and policy papers associated with the adaptive management areas.

Stankey, GH, BT Bormann, C Ryan, B Shindler, V Sturtevant, RN Clark, and C Philpot. 2003. Adaptive management and the Northwest Forest Plan—Rhetoric and reality. *Journal of Forestry* 101(1): 40–46.

For forest policy analysts. Adaptive management should turn management policies into a source of learning that can improve future actions. For the most part, implementing adaptive management has failed in the Northwest Forest Plan. Lack of leadership, increasing workloads and declining resources that restrict learning-based approaches, and institutional and regulatory environments that prevent innovation are some of the obstacles to success. The authors suggest that now is the time to revitalize efforts to make adaptive management the central strategy of the Northwest Forest Plan.

Walstad, JD, MD Reed, PS Doescher, JB Kauffman, RF Miller, BA Shindler, and JC Tappeiner. 2003. Distance education—A new course in wildland fire ecology. *Journal of Forestry* 101(7): 16–20.

For natural resource and distance-learning educators. The authors describe their experience in developing an interdisciplinary course on wildland fire ecology, to be offered by distance education. They conclude that specialists in media production and web-page development are critical to the success of such a project, which may require \$100,000 or more to develop. They recommend testing the product with a live student audience. In spite of the challenges, such an approach to college-level education holds a great deal of promise and can most likely be financially feasible.

Wing, MG, and P Bettinger. 2003. An updated primer on a powerful management tool. *Journal of Forestry* 101(4): 4–8.

For forest and natural resource managers and organizations. Geographic information systems (GIS) have had a great effect on forest and natural resource organizations because they increase mapping and analytical capabilities, are affordable, and are easily accessible.

The authors explain how GIS developed and look at the challenges and opportunities that GIS use is facing today. Some of the issues are the collection of data and its accuracy, structure of data, personnel, legal issues, and certifying of users.

Withrow-Robinson, B, S Broussard, V Simon-Brown, M Engle, and AS Reed. 2002. Seeing the forest: Art about forests and forestry. *Journal of Forestry* 100(8): 8–14.

For forestry educators and interested public. Forestry comprises many complex related issues that tend to be oversimplified by the media and public. These extension foresters developed a traveling art show to communicate with new audiences and stimulate dialogue about these issues. The paintings, photography, and other art media introduced some science and policy issues, increased viewers' awareness of forestry, challenged their beliefs, and stimulated consideration of other points of view.

Wood Processing and Product Performance

Bermek, H, K Li, and K-EL Eriksson. 2002. Studies on inactivation and stabilization of manganese peroxidase from *Trametes versicolor*. *Progress in Biotechnology* 21: 141–149.

For researchers in forest products and pulp and paper. High concentrations of H_2O_2 cause inactivation of manganese peroxidase (MnP). A method for stabilization of MnP used for pulp bleaching in the presence of high concentrations of H_2O_2 has been developed. Formation of the inactive form of MnP (Compound III) was shown to be the major reason for the inactivation in which hydroxyl free radicals or superoxide anion radicals are not involved. In addition, 1-hydroxybenzotriazole, 2,2,6,6-tetramethyl-1-piperidinyloxy free radical, violuric acid, 3-hydroxy-1,2,3-benzotriazin-4-(3H)-one and chlorpromazine stabilized MnP. The stabilizing effect by 1-hydroxybenzotriazole is due to the conversion of the inactive Compound III to the native enzyme.

Bermek, H, K Li, and K-EL Eriksson. 2002. Studies on mediators of manganese peroxidase for bleaching of wood pulps. *Bioresource Technology* 85: 249–252.

For researchers in forest products and pulp and paper. In order to enhance the bleaching effect of manganese peroxidase (MnP), unsaturated fatty acids, thiol-containing compounds, and various other organic compounds were applied in pulp bleaching experiments with MnP. Thiol-containing compounds did not improve the pulp bleaching effect by MnP. Some unsaturated fatty acids, linoleic acid, and linolenic acid provided a better pulp bleaching effect than did Tween 80. The correlation between the number of C=C bonds in a fatty acid and its pulp bleaching effect was also investigated. The MnP pulp bleaching capability depended on the carboxylic acid used. A combination of Tween 80 and a carboxylic acid resulted in higher pulp brightness than that obtained with Tween 80 alone. A laccase mediator, 3-hydroxy-

1,2,3-benzotriazin-4(3H)-one, could also enhance the MnP pulp bleaching effect.

Boston, K, and G Murphy. 2003. Value recovery from two mechanized bucking operations in the southeastern United States. *Southern Journal of Applied Forestry* 27: 259–263.

For logging managers. The optimal recovered value of two mechanized bucking operations, computed by an individual-stem log optimization program, was compared with actual recovered value. In one operation, actual value recovery was 95% of optimal; most of the loss was attributable to loss of potential saw-log volume resulting from faulty calibration of the machine. In the other operation, only 58% of optimal value was recovered, due mainly to poor length measurement. Logs were cut too long in the first operation and too short in the second. Monitoring mechanized bucking operations with low-cost quality control methods should help reduce value lost from inconsistent measurements.

Bouffier, LA, BL Gartner, and JC Domec. 2003. Wood density and hydraulic properties of ponderosa pine from the Willamette Valley vs. the Cascade Mountains. *Wood and Fiber Science* 35: 217–233.

For silviculturists, ecologists, and forest and wood scientists. The authors compared ponderosa pine (*Pinus ponderosa*) from 30 to 83 years old to determine differences in wood quality. Four sites were in the Willamette Valley (WV) and four in the eastern Cascade Mountains (CM). At one of each site type, they studied the differences in behavior of the wood for water transport. The WV trees had denser total wood, earlywood, and latewood between rings 27 and 31 and as distance from the pith increased, but did not differ from CM trees in latewood proportion or mean growth ring width. CM trees had less dense total wood and latewood with increasing ring width; earlywood density did not change. Trees grown from a CM seed

source but planted in the WV resembled a WV tree after the first few rings. Unlike the CM trees, the WV did not decrease in k_s from outer to inner sapwood. At an applied air pressure of 3.0 MPa, the WV trees lost 19% of their k_s and the CM trees lost 32%. At 4.0 MPa, the CM trees lost more relative water content. Specific conductivity indicated that the WV race is better adapted to drought.

- Bowers, S. 2003. Dichotomous keys for scaling and grading merchantable quality sawlogs. *Western Journal of Applied Forestry* 18: 250–258.

For log scalers and graders. The author developed, documented, and field-tested a simplified version of the Westside Grading Guidelines, as published in the Official Rules Handbook by the Northwest Log Rules Advisory Group. The study included two dichotomous keys: a four-step dichotomous key to determine merchantable vs. nonmerchantable logs and an individual seven-step dichotomous log-grading key. Results were compared with certified scalers. Participants in the study measured log length correctly 99% of time. They recorded scaling diameters correctly at an 89% rate and merchantability and log grade at 98% and 97%, respectively.

- Chai, Z, KJ Fridley, MO Hunt, and DV Rosowsky. 2002. Creep and creep-recovery models for wood under high stress levels. *Wood and Fiber Science* 34: 425–433.

For wood scientists and wood engineers. Small clear southern pine specimens were loaded under third-point bending, bent to a stress level between 69% and 91% of the predicted static strength for 34 hours, and allowed to recover for 1 hour. The authors studied the resulting deflection vs. time behavior. Modified power law functions provide the best fit to both primary and secondary experimental data. The viscoelastic behavior of wood under high stress levels can be modeled using this method.

- Chen, H, R Rhatigan, and JJ Morrell. 2003. A rapid method for fluoride analysis of treated wood. *Forest Products Journal* 53(5): 43–45.

For wood products scientists and manufacturers. Analyzing fluoride in wood by extraction, rather than ash-

ing, was evaluated with Douglas-fir heartwood and ponderosa pine sapwood treated with various levels of fluoride. Ashing limits the typical laboratory to only eight samples per day. Extraction underestimated fluoride levels slightly but required less time, allowing analysis of many more samples.

- Dean, TJ, SD Roberts, DW Gilmore, DA Maguire, JN Long, KL O'Hara, and RS Seymour. 2002. An evaluation of the uniform stress hypothesis on stem geometry in selected North American conifers. *Trees—Structure and Function* 16: 559–568.

For those interested in wood properties and stem structure. The authors evaluated the uniform stress hypothesis of stem formation in nine species of conifer by using regression analysis to compare stem taper to the stem taper expected if stems distribute stress uniformly during development. Their results suggest that bending curvature is regulated somewhat by adjustments in cross sectional area and that stems taper to maintain a uniform bending curvature. In addition, stem diameter can be predicted from the bending moment when the modulus of elasticity is relatively constant.

- Eiden, C, RJ Leichti, and TH Miller. 2003. Nonlinear dynamic analysis of heavy timber structures including passive damping devices, p. 44 in *Biographies & Abstracts, Forest Products Society 57th Annual Meeting, June 22–25, 2003, Bellevue WA*.

For wood products manufacturers and researchers. This computational study summarizes lateral forces and displacements when friction dampers are used in timber frames exposed to seismic ground motion. Some of the study variables included connection rigidity and bracing alternatives. Four different structures with different connection strategies were examined. Analyzing the results involved three steps: analyzing without damping effects; evaluating with only semi-rigid connections, then with rigid connections, and then with rigid connections and dampers; and analyzing with semi-rigid connections and damping devices together in the same model.

- Fell, D, EN Hansen, and J Punches. 2002. Segmenting single-family home builders on a measure of innovativeness. *Forest Products Journal* 52(6): 28–34.

For forest products managers and general public interested in forest products and construction. There was explosive growth in popularity of engineered wood in the 1990s, even though these products had been on the market long before. Two hundred single-family homebuilders in Washington, Oregon, and California were surveyed regarding their use of nine innovative building products. The most innovative builders tended to be larger firms building high-end homes.

Fell, DR, EN Hansen, and BW Becker. 2003. Measuring innovativeness for the adoption of industrial products. *Industrial Marketing Management* 32: 347–353.

For forest industry professionals and market analysts. There are two traditional methods for measuring firm innovativeness in industrial markets. One bases innovativeness on the time in which a single product is adopted. The other measures the usage of multiple products at a single point in time. Both the traditional measures fail to capture the time and the degree of adoption. The authors propose a new innovativeness measure. The new measure is a hybrid of the other two measures and captures what the other methods failed to capture.

Freitag, CM, and JJ Morrell. 2002. Effect of glycol on movement of borate from fused borate rods. *Forest Products Journal* 52(6): 68–74.

For forest scientists, chemists, and forest products managers. Researchers studied the effects of glycol compounds on borate distribution from fused sodium borate rods, using Douglas-fir heartwood blocks conditioned to 15%, 30%, or 60% moisture content. The effect of glycol was most pronounced at 30% moisture content. While glycol can slightly enhance borate diffusion, the added costs probably do not justify the use of this compound in place of water as a medium for enhanced diffusion.

Freitag, C, KC Li, and JJ Morrell. 2003. Potential for the use of hydroxylamine derivatives as wood preservatives. *Forest Products Journal* 53(7–8): 77–79.

For wood preservationists and wood products manufacturers. Oven-dried blocks of ponderosa pine sapwood

were exposed to one of two decay fungi (*Gloeophyllum trabeum* or *Trametes versicolor*) after treatment with 1 of 17 hydroxylamine derivatives. The authors concluded that the potential of the chemicals tested for preserving wood is low.

Funck, JW, Y Zhong, DA Butler, CC Brunner, and JB Forrer. 2003. Image segmentation algorithms applied to wood defect detection. *Computers and Electronics in Agriculture* 41: 157–179.

For wood products manufacturers and those involved in wood quality control. Many image segmentation algorithms are used in detection of defects of wood surfaces. Selecting the most appropriate algorithms can be difficult. The authors used a variety of algorithms to detect features of wood surfaces and defined measures for examining algorithm performance. The best performance overall was obtained with a region-based similarity algorithm that combines clustering and region-growing techniques. This algorithm was particularly effective with subtle defects. Edge detection algorithms gave slightly better clearwood detection and were as effective as the region-growing algorithm if subtle defects were unimportant. Algorithms and factors must be chosen in light of the defect detection requirements of each wood processing application.

Geng, X, and K Li. 2002. Degradation of non-phenolic lignin by the white-rot fungus *Pycnoporus cinnabarinus*. *Applied Microbiology and Biotechnology* 60: 342–346.

For mycologists and wood scientists. The authors studied high molecular weight lignin, both methylated nonphenolic and unmethylated phenolic, mixed with softwood pulp and degraded by white rot fungus. After 3 months of incubation, 40% of the methylated lignin and 70% of the unmethylated were degraded. Phenolic hydroxyl groups in the lignin greatly increased the degradation rate. Both types of lignin showed a substantial increase in carboxylic acids after degradation. The study suggests that a laccase/mediator system is part of the complete degradation of lignin.

Geng, X, and K Li. 2003. Deinking of recycled mixed office paper using two endo-glucanases, CelB and

CelE, from the anaerobic fungus *Orpinomyces* PC2. *TAPPI Journal* 2(7): 29–32.

For researchers and pulp and paper manufacturers. The authors investigated the deinking of recycled mixed office paper (MOP) with two endo-glucanases, CelB and CelE. Treatment of MOP pulp with either enzyme, followed by flotation, significantly reduced dirt count and residual ink area and increased brightness. CelE appeared to have superior deinking effects to CelB. CelB was more effective at hydrolyzing pulp cellulose than CelE. Ink particles in MOP treated with CelB tended to be smaller than those treated with CelE; ink particles smaller than 20 µm were not efficiently removed by flotation.

Geng, X, K Li, IA Kataeva, X Li, and LG Ljungdahl. 2003. Effects of two cellobiohydrolases CbhA and CelK, from *Clostridium thermocellum* on deinking of recycled mixed office paper. *Progress in Paper Recycling* 12(3): 6–10.

For researchers in biotechnology and pulp and paper. Deinking effects of two cellobiohydrolases, CbhA and CelK, from *Clostridium thermocellum* were studied on mixed office paper (MOP). Treatments of MOP with both CbhA and CelK, followed by flotation, increased the residual ink area and the number of residual ink particles. CbhA decreased deinking more, hydrolyzed cellulose more effectively, and released more reducing sugars into the pulp slurry than did CelK. A family 3 cellulose-binding domain at the C-terminus of CbhA likely is important in the higher hydrolytic activity of CbhA. Treatment of MOP by CbhA and CelK did not significantly affect the tear and tensile strengths of handsheets. The inability of both CbhA and CelK to modify fiber structures substantially is likely to make both enzymes ineffective for facilitating ink removal from MOP. The interference of both enzymes on the efficiency of ink removal in the flotation step may be responsible for reduction of overall deinking effects by these two enzymes.

Gonzalez-Hernandez, MP, J Karchesy, and EE Starkey. 2003. Research observation: Hydrolyzable and condensed tannins in plants of northwest Spain forests. *Journal of Range Management* 56: 461–465.

For plant biochemists and chemical ecologists. Tannins, astringent compounds produced by plants, may affect browsing and grazing by mammals in forest ecosystems. The authors tested for hydrolysable and condensed tannins in 30 plant species grazed by livestock and deer. Plants in the heather and rose families had tannins, whereas forbs, grasses and shrubs other than heathers did not. *Rubus* sp. had the highest tannin content. In most species, levels of condensed tannins were higher than those of hydrolysable tannins. Tannin content changed with the seasons and was highest in the growing season (late winter to early spring, depending on species).

Gupta, R, and B Wagner. 2002. Effect of metal connector plates on the bending strength of solid sawn lumber and LVL: A pilot study. *Forest Products Journal* 52(10): 71–74.

For wood truss designers. The result of this study may help dispel the notion that the teeth of metal connector plates damage fiber and weaken its properties. This study shows that they have no effect on bending strength. Regular truss lumber was used to determine the bending strength when a metal connector plate was affixed to it. In all but five solid-sawn lumber (SSL) cases, the lumber failed at a knot. The specimens failed between 71 and 332 seconds. In the laminated veneer lumber (LVL) cases failure usually occurred at the edge of the plate.

Gupta, R, LR Heck, and TH Miller. 2002. Experimental evaluation of the torsion test for determining shear strength of structural lumber. *Journal of Testing and Evaluation* 30: 283–290.

For wood technologists, scientists, and engineers. The study examines the use of torsion, instead of the standard method of using a shear block, as a test method to determine shear strength of wood. Shear strength based on torsion was higher than the shear strength based on shear block. Shear strength based on torsion is pure shear strength and, therefore, more representative of shear strength of wood.

Gupta, R, LR Heck, and TH Miller. 2002. Finite-element analysis of the torsion test for determining shear strength of structural lumber. *Journal of Testing and Evaluation* 30: 291–302.

For wood technologists, scientists, and engineers. The study shows that the shear failure in torsion is similar to the shear failure of specimens subjected to transverse loads. The torsion test is the best practical method to determine the pure shear strength of full-size, structural lumber. Uniform shear stress occurs within the shear span. The shear span begins and ends at a distance of approximately twice the depth plus the grip distance away from each end of the specimen. Shear slippage and the shear-failure plane are parallel to the grain.

Hamilton, ED, DA Butler, and CC Brunner. 2002. *Cutting to order in the rough mill: A sampling approach.* *Wood and Fiber Science* 34: 560–576.

For forest products manufacturers. The authors adapted an earlier linear programming approach to filling a cutting order for lumber to handle nonuniform stock material that contains defects that are not known in advance of cutting. The new method uses a random sample to construct a linear program and prices, rather than cutting patterns, to specify a solution. The expected cost of filling an order approximately equals the minimum possible expected cost for sufficiently large order and sample sizes, and there is a lower bound on the minimum possible expected cost.

Hansen, E, J Seppala, and H Juslin. 2002. *Marketing strategies of softwood sawmills in western North America.* *Forest Products Journal* 52(10): 19–25.

For sawmill owners and forest product marketers. Data about the product, customer, market area, and competitive advantage of their marketing strategy were collected from 52 independent marketing units of softwood sawmills in Northern California, Oregon, Washington, and British Columbia. Companies may not fully understand the forces operating in their business environment and might need to focus their strategies better. Further refinement of the theory underlying competitive strategy and the measurement of strategy may be needed.

Jung, H, F Xu, and K Li. 2002. *Purification and characterization of laccase from wood-degrading fungus *Trichophyton rubrum* LKY-7.* *Enzyme and Microbial Technology* 30: 161–168.

For researchers in forest products and pulp and paper. A new wood-degrading fungus, *Trichophyton rubrum* LKY-7, secretes a high level of laccase in a glucose-peptone liquid medium. Fungal production was barely induced by 2,5-xylidine. The laccase was purified to homogeneity with an overall yield of 40%. The purified laccase had the distinct color and the basic spectroscopic features of a typical blue laccase, with a molecular mass of about 65 kDa. Sequencing of the N-terminus revealed high homology to laccases from wood-degrading white-rot fungi but little similarity to laccases from non-wood-degrading fungi. Redox potential of the enzyme was low, yet it was one of the most active laccases in oxidizing a series of representative substrates/mediators. Compared with other fungal laccases, the laccase has a very low K_m value with 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) as a substrate and a very high K_m value with violuric acid as a substrate. Isoelectric point was 4.0. Its optimal pH values were very acidic, although it was more stable at neutral than at acidic pH. The laccase oxidized hydroquinone faster than catechol or pyrogallol; oxidation of tyrosine was not detectable. Sodium azide and sodium fluoride were strong inhibitors.

Leavengood, S, and I Petaisto. 2002. *WoodDensity.xls.* Wood Products Extension, Corvallis, Oregon. Available at (<http://wood.oregonstate.edu/pubs.php>), last accessed April 15, 2005.

For logging engineers and others interested in estimating the weights of standing timber. This site provides an Excel-based program for calculating density of logs for estimating yields from timber sales. The program creates the estimate by inputting species, amount of sapwood, and log size.

Leavengood, S, and Western Wood Products Association. 2003. *Lumber Shrinkage Estimator.* Western Wood Products Association, Portland, Oregon. Available at (<http://www.wwpa.org/techguide/shrinkage.htm>), last accessed April 15, 2005.

For architects, structural engineers, and other users of western lumber. This site provides an Excel-based program that estimates shrink and swell for western wood species groups. The user inputs board size, initial

moisture, and final moisture content. The program can also be used to compare two different species.

- Lecourt, M, A Pizzi, and P Humphrey. 2003. Comparison of TMA and ABES as forecasting systems of wood bonding effectiveness. *Holz als Roh- und Werkstoff* 61: 75–76.

For wood products manufacturers and wood products researchers. The authors tested tannin adhesives by thermomechanical analysis (TMA) and by an automated bond evaluation system (ABES). They conclude that TMA provided greater precision, but ABES showed faster response to temperature and hardener variations. There was a clear correlation between ABES breaking load and TMA modulus of elasticity (MOE).

- Leichti, RJ, K Crews, and RA Hyde. 2002. Meeting the triple bottom line using a semi-rigid timber framing system, pp. 362–369 in *7th World Conference on Timber Engineering*, Vol. 2, August 12–15, 2002, Shah Alam, Malaysia.

For forest products researchers and manufacturers, and builders. The paper argues for care and selection of materials and systems to meet environmental needs, as well as special and economic considerations. A prototype building with a semi-rigid structural system is described that meets the criteria.

- Leichti, RJ, A Tjahyadi, A Bienhaus, R Gupta, T Miller, and S Duff. 2002. Design and behavior of friction dampers for two-dimensional braced and moment-resisting timber frames, pp. 267–274 in *7th World Conference on Timber Engineering*, Vol. 3, August 12–15, 2002, Shah Alam, Malaysia.

For wood products manufacturers and wood products researchers. Linear and moment-resisting friction dampers were implemented into connections for heavy timber frames for seismic energy dissipation. The design, testing, and energy dissipation characteristics were evaluated.

- Leichti, RJ, M Meisenzahl, and D Parry. 2003. Structural timbers from retired Douglas-fir utility poles, p. 45 in *Biographies & Abstracts, Forest Products*

Society 57th Annual Meeting, June 22–25, 2003, Bellevue WA.

For wood products manufacturers and wood products researchers. Wood quality and potential for production of structural timbers from used utility poles were investigated. Wood quality appeared to be unaffected by prior use as a pole. Visual grades from clear wood properties were compared with actual timbers that are tested in bending. The wood quality of the samples was similar to published values. Posts and timbers with heart center can meet the published allowable values for No. 1 according to the allowable properties derived from small clear specimens and the full-size tests. Visual inspection proved to be a good way to separate poles that meet the visual grade requirements for structural products.

- Li, K, and X Xu. 2002. Effects of a cellulose binding domain on deinking of recycled mixed office paper. *Progress in Paper Recycling* 11(2): 9–13.

For researchers in biotechnology and pulp and paper. A fusion protein containing a cellulose binding domain (CBD) from *Cellulomonas fimi* endoglucanase A was prepared and purified. The purified CBD protein was used in deinking a mixed office paper (MOP). The deinking process included the repulping of the MOP, incubation of MOP pulp slurry with the CBD protein, and a flotation. The incubation of the pulp slurry with the CBD greatly increased total dirt count and residual ink area. Direct addition of the CBD to the flotation stage also increased dirt count and residual ink area significantly. The overall reduction of the deinking efficiency by the CBD was due to a decrease in the efficiency of ink removal in the flotation stage.

- Li, K. 2003. The role of enzymes and mediators in lignocellulose degradation, pp. 196–209 in *Wood Deterioration and Preservation, Advances in our Changing World*, B Goodell, D Nicholas, and T Schultz, eds. ACS Symposium Series 845. American Chemical Society, Washington, DC.

For researchers in forest products and pulp and paper. White-rot fungi can selectively and efficiently degrade lignin through secreting enzymes. Major lignin-degrading enzymes include lignin peroxidase

(LiP), manganese peroxidase (MnP) and laccase. LiP and MnP require hydrogen peroxide (H_2O_2) for their activities, but they are inactivated by a high concentration of H_2O_2 . White-rot fungi produce various H_2O_2 -producing enzymes. LiP oxidizes both phenolic and nonphenolic lignin substructures, whereas MnP and laccase are only able to degrade phenolic lignin substructures. An unsaturated fatty acid or a thio-containing compound enables MnP to degrade nonphenolic lignin substructures. Several in vitro studies reveal that some enzymes can synergistically degrade lignin. As lignin-degrading enzymes are too bulky to penetrate plant cell walls, the role of various small organic/inorganic compounds serving as redox mediators of lignin-degrading enzymes is discussed in detail.

- Liu, Y, and K Li. 2002. Chemical modification of soy protein for wood adhesives. *Macromolecular Rapid Communications* 23: 739–742.

For researchers in forest products and wood composites. Mussel protein is a strong and water-resistant adhesive, but is expensive and not readily available. Soy protein is inexpensive, abundant, and annually renewable, but suffers from low adhesive strengths and low water resistances to the bonded products. This study reveals that introduction of a key functional group found in the marine adhesive protein to soy protein could convert the soy protein to a strong and water-resistant wood adhesive.

- Mankowski, M, E Hansen, and JJ Morrell. 2002. Wood pole purchasing, inspection, and maintenance: A survey of utility practices. *Forest Products Journal* 52(11–12): 43–50.

For utilities, wood treaters, and chemical companies. The purchasing, inspection, and maintenance practices related to wood use by 261 North American utilities were surveyed. The results were compared with a similar survey performed in 1983. The results suggest the need for more continuing education offerings to better educate utilities about how to best manage their wood pole systems for maximum value.

- Matzka, PJ, and LD Kellogg. 2003. Harvest system selection and design for damage reduction in noble

- fir stands: A case study on the Warm Springs Indian Reservation, Oregon. *Western Journal of Applied Forestry* 18: 118–126.

For timber harvesters and harvest methods analysts. The relationship of logging production and costs to residual stand damage during commercial thinning was studied by looking at four ground-based harvesting systems and two harvest unit layout methods. The costs ranged from \$67.75 to \$92.66 per thousand board feet. Residual stand damage was between 20.1% and 62.6%. Equipment size, log lengths, and layout method affected total residual stand damage.

- Milota, MR. 2002. Drying emissions and environmental regulations, p. 9 in *Biographies and Abstracts, Quality Drying: The Key to Profitable Manufacturing*, Sept. 23–25, 2002, Crowne Plaza Montreal Centre, Montreal, Quebec, Canada.

For industry personnel. This report summarizes research at OSU and elsewhere on lumber drying emissions, including factors that affect emissions. Volatile organic compound emission factors for 22 species and hazardous air pollutant emission factors for five species are presented. The new source review, the boiler panel MACTs, and the regional haze rule, with the caveat that mill location and proximity to other company operations can influence how regulations are applied, are discussed.

- Milota, MR. 2002. Factors affecting lumber kiln VOC emissions, pp. 4–5 to 4–14 in *Proceedings of the National Council for Air and Stream Improvement, West Coast Regional Meeting*. Portland, OR, September 25–26.

For industry personnel. The author summarizes research at OSU and elsewhere on how temperature, humidity, and storage affect lumber drying emissions.

- Milota, MR. 2003. Designing and implementing an effective quality programme for softwoods, pp. n.a. in *DryTech 2003: Tools & Technologies to Improve Kiln Drying operations*. Forest Industry Engineering Association, Melbourne, Victoria, Australia, May 22–23, 2003.

For industry personnel. This paper presents a tutorial on the factors that contribute to quality kiln drying of softwoods.

- Milota, MR. 2003. HAP and VOC emissions from white fir lumber dried at high and conventional temperatures. *Forest Products Journal* 53(3): 60–64.

For industry personnel. Emissions were a strong function of drying temperature for this species. Total hydrocarbon emissions from white fir dried at 115.6 °C (0.141 kg/m³) were more than double those from the same wood dried at 82.2 °C (0.052 kg/m³). The high temperature also caused a 240% increase in methanol emissions and a 470% increase in formaldehyde emissions. Under Title III of the Clean Air Act Amendment, a large mill could be considered a major source of pollution when drying at a higher temperature.

- Milota, MR. 2003. International developments for in-kiln systems, pp. n.a. in *DryTech 2003: Tools & Technologies to Improve Kiln Drying Operations*. Forest Industry Engineering Association, Melbourne, Victoria, Australia, May 22–23, 2003 and Rotorua, New Zealand, May 27, 2003.

For industry personnel. This report reviews current systems available for measuring moisture content during lumber drying.

- Milota, MR. 2003. Recent advances in international kiln drying technologies, pp. n.a. in *DryTech 2003: Tools & Technologies to Improve Kiln Drying Operations*. Forest Industry Engineering Association, Melbourne, Victoria, Australia, May 22–23, 2003.

For industry personnel. The author reviews how drying practices are changing.

- Milota, MR. 2003. The U.S. Market—quality demands and consumer concerns, pp. n.a. in *DryTech 2003: Tools & Technologies to Improve Kiln Drying Operations*. Forest Industry Engineering Association, Rotorua, New Zealand, May 27, 2003.

For industry personnel. This paper is a report to New Zealand producers about the kiln drying factors that

are important to US companies that import radiata pine.

- Milota, MR, and MR Lavery. 2003. Temperature and humidity effects on emissions of volatile organic compounds from ponderosa pine lumber. *Drying Technology* 21: 165–174.

For industry personnel. Emissions are reported for ponderosa pine dried throughout the normal range of kiln conditions. When the temperature increased from 68 °C to 85 °C, emissions increased 34%. Total carbon emissions were unaffected by an 11 °C change in wet-bulb depression. When the lumber began green and was dried to 12% moisture content, the average emissions for a drying cycle were 1.4 g/kg of oven-dry wood.

- Moore, JR, DA Maguire, DL Phillips, and CB Halpern. 2002. Effects of varying levels and patterns of green-tree retention on amount of harvesting damage. *Western Journal of Applied Forestry* 17: 202–206.

For tree harvesters, forest managers, and forest resource analysts. The DEMO (Demonstration of Ecosystem Management Options) study contains five blocks with various levels of retention of green trees, either aggregated or dispersed, and one control block with 100% retention. The authors investigated the fresh logging wounds on these various blocks. Suppressed trees tended to sustain the most damage of all the crown classes. More trees were damaged in the dispersed treatments than the aggregated. The plot that retained 15% of the trees in a dispersed pattern sustained the most damage. Steeper topography seemed to be associated with more tree damage.

- Morrell, JJ, D Keefe, and RT Baileys. 2003. Copper, zinc, and arsenic in soil surrounding Douglas-fir poles treated with ammoniacal copper zinc arsenate (ACZA). *Journal of Environmental Quality* 32: 2095–2099.

For wood preservationists. The soil surrounding Douglas-fir utility poles treated with ammoniacal copper zinc arsenate was analyzed to determine levels of copper, zinc, and arsenic. All were elevated in soil next

to the poles, but declined as soil depth and horizontal distance from the pole increased. Zinc levels decreased most slowly and arsenic, most quickly. Metals leaching from ACZA treated poles apparently do not migrate far in the soil.

- Morrell, JJ, A Paillard, D Gnoblei, BL Gartner, MR Milota, and RG Rhatigan. 2003. Variations in longitudinal permeability of coastal western hemlock. *Wood and Fiber Science* 35: 397–400.

For wood preservationists and anatomists, wood products manufacturers, and wood products researchers. Lumber of western hemlock varies widely in treatability. The authors found that air permeability of this species varied widely among trees and by position within a tree and tended to decrease with distance from the bark. The species may have a heartwood zone. The permeability differences may contribute to the differences in treatability.

- Murphy, G. 2003. Procedures for scanning radiata pine stem dimensions and quality on mechanized processors. *International Journal of Forest Engineering* 14(2): 91–101.

For log processors and quality controllers. Productivity, costs, and value recovery were evaluated for four simulated procedures for scanning and optimal bucking of pruned and unpruned radiata pine (*Pinus radiata*): a conventional scan and three types of automated scan. The net value recovery was 5–8% higher with the automated methods than with the conventional scan. New scanning and optimization equipment on mechanized processors could involve break-even investment costs between \$240,000 and \$450,000 US.

- Murphy, G. 2003. Reducing trucks on the road through optimal route scheduling and shared log transport services. *Southern Journal of Applied Forestry* 27: 198–205.

For forest transportation and site planners. Forest companies are seeking new transport management systems and novel approaches to using trucking resources because of concerns about safety, costs, and energy efficiency. The author developed a model for scheduling truck routes and tested it in two medium-sized

companies in New Zealand. Reductions in fleet size of 25–50% and substantial cost savings appeared possible, although actual reductions will probably be smaller because of simplifying assumptions included in the models. The model is suitable for tactical planning involving small or medium problems, but not for dispatching log trucks or for use with large operations.

- Peshkova, S, and KC Li. 2003. Investigation of chitosan-phenolics systems as wood adhesives. *Journal of Biotechnology* 102: 199–207

For wood products researchers, engineers and manufacturers. Pieces of wood veneer only adhere when chitosan, laccase, and a phenolic compound are all present. In adhesive systems with a phenolic compound and one phenolic hydroxyl group, adhesive strength depended on its chemical structure and its relative oxidation rate with laccase. Adhesive strengths were correlated to the viscosity of the adhesive system. If two or three phenolic hydroxyl groups were adjacent to each other, there were no correlations. The adhesion mechanisms of chitosin-phenolic systems may be similar to the adhesive system of mussels.

- Peshkova, S, and KC Li. 2003. Investigation of poly(4-vinylphenol) as a wood adhesive. *Wood and Fiber Science* 35: 41–48.

For wood product researchers and developers. The authors investigated whether a polymer, poly(4-vinylphenol) (PVP), could be used as a wood adhesive, since it contains components similar to those of environmentally friendly marine adhesives. An aqueous suspension of PVP provided up to 3 MPa of shear strength for wood composites bonded with it. Adding 1,6-hexanediamine or diethylenetriamine to the PVP suspension increased the strength up to twice that of the aqueous solution. Curing mechanisms are believed to be the same for PVP and 1,6-hexanediamine/diethylenetriamine as in the natural quinone-tanning process.

- Reeb, JE. 2003. Simulating an extra grader in a sawmill. *Forest Products Journal* 53(11): 81–84.

For wood products manufacturers and managers. Simulations can help managers to anticipate how their deci-

sions may affect a manufacturing system. They cost relatively little and cannot damage the system. This paper describes a simulation experiment done to help managers of a southern pine sawmill to determine the effect of adding an extra grader to each of two shifts. On the basis of the results, an extra grader was added to each shift.

Reinhold, TA, SD Schiff, DV Rosowsky, and BL Sill. 2002. The case for enhanced in-home protection from severe winds. *ASCE Journal of Architectural Engineering* 8: 60–68.

For home owners, home builders, and wood engineers. The authors investigated ways to give protection from physical wind damage and tornados to houses. The results were for existing houses but can be extended to new construction. Tornado hazards discussed are wind pressures, windborne debris, and falling objects. The impact resistance of a wall consisting of several layers can be deduced by adding the impact resistance of the individual layers. Walls that can resist debris impact will also tend to resist severe damage due to tree-fall.

Rhatigan, RG, JJ Morrell, and CM Freitag. 2002. Movement of boron and fluoride from rod formations into Douglas-fir heartwood. *Forest Products Journal* 52(11–12): 38–42.

For wood technologists and electric utilities. Using sections of Douglas-fir poles, the authors examined the ability of boron and fluoride to diffuse from sodium fluoride and fluoride/boron rods. Chemical levels in the wood were generally too low to inhibit fungal attack, regardless of the dosage. The potential for weakening the poles by drilling additional treatment holes may outweigh any possible benefits of a higher dosage.

Rhatigan, RG, and JJ Morrell. 2003. Use of through-boring to improve CCA or ACZA treatment of refractory Douglas-fir and grand fir. *Forest Products Journal* 53(6): 33–35.

For forest managers and wood treatment specialists. Eastern Oregon forests are full of small-diameter trees that need to be thinned to prevent catastrophic

wildfire. Their distance from markets and resistance to conventional pressure treatment makes the forests difficult to use. As the authors suggest, they could be used as fence posts if an effective treatment was developed. Through-boring largely did not improve treatment results, but an ammoniacal-based treatment showed promise.

Rhatigan, RG, MR Milota, JJ Morrell, and MR Lavery. 2003. Effect of high temperature drying on permeability and treatment of western hemlock lumber. *Forest Products Journal* 53(9): 55–58.

For wood products manufacturers, wood preservationists, and kiln operators. Western hemlock lumber dried at high or conventional temperatures showed no difference in gas permeability between the temperature treatments. Drying at high temperature improved penetration of ammoniacal copper zinc arsenate, but reduced penetration of chromated copper arsenate.

Rosowsky, DV. 2002. Performance of timber buildings under high wind loads. *Progress in Structural Engineering and Materials* 4: 286–290.

For wood scientists, structural engineers, and home builders. Regions that have the highest risk of hurricanes and other high wind events often have the most timber structures. Most low-rise structures, including residential and light commercial, are made of wood in countries where wood is used. The author discusses the implications of high wind for design. Recent and ongoing research is also highlighted. Also covered are developments in the areas of codes and standards. Last, the author surveys the directions of future research.

Rosowsky, DV. 2002. Reliability-based seismic design of wood shearwalls. *ASCE Journal of Structural Engineering* 128: 1439–1453.

For structural engineers and wood engineers. The author sought to develop a risk-based methodology for seismic design of shear walls based on reliability principles in addition to performance-based concepts. The study evaluates sources of uncertainty to shear wall performance, evaluates variables in the peak response, and develops a risk-based procedure for performance-

based design of wood shear walls. The procedure may be useful for determining the limits on the seismic weight to ensure target nonexceedence probabilities for the different performance levels.

- Rosowsky, D, and S Schiff. 2003. What are our expectations, objectives, and performance requirements for wood structures in high wind regions? *Natural Hazards Review* 4(3): 144–148.

For structural engineers and wood products manufacturers. Tremendous losses of wood-frame structures in recent storms have spurred considerable efforts to move from prescriptive design to engineered design of wood-frame structures built in hurricane-prone areas, with the assumption that this change will improve performance of wood-frame constructions in high winds. Expectations and objectives of the owners, builders, engineers, and insurers are often not in agreement. The authors draw on their own experience to discuss some of these incongruencies in expectations, objectives, and performance requirements.

- Rosowsky, DV, TG Walsh, and JH Crandell. 2003. Reliability of residential woodframe construction from 1900 to present. *Forest Products Journal* 53(4): 19–28.

For structural engineers, home builders, and wood technologists and engineers. The authors investigated reliability of selected structural members in single-family dwellings over the last 100 years. Among other things, they considered the materials, member sizes, framing techniques, and connections schedules of floor joists, roof rafters, and roof sheathing. Relative risk and a change in the safety index also were evaluated. Roof rafters and floor joists have remained relatively constant. Some decline has occurred due to conservatism used in assigning nominal design values and reduced strength resulting from changes in growth characteristics. Reliability of roof sheathing has increased because of better fastening techniques, dramatically decreasing problems caused by wind uplift.

- Schneider, PF, KL Levien, and JJ Morrell. 2003. Internal pressure measurement techniques and pressure response in wood during treating processes. *Wood and Fiber Science* 35: 282–292.

For wood products manufacturers, technologists, and wood treatment specialists. Pressure within wood caused by preservative impregnation was examined in Douglas-fir (*Pseudotsuga menziesii*) heartwood and ponderosa pine (*Pinus ponderosa*) sapwood. Pressure sensors attached to sample holders collected the data most reliably. Pressure reached equilibrium the fastest with the air treatment in ponderosa pine. In Douglas-fir heartwood, rapidly changing pressure conditions probably will affect fluid penetration into the wood very little.

- Scott, RJ, RJ Leichti, and TH Miller. 2003. Lateral force resisting pathways in log structures, p. 44 in *Biographies & Abstracts, Forest Products Society 57th Annual Meeting, June 22–25, 2003, Double-Tree Hotel, Bellevue WA*.

For wood products manufacturers and wood products researchers. This study was conducted to evaluate lateral force resisting pathways in log structures that are developed by anchor bolts, thru-rods, friction, and perpendicular wall connection. To develop a log wall section that was loaded in shear, a fine-element model (ANSYS 6.0) was used. The contribution of construction details to lateral displacement and capacity was shown. Thru-rod holes can be the source of increased lateral displacement.

- Singleton, R, DS DeBell, and BL Gartner. 2003. Effect of extraction on wood density of western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) *Wood and Fiber Science* 35: 363–369.

For wood products manufacturers, and wood chemists. Chemical deposits (extractives) in wood samples can influence wood density, but laboratories that determine wood density may or may not remove them before assessing density. Wood density of young-growth western hemlock samples was compared before and after extraction. Ring densities were lower in extracted than in unextracted samples. Extractive levels were slightly higher near the pith, but extractive content was generally consistent among samples and along the radial profile.

- Singleton, R, DS DeBell, DD Marshall, and BL Gartner. 2003. Eccentricity and fluting in young-

growth western hemlock in Oregon. *Western Journal of Applied Forestry* 18: 221–228.

For wood products manufacturers and tree and stand evaluators. In order to measure eccentricity and fluting, 61 trees from pure western hemlock stands across a range of age, sites, and densities in the Oregon Coast Range were cut down. Indices of out-of-roundness (OOR), pith-off-center (POC), and fluting severity (fluting index) were computed, flutes were counted, and depth of deepest flute was measured on disks from breast height, base of live crown, and various percentage-of-height locations along the bole. Stems tended to be more out-of-round and have more off-centered piths in the lower portions than in the upper. Basal and breast-height disks had more, deeper, and more severe flutes than those from the upper stem. Tree size (diameter at 4.5 ft) was strongly correlated with more flute and deeper flutes and higher fluting severity. OOR was weakly correlated with tree size. OOR and POC were not significantly correlated with any other tree or stand attributes. Fluting variables were correlated positively with stand age and overall tree growth rate and negatively with tree density. Silvicultural practices involving more rapid growth, wider spacing, and longer rotations are likely to result in more extensive fluting, but have little or no effect on stem eccentricity.

Smith, B, and E Hansen. 2003. Contributions of marketing to wood science. *Wood and Fiber Science* 35: 153.

For wood marketers and scientists. Drawing on the history of forest products marketing, this article argues that marketing is a science complementary to traditional wood sciences.

Stewart, MG, DV Rosowsky, and Z Huang. 2003. Hurricane risks and economic viability of strengthened construction. *Natural Hazards Review* 4: 12–19.

For economists, insurance companies, and home remodelers. The authors describe a way of determining the economic viability of costs of changing existing residential structural vulnerability to hurricane damage compared to cost in insurance losses. The models are

scenario-based and show the vulnerability changes of the existing building stock because of improvements. Next, the change in insurance costs can be calculated. The model shows when retrofitting of existing residential construction is cost-effective; this is called “zones of economic viability”. Retrofits of up to 40% of the initial building costs could be economically viable in some cases.

Tarakandha, B, KS Rao, JJ Morrell, RG Rhatigan, and DB Thies. 2003. Performance of ACZA- and CDDC-treated conifers in tropical marine exposures in Krishnapatnam, India. *Journal of Tropical Forest Products* 9(1–2): 134–144.

For wood technologists and wood treatment specialists. The authors assessed the performance of conifer panels treated with ammoniacal copper zinc arsenate (ACZA) or copper dimethyldithiocarbamate (CDDC) in marine environments over 32 months near Krishnapatnam, India. CDDC did not seem effective for marine exposures under the conditions evaluated, but ACZA appeared to perform well at a retention level of 40 kg/m³.

Taylor, AM, BL Gartner, and JJ Morrell. 2002. Heartwood formation and natural durability: A review. *Wood and Fiber Science* 34: 587–611.

For researchers in wood quality and wood products durability. This review builds upon previous reviews of literature relating to the processes involved in heartwood formation and the natural durability of wood. It discusses the formation and function of heartwood in living trees, factors influencing its natural durability, and variations in quantity and quality. Heartwood forms regularly in tree stems. Heartwood has a different natural decay resistance than sapwood, among other differences. Understanding heartwood formation is important, including the biochemical processes through enzymatic analyses.

Taylor, AM, BL Gartner, and JJ Morrell. 2003. Coincident variations in growth rate and heartwood extractive concentration in Douglas-fir. *Forest Ecology and Management* 185: 257–260.

For silviculturists and wood anatomists and chemists. Although extractives can greatly affect heartwood

properties, little is known about heartwood formation and extractive production, nor is there much information about the effect of environment on heartwood extractive content. Douglas-fir trees, 53–61 years old, in a recently thinned stand were sampled and the relationship between growth ring width and heartwood extractive content was assessed. After thinning, growth ring width increased, as did extractive content of heartwood thought to have been formed at the same time. Growth ring width and extractive content before thinning also seemed to be roughly correlated. Wood durability in Douglas fir thus may be affected by silvicultural treatments affecting growth rate.

Thiam, M, MR Milota, and RJ Leichti. 2002. Effect of high-temperature drying on bending and shear strength of western hemlock lumber. *Forest Products Journal* 52(4): 64–68.

For wood scientists and wood products engineers. The authors dried western hemlock (38- by 140-mm) No. 2 and better lumber using conventional and accelerated kiln schedules and examined the effect of the high temperature. Conventional drying took 48 hours, whereas the accelerated schedule required about 24 hours. The drying method did not affect the mean bending strength, stiffness, or variation associated with the bending and shear properties. The accelerated method reduced shear strength by 6.4%, base design bending stress by 8.1%, and base design shear stress by 14%.

Thoemen, H, and PE Humphrey. 2003. Modeling the continuous pressing process for wood-based composites. *Wood and Fiber Science* 35: 456–468.

For wood products manufacturers. Continuous pressing has become increasingly important, both quantitatively and qualitatively, over the last 20 years. The authors developed a simulation model that allows prediction of temperature, moisture content, air and water vapor pressure, density profile, adhesive bond strength, and other important variables. They present the scientific principles underlying the model and the boundary conditions and modeling strategy used and discuss the model predictions for a typical medium-density fiberboard production plant.

Wagner, ER, and EN Hansen. 2002. Methodology for evaluating green advertising of forest products in the United States: A content analysis. *Forest Products Journal* 52(4): 17–23.

For forest products marketers. Environmental (“green”) advertisements may promote a green life style, present an image of corporate environmental responsibility, or indicate a positive relationship between what is being advertised and the environment. The authors measured the level of “greenness” over 5 years of advertisements in magazines and defined five levels, ranging from extra green to brown. Five to 7% of the advertisements were classified as extra green or green. The authors suggested ways to make advertisements appear greener and noted that companies now focus advertising mainly on architects.

Xu, F, K Li, and TJ Elder. 2002. N-hydroxy mediated laccase biocatalysis: Recent progress on its mechanism and future prospect of its application. *Progress in Biotechnology* 21: 89–104.

For researchers in biotechnology and pulp and paper. N-hydroxy compounds are important in many biological, pharmacological, and industrial processes. The traditional emphasis on their metal-ion-chelating property has recently been shifted to the redox chemistry of the N-OH site, which is of great interest in developing mediated oxidoreductase-based biocatalyses, such as laccase-catalyzed delignification, decontamination, and organic synthesis. In an N-OH-mediated laccase biocatalysis system, N-OH is first oxidized into N-O• by laccase. A study involving 33 N-OH compounds and seven fungal laccases showed that the oxidation is controlled by the electron transfer from N-OH to laccase, the rate of which depends on the redox potential difference between laccase and N-OH. Higher redox potential tends to reduce the oxidation rate of N-OH, similar to other laccase substrates. The redox potential of N-OH is related to the frontier molecular orbital energy, which is proportional to electron-withdrawing N-phenyl substituents. Balancing the reactivity and stability of N-O• is key to catalytic efficiency. The prospect of N-OH mediated laccase biocatalysis is discussed in terms of applying quantum calculation, rational design, and methodology development.

Zhang, C, K Li, and J Simonsen. 2003. A novel wood-binding domain of a wood-plastic coupling agent: Development and characterization. *Journal of Applied Polymer Science* 89: 1078–1084.

For researchers in forest products and wood composites.

Poly(*N*-acryloyl dopamine) (PAD) was successfully synthesized through free radical homopolymerization of *N*-acryloyl-*O,O'*-diphenylmethyl dopamine and subsequent deprotection. PAD underwent substantial oxidation and cross-linking reactions at about 80 °C. Therefore, maple veneer samples bonded with PAD powder at the press temperature of 120 °C

had high shear strengths and high water resistance. In contrast to conventional wood adhesives, PAD increased, rather than decreased, the shear strengths of 2-ply laminated maple veneer test specimens after the specimens had been soaked in water and dried. A mixture of PAD and polyethylenimine (PEI) resulted in much higher shear strengths than PAD alone. To achieve high shear strengths and high water resistances, the maple specimens bonded with PAD/PEI mixtures had to be cured above 150 °C. Water resistances of the maple specimens bonded with PAD/PEI mixtures depended on the PDA/PEI weight ratio and the curing temperature.