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Biennial Bibliography 1992-1994

Compiled by Judy D. Starnes

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FOREST RESEARCH LABORATORY

Forest Research Laboratory

Biennial Bibliography 1992-1994

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The product of our research, new knowledge, is made available to those who wish to use it through a variety of mechanisms. Our research program is closely linked to an outstanding forestry Extension program that delivers problem-solving education to people throughout Oregon. We offer 35-40 workshops each year on a variety of topics through our continuing education program, which helps move research results into application. Scientists at the Forest Research Laboratory also spend a great deal of time answering requests for information by Oregonians who call or write for help.

One of the most important ways we help Oregonians know what we have learned through our research program is to publish our findings in a variety of written media. The following bibliography, whose sections correspond with our five program areas, provides a listing of our published material from July 1, 1992, to June 30, 1994. The list includes publications sponsored by the Forest Research Laboratory, those funded by grants from public and private agencies or other departments of the university, and those representing unsponsored research. Each publication is annotated with a short description of its contents, who the intended audience is, and where copies of the article can be obtained. (Where no University source exists, reprints may be requested directly from the author(s), journal, publisher, or agency stated in the citation.)

There are over 460 citations in this bibliography, a tribute to the productivity and hard work of Forest Research Laboratory scientists. I believe you will be impressed with the quality of the work that has been done, as well. The breadth of subject matter is also significant and reflects the attention the Laboratory gives to all aspects of Oregon's forest resources.

I hope you find this bibliography helpful in obtaining new knowledge about Oregon's forest resources and their utilization. Single copies of reprints available from the Forest Research Laboratory are free; I urge you to take advantage of this opportunity to learn from then.

Sincerely yours,

George W Brown

George W. Brown, Director

FORESTRY PUBLICATIONS

Research results find application in many areas as scientists at the Forest Research Laboratory and their cooperators publish their findings. Publications issued between July 1, 1992, and June 30, 1994, are grouped here according to five program areas:

Forest Regeneration	2
Forest Ecology, Culture, and Productivity	11
Integrated Protection of Forests and Watersheds	25
Evaluation of Forest Uses, Practices, and Policies	30
Wood Processing and Product Performance	40

The lists include publications sponsored by the Forest Research Laboratory, those funded by grants from public and private agencies or other departments of the University, and those representing unsponsored research.

SOURCE FOR REPRINTS

Reprints available from the Forest Research Laboratory are indicated in parentheses at the end of the citations. If not available from the Forest Research Laboratory, reprints may be requested directly from the author(s), journal, publisher, or agency stated in the citation.

FOREST REGENERATION

Adams, W.T. 1992. Gene dispersal within forest tree populations. New Forests 6:217-240.

For forest geneticists. This paper reviews methods of measuring gene dispersal and current information on patterns of dispersal within local populations of forest trees.

Adams, W.T., D.S. Birkes, and V.J. Erickson. 1992. Using genetic markers to measure gene flow and pollen dispersal in forest tree seed orchards. P. 37-61 *in* Ecology and Evolution of Plant Reproduction. R. Wyatt, ed. Chapman & Hall, New York, London.

For forest geneticists and tree breeders. Mating patterns, including effecting pollen dispersal within populations and gene flow between populations, are important determinants of the genetic structure of plant species. In this chapter, the authors describe and compare statistical procedures that have been developed for examining mating patterns in plants and review their application in conifer seed orchards.

Adams, W.T., A.R. Griffin, and G.F. Moran. 1992. Using paternity analysis to measure effective pollen dispersal in plant populations. The American Naturalist 140:762-780. (For. Res. Lab.)

For plant population biologists and plant geneticists. Reliable estimates of mean effective distance of pollen dispersal can be obtained in plant populations by the paternity analysis. However, unless all but a few potential males are eliminated by genetic exclusion, assigning paternity solely on the basis of genetic information is subject to considerable error.

Ahrens, G.R. 1994. Seedling quality and nursery practices for red alder. P. 170-185 *in* The Biology and Management of Red Alder. D.E. Hibbs, D.S. DeBell, and R.F. Tarrant, eds. Oregon State University Press, Corvallis.

For nursery managers, foresters, and biologists. This chapter reviews and synthesizes available information on seedling quality and nursery practices for red alder. Typical cultural systems are discussed, and recommendations for increasing the reliability and success of nursery practices for red alder are provided.

Amaranthus, M.P., J.M. Trappe, and D.A. Perry. 1993. Soil moisture, native revegetation, and *Pinus lambertiana* seedling survival, growth, and mycorrhiza formation following wildfire and grass seeding. Restoration Ecology 1:188-195.

For regeneration specialists and ecologists. The studies reported here indicate that, in an area characterized by extended summer drought, dense stands of annual ryegrass impeded regeneration of sugar pine during the first season and native vegetation for an extended period after fire. Seeding of annual ryegrass in large amounts seems ill-advised when restoration of native plant communities is a priority.

Bousquet, J., S.H. Strauss, A.H. Doerksen, and R.A. Price. 1992. Extensive variation in evolutionary rate of *rbcL* gene sequences among seed plants. Proceedings of the National Academy of Sciences USA 89:7844-7848. (For. Res. Lab.)

For forest and other plant geneticists. Extensive variation in rates of DNA sequence evolution were found for a chloroplast gene. Fifty ribulose-1,5-bisphosphate carboxylase genes from 18 families of seed plants representing the gymnosperms, the dicots, and the monocots—and including pine, Douglas-fir, poplar, and oak—were included in the analysis. Woody perennials evolved substantially slower than annual plants.

Bousquet, J., S.H. Strauss, and P. Li. 1992. Complete congruence between morphological and *rbcL*-based molecular phylogenies in birches and related species (Betulaceae). Molecular Biology and Evolution 9:1076-1088. (For. Res. Lab.)

For forest biologists and geneticists. The authors compared morphological and molecular phylogenies in an ancient family of woody dicots, the Betulaceae (birch family). The phylogenetic trees determined by gene sequences and morphology were completely congruent, and bootstrapping strongly supported the division of the family Betulaceae into two major groups, Betuleae (birch, alder) and Coryleae (hazelnut).

Camm, E.L., D.C. Goetze, S.N. Silim, and D.P. Lavender. 1994. Cold storage of conifer seedlings: an update from the British Columbia perspective. Forestry Chronicle 70:311-316.

For nurserymen, silviculturists, and foresters. This paper reviews effects of cold storage of seedlings of boreal species. The principal focus is on their annual cycle of dormancy and stress resistance. The data presented demonstrate that plants placed in cold storage after mid-November generally have greater post-storage vigor than similar plants stored earlier in the fall.

Camm, E.L., and D.P. Lavender. 1993. Photosynthetic apparatus in cold-stored conifer seedlings is affected by nursery and storage photoperiod. Forest Science 39:546-560.

For forest scientists and nurserymen. This paper describes the effects of daylength during the late summer and a daily light period during cold storage on the fluorescence of lodgepole pine and white spruce seedlings and discusses the significance of the results for seedling physiology.

Castellano, M.A. 1994. Current status of outplanting studies using ectomycorrhiza-inoculated forest trees. P. 261-281 *in* Mycorrhizae and Plant Health. F.L. Pfleger and R.G. Linderman, eds. American Phytopathological Society Press, St. Paul, Minnesota.

For forest managers. This chapter summarizes the current literature on using ectomycorrhiza-inoculated forest seedlings in reforestation around the world.

Copes, D.L., and R.A. Sniezko. 1991. The influence of floral bud phenology on the potential mating system of a wind-pollinated Douglas-fir orchard. Canadian Journal of Forest Research 21:813-820.

For forest geneticists and tree breeders. Observations of and calculations from reproductive bud phenology from 1983 through 1989 in a Douglas-fir clonal orchard near Monmouth, Oregon, are reported. Use of procedures outlined in this report will allow tree-improvement workers to calculate the maximum outcross efficiency of each seed crop produced by their orchards.

Crannell, W.K., Y. Tanaka, and D.D. Myrold. 1994. Calcium and pH interaction on root nodulation of nursery grown red alder (*Alnus rubra* Bong.) seedlings by *Frankia*. Soil Biology and Biochemistry 26:607-613.

For nursery managers, foresters, microbiologists, and soil scientists. The possibility for enhancing nodulation and seedling growth by modifying soil pH and Ca concentrations was evaluated. Greater nodulation and seedling growth was observed in plots with $CaCl_2$, which had little effect on soil pH, than in control or limed plots.

Dixon, R.K., V.K. Garg, and M.V. Rao. 1993. Inoculation of *Leucaena* and *Prosopis* seedlings with *Glomus* and *Rhizobium* species in saline soil: rhizosphere relations and seedling growth. Arid Soil Research and Rehabilitation 7:133-144.

For soil biologists and land reclamation specialists. In salt-affected soil, *Leucaena* and *Prosopis* tree seedlings inoculated with vesicular-arbuscular mycorrhizal fungi and *Rhizobium* (a nitrogen-fixing symbiont) had improved survival and juvenile growth. Seedlings with root-system symbionts did not develop normally or survive in high-salt media.

Dixon, R.K., and F. Hiol Hiol. 1992. Mineral nutrition of *Pinus caribaea* and *Eucalyptus camaldulensis* seedlings inoculated with *Pisolithus tinctorius* and *Thelephora terrestris*. Communications in Soil Science and Plant Analysis 23:1387-1396.

For tropical silviculturists and nursery managers. The mineral nutrition of Caribbean pine and eucalyptus tree seedlings varied significantly with host ectomycorrhizal symbiont. Macro- and micronutrient contents of seedlings without ectomycorrhizae were in the deficient range.

Dixon, R.K., and F. Hiol Hiol. 1992. Water relations and photosynthesis of *Eucalyptus camaldulensis* seedlings inoculated with different ectomycorrhizal symbionts. Plant and Soil 147:143-149.

For tropical silviculturists, soil biologists, and tree physiologists. Ectomycorrhizal fungi help juvenile eucalyptus trees avoid drought through several physiologic and morphologic mechanisms. Diurnal and temporal patterns of water use and photosynthesis vary significantly with combination of eucalyptus with ectomycorrhizal fungi.

Dixon, R.K., and P.S. Johnson. 1992. Synthesis of ectomycorrhizae on northern red oak seedlings in a Michigan nursery. Journal of Arboriculture 180:266-272.

For soil biologists and nursery managers. Oak seedlings are highly dependent on ectomycorrhizal fungi for juvenile growth and survival in the field. Procedures were developed to introduce *Suillus luteus*, a symbiont of oak, into a northern Michigan nursery to improve proportion of seedlings with ectomycorrhizal fungi.

Dixon, R.K., M.V. Rao, and V.K. Garg. 1993. Salt stress affects *in vitro* growth and *in situ* symbioses of ectomycorrhizal fungi. Mycorrhiza 3:63-68.

For soil biologists and land reclamation specialists. Ectomycorrhizal fungi increase the survival and gtowth of tree seedlings in some salt-affected soils. In high-salt media the growth and symbiotic potential of ectomycorrhizal fungi are reduced.

Dixon, R.K., M.V. Rao, and V.K. Garg. 1994. *In situ* and *in vitro* response of mycorrhizal fungi to salt stress. Asia Mycorrhizae Network News, Delhi, India 5:6-8.

For soil biologists and land reclamation specialists. Mycorrhizal fungi can be used as aids to reforestation of degraded lands in India.

Entry, J.A., K.G. Mattson, and W.H. Emmingham. 1993. The influence of nitrogen on atrazine and 2,4-dichlorophenoxyacetic acid mineralization in grassland soils. Biology and Fertility of Soils 16:179-182. (For. Res. Lab.)

For researchers working with soils and herbicides. The results indicate that nitrogen additions to soil can suppress the decomposition of resistant compounds such as atrazine and 2,4-D but stimulate the primary growth of fungi.

Entry, J.A., P.T. Rygiewicz, and W.H. Emmingham. 1993. Accumulation of Cesium-137 and Strontium-90 in pon-

derosa pine and Monterey pine seedlings. Journal of Environmental Quality 22:742-746. (For. Res. Lab.)

For ecotoxicologists, nuclear plant managers, and foresters. This study found curvilinear relationships between time and radioisotope uptake and between soil radioisotope concentration and radioisotope uptake for both ponderosa pine and Monterey pine seedlings. The ability of trees to sequester and store ^{137}Cs and ^{90}Sr introduces the possibility of using reforestation to remediate contaminated soils.

Fiorella, M., and W.J. Ripple. 1993. Analysis of conifer forest regeneration using Landsat Thematic Mapper data. Photogrammetric Engineering & Remote Sensing 59:1383-1388. (For. Res. Lab.)

For foresters, natural resource analysts, and remote sensing specialists. Landsat Thematic Mapper (TM) data were used to evaluate young conifer stands in the western Cascade Mountains of Oregon. With one exception, all TM bands showed a strong inverse correlation with age of young Douglas-fir stands. Poorly regenerated stands were spectrally distinct from well-regenerated stands at and beyond age 15 years.

Ghersa, C.M., R.L. Benech Arnold, and M.A. Martinez-Ghersa. 1992. The role of fluctuating temperatures in germination and establishment of *Sorghum halepense*. Regulation of germination at increasing depths. Functional Ecology 6:460-468.

For weed researchers. This study demonstrated that *Sorghum halepense* seeds are sensitive to amplitudes of temperature fluctuations in soil and that this sensitivity is a major component of the mechanism that enables *S. halepense* seeds to detect soil depth. Loss of the depth-detection mechanism by ageing seeds results in failure to regulate germination.

Ghersa, C.M., M.A. Martinez-Ghersa, E.H. Satorre, M.L. Van Esso, and G. Chichotky. 1993. Seed dispersal, distribution and recruitment of seedlings of *Sorghum halepense* (L.) Pers. Weed Research 33(1):79-86.

For weed researchers. Patterns of seed dispersal and seedling recruitment of *Sorghum halepense* were compared in abandoned and cultivated fields in Argentina. Important factors in the temporal and spatial patterns of seed distribution included availability of seed for dispersal, the direction and velocity of winds, and the combine harvester.

Ghersa, C.M., and M.L. Roush. 1993. Searching for solutions to weed problems: do we study competition or dispersion? BioScience 43:104-109. (For. Res. Lab.)

For a general science audience. Authors compare the impact on crop yields of (1) reducing the weed capacity to disperse with (2) increasing the relative crop capacity to compete for resources. They conclude that pursuing strategies to reduce yield losses by improving the capability of a crop to compete against weeds is less profitable than pursuing strategies to manage dispersal and distribution of weed propagules.

Ghersa, C.M., M.L. Roush, S.R. Radosevich, and S.M. Cordray. 1994. Coevolution of agroecosystems and weed management. BioScience 44:85-94. (For. Res. Lab.)

For agronomists and those interested in weed management and ecology. The authors explore how ecological theory can be applied to agroecosystems and thus improve perception of how human activities are related to the biological system.

Gordon, J.C., B.T. Bormann, and A.R. Kiester. 1992. Ecosystem physiology and genetics: a new target? or forestry contemplates an entangled bank. *In* Proceedings 12th North American Forest Biology Workshop, Sault Ste. Marie, Ontario.

For forest ecologists, geneticists, physiologists, and evolutionary biologists. This paper seeks to integrate physiology and genetics within an ecosystems perspective. The concept of ecosystem fit is described and proposed as a means to achieve this integration.

Graham, J.S., and S.D. Hobbs. 1994. Spring growth of Douglas-fir seedlings from two bud development regimes. New Forests 8:15-24. (For. Res. Lab.)

For regeneration scientists and tree nursery managers. The effect of two bud development treatments on post-dormancy shoot growth was investigated with 1-year-old container-grown Douglas-fir seedlings. Results suggest that complete bud development should be promoted to maximize spring shoot growth of Douglas-fir seedlings.

Haase, D.L., J.H. Batdorff, and R. Rose. 1993. Effect of root form on 10-year survival and growth of planted Douglas-fir trees. Tree Planters' Notes 44:53-57.

For reforestation and nursery personnel. After 10 years, there were no significant differences in outplanting performance among three root-form treatments of Douglas-fir on a good site in western Oregon. These results agree with other studies which suggest that, when no other confounding planting errors are present, deformed root systems do not play as important a role in subsequent field performance as is generally thought.

Haase, D.L., and R. Rose. 1993. Soil moisture stress induces transplant shock in stored and unstored 2 + 0 Douglas-fir seedlings of varying root volumes. Forest Science 39:275-294. (For. Res. Lab.)

For forest regeneration professionals. Transplant shock was induced by applying a range of soil water contents to unstored and cold-stored 2-year-old (2 + 0) bareroot Douglas-fir seedlings graded by root volume. Moisture stress is a cause of transplant shock, and increased seedling root volume may enable seedlings to avoid shock following outplanting to a specific site.

Haase, D.L., and R. Rose. 1994. Effects of soil water content and initial root volume on the nutrient status of 2 + 0 Douglas-fir seedlings. New Forests 8:265-277. (For. Res. Lab.)

For forest regeneration professionals. Decreasing soil water content resulted in higher concentrations of phosphorus, potassium, and particularly nitrogen in both old and new foliar tissue. Seedlings with relatively higher root volumes exhibited higher nutrient concentrations and contents, as well as increased growth.

Haeussler, S., and J.C. Tappeiner II. 1993. Effect of the light environment on seed germination of red alder (*Alnus rubra*). Canadian Journal of Forest Research 23:1487-1491. (For. Res. Lab.)

For forest ecologists and silviculturists. Red alder seed showing strong phytochrome activity in the laboratory was tested to determine whether the phytochrome effect could influence germination under light conditions prevailing in the field. Germination was highest in clearcuts (68.6 percent), intermediate in Douglas-fir stands (47.4 percent), and lowest in red alder stands (11.7 percent). The results suggest that there is a phytochrome effect in the field.

Harrington, T.B., R.J. Pabst, and J.C. Tappeiner II. 1994. Seasonal physiology of Douglas-fir saplings: response to microclimate in stands of tanoak or Pacific madrone. Forest Science 40:59-82. (For. Res. Lab.)

For tree physiologists, ecologists, and ecophysiologists. This study describes the influences of light, soil water, temperature, and relative humidity in young stands of tanoak or Pacific madrone on the physiology of Douglas-fir.

Harrington, T.B., and L.A. Parendes, editors. 1993. Forest Vegetation Management without Herbicides. Proceedings of a workshop. Forest Research Laboratory, Oregon State University, Corvallis. 129 p. (For. Res. Lab.)

For foresters, wildlife biologists, researchers, and natural resource managers. In this 1992 workshop at Oregon State University, 25 papers were presented on managing forest vegetation without herbicides in the Pacific Northwest. Information on a given technique was presented first as a synthesis of current research and then as discussion of its application in mesic (coastal) and xeric (interior) forest ecosystems.

Harrington, T.B., J.C. Tappeiner II, and R. Warbington. 1992. Predicting crown sizes and diameter distributions of tanoak, Pacific madrone, and giant chinkapin sprout clumps. Western Journal of Applied Forestry 7:103-108. (For. Res. Lab.)

For forest managers, vegetation management specialists, and mathematical modelers of forest growth and yield. Crown size and stem diameters were measured on a total of 908 sprout clumps of tanoak, Pacific madrone, and giant chinkapin at sites in southwestern Oregon and northwestern California. Regression equations were developed for predicting individual-clump crown size and stem-diameter distributions of dominant sprouts from the total basal area in stems of the parent tree and number of growing seasons since burning or cutting.

Hibbs, D.E., and B.J. Yoder. 1993. Development of Oregon white oak seedlings. Northwest Science 67:30-36. (For. Res. Lab.)

For forest researchers and land managers. Seedlings of Oregon white oak growing in western Oregon developed a multi-stemmed morphology that persisted for many years ($\bar{x}$ = 14 years) before shifting to a form dominated by a single stem (a sapling). The causes of the prolonged seedling phase and subsequent shift in morphology and growth rate are not clear. Browsing did not contribute to the prolonged multi-stemmed phase, and the shift to the sapling phase did not appear to be related to moisture availability.

Hong, Y.-P., V.D. Hipkins, and S.H. Strauss. 1993. Chloroplast DNA diversity among trees, populations and species in the California closed-cone pines (*Pinus radiata, Pinus muricata* and *Pinus attenuata*). Genetics 135:1187-1196. (For. Res. Lab.)

For plant and forest geneticists. The amount, distribution, and mutational nature of chloroplast DNA polymorphisms were studied in three closely related species—knobcone pine, bishop pine, and Monterey pine. Diversity was low but strongly differentiated among races and species in comparison with that found in isozyme studies.

Hong, Y.-P., A.B. Krupkin, and S.H. Strauss. 1993. Chloroplast DNA transgresses species boundaries and evolves at variable rates in the California closed-cone pines (*Pinus radiata, P. muricata*, and *P. attenuata*). Molecular Phylogenetics and Evolution 2:322-329. (For. Res. Lab.)

For evolutionary biologists and forest geneticists. The authors studied phylogenetic relationships among populations and species in the California closed-cone pines by analyzing chloroplast DNA restriction sites. The results differ significantly from a recent allozyme study and corroborate previous observations that chloroplast genome phylogeny can depart substantially from that of nuclear genes.

Howe, G.T., S.H. Strauss, and B. Goldfarb. 1991. Insertion of the maize transposable element *AC* into poplar. P. 283-294 *in* Woody Plant Biotechnology. M.R. Ahuja, ed. Plenun Press, New York. (For. Res. Lab.)

For plant geneticists and biotechnologists. This is the first report of heterologous transposon activity in a woody plant.

Huffman, D.W., J.C. Tappeiner II, and J.C. Zasada. 1994. Regeneration of salal (*Gaultheria shallon*) in the central

Coast Range forests of Oregon. Canadian Journal of Botany 72:39-51. (For. Res. Lab.)

For forest ecologists, botanists, and foresters. The objective of the two studies (clone and seedling) reported here was to determine how salal colonizes and maintains itself in the understories of Douglas-fir forests by vegetative expansion and seedling establishment.

Kavanagh, K.L., D.-H. Lee, A.P. Drew, and C.A. Maynard. 1993. The effects of GA_3 and organic solvents on acclimatization of tissue culture propagated black cherry (*Prunus serotina* Ehrh.) plantlets. Forest Science 39:644-654. (For. Res. Lab.)

For those working with tissue culture and plant hormones. Both gibberellic acid (GA_3) and chilling were effective for inducing stem elongation of black cherry plantlets during acclimatization.

Li, P., and W.T. Adams. 1993. Genetic control of bud phenology in pole-size trees and seedlings of coastal Douglas-fir. Canadian Journal of Forest Research 23:1043-1051. (For. Res. Lab.)

For forest geneticists and tree breeders. The extent to which bud phenology is genetically controlled and related to growth traits was examined in seedlings and pole-size trees of coastal Douglas-fir.

Malavasi, U.C., and D.A. Perry. 1993. Genetic variation in competitive ability of some shade-tolerant and shade-intolerant Pacific Coast (USA) conifers. Forest Ecology and Management 56:69-81. (For. Res. Lab.)

For ecologists and population geneticists. Variability in growth response to stocking density and neighbor composition was compared among half-sibling families of four tree species representing two pairs of shade-tolerant and shade-intolerant species, each pair from the same life zone. Shade-tolerant species were significantly more variable than shade-intolerant ones, a result that supports the idea that at least a portion of genetic variability contained within populations represents adaptation to variable environments.

Martin, K.J., Y. Tanaka, and D.D. Myrold. 1992. Dual inoculation of red alder (*Alnus rubra* Bong.) with effective *Frankia alni* for nursery bare-root seedling production. Acta Œcologia 13:508-509.

For nursery managers, foresters, microbiologists, and soil scientists. This brief note summarizes the effect of inoculating red alder with more than one *Frankia* strain. Nodulation and seedling size were dependent on the *Frankia* strain used, with dual inoculation better than using either strain separately.

Mattson, K.G., and H.C. Smith. 1993. Detrital organic matter and soil CO_2 efflux in forests regenerating from cutting in West Virginia. Soil Biology and Biochemistry 25:1241-1248.

For researchers in soils, carbon modelers, and forest managers. Cutting of hardwood stands resulted in decreases in the organic matter of the forest floor but not of the soil. The loss of forest floor was associated with increased efflux of CO_2 from the soil surface, suggesting that decomposition rates in the forest floor were elevated.

Maxwell, B.D., J.C. Zasada, and S.R. Radosevich. 1993. Simulation of salmonberry and thimbleberry population establishment and growth. Canadian Journal of Forest Research 23:2194-2203.

For population biologists and computer modelers. A model for simulating populations of salmonberry and thimbleberry was developed and compared with field observations for verification and validation.

McNabb, D.H., K. Baker-Katz, and S.D. Tesch. 1993. Machine site preparation improves seedling performance on a high-elevation site in southwest Oregon. Western Journal of Applied Forestry 8:95-98. (For. Res. Lab.)

For forest managers. Douglas-fir seedlings planted on areas receiving one of four site preparation treatments and on unprepared control areas were compared for 5 years at a high-elevation, nutrient-poor site in southwest Oregon. Fifth-year survival of seedlings was at least 85 percent among machine-prepared plots, compared to 42 percent on control plots.

McNabb, D.H., and L. Boersma. 1993. Evaluation of the relationship between compressibility and shear strength of Andisols. Soil Science Society of America Journal 57:923-929. (For. Res. Lab.)

For forest scientists and managers. Andisols, and other soils with low bulk density, are often considered less susceptible to compaction than soils with higher bulk density. This study concluded that Andisols have a low compression index and a low compacted bulk density because of a high shear strength at a high water content.

Minore, D., and H.G. Weatherly. 1994. Riparian trees, shrubs, and forest regeneration in the coastal mountains of Oregon. New Forests 8:249-263.

For silviculturists and watershed managers. Basal area of conifers increased with elevation, stream gradient, time since disturbance, and distance from the stream; it decreased with stream width. Although forest regeneration was poor everywhere, it decreased with total shrub cover and increased with stream gradient. Reserving or preserving areas dominated by hardwoods and shrubs will not supply the needed conifer debris; silvicultural treatments will be necessary.

Minore, D., H.G. Weatherly, and P.G. Cunningham. 1993. Sowing at 1.5 cm (0.6-inch) depth produces heaviest Douglas-fir roots in small containers. Tree Planters' Notes 44:122-124.

For nurserymen. Sowing seeds of Douglas-fir at five depths in Leach Super Cells indicated that the only benefit of deep sowing in small containers occurred at a depth of 1.5 cm (0.6 inch). Planting at this depth produced heavier roots without a significant reduction in seedling emergence.

Newton, M., and E.C. Cole. 1994. Stand development and successional implications: pure and mixed stands. P. 106-115 *in* The Biology and Management of Red Alder. D.E. Hibbs, D.S. DeBell, and R.F. Tarrant, eds. Oregon State University Press, Corvallis.

For silviculturists and forest landowners. This chapter describes what is presently understood about the roles of site factors, stand density, associated vegetation, and mechanisms of competitive interactions in determining stand growth and structure, as well as succession in stands originating with a major alder component.

Newton, M., E.C. Cole, M.L. McCormack, Jr., and D.E. White. 1992. Young spruce-fir forests released by herbicides. II. Conifer response to residual hardwoods and overstocking. Northern Journal of Applied Forestry 9:130-135. (For. Res. Lab.)

For forest managers and silviculturists. Responses of conifers and other vegetation to nine aerial herbicide treatments were evaluated in a replicated conifer-release experiment in a 7-year-old spruce-fir clearcut in central Maine. Development of the naturally regenerated conifers was inversely related to residual and germinating hardwood cover and conifer stocking during the 9 years after treatment. Treatments variably reduced competition and increased tree growth.

Newton, M., E.C. Cole, and D.E. White. 1993. Tall planting stock for enhanced growth and domination of brush in the Douglas-fir region. New Forests 7:107-121. (For. Res. Lab.)

For regeneration specialists and silviculturists. The use of tall planting stock of Douglas-fir or western hemlock leads to best growth overall and is especially important in areas threatened by brush. Both species grow best with little competition.

Newton, M., E.C. Cole, D.E. White, and M.L. McCormack, Jr. 1992. Young spruce-fir forests released by herbicides. I. Response of hardwoods and shrubs. Northern Journal of Applied Forestry 9:126-130. (For. Res. Lab.)

For forest managers, ecologists, and wildlife researchers. Responses of shrubs and hardwoods to nine aerial herbicide treatments were evaluated in a replicated conifer-release experiment in a 7-year-old spruce-fir clearcut in west-central Maine. All herbicides and rates of application reduced hardwood and shrub cover by 50 percent or more while untreated controls increased in total cover by about 50 percent between years 7 and 9. By the 16th year, major differences in height and cover still existed between all treatments and the controls. All species were still present.

Omi, S.K., R. Rose, and T.E. Sabin. 1994. Fall lifting and long-term freezer storage of ponderosa pine seedlings: effects on starch, root growth, and field performance. Canadian Journal of Forest Research 24:624-637.

For forest nursery personnel and regeneration specialists. The response of ponderosa pine seedlings lifted in the fall and stored at temperatures below 0° until outplanting was determined.

Radosevich, S.R., and C.M. Ghersa. 1992. Weeds, crops, and herbicides: a modern-day "neckriddle." Weed Technology 6:788-795. (For. Res. Lab.)

For vegetation management specialists and research scientists. The 20th century has seen unparalleled agricultural productivity. Questions are being asked, however, about the economic stability and environmental health of an agricultural system that relies heavily on monetary subsidies as well as inputs of energy, synthetic fertilizers, and pesticides. This essay looks at weed science as a microcosm of the agricultural "neckriddle."

Radosevich, S.R., C.M. Ghersa, and G. Comstock. 1992. Concerns a weed scientist might have about herbicide-tolerant crops. Weed Technology 6:635-639. (For. Res. Lab.)

For weed scientists, biotechnologists, and geneticists. The potential benefits from the improved weed control of herbicide-tolerant crops must be weighed against the possible increased costs of production, as well as the potential for genes that control herbicide tolerance to escape into non-tolerant plant populations. In addition to technological and biological concerns, the paper addresses ethical questions about who benefits from this technology and about its economic, ecological, and social consequences.

Rojas, N.S., D.A. Perry, C.Y. Li, and J. Friedman. 1992. Influence of actinomycetes on *Frankia* infection, nitrogenase activity and seedling growth of red alder. Soil Biology and Biochemistry 24:1043-1049. (For. Res. Lab.)

For forest researchers. The influence of actinomycetes isolated from different sources on acetylene reduction, nodule weight, and total biomass of red alder seedlings was examined. Reduced seedling weight was by far the major influence.

Rose, R., J.F. Gleason, and M. Atkinson. 1993. Morphological and water-stress characteristics of three Douglas-fir stocktypes in relation to seedling performance under different soil moisture conditions. New Forests 7:1-17. (For. Res. Lab.)

For reforestation personnel and researchers. This one-time greenhouse study examined the phenology, morphology, frost hardiness, and response to moisture stress of three Douglas-fir stocktypes from the same seedlot.

Silim, S.N., R.D. Guy, and D.P. Lavender. 1993. Mefluidide-induced drought resistance in seedlings of

three conifer species. Canadian Journal of Forest Research 71:1087-1092.

For forest scientists and silviculturists. This paper describes the effects of a plant growth retardant, mefluidide, on the stomatal functioning of western red cedar, Alaska yellow cedar, and white spruce. Treated seedlings demonstrated greater drought resistance than the controls.

Silim, S.N., and D.P. Lavender. 1994. Seasonal patterns and environmental regulation of frost hardiness in shoots of seedlings of *Thuja plicata*, *Chamaecyparis nootkatensis*, and *Picea glauca*. Canadian Journal of Botany 72:309-316.

For forest nurserymen, tree physiologists, and silviculturists. The role of the environment in regulating hardening and dehardening in the named species is discussed. The cedars harden in response to low temperatures, while the spruce initiates hardening in response to a shortening photoperiod and completes the process after exposure to temperatures between 0 and 10° C. The cedars deharden in response to rising temperatures in the spring, but the dehardening response of spruce is strongly correlated with the number of chilling hours to which it has been exposed, and reflects the dormancy stage of the seedling.

Sorensen, F.C. 1992. Genetic variation and seed transfer guidelines for lodgepole pine in central Oregon. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. Research Paper PNW-RP-453. 30 p.

For forest geneticists, silviculturalists, and genecologists. Variation in seed and seedling traits of lodgepole pine on the east slopes of the Cascades in Oregon was related to geographic and topographic variables of the seed origin. Provisional seed transfer guidelines are given, including a regression equation for guiding seed transfer and a new outline of fixed seed zones.

Sorensen, F.C., and W.T. Adams. 1992. Self fertility and natural selfing in three Oregon Cascade populations of lodgepole pine. P. 358-374 *in* Proceedings on *Pinus contorta*—from Untamed Forest to Domesticated Crop. Meeting of IUFRO WP 2.02.06 and Frans Kempe Symposium, Umeå, Sweden. D. Lindgren, ed. Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences Report 11.

For forest geneticists and population biologists. Yields of round and filled seeds after self, cross, and wind pollination were determined for lodgepole pine in three mixed conifer stands containing 8 to 81 percent lodgepole pine. Differences among the stands in species structure were thought to be historical. Self fertility and natural selfing were higher in the stand with a low frequency of lodgepole pine than in the other two stands.

Sorensen, F.C., and R.K. Campbell. 1993. Seed weight-seedling size correlation in coastal Douglas-fir: genetic and environmental components. Canadian Journal of Forest Research 23:275-285.

For forest geneticists and plant breeders. When 111 families were grown in two experiments, developmental associations between seed weight, a maternally inherited trait, and seedling height and its components indicated both "environmental" and "genetic" contributions of seed weight to seedling height. The genetic component was quite stable across treatment effects.

Sorensen, F.C., and J.C. Weber. 1994. Genetic variation and seed transfer guidelines for ponderosa pine in the Ochoco and Malheur National Forests of central Oregon. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. Research Paper PNW-RP-468. 30 p.

For forest geneticists, silviculturalists, and genecologists. Variation in seed and seedling traits of ponderosa pine from the Cascade crest east across the mountains of central Oregon is related to geographic and topographic variables of the seed origin. Provisional seed transfer guidelines are given. The variation pattern of ponderosa pine, as contrasted with that of Douglas-fir across the same west-east transect, is much more gradual with longitude, but similar with elevation.

Stauffer, A., and W.T. Adams. 1993. Allozyme variation and mating system of three Douglas-fir stands in Switzerland. Silvae Genetica 42:254-258.

For foresters and forest geneticists. Assays of three populations of Douglas-fir in Switzerland indicated that, because of the high levels of selfing noted, special precautions should be taken in using seeds from these stands for reforestation.

St. Clair, J.B., and W.T. Adams. 1993. Family composition of Douglas-fir nursery stock as influenced by seed characters, mortality, and culling practices. New Forests 7:319-329. (For. Res. Lab.)

For forest geneticists, nursery and tree improvement specialists. Observed changes in family composition during nursery production were not large enough to markedly reduce genetic diversity or affect expected genetic gains.

Strauss, S.H., J. Bousquet, V.D. Hipkins, and Y.-P. Hong. 1992. Biochemical and molecular genetic markers in biosystematic studies of forest trees. New Forests 6:125-158. (For. Res. Lab.)

For forest geneticists. Biochemical and molecular markers have proven to be powerful tools for discerning biosystematic, biogeographic, and phylogenetic relationships. Biosystematic information can be important for guiding traditional breeding programs, gene transfer, interspecific hybridization, and gene conservation. An intensive review of the literature is provided.

Strauss, S.H., Y.-P. Hong, and V.D. Hipkins. 1993. High levels of population differentiation for mitochondrial DNA haplotypes in *Pinus radiata, muricata,* and *attenuata*. Theoretical and Applied Genetics 86:605-611. (For. Res. Lab.)

For forest geneticists, breeders, and conservation biologists. The authors studied the natural distribution of mitochondrial (mt) DNA variation among and within populations of three pines from California, Oregon, and Mexico. They reported a high degree of population differentiation for mtDNA variance. It, therefore, may be a useful marker for conservation biology and breeding.

Strauss, S.H., R. Lande, and G. Namkoong. 1992. Limitations of molecular-marker-aided selection in forest tree breeding. Canadian Journal of Forest Research 22:1050-1061. (For. Res. Lab.)

For forest and plant geneticists. This is one of several articles from a special issue of the journal on use of DNA markers to aid tree breeding. Linkage equilibrium and genetic complexity of trees are identified as key obstacles. Simple, high-heritability traits such as wood density and resistance to biotropic disease appear to hold more promise than weakly inherited traits such as height growth.

Tappeiner, J.C., and J.C. Zasada. 1993. Establishment of salmonberry, salal, vine maple, and bigleaf maple seedlings in the coastal forests of Oregon. Canadian Journal of Forest Research 23:1775-1780. (For. Res. Lab.)

For forest ecologists. To identify seedling regeneration niches for four coastal Oregon shrub and hardwood species, the authors studied seed predation, emergence, survival, and growth of these species on disturbed and undisturbed soil in thinned, unthinned, and clear-cut conifer stands. Results suggest that commercial thinning will favor the establishment of seedlings of the species studied. These species are not likely to provide competition to conifer seedlings planted in clearcuts or other disturbed sites.

Tesch, S.D., K. Baker-Katz, E.J. Korpela, and J.W. Mann. 1993. Recovery of Douglas-fir seedlings and saplings wounded during overstory removal. Canadian Journal of Forest Research 23:1684-1694. (For. Res. Lab.)

For forest managers, ecologists, and silviculturists. Damaged and undamaged Douglas-fir seedlings and saplings, ranging in height from 15 to 450 cm, were monitored for 6 years after overstoty removal to evaluate recovery from an assortment of logging wounds. Mortality was concentrated in smaller seedlings and was not related to damage. Surviving trees recovered from most wounds within the 6-year period, with recovery strongly related to tree vigor at time of injuty.

Tesch, S.D., and E.J. Korpela. 1993. Douglas-fir and white fir advance regeneration for renewal of mixed-conifer forests. Canadian Journal of Forest Research 23:1427-1437. (For. Res. Lab.)

For forest managers and silviculturists. Stem analysis of Douglas-fir and white fir advance regeneration 20 years after overstoty removal showed that both species can respond in height growth to become dominant components of future stands on medium- to low-quality sites with a Mediterranean climate.

Tesch, S.D., E.J. Korpela, and S.D. Hobbs. 1993. Effects of sclerophyllous shrub competition on root and shoot development and biomass partitioning of Douglas-fir seedlings. Canadian Journal of Forest Research 23:1415-1426. (For. Res. Lab.)

For forest scientists and ecologists. On a site characterized by hot temperatures, limited precipitation during the growing season, and a relatively limited soil-moisture-holding capacity, increasing cover from competing sclerophyllous shrub sprouts reduced conifer seedling growth. However, allometric regression analyses showed no significant difference in biomass allocation to shoots and roots among treatments 5 years after planting.

Walstad, J.D. 1993. Social and ecological factors affecting the future of forest vegetation management. P. 30-43 *in* Proceedings, International Conference on Forest Vegetation Management. Auburn University, Auburn, Alabama. School of Forestry Report 1993:1.

For forest managers and vegetation management specialists. This study provides an historical and futuristic view of key developments in society, forestry, and vegetation management since World War II.

Zaerr, J.B. 1991. Measuring plant growth regulators. P. 257-273 *in* Techniques and Approaches in Forest Tree Ecophysiology. J.P. Lassoie and T.M. Hinckley, eds. CRC Press, Boca Raton, Florida.

For forest ecophysiologists. This chapter focuses on naturally occurring plant growth regulators (PGRs) that may regulate some of the physiological processes of growth and development in forest species. PGRs are an important tool for research on tree growth and development and will be a critical part of any tissue culture system used for clonal propagation of trees.

Zasada, J.C., J.C. Tappeiner III, B.D. Maxwell, and M.A. Radwan. 1994. Seasonal changes in shoot and root production and in carbohydrate content of salmonberry (*Rubus spectabilis*) rhizome segments from the central Oregon Coast Ranges. Canadian Journal of Forest Research 24:272-277.

For forest ecologists and silviculturists. The authors studied the seasonal variation in the production of shoots and roots from salmonberry rhizome segments and the association of that production with carbohydrate reserves. Association of low shoot production with low levels of total nonstructural carbohydrates suggests that salmonberry's capacity for regrowth following a May-through-July disturbance is relatively low.

Zasada, J., J. Tappeiner, and M. O'Dea. 1992. Clone structure of salmonberry and vine maple in the Oregon Coast Range. P. 56-60 *in* Proceedings—Symposium on Ecology and Management of Riparian Shrub Communities. USDA Forest Service, Intermountain Research Station, Ogden, Utah. General Technical Report INT-289.

For forest ecologists and foresters. Salmonberry and vine maple form clones of varying sizes and densities on forest sites in the Oregon Coast Range. Their clones can be similar in size and dimensions, but their method of clone formation is very different. Selected aspects of clone development and morphology in these species are described, and the implications are discussed.

Forest Ecology, Culture, and Producivity

Alvarez, I.F., J. Parlade, J.M. Trappe, and M.A. Castellano. 1993. Hypogeous mycorrhizal fungi of Spain. Mycotaxon 67:201-217.

For forest mycologists. This paper includes first reports of 18 species of truffle-like fungi new to Spain, including two undescribed species and one new genus.

Amaranthus, M.P., and D.A. Perry. 1993. The functioning of ectomycorrhizal fungi in the field: linkages in space and time. Plant and Soil 159:133-140.

For research foresters. Studies indicate that ectomycorrhizal (ECM) fungi linkages can reduce plant competition for resources, promote forest recovery, and influence the pattern of plant succession. This paper reviews what is known about the functional role of ECM fungi as spatial and temporal linkages and how such linkages might be affected by forest management.

Amaranthus, M.P., and J.M. Trappe. 1993. Effects of erosion on ecto- and VA-mycorrhizal inoculum potential of soil following forest fire in southwest Oregon. Plant and Soil 150:41-49.

For silviculturists and reforestation specialists. One growing season after a fire on eroded plots in the Siskiyou Mountains, incense-cedar seedlings planted in eroded soil containing spores had formed nearly four times the vesicular-arbuscular mycorrhizae that seedlings in unamended control soil had. Seedlings in pasteurized eroded soil had more than twice as many mycorrhizae as did the control seedlings. Ectomycorrhiza formation on Douglas-fir seedlings did not differ among treatments.

Aquilera, L., and R.P. Griffiths. 1993. Nitrogen in ectomycorrhizal mat and non-mat soils of different-age Douglas-fir forests. Soil Biology and Biochemistry 25:1015-1019.

For mycologists and forest ecologists. Total nitrogen was found to increase with stand age. Organic nitrogen potentially available for use by microorganisms was found to be selectively removed from soils by ectomycorrhizal mats.

Bennetts, R.E., M.W. Collopy, and R.A. Rodgers, Jr. 1994. The snail kite in the Florida Everglades: a food specialist in a changing environment. P. 507-532 *in* Everglades: the Ecosystem and its Restoration. S.M. Davis and J.C. Ogden, eds. St. Lucie Press, Delray Beach, Florida.

For wildlife biologists. This is a review of the snail kite's reproductive ecology and habitat requirements in the Florida Everglades. It discusses what is known about the kite's spatial and temporal responses to south Florida's fluctuating wetland environment.

Bettinger, P., and L.D. Kellogg. 1993. Residual stand damage from cut-to-length thinning of second-growth timber in the Cascade Range of western Oregon. Forest Products Journal 43(11/12):59-64. (For. Res. Lab.)

For logging contractors, land managers, sale administrators, and the interested public. When residual damage was measured on an area thinned with a cut-to-length logging system, only 0.8 percent of the trees were found to have sustained major damage.

Binkley, D., R. Bell, and P. Sollins. 1992. Comparison of methods for estimating soil nitrogen transformations in adjacent conifer and alder-conifer forests. Canadian Journal of Forest Research 22:858-863.

For soil scientists. Net nitrogen mineralization was measured in a year-long series of resin-core incubations of forest floor plus soil (to a 15-cm depth) in paired adjacent conifer and alder-conifer stands at a low-productivity site at Wind River and a high-productivity site at Cascade Head. Net mineralization was about 9 $kmol \cdot ha^{-1} \cdot year^{-1}$ in the two alder-conifer stands but almost nil in the Wind River conifer stand and 2.1 $kmol \cdot ha^{-1} \cdot year^{-1}$ in the Cascade Head conifer stand.

Binkley, D., K. Cromack, Jr., and D.D. Baker. 1994. Nitrogen fixation by red alder: biology, rates, and controls. P. 57-72 *in* The Biology and Management of Red Alder. D.E. Hibbs, D.S. DeBell, and R.F. Tarrant, eds. Oregon State University Press, Corvallis.

For silviculturists and forest landowners. This chapter summarizes the biology of nitrogen fixation, compiles currently available estimates of nitrogen-fixation rates for red alder stands, and discusses the factors that control these rates.

Binkley, D., P. Sollins, R. Bell, D. Sachs, and D. Myrold. 1992. Biogeochemistry of adjacent conifer and alder-conifer stands. Ecology 73:2022-2033.

For forest ecologists, soil scientists, and biogeochemists. This study characterized within-system nutrient fluxes in adjacent conifer and alder-conifer stands at two sites. Nitrogen-use efficiency was generally lower for the alder-conifer stands at both sites. Denitrification appeared negligible in all stands.

Bormann, B.T., F.H. Bormann, W.B. Bowden, R.S. Pierce, S.P. Hamburg, D. Wang, M.C. Snyder, C.Y. Li, and R.C. Ingersoll. 1992. Rapid N_2 fixation in pines, alder, and

locust: evidence from the sandbox ecosystem study. Ecology 74:583-598.

For forest ecologists. Rapid acetylene reduction in pine rhizospheres and in cultures from washed roots suggests that unexplained gains are due to associative N_2 fixation.

Bormann, B.T., K. Cromack, Jr., and W.O. Russell III. 1993. Influences of alder on soils and long-term ecosystem productivity. P. 47-56 *in* The Biology and Management of Red Alder. Oregon State University Press, Corvallis.

For foresters, ecologists, and soil scientists. Published reports on the effect of alder on soil nitrogen, organic matter, acidity, cation availability and weathering are reviewed. Alders appear to greatly benefit sites with young soils but may acidify highly weathered soils when grown in repeated pure alder rotations.

Bougher, N.L., and M.A. Castellano. 1993. Delimitation of *Hymenogaster* sensu stricto and four new segregate genera. Mycologia 85:273-293.

For forest mycologists. Re-examination of the original eight species assigned to the genus *Hymenogaster* and subsequent species described from the Southern Hemisphere reveal four new genera, which are described and keyed. Additional species placement for former *Hymenogaster* species from the Southern Hemisphere are also included.

Bradshaw, G.A., and T.A. Spies. 1992. Characterizing canopy gap structure in forests using wavelet analysis. Journal of Ecology 80:205-215.

For forest biometricians. Although trends in canopy patterns follow the stages of stand development, small to intermediate disturbances significantly influence canopy structure.

Brasier, C.M., P.B. Hamm, and E.M. Hansen. 1993. Cultural characters, protein patterns and unusual mating behavior of *Phytophthora gonapodyides* isolates from Britain and North America. Mycological Research 97:1287-1298.

For mycologists. A common but unusual water mold found in forest streams in western North America is shown to be *P. gonapodyides*.

Carlson, D.H., S.H. Sharrow, W.H. Emmingham, and D.P. Lavender. 1994. Plant-soil-water relations in forestry and silvopastoral systems in Oregon. Agroforestry Systems 25:1-12.

For agroforesters, rangeland managers, foresters, and silviculturists. This study found that intensive grazing by sheep in silvopastoral systems can reduce water stress of trees during dry periods by reducing transpirational water use by forage plants, and that N-fixing plants plus grazing can increase nitrogen uptake by associated trees.

Castellano, M.A., and J.M. Trappe. 1992. Australasian truffle-like fungi. V. Nomenclatural bibliography of type descriptions of Ascomycotina and Zygomycotina. Australian+ Systematic Botany 5:631-638.

For forest mycologists. This bibliography includes all truffle-like Ascomycotina and Zygomycotina originally reported with Australasian mycorrhizal host plants, regardless of the hemisphere in which they grow. All nonsporocarpic Zygomycotina are also included because of the potential for some taxa to form single or clustered spores in the soil in addition to sporocarps.

Castellano, M.A., and J.M. Trappe. 1992. Australasian truffle-like fungi. VI. *Gigasperma* (Basidiomycotina, Tricholomataceae) and *Horakiella* gen. nov. (Basidiomycotina, Sclerodermataceae). Australian Systematic Botany 5:639-643.

For forest mycologists. Re-examination of both species assigned to the genus *Gigasperma* reveals significant differences between the two taxa that warrant separation at the order level. *Gigasperma cryptica* is characterized by large, smooth, extremely thick-walled, reddish brown spores borne on four-spored basidia as in some Agaricales. *Horakiella clelandii* gen. et comb. nov. differs in its ornamented, hyaline to pale brown spores enclosed by nurse hyphae as in the Sclerodermatales.

Castellano, M.A., J.M. Trappe, and N. Malajczuk. 1992. Australasian truffle-like fungi. III. *Royoungia* gen. nov. and *Mycoamaranthus* gen. nov. (Basidiomycotina). Australian Systematic Botany 5:613-616.

For forest mycologists. This paper describes two new genera of truffle-like Basidiomycotina. *Royoungia boletoides* is described from Cooloola, Queensland, and is tentatively assigned to the Boletales on the basis of sporocarp and spore morphology. *Mycoamaranthus auriorbis* is described from a number of collections from northern Queensland and is not placed in any currently described family.

Cázares, E., and J.M. Trappe. 1991. Alpine and subalpine fungi of the Cascade and Olympic Mountains. 2. *Macowanites lymanensis* sp. nov. Mycotaxon 42:333-338.

For forest mycologists. A new *Macowanites* species is described from near Lyman Lake, Glacier Peak Wilderness Area, in the North Cascade Range, Washington.

Cázares, E., and J.M. Trappe. 1991. Alpine and subalpine fungi of the Cascade and Olympic Mountains. 3. *Gastroboletus ruber* comb. nov. Mycotaxon 42:339-345.

For forest mycologists. A new combination of *Gastroboletus ruber* is made from *Truncocolumella rubra* Zeller. The range of the species in the Cascade Mountains is extended from northern Washington to mid-Oregon.

Cázares, E., and J.M. Trappe. 1993. Vesicular endophytes in roots of the Pinaceae. Mycorrhiza 2:153-156.

For mycologists and ecologists. Vesicles and hyphae typical of vesicular-arbuscular mycorrhizae (VAM) were common in seedlings of *Pseudotsuga menziesii*, *Abies lasiocarpa*, and *Tsuga mertensiana* growing in openings where herbaceous hosts of these fungi were common. The ecological significance of abundant VAM-type endophytes in otherwise ectomycorrhizal hosts deserves comprehensive study.

Cohen, W.B., P. Sollins, P. Homann, W.K. Ferrell, M.E. Harmon, D.O. Wallin, and M. Fiorella. 1994. Using a GIS to model effects of land use on carbon storage in the forests of the Pacific Northwest. P. 487-499 *in* Environmental Information Management and Analysis: Ecosystem to Global Scales. Taylor & Francis, London.

For atmospheric scientists, modelers, and ecologists. Presents modeling framework to be used for evaluating the effects of timber harvesting on the carbon budget of Pacific Northwest forests. The goal of this research is to determine the extent to which this region has been either a net source or a net sink for atmospheric carbon dioxide.

Cohen, W.B., D.O. Wallin, M.E. Harmon, P. Sollins, C. Daly, and W.K. Ferrell. 1992. Modeling the effect of land use on carbon storage in the forests of the Pacific Northwest. P. 1023-1026 *in* Proceedings of the International Geosciences and Remote Sensing Symposium, Houston, Texas. IEEE 92CH3041-1.

For atmospheric scientists, modelers, and ecologists. This paper presents a modeling framework to be used for evaluating the effects of timber harvesting on the carbon budget of Pacific Northwest forests. The goal of this research is to determine the extent to which this region has been either a net source or a net sink for atmospheric carbon dioxide.

Crespo, E., and L. Dominguez de Toledo. 1992. About the hygroscopic properties of *Geastrum* and *Astraeus*. Boletin de la Sociedad Argentina de Botanica 29(1-2):109-113.

For mycologists and taxonomists. The authors conducted a morphological and experimental study to determine the peridial layer that is involved in the opening of the rays of *Geastrum* and *Astraeus*.

Crespo, E., and L. Dominguez de Toledo. 1994. About the presence of *Tuber separans* (Tuberaceae-Ascomycotina) in Argentina. Kurtziana 23:125-129.

For mycologists. The occurrence of a truffle (*Tuber separans*) associated with *Pinus elliottii*, an introduced species, is reported for the first time.

Cromack, K., Jr., and B.A. Caldwell. 1992. The role of fungi in litter decomposition and nutrient cycling. P. 653-668 *in* The Fungal Community. Its Organization and Role in the Ecosystem. Second edition. G.C. Carroll and D.T. Wicklow, eds. Marcel Dekker, Inc., New York, Basel, Hong Kong.

For forest mycologists and ecologists. This chapter focuses on aspects of nutrient cycling in forested terrestrial ecosystems where litter and soil fungi play crucial roles.

Dahm, H., H. Rozycki, E. Strzelczyk, and C.Y. Li. 1993. Production of B-group vitamins by *Azospirillum* spp. grown in media of different pH at different temperatures. Zentralblatt fuer Mikrobiologie 148:195-203.

For soil microbiologists. Mycorrhizal fungi *Suilus bovinus*, *Hebeloma crustuliniforme*, *H. mesophaeum*, *Cenococcum graniforme*, and *Pisolithus tinctorius* produced B-group vitamins *in vitro*. The pH of the medium strongly influenced their production.

DeBell, D.S., and P.A. Giordano. 1994. Growth patterns of red alder. P. 116-130 *in* The Biology and Management of Red Alder. D.E. Hibbs, D.S. DeBell, and R.F. Tarrant, eds. Oregon State University Press, Corvallis.

For silviculturists and forest landowners. This chapter summarizes current information on general growth habits, patterns of height and diameter growth, partitioning of dry matter, and stand development of red alder.

Dixon, R.K. 1994. Global climate change and carbon cycling in the terrestrial biosphere. Life Support and Biosphere Science 1:27-28.

For global biogeochemists. Closed environmental systems can be employed to evaluate terrestrial and aquatic carbon biogeochemistry.

Dixon, R.K., S. Brown, R.A. Houghton, A.M. Solomon, M.C. Trexler, and J. Wisniewski. 1994. Carbon pools and flux of global forests systems. Science 263:185-190.

For global biogeochemists and policy analysts. Boreal, temperate, and tropical forests cover over 4 billion ha worldwide. These forests contain 1146 Pg of carbon, with 37, 14, and 49 percent in low, mid, and high latitudes, respectively. High- and mid-latitude forests are current CO_2 sinks. Low-latitude forests are a major source of CO_2 emissions.

Dixon, R.K., and O.N. Krankina. 1993. Forest fires in Russia: carbon dioxide contributions to the atmosphere. Canadian Journal of Forest Research 23:700-705.

For fire ecologists and global biogeochemists. The occurrence and intensity of forest fires in Russian forests have historically been underestimated. Emissions of CO_2 from Russian forest fires to the atmosphere are globally significant.

Dixon, R.K., J.K. Winjum, and P.E. Schroeder. 1993. Conservation and sequestration of carbon: the potential of forest and agroforest management practices. Global Environmental Change 2:159-173.

For global biogeochemists and policy analysts. Global forests can be established and managed to sequester 50 to 70 Pg of carbon over a 50-year period. Approximately 570

ha of technically suitable land will be required to maintain these forest carbon reservoirs. The median cost of such sequestration in low- and mid-latitude nations is $10 per Mg of carbon.

Dominguez de Toledo, L. 1993. Gasteromycetes of the central and west region of Argentina 1. Critical analysis of the taxonomic characters, generic key and Ord. Podaxales. Darwiniana 32(1-4):195-235.

For mycologists and taxonomists. The most important taxonomic characters for Gasteromycetes are reviewed. A key for all the genera present in the central region of Argentina is presented with special consideration to the order Podaxales.

Dominguez de Toledo, L. 1994. Suggestions for describing and representing fungal spores. Mycotaxon 52(1):259-270.

For mycologists, toxicologists, and paleontologists. A methodology for describing and representing fungal spores is proposed. Figures illustrate the suggested methodology, which can be applied to different fungal groups.

Duddles, R.E., and M. Cloughesy. 1992. An introduction to conifer release. Oregon State University Extension Service, Corvallis. Extension Circular 1388. 8 p.

For woodland owners and foresters. This publication describes how to evaluate when plantation release is needed, the different types of competition that conifers face, and the types of release treatments used in various situations.

Edwards, R., L. Kellogg, and P. Bettinger. 1992. Skyline logging planning and harvest cost in five alternative group selection systems. P. 121-133 *in* Proceedings of the International Mountain Logging and 8th Pacific Northwest Skyline Symposium, P. Schiess and J. Sessions, eds., Bellevue, Washington.

For logging managers, forest engineers, planners, and foresters. In group selection units, total planning and harvest cost increased from 7.3 to 31.5 percent over that for clearcutting. Group selection planning and layout took 2.6 to 5.9 times longer than did the clearcut.

Entry, J.A., K.G. Mattson, and M.B. Adams. 1993. Carbon balance in forest ecosystems: response to nitrogen. P. 155-166 *in* Carbon Cycling in Boreal Forests and Sub-Arctic Ecosystems. T.S. Vinson and T.P. Kolchugina, eds. USEPA Office of Research and Development, Washington, D.C. EPA/600R-93/084.

For carbon modelers and forest managers. Effects of nitrogen on above-ground growth have been well studied on a short-term basis, but the long-term effects on forest ecosystems and carbon sequestration are not known. The authors review the literature on this subject.

Entry, J.A., C.L. Rose, and K. Cromack. 1992. Microbial biomass and nutrient concentrations in hyphal mats of the ectomycorrhizal fungus *Hysterangium setchellii* in a coniferous forest soil. Soil Biology and Biochemistry 24:447-453. (For. Res. Lab.)

For forest mycologists and those interested in mycorrhizal associations. The ectomycorrhizal fungus *Hysterangium setchellii* can concentrate in hyphal tissue nutrients that are important to the growth and productivity of Douglas-fir forests.

Fiorella, M., and W.J. Ripple. 1993. Determining successional stage of temperate coniferous forests with Landsat satellite data. Photogrammetric Engineering & Remote Sensing 59:239-246. (For. Res. Lab.)

For ecologists, foresters, and remote sensing scientists. Thematic Mapper digital imagery was used to map forest successional stages and to evaluate spectral differences between old-growth and mature forests in the central Cascade Range of Oregon. Old-growth forests were successfully distinguished from mature forests with the satellite data. This success was attributed to the old-growth canopies having more shadowing caused by canopy gaps and uneven tree sizes.

Gartner, B.L., C. Wasser, E. Rodriguez, and W.L. Epstein. 1993. Seasonal variation of urushiol content in poison oak leaves. American Journal of Contact Dermatitis 4(1):33-36.

For botanists and allergists. The concentration of urushiol (the causative agent in poison oak dermatitis) remains relatively constant in inland clones until early November, when it increases by three to six times. However, leaf litter has very low concentrations. The late-season increase may be responsible for the greater number of cases some dermatologists have noticed in the autumn.

Giordano, P.A., and D.E. Hibbs. 1993. Morphological response to competition in red alder: the role of water. Functional Ecology 7:462-468. (For. Res. Lab.)

For applied ecologists. The morphological responses of red alder to water availability were studied by measuring growth and biomass allocation among trees at different levels of intraspecific competition. The combination of sensitivity to water stress and high rates of biomass production in mesic environments suggests that red alder's water-stress avoidance syndrome is a major factor in its high growth rate.

Goward, S.N., R.H. Waring, D.G. Dye, and J. Yang. 1994. Ecological remote sensing at OTTER: satellite macroscale observations. Ecological Applications 4:322-343.

For foresters, natural resource analysts, and remote sensing specialists. Coarse, global-scale observations remotely sensed by satellite are compared with ground measurements collected during the Oregon Transect Ecosystems Research (OTTER) study. The objective was derivation of ecological and environmental variables from the satellite

data as needed to define primary production in western Oregon. This study demonstrates that remote sensing by satellite is capable of providing information needed for macroscale ecological monitoring.

Greene, S.E., P.A. Harcombe, M.E. Harmon, and G. Spycher. 1992. Patterns of growth, mortality and biomass change in a coastal *Picea sitchensis-Tsuga heterophylla* forest. Journal of Vegetation Science 3:697-706.

For forest ecologists. Patterns of growth and mortality were measured for 10 years in a 130-year-old stand on the Oregon coast where western hemlock constitutes 90 percent of the individuals and 57 percent of the biomass. Wind damage is a major factor in high rates of mortality. New production of biomass did not equal mortality, and total biomass has declined because more trees are exposed to potential wind damage.

Griffiths, R.P., J.E. Baham, and B.A. Caldwell. 1994. Soil solution chemistry of ectomycorrhizal mats in forest soil. Soil Biology and Biochemistry 26:331-337.

For soil chemists. Survival and productivity of Douglas-fir depend on close association between host trees and ectomycorrhizal fungi. This study examined the possible role of two ectomycorrhizal fungal mats in altering the chemistry and mineral nutrition of the soil, producing conditions that increase nutrient availability and could increase tree growth.

Griffiths, R.P., B.A. Caldwell, and P. Sollins. 1993. Effects of vegetation regime on denitrification potential in two tropical volcanic soils. Biology and Fertility of Soils 16:157-162.

For tropical silviculturists and ecologists. Potential denitrification rates were found to have high positive correlations with respiration rates, levels of mineralizable nitrogen, microbial biomass, and moisture content. This study shows the extent to which vegetation can affect nutrient cycling in tropical soils.

Griffiths, R.P., M.E. Harmon, B.A. Caldwell, and S.E. Carpenter. 1993. Acetylene reduction in conifer logs during early stages of decomposition. Plant and Soil 148:53-61. (For. Res. Lab.)

For forest ecologists and soil scientists. Acetylene reduction was examined periodically for 68 months in the outer and inner bark, sapwood, and heartwood of decaying logs of four conifer species in the Cascade Mountains of western Oregon.

Halpern, C.B., J.A. Antos, K. Cromack, Jr., and A.M. Olson. 1992. Species' interactions and plant diversity during secondary succession. Northwest Environmental Journal 8:202-205.

For forest ecologists. To examine competitive interactions, the authors have initiated an experiment involving manipulations of *Senecio sylvaticus, Epilobium angustifolium, Ceanothus* spp., and *Rubus ursinus*. This research will focus on the first 3 to 5 years of secondary succession.

Hansen, A.J., S.L. Garman, P. Lee, and E. Horvath. 1993. Do edge effects influence tree growth rates in Douglas-fir plantations? Northwest Science 67:112-116.

For silviculturists and managers of public and private forests. Measurements in a single plantation partially shaded by a neighboring stand indicated that both tree height and DBH were significantly related to distance from the plantation edge after the effects of tree density were accounted for.

Hansen, A.J., S.L. Garman, B. Marks, and D.L. Urban. 1993. An approach for managing vertebrate diversity across multiple-use landscapes. Ecological Applications 3:481-496.

For forest scientists and land managers. The authors present an approach for maintaining biodiversity on lands also used for commodity production. The approach was demonstrated for a watershed in western Oregon where the objectives were to maximize habitat diversity for early- and late-successional bird species and to produce saw timber at levels compatible with habitat goals.

Hansen, A.J., and D.L. Urban. 1992. Avian response to landscape pattern: the role of species' life histories. Landscape Ecology 7:163-180.

For forest scientists and land managers. The life-history structures of avifauna from the Eastern Deciduous and Pacific Northwest forests were compared for the number of species present, the relative sensitivity of each community to forest fragmentation and landscape change, and the population trends of some species. This knowledge is useful for predicting community response to landscape change and planning conservation strategies.

Hibbs, D.E., and D.S. DeBell. 1994. Management of young red alder. P. 202-215 *in* The Biology and Management of Red Alder. D.E. Hibbs, D.S. DeBell, and R.F. Tarrant, eds. Oregon State University Press, Corvallis. (For. Res. Lab.)

For forest managers and silviculturists. This chapter discusses management principles and strategies for young red alder stands. An up-to-date synthesis of research results and management experience is provided. The focus is on general information pertinent to decision making in any specific case, rather than on specific recommendations.

Hibbs, D.E., D.S. DeBell, and R.F. Tarrant, editors. 1994. The Biology and Management of Red Alder. Oregon State University Press, Corvallis. 256 p.

For forest managers and silviculturists. This book provides a synthesis of current knowledge about the biology and management of red alder. The first section covers topics in the basic biology of alder, on a microorganism-to-landscape scale. The second section offers principles and prac-

tices of alder management founded upon biological knowledge.

Hibbs, D.E., D.S. DeBell, and R.F. Tarrant. 1994. Whose fat shadow nourisheth. P. 248-251 *in* The Biology and Management of Red Alder. D.E. Hibbs, D.S. DeBell, and R.F. Tarrant, eds. Oregon State University Press, Corvallis.

For forest managers and silviculturists. This chapter reviews the highlights of alder research since the 1970s and lists research needs that appear most critical.

Hilger, A.B., and D.D. Myrold. 1992. Quantitation of soil *Frankia* by bioassay and gene probe methods: response to host and non-host rhizospheres and liming. Acta Œcologia 13:505-506.

For microbiologists and soil scientists. This brief note describes a method for counting *Frankia* populations in soil and indicates how these populations are affected by liming and the presence of various plant species. Changes in infective *Frankia* were observed, but total populations of *Frankia* were unaffected by treatments.

Ho, I. 1993. Analyses of nutrient uptake by six species of vesicular-arbuscular mycorrhizal fungi in *Zea mays* L. Indian Journal of Mycology and Plant Pathology 23(1):64-69.

For mycologists. *Zea mays* L. plants inoculated with one of six species of vesicular-arbuscular mycorrhizal fungi were compared with uninoculated plants for content of nitrogen, phosphorus, potassium, and the micronutrients zinc, copper, iron, magnesium, and manganese. Generally, plants inoculated with any of the mycorrhizal fungi contained significantly greater concentrations of all nutrient elements except potassium in both roots and leaves, phosphorus in leaves, and zinc in roots.

Ho, I., and J.M. Trappe. 1992. Enzyme activity and phytohormone production of *Tricholoma magnivelare* (Peck) Redhead, the "American matsutake." Indian Journal of Mycology and Plant Pathology 22(1):66-72.

For mycologists. *Tricholoma magnivelare* Redhead forms mycorrhizae with conifers in the Pacific Northwest. Two Oregon isolates of *T. magnivelare* were examined for pH optima, enzymatic activity, and production of extracellular growth regulators. The pH optima did not differ significantly between the two isolates.

Huss-Daniel, K., and D.D. Myrold. 1994. Intrageneric variation in nodulation of *Alnus*: consequences for quantifying *Frankia* infective units in soil. Soil Biology and Biochemistry 26:525-531.

For microbiologists and soil scientists. The plant bioassay system for measuring numbers of infective *Frankia* in soil is evaluated. Results show that careful standardization is necessary to allow for meaningful comparisons. Plant species have an effect on the numbers of infective *Frankia* detected.

Johnson, M.G., D.A. Lammers, C.P. Andersen, P.T. Rygiewicz, and J.S. Kern. 1992. Sustaining soil quality by protecting the soil resource. *In* Soil Quality Symposium. P.E. Avers and G.B. Muckel, eds. USDA Forest Service, Washington, D.C. Publication WO-WSA-2.

For land managers, foresters, agronomists, and environmental scientists. This paper presents an analysis of soil as a sustainable and non-renewable/renewable resource. It also discusses soil properties and processes that are inherent in preserving soil quality.

Jones, J.A. 1992. Soil nutrient dynamics at the forest-savanna boundary in East Africa. P. 185-212 *in* Nature and Dynamics of Forest-Savanna Boundaries. P.A. Furley, J. Proctor, and J.A. Ratter, eds. Chapman & Hall, London.

For soil scientists and ecologists. Soil properties and vegetation communities are strongly correlated with landforms, geology, presence of termites, and human use of the landscape for cultivation, grazing, and wood fuel collection. Woodland species composition appears to be related to nitrogen and phosphorus status of soils and the potential for symbiotic root associations including N-fixation and ectomycorrhizae.

Kaushik, A., R.K. Dixon, and K.G. Mukerji. 1992. Vesicular-arbuscular mycorrhizal relationships of *Prosopis juliflora* and *Zizyphus jujuba*. Phytomorphology 42:133-137.

For soil biologists and desert ecologists. The vesicular-arbuscular mycorrhizal relationships of the tree genera *Prosopis* and *Zizyphus* were characterized on arid sites in the Rajasthan Desert of India. Mycorrhizal fungi were detected in compacted, low-fertility, arid soils when soil-surface temperatures exceeded 50° C.

Kellogg, L.D., and P. Bettinger. 1994. Thinning productivity and cost for a mechanized cut-to-length system in the Northwest Pacific Coast region of the USA. Journal of Forest Engineering 5(2):43-54.

For logging contractors, land managers and planners, and foresters. In a second-growth thinning operation, harvester production levels exceeded 30 m^3/productive machine hour (PMH) and forwarder production levels ranged from 10.2 m^3 to 14.5 m^3/PMH. Thinning cost was US $12.49/$m^3$, excluding hauling and a profit-and-risk allowance.

Kellogg, L.D., P. Bettinger, and D. Studier. 1993. Terminology of ground-based mechanized logging in the Pacific Northwest. Forest Research Laboratory, Oregon State University, Corvallis. Research Contribution 1. 12 p. (For. Res. Lab.)

For forest engineers. Terminology is defined for mechanized harvesting equipment and logging systems applicable to the Pacific Northwest.

Kellogg, L.D., and M. Brink. 1992. Mechanized felling in the Pacific Northwest: existing and future technology. Forest Research Laboratory, Oregon State University, Corvallis. Special Publication 25. 7 p. (For. Res. Lab.)

For forest managers and engineers. Researchers, equipment manufacturers, dealers, and contractors were interviewed in order to assess present technology for mechanized felling technology in the Pacific Northwest and to predict developments within the next 5 to 10 years.

Kellogg, L.D., S.J. Pilkerton, and A. Skaugset. 1993. Harvesting for active riparian zone management and the effects on multiple forest resources. *In* Proceedings of the Council on Forest Engineering 16th Annual Meeting, Savannah, Georgia.

For land managers, foresters, and hydrologists. An integrated forest resource study on active management in hardwood-dominated riparian areas is described. Total cost was $200 for installation of five debris structures on one stream during skyline logging. The estimated market value for debris pieces was $656.

Kelsey, R.G., and N.C. Vance. 1992. Taxol and cephalomannine concentrations in the foliage and bark of shade-grown and sun-exposed *Taxus brevifolia* trees. Journal of Natural Products 55:912-917.

For tree physiologists and natural products and forest products chemists. Bark was the only tissue from shade-grown Pacific yew trees to contain higher concentrations of taxol and cephalomannine than did tissues from trees grown in full sun. For trees in either light regimen, taxol concentrations were greater in the bark than in the needles or twigs.

Kimmins, J.P., and D.P. Lavender. 1992. Ecosystem-level changes that may be expected in a changing global climate: a British Columbia perspective. Environmental Toxicology and Chemistry 11:1061-1068.

For forest scientists and silviculturists. This paper reviews the probable effects of global warming on the major components of forest ecosystems in British Columbia and suggests possible responses of forest species.

Knoepp, J.D., D.P. Turner, and D.T. Tingey. 1993. Effects of ammonium and nitrate on nutrient uptake and activity of nitrogen assimilating enzymes in western hemlock. Forest Ecology and Management 59:179-191.

For forest ecologists and tree physiologists. The objectives of this study were to examine (1) possible selectivity for ammonium or nitrate as an N source, (2) the maintenance of charge balance during ammonium and nitrate uptake, and (3) the activity of the nitrogen-assimilating enzymes nitrate reductase, glutamine synthetase, and glutamate dehydrogenase in relation to the uptake of different nitrogen sources. Results indicate that western hemlock may be adapted to sites where ammonium is the predominant N source.

Kobak, K.I., R.K. Dixon, T.S. Vinson, T.P. Kolchugina, M.S. Botch, and V.V. Zelenev. 1993. Carbon cycling in boreal forests and sub-arctic ecosystems. Lesovedeniye (Forest Science) 1:92-93 (in Russian).

For global biogeochemists and policy analysts. High-latitude systems (tundra and boreal forests) contain approximately 40 percent of the carbon in the terrestrial biosphere. Carbon flux from tundra and boreal forests to the atmosphere will increase with global warming.

Law, B.E., and R.H. Waring. 1994. Remote sensing of leaf area index and radiation intercepted by understory vegetation. Ecological Applications 4:272-279. (For. Res. Lab.)

For forest ecologists and those interested in remote sensing of such structural variables of the vegetation canopy as leaf area index and light interception. Spectral vegetation indices calculated from a field spectroradiometer were tested on bitterbrush and manzanita.

Li, C.Y., H.B. Massicotte, and L.V.H. Moore. 1992. Nitrogen-fixing *Bacillus* sp. associated with Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) tuberculate ectomycorrhizae. Plant and Soil 140:35-40.

For forest ecologists. Nitrogenase activities, measured by acetylene reduction, were detected under microaerophilic field conditions in Douglas-fir tuberculate ectomycorrhizae. The N_2-fixing is by spore-forming *Bacillus* sp.

Marquet, P., S. Bollens, J. Clark, M.-J. Fortin, C.M. Jacobi, J. Pineda, D.O. Wallin, and Y. Wu. 1993. The ecological and evolutionary consequences of patchiness: a marine-terrestrial perspective. *In* Patch Dynamics. Volume 96: Lecture Notes in Biomathematics. S. Levin, T. Powell, and J. Steele, eds. Springer-Verlag, New York.

For ecologists. The authors discuss patch dynamics in marine and terrestrial systems.

Marshall, D.D., J.F. Bell, and J.C. Tappeiner. 1992. Levels-of-growing-stock cooperative study in Douglas-fir: Report no. 10—the Hoskins study, 1963-83. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. Research Paper PNW-RP-448. 65 p.

For forest ecologists, managers, and silviculturists. Results of the Hoskins LOGS study in western Oregon are summarized, and management implications are discussed through the fifth and final planned treatment period. To age 40, thinnings on this productive Douglas-fir stand resulted in large increases in diameter growth with some reductions in basal area and volume growth and yield.

Massicotte, H.B., L.H. Melville, C.Y. Li, and R.L. Peterson. 1992. Structural aspects of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) tuberculate ectomycorrhizae. Trees (Berlin) 6:137-146.

For forest researchers. Tubercules of Douglas-fir consisted of clusters of ectomycorrhizae surrounded by peridium-like rind. N_2-fixing bacteria were located along with hyphae within the rind or as colonies on the surface of the tubercule.

Massicotte, H.B., L.H. Melville, R. Molina, and R.L. Peterson. 1993. Structure and histochemistry of mycorrhizae synthesized between *Arbutus menziesii* (Ericaceae) and two basidiomycetes, *Pisolithus tinctorius* (Pisolithaceae) and *Piloderma bicolor* (Corticiaceae). Mycorrhiza 3:1-11.

For forest mycologists. Histochemical analyses indicated that phenolic substances present in epidermal cells may be an important factor in mycorrhiza establishment.

Massicotte, H.B., J.M. Trappe, R.L. Peterson, and L.H. Melville. 1992. Studies on *Cenococcum geophilum*. II. Sclerotium morphology, germination, and formation in pure culture and growth pouches. Canadian Journal of Botany 70:125-132.

For mycologists. *Cenococcum geophilum* morphology, germination, and formation in pure culture and growth pouches are described.

McComb, W.C. 1992. Modeling systems for prescription development. P. 377-393 *in* Silvicultural Approaches to Animal Damage Management in Pacific Northwest Forests. H.C. Black, tech. ed. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. General Technical Report PNW-GTR-287. (For. Res. Lab.)

For field foresters. This paper provides examples of models of wildlife habitat in forest settings to illustrate how models could be developed to help land managers solve current or future problems.

McComb, W.C., C.L. Chambers, and M. Newton. 1993. Small mammal and amphibian communities and habitat associations in red alder stands, central Oregon Coast Range. Northwest Science 67:181-188. (For. Res. Lab.)

For wildlife biologists and forest managers. The authors compare habitat characteristics and abundance of small mammals and amphibians on streamside and upland sites in three red alder stands. Habitat relationships of small mammals and amphibians in these stands are examined. Nine species captured along streamsides and four species captured in uplands were not predicted by an existing model of wildlife habitat relationships.

McComb, W.C., K. McGarigal, and R.G. Anthony. 1993. Small mammal and amphibian abundance in streamside and upslope habitats of mature Douglas-fir stands, western Oregon. Northwest Science 67:7-15. (For. Res. Lab.)

For forest managers and wildlife biologists. Capture rates of small mammals and amphibians were compared between streamside and upslope habitats along 700-m transects in each of six mature Douglas-fir stands in 1988. Equitability and diversity of small mammal communities were higher along streamside than upslope transects. There was no difference in small mammal or amphibian species richness per transect between stream and upslope transects.

McComb, W.C., T.A. Spies, and W.H. Emmingham. 1993. Douglas-fir forests: managing for timber and mature-forest habitat. Journal of Forestry 91(12):31-42. (For. Res. Lab.)

For forest managers, wildlife biologists, and silviculturists. This article describes a conceptual basis for silvicultural systems that integrates mature-forest wildlife habitat and timber objectives in managed Douglas-fir forests of western Oregon and Washington.

Means, J.E., P.C. MacMillan, and K. Cromack, Jr. 1992. Biomass and nutrient content of Douglas-fir logs and detrital pools in an old-growth forest, Oregon, U.S.A. Canadian Journal of Forest Research 22:1536-1546. (For. Res. Lab.)

For ecologists and soil scientists. Logs, forest floor, and mineral soil were sampled and measured, and snags were measured, in a 450-year-old Douglas-fir stand. Logs, some still identifiable after 300 years on the forest floor, contained large amounts of organic matter, carbon, water, nitrogen, and calcium, and smaller amounts of phosphorus, potassium, magnesium, and sodium. The forest soil contained the largest reserves of nitrogen.

Miller, S.L., C.D. Koo, and R. Molina. 1992. Early colonization of red alder and Douglas-fir by ectomycorrhizal fungi and *Frankia* in soils from the Oregon Coast Range. Mycorrhiza 2:53-61.

For forest mycologists. Potential for mycorrhizal formation and *Frankia* nodulation in soil from six sites representing a successional sequence in the Pacific Northwest was studied by a greenhouse procedure with red alder and Douglas-fir seedlings. Ectomycorrhizal colonization of red alder and Douglas-fir differed according to site soil.

Minore, D., and H.G. Weatherly. 1994. Effects of partial bark removal on the growth of Pacific yew. Canadian Journal of Forest Research 24:860-862.

For silviculturists and harvesters of special forest products. The authors measured 121 yews that had been scarred by windthrow or logging damage 3 to 92 years earlier and found that their growth did not differ significantly from the growth of nearby unscarred yews. Radial growth of the scarred trees was strongly correlated with growth before scarring; it was slightly associated with the density and elevation of the overstory canopy and with the amount of bark removed.

Molina, R., H. Massicotte, and J.M. Trappe. 1992. Specificity phenomena in mycorrhizal symbioses: community-ecological consequences and practical implications. P. 357-423 *in* Mycorrhizal Functioning: An Integrative

Plant-Fungal Process. M.F. Allen, ed. Chapman and Hall, New York.

For mycologists. This chapter summarizes current knowledge on specificity phenomena in mycorrhizal symbioses and the impact of these phenomena on plant community dynamics. Integration into a holistic understanding of ecosystems is emphasized.

Molina, R., D.D. Myrold, and C.Y. Li. 1994. Root and soil biology of alder. P. 23-46 *in* The Biology and Management of Red Alder. D.E. Hibbs, D.S. DeBell, and R.F. Tarrant, eds. Oregon State University Press, Corvallis.

For forest ecologists, microbiologists, and soil scientists. This chapter reviews the alder-*Frankia* symbiosis with special emphasis on *Frankia* and mycorrhizal fungi.

Molina, R., T. O'Dell, D. Luoma, M. Amaranthus, M. Castellano, and K. Russell. 1993. Biology, ecology and social aspects of wild edible mushrooms in the forests of the Pacific Northwest: a preface to managing commercial harvest. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. General Technical Report PNW-GTR-309. 42 p.

For forest managers. This overview provides information on the biology of forest fungi, describes the major edible forest fungi harvested in the Pacific Northwest, discusses the social aspects of the mushroom harvest issue, summarizes the development of the commercial mushroom industry, and suggests research and monitoring protocols for developing management guidelines.

Myrold, D.D. 1994. *Frankia* and the actinorhizal symbiosis. P. 291-328 *in* Methods of Soil Analysis, Part 2. Microbiological and Biochemical Properties. R.W. Weaver, S. Angle, and P.J. Bottomley, eds. Soil Science Society of America, Madison, Wisconsin. Soil Science Society of America Book No. 5.

For microbiologists and soil scientists. This paper is a review of *Frankia* and actinorhizal plants, with special emphasis on methodology used to study these organisms.

Myrold, D.D., A.B. Hilger, K.J. Martin, and K. Huss-Danell. 1994. Enumerating *Frankia* in soil using molecular methods. P. 127-136 *in* Beyond the Biomass: Compositional and Functional Analysis of Soil Microbial Communities. K. Ritz, J. Dighton, and K.E. Giller, eds. John Wiley, Chichester, United Kingdom.

For microbiologists and soil scientists. This paper describes the use of plant bioassay and the polymerase chain reaction to enumerate *Frankia* in soil. The advantages and disadvantages of each approach are discussed.

Myrold, D.D., and K. Huss-Danell. 1994. Population dynamics of *Alnus*-infective *Frankia* in a forest soil with and without host trees. Soil Biology and Biochemistry 26:533-540.

For microbiologists and soil scientists. Populations of total and alder-infective *Frankia* were determined in soils with and without the host plant (alder) and with and without various nutrient amendments. No significant treatment differences were observed; however, there were temporal changes in the population of alder-infective *Frankia*.

Nakamura, F., and F.J. Swanson. 1993. Effects of coarse woody debris on morphology and sediment storage of a mountain stream system in western Oregon. Earth Surface Processes and Landforms 18:43-61.

For watershed specialists, forest ecologists, and hydrologists. The effects of coarse woody debris (CWD) were investigated at sites representative of first-order through fifth-order streams. In this Cascade Mountain stream system, CWD promoted lateral migration of the channel but only temporary storage of sediment.

Nason, G.E., and D.D. Myrold. 1992. Nitrogen fertilizers: fates and environmental effects in forests. P. 67-81 *in* Forest Fertilization: Sustaining and Improving Nutrition and Growth of Western Forests. H.N. Chappell, G.F. Weetman, and R.E. Miller, eds. College of Forest Resources, University of Washington, Seattle, Washington. Institute of Forest Resources Contribution 73.

For forest ecologists, forest managers, and soil scientists. This paper is a review of past research with special emphasis on ^{15}N studies. These studies have found that about 20-30 percent of the applied N is taken up by trees, about 50 percent of the N is immobilized in soil, and the remainder is lost by volatilization, leaching, or denitrification. Repeated applications seem to enhance the production of NO_3^- by nitrification.

Nouhra, E., and L. Dominguez de Toledo. 1992. Interaction between *Podaxis argentinus* (Basidiomycotina) and Muscidae (Dipterae). Boletin de la Sociedad Argentina de Botanica 28(1-2):41-45.

For entomologists, taxonomists, and mycologists. The life cycle of a Muscidae species occurring within the sporocarp of a Gasteromycete was studied.

Nouhra, E., and L. Dominguez de Toledo. 1993. Interaction between Lycoperdales and Tulostomatales (Basidiomycotina) and Sphindidae (Coleoptera). Boletin de la Sociedad Argentina de Botanica 29(3-4):173-177.

For entomologists, taxonomists, and mycologists. The sporocarps of species belonging to the orders Lycoperdales and Tulostomatales are used as a food source by a species of Sphindidae.

O'Dell, T.E., M.A. Castellano, and J.M. Trappe. 1992. Biology and application of ectomycorrhizal fungi. P. 379-416 *in* Soil Microbial Ecology. F.B. Metting, Jr., ed. Marcel Dekker, Inc., New York, Basel, Hong Kong.

For foresters and mycologists. This chapter introduces nonspecialists to a current understanding of ectomycorrhizae, their biology, and their management.

O'Dell, T.E., H.B. Massicotte, and J.M. Trappe. 1993. Root colonization of *Lupinus latifolius* Agardh. and *Pinus contorta* Dougl. by *Phialocephala fortinii* Wang & Wilcox. New Phytology 124:93-100.

For forest mycologists. The fungus colonized epidermal and cortical cells in pine feeder roots, as well as cortical and epidermal cells of primary roots of both hosts.

O'Dell, T.E., and J.M. Trappe. 1992. Root endophytes of lupin and some other legumes in Northwestern USA. New Phytologist 122:479-485.

For mycologists and ecologists. Roots of ten species of *Lupinus* and three other legumes collected from field soils were cleared, stained, and examined for fungal colonization. Three species were not colonized; nine species were colonized by aseptate hyphae and vesicles attributable to vesicular-arbuscular mycorrhizae. Seven species were sometimes colonized by fungi with septate hyphae, which ofren formed intracellular sclerotia.

Pais, R.C., S.A. Bonney, and W.C. McComb. 1988. Herpetofaunal species richness and habitat associations in an eastern Kentucky forest. Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 42:448-455.

For wildlife biologists. Species richness was lower in mature forest than in clearcuts or wildlife clearings. Slimy salamanders were associated with steep slopes and dense shrub cover on clearcuts, red-spotted newts with forest canopy, and American toads with dense herbaceous cover in forest clearings.

Pais, R.C., W.C. McComb, and J. Phillips. 1991. Habitat associated with home ranges of female *Odocoileus virginianus* (Mammalia: Cervidae) in eastern Kentucky. Brimleyana 17:57-66. (For. Res. Lab.)

For wildlife specialists. Data obtained on vegetation, land use, and topography from a computerized Geographic Information System (GIS) for eight does relocated from bottomland hardwood habitat of western Kentucky to eastern Kentucky and six does resident to eastern Kentucky indicated that GIS may be an economical tool for identifying future release sites.

Perry, D.A. 1993. Biodiversity and wildlife are not synonymous. Conservation Biology 7:204-205. (For. Res. Lab.)

For researchers. The author responds to an editorial in *Conservation Biology* that suggests that wildlife and biodiversity should be made synonymous in the public mind. He instead proposes a program of ecological education about the network of relationships and processes that ultimately determine the health of any individual species.

Peterson, E.C., and R.A. Mickler. 1994. A synthesis from controlled seeding exposure studies of acid precipitation. Journal of Environmental Quality 23:257-267.

For all scientists. The critical importance of statistical power, population inference, quality assurance, and quality control in evaluating the outcome of individual or combined ecological studies is graphically illustrated from analysis of over two dozen national studies conducted from 1985 to 1990 in the National Acid Precipitation Assessment Program.

Pokojska, A., E. Strzelczyk, C.Y. Li, H. Rozycki, and M. Szablewska. 1993. Effect of plant growth regulators on growth of ectomycorrhizal fungi. Cryptogamic Botany 4(1):8-13.

For soil microbiologists. Plant growth regulators were tested on ectomycorrhizal fungi *Laccaria laccata*, *Hebeloma crustuliniforme*, and *Rhizopogon vinicolor*. Auxins did not affect the growth of *L. laccata*, but some of them exhibited both inhibitory and stimulatory effects on the growth of *H. crustuliniforme* and *R. vinicolor*.

Puettmann, K.J., D.S. DeBell, and D.E. Hibbs. 1993. Density management guide for red alder. Forest Research Laboratory, Oregon State University, Corvallis. Research Contribution 2. 6 p. (For. Res. Lab.)

For forest managers. A diameter-based density management guide (diagram) was developed for red alder. The management zone defines a reasonable compromise between individual-tree and stand growth and mortality. Factors considered in its formation include desired tree size at harvest, growth rate, and yield per acre.

Puettmann, K.J., D.W. Hann, and D.E. Hibbs. 1993. Evaluation of the size-density relationships for pure red alder and Douglas-fir stands. Forest Science 39:7-27. (For. Res. Lab.)

For forest researchers. Size-density trajectories were developed for pure red alder and Douglas-fir stands with quadratic mean diameter of the stand as the tree-size variable. The resulting self-thinning or maximum size-density line for red alder had a steeper slope than that for Douglas-fir. The assumption of a common slope for all species is therefore not supported by this study.

Puettmann, K.J., D.E. Hibbs, and D.W. Hann. 1992. The dynamics of mixed stands of *Alnus rubra* and *Pseudotsuga menziesii*: extension of size—density analysis to species mixture. Journal of Ecology 80:449-458. (For. Res. Lab.)

For ecologists and land managers. The monoculture self-thinning concept was expanded to polycultures by describing a self-thinning surface in a mixed-species size—density space. For polycultures of *Alnus rubra* (red alder) and *Pseudotsuga menziesii* (Douglas-fir), the average size—density surface showed a near-planar region for stands consisting principally of red alder. At high proportions of Douglas-fir, the surface showed a curvilinear increase toward the relative density of pure Douglas-fir.

Radulovich, R., and P. Sollins. 1991. Nitrogen and phosphorus leaching in zero-tension drainage from a humid tropical soil. Biotropica 23(1):84-87.

For forest ecologists and biogeochemists. The authors studied the concentrations of inorganic nitrogen and phosphorus in water collected by large zero-tension lysimeters at the La Selva Biological Station, Costa Rica. They conclude that, for these little-disturbed, well-aggregated soils, zero-tension lysimeters probably give good estimates of total leaching losses.

Radulovich, R., P. Sollins, P. Baveye, and E. Solórzano. 1992. Bypass water flow through unsaturated microaggregated tropical soils. Soil Science Society of America Journal 56:721-726. (For. Res. Lab.)

For soil scientists, hydrologists, and forest ecologists. Bypass water flow occurred in two microaggregated Inceptisols from the humid Atlantic region of Costa Rica under water-application rates below those needed to produce ponding. Results suggest that bypass flow will occur in the noncapillary interpedal pore space whenever the application rate exceeds the infiltration rate of individual microaggregates.

Rozycki, H., E. Strzelczyk, E. Raczkowska, and C.Y. Li. 1992. Effect of different carbon and nitrogen sources and vitamins on growth of *Azospirillum* spp. isolated from coniferous ectomycorrhizae and sporocarps of ectomycorrhizal fungi. Acta Microbiologica Polonica 41:193-201.

For environmental microbiologists. Different carbon and nitrogen sources were tested for their effect on growth of three strains of N_2-fixing *Azospirillum* associated with mycorrhizal fungi of Douglas-fir. Physiological differences among the strains were observed.

Runyon, J., R.H. Waring, S.N. Goward, and J.M. Welles. 1994. Environmental limits on net primary production and light-use efficiency across the Oregon transect. Ecological Applications 4:226-237. (For. Res. Lab.)

For forest ecologists. The authors evaluated how climate constrains net primary production by limiting the utilization of intercepted photosynthetically active radiation.

Rygiewicz, P.T., and C.P. Andersen. 1994. Mycorrhizae alter the quality and quantity of carbon allocated belowground. Nature 369:58-60.

For plant physiologists and process modelers. A carbon budget of both mycorrhizal and nonmycorrhizal ponderosa pine seedlings is presented. The budget includes respiration measurements of roots and extramatrical hyphae.

Schreiber, B., and D.S. deCalesta. 1992. The relationship between cavity-nesting birds and snags on clearcuts in western Oregon. Forest Ecology and Management 50:299-316.

For professional wildlife biologists. To optimize density and richness of cavity-nesting birds, forest managers should provide 14 or more snags per hectare between 28 and 128 cm diameter at breast height (dbh), between 6.4 and 25 m tall, with at least 10% bark cover, and with a majority in hardness stages 3 and 4 (stage 1, minimal deterioration-stage 5, maximum deterioration).

Shainsky, L.J., B.J. Yoder, T.B. Harrington, and S. Chan. 1994. Physiological characteristics of red alder: water relations and photosynthesis. P. 73-91 *in* The Biology and Management of Red Alder. D.E. Hibbs, D.S. DeBell, and R.F. Tarrant, eds. Oregon State University Press, Corvallis.

For tree physiologists, process-modelers of forest growth, and forest managers. This chapter reviews research dealing with the photosynthesis and water relations of red alder.

Smith, T.M., W.P. Cramer, R.K. Dixon, R. Leemans, R.P. Neilson, and A.M. Solomon. 1993. The global terrestrial carbon cycle. Water, Air and Soil Pollution 70:19-37.

For global biogeochemists and policy analysts. The oceans and terrestrial biosphere contain approximately 40,000 and 2000 Pg of carbon, respectively. Global climate change will increase carbon flux from terrestrial biosphere to the atmosphere unless mitigation and adaptation measures are implemented.

Sollins, P. 1991. Effects of soil microstructure on phosphorus sorption in soils of the humid tropics. P. 168-175 *in* Phosphorus Cycles in Terrestrial and Aquatic Ecosystems. Proceedings, Regional Workshop 3: South and Central America, Scientific Committee on Problems of the Environment (SCOPE) and the United Nations Environmental Programme (UNEP). H. Tiessen, D. López-Hernández, and I.H. Salcedo, eds. Saskatoon Institute of Pedology, Saskatoon, Saskatchewan, Canada.

For soil scientists and biogeochemists. This paper reviews recent studies suggesting that the physical characteristics of soil constituents, as opposed to their chemical characteristics, may be more important than previously thought in determining patterns of phosphorus availability in acidic soils of the humid tropics.

Sollins, P., F. Sancho, R. Mata, and R.L. Sanford, Jr. 1994. Soils and soil process research. P. 34-53 *in* La Selva - Ecology and Natural History of a Neotropical Rain Forest. The University of Chicago Press, Chicago and London.

For forest and plant ecologists and soil scientists. The soils and soil process research at La Selva are described. Although unusual in their physical properties, La Selva's soils span a large portion of the range in soil chemical properties within the humid tropics.

Stark, N. 1992. An approach to nutrient management in mountain forest ecosystems. P. 156-161 *in* Proceedings,

5th Workshop of Ecology of Subalpine Zones, IUFRO, Beijing, China. Y. Yupo and Z. Jiangling, eds.

For forest managers. The publication outlines a nutrient-based management system that allows the nutrient costs of various management alternatives to be evaluated. Twenty years of forest nutrient research provide the basis for the proposed model.

Stark, N., and S. Baker. 1992. The ecology and culture of Montana huckleberries. Montana Forest and Conservation Experiment Station, The University of Montana, Missoula, Montana.

For scientists and the general public (written by sections for separate audiences). Based on 6 years of intensive research on the ecology of wild huckleberries from Oregon, Washington, and Montana, this book discusses seed germination, culture, nutritional demands, productivity, niche requirements, and commercial potential.

Strickland, T.C., P. Sollins, N. Rudd, and D.S. Schimel. 1992. Rapid stabilization and mobilization of ^{15}N in forest and range soils. Soil Biology and Biochemistry 24:849-855.

For soil scientists. Effects of physical protection of soil organic matter on rates of nitrogen mineralization and immobilization were studied in five contrasting soils from North and Central America.

Strzelczyk, E., M. Kampert, and C.Y. Li. 1994. Cytokinin-like substances and ethylene production by *Azospirillum* in media with different carbon sources. Microbiological Research 149:1-6.

For soil microbiologists. Nitrogen-fixing *Azospirillum* sp. associated with ectomycorrhizae of Douglas-fir produced cytokinin-like substances in vitro.

Strzelczyk, E., A. Pokojska, H. Rozycki, D.A. Perry, and C.Y. Li. 1993. Growth of mycorrhizal fungi in dixenic cultures with bacteria in media of different composition. Acta Microbiologica Polonica 42:41-50.

For research foresters. Soil bacteria, such as *Arthrobacter globiformis*, *Bacillus subtilis*, and *Pseudomonas fluorescens*, can increase biomass production of three ectomycorrhizal fungi of Douglas-fir. However, composition of the medium and its pH affected mycelial growth.

Studier, D. 1993. Carriages for skylines. Forest Research Laboratory, Oregon State University, Corvallis. Research Contribution 3. 14 p. (For. Res. Lab.)

For forest engineers and harvest planners. Skyline systems use a carriage to aid in yarding logs to the landing. These carriages may be classified as slackpulling or non-slackpulling. Slackpulling carriages provide the skyline with lateral yarding capability and therefore can be used in a variety of silvicultural prescriptions. Non-slackpulling carriages can include either chokers or grapples and are used in clearcuts.

Swanson, F.J., J.A. Jones, D.O. Wallin, and J. Cissel. 1993. Natural variability: implications for ecosystem management. P. 89-103 *in* Eastside Forest Ecosystem Health Assessment—Volume II. Ecosystem Management Principles and Applications. M.E. Jensen and P.S. Bourgeron, eds. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon.

For ecologists and forest managers. Discussion of how information on the historic variability in ecosystem conditions and natural disturbance regimes can be used in making ecosystem management decisions.

Trappe, J.M., and M.A. Castellano. 1992. MYCOLIT: A Mycorrhiza Bibliography, 1758-1991. Mycologue Publications, Waterloo, Ontario, Canada. 550 p. (Available in hard copy or on computer disk with capability for searching by author, outlet, and key words.)

For foresters and agronomists. Over 11,600 references are presented in this nearly complete listing of the mycorrhiza literature.

Trappe, J.M., M.A. Castellano, and N. Malajczuk. 1992. Australasian truffle-like fungi. II. *Labyrinthomyces*, *Dingleya* and *Reddellomyces* gen. nov. (Ascomycotina). Australian Systematic Botany 5:597-611.

For forest mycologists. Re-examination of species ascribed to the genus *Labyrinthomyces* plus the authors' collections of related undescribed taxa revealed three distinct morphological groups which the authors segregated at the generic level.

Trappe, J.M., M. A. Castellano, and M.J. Trappe. 1992. Australasian truffle-like fungi. IV. *Malajczukia* gen. nov. (Basidiomycotina, Mesophelliaceae). Australian Systematic Botany 5:617-630.

For forest mycologists. *Malajczukia*, a new genus of truffle-like fungi, is described along with six new species (*M. amicorum*, *M. fusipora*, *M. karrialis*, *M. spumoidea*, *M. tropica*, and *M. viridigleba*) and two new combinations (*M. ingratissima* and *M. novae-zelandiae*).

Trappe, J.M., and D.L. Luoma. 1992. The ties that bind: fungi in ecosystems. P.17-27 *in* The Fungal Community. Its Organization and Role in the Ecosystem. G.C. Carroll and D.T. Wicklow, eds. Marcel Dekker, Inc., New York, Basel, Hong Kong.

For mycologists and ecologists. Fungi profoundly affect nearly all ecological processes and events. The authors present examples of mycorrhizal symbiosis as illustrations.

Triquet, A.M., W.C. McComb, and J.D. Sole. 1989. Ruffed grouse drumming sites in eastern Kentucky. Kentucky Warbler 64:54-60.

For forest managers and wildlife biologists. During a study of habitat use and mortality of ruffed grouse on the Cumberland Plateau, the authors found that composition

of the overstory, structure of the understory and midstory, log size, and slope are features that contribute collectively to site selection of drumming sites by male ruffed grouse. The vegetative structure and composition typical of drumming sites can be provided by patch clearcutting, but some provisions for drumming logs or alternative stages must be made if forests are to be managed for both wood products and ruffed grouse.

Turner, D.P., P. Sollins, M. Leuking, and N. Rudd. 1993. Availability and uptake of inorganic nitrogen in a mixed old-growth coniferous forest. Plant and Soil 148:163-174.

For forest ecologists. Rates of nitrogen mineralization and nitrification and an index of ammonium and nitrate uptake in a mixed old-growth stand of Douglas-fir, western hemlock, and western redcedar were monitored for 2 years. Results indicate species-specific effects on ammonium and nitrate production and uptake within this forest type.

Urban, D.L., A.J. Hansen, D.O. Wallin, and P.J. Halpin. 1992. Life-history attributes and avian diversity: scaling implications for global change. P. 173-195 *in* Biodiversity and Global Change, Monograph No. 8. O.T. Solbrig, H.M. van Emden, and P.G.W.J. van Oordt, eds. International Union of Biological Sciences, Paris, France.

For ecologists. Provides examples of problems that can arise when using results of small-scale studies to make predictions about larger scale phenomena. Focuses on problems associated with making predictions of changes in patterns of biological diversity that may occur as a result of climate and land-use changes.

Velazquez-Martinez, A., D.A. Perry, and T.E. Bell. 1992. Response of aboveground biomass increment, growth efficiency, and foliar nutrients to thinning, fertilization, and pruning in young Douglas-fir plantations in the central Oregon Cascades. Canadian Journal of Forest Research 22:1278-1289. (For. Res. Lab.)

For forest researchers and managers. The effect of thinning and cultural practice (multinutrient fertilization, pruning) on total aboveground biomass increment and growth efficiency was studied over three consecutive 2-year periods in young Douglas-fir plantations. Foliage analyses indicate that thinning improved nitrogen, potassium, and magnesium nutrition and increased the translocation of potassium to support new growth. However, fertilization increased foliar nitrogen and phosphorus contents only when coupled with pruning, suggesting that trees favor total leaf area over individual needle nutrition.

Vermes, J.-F., and D.D. Myrold. 1992. Denitrification in forest soils of Oregon. Canadian Journal of Forest Research 22:504-512.

For soil scientists and forest ecologists. *In situ* denitrification rates were studied in a range of forest ecosystems in order to assess the importance of selected soil properties as controlling factors of denitrification in forest soils. Relatively little N is apparently lost from Oregon forest soils as N gases.

Walker, C., and J.M. Trappe. 1993. Names and epithets in the Glomales and Endogonales. Mycological Research 97:339-344.

For mycologists and taxonomists. This paper reviews errors in names of the Glomales and Endogonales, determines corrections, and lists the proper names for all known species in these orders.

Wallin, D.O., C.C.H. Elliott, H.H. Shugart, C.J. Tucker, and F. Wilhelmi. 1992. Satellite remote sensing of breeding habitat for an African weaver-bird. Landscape Ecology 7(2):87-99.

For ecologists. Demonstrates feasibility of using coarse spatial resolution satellite data to monitor potential breeding habitat for a highly mobile, granivorous bird.

Wallin, D.O., F.J. Swanson, and B. Marks. 1994. Landscape pattern response to changes in the pattern-generation rules: land-use legacies in forestry. Ecological Applications 4(3):569-580.

For ecologists, modelers and forest managers. Discussion of the development of landscape patterns in response to timber harvesting and the degree to which established landscape patterns can be changed. Results indicate that patterns created by dispersed ("staggered setting") cutting are extremely difficult to change without a substantial reduction in the cutting rate or a reduction in the minimum stand age eligible for cutting.

Waring, R.H. 1991. Responses of evergreen trees to multiple stresses. P. 371-390 *in* Response of Plants to Multiple Stresses. E.J. Pell, W.E. Winner, and H.A. Mooney, eds. Academic Press, San Diego, California.

For silviculturists, forest managers, and tree physiologists. Various kinds of environmental stresses induce predictable changes in how carbohydrates are partitioned to leaves, stem, roots, and storage reserves of evergreen trees. Sustained stress results in premature shedding of foliage and a loss of competitive status relative to many deciduous trees.

Waring, R.H. 1993. The Oregon Transect Ecosystem Research (OTTER) project. P. 247-250 *in* 16th Canadian Symposium on Remote Sensing, Sherbrooke, Quebec.

For forest ecologists and those interested in remote sensing. This project compared the rates of carbon, water, and nitrogen movement through a range of Pacific Northwest ecosystems against those rates predicted by a simulation model. Remote sensing techniques were employed to extend the model's application.

Webb, W.L. 1991. CO_2 and climate interactions: a process model of tree growth in response to global change. World Resource Review 2(3):338-366.

For all those interested in global changes in climate. A model is described for determining the effects of increased CO_2 concentration and climate change on net photosynthesis and seedling growth.

Webb, W.L., and K.J. Kilpatrick. 1993. Starch content in Douglas-fir: diurnal and seasonal dynamics. Forest Science 39:359-367. (For. Res. Lab.)

For forest scientists. Diurnal and seasonal starch dynamics in the crowns of young-growth Douglas-fir and seasonal starch dynamics in various tissues of field-grown Douglas-fir seedlings were determined in coastal mountains and valley sites in Oregon. Starch content is too small to directly affect growth rates during the growing season. Starch may act as a buffer between rapidly fluctuating photosynthesis rates and other growth processes.

Webb, W.L., and M.J. Ungs. Three dimensional distribution of needle and stem surface area in a Douglas-fir. Tree Physiology 13:203-212.

For forest scientists. This paper describes the spatial arrangement of foliar surface area in Douglas-fir and its important use with radiation transfer models, which are needed to predict photosynthesis and related ecosystem processes.

Wilson, B.F., C.-T. Chien, and J.B. Zaerr. 1989. Distribution of endogenous indole-3-acetic acid and compression wood formation in reoriented branches of Douglas-fir. Plant Physiology 91:338-344.

For plant and tree physiologists. Five-year-old segments of intact 7-year-old branches of Douglas-fir were reoriented to determine the relation between indole-3-acetic acid (IAA) and the formation of compression wood (CW). Although IAA was present and may be required for CW formation, the concentration of endogenous IAA was not positively related to CW formation; thus, some other substance may regulate CW formation.

Winjum, J.K., R.K. Dixon, and P.E. Schroeder. 1992. Estimating the global potential of forest and agroforest management practices to sequester carbon. Water, Air and Soil Pollution 64:213-227.

For global biogeochemists and global ecologists. Agroforest and forest ecosystems can be established and managed to help stabilize the emissions of CO_2 to the atmosphere.

Wisniewski, J., R.K. Dixon, J.D. Kinsman, R.N. Sampson, and A.E. Lugo. 1993. Carbon dioxide sequestration in terrestrial systems. Climate Research 3:1-5.

For global biogeochemists and policy analysts. The flux of carbon between the terrestrial biosphere and the atmosphere is 70 to 100 Pg annually. Forest and agroecosystems, arid lands, wetlands, and tundra all contribute to carbon biogeochemistry in the terrestrial biosphere.

Wood, P.B., and M.W. Collopy. 1993. Effects of egg removal on bald eagle productivity in northern Florida. Journal of Wildlife Management 57:1-9.

For wildlife biologists. A 6-year experimental study involving 115 pairs of bald eagles was conducted to determine if eagles would produce a replacement clutch in the same year that their initial clutch was removed. Potential adverse effects of "double-clutching" on both the parents and their offspring were investigated, and recommendations are made on the use of this technique for providing eagles to reintroduction programs in the Southeast.

INTEGRATED PROTECTION OF FORESTS AND WATERSHEDS

Adams, P.W. 1993. Closing the gaps in knowledge, policy and action to address water issues in forests. Journal of Hydrology 150:773-786. (For. Res. Lab.)

For hydrologists and other resource specialists, planners, and decision makers. Water issues on forest lands involve many human elements and needs that are not addressed by advanced physical and biological research and technology. Problem-solving research, education, policy, and communications thus play vital, and often overriding, roles in what actually is done on the land and on the resulting effects on water.

Angwin, P.A., and E.M. Hansen. 1993. Pairing tests to determine mating compatibility in *Phellinus weirii* (Murr.) Gilbertson. Mycological Research 97:1469-1475.

For mycologists and forest pathologists. A new technique reveals patterns of sexuality and intersterility in Basidiomycetes that do not form clamp connections.

Baker, F.A., M. Slivitsky, and K. Knowles. 1992. Impact of dwarf mistletoe on jack pine forests in Manitoba. Plant Disease 76:1256-1259.

For forest managers. Incidence of forest areas severely infested with dwarf mistletoe was assessed from the air on 140,000 ha of mature jack pine in commercially important forests in Manitoba. Approximately 12,000 ha or 9 percent of the area surveyed was infested. The volume reduction caused by dwarf mistletoe represented 4-8 percent of the merchantable volume on the surveyed area.

Brasier, C.M., and E.M. Hansen. 1992. Evolutionary biology of *Phytophthora*, Part II: Phylogeny, speciation, and population structure. Annual Review of Phytopathology 30:173-200.

For plant pathologists and mycologists. Literature on *Phytophthora* evolution is summarized and new ideas on speciation and species concepts are offered.

Bronson, M.R., Li, Yong-An, R.K. Dixon, G.B. Runion, W.D. Kelley, and C.M. Peterson. 1992. *In vitro* host-pathogen interactions of *Pinus elliottii* calli and *Fusarium monoliforme* var. subglutinans. European Journal of Forest Pathology 22:432-440.

For forest pathologists and biotechnology specialists. An *in vitro* procedure was developed to examine interactions between slash pine and pathogenic fungi. Pathogen-resistant genotypes of slash pine can be selected *in vitro*.

Castellano, M.A., D. McKay, and W.G. Thies. 1993. Ecological impacts of using chloropicrin to control laminated root rot in northwest conifer forests: growth and mycorrhiza formation of planted Douglas-fir seedlings after two growing seasons. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. Research Paper PNW-RP-464. 4 p.

For foresters and researchers. Bareroot Douglas-fir seedlings processed by standard nursery and reforestation procedures were planted around Douglas-fir stumps injected with chloropicrin as a control for laminated root rot. The seedlings grew equally well around treated and nontreated stumps. All surviving seedlings grew well and had well-developed ectomycorrhizae. Seedling survival averaged 80 percent across all treatments after two growing seasons.

Entry, J.A., P.K. Donnelly, and K. Cromack, Jr. 1992. The influence of carbon nutrition on *Armillaria ostoyae* growth and phenolic degradation. European Journal of Forest Pathology 22:149-156. (For. Res. Lab.)

For forest pathologists. Colony size and biomass of *Armillaria ostoyae* isolates grown in basal media usually were greater when the carbon source was glucose rather than fructose or sucrose.

Entry, J.A., P.K. Donnelly, and K. Cromack, Jr. 1993. Effect of nitrogen and carbon sources on lignin and cellulose degradation by *Armillaria ostoyae* European Journal of Forest Pathology 23:129-137. (For. Res. Lab.)

For forest pathologists. Degradation of lignin and cellulose by *Armillaria ostoyae* cultured in a medium containing various nitrogen and carbon sources was measured radiometrically. More lignin was degraded as the concentrations of glucose and sucrose increased. No consistent pattern of lignin degradation was found with varying nitrogen or sucrose concentrations.

Filip, G.M., J.J. Colbert, C.G. Shaw III, P.F. Hessburg, and K.P. Hosman. 1993. Influence of dwarf mistletoe and western spruce budworm on growth and mortality of Douglas-fir in unmanaged stands. Forest Science 39:465-477. (For. Res. Lab.)

For forest scientists, pathologists, and entomologists. Permanent inventory plots in 94 unmanaged stands of primarily Douglas-fir on three national forests were examined for growth suppression caused by dwarf mistletoe and western spruce budworm. Both dwarf mistletoe and western spruce budworm significantly decreased 10-year diameter increment. Mortality was highest in stands with the most dwarf mistletoe and in stands with the most severe defoliation.

Filip, G.M., C.A. Parks, and G.L. Starr. 1992. Incidence of wound-associated infection by *Cytospora* sp. in mountain alder, red-osier dogwood, and black hawthorn in Oregon. Northwest Science 66:194-198. (For. Res. Lab.)

For wildlife biologists and forest pathologists. *Cytospora* sp. is associated with stem cankering and mortality of mountain alder in northeastern Oregon. This is the first report of mountain alder as a host for *Cytospora* sp. in Oregon.

Goheen, D.J., and E.M. Hansen. 1993. Effects of pathogens and bark beetles on forests. P. 175-198 *in* Beetle Pathogen Interactions in Conifer Forests. T.D. Schowalter and G.M. Filip, eds. Academic Press, New York. 252 p.

For foresters and forest protection specialists. The authors review the various impacts of root pathogens and associated bark beetles on economic and ecological properties of forests.

Hamelin, R.C., L. Shain, R.S. Ferriss, and B.A. Thielges. 1993. Quantification of disease progress and defoliation in the poplar leaf rust-eastern cottonwood pathosystem. Phytopathology 83:140-144.

For forest pathologists and geneticists. Over two seasons in a western Kentucky plantation, field resistance of eastern cottonwood families derived from natural stands along the Mississippi River segregated into northern clusters of susceptible families and southern clusters of resistant families. This north-south gradient of decreasing susceptibility was again evident during a third season, and could be estimated by a single determination in late September-early October.

Hamelin, R.C., L. Shain, and B.A. Thielges. 1992. Adaptation of poplar leaf rust to eastern cottonwood. Euphytica 62:69-75.

For forest geneticists and pathologists. Poplar leaf tust isolates of southern origin have broader adaptation and greater virulence on host genotypes of southern origin. However, larger variance attributable to specific interactions in northern rust isolates indicates a potential for adaptation to resistant host genotypes.

Hamelin, R.C., L. Shain, and B.A. Thielges. 1992. Influence of leaf wetness, temperature, and rain on poplar leaf rust epidemics. Canadian Journal of Forest Research 22:1249-1254.

For forest pathologists. Rain deficit and high maximum temperatures are not limiting factors for poplar leaf tust epidemics if night conditions frequently offer optimal temperature and leaf wetness for infection.

Hansen, E.M., J. Stenlid, and M. Johansson. 1993. Genetic control and somatic incompatibility in the root-rotting basidiomycete *Heterobasidion annosum*. Mycological Research 97:1229-1233.

For forest pathologists and mycologists. Incompatibility between heterokaryotic isolates of this important root decay fungus is genetically controlled, at three or more loci.

Hansen, E.M., J. Stenlid, and M. Johansson. 1993. Somatic incompatibility and nuclear reassortment in *Heterobasidion annosum*. Mycological Research 97:1223-1228.

For forest pathologists and mycologists. A novel form of nuclear reassortment occurs when incompatible isolates of *H. annosum* meet, allowing the formation of new genotypes.

Hennon, P.E., C.G. Shaw III, and E.M. Hansen. 1992. Alaska yellow cedar decline: distribution, epidemiology, and etiology. P. 108-122 *in* Forest Decline Concepts. P.D. Manion and D. Lachance, eds. APS Press, St. Paul, Minnesota.

For ecologists, silviculturists, and forest pathologists. A review of the research on this widespread and lethal disease of Alaska cedar, cause unknown, but apparently not due to insects, pathogenic fungi, or human-initiated disturbances.

Herlihy, A.T., P.R. Kaufmann, M.R. Church, P.J. Wigington, Jr., J.R. Webb, and M.J. Sale. 1993. The effects of acidic deposition on streams in the Appalachian Mountain and Piedmont Region of the Mid-Atlantic United States. Water Resources Research 29:2687-2703.

For researchers and policy makers dealing with issues related to the effects of acidic deposition on aquatic ecosystems. Paper provides a comprehensive evaluation of the effects of acidic deposition on streams of the mid-Atlantic.

Holah, J., M. Wilson, and E.M. Hansen. 1994. Effects of *Phellinus weirii* on plant community composition and succession in old-growth Douglas-fir forests. Canadian Journal of Forest Research 23:2473-2480.

For ecologists and forest pathologists. The fungus that causes laminated root rot, well known as a desttuctive pathogen in commercial forests, is also an important agent of natural disturbance in wild forests.

Joseph, G., and R.G. Kelsey. 1994. Acceptability and suitability of Douglas-fir as a secondary host for gypsy moth (Lepidoptera: Lymantriidae). Environmental Entomology 23:396-405.

For forest entomologists, forest pest managers, and chemical ecologists. Although new Douglas-fir foliage was the most acceptable, it was not the most suitable for first- or fourth-instar gypsy moth larvae. Switching second, third, or fourth instars from white alder to Douglas-fir reduced pupal weights in comparison with those of larvae fed white alder alone, but it did not affect development rate.

Joseph, G., R.G. Kelsey, A.F. Moldenke, J.C. Miller, R.E. Berry, and J. Wernz. 1993. Effect of nitrogen and Douglas-fir allelochemicals on development of the gypsy moth, *Lymantria dispar*. Journal of Chemical Ecology 19:1245-1263.

For forest entomologists, forest pest managers, and chemical ecologists. Foliar concentrations of nitrogen and

allelochemicals were manipulated by fertilizing potted Douglas-fir seedlings with 0 or 200 ppm of nitrogen. The pupal weights from sixth-instar gypsy moth larvae fed with these seedlings were positively correlated with foliar nitrogen, negatively correlated with foliar phenolics, and uncorrelated with terpene concentrations.

Leidholt-Bruner, K., D.E. Hibbs, and W.C. McComb. 1992. Beaver dam locations and their effects on distribution and abundance of coho salmon fry in two coastal Oregon streams. Northwest Science 66:218-223. (For. Res. Lab.)

For fisheries and wildlife biologists and plant ecologists. The relationships between beaver dams and coho salmon were examined in two coastal Oregon streams in 1987. Although density of coho was similar among pool types, beaver ponds were larger and contained more coho fty than did non-beaver ponds; thus, beavers increased rearing habitat for coho during the late-summer low flow.

McComb, W.C. 1994. Red alder: interactions with wildlife. P. 131-138 *in* The Biology and Management of Red Alder. D.E. Hibbs, D.S. DeBell, and R.F. Tarrant, eds. Oregon State University Press, Corvallis. (For. Res. Lab.)

For wildlife biologists, silviculturists, and forest planners. This chapter describes the use of red alder trees and stands by wildlife species, the role of red alder in upslope and riparian systems, and the potential influence of red alder on animal diversity in conifer-hardwood stands and Pacific Northwest landscapes.

Moldenke, A.F., R.E. Berry, J.C. Miller, R.G. Kelsey, J.G. Wernz, and S. Venkateswaran. 1992. Carbaryl susceptibility and detoxication enzymes in gypsy moth (Lepidoptera: Lymantriidae): influence of host plant. Economic Entomology 85:1628-1635.

For forest entomologists, forest pest managers, and chemical ecologists. Toxicity of carbaryl and levels of detoxifying enzymes were determined in gypsy moth larvae reared on white alder or Douglas-fir. Larvae reared on Douglas-fir produced higher levels of detoxication enzymes and were significantly more tolerant of carbatyl than larvae reared on white alder.

Oester, P.T., S.A. Fitzgerald, W.H. Emmingham, A. Campbell, and G.M. Filip. 1992. Forest health in eastern Oregon. Oregon State University Extension Service, Corvallis. Extension Publication EC1143. 6 p.

For decision makers. Describes forest health problems in eastern Oregon and causes. Potential solutions are outlined, including monitoring, doing nothing, spraying, and sanitizing and restoring. Future strategies and how policy makers can influence forest health decisions are explored.

Ross, D.W. 1992. Integrating forest protection with silvicultural planning and practice. P. 4-12 *in* Biocontrol of Forest Weeds. Proceedings of a workshop at the Western International Forest Disease Work Conference, Vernon, British Columbia. C. Dorworth and S.G. Glover, eds. Forestry Canada, Pacific and Yukon Region, Pacific Forestry Centre, Victoria, British Columbia.

For forest managers and specialists in forest pest management. This paper briefly discusses some of the principles of integrated pest management in relation to forestty. It cites specific examples from research on forest vegetation management to illustrate the need for an interdisciplinary approach in the development and application of programs on forest pest management.

Ross, D.W., P. Fenn, and F.M. Stephen. 1992. Growth of southern pine beetle associated fungi in relation to the induced wound response in loblolly pine. Canadian Journal of Forest Research 22:1851-1859.

For forest entomologists and pathologists. Growth of the three major fungal associates of southern pine beetles in loblolly pine phloem was evaluated with respect to development of wound-induced lesions following artificial inoculations with the fungi.

Schowalter, T.D., and G.M. Filip. 1993. Bark beetle-pathogen-conifer interactions: an overview. P. 3-19 *in* Beetle-Pathogen Interactions in Conifer Forests. T.D. Schowalter and G.M. Filip, eds. Academic Press, London, San Diego.

For forest entomologists, pathologists, and silviculturists. Forests are now viewed as integrated ecosystems in which species interact in response to changes in forest condition in order to maintain nutrient cycling and soil fertility. This view, coupled with increasing insect and pathogen problems in stressed forests and greater public demand for nontimber amenities, is revolutionizing forestty and our approach to forest protection. Bark beetle-pathogen interactions are discussed.

Schowalter, T.D., and G.M. Filip, editors. 1993. Beetle-Pathogen Interactions in Conifer Forests. Academic Press, London, San Diego, New York. 252 p.

For forest entomologists, pathologists, ecologists, and managers. This book provides a synthesis of work on the importance of interactions among bark beetles, pathogens, and trees to productivity of conifer forests in North America. The focus is on patterns and processes central to bark beetle and pathogen epidemiology in conifer forests, rather than on particular interactions.

Schowalter, T.D., and P. Turchin. 1993. Southern pine beetle infestation development: interaction between pine and hardwood basal areas. Forest Science 39:201-210.

For forest entomologists, silviculturists, and landowners. Thinned stands are less susceptible to southern pine beetles than are dense stands, and the presence of hardwoods in pine stands apparently does not increase susceptibility and may interfere with expansion of any infestations that occur.

Thies, W.G. 1992. Laminated root rot: all about it and how to break the cycle. Northwest Woodlands 8(4):20-21, 31.

For nonindustrial landowners and land managers. Laminated root rot is widespread throughout the range of Douglas-fir in the Pacific Northwest. Identification of the disease and its damage is reviewed, and recommendations are made for management.

Thies, W.G. 1994. Do you dig roots? P. 107-109 *in* Research and Applications of Chemical Sciences in Forestry. Proceedings, 4th Southern Station Chemical Sciences Meeting. USDA Forest Service, Southern Forest Experiment Station, New Orleans, Louisiana. General Technical Report S0-104.

For researchers. This paper discusses the removal of stumps with an excavator.

Thies, W.G. 1994. Fumigant application to reduce inoculum of laminated root rot: from stumps to living trees. P.100-104 *in* Research and Applications of Chemical Sciences in Forestry. Proceedings, 4th Southern Station Chemical Sciences Meeting. USDA Forest Service, Southern Forest Experiment Station, New Orleans, Louisiana. General Technical Report S0-104.

For researchers and land managers. Laminated root rot, caused by *P. weirii*, survives in dead trees and stumps and later spreads through root contacts in the succeeding stand. The paper discusses four field studies used to develop application techniques and establish dosages for use of chloropicrin, methylisothiocyanate, and Vorlex in reducing inoculum of *P. weirii* in stumps or in living Douglas-fir.

Thies, W.G., and E.E. Nelson. 1993. Bulldozing stumps and fertilizing affect laminated root rot-caused mortality and growth of planted Douglas-fir. P. 56-62 *in* Proceedings of the 40th Annual Western International Forest Disease Work Conference, Durango, Colorado.

For foresters and researchers. Bulldozing stumps from the soil and applying a preplant application of ammonium nitrate were tested as means to reduce the impact of laminated root rot. Preliminary results indicated that the bulldozing reduced the number of diseased seedlings in the replacement stand, but that fertilization had little impact on the disease.

Thies, W.G., and E.E. Nelson. 1994. Injection of chloropicrin, methylisothiocyanate, or Vorlex into living Douglas-fir reduces root colonization by the pathogen *Phellinus weirii*. P. 529-530 *in* Foresters Together: Meeting Tomorrow's Challenges. Proceedings, 1993 Society of American Foresters National Convention, Indianapolis, Indiana. Society of American Foresters, Bethesda, Maryland.

For foresters and land managers. This paper reviews a study in which fumigants were injected into live Douglas-fir infected by laminated root rot. Results demonstrate that fumigation can effectively reduce *P. weirii* in living Douglas-fir without killing the tree.

Thies, W.G., and E.E. Nelson. 1994. Therapeutic treatment of mature, living Douglas-fir with chloropicrin, methylisothiocyanate, or Vorlex reduces root colonization by the pathogen *Phellinus weirii*. P. 736-741 *in* Proceedings of the Eighth International Conference on Root and Butt Rots, Wik, Sweden, and Haikko, Finland.

For forest managers and pathologists. Douglas-fir, some infected by *Phellinus weirii*, were treated with chloropicrin or methylisothiocyanate at various concentrations. Some trees died, presumably from the treatment, but most survived. The volume of root system occupied by viable *P. weirii* was reduced by 80 to 90 percent.

Thies, W.G., E.E. Nelson, and D. Zabowski, 1994. Removal of stumps from a *Phellinus weirii*-infested site and fertilization affect mortality and growth of planted Douglas-fir. Canadian Journal of Forest Research 24:234-239.

For foresters and researchers. Although the stand was only 10 years old, three conclusions came from this study that may influence stand management decisions: (1) removing *P. weirii*-infested stumps reduces laminated root rot-caused mortality, at least during the first 10 years of stand establishment; (2) preplant broadcast fertilization with ammonium nitrate increases the growth of Douglas-fir seedlings; and (3) carefully removing stumps from a site causes only a minor increase in soil bulk density and will probably not reduce seedling growth.

Tranter, M., T.D. Davies, P.J. Wigington, Jr., and K.N. Eshleman. 1994. Episodic acidification of freshwater systems in Canada—physical and geochemical processes. Water, Air, and Soil Pollution 72: 19-39.

For hydrologists and those studying the effect of acidic deposition on aquatic ecosystems. Paper describes the occurrence of and the processes controlling episodic acidification in Canada.

Walstad, J.D. 1992. Implications of intensive forest management in relation to forest insect and disease problems: what is intensive forest management? P. 77 *in* Proceedings, North American Forest Insect Work Conference, Denver, Colorado. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. General Technical Report PNW-GTR-294.

For forest managers and pest management specialists. This study defines intensive forest management in the context of both "tree farming" and "new forestry" approaches to silviculture. The advantages, disadvantages, and uncertainties associated with each approach are discussed from a pest management perspective.

Wigington, P.J., Jr., J.P. Baker, D.R. DeWalle, W.A. Kretser, P.S. Murdoch, H.A. Simonin, J. Van Sickle, M.K. McDowell, D.V. Peck, and W.R. Barchet. 1993.

Episodic acidification of streams in the northeastern United States: chemical and biological results of the Episodic Response Project. U.S. Environmental Protection Agency, Corvallis, Oregon. EPA/600/R-93/190. 337 p.

For researchers and policy makers dealing with issues related to the effects of acidic deposition on aquatic ecosystems. Report summarizes the results of a major study of the occurrence, causes, and biological consequences of episodic acidification in streams of the Northeast.

Wilcox, W.F., P.H. Scott, P.B. Hamm, D.M. Kennedy, J.M. Duncan, C.M. Brasier, and E.M. Hansen. 1993. Identity of *Phytophthora* species attacking raspberry in Europe and North America. Mycological Research 97:817-831.

For plant pathologists and mycologists. Molecular and morphological criteria show that the same fungus is responsible for raspberry root rot in Europe and North America. The taxonomy has been confusing, but the fungus is shown to be a new variety of *Phytophthora fragariae*.

EVALUATION OF FOREST USES, PRACTICES, AND POLICIES

Adams, D.M., R.J. Alig, D. Anderson, J. Stevens, and J. Chmelik. 1992. Future prospects for western Washington's timber supply. Institute of Forest Resources, University of Washington, Seattle, Washington. 201 p.

For forest analysts and managers. Total harvest levels in western Washington can be maintained for several decades if there is a shift in timber harvest toward private lands and those administered by the Washington Department of Natural Resources and an increase in the proportion of hardwood in the harvest.

Adams, D.M., R.W. Haynes, B. Lippke, and J. Perez-Garcia. 1992. Forest sector, trade and environmental impact models: theory and applications. Proceedings of an International Symposium. CINTRAFOR, College of Forest Resources, University of Washington, Seattle, Washington. 237 p.

For forest economists and compilers of environmental impact statements. This is a proceedings of a symposium on forest sector models and their use in policy analysis, including determining environmental impacts.

Alig, R.J. 1992. Projecting forest type area changes in western Washington: ecological and economic factors. *In* Proceedings, Forestry and the Environment Conference, Jasper, Alberta.

For managers and analysts of natural resources. Economic forces have resulted in substantial increases in Douglas-fir area on forest industry timberlands. Natural successional trends have been less altered on nonindustrial private timberlands.

Alig, R., and D. Adams. 1993. Long-term timber supply in western Washington: the role of the nonindustrial private forest owner. Northwest Woodlands (Winter):14-15.

For forest managers and policy analysts. Nonindustrial private owners in western Washington have forests with high productive potential; they are the most affected by land use changes of any ownership; and their share of the harvest exceeds their share of the total timberland base.

Alig, R.J., D.M. Adams, and M. Boscolo. 1992. Modeling issues from the Washington Timber Supply Study: changes in land use, forest cover types, and wildlife habitat. P. 173-178 *in* Proceedings of the International Symposium on Forest Sector, Trade, and Environmental Impact Models, University of Washington, Seattle, Washington.

For modelers and managers of natural resources. In the future, forest land base in western Washington is projected to have proportionately less area in the following classes: grass-forb, open sapling-pole, and closed sapling-pole-sawtimber. Areas of large sawtimber and old-growth are projected to increase, largely because of reservation of certain public lands from harvesting.

Alig, R., D. Adams, and R. Haynes. 1994. Regional changes in land uses and cover types: modeling links between forestry and agriculture. *In* Proceedings of the Southern Forest Economists Workshop, D. Newman, ed., Savannah, Georgia.

For forest economists and modelers. Private owners are projected to adjust quickly to the establishment of large areas of trees planted to address concerns about global warming, as well as to a reduction in the tree planting planned by forest industry in the South.

Alig, R., D. Adams, R. Moulton, and E. Moore. 1993. Improvements in modeling systems for analyzing forest resources and economic and environmental impacts from area changes in forest cover in the U.S. *In* Proceedings of the International Symposium on Systems Analysis and Management Decisions in Forestry, Valdivia, Chile.

For forest modelers and economists. Planned advancements in modeling aggregate forest resources include an optimization model for the forest and agricultural sectors of the United States.

Bettinger, P. 1993. Incorporating state income taxes in soil expectation values: impacts and pitfalls. Forest Products Journal 43(5):61-67. (For. Res. Lab.)

For forest economists, managers, and planners. Key provisions of 1992 state income tax laws for the principal forested states in the United States are presented. The proper use of state income tax rates in the formula for soil expectation values for cases in which annual costs are either expensed or capitalized is also presented.

Bettinger, P., L.D. Kellogg, and E.D. Olsen. 1993. Key issues and future directions of mechanized harvesting: discussions and guidance from working groups. Forest Research Laboratory, Oregon State University, Corvallis. Research Contribution 5. 8 p. (For. Res. Lab.)

For practitioners of and researchers in mechanized harvesting. Recognition of the problems and opportunities in mechanized harvesting should help in development of solutions and maximum realization of the potentials of this

approach. This paper presents feedback from five working groups, the members of which were involved in mechanized harvesting issues with various organizations in the Pacific Northwest.

Bettinger, P., J. Sessions, and L. Kellogg. 1993. Potential timber availability for mechanized harvesting in Oregon. Western Journal of Applied Forestry 8:11-15. (For. Res. Lab.)

For logging managers, forest engineers and planners, and foresters in general. Because of the transition from harvesting old-growth to second-growth timber, most of the Oregon harvest in the next decade will be comprised of trees small enough to permit some form of mechanized harvesting. The authors assessed the availability of timber for mechanized harvesting in Oregon with regard to timber size, slope class, ownership, and geographic location and found that almost 60 percent of the timberland in western Oregon and 85 percent in eastern Oregon are potentially accessible for ground-based, in-woods mechanization.

Birch, K., and K.N. Johnson. 1992. Stand-level wood-production costs of leaving live, mature trees at regeneration harvest in coastal Douglas-fir stands. Western Journal of Applied Forestry 7:65-68.

For forest economists, land managers, and regional planners. The growth, yield, and financial costs associated with leaving various numbers of live trees during regeneration harvests of coastal Douglas-fir stands are simulated. Implications for harvests on National Forests in the Douglas-fir region are discussed.

Blahma, D.J., S.A. Dawson, M. Lee, and P. Brown. 1993. Interpretation at Great Basin National Park: results of the 1988 visitor study. National Park Service, Seattle, Washington. Technical Report NPS/PNROSU/NRTR-93/18.

For park planners and policy makers. This paper presents results of a visitor survey focused on interpretation of natural and human history at Great Basin National Park. Baseline data for later comparison of the effects of National Park Service policies are included.

Bormann, B.T., M.H. Brookes, E.D. Ford, A.R. Kiester, C.D. Oliver, and J.F. Weigand. 1994. A framework for sustainable-ecosystem management. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. General Technical Report PNW-GTR-331. 73 p.

For policy makers, foresters, ecologists, social scientists, and the public. A view of sustained management of ecosystems is derived by integrating fundamental, societal, and scientific premises. Sustainability is described as the overlap between what people want for themselves and for future generations and what is ecologically possible over the long run. A model is proposed that may enhance planning and decision-making.

Boyle, J.R., and S. Arbogast, compilers. [1992.] Changing values—changing institutions. The 1991 Starker Lectures. College of Forestry, Oregon State University, Corvallis. 33 p. (For. Res. Lab.)

For concerned citizens. The 1991 Starker Lectures depict a variety of viewpoints on the changing values and changing institutions in forestry. Bill Gregory presents "some views of an ex-mill owner;" Jeff Sirmon focuses on "changing values—changing institutions: the Forest Service;" Harold Steen offers an historian's views on "changing values—changing institutions in forestry;" and Sally Fairfax, from the University of California, Berkeley, discusses the concept of "environmental justice."

Brown, P.J. 1993. Ecosystems, regions, and benefits: trends in outdoor recreation planning for the 1990s. P. 5-10 *in* Proceedings, IUFRO Interim Meeting and Excursion in South Korea and China-Taipei. Seoul National University, Seoul, South Korea.

For recreation planners and natural resource policy makers. Concepts of recreation planning and management are examined with an eye toward future needs. The integration of recreation into ecosystem management is discussed, ideas for development of regional systems are presented, and the trend toward benefits-based management is presented.

Buckman, R.E. 1992. Forestry research in the developing world: problems and opportunities. P. 19-23 *in* Proceedings, Bio-Refor Workshop, Tsukubo, Japan.

For students of forest research on a global scale. This keynote address at a conference to review Japanese leadership of a research network in Southeast Asia examines major obstacles to forestry in the developing world, as well as efforts underway to correct them.

Buckman, R.E. 1993. Experimental forests of the U.S. Forest Service. P. 15-26 *in* Proceedings of the Experimental Forests Workshop. Canadian Forest Service, Victoria, British Columbia. British Columbia Ministry of Forests BC FRAC Report 2.

For those interested in the history of research. Characteristics of the U.S. Forest Service system of experimental forests are outlined, as well as several ingredients that have enhanced the impact of these forests on forestry and forest science.

Buckman, R.E. 1994. View from the top: Forest Service research by R. Keith Arnold, M.B. Dickerman, Robert E. Buckman. P. 197-365 *in* A Published Oral History. H.K. Steen, ed. Forest History Society, Duke University, Durham, North Carolina.

For those interested in the history of research. Professor Robert Buckman, along with two preceding deputy chiefs (R. Keith Arnold and M.B. Dickerman) review their

respective roles in the evolution of U.S. Forest Service research from the period 1968 to 1986.

Castle, E.N. 1993. A pluralistic, pragmatic and evolutionary approach to natural resource management. Forest Ecology and Management 56:279-295. (For. Res. Lab.)

For natural resource managers. This paper demonstrates the partial nature of individual academic disciplines with respect to natural resource management and states the requirements of a satisfactory approach to such management. The philosophic justification for pluralism, pragmatism, and evolution in natural resource policy is discussed, thereby providing a framework for interdisciplinary communication.

Castle, E.N., and R.P. Berrens. 1993. Endangered species, economic analysis, and the safe minimum standard. Northwest Environmental Journal 9:108-130. (For. Res. Lab.)

For wildlife managers and biologists, as well as forest economists. The economics of species preservation is a classic case of making policy in the presence of uncertainty.

Coleman, N., and M.J. Cloughesy. 1994. ALLTREE: stand volume measurement software and documentation. Oregon State University Extension Service, Corvallis.

For woodland owners and foresters. The ALLTREE program performs the calculations necessary to estimate the volume of a stand of timber. The program runs on IBM-compatible computers and requires a hard-drive.

Coleman, N., and M.J. Cloughesy. 1994. TIMBER: stand volume and growth measurement software and documentation. Oregon State University Extension Service, Corvallis.

For woodland owners and foresters. The TIMBER program performs the calculations necessary to estimate the volume and growth of a stand of timber. The program runs on IBM-compatible computers and requires a hard-drive and a printer.

Collion, M.H., and M.D. Reed. 1993. A Trainer's Guide to Program Planning and Priority Setting. International Service for National Agricultural Research, The Hague, The Netherlands. 181 p.

For trainers, advisors, and agricultural research managers. This trainer's guide provides a set of materials (syllabus, lecture outlines, visual aids, exercises, and reference readings) to help plan and deliver a two-day workshop on long-term planning and priority setting of research programs.

Collopy, M.W., J. Cannell, S. Daniels, D. Dippon, E. Gaar, B. Mulder, C. Philpot, J. Steffenson, and F. Swanson. 1993. Implementation and adaptive management. Chapter VIII. P. 1-54 *in* Forest Ecosystem Management: Ecological, Economic and Social Assessment. Final report of the Forest Ecosystem Management Assessment Team (FEMAT). U.S. Government Printing Office, Washington, D.C.

For managers and research scientists. A strategy for reorganizing the federal government's approach to adaptively managing public lands is proposed. Recommendations for managing ecosystems at different spatial scales and using adaptive management as a process to guide future management actions are proposed.

Curtis, R.O., and D.D. Marshall. 1993. Douglas-fir rotations—time for reappraisal. Western Journal of Applied Forestry 8:81-85.

For forest managers, policy makers, and silviculturists. Comparisons with simulators and remeasured plots suggest that the age for culmination of mean annual increment (MAI) for Douglas-fir appears later than most people think. In addition, the MAI curve is relatively flat near and beyond culmination. Extended rotations may offer one option for addressing many of the environmental concerns of today.

Daniels, S.E., and R.S. Krannich. 1990. The recreational opportunity spectrum as a conflict management tool. P. 165-179 *in* Social Science and Recreation Management. J. Vining, ed. Westview Press, Boulder, San Francisco, and Oxford.

For recreation researchers and managers. The USDA Forest Service developed the Recreation Opportunity Spectrum (ROS), which characterizes and classifies different dispersed recreation settings, to facilitate a more structured approach to recreation management. In this chapter, the authors discuss the ways ROS management guidelines can limit the potential for conflict among resource users with divergent orientations toward forest management.

Daniels, S.E., and K. Merrill. 1992. The Committee of Scientists: a forgotten link in national forest planning history. Forest & Conservation History 36:108-116.

For historians and policy analysts. The National Forest Management Act (NFMA) of 1976 created the Committee of Scientists to advise and counsel the Secretary of Agriculture in developing regulations for implementing the act. This article reviews the history of the Committee of Scientists with special attention to its evolution from an advising into a participating body and its involvement in drafting the regulations and shaping the Forest Service interpretation of the NFMA.

Dixon, R.K. 1992. Regional forest management planning in the southern United States. P. 378-389 *in* Forests in a Changing Climate. A. Quereshi, ed. Climate Institute, Washington, D.C.

For ecologists and policy analysts. The forests of the southern United States will be highly vulnerable to climate changes in the next century.

Dixon, R.K., and K. Andrasko. 1992. Integrated systems: assessment of promising agroforest and alternative land-use practices to enhance carbon conservation and sequestration. P. 48-54 *in* Proceedings, IPCC Workshop: Assessing Technologies and Management Systems for Agriculture and Forestry in Relation to Global Climate Change. Australian Government Publishing Service, Canberra, Australia.

For ecologists, agronomists and policy analysts. Agroforestry systems can be managed to reduce the emission of CO_2 to the atmosphere.

Dixon, R.K., K.J. Andrasko, F.G. Sussman, M.A. Lavinson, M.C. Trexler, and T.S. Vinson. 1993. Forest sector carbon offset programs: near-term opportunities to mitigate greenhouse gas emissions. Water, Air and Soil Pollution 70:561-577.

For global ecologists and policy analysts. The 1992 U.S. Energy Policy Act established the basis for carbon sequestration in the forest sector and for conservation programs to offset emissions of CO_2. Analysis of biogeochemical, socioeconomic, and logistical attributes of eight projects in six countries revealed that such emissions could be offset for $1-8 per Mg of carbon.

Forlines, D.R., T. Tavenner, J.C.S. Malan, and J.J. Karchesy. 1992. Plants of the Olympic coastal forests: ancient knowledge of materials and medicines and future heritage. P. 767-782 *in* Plant Polyphenols. R.W. Hemingway and P.E. Laks, eds. Plenum Press, New York. (For. Res. Lab.)

For plant and wood chemists and those interested in herbal lore. The indigenous people of the west coast of Washington's Olympic Peninsula have made materials and medicines from a wide variety of forest plants for centuries. The late David Forlines shared at least eight generations of knowledge of uses of these plants in hopes that this information might "help science catch up with the old people."

Gagliuso, R., and W.C. McComb. 1992. Designing landscapes for wildlife and timber. P. 379-388 *in* Integrating Forest Information Over Space and Time. Proceedings, IUFRO Conference. G. Wood and B. Turner, eds. ANUTECH Pty. Ltd., Canberra, Australia. (For. Res. Lab.)

For forest managers and researchers. A process for collecting and organizing spatial information over large (>5,000 ha) landscapes to meet goals for timber and habitat for selected wildlife species is described. The authors provide an example of designing a landscape for winter elk habitat in western Oregon, while considering the effects on two other forest-associated species and timber.

Gapasin, D., and M.D. Reed. 1993. A Trainer's Guide to Research Program Planning and Monitoring. International Service for National Agricultural Research, The Hague, The Netherlands. 189 p.

For trainers, advisors, and agricultural research managers. A set of materials (syllabus, lecture outlines, visual aids, exercises, and reference readings) is provided to help plan and deliver a 2-day workshop on research program planning and monitoring of research programs.

Garman, S.L., A.J. Hansen, D.L. Urban, and P.F. Lee. 1992. Alternative silvicultural practices and diversity of animal habitat in western Oregon: a computer simulation approach. P. 777-781 *in* Proceedings of the 1992 Summer Simulation Conference, Reno, Nevada. P. Luker, ed. The Society for Computer Simulation, San Diego, California.

For forest managers and scientists. The authors modified a forest succession model, ZELIG, to better simulate custom-designed silvicultural prescriptions and to evaluate suitability of animal habitat with empirically derived statistical habitat models. An overview of the design and use of this approach is presented.

Greber, B.J. 1992. Assessment of the BLM exemption request for sales ruled to jeopardize the northern spotted owl, including a statement of conclusions by Tom Walsh, Oregon Representative on the Endangered Species Committee. Forest Research Laboratory, Oregon State University, Corvallis. Papers in Forest Policy 2. 24 p. (For. Res. Lab.)

For policy makers and analysts and those interested in resource allocation and preservation in the Northwest. In September 1991, the Bureau of Land Management asked the Secretary of the Interior to convene the Endangered Species Committee; the Bureau sought permission to proceed with 44 timber sales in Oregon that the U.S. Fish and Wildlife Service had ruled would jeopardize the continued existence of the northern spotted owl. Before the committee met on May 14, 1992, Greber prepared a summary report (reproduced here) of information deemed important to its decision.

Greber, B.J. 1993. Impacts of technological change on employment in the timber industries of the Pacific Northwest. Western Journal of Applied Forestry 8:34-37. (For. Res. Lab.)

For policy makers, general citizens, and those in the forest industry. The impacts of technological change on employment in the timber industries are of particular concern to timber-dependent communities of the Pacific Northwest. This commentary summarizes labor displacement in the forest products sector in the 1980s and the outlook for technological change in this sector in the 1990s.

Greber, B., R. Haynes, and C. Swanson. 1993. Economic evaluation of options. *In* Forest Ecosystem Management: Ecological, Economic and Social Assessment. Final report of the Forest Ecosystem Management Assessment

Team (FEMAT). U.S. Government Printing Office, Washington, D.C.

For forest economists. This is chapter 6 of the FEMAT report.

Hann, D.W. 1994. A key to the literature presenting tree volume equations for species in the Pacific Northwest and California. Forest Research Laboratory, Oregon State University, Corvallis. Research Contribution 6. 58 p. (For. Res. Lab.)

For forest biometricians and modelers. Summaries from 49 published articles on tree volume and taper equations are presented for 39 western tree species. Each summary describes the types of dependent variables predicted by the equations and the geographic location, number of trees, range in DBH, and range in total height for trees in the sample used to develop the equations.

Haynes, R.W. 1992. Owls, jobs, & old-growth. Forest Watch 12(10):15-17.

For the interested public. Haynes' testimony before the "God Squad" Committee is presented.

Haynes, R.W. 1993. Economic prospects for the forest sector, Pacific Coast states. *In* Alberta: Growing for the Future Forestry Outlook Conference. Proceedings of the Forest Industry Outlook Conference, Edmonton, Alberta.

For lay audiences. This is a general overview of the economic prospects for the forest sector in the Pacific Coast States.

Haynes, R.W. 1993. Forestry sector analysis for developing countries: issues and methods. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. General Technical Report PNW-GTR-314. 47 p.

For forest economists and cartographers. This text was prepared for the World Bank to use in training courses on forest sector analysis.

Haynes, R.W. 1993. Public harvest reductions provide opportunity for small woodland owners. Northwest Woodlands (Winter):16-17.

For forest landowners in the Northwest. This is a brief summary of the prospects for nonindustrial landowners in Washington, Oregon, and Idaho.

Haynes, R.W., and D.M. Adams. 1992. Assessing economic impacts of air pollution damage to U.S. forests. P. 13-18 *in* The Economic Impacts of Air Pollution on Timber Markets: Studies from North America and Europe. J.E. de Steiguer, ed. USDA Forest Service, Southeastern Forest Experiment Station, Asheville, North Carolina. General Technical Report SE-75.

For forest economists and strategic planners. Methods used in the National Acid Precipitation Assessment Program to assess economic impacts of air pollution damage to forests in the United States are described.

Haynes, R.W., N.A. Bolon, and D.T. Hormaechea. 1992. The economic impact on the forest sector of critical habitat delineation for salmon in the Columbia and Snake River Basins. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. General Technical Report PNW-GTR-307. 33 p.

For forest economists and wildlife biologists. This paper discusses the economic impact on the forest sector of critical habitat delineation for salmon in the Columbia and Snake River Basins. It was compiled as part of the effort to provide the National Marine Fisheries Service with an early estimate of the economic impacts of habitat protection.

Hessburg, P., R. Haynes, and R. Everett. 1993. What are alternative management scenarios? What process should be used to evaluate alternative rates of investment in ecosystem management? P. 30-37 *in* Eastside Forest Ecosystem Health Assessment. Volume 1. Executive Summary. USDA Forest Service, Portland, Oregon.

For forest economists and managers. A section from the executive summary of the Eastside Forest Health Assessment describes how alternative management regimes should and could be evaluated.

Johnson, K.N. 1992. Consideration of watersheds in long-term forest planning models: the case of FORPLAN and its use on the National Forests. P. 347-360 *in* Watershed Management: Balancing Sustainability and Environmental Change. R.J. Naiman, ed. Springer-Verlag, New York.

For forest planners and managers. Over the next few years, the need to demonstrate that timber production is compatible with preservation of watersheds and wildlife habitat will bring about major changes in long-term planning on the National Forests. Harvest-scheduling models such as FORPLAN will still have a place, but they will no longer be the central focus.

Johnson, K.N., R.L. Johnson, D.K. Edwards. and C.A. Wheaton. 1993. Public participation in wildlife management: opinions from public meetings and random surveys. Wildlife Society Bulletin 21:218-225. (For. Res. Lab.)

For wildlife managers and the interested public. This article showed that opinions and preferences of public meeting attendees differed from a representative sample of the interested and affected public. Because opinions expressed at meetings are often incorporated into management decisions, the differences are important.

Johnson, R.L., M.W. Brunson, and T. Kimura. 1994. Using image-capture technology to assess scenic value at the urban/forest interface: a case study. Journal of Environmental Management 40:183-195. (For. Res. Lab.)

For forest managers and academics. This paper describes a pilot study in which home owners adjacent to forests in Oregon viewed computer "image-capture" slides simulating the views from their own homes if various silvicultural practices were used on the adjacent forest. Although generating slides for individual home sites was cumbersome, this method of displaying possible localized impacts of timber management showed promise. A majority of landowners were willing to pay for scenic protection measures that would restrict timber-harvest options on adjacent properties.

Johnson, R.L., and E. Moore. 1993. Tourism impact estimation. Annals of Tourism Research 20:279-288. (For. Res. Lab.)

For professional agency, academic, and consulting economists and natural resource managers. Economic impacts associated with whitewater recreation on the Klamath River in Oregon are estimated from a combination of primary expenditure data and the IMPLAN input-output system. Overall results show that whitewater recreation, even on a small scale, can help to diversify a region's economy.

Joyce, L.A., and R.W. Haynes. 1992. Integrating resource projections with timber projections. *In* Forest Sector, Trade and Environmental Impact Models: Theory and Applications. Proceedings of an International Symposium. D.M. Adams, R.W. Haynes, B. Lippke, and J. Perez-Garcia, eds. CINTRAFOR, College of Forest Resources, University of Washington, Seattle, Washington.

For forest economists. The problem of integrating other resource projections with timber projections is reviewed.

Kingslien, H., and B.J. Greber. 1993. Wood remanufacturing: growth trends and selected characteristics identify opportunities. Forest Products Journal 43(6):29-34. (For. Res. Lab.)

For economic planners and political and industrial decision makers. This paper examines eight characteristics of employment, value added, value of shipments, and wood use in 20 sectors of the remanufacturing industry. Sectors that have been expanding at the fastest rate are identified.

Klemperer, D., J. Cathcart, T. Haring, and R. Alig. 1993. Risk and the discount rate in forestry. Canadian Journal of Forest Research 24:390-397.

For investment analysts and forest managers. Results suggest that the appropriate risk premium for many forest investments may decline with lengthening pay-off period.

Knowe, S.A. 1992. Predicting the impact of interspecific competition in young loblolly pine plantations with diameter distribution models. Forest Ecology and Management 55:65-82.

For forest mensurationists and modelers. A system of prediction equations was developed to examine the effects of interspecific competition on diameter distributions for young loblolly pine plantations in the Piedmont of Georgia. The system was sensitive to varying amounts of specific hardwood competitors.

Knowe, S.A., G.S. Foster, R.J. Rousseau, and W.L. Nance. 1994. Eastern cottonwood clonal mixing study: predicted diameter distributions. Canadian Journal of Forest Research 24:405-414.

For forest modelers and geneticists. Genetic differences associated with monocultures and mixtures of eastern cottonwood clones were incorporated into diameter distribution models. Interactions between clones in mixtures were not statistically significant through age 4.

Knowe, S.A., T.B. Harrington, and R.G. Shula. 1992. Incorporating the effects of interspecific competition and vegetation management treatments in diameter distribution models for Douglas-fir saplings. Canadian Journal of Forest Research 22:1255-1262. (For. Res. Lab.)

For forest modelers and silviculturists. A procedure was developed to account for the effects of interfering vegetation on diameter distributions in young Douglas-fir plantations. The effects of interspecific competition and vegetation management treatments were more pronounced on xeric sites in southwest Oregon than on mesic sites in the Coast Ranges.

Krankina, O.N., and R.K. Dixon. 1994. Forest management options to conserve and sequester terrestrial carbon in the Russian Federation. World Resource Review 6:88-101.

For global biogeochemists and policy analysts. The forests of Russia currently sequester 0.3 to 0.5 Pg of carbon annually. Forestation, land reclamation, silvicultural treatments, and forest protection can increase carbon storage of forests in most ecoregions in Russia.

Kurtz, W., G. Noweg, R. Moulton, and R. Alig. 1994. An analysis of the retention, condition, and land-use implications of tree plantings established under the Soil Bank Program, the Forestry Incentives Program, and the Agricultural Conservation Program. University of Missouri, Columbia, Missouri. Agricultural Experiment Station Report 464.

For forestry and timber-supply analysts. The vast majority of tree plantings established with federal cost-sharing have been retained in trees and are in reasonably good silvicultural condition.

Lee, K., F. Kaiser, and R. Alig. 1992. Substitution of public for private funding in planting southern pine. Southern Journal of Applied Forestry 16:204-208.

For foresters and analysts of forestry programs. We did not find conclusive evidence that public funds had been substituted for private ones in tree planting on non-industrial

private land. Increases in inventories and timber supplies should result from public tree-planting programs.

Lee, M.E., and P.J. Brown. 1993. Great Basin Visitor Surveys: Comparison of 1988 and 1990 Results. National Park Service, Seattle, Washington. Technical Report NPS/PNROSU/NRTR-93/07.

For park planners and policy makers. This paper provides data on user response to designation of Great Basin National Park and user perceptions of management needs. Baseline data for later comparison of the effects of National Park Service policies are included.

Lee, M.E., and P.J. Brown. 1993. Resident use of and attitudes toward Great Basin National Park. National Park Service, Seattle, Washington. Technical Report NPS/PNROSU/NRTR-93/05.

For park planners and policy makers. The uses of Great Basin National Park by regional residents are examined, as are residents' attitudes toward establishment of the park.

Marshall, D.D. 1993. Monitoring of growth and yield and response to silvicultural treatments. Environmental Monitoring and Assessment 26:195-201.

For inventory specialists. There are many reasons for having a growth and yield monitoring system. Both traditional inventories and research data have drawbacks for observing growth and yield and treatment response. The specific objectives of research determine whether the monitoring system will have an inventory or a research type design. Monitoring programs will lead to confidence and credibility in management practices and in the use of tested models.

Martinson, K.S., and B. Shelby. 1992. Encounter and proximity norms for salmon anglers in California and New Zealand. North American Journal of Fisheries Management 12:559-567.

For recreation developers and researchers. The results suggest that contacts with other people have an impact on the recreational experience of salmon anglers; there is an identifiable range of acceptable encounters, and the acceptable range varies for different fishing experiences in different settings.

Merriam, L.C., Jr., and D.G. Talbot. 1992. Oregon's highway park system, 1921-1989, an administrative history. Oregon Parks and Recreation Department, Salem, Oregon. 310 p.

For the general public and students in public administration. Historical evolution of the Oregon state parks under the aegis of the Oregon Highway Commission is indicative of their close relationship to highway location, access, and administration. Included are a directory of the 225 areas in the park system and reminiscences of the director, D.G. Talbot, about his tenure, 1964-89. Maps and photographs.

Norris, L.A., H. Cortner, M.R. Cutler, S.G. Haines, J.E. Hubbard, M.A. Kerrick, W.B. Kessler, J.C. Nelson, R. Stone, J.M. Sweeney, and L.W. Hill. 1993. Sustaining long-term forest health and productivity. Society of American Foresters. Bethesda, Maryland. 83 p.

For forestry professionals. This is a report of a national task force of the Society of American Foresters. Its mission was to recommend how the forests of the United States could be managed to provide for the long-term health and productivity of all values.

Reed, M., L. Kimani, D. Horton, D. Gapasin, and H. Ondatto, editors. 1994. Monitoring and Evaluating Agricultural Research: Report of a Workshop in Muguga, Kenya. International Service for National Agricultural Research, The Hague, The Netherlands. 78 p.

For agricultural research managers, trainers, and advisors. This is a report of a five-day workshop for middle-level agricultural research managers in the Kenya Agricultural Research Institute (KARI).

Schroeder, P.E., J.K. Winjum, and R.K. Dixon. 1992. What is the potential of forest management to slow the increase of atmospheric CO_2? P. 30-40 *in* Proceedings 17th Annual Conference of the National Association of Environmental Professionals: Changing and Innovative Strategies for Environmental Protection, Washington, D.C.

For policy analysts. Forests can be managed to reduce the emission of CO_2 to the atmosphere and achieve other environmental benefits.

Shelby, B., and S. Arbogast, compilers. [1994.] Culture and natural resources. The 1992 Starker Lectures. College of Forestry, Oregon State University, Corvallis. 92 p. (For. Res. Lab.)

For concerned citizens. The 1992 Starker lecturers examine the strong link between culture and natural resources. Marc Reisner contends that the use of resources in the American West has fallen short of sustainability and that to attain this ideal will require giving up some myths of the frontier. Winona LaDuke considers a number of resource issues in the context of native peoples and their reciprocal relationship with the land. David Pearson discusses cultural clashes and the future of conserving tropical rain forests. Doug MacCleery presents a brief overview of the condition and trends of forests in the United States. Margaret Shannon offers a feminist's insight into the ways in which the women's view can affect resource management and policy.

Shelby, B., T.C. Brown, and R. Baumgartner. 1992. Effects of streamflows on river trips on the Colorado River in Grand Canyon, Arizona. Rivers 3(3):191-201.

For researchers and resource managers. The authors conducted a survey of river guides and trip leaders of whitewater boating trips on the Colorado River in the Grand Canyon

below Glen Canyon Dam. The study identified the diversity of attributes affected by flows, evaluated specific effects of flows on those attributes, and presented methods for data collection, analysis, and interpretation.

Shelby, B., T.C. Brown, and J.G. Taylor. 1992. Streamflow and recreation. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. General Technical Report RM-209. 27 p.

For researchers and resource managers. This report reviews the legal basis, agency policy, and research studies regarding streamflows and recreation. Most studies have demonstrated a similar, nonlinear relation of recreation to streamflow: quality increases with flow to a point, but decreases for further increases in flow. Knowledge of the flow-recreation relation, and its accurate calibration in specific locations, is an important ingredient in the determination of wise policies about streamflow.

Shelby, B., and R.W. Speaker. 1990. Public attitudes and perceptions about prescribed burning. P. 253-260 *in* Natural and Prescribed Fire in Pacific Northwest Forests. J.D. Walstad, S.R. Radosevich, and D.V. Sandberg, eds. Oregon State University Press, Corvallis.

For resource managers and scientists. Public support for the use of prescribed burning in forested recreation lands has increased greatly through a long-term effort to inform people about the natural role of fire in undisturbed ecosystems. A similar long-term information effort will be required to increase support for prescribed burning for removal of logging slash and site preparation in commercially managed forests.

Shindler, B., P. List, and B.S. Steel. 1993. Managing federal forests: public attitudes in Oregon and nationwide. Journal of Forestry 91(7):36-42.

For natural resource professionals. This research project examined national and regional views of the major issues in the debate over forest practices and the management of federal forest lands in the Pacific Northwest. The results show broad support for a more environmentally oriented, multiple-valued, and publicly influenced approach to federal forest management.

Sohngen, B.L., and R.W. Haynes. 1994. Hardwood price reporting. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. Research Paper PNW-PR-470. 16 p.

For economists and those interested in stumpage prices. This is the first attempt to document available information about hardwood stumpage prices in the Pacific Northwest.

Spanner, M., L. Johnson, J. Miller, R. McCreight, J. Freemantle, J. Runyon, and P. Gong. 1994. Remote sensing of seasonal leaf area index across the Oregon Transect. Ecological Applications 4:258-271.

For forest ecologists and those interested in remote sensing. This study demonstrates that remotely sensed data from both broad- and narrow-spectral-band instruments can provide estimates of leaf area index for use in forest ecosystem simulation models that estimate evapotranspiration, photosynthesis, canopy turnover, and net primary production over large areas.

Stafford, S.G. 1993. Data, data everywhere but not a byte to read: managing monitoring information. Environmental Monitoring and Assessment 26:125-141. (For. Res. Lab.)

For natural resource managers and scientists. The problem of managing scientific information for widespread availability and use can be overwhelming. At Oregon State University, the Quantitative Sciences Group has developed a Forest Science Data Bank to house data generated by scientists and collaborating researchers in the Forest Science Department with special emphasis on the Andrews Long-Term Ecological Research program. This paper describes what has been learned from setting up the Forest Science Data Bank and what may be particularly useful in establishing long-term monitoring programs.

Stafford, S.G. 1993. Editorial: Improving natural resource management through monitoring. Environmental Monitoring and Assessment 26:85-89. (For. Res. Lab.)

For natural resource managers and scientists. The issues raised in the various papers presented at a March 1992 workshop entitled "Improving Natural Resource Management Through Monitoring" are highlighted.

Stankey, G.H., P.J. Brown, and R.N. Clark. 1992. Allocating and managing for diverse values of forests: the market place and beyond. P. 257-271 *in* Integrated Sustainable Multiple-Use Forest Management Under the Market System. Proceedings, IUFRO International Conference, Pushkino, Moscow Region, Russia. Danish Forest and Landscape Research Institute, Copenhagen, Denmark.

For forest economists. Recreation and scientific information are examples of forest values that are of increasing importance to society, but our ability to measure or assess them is inadequate. This paper examines ways in which these emerging values can be better accounted for in planning and management decisions and identifies changes that are needed in education, management, and research.

Stout, B.B. 1993. The good, the bad, and the ugly of monitoring programs: defining questions and establishing objectives. Environmental Monitoring and Assessment 26:91-98.

For forest managers and the interested public. Issues of monitoring are discussed. Data from long-term forest monitoring are examined in the light of determining when a change is or is not abnormal to the system in question.

Stout, B.B. 1994. Reflections on forest history and management plans. AOI Business Viewpoint January/February:15.

For forest mangers and the interested public. Assertions about the conditions of forests in the Coast Range of Oregon are examined in the light of the history of forests on the East Coast. There, as here, assertions were made about the status of forest when Europeans arrived that were not consonant with descriptions of early viewers.

Stout, B.B. 1994. Testimony of Benjamin Stout. Evergreen (March/April):29-31.

For general audiences in Oregon and those concerned about natural resources. This is a discussion of the positive influences that man can have on natural resources in the Pacific Northwest.

Swanson, F.J., and J.F. Franklin. 1992. New forestry principles from ecosystem analysis of Pacific Northwest forests. Ecological Applications 2(3):262-274.

For ecologists and land managers. Changes underway in forestry on federal lands in the Pacific Northwest derive in part from results of analysis of managed and natural ecosystems in stable and recently disturbed states. The intent of these changes is to retain critical levels of structural and compositional diversity in managed forest stands and landscapes in order to sustain biological diversity and ecosystem processes.

Tucker, G.F., J.P. Lassoie, and T.J. Fahey. 1993. Crown architecture of stand-grown sugar maple (*Acer saccharum* Marsh.) in the Adirondack Mountains. Tree Physiology 13:297-310. (For. Res. Lab.)

For forest tree ecophysiologists. Leaf and crown morphology of shade-tolerant sugar maple were examined to test the hypotheses (1) that leaf area exhibits significant plasticity both within and between crown classes and individual tree crowns and (2) that leaf area is accurately predicted from estimates of crown volume. Total crown volume was a good predictor of whole-tree leaf area in sugar maple and may be a useful predictor in other species as well.

Turner, D.P., G. Koerper, H. Gucinski, C. Peterson, and R.K. Dixon. 1993. Monitoring global change: comparison of forest cover estimates using remote sensing and inventory approaches. Environmental Monitoring and Assessment 26:295-305.

For ecologists interested in remote sensing and forest inventory development. Forest cover estimates for the United States from a recently developed land-surface-cover map generated from satellite remote sensing data were compared to state-level inventory data from the U.S. National Resources Planning Act Timber Database. The comparisons revealed close agreement in the estimate of forest cover for extensively forested states such as Oregon that have large polygons of relatively similar vegetation. Larger differences in forest cover were observed in other states; some regional patterns were apparent.

Urban, D.L., M.E. Harmon, and C.B. Halpern. 1993. Potential response of Pacific Northwestern forests to climatic change, effects of stand age and initial composition. Climatic Change 23:247-266.

For forest modelers and those interested in climatic change. The authors used an individual-based forest simulator (a gap model) to assess the potential effects of human-caused climatic change on conifer forests of the Pacific North.

Warner, W.S., and W.W. Carson. 1992. Development of a monoscopic measurement system for small format oblique photography. Photogrammetric Record 14(80):303-311.

For natural resource managers. This paper discusses development of a monoscopic measurement system for oblique photography; the system is based upon space resection by collinearity. The method consists of enlarging 35-mm slides with a color-laser scanned copier, then digitizing surveyed targets with a standard digitizing tablet.

Warner, W.S., and W. Carson. 1992. Mapping monoscopically: an innovative system for vertical and oblique aerial photographs. ITC Journal 3:228-233.

For natural resource managers. The authors developed a simple, inexpensive monoscopic measurement and mapping system for those with limited training in photogrammetry. This paper describes a study in which they used the system with different camera formats, camera orientations, and film types for mapping croplands during a 39-year period.

Warner, W.S., W.W. Carson, and K. Bjørkelo. 1993. Relative accuracy of monoscopic 35-mm oblique photography. Photogrammetric Engineering & Remote Sensing 59(1):101-105.

For natural resource managers. An innovative method for creating a digital elevation model (DEM) from a small-format stereopair was developed for a digital monoplotter. A DEM created from a 35-mm oblique stereopair provided relative point-location accuracy of about 3 m for monoscopic measurements from a 1:37,000-scale oblique photograph.

Weigand, J.F., R.W. Haynes, A.R. Tiedemann, R.A. Riggs, and T.M. Quigley. 1993. Economic assessment of ungulate herbivory in commercial forests of eastern Oregon and Washington, USA. Forest Ecology and Management 61:137-155.

For forest managers and those interested in forest grazing. The impact of livestock grazing on eastside forests is documented with data from several exclosures. The study provides insight into implications of grazing for ecosystem managers.

Whittaker, D., B. Shelby, W. Jackson, and R. Beschta. 1993. Instream flows for recreation: a handbook on concepts and research methods. U.S. Department of Interior, National Park Service, Rivers and Trails Conservation Program, Anchorage, Alaska, in cooperation with Cooperative Park Studies Unit, Oregon State University, and National Park Service, Water Resources Division. 103 p.

For recreation managers and researchers. The quality of river recreation depends on instream flows. This handbook presents a conceptual framework, a study process, and approaches used to study the effect of flows on resource conditions and the quality of recreation opportunities.

Winjum, J.K., R.K. Dixon, and P.E. Schroeder. 1992. Global assessment of promising forest management practices for sequestration of carbon. P. 85-96 *in* Symposium on the Implications of Climate Change for Pacific Northwest Forest Management. G. Wall, ed. University of Waterloo, Ontario.

For ecologists and policy analysts. Forests of the Pacific Northwest are significant reservoirs of carbon and sustained management of these stands can reduce the emission of CO_2.

Winjum, J.K., R.K. Dixon, and P.E. Schroeder. 1993. Forest management and carbon storage: an analysis of 12 key forest nations. Water, Air and Soil Pollution 70:239-257.

For global biogeochemists and policy analysts. Argentina, Australia, Brazil, Canada, China, Germany, India, Malaysia, Mexico, Russia, South Africa, and the United States contain approximately 55 percent of the world's forests. Forest establishment and management can be increased in these nations to enhance CO_2 sequestration by 1.0 to 1.5 Pg annually.

Winjum, J.K., R.A. Meganck, and R.K. Dixon. 1993. Expanding global forest management: an easy first suggestion. Journal of Forestry 91:38-42.

For global ecologists and policy analysts. The 1989 Noordwijk Ministerial Conference identified the goal of expanding the net forest area to 12 million ha annually. A plan is presented to expand the establishment and management of boreal, temperate, and tropical forests worldwide.

Winnett, S.M., R.W. Haynes, and W.G. Hohenstein. 1993. Economic impacts of individual climate change mitigation options in the U.S. forest sector. Climate Research 3:121-128.

For forest planners and silviculturists. This article summarizes several alternatives being considered by the EPA to increase the amount of carbon stored in forests of the United States.

Zumrawi, A.A., and D.W. Hann. 1993. Diameter growth equations for Douglas-fir and grand fir in the western Willamette Valley of Oregon. Forest Research Laboratory, Oregon State University, Corvallis. Research Contribution 4. 6 p. (For. Res. Lab.)

For forest biometricians and modelers. Equations are presented that predict individual-tree 5-year diameter growth, outside bark, for Douglas-fir and grand fir. These equations express diameter growth as a function of diameter at breast height, crown ratio, site index, total stand basal area, and stand basal area in trees with diameters larger than the subject tree's diameter.

Wood Processing and Product Performance

Abdel-Gadir, A.Y., and R.L. Krahmer. 1993. Estimating the age of demarcation of juvenile and mature wood in Douglas-fir. Wood and Fiber Science 25:242-249. (For. Res. Lab.)

For wood scientists and technologists. Piecewise regression models were used successfully to characterize radial development of wood density and to determine the age of transition from juvenile to mature wood. For all trees, average ring density along the radius showed an initial decline within the first ten rings from the pith, a rapid increase to about ring thirty, and a continued increase at a lower rate thereafter.

Abdel-Gadir, A.Y., and R.L. Krahmer. 1993. Genetic variation in the age of demarcation between juvenile and mature wood in Douglas-fir. Wood and Fiber Science 25:384-394. (For. Res. Lab.)

For wood scientists and technologists. The age of demarcation between juvenile and mature wood (which are distinguished on the basis of wood density) is extremely variable in Douglas-fir. A significant portion of the variation is attributable to families-within-provenances. Therefore, the potential exists for reducing the period of juvenile wood production by genetic manipulation.

Abdel-Gadir, A.Y., R.L. Krahmer, and M.D. McKimmy. 1993. Intra-ring variations in mature Douglas-fir trees from provenance plantations. Wood and Fiber Science 25:170-181. (For. Res. Lab.)

For wood and forest scientists. Variations in seven intra-ring characteristics were studied in juvenile and mature wood from two Douglas-fir genetic plantations. Differences between plantations were significant for all traits except average density of juvenile rings, total width of mature rings, and earlywood density.

Abdel-Gadir, A.Y., R.L. Krahmer, and M.D. McKimmy. 1993. Relationships between intra-ring variables in mature Douglas-fir trees from provenance plantations. Wood and Fiber Science 25:182-191. (For. Res. Lab.)

For wood and forest scientists. Relationships among a variery of densitometric characteristics of juvenile and mature wood from 360 trees growing in two plantations of the 1912 Douglas-fir Heredity Study were examined. Results show that the potential exists for improving wood density in juvenile and mature wood by selection with only a minor impact on radial growth.

Anderson, J.D., C.C. Brunner, and A.G. Maristany. 1992. Effect of sawing stages on fixed-width, fixed-length dimension yields. Forest Products Journal 42(11/12):74-78. (For. Res. Lab.)

For researchers and industry personnel. This study examined how the number of stages in a cutting process affects yields. Versions of the computer program CORY for lumber cut-up were used to simulate the sawing of fixed-width, fixed-length cutting sizes from hard maple boards. Results indicate substantial improvement in yield between two- and three-stage cutting strategies.

Archer, K.J., and J.J. Morrell. 1993. The use of soil bed facilities to evaluate preservative performance. American Wood-Preservers' Association Proceedings 89:307-326. (For. Res. Lab.)

For wood preservationists. This paper describes the comparative testing of field and soil-bed stakes treated with several waterborne copper-based preservatives and examines the effects of various procedural and methodological variables on stake conditions. Accelerated soil-bed testing can generate valid performance data in less time than can a conventional field trial with material in ground contact.

Bae, Y.S., L.Y. Foo, and J.J. Karchesy. 1994. GPC of natural procyanidin oligomers and polymers. Holzforschung 48:4-6. (For. Res. Lab.)

For wood chemists. The authors report on the use of N, N-dimethylformamide solvent system, and standard polystyrene-divinylbenzene columns for rapid GPC analysis of procyanidin oligomers and polymers in their free phenolic form.

Biermann, C.J. 1993. Essentials of Pulping and Papermaking. Academic Press, San Diego, California. 488 p.

For anyone requiring knowledge of technical aspects of the paper industry. This is an introductory textbook with a bibliography sufficiently inclusive and annotated to provide detailed, current information on most aspects of pulping and papermaking. Ten pages of color plates are included.

Biermann, C.J. 1993. Paper. P. 1921-1927 *in* Magill's Survey of Science: Applied Science. F.N. Magill, ed. Salem Press, Pasadena, California.

Biermann, C.J. 1993. Pulp. P. 2140-2146 *in* Magill's Survey of Science: Applied Science. F.N. Magill, ed. Salem Press, Pasadena, California.

Biermann, C.J. 1993. Wood. P. 2861-2868 *in* Magill's Survey of Science: Applied Science. F.N. Magill, ed. Salem Press, Pasadena, California.

These three references are for students who are writing research papers on aspects of applied science. They appear in a compendium (a total of six volumes with 2,918 pages plus indexes) that is especially designed for high school and college libraries.

Biermann, C.J., and J.L. Hull. 1992. Replacement of the Canadian Standard freeness temperature and consistency correction tables with equations suited to computer use. Tappi Journal 75(10):245-246. (For. Res. Lab.)

For pulp and paper personnel in quality control. Empirical equations are presented that yield correction values for Canadian Standard freeness tests. The equations, which are suited for computer use, are probably more realistic than the Standard tables for freeness values of chemical pulps above 80 ml.

Bolton, A.J., and P.E. Humphrey. 1994. The permeability of wood-based composite materials. Part 1. A review of the literature and some unpublished work. Holzforschung 48(Suppl.):95-100. (For. Res. Lab.)

For academic and industrial researchers. The existing literature on the permeability of reconstituted wood products is reviewed. The effect of product density on permeability is great; unfortunately, most materials tested to date have contained a systematic spatial variation of density. As a result, the true relationship between density and permeability remains uncertain. The permeation of water vapor plays a critical role in the pressing operation of wood-based composite materials.

Brunner, C.C., A.G. Maristany, D.A. Butler, and J.W. Funck. 1993. Enhancing color-image data for wood-surface feature identification. P. 1-13 *in* Scan Pro, 5th International Conference on Scanning Technology & Process Control for the Wood Products Industry, sponsored by *Wood Technology*. Miller Freeman, San Francisco. (For. Res. Lab.)

For those interested in optical scanning and sawmill technology. The detection of surface features of wood by using color computer vision is discussed in terms of the nature of color and the physics of wood reflectance.

Brunner, C.C., A.G. Maristany, D.A. Butler, D. VanLeeuwen, and J.W. Funck. 1992. An evaluation of color spaces for detecting defects in Douglas-fir veneer. Industrial Metrology 2:169-184. (For. Res. Lab.)

For practitioners interested in wood color. Color information can be valuable for detecting and classifying surface defects in wood. For images of Douglas-fir veneer, only two color-components are necessary for classification, regardless of the color space used.

Butler, D.A., J.W. Funck, and C.C. Brunner. 1993. An adaptive image preprocessing algorithm for defect detection in Douglas-fir veneer. Forest Products Journal 43(5):57-60. (For. Res. Lab.)

For researchers, technical directors, and equipment manufacturers. SISM and NSISM are algorithms that identify clear regions in images of wood so that such regions can be largely ignored in subsequent processing. This paper describes how a new algorithm (ASISM) was refined from NSISM. ASISM performs better than or equal to its predecessors across a range of commonly occurring wood features in Douglas-fir veneer.

Clarke, J.W., T.E. McLain, M.S. White, and P.A. Araman. 1993. Evaluation of metal connector plates for repair of wood pallet stringers. Forest Products Journal 43(10):15-22.

For pallet manufacturers, users, or recyclers as well as plate manufacturers. Repair of damaged pallets with metal connector plates may reduce the waste of wood while providing high-quality, economical pallets.

Clarke, J.W., T.E. McLain, M.S. White, and P.A. Araman. 1993. Reinforcement of wood pallets with metal connector plates. Forest Products Journal 43(10):70-76.

For pallet manufacturers, users, or recyclers as well as plate manufacturers. Reinforcement of the damage-prone areas of wood-pallet stringers with metal connector plates may increase the useful life of pallets or permit the use of less desirable wood species.

Dawson-Andoh, B.E., and J.J. Morrell. 1991. Screening of *Trichoderma* isolates as potential bioprotectants against *Postia placenta* in Douglas-fir heartwood. Material und Organismen 26:241-246. (For. Res. Lab.)

For wood preservers and microbiologists. A wood-wafer assay was used as a tool for investigating the ability of 60 isolates of *Trichoderma* spp. to inhibit decay of Douglas-fir heartwood by *Postia placenta*. Thirty-two of the isolates tested exhibited some activity against the test organism, and four were highly effective.

Dawson-Andoh, B.E., and J.J. Morrell. 1992. Enhancing the performance of bioprotection agents by pretreatment with waterborne salts. Wood and Fiber Science 24:347-352. (For. Res. Lab.)

For wood microbiologists. Application of relatively low levels of diffusible fluorides or fluoroborates can alter the wood environment and provide bioprotection against wood-decay fungi.

DeBell, J.D., J.C. Tappeiner II, and R.L. Krahmer. 1994. Wood density of western hemlock: effect of ring width. Canadian Journal of Forest Research 24:638-641. (For. Res. Lab.)

For wood anatomists. Wood density of western hemlock was determined by X-ray densitometry of strips from breast-height samples consisting of rings 20-24 from the pith. Wood density of western hemlock decreased at higher growth rates, primarily because earlywood width increased while latewood width remained the same.

Eskelsen, V., W.L. Galligan, B.E. Shelley, and J. Peterson. 1993. Exploring the effects of further drying on the tensile capacity of kiln-dried lumber. Forest Products Journal 43(1):25-32. (For. Res. Lab.)

For engineers and researchers of dimension lumber. The authors compared the ultimate tensile capacity of Douglas-fir dried to a target average of 12 percent moisture content by a commercial schedule to that of a sample of the same lumber dried further (to simulate in-service drying). Further drying resulted in significant loss in ultimate tensile capacity between the 10th and 60th percentiles.

Foliente, G.C., and T.E. McLain. 1992. Design of notched wood beams. Journal of Structural Engineering 118:2407-2420.

For engineers, code officials, and industry technical specialists. This paper describes a new method for the engineering design of wood beams that are notched on the tension face.

Forsyth, P.G., and T.L. Amburgey. 1992. Prevention of non-microbial sapstains in water-stored oak logs. Forest Products Journal 42(4):59-61.

For those interested in wood preservation. Non-microbial sapstain can be prevented in lumber from freshly cut red oak logs with a 5-minute dip in 5 percent sodium bisulfite, whereas 10 percent sodium bisulfite is needed for lumber cut from water-stored logs.

Forsyth, P.G., and J.J. Morrell. 1992. Diffusion of copper and boron from a groundline wrap formulation through Douglas-fir heartwood. Forest Products Journal 42(11/12):27-29. (For. Res. Lab.)

For utilities personnel and wood technologists. The effect of grain orientation and moisture content (MC) on diffusion of copper and boron from a groundline wrap paste was evaluated in small Douglas-fir heartwood blocks over a 1-year period. Diffusion of boron was consistently greater than that found with copper naphthenate, reflecting the higher water solubility of the former compound. Diffusion of both components was greatest in the longitudinal direction in blocks at 60 percent MC.

Forsyth, P.G., and J.J. Morrell. 1993. Preliminary field trials using the solid fumigant Basamid amended with selected additives. Forest Products Journal 43(2):41-44. (For. Res. Lab.)

For wood preservationists and utility company personnel. The effect of selected additives on the decomposition of Basamid to methylisothiocyanate, a potent fungicide for remedial control of wood decay, was evaluated in Douglas-fir pole stubs over 2 years. The results suggest that Basamid may be useful in preventing internal decay in utility poles.

Frederick, W.J., Jr., K.P. Wilson, M.L. Laver, and S.A. Sinquefield. 1988. Solute rejection in the ultrafiltration of polydisperse organics from natural products. Chemical Engineering Communications 68:197-211.

For chemical engineers. A model was successfully devised for evaluating ultrafiltration membranes for specific applications of solute fractionation.

Freitag, M., and J.J. Morrell. 1992. Changes in selected enzyme activities during growth of pure and mixed cultures of the white-rot decay fungus *Trametes versicolor* and the potential biocontrol fungus *Trichoderma harzianum*. Canadian Journal of Microbiology 38:317-323. (For. Res. Lab.)

For wood microbiologists and mycologists. None of the monitored extracellular enzymes can serve as a quantitative indicator for biomass accumulation, but the results suggest that the bioprotectant induced earlier secondary metabolism in the white-rot fungus. These results may help explain the poor performance of bioprotectants against white-rot fungi.

Freitag, M., and J.J. Morrell. 1992. Decolorization of the polymeric dye Poly R-478 by wood-inhabiting fungi. Canadian Journal of Microbiology 38:811-822. (For. Res. Lab.)

For wood microbiologists and mycologists. Decolorization of the polymeric dye Poly R-478, an indicator of phenoloxidase activity, was examined as a potential method for separating white- and brown-rot fungi taxonomically and for screening for ligninolytic capability. Poly R-478 proved useful for selecting most white-rot fungi; however, some brown-rot fungi also reacted positively. No purified manganese or lignin peroxidase activity was obtained from any of the test fungi except *Phanerochaete chrysosporium*.

Fuller, J.J., R.J. Leichti, and R.H. White. 1992. Temperature distribution in a nailed gypsum-stud joint exposed to fire. Fire and Materials 16:95-99. (For. Res. Lab.)

For wood engineers and scientists. Although the type of gypsum board and wood density do not affect temperature distribution in a nailed gypsum-to-stud connection, mechanical performance of the joint is controlled by the temperature dependency of the strength and stiffness of the materials in the joint.

Funck, J.W., J.B. Forrer, D.A. Butler, C.C. Brunner, and A.G. Maristany. 1992. Measuring surface roughness on wood: a comparison of laser scatter and stylus tracing approaches. P. 173-184 *in* Industrial Applications of Optical Inspection, Metrology, and Sensing. G.M. Brown, K.G. Harding, and H.P. Stahl, eds. Proceedings, SPIE 1821. (For. Res. Lab.)

For researchers. This paper discusses the performance characteristics of a laser-scatter/optical-imaging system for measuring wood roughness and compares them to those of a stylus tracing system. The abilities of both approaches to capture the types of information on roughness required in wood manufacturing processes are discussed, as is the functionality of 1-dimensional (1-D), 2-D, and 3-D roughness descriptors.

Funck, J.W., J.A. Gaber, and F. Aslam. 1992. Using image analysis for lumber size control measurements. Industrial Metrology 2:237-252. (For. Res. Lab.)

For quality control personnel and industrial metrologists. An optical imaging system is proposed for monitoring thickness or width for on-line size control in lumber production.

Funck, J.W., A.G. Maristany, D.A. Butler, and C.C. Brunner. 1989. Resolution in machine vision—what is it and why is it important? P. XIII-1 - XIII-11 *in* Third International Conference on Scanning Technology in Sawmilling. Miller-Freeman Publications, San Francisco. (For. Res. Lab.)

For wood technologists and users of machine-vision systems. While the application of machine-vision systems to the wood products industry will enhance production capabilities and efficiencies, it will also require mill managers and purchasers to understand the terminology involved.

Funck, J.W., Y. Zeng, C.C. Brunner, and D.A. Butler. 1993. SAW3D: a real shape log breakdown model. P. 1-19 *in* Scan Pro, 5th International Conference on Scanning Technology & Process Control for the Wood Products Industry, sponsored by *Wood Technology*. Miller Freeman, San Francisco. (For. Res. Lab.)

For sawmill managers, technical directors, and other researchers. SAW3D is a computer algorithm for optimizing the log breakdown, edging, and trimming operations by using a 3-dimensional representation of log shape. This paper presents results of tests in which SAW3D was used to determine the effects of such variables as (1) improved log shape representation, (2) optimizing for value versus volume, (3) scanning densities around the log's circumference, and (4) log/cant/flitch/board positioning control.

Groom, K.M., and R.J. Leichti. 1993. Load-withdrawal displacement characteristics of nails. Forest Products Journal 43(1):51-54. (For. Res. Lab.)

For structural engineers and researchers. Load-withdrawal displacement relationships were established for five different nails for use in nonlinear finite-element models. These nails were hand-driven into Douglas-fir 2-by-4 studs and withdrawn from the wood specimens at a constant rate. Load and nail displacement were monitored. Typical results are described.

Groom, K.M., and R.J. Leichti. 1994. Transforming a corner of a light-frame wood structure to a set of nonlinear springs. Wood and Fiber Science 26:28-35. (For. Res. Lab.)

For structural engineers. This study examines the transformation from the physical exterior-wall-to-exterior-wall connection (a corner) of a light-frame wood structure, first, to a two-dimensional finite-element model and, then, to a set of nonlinear springs.

Groom, L., and A. Polensek. 1992. Nonlinear modeling of truss-plate joints. Journal of Structural Engineering 118:2514-2531.

For timber engineers. A theoretical model was successfully developed for predicting mechanisms of load transfer between a wood member and a metal die-punched truss plate.

Gupta, R. 1994. Metal-plate connected tension joints under different loading conditions. Wood and Fiber Science 26:212-222. (For. Res. Lab.)

For wood engineers. Combined loading tests showed that the axial load capacity of joints decreased with an increase in applied bending moment. The most common mode of failure was tooth withdrawal.

Gupta, R., and K.G. Gebremedhin. 1992. Resistance distributions of a metal-plate-connected wood truss. Forest Products Journal 42(7/8):11-16. (For. Res. Lab.)

For wood engineers. Modeling metal-plate-connected wood trusses and simulating three different types of joints revealed that reliability index and probability of failure for the three joint types were unequal.

Gupta, R., K.G. Gebremedhin, and J.R. Cooke. 1992. Analysis of metal-plate-connected wood trusses with semi-rigid joints. Transactions of the American Society of Agricultural Engineers 35:1011-1018. (For. Res. Lab.)

For wood engineers. Incorporating semi-rigid behavior of joints in analyses of metal-plate-connected wood trusses yields more accurate calculation of member forces and thereby enables closer prediction of actual truss behavior.

Gupta, R., K.G. Gebremedhin, and M.D. Grigoriu. 1992. Characterizing the strength of wood truss joints. Transactions of the ASAE 35:1285-1290. (For. Res. Lab.)

For structural engineers. Probability density functions (normal, lognormal, and three-parameter Weibull) were used to characterize strength data for three types of metal-plate-connected wood truss joints (web at the bottom chord, tensions splice, and heel).

Helm, R.F., and J.J. Karchesy. 1993. Acid- and base-catalyzed D-glucosylurea anomerization. Journal of Carbohydrate Chemistry 12(3):277-290. (For. Res. Lab.)

For wood and adhesive chemists. As part of their investigation into the chemistry of carbohydrate-urea-phenol-based adhesives, the authors found that the D-glucosylureas undergo both acid- and base-catalyzed anomerization. This paper discusses efforts to determine the mechanistic aspects of the transformations.

Jeihooni, A., R.L. Krahmer, and J.J. Morrell. 1994. Properties and decay resistance of preservative-treated Douglas-fir flakeboard. Wood and Fiber Science 26:178-184. (For. Res. Lab.)

For wood preservationists. The effects of pretreatment of Douglas-fir flakes with CCA-C, borate, and azaconazole on properties of flakeboard were studied. Treatment markedly enhanced resistance to brown rot, but flakes treated with boron tended to produce weaker boards.

Kasal, B., and R.J. Leichti. 1992. Incorporating load sharing in shear wall design of light-frame structures. Journal of Structural Engineering 118:3350-3361. (For. Res. Lab.)

For structural engineers and researchers. A three-dimensional nonlinear finite-element model of a light-frame wood building was created and used to determine internal forces caused by wind pressure in shear walls. Results confirm the assumption of current design procedures that one-half of the load is transferred directly to the foundation. Calculating internal forces in the shear walls by simple- and continuous-beam models does not reflect the real situation and may lead to erroneous results.

Kasal, B., and R.J. Leichti. 1992. Nonlinear finite-element model for light-frame stud walls. Journal of Structural Engineering 118:3122-3135. (For. Res. Lab.)

For structural engineers. The authors use load-deflection characteristics to transform a three-dimensional detailed model of a wood-frame study wall into a simple two-dimensional model made equivalent to the original substructure by energy concepts. The application of equivalent models in a full-structure nonlinear analysis yields the global behavior of the structure (deflections and reaction), in reasonable computer times.

Kasal, B., and R.J. Leichti. 1994. Nonlinear finite-element model for light-frame stud walls, discussion closure. Journal of Structural Engineering 120:1679-1680.

For structural engineers. The authors respond to discussion on the original paper (see Kasal and Leichti, 1992, above). It was acknowledged that various strategies for modeling light-frame stud walls were feasible. The approach of the authors was demonstrated to be most versatile and to incorporate the essential aspects of behavior.

Kasal, B., R.J. Leichti, and R.Y. Itani. 1994. Nonlinear finite-element model of complete light-frame wood structures. Journal of Structural Engineering 120:100-119. (For. Res. Lab.)

For those interested in behavior and modeling of light-frame structures. A one-story wood-frame building was tested under cyclic quasistatic loads, and results were used to verify a nonlinear finite-element model of the full building. Experimental and analytical results agreed closely.

Kreber, B., P.E. Humphrey, and J.J. Morrell. 1993. Effect of polyborate pre-treatment on the shear strength development of phenolic resin to Sitka spruce bonds. Holzforschung 47:398-402. (For. Res. Lab.)

For industrial and academic research and development personnel in preservation, composites, and adhesive areas. Pre-treating the constituents of wood-based composite panels with fungitoxic chemicals prior to lay-up and pressing offers some advantage over post-pressing treatment. In this study, the effects of the loading level of boron on the rates of strength development of small phenol formaldehyde-to-wood test bonds were investigated. All levels of boron pretreatment hastened initial rates of strength development.

Kreber, B., and J.J. Morrell. 1993. Ability of selected bacterial and fungal bioprotectants to limit fungal stain in ponderosa pine sapwood. Wood and Fiber Science 25:23-34. (For. Res. Lab.)

For microbiologists and wood technologists. The ability of 15 bacterial and fungal isolates to inhibit fungal stain of ponderosa pine sapwood was studied on small wood samples exposed in a moist environment. Several isolates including *Bacillus subtilis* were capable of inhibiting fungal stain, although the protective effect was lost upon prolonged exposure.

Laver, M.L., and K.P. Wilson. 1993. Determination of carbohydrates in wood pulp products. Tappi Journal 76(6):155-158. (For. Res. Lab.)

For pulp and paper analysts and pulp users. Anion exchange separation and pulsed amperometric detection provided an analytical procedure for determining carbohydrates in wood pulp products with a minimum of sample preparation and with improved accuracy. Together, they also provide a method to calculate hemicellulose content.

Lebow, S.T., and J.J. Morrell. 1993. ACZA fixation: the roles of copper and zinc in arsenic precipitation. American Wood-Preservers' Association Proceedings 89:133-146. (For. Res. Lab.)

For wood preservationists. In this study, the roles of copper and zinc in arsenic precipitation were compared by conducting precipitation tests with ammoniacal copper zinc arsenate (ACZA) solutions and by electron microprobe analyses of ACZA-treated wood. The results suggest that the presence of zinc in the solution enhances arsenic retention, minimizing the risk of leaching in service.

Lebow, S.T., and J.J. Morrell. 1993. Effect of steaming on treatability of Douglas-fir heartwood with sodium octaborate tetrahydrate. Forest Products Journal 43(4):35-38. (For. Res. Lab.)

For practitioners of and researchers in wood preservation. The use of presteaming to enhance boron treatment of Douglas-fir heartwood lumber was evaluated with specimens cut from unseasoned and air-dried boards. For both types of specimens, boron treatment within an hour of presteaming produced the most marked improvement in boron retention.

Lebow, S.T., and J.J. Morrell. 1993. Methlyisothiocyanate fumigant content of Douglas-fir heartwood at various

moisture levels after treatment with solid sodium n-methyldithiocarbamate. Wood and Fiber Science 25:87-90. (For. Res. Lab.)

For wood technologists and utilities personnel. The relationship between moisture content and the presence of methylisothiocyanate (MITC) in wood after various applications of sodium n-methyldithiocarbamate was investigated with small Douglas-fir heartwood blocks. While MITC levels were initially higher in wetter blocks, MITC levels in drier blocks remained more stable over the 8-week test period.

Lebow, S.T., and J.J. Morrell. 1993. Pressure treatment of Sitka spruce lumber with ammoniacal copper zinc arsenate or chromated copper arsenate. Forest Products Journal 43(10):41-44. (For. Res. Lab.)

For wood treaters. Air-seasoned Sitka spruce was treated with ammoniacal copper zinc arsenate (ACZA) or chromated copper arsenate (CCA) at 11 commercial plants. All but 2 of the 14 charges treated with ACZA met the American Wood-Preservers' Association specifications for treatment of lumber in gtound contact. Despite incising, none of the CCA treatments reached the required depth of penetration, and only 3 of 15 CCA charges achieved the desired chemical loading.

Leichti, R.J. 1992. A preliminary report on timber bridge superstructure cost. Wood Design Focus 3(3):14-15.

For structural engineers and building officials. The results of the USDA Timber Bridge Initiative Program are summarized from a report by the Timber Bridge Resource Information Center. Costs of bridge superstructures in terms of length, materials, and location are discussed.

Leichti, R.J. 1992. In the literature: repair of timber structures. Wood Design Focus 3(3):20-21.

Leichti, R.J. 1992. In the literature: multistory wood-frame structures—design and performance. Wood Design Focus 3(2):13-14.

Leichti, R.J. 1993. In the literature: the environmental impact of using wood as a structural material. Wood Design Focus 4(2):20-21.

Leichti, R.J., and M.B. Scroggins. 1993. In the literature: wood and wood-based products for exterior exposures. Wood Design Focus 4(3):23-24.

For structural engineers involved with wood engineering. Each of the above four literature reviews contain annotated papers, lists of related citations, recent theses and dissertations, and new information.

Leichti, R.J., P.C. Gilham, and D.A. Tingley. 1993. The Taylor Lake Bridge: a reinforced glulam structure. Wood Design Focus 4(2):3-4.

For structural engineers and building officials. The use of a high-strength, fiber-reinforced plastic has been developed to replace high-grade tensile laminae in glued-laminated beams. The design for a pedestrian bridge is discussed, and the reinforced members are compared with a design for the same bridge when based on standard glulam technology.

Leichti, R.J., and C.H. Yoo. 1992. Straight, single-tapered composite I-beams of orthotropic materials. Journal of Materials in Civil Engineering 4:399-414. (For. Res. Lab.)

For structural engineers. The effects of taper geometry and elastic constants of the web material of straight, single-tapered composite I-beams were examined over a very limited range of materials and tapers. Although wood and wood composites were assumed for the materials, the method and results are generally applicable to other orthotropic materials.

Lowell, E.C., and R.L. Krahmer. 1993. Effects of lean in red alder trees on wood shrinkage and density. Wood and Fiber Science 25:2-7.

For wood scientists and technologists. Certain wood qualities may be affected by lean in red alder trees. Shrinkage and density can potentially cause problems in the manufacture of products from red alder. In this study, longitudinal, radial, and tangential shrinkages were affected by all or some of the following factors: lean, side, and position. There was no significant effect of lean or side on wood density.

Maki, R.G., and M.R. Milota. 1993. Statistical quality control applied to lumber drying. Quality Progress 26(12):75-79.

For those concerned with quality control in lumber mills. The authors describe the ways in which timber companies use statistical quality control to maximize the quality and quantity of wood from each tree.

Malan, J.C.S., J. Chen, L.Y. Foo, and J.J. Karchesy. 1992. Phlobaphene precursors in Douglas-fir outer bark. P. 411-419 *in* Plant Polyphenols. R.W. Hemingway and P.E. Laks, eds. Plenum Press, New York. (For. Res. Lab.)

For wood and adhesive chemists. Several different groups of low-molecular-weight polyphenols in Douglas-fir outer bark appear to be precursors to phlobaphene formation. Fungi on the outer bark may be involved in some chemical transformations of bark polyphenols.

Mankowski, M.E., and J.J. Morrell. 1993. Resistance of dampwood termites to preservative-treated wood. Forest Products Journal 43(9):58-60. (For. Res. Lab.)

For wood technologists and entomologists. Wood treated with chromated copper arsenate and ammoniacal copper zinc arsenate was highly resistant to dampwood termite attack. Protozoa levels also declined in termites exposed to these preservatives. Preservative-treated wood should provide excellent protection against dampwood termites.

Maristany, A.G., D.A. Butler, C.C. Brunner, and J.W. Funck. 1991. Exploiting local color information for defect detection on Douglas-fir veneer. Proceedings, 4th International Conference on Scanning Technology in the Wood Industry, Burlingame, California. (For. Res. Lab.)

For researchers in optical scanning. The use of color alone in machine vision systems is insufficient to identify defects on wood surfaces. Distinguishing defects from clear wood involves a combination of relative colors, textures, and defect edge intensities. This paper examines some of the most suitable representations of color information.

Maristany, A.G., P.K. Lebow, and C.C. Brunner. 1994. Application of the dichromatic reflection model to wood. Wood and Fiber Science 26:249-258. (For. Res. Lab.)

For those interested in the spectral reflectance of wood and computer vision. The applicability of the dichromatic reflection model to describe wood-light interactions in Douglas-fir veneer was investigated.

Maristany, A.G., P.K. Lebow, C.C. Brunner, D.A. Butler, and J.W. Funck. 1993. Classifying wood-surface features using dichromatic reflection. P. 56-64 *in* Optics in Agriculture and Forestry. Proceedings SPIE 1836. J.A. DeShazer and G.E. Meyers, eds. SPIE—The International Society for Optical Engineering, Bellingham, Washington. (For. Res. Lab.)

For researchers in optical scanning. This study tested whether the use of only the body component of reflective light can significantly improve the classification of wood-surface features. Reflectance curves of various Douglas-fir veneer features were separated into body and interface components, and two discriminant functions were developed and their performances compared. No advantage was found in estimating body reflection when classifying veneer surface features.

McLain, T.E. 1992. Performance of nailed-bolted connections. Forest Products Journal 42(7/8):70-72.

For engineers and architects. This article describes a series of tests that quantified the effect on lateral strength of combining two different types of fasteners in a connection.

McLain, T.E. 1992. Strength of lag screw connections. Journal of Structural Engineering 118:2855-2871.

For engineers, code officials, and industry technical specialists. This paper presents an extensive review of existing data on the strength of lag screw connections and describes a theoretical method of predicting lateral shear resistance. It also documents the evidence supporting new design provisions found in the 1991 *National Design Specification for Wood Construction.*

McLain, T.E. 1993. Bolted connection design in the United States. P. 122-127 *in* Proceedings, International Workshop on Wood Connectors, Las Vegas, Nevada. Forest Products Research Society, Madison, Wisconsin.

For international building code officials, specifications writers, and engineers. An overview of design provisions for bolted connections used in the United States is provided.

McLain, T.E. 1993. Enhancements to performance—connections. P.68-74 *in* Proceedings, FPRS International Conference on Wood Products for Engineered Structures, Las Vegas, Nevada. Forest Products Research Society, Madison, Wisconsin.

For designers, specifiers, managers, suppliers and marketing and sales specialists. The author discusses some of the connection-related constraints on growth of engineered wood products and some strategies and opportunities to reduce these barriers.

McLain, T.E. 1993. US connection design code development and application—generic fasteners. P. 52-56 *in* Proceedings, International Workshop on Wood Connectors, Las Vegas, Nevada. Forest Products Research Society, Madison, Wisconsin.

For international building code officials, specifications writers, and engineers. An overview is provided of new design provisions for connections now being implemented in the United States.

McLain, T.E., L.A. Soltis, D.G. Pollock, Jr., and T.L. Wilkinson. 1993. LRFD for engineered wood structures—connection behavioral equations. Journal of Structural Engineering 119:3024-3038. (For. Res. Lab.)

For engineers, designers, and building code officials. A new design specification for engineered wood structures has been proposed in load and resistance factor design (LRFD) format. This paper provides an overview of the proposed LRFD connection design criteria. The LRFD document contains substantial improvement in code clarity, simplification, and structure over the historic allowable stress specification.

Milota, M.R. 1994. Specific gravity as a predictor of species correction factors for a capacitance-type moisture meter. Forest Products Journal 44(3):63-68. (For. Res. Lab.)

For primary and secondary manufacturers who use a capacitance-type moisture meter. The effect of specific gravity is demonstrated, and it is shown that, if a species correction factor is not available, the user can estimate one on the basis of specific gravity.

Milota, M.R., J.J. Morrell, and S.T. Lebow. 1993. Reducing moisture content variability in kiln-dried hem-fir lumber through sorting: a simulation. Forest Products Journal 43(6):6-12. (For. Res. Lab.)

For persons involved in lumber drying. Post-sorting hem-fir lumber by moisture content (MC) can reduce time in

the kiln by 10 percent and decrease board-to-board variability in MC.

Morrell, J.J. 1987. Decay management: preventing and controlling deterioration of wood poles. Canadian Wood Preservation Association Proceedings 8:104-111.

For wood preservationists and utility managers. As indicated by the title, this paper focuses on methods of detecting and preventing decay in wood poles, and on controlling decay once it has been detected.

Morrell, J.J. 1994. Decomposition of metham sodium to methylisothiocyanate as affected by wood species, temperature, and moisture content. Wood and Fiber Science 26:62-69. (For. Res. Lab.)

For wood preservationists. The effect of various wood characteristics on decomposition of metham sodium to methylisothiocyanate in 16 North American and southeast Asian hardwoods and softwoods was investigated. Wood moisture content had the greatest influence on decomposition, while temperature had a lesser effect. Results suggest that the wood environment could be manipulated to enhance metham sodium decomposition.

Morrell, J.J., and M.Y. Giron. 1987. Control of decay of Philippine wood species by fumigants. Philippine Technology Journal 12(1):44-47.

For Philippine wood users. Preliminary tests indicate that Philippine wood species are amenable to fumigant treatment; however, field tests must be undertaken to ensure that these chemicals will perform under Philippine climatic conditions. Results suggest that higher dosages of fumigants will be needed to control decay fungi. In some instances, the higher chemical dosages may also improve insect control.

Morrell, J.J., R.D. Graham, and G.G. Helsing. 1993. Protecting Douglas-fir pile tops from internal decay: a 15-year field trial. Forest Products Journal 43(6):63-65. (For. Res. Lab.)

For wood preservationists operating in marine environments. Capping sharply limited fungal colonization in Douglas-fir piles over a 15-year period, as did application of the diffusible biocides ammonium bifluoride or fluorchrome-arsenic-phenol. Boron was less effective, as was pentachlorophenol in combination with capping.

Morrell, J.J., S.T. Lebow, and M.R. Milota. 1993. Treatability of hem-fir and Douglas-fir lumber in relation to storage time after kiln-drying. Forest Products Journal 43(6):35-37. (For. Res. Lab.)

For wood preservationists and operators of lumber mills. Storage of hem-fir and Douglas-fir lumber for as long as 6 months after kiln-drying does not adversely affect subsequent preservative treatment with chromated copper arsenate.

Morrell, J.J., M.A. Newbill, and C.M. Freitag. 1994. Capacity of surface and internal groundline treatments to protect untreated Douglas-fir posts. Holzforschung 48:113-116. (For. Res. Lab.)

For wood treaters and users. The results of this 10-year evaluation indicated that combinations of groundline preservative pastes and fumigants can protect the groundline region of untreated Douglas-fir posts if applied at regular intervals, but they cannot completely protect the region above.

Morrell, J.J., M.A. Newbill, and C.M. Sexton. 1992. Remedial treatment of Douglas-fir and southern pine poles with methylisothiocyanate. Forest Products Journal 42(10):47-54. (For. Res. Lab.)

For wood technologists and managers of utilities. The relative effectiveness of glass-encapsulated methylisothiocyanate (MITC-Fume®) and metham-sodium as fumigants of Douglas-fir and southern pine poles was examined over 3 years with fungal bioassays and chemical analysis. Performance of MITC-Fume® exceeded that of a 500-ml metham-sodium treatment, even at the lowest dosage evaluated (60 g).

Morrell, J.J., and C.M. Sexton. 1993. Fungal staining of ponderosa pine sapwood: effects of wood preconditioning and bioprotectants. Wood and Fiber Science 25:322-325. (For. Res. Lab.)

For wood technologists. Differences in susceptibility were evaluated on sterile and unsterile samples of freshly sawn, frozen and thawed, or oven-dried and rewetted ponderosa pine sapwood. In general, fresh unsterile samples were less stained than either frozen or oven-dried wood.

Morrell, J.J., C.M. Sexton, and K. Archer. 1992. Diffusion of boron from fused borate rods through selected woods. Forest Products Journal 42(7/8):41-44. (For. Res. Lab.)

For those interested in wood preservation. Remedial treatments with borate rods were highly effective in killing decay fungi in white fir, Douglas-fir, western hemlock, western larch, and sugar maple.

Morrell, J.J., S.M. Smith, and J.E. Winandy. 1991. Effects of incising on preservative treatment of Douglas-fir lumber. Canadian Wood Preservation Association Proceedings 12:263-276.

For wood preservationists. The authors describe a method for non-destructively assessing the effects of incising on preservative distribution in Douglas-fir heartwood lumber.

Morrell, J.J., and A.R. Zahora. 1988. Managing wood decay through controlled release of fumigants: current technology and future prospects. P. 673-677 *in* Proceedings of the 1988 International Conference on Timber Engineering. Volume 2. R.Y. Itani, ed. Forest Products Research Society, Madison, Wisconsin.

For wood pathologists and preservers. This paper discusses research to identify safer, more effective wood fumigants and systems for applying registered chemicals.

Narayana Prasad, T.R., P.E. Humphrey, and J.J. Morrell. 1994. The effects of chromated copper arsenate and ammoniacal copper zinc arsenate on shear strength development of phenolic resin to Sitka spruce bonds. Wood and Fiber Science 26:223-228. (For. Res. Lab.)

For wood preservationists and engineers. Preservative pretreatment did not significantly affect shear strength development rates at the chemical retention levels and pressing and testing conditions employed.

Newbill, M.A., and J.J. Morrell. 1992. Laboratory evaluation of chemicals for preventing decay of preservative-treated wood after field damage. Wood Protection 2(1):19-22. (For. Res. Lab.)

For wood preservationists. This paper reports the performance of 14 promising chemicals (besides pentachlorophenol) in protecting the heartwood of Douglas-fir and the sapwood of ponderosa pine against the fungus *Postia placenta*.

Newbill, M.A., and J.J. Morrell. 1993. Over-the-counter preservatives: their ability to protect western woods from fungal attack through soil contact. Forest Products Journal 43(10):35-40. (For. Res. Lab.)

For wood users and technologists. The efficacy of over-the-counter preservatives was assessed on five wood species in soil-block and fungus-cellar trials. Preservative treatments improved performance of most species except lodgepole pine. Results suggest that topical application of commercially available preservatives has merit for improving the performance of naturally durable woods in soil contact, but its value for less durable woods is questionable.

Peralta, P.N., and J.J. Morrell. 1992. Steady-state diffusion of chloropicrin in Douglas-fir heartwood. Wood and Fiber Science 24:442-447. (For. Res. Lab.)

For wood scientists. Steady-state diffusion of chloropicrin through Douglas-fir heartwood was strongly affected by moisture content and wood orientation, but unaffected by changes in chemical concentration or temperature. The interactions of chloropicrin with wood initially slow fumigant distribution, but result in longer retention times.

Randhawa, S.U., C.C. Brunner, J.W. Funck, and G. Zhang. 1993. An object-oriented modeling framework for sawmill simulation. Computers and Industrial Engineering 25(1-4):565-568. (For. Res. Lab.)

For industrial modelers and engineers. This paper describes a flexible, general-purpose system for modeling and analyzing softwood sawmills in the Pacific Northwest.

Randhawa, S.U., C.C. Brunner, J.W. Funck, and G. Zhang. 1994. A discrete-event object-oriented modeling environment for sawmill simulation. Simulation 64(2):119-130. (For. Res. Lab.)

For sawmill operators and those in the forest products industry. This paper presents a simulation modeling environment developed for sawmill design and analysis in the forest products industry. The design facilitates flexibility in modeling different sawmill configurations and production scenarios.

Rowell, R.M., H. Spelter, R.A. Arola, P. Davis, T. Friberg, R.W. Hemingway, T. Rials, D. Luneke, R. Narayan, J. Simonsen, and D. White. 1993. Opportunities for composites from recycled wastewood-based resources: a problem analysis and research plan. Forest Products Journal 43(1):55-63.

For all those interested in recycling or wood-based composites. The resources available for producing composites from recycled bio-based fibers are described, as are the problems associated with collecting, sorting, cleaning, breakdown, classification, and blending of the recycled resources. A framework for research into the use of bio-based resources is proposed.

Rui, C., and J.J. Morrell. 1993. Production of fungal protoplasts from selected wood-degrading fungi. Wood and Fiber Science 25:61-65. (For. Res. Lab.)

For mycologists and microbiologists. There are few reports of protoplast production from economically important wood decayers. In this report, protoplasts were produced from hyphae of the common wood-degrading fungi *Phanerochaete chrysosporium*, *Postia placenta*, *Gloeophyllum trabeum*, and *Trametes versicolor* with a commercially prepared mixture of cell-wall degrading enzymes.

Rui, C., and J.J. Morrell. 1994. Assessing biocide effects on protoplasts of wood decay fungi. Wood and Fiber Science 26:205-211. (For. Res. Lab.)

For wood preservationists. Hyphal fragments and protoplasts of two wood-degrading fungi were used to examine the effects of two fungicides, copper sulfate and azaconazole, on fungal health. This technique may prove useful for assessing the mechanisms of new fungicides.

Scheffer, T.C., and C.S. Moses. 1993. Survey of moisture content in houses for evidence of decay susceptibility. Forest Products Journal 43(11/12):45-51. (For. Res. Lab.)

For wood preservationists, home builders, and homeowners. In 1,000 houses surveyed over seven areas with different climates, the decay hazard was found to be generally small and manageable by simple precautionary measures.

Sexton, C.M., M.E. Corden, and J.J. Morrell. 1993. Assessing fungal decay of wood by small-scale toughness tests. Wood and Fiber Science 25:375-383. (For. Res. Lab.)

For wood microbiologists and technologists. Impact bending and breaking radius were used to measure loss in toughness caused by basidiomycetes isolated from wood. Wide differences were found among, and sometimes within, the 26 species tested. Brown-rot fungi tended to cause greater losses than white-rot fungi, but no consistent difference was found between monokatyons and dikaryons of the same species.

Sexton, C.M., P.G. Forsyth, and J.J. Morrell. 1993. A comparison of agar exposure and vermiculite burial methods for preparing basidiomycete-colonized wood. Material und Organismen 28:39-46. (For. Res. Lab.)

For wood microbiologists and forest pathologists. Wood uniformly colonized by a test fungus is required for many applications, including examination of fungal effects on wood properties and extraction of fungal enzymes. This study compares the agar method with the use of vermiculite in a plastic bag as a medium for fungal growth. The vermiculite method was an equally effective, but more efficient, method for preparing fungus-colonized wood.

Sexton, C.M., S.M. Smith, J.J. Morrell, B.R. Kropp, M.E. Corden, and R.D. Graham. 1992. Identity and distribution of Basidiomycotina colonizing Douglas-fir poles during three years of air-seasoning. Mycological Research 96:321-330. (For. Res. Lab.)

For mycologists. The identity and distribution of wood-decay fungi colonizing Douglas-fir poles under different exposure conditions were determined. Poles were rapidly colonized by a variety of Basidiomycotina, but four taxa tended to dominate. *Antrodia carbonica* and *Postia placenta* predominantly colonized the heartwood at the ends and upper halves of the pole sections. *Stereum sanguinolentum* and *Peniophora* spp. were found throughout the pole sections in the sapwood. Colonization patterns were consistent among sites.

Smith, S.M., E. Sahle Demessie, J.J. Morrell, K.L. Levien, and H. Ng. 1993. Supercritical fluid (SCF) treatment: its effect on bending strength and stiffness of ponderosa pine sapwood. Wood and Fiber Science 25:119-123. (For. Res. Lab.)

For wood technologists. Adverse effect on strength properties when supercritical fluid is used to increase preservative penetration of refractoty woods was evaluated by treating small ponderosa pine sapwood specimens with supercritical carbon dioxide. The supercritical fluid had no adverse effects on strength and stiffness of treated and identical untreated specimens under the temperature (35 to 80 C), pressure (1,000 to 4,000 psi) and time conditions (0.5 to 2 h) in this study.

Sundrani, R.S., J.L. Hull, and C.J. Biermann. 1993. Correction tables for Canadian standard freeness of chemical pulps at nonstandard temperature and consistency. Tappi Journal 76(5):147-152. (For. Res. Lab.)

For quality control personnel at pulp and paper mills. The correction tables for chemical pulps presented in this report show that the correction values for chemical pulp are significantly higher than those for groundwood pulp. The report also identifies two potential deficiencies in current test methods for pulp freeness.

Vargas-Hernandez, J., W.T. Adams, and R.L. Krahmer. 1994. Family variation in age trends of wood density traits in young coastal Douglas-fir. Wood and Fiber Science 26:229-236. (For. Res. Lab.)

For tree breeders and wood technologists. Changes in ring density and its components with increasing distances from the pith (i.e., age trends) were examined in 15-year-old trees of open-pollinated families. Plateau in age trend of weighted earlywood density may be an indication of transition from juvenile to mature wood formation.

Zhuang, J., and C.J. Biermann. 1993. Rosin soap sizing with ferric and ferrous ions as mordants. Tappi Journal 76(12):141-147. (For. Res. Lab.)

For chemists specializing in pulp and paper. Ferric and ferrous ions vary in their ability to induce sizing in Douglas-fir pulps, possibly because lignin content differs between unbleached and bleached pulps. Notably, lignin-rich pulps have extraordinary sizing while lignin-free pulps have no sizing. Two possible structures of the complex formed between these metal ions and lignin are postulated.

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