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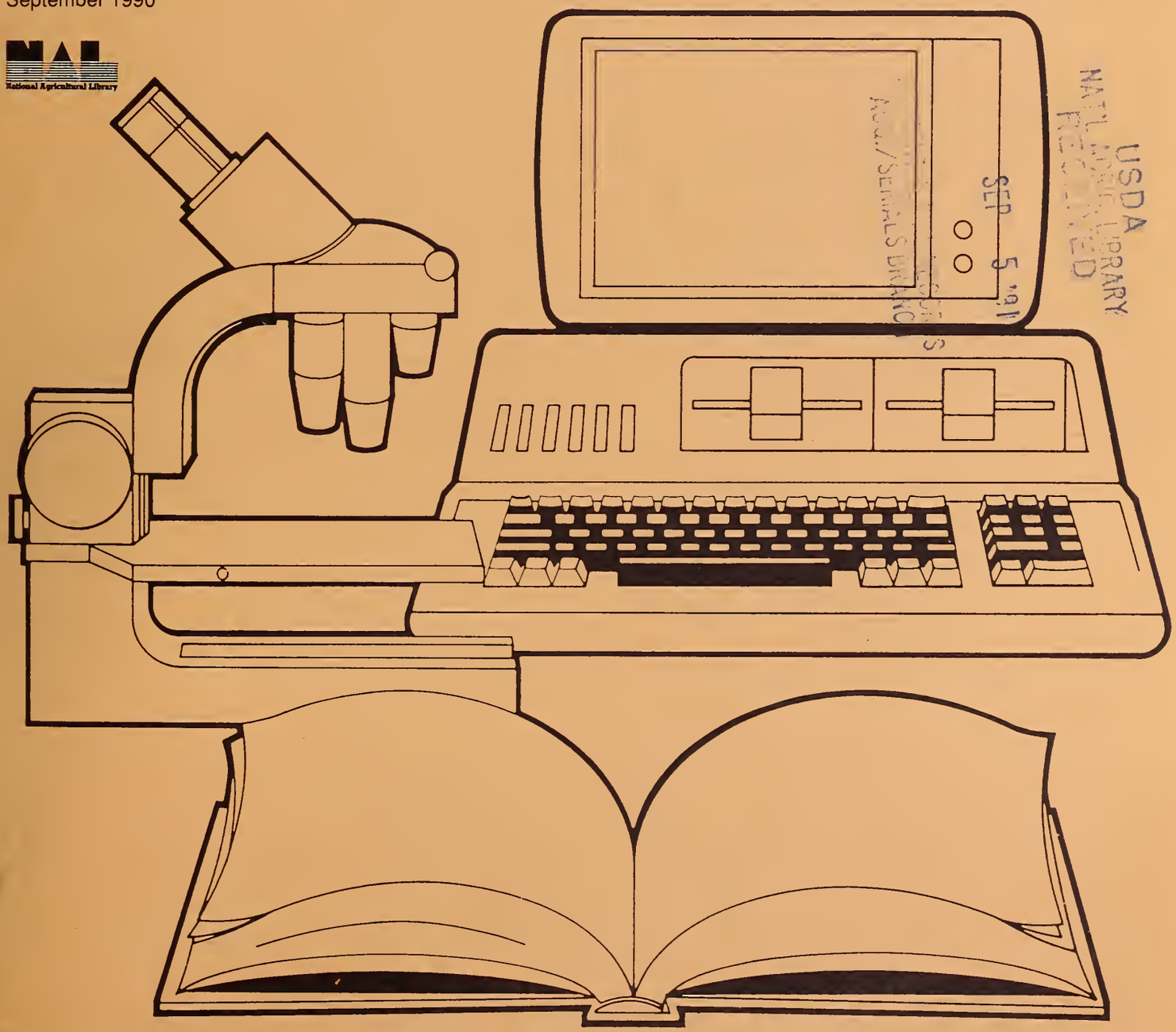
The Protection of Forestry, 1985 - 1989

Citations from AGRICOLA Concerning Diseases and other Environmental Considerations



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National Agricultural Library

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FOREWORD

This is the 38th volume in a series of commodity-oriented environmental bibliographies resulting from a memorandum of understanding between the U.S. Department of Agriculture, National Agricultural Library (USDA-NAL), and the U.S. Environmental Protection Agency, Office of Pesticide Programs (EPA-OPP).

This close working relationship between the two agencies will produce a series of bibliographies which will be useful to EPA in the regulation of pesticides, as well as to any researcher in the field of plant or commodity protection. The broad scope of information contained in this series will benefit USDA, EPA, and the agricultural community as a whole.

The sources referenced in these bibliographies include the majority of the latest available information from U.S. publications involving commodity protection throughout the growing and processing stages for each agricultural commodity.

We welcome the opportunity to join this cooperative effort between USDA and EPA in support of the national agricultural community.

JOSEPH H. HOWARD, Director
National Agricultural Library

DOUGLAS D. CAMPT, Director
Office of Pesticide Programs

INTRODUCTION

The citations in this bibliography, The Protection of Forestry, are selected from the AGRICOLA (AGRICultural OnLine Access) database limited to those produced by North American authors. They cover articles or monographic publications added to the database from 1985 - 1989.

This is the 38th bibliography in a series of commodity-oriented listings of citations from AGRICOLA jointly sponsored by the U.S. Department of Agriculture, National Agricultural Library (USDA-NAL), and the U.S. Environmental Protection Agency, Office of Pesticide Programs (EPA-OPP). Additional volumes issued recently include The Protection of Cotton, 1985 - 1989, The Protection of Soybeans, 1985 - 1989, The Protection of Small Fruits and Berries, The Protection of Grapes and Cherries, The Protection of Ornamental Plants, The Protection of Farm Animals, and The Protection of Wildlife and Vertebrate Pest Control. The 1990 volumes include The Protection of Tropical and Subtropical Fruits, The Protection of Small Grains (other than Wheat, Rice or Sorghums), The Protection of Cucurbits, The Protection of Minor Vegetable Crops, The Protection of Beans, Peas, and Lentils, and The Protection of Forestry.

Entries in the bibliography are subdivided into a series of section headings used in the contents of the Bibliography of Agriculture. Each item appears under every section heading assigned to the cited document. A personal author index is also included in the publication. The site index to plants that would normally follow the personal author index will be printed separately. Copies of the site index may be obtained from the address below.

The U.S. Environmental Protection Agency contact for this project is Richard B. Peacock, Office of Pesticides and Toxic Substances.

Any comments or questions concerning this bibliography may be addressed to the compiler and editor:

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AMNAA. McPherson, G.R. Wright, H.A.; Wester, D.B. Notre Dame, Ind. : University of Notre Dame. American midland naturalist. Oct 1988. v. 120 (2). p. 391-397. Includes references. (NAL Call No.: DNAL 410 M58).

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Acclimation and low-temperature tolerance of eight woody taxa.
HJHSA. Lindstrom, O.M. Dirr, M.A. Alexandria, Va. : American Society for Horticultural Science. HortScience. Oct 1989. v. 24 (5). p. 818-820. Includes references. (NAL Call No.: DNAL SB1.H6).

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Application of growth models for simulating genetic gain of loblolly pine.
FOSCA. Knowe, S.A. Foster, G.S. Bethesda, Md. : Society of American Foresters. A technique for predicting genetic gain in progeny tests using height-age models and stand-stimulations is presented for loblolly pine (Pinus taeda L.). Periodic remeasurements for a block-plot open-pollinated progeny test are used to examine trends in height growth, selection differential, and percent gain in height and volume. Using the Chapman-Richards model and approximate F tests, significant differences among families were detected in asymptote and rate parameters but not for the shape parameter. Separate base-age invariant height-age equations were developed for each family to account for polymorphism associated with the rate parameter. Selection differential calculated from either observed or preoicted heights exhibited similar-trends although estimates from the height-age equations are consistently higher than obtained with observed height after age 5. Family rankings using the height-age models are consistent with those obtained using observed heights. Also, percent gain calculated from predicted heights is within 2% of the estimates obtained with observed heights at ages greater than 3 years. Differences in survival, height, and diameter were combined to examine trends in volume production associated with families. Predicted volume for each family was simulated using a bivariate distribution of height and diameter accounting for differences in height-growth patterns among families. Family rankings for volume are also closely correlated, resulting in two or three of the same families being selected using observed and predicted data. Selection differential obtained from simulated and observed volume fluctuates in rank producing a satisfactory trend based on predicted volume after age 5. Gain based on simulated volume tends to be slightly greater than gain based on observed volume. Estimates of percent gain obtained by reinitializing the simulations with quadratic mean dbh and residual trees per acre after thinning differed more from the observed trends th. Forest science. Mar 1989. v. 35 (1). p. 211-228. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Torrey, J.G. New York : Plenum, c1988. Genetic manipulation of woody plants / edited by James W. Hanover and Daniel E. Keathley ; technical editors Claire M. Wilson and Gregory Kuny. Literature review. p. 1-21. Includes references. (NAL Call No.: DNAL SB123.57.C65 1987).

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PVPCB. Rousi, M. Tahvanainen, J.; Julkunen-Tiitto, R.; Kurten, U. Davis, Calif. : University of California. Proceedings ... Vertebrate Pest Conference. 1988. (13th). p. 180-182. Includes references. (NAL Call No.: DNAL SB950.A1V4).

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Characterization of leucine auxotrophs of the white rot basidiomycete Phanerochaete chrysosporium.
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ECOLA. Ketcham, R.B. Eisenberg, R.M. Tempe, Ariz. : The Society. Ecology : a publication of the Ecological Society of America. Oct 1989. v. 70 (5). p. 1425-1433. Includes references. (NAL Call No.: DNAL 410 EC7).

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Development and verification on models of freezing tolerance for Douglas-fir populations in the inland Northwest.
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FOSCA. White, T.L. Bethesda, Mo. : Society of American Foresters. Forest science. June 1987. v. 33 (2). p. 283-293. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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FOSCA. DeBell, D.S. Silen, R.R.; Radwan, M.A.; Mandel, N.L. Bethesda, Md. : Society of American Foresters. Forest science. Sept 1986. v. 32 (3). p. 643-652. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Effect of inoculum density and fertilization on greenhouse screening of loblolly pine seedlings for resistance to fusiform rust.
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Effects and adjustments of competition bias in progeny trials with single-tree plots.
FOSCA. Magnussen, S. Bethesda, Md. : Society of American Foresters. A competition model based on the height difference between a subject tree and its neighbors was used to adjust annual growth data (age 1-5) in a close-spaced single tree plot trial of 25 open-pollinated Pinus banksiana progenies. Competition effects in tree height, basal area, and volume growth were estimated within each of eight classes of dominance suppression. This procedure allowed a differential adjustment of family performances to their large plot expectations. It is limited to the absence of competition effects on height growth. Response to competition was the same in all families. Variance components and heritability estimates of basal area and stem volume were inordinately inflated by competition. Forest science. June 1989. v. 35 (2). p. 532-547. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Effects of ozone or sulfur dioxide on pitch pine seedlings.
JEVQAA. Scherzer, A.J. McClenahen, J.R. Madison, Wis. : American Society of Agronomy. Pitch pine seedlings (Pinus rigida Mill.) were fumigated with O3 or SO2 to determine their effects on growth and symptom expression. Seedlings fumigated twice with 0.20 microliter O3L-1 for 4 hr at age 14 and 22 wk had significantly greater shoot weight than those fumigated with 0.30 microliter O3L-01; 0, 0.08, 0.10, and 0.15 microliter L-1 were intermediate and not significantly different. Root starch content tended to decrease with increasing O3 with control seedlings being significantly higher than the 0.15, 0.20, and 0.30 microliter O3L-1 treatments. Root starch of seedlings treated with 0.20, 0.50, 0.60, 0.70, and 0.90 microliter SO2L-1 was significantly lower than the controls. Seedlings from six families fumigated for 5 wk starting at age 6 wk differed in direction and degree of growth response when exposed to 0.08 and 0.30 microliter O3L-1. Significant differences exited among families for needle weight, shoot weight, and total weight. No differences were found among O3 treatments within a family, but patterns suggest some pitch pine individuals may be sensitive to low O3 while others are stimulated. Visible injury consisted of light chlorotic mottle on oldest needles. Discriminant function analysis indicated that growth responses were indistinguishable among families receiving no treatment; however, treated seedlings could be classified based on various height measurements and/or shoot weight. Differences in visible injury were apparent among families of seedlings treated with 0.40 microliter O3L-1, indicating some pitch pine families are more sensitive to O3 than others. Journal of environmental quality. Jan/Mar 1989. v. 18 (1). p. 57-61. Includes references. (NAL Call No.: DNAL QH540.J6).

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The effects of seed origin on drought resistance of lodgepole pine (Pinus contorta Dougl.) seedlings.
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Elm tree named Independence.
Smalley, E.B. Lester, D.T. Washington, D.C. : The Office. An elm tree characterized by high resistance to Dutch Elm Disease. Plant patent - United States Patent and Trademark Office. July 19, 1988. (6227). 2 p. plates. (NAL Call No.: DNAL 156.65 P69).

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Estimates of genetic parameters for deer browsing of Douglas-fir.
FOSCA. Silen, R.R. Randall, W.K.; Mandel, N.L. Bethesda, Md. : Society of American Foresters. Forest science. Literature review. Mar 1986. v. 32 (1). p. 178-184. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Experimental studies of ponderosa pine. II. Quantitative genetics of morphological traits.
AJBOAA. Grant, M.C. Linhart, Y.B.; Monson, R.K. Columbus, Ohio : Botanical Society of America. American journal of botany. July 1989. v. 76 (7). p. 1033-1040. Includes references. (NAL Call No.: DNAL 450 AM36).

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Experimental studies of ponderosa pine. III. Differences in photosynthesis, stomatal conductance, and water-use efficiency between two genetic lines.
AJBOAA. Monson, R.K. Grant, M.C. Columbus, Ohio : Botanical Society of America. American journal of botany. July 1989. v. 76 (7). p. 1041-1047. ill. Includes references. (NAL Call No.: DNAL 450 AM36).

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The fall and rise of the beloved elm.
ANURA. Robinson, D. Chicago, Ill. : American Nurseryman Publishing Co. American nurseryman. May 1, 1987. v. 165 (9). p. 121-122, 124, 126, 128. ill. (NAL Call No.: DNAL 80 AM371).

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First-year growth of hybrid poplar shoots from cutting or coppice origin.
FOSCA. Bergez, J.E. Auclair, D.; Bouvarel, L. Bethesda, Md. : Society of American Foresters. Height growth, mortality, and dry woody biomass were studied on hybrid poplar shoots during their first year after coppicing or during the year of establishment from cuttings. Two coppice treatments (1- and 2-year rotations) and two treatments for cuttings (irrigated or not) were compared. A slight delay was observed in the height growth of cuttings compared to coppice treatments, but total height growth was not significantly different between treatments at the end of the growing season. Irrigation reduced mortality during establishment of cuttings. Total biomass produced was higher in the coppice stands, due to a greater number of shoots per stool. Coppice maintained its growth capacity even after the fifth 1-year cycle. Forest science. Dec 1989. v. 35 (4). p. 1105-1113. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Gene exchange in loblolly pine: the relation between pollination mechanism, female receptivity and pollen availability.
AJBOA. Greenwood, M.S. Baltimore, Md. : Botanical Society of America. American journal of botany. Oct 1986. v. 73 (10). p. 1443-1451. ill. Includes references. (NAL Call No.: DNAL 450 AM36).

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Genetic improvement effects on growth and yield of loblolly pine plantations.
FOSCA. Buford, M.A. Burkhart, H.E. Bethesda, Md. : Society of American Foresters. Forest science. Sept 1987. v. 33 (3). p. 707-724. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Genetic variation in douglas-fir: a 20-year test of provenances in eastern Nebraska.
Van Haverbeke, D.F. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. July 1987. (141). 8 p. maps. Includes references. (NAL Call No.: DNAL aSD11.A42).

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The genome of Entomophaga aulicae (Entomophthorales, Zygomycetes): base composition and size.
EXMYD. Murrin, F. Holtby, J.; Nolan, R.A.; Davidson, W.S. Orlando, Fla. : Academic Press. Experimental mycology. Mar 1986. v. 10 (1). p. 67-75. ill. Includes references. (NAL Call No.: DNAL QK600.E9).

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Geographic variation of red pine survival, growth and productivity in a Minnesota field test.
Nelson, C.D. Mohn, C.A.; Stewart, W.K. Madison, Wis. : Dept. of Forestry, University of Wisconsin-Madison. Proceedings of the ... North Central Tree Improvement Conference. Conference held August 10-12, 1987, Fargo, North Dakota. 1987? . p. 43-50. maps. Includes references. (NAL Call No.: DNAL SD399.5.N6).

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Green ash named 'Wasky'.
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least-infested and most-infested clones or progeny. Seed losses in the progeny plantation indicated that resistance to these two insects is a heritable trait, with greater resistance showing a tendency to dominate over lesser resistance. Insect responses to host genotype may be modified by factors associated with the position of the tree within the stand. Implications of these results for tree improvement programs and seed orchard management are discussed. Environmental entomology. Feb 1989. v. 18. p. 94-97. Includes references. (NAL Call No.: DNAL QL461.E532).

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FOSCA. Joly, R.J. Adams, W.T.; Stafford, S.G. Bethesda, Md. : Society of American Foresters. Patterns of genetic variation in morphological and phenological responses to water deficit are described n seedling progeny of four populations of coastal Douglas-fir (Pseudotsuga menziesii Mirb. Franco var. menziesii), sampled from coastal and inland sites in Oregon. Progeny of coastal and inland populations differed for all traits measured, and differences appear to reflect adaptation to the source environment. Inland populations were characterized by early budset, slower rates of shoot extension, and higher root-shoot ratios. A significant fraction of total variability was attributable to differences among families within populations. Little evidence for irrigation x population interaction was found when seedling traits were examined singly. Of 16 traits analyzed, only average dally rate of growth and seedling height had significant interaction terms. Interactions between irrigation and families-within-population were more prevalent. A canonical discriminant analysis was used to identify a subset of variables that best revealsdifferences among progeny of coastal and inland populations. Implications for seed transfer and for selection and breeding of genotypes suitable for xeric environments are discussed. Forest science. Dec 1989. v. 35 (4). p. 987-1005. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Sources of variation in osmotic potentials with special reference to North American tree species.
FOSCA. Abrams, M.D. Bethesda, Md. : Society of American Foresters. The purpose of this review is to discuss sources of variation in osmotic potentials (psi pi), with special reference to North American tree species. Lowering of osmotic potentials by solute accumulation (osmotic adjustment) has been reported in a wide variety of tree species during drought, but not in all species. Osmotic potentials at zero turgor for 37 tree species throughout the United States and Canada averaged (+/- s.e.) -2.06 +/- 0.13 MPa and -2.54 +/- 0.06 MPa for leaves or shoots under moist and dry conditions, respectively. The low standard error associated with the mean values suggest that, as a group, North American trees develop fairly similar osmotic potentials for a range of moisture conditions. Substantial solute accumulation often routinely occurs in developing leaves and in over-wintering leaves. Drought preconditioning can increase physiological activity in plants during subsequent drought by lowering psi pi. However, if drought is imposed too rapidly osmotic adjustment may not occur. Physiological plasticity in trees may cause variations in psi pi in responses to light regime and leaf canopy position. Light and nutrient regimes that promote high net photosynthesis should also promote the ability to osmotically adjust. However, stomatal responses and growth during water and nutrient stress may be unrelated to osmotic potentials because of species differences in rooting and water transport, guard cell turgor not being closely coupled with that of the bulk leaf, and changes in plant growth regulator concentrations. When examining changes in osmotic potentials using pressure-volume curves, it is important to rehydrate plant material to a water potential characteristic for that species at full hydration in the field. Moreover, as with most physiological measurements, sampling variation in light regime, canopy position, nutrient status, temperature, age, phenology, drought history, and diurnal timing of harvesting of the leaves and shoots should be mi. Forest science. Dec 1988. v. 34 (4). p. 1030-1046. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Aluminum effects on northern red oak seedling growth in six forest soil horizons.
SSSJD4. Joslin, J.D. Wolfe, M.H. Madison, Wis. : The Society. The response of northern red oak (Quercus rubra L.) seedlings to varying levels of soil Al was examined in a 16-wk greenhouse study. Forest soil samples representing three soil series were used as growth media: Captina (Fragiudult, Missouri), Lexington (Paleudalf, Mississippi) and Becket (Fragiorthod, New York). Soil from two horizons from each series was separately amended in four treatments to create a wide range of soil Al availability: (i) control, (ii) limed Ca(OH)2 , (iii) acidified (HCl), (iv) acidified with supplemental calcium added (+HCl and CaSO4). Treatments significantly (p less than 0.05) altered soil pH (range 3.65 to 5.48), base saturation, and 0.01 M SrCl2-extractable Al (range 0.6-37.2 mg kg-1). Compared to controls, both acidification treatments resulted in significant reductions in fine root and foliar biomass production or in fine root branching, in all horizons except the highly organic Bhs of the Fragiorthod. In the remaining five horizons, fine root branching and biomass production were highly and negatively correlated (R2 = 0.70 and 0.50, respectively) with 0.01 M SrCl2-extractable Al. Although fine root tissue concentrations of Al correlated highly with 0.01 M SrCl2- extractable Al levels, root tissue Al predicted root branching and biomass only moderately well (R2 = 0.30 and 0.21, respectively). Fine root branching was more sensitive to treatment effects than either root biomass production or root elongation. Reductions in foliar biomas appeared to be secondary responses to direct effects on root systems. Present soil Al levels and acidic deposition rates appear to pose no threat to northern red oak in the southern portion of its range, whereas the possibility of Al toxicity in northeastern Spodosols deserves further study. Soil Science Society of America journal. Jan/Feb 1989. v. 53 (1). p. 274-281. Includes references. (NAL Call No.: DNAL 56.9 S03).

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Marshall, J.D. Corvallis : Forest Research Laboratory, Oregon State University, 1985. Evaluating seedling quality : principles, procedures, and predictive abilities of major tests : proceedings of the workshop held October 16-18, 1984 / Mary L. Duryea, editor. Literature review. p. 49-58. ill. Includes references. (NAL Call No.: DNAL SD404.E93).

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Characteristics of woodland rhizobial populations from surface- and deep-soil environments of the Sonoran Desert.
APMBA. Waldon, H.B. Jenkins, M.B.; Virginia, R.A.; Harding, E.E. Washington, D.C. : American Society for Microbiology. A collection of 74

rhizobial isolates recovered from nodules of the desert woody legumes Prosopis glandulosa, Psorothamnus spinosus, and Acacia constricta were characterized by using 61 nutritional and biochemical tests. We compared isolates from A. constricta and Prosopis glandulosa and tested the hypothesis that the rhizobia from a deep-phreatic rooting zone of a Prosopis woodland in the Sonoran Desert of southern California were phenetically distinct from rhizobia from surface soils. Cluster analysis identified four major homogeneous groups. The first phenon contained slow-growing (SG) Prosopis rhizobia from surface and deep-phreatic-soil environments. These isolates grew poorly on most of the media used in the study, probably because of their requirement for a high medium pH. The second group of isolates primarily contained SG Prosopis rhizobia from the deep-phreatic rooting environment and included two fast-growing (FG) Psorothamnus rhizobia. These isolates were nutritionally versatile and grew over a broad pH range. The third major phenon was composed mainly of FG Prosopis rhizobia from surface and dry subsurface soils. While these isolates used a restricted range of carbohydrates (including sucrose) as sole carbon sources, they showed better growth on a range of organic acids as sole carbon sources and amino acids as sole carbon and nitrogen sources than did other isolates in the study. They grew better at 36 degrees C than at 26 degrees C. The FG Acacia rhizobia from surface-soil environments formed a final major phenon that was distinct from the Prosopis isolates. They produced very high absorbance readings on all of the carbohydrates tested except sucrose, grew poorly on many of the other substrates tested, and preferred a 36 to a 26 degree C incubation temperature. The surface populations of Prosopis rhizobia required a higher pH for growth and, under the conditions used in this study, were less tolerant of low solute potential and high growth temperatu. Applied and environmental microbiology. Dec 1989. v. 55 (12). p. 3058-3064. Includes references. (NAL Call No.: DNAL 448.3 AP5).

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Comparative effects of the soil microflora on ectomycorrhizal inoculation of conifer seedlings.
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Design efficiencies with planned and unplanned unbalance for estimating heritability in forestry.
FOSCA. McCutchan, B.G. Namkoong, G.; Giesbrecht, F.G. Bethesda, Md. : Society of American Foresters. Design efficiencies are evaluated for the estimation of heritability in unbalanced designs using Modified Maximum Likelihood estimation. Assuming knowledge of the variance components, the variance of the estimate of heritability is calculated. The effects of block size, plot size, family size, variance of family size, and total number of observations on design efficiency are examined across the range of heritability and under 100%, 90%, 80%, and 60% survival. The implications of each of these design factors are discussed. There is no uniformly best design for estimating heritability; the most efficient design is a function of the heritability. Forest science. Sept 1989. v. 35 (3). p. 801-815. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Development of an ectomycorrhizal inoculation procedure for micropropagated Eucalyptus plantlets.
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TPLNA. Rietveld, W.J. Sharp, R.A.; Kienzler, M.F.; Dixon, R.K. Washington, D.C. : The Service. Tree planters' notes - U.S. Department of Agriculture, Forest Service. Spring 1989. v. 40 (2). p. 12-17. Includes references. (NAL Call No.: DNAL 1.962 C5T71).

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Effect of different mycorrhizal fungi on Pinus radiata seedling growth.
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Effect of various nutrient regimes and ectomycorrhizal inoculations on field survival and growth of Ponderosa pine (Pinus ponderosa var. scopulorum Engelm.) container seedlings in Arizona.
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Effects of atmospheric CO2 enrichment on the growth and mineral nutrition of Quercus alba seedlings in nutrient-poor soil.
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Effects of different urea fertilizers on soil and trees in a young thinned stand of western hemlock.
SSSJD4. Radwan, M.A. DeBell, D.S. Madison, Wis. : The Society. Effects of three different urea fertilizers on selected chemical characteristics of soils and foliage, and on growth per tree of a 24-yr-old thinned stand of werstern hemlock Tsuga heterophylla (Raf.) Sarg. were compared at a site in coastal Oregon. Treatments were the following: untreated control (C), urea (U), urea treated with N-Serve nitrapyrin, 2-chloro-6-(trichloromethyl) pyridine (U + NS), and sulfur-coated urea (SCU). Fertilizers were uniformly applied by hand to 0.03-ha plots in March at 224 kg N ha-1. Soil, to a depth of 20 cm, and current-year foliage were sampled periodically for 2 yr. Height and diameter of 10 dominant or codominant trees per plot were measured annually for 6 yr. Treatment effects on soil pH va ried by fertilizer and sampling date; throughout, pH was lower with U + NS than with U, and the smallest change in ph was associated with SCU. Effects of fertilizer on inorganic N in the soil and on foliar nutrients varied by fertilizer and sampling date. Initially, N-Serve inhibited nitrification and produced the highest NH4-N concentrations. In general, all fertilizers increased inorganic N in the soil and total N in the foliage. Fertilizers significantly reduced foliar concentrations of some other macronutrients, especially in the first year after fertilization; some depressions were significantly less with SCU than with the other two fertilizers. Height growth per tree was not significantly affected by any of the fertilizers. Basal-areaand volume growth per tree were significantly greater with the SCU treatment than with the control, U, or U + NS treatments. Beneficial effects of SCU seemed to be mostly due to the slow release of N from the fertilizer, although some positive effect of S cannot be ruled out. Soil Science Society of America journal. May/June 1989. v. 53 (3). p. 941-946. Includes references. (NAL Call No.: DNAL 56.9 S03).

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Verkade, S.D. Hamilton, D.F. Washington, D.C. : Horticultural Research Institute. Journal of environmental horticulture. Sept 1985. v. 3 (3). p. 101-103. Includes 24 references. (NAL Call No.: DNAL SB1.J66).

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AJBOA. Day, F.P. Jr. Baltimore, Md. : Botanical Society of America. American journal of botany. Oct 1987. v. 74 (10). p. 1541-1554. Includes references. (NAL Call No.: DNAL 450 AM36).

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FOSCA. Bunderson, E.D. Weber, D.J. Bethesda, Md. : Society of American Foresters. Forest science. Mar 1986. v. 32 (1). p. 149-156. maps. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Growth and nutrient status of black spruce seedlings as affected by water table depth.
Czapowskyj, M.M. Rourke, R.V.; Grant, W.J. Broomall, Pa. : The Station. USDA Forest Service Research Paper NE-RP - Northeastern Forest Experiment Station. Aug 1986. (591). 9 p. Includes references. (NAL Call No.: DNAL A99.9 F7622UN).

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Growth, xylem pressure potential, and nutrient absorption of loblolly pine on a reclaimed surface mine as affected by an induced Pisolithus tinctorius infection.
FOSCA. Walker, R.F. West, D.C.; McLaughlin, S.B.; Amundsen, C.C. Bethesda, Md. : Society of American Foresters. The effects of Pisolithus tinctorius ectomycorrhizae on survival, growth, xylem pressure potential, and nutrient uptake of loblolly pine on a southern Appalachian coal surface mine were examined. One-year-old bareroot seedlings artificially inoculated with P. tinctorius and control seedlings with Thelephora terrestris ectomycorrhizae were outplanted on a surface-mined site in Tennessee. The site had previously been contoured and hydroseeded with a mixture of herbaceous ground cover species. A soil fertility variable was imposed in the study by broadcast fertilization at outplanting of one-half of the plots of each mycorrhizal treatment at the rate of 336 kg/ha NPK. After 7 years, survival and growth of trees previously inoculated with P. tinctorius were significantly improved relative to control trees. Fertilization elicited a significant reduction in survival and a negligible growth response in trees of both mycorrhizal treatments due primarily to its stimulation of competing herbaceous species. During the third

growing season, xylem pressure potential of seedlings with P. tinctorius ectomycorrhizae was significantly less negative than that of control seedlings during a prolonged period of moisture stress. Analyses of foliar samples collected during the third growing season revealed that seedlings infected by P. tinctorius had more NO3 and less Zn in their needles than control seedlings. The results of this study provide evidence that the benefits afforded loblolly pine on surface mines by P. tinctorius ectomycorrhizae include enhanced absorption of water as well as increased uptake of nutrients, and these benefits are not compromised by the presence of competing herbaceous species. Forest science. June 1989. v. 35 (2). p. 569-581. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Herbicide conversion of a sand shinnery oak (Quercus havardii) community: effects on nitrogen.
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Incompatibility factors and mating competence of two Laccaria spp. (Agaricales) associated with black spruce in northern Minnesota.
PHYTA. Doudrick, R.L. Anderson, N.A. St. Paul, Minn. : American Phytopathological Society. Sporocarps of Laccaria were collected in conjunction with a survey of potential ectomycorrhizal fungi associated with black spruce in northern Minnesota. Homokaryons were grown from single spores, and dikaryons were isolated from sporocarp tissue and from surface-disinfested ectomycorrhizae. Pairings of sibling homokaryons indicated a bifactorial (tetrapolar) sexual incompatibility system for all sporocarps. In only six of 37 cases were 15-22 homokaryons insufficient to find the four mating-type factors from a single sporocarp. All pairings between homokaryons obtained from sporocarps collected on peatlands with those from mineral soils were negative. Sporocarps collected in black spruce stands on peatlands were members of a freely interbreeding population, Laccaria laccata var. moelleri Sporocarps collected on mineral soils represented serveral populations of Laccaria bicolor, with reduced outbreeding efficiency. The reduced outbreeding efficiency in L. bicolor (evident as a decrease in the number of clamp-connections produced in pairings of nonsibling sexually compatible homokaryons) apparently is due to a heterogenic incompatibility system, superimposed on the sexual incompatibility system. Preliminary evidence suggested a possible relationship between site-related factors for collections of L. bicolor identified by the survey and their mating competence. Di-mon pairings of L.l. moelleri and L. bicolor homokaryons with dikaryons isolated from black spruce ectomycorrhizae synthesized in aseptic culture indicated that precise genetic identification of the dikaryotic strains of both species was possible when known A and B mating-type factors were used as markers. Phytopathology. June 1989 v. 79 (6). p. 694-700. ill., maps. Includes references. (NAL Call No.: DNAL 464.8 P56).

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Influence of VA mycorrhiza on growth, nutrient absorption and water relations in Leucaena leucocephala.
Huang, R.S. Smith, W.K.; Yost, R.S. Corvallis, Or. : Oregon State University , Forest Research Laboratory, 1985. Proceedings of the 6th North American Conference on Mycorrhizae : June 25-29, 1984, Bend, Oregon / compiled and edited by Randy Molina ; sponsoring institutions, Oregon State University, College of Forestry, and USDA. p. 411. Includes references. (NAL Call No.: DNAL aQK604.N6 1984).

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Interactions of fire with nutrients in the herbaceous layer of a nutrient-poor Coastal Plain forest.
BTBCAL. Gilliam, F.S. Bronx, N.Y. : The Club. The Bulletin of the Torrey Botanical Club. Oct/Dec 1988. v. 115 (4). p. 265-271. Includes references. (NAL Call No.: DNAL 451 T63B).

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Interactions of nitrogen, phosphorus and mycorrhizae inoculation on nutrient content and growth of Pinus contorta.
Rousseau, J. Reid, C.P.P. Corvallis, Or. : Oregon State University , Forest Research Laboratory, 1985. Proceedings of the 6th North American Conference on Mycorrhizae : June 25-29, 1984, Bend, Oregon / compiled and edited by Randy Molina ; sponsoring institutions, Oregon State University, College of Forestry, and USDA. p. 340. Includes references. (NAL Call No.: DNAL aQK604.N6 1984).

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Microbial inoculants for tissue-cultured ectomycorrhizal and actinorhizal trees.
Loree, M. Stowers, M.; Garton, S.; Wood, T. Corvallis, Or. : Oregon State University , Forest Research Laboratory, 1985. Proceedings of the 6th North American Conference on Mycorrhizae : June 25-29, 1984, Bend, Oregon / compiled and edited by Randy Molina ; sponsoring institutions, Oregon State University, College of Forestry, and USDA. p. 66-68. Includes references. (NAL Call No.: DNAL aQK604.N6 1984).

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Mycorrhizae benefit plants under fertile conditions.
ANURA. Verkade, S.D. Hamilton, D.F. Chicago, Ill. : American Nurseryman Publishing Co. American nurseryman. Dec 15, 1985. v. 162 (12). p. 67-71. Includes references. (NAL Call No.: DNAL 80 AM371).

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Mycorrhizal formation on containerized seedlings in the Intermountain Region.
Kidd, F. Breuer, D.; Miller, D. Corvallis, Or. : Oregon State University , Forest Research Laboratory, 1985. Proceedings of the 6th North American Conference on Mycorrhizae : June 25-29, 1984, Bend, Oregon / compiled and edited by Randy Molina ; sponsoring institutions, Oregon State University, College of Forestry, and USDA. p. 218. ill. Includes references. (NAL Call No.: DNAL aQK604.N6 1984).

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Mycorrhizal growth enhancement in Sitka spruce seedlings differs in nonsterile compared to sterilized soil.
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Mycorrhizal responsiveness of four cedar and redwood species of western North America.
Kough, J.L. Molina, R.; Linderman, R.G. Corvallis, Or. : Oregon State University , Forest Research Laboratory, 1985. Proceedings of the 6th North American Conference on Mycorrhizae : June 25-29, 1984, Bend, Oregon / compiled and edited by Randy Molina ; sponsoring institutions, Oregon State University, College of Forestry, and USDA. p. 259. (NAL Call No.: DNAL aQK604.N6 1984).

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Natural mycorrhizal colonization of pines on reclaimed surface mines in Virginia.
JEVQAA. Schoenholtz, S.H. Burger, J.A.; Torbert, J.L. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. Apr/June 1987. v. 16 (2). p. 143-146. Includes references. (NAL Call No.: DNAL QH540.J6).

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Nitrogen fertilisation and ectomycorrhizal formation of Pinus caribaea (Morelet) seedlings.
Amakiri, M.A. Ojobo, L.I. Corvallis, Or. : Oregon State University , Forest Research Laboratory, 1985. Proceedings of the 6th North American Conference on Mycorrhizae : June 25-29, 1984, Bend, Oregon / compiled and edited by Randy Molina ; sponsoring institutions, Oregon State University, College of Forestry, and USDA. p. 339. ill. Includes references. (NAL Call No.: DNAL aQK604.N6 1984).

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Nitrogen isotope fractionation in burned and unburned chaparral soils.
SSSJD4. Herman, D.J. Rundel, P.W. Madison, Wis. : The Society. Plant and soil processes involving N-transformations have been monitored by techniques measuring the 15N/14N ratio in a sample relative to the atmosphere (delta 15N). Ususually low delta 15N values have been reported in the tissues of chaparral shrubs. The primary objective of this study was to investigate soil N-cycling processes which may yield the low plant tissue delta 15N levels. Since the chaparral is subject to periodic brush fires, which in turn result in high levels of inorganic N-forms in the soil during the first year following the burn, possible effects of burning on soil delta 15N were also investigated. Incubations were conducted on soils from an area which had been subjected to a brush fire, and an adjacent unburned area; both soils are fine, thermic, schistose, very steep Ultic Haploxeralfs. Concentrations and delta 15N of soil NH4(1+) and NO3(-1) were periodically measured. A C- and N-rich ash resulted in rapid mineralization of N in the burned soil; a substrate more resistant to biological degradation resulted in an initial loss, then subsequent slow accumulation of inorganic-N in the unburned soil. Nitrate was the dominant mineral species in each soil after a few weeks. As nitrification progressed, delta 15N of NH4(1+) increased and delta 15N of NO3(-1) decreased. Since the mineral pool in each soil became dominated by NO3(-1) delta 15N of the mineral pool became strongly negative. A mathematical model of isotope dynamics fits empirical data well. Soil Science Society of America journal. July/Aug 1989. v. 53 (4). p. 1229-1236. Includes references. (NAL Call No.:

DNAL 56.9 S03).

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Millbank, J.W. New York : Plenum Press, c1985. Lichen physiology and cell biology / edited by D.H. Brown. Literature review. p. 161-172. Includes references. (NAL Call No.: DNAL QK581.L49).

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TPLNA. Torbert, J.L. Burger, J.A.; Kreh, R.E. Washington, D.C. : The Service. Tree planters' notes - U.S. Department of Agriculture, Forest Service. Summer 1986. v. 37 (3). p. 17-22. Includes references. (NAL Call No.: DNAL 1.962 C5T71).

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Performance of Miconia albicans (Sw.) triana, an aluminum-accumulating species, in acidic and calcareous soils.
CSOSA2. Haridasan, M. New York, N.Y. : Marcel Dekker. Communications in soil science and plant analysis. May/Sept 1988. v. 19 (7/12). p. 1091-1103. Includes references. (NAL Call No.: DNAL S590.C63).

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Predicting fertilizer response of loblolly pine using foliar and needle-fall nutrients sampled in different seasons.
FOSCA. McNeil, R.C. Lea, R.; Ballard, R.; Allen, H.L. Bethesda, Md. : Society of American Foresters. Nitrogen (N) phosphorus (P) concentrations in loblolly pine (Pinus taeda) foliage and needle-fall were determined five times during 1979 on ten fertilizer trails installed between 1971 and 1973. Bole volume responses to fertilizers were regressed on initial stand basal area, and the residual errors were used as dependent variables in regressions with the nutrient variables. The only sampling period during which the N response residuals had a significant relation to foliar nutrients was early fall. The needle-fall N/P ratio was significantly related to the N response residuals in late winter, late spring, and early fall. Phosphorus response residuals were significantly related to foliar nutrients during all sampling periods and to needle-fall N/P in all sampling periods except late winter. The maximum R2, 0.73, was for the regression of the P response residuals versus a foliar N/P ratio in late spring. The N + P response residuals were not significantly related to foliar or needle-fall nutrients. For. Sci. 34(3):698-707. Forest science. Sept 1988. p. 698-707. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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The role of elicitors in ectomycorrhizal formation.
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Root and foliar nutrient concentrations in loblolly pine: effects of season, site, and fertilization.
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JEVQAA. LeBlanc, D.C. Raynal, D.J.; White, E.H. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. Oct/Dec 1987. v. 16 (4). p. 325-333. Includes references. (NAL Call No.: DNAL QH540.J6).

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JEVQAA. LeBlanc, D.C. Raynal, D.J.; White, E.H. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. Oct/Dec 1987. v. 16 (4). p. 334-340. Includes references. (NAL Call No.: DNAL QH540.J6).

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Action of 6-benzylamino purine and indole-3-butyric acid on development of immature embryos of Populus deltoides Bartr.
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TPLNA. McDonald, P.M. Washington, D.C. : The Service. Tree planters' notes - U.S. Department of Agriculture, Forest Service. Fall 1987. v. 38 (4). p. 31-36. ill. Includes references. (NAL Call No.: DNAL 1.962 C5T71).

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IFRRA. David, M.B. Cote, B.; Vance, G.F. Urbana, Ill. : The Station. Forestry research report - Agricultural Experiment Station, University of Illinois. Aug 1988. (88-7) AGL. 6 p. Includes references. (NAL Call No.: DNAL SD12.I3I4).

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Analysis of forest fertilizer experiments: obtaining better precision and extracting more information.
FOSCA. Woollons, R.C. Whyte, A.G.D. Bethesda, Md. : Society of American Foresters. Later-age forest fertilizer experiments can be quite difficult to analyze appropriately and in ways that extract all the information inherent in the collected data. Observed responses are

likely to be partially confounded with variations in pretreatment stand development, most of which can be removed through analyses of covariance using quanta of initial growing stock as a covariate. Pretreatment growth rate may represent an even more discerning covariate. Rather than use covariance some authors have chosen, instead, to use arithmetical procedures to adjust treatment responses. Reanalysis of a Canadian experiment of this latter kind suggests that such methodology may be less than ideal, and should not be preferred to covariance analysis. A general and systematic procedure for examining forest nutrition experiments is proposed for those involving t treatments, and also those where the t treatments represent n factors at p levels in factorial combination. An example of adopting the recommendation methodology for the first type is given using a completely randomized experiment in naturally regenerated radiata pine in New Zealand with five replications of four treatments. Adoption of the suggested procedures in conjuction with two covariates provides a useful insight into the data, and appreciably increases precision. The system is sequential in structure, necessarily inducing some risk of erroneous hypothesis testing. Such a danger is usually minimal, however, and the suggested system, it is claimed, represents a useful method for isolating treatment and growth effects in forest fertilizer trials. For. Sci. 34(3):769-780. Forest science. Sept 1988. p. 769-780. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Anatomical changes and peroxidase activity after cytokinin treatments inducing adventitious bud formation on embryos of Picea abies.
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Joyce, L.A. Kickert, R.N. Boca Raton, Fla. : CRC Press, 1987. Plant growth modeling for resource management / editors, Karin Wisiol, J.D. Hesketh. Literature review. v. 1 p. 17-55. Includes references. (NAL Call No.: DNAL QK731.P593).

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Astringency of Douglas-fir foliage in relation to phenology and xylem pressure potential.
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Lavender, D.P. Corvallis : Forest Research Laboratory, Oregon State University, 1985. Evaluating seedling quality : principles, procedures, and predictive abilities of major tests : proceedings of the workshop held October 16-18, 1984 / Mary L. Duryea, editor. Literature review. p. 7-15. Includes references. (NAL Call No.: DNAL SD404.E93).

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Budbreak for twenty-three upland hardwoods compared under forest canopies and in recent clearcuts.
FOSCA. McGee, C.E. Bethesda, Md. : Society of American Foresters. Forest science. Dec 1986. v. 32 (4). p. 924-935. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Buffer capacities of leaves, leaf cells, and leaf cell organelles in relation to fluxes of potentially acidic gases.
PLPHA. Pfanz, H. Heber, U. Rockville, Md. : American Society of Plant Physiologists. Plant physiology. June 1986. v. 81 (2). p. 597-602. Includes 38 references. (NAL Call No.: DNAL 450 P692).

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Canopy conductance of coniferous forests related to climate.
WRERA. Lindroth, A. Washington, D.C. : American Geophysical Union. Water resources research. Mar 1985. v. 21 (3). p. 297-304. Includes references. (NAL Call No.: DNAL 292.8 W295).

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Carbohydrate concentration in pine as affected by inoculation with Bursaphelenchus xylophilus.
JONEB. Bolla, R.I. Fitzsimmons, K.; Winter, R.E.K. Raleigh, N.C. : Society of Nematologists. Journal of nematology. Jan 1987. v. 19 (1). p. 51-57. Includes references. (NAL Call No.: DNAL QL391.N4J62).

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Marshall, J.D. Corvallis : Forest Research Laboratory, Oregon State University, 1985. Evaluating seedling quality : principles, procedures, and predictive abilities of major tests : proceedings of the workshop held October 16-18, 1984 / Mary L. Duryea, editor. Literature review. p. 49-58. ill. Includes references. (NAL Call No.: DNAL SD404.E93).

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Carbon dynamics of Northern hardwood forests gas exchange characteristics /Thomas W. Jurik, George M. Briggs and David M. Gates.
Jurik, Thomas W. Briggs, George M.; Gates David Murray,_1921-. Washington, D.C. : U.S. Dept. of Energy, Office of Energy Research, Office of Basic Energy Sciences, Carbon Dioxide Division ; Springfield, Va. : Available from the National Technical Information Service, U.S. Dept. of Commerce, 1985 . "DOE/EV/10091-1."~ "Under contract no. DE-AC02-79EV10091."~ "TR019."~ "February 1985.". 70 p. : ill. ; 28 cm. Bibliography: p. 60-61. (NAL Call No.: DNAL SD397.H3J87).

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Carbon metabolism in scions of Colorado blue spruce. I. Needle starch.
JOSHB. Beeson, R.C. Jr. Proebsting, W.M. Alexandria, Va. : The Society. Needle starch metabolism was studied during graft development of Colorado blue spruce (Picea pungens Englemann 'Hoopsi') scions on Norway spruce Picea abies (L.) Karst rootstocks. Starch accumulated during the initial stages of union formation, but the rate of accumulation slowed over time. Peak starch content in developing greenhouse grafts was approximately 30% and, in lath house grafts, approximately 50% of that in 3-year-old grafts forced in the greenhouse. Prior to budbreak, starch content declined rapidly, stabilizing at pre-grafting levels during shoot elongation. Grafts with misaligned unions accumulated starch during the first week, but the starch content then declined. Preventing photosynthesis in scions during unionformation prevented starch accumulation, but did not affect graft success or subsequent scion growth. We concluded that neither starch accumulation nor current photosynthesis in the scion were required during union development. Journal of the American Society for Horticultural Science. Sept 1988. v. 113 (5). p. 796-799. Includes references. (NAL Call No.: DNAL 81 SO12).

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Carbon metabolism in scions of Colorado blue spruce. II. Carbon storage compounds.
JOSHB. Beeson, R.C. Jr. Proebsting, W.M. Alexandria, Va. : The Society. The study evaluated the roles of storage carbohydrates and neutral lipids in the success of Colorado blue spruce (Picea pungens Englemann 'Hoopsi') grafts. These scions do not require photosynthesis nor receive photosynthates from the rootstock during union development. Carbohydrate and neutral lipid contents, along with respiration and scion water relations, were measured during union development. Stored carbon compounds were sufficient to supply the needs of the scion during the 9 weeks of union development. Estimates of carbohydrate use indicated that decreases in sugar content (bark and needle) were insufficient to account for more than 25% of the estimated respiration. The

results indicate that the quantity of carbon storage compounds is not a factor in graft success. We propose that neutral lipids may be the major carbon reserve of the scion during graft formation. Journal of the American Society for Horticultural Science. Sept 1988. v. 113 (5). p. 800-805. Includes references. (NAL Call No.: DNAL 81 SO12).

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Carbon-13/carbon-12 variations in bristlecone pine over the past 600 years and their relation to climate and global atmosphereic CO2.
Long, A. Leavitt, S.W.; Cheng, S. Washington, DC : U.S. Department of Energy, Office of Energy Research, 1986. Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis / compiled by G.C. Jacoby, J.W. Hornbeck. p. 485-493. Includes references. (NAL Call No.: DNAL QK477.2.A6I5 1986).

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Catkin growth, seed production, and development of seed germinability in quaking aspen in central Alberta.
TPLNA. Brown, K.R. Washington, D.C. : The Service. Tree planters' notes - U.S. Department of Agriculture, Forest Service. Spring 1989. v. 40 (2). p. 25-29. Includes references. (NAL Call No.: DNAL 1.962 C5T71).

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Causes of mortality in outplanted ponderosa pine container seedlings in the Southwest.
TPLNA. Heidmann, L.J. Haase, S.M. Washington, D.C. : The Service. Tree planters' notes - U.S. Department of Agriculture, Forest Service. Summer 1989. v. 40 (3). p. 16-19. Includes references. (NAL Call No.: DNAL 1.962 C5T71).

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'Cedar' Palmer penstemon: a selected penstemon for semiarid ranges.
Stevens, R. Monsen, S.B. Denver, Colo. : Society for Range Management. Rangelands. Aug 1988. v. 10 (4). p. 163-164. ill., maps. (NAL Call No.: DNAL SF85.A1R32).

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Cellular drought tolerance studies in loblolly pine.
Newton, R.J. Puryear, J.D.; Sen, S. s.l. : Southern Forest Tree Improvement Committee. Proceedings of the ... Southern Forest Tree Improvement Conference. 1987. (41). p. 71-78. Includes references. (NAL Call No.: DNAL A99.9 F769).

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Changes in levels of foliar minerals and phenolics in trembling aspen, Populus tremuloides, in response to artificial defoliation.
Mattson, W.J. Palmer, S.R. New York : Springer-Verlag, c1988. Mechanisms of woody plant defences against insects : search for pattern / William J. Mattson, Jean Levieux, C. Bernard-Dagan, editors. p. 157-169. Includes references. (NAL Call No.: DNAL SB761.M46).

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Changes in net primary productivity and cellulose decomposition rates in a water tupelo - bald cypress swamp following timber harvest.
Mader, S.F. Aust, W.M.; Lea, R. New Orleans, La. : The Station. General technical report SO - U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. Paper presented at the Fifth Biennial Southern Silvicultural Research Conference, Nov 1-3, 1988, Memphis, Tennessee. 1989. (74). p. 539-543. Includes references. (NAL Call No.: DNAL aSD11.U57).

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Changes in pattern of stem growth in pole-sized loblolly pine after sewage sludge application.
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Changes in the ultrastructure of xylem parenchyma cells of peach (Prunus persica) and red oak (Quercus rubra) in response to a freezing stress.
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BOGAA. Paquet, P.J. Knutson, D.M.; Tinnin, R.O.; Tocher, R.D. Chicago, Ill. : University of Chicago Press. Botanical gazette. June 1986. v. 147 (2). p. 156-158. Includes references. (NAL Call No.: DNAL 450 B652).

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Characterization of an extracellular lignin peroxidase of the lignocellulolytic actinomycete Streptomyces viridosporus.
APMBA. Ramachandra, M. Crawford, D.L.; Hertel, G. Washington, D.C. : American Society for Microbiology. Previously we reported production of an extracellular lignin-inducible peroxidase by Streptomyces viridosporus (M. Ramachandra, D. L. Crawford, and A. L. Pometto III, Appl. Environ. Microbiol. 53:2754-2760, 1987). This peroxidase was shown to oxidize 3,4-dihydroxyphenylalanine, 2,4-dichlorophenol, homoprotocatechuic acid, caffeic acid, and N,N,N',N'-tetramethylphenylenediamine and was found in higher than normal levels in strains enhanced for lignocellulose degradation. In the present study, we used a pure extracellular enzyme preparation with high peroxidase isoform P3 activity to oxidize lignin substructure model compounds of both the 1,2-diaryl propane and arylglycerol-beta-aryl ether types and containing C alpha-carbonyl and C alpha-hydroxyl groups. The reactions were monitored by gas chromatography-mass spectrometry and high-pressure liquid chromatography techniques. In the presence, but not the absence, of hydrogen peroxide, the enzyme preparation catalyzed C alpha-C beta bond cleavage in the side chains of the diaryl ethers 1-(3,4-dimethoxyphenyl)-2-(2-methoxyphenoxy)propane-1,3-diol (I) and 1-(4-hydroxy-3-methoxyphenyl)-2-(2-methoxyphenoxy)propan-1-one (II) and the diaryl ethane 1-(4-methoxyphenyl)-2-(phenyl)ethan-1-one (III). Rapid hydrogen peroxide consumption was observed wehn the enzyme preparation was added to either milled corn lignin or lignocellulose. Additional characterizations showed that this enzyme is a heme protein (Soret band, 408 nm) and a major component of the ligninolytic system of S. viridosporus T7A. This is the first report of a lignin peroxidase in a bacterium. We have designated this new lignin peroxidase as ALiP-P3. Applied and environmental microbiology. Dec 1988. v. 54 (12). p. 3057-3063. ill. Includes references. (NAL Call No.: DNAL 448.3 AP5).

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Characterization of historical growth patterns in declining red spruce trees.
LeBlanc, D.C. Raynal, D.J.; White, E.H.; Ketchledge, E.H. Washington, DC : U.S. Department of Energy, Office of Energy Research, 1986. Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis / compiled by G.C. Jacoby, J.W. Hornbeck. p. 360-371. Includes references. (NAL Call No.: DNAL QK477.2.A6I5 1986).

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Characterization of leucine auxotrophs of the white rot basidiomycete Phanerochaete chrysosporium.
APMBA. Molskness, T.A. Alic, M.; Gold, M.H. Washington, D.C. : American Society for Microbiology. Applied and environmental microbiology. June 1986. v. 51 (6). p. 1170-1173. ill. Includes 26 references. (NAL Call No.: DNAL 448.3 AP5).

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Characterization of sucrolysis via the uridine diphosphate and pyrophosphate-dependent sucrose synthase pathway.
PLPHA. Xu, D.P. Sung, S.J.S.; Loboda, T.; Kormanik, P.P.; Black, C.C. Rockville, Md. : American Society of Plant Physiologists. The breakdown of sucrose to feed both hexoses into glycolytic carbon flow can occur by the sucrose synthase pathway. This uridine diphosphate (UDP) and pyrophosphate (PPi)-dependent pathway was biochemically characterized using soluble extracts from several plants. The sucrolysis process required the simultaneous presence of sucrose, UDP, and PPi with their respective Km values being about 40 millimolar, 23 micromolar, and 29 micromolar. UDP was the only active nucleotide diphosphate. Slightly alkaline pH optima were observed for sucrose breakdown either to glucose 1-phosphate or to triose phosphate. Sucrolysis increased with increasing temperature to near 50 degrees C and then a sharp drop occurred between 55 and 60 degrees C. The breakdown of sucrose to triose-P was activated by fructose 2,6-P2 which had a Km value near 0.2 micromolar. The cytoplasmic phosphofructokinase and fructokinase in plants were fairly nonselective for nucleotide triphosphates (NTP) but glucokinase definitely favored ATP. A predicted stoichiometric relationship of unity for UDP and PPi was measured when one also measured competing UDPase and pyrophosphatase activity. The cycling of uridylates, UDP to UTP to UDP, was demonstrated both with phosphofructokinase and with fructokinase. Enzyme activity measurements indicated that the sucrose synthase pathway has a major role in plant sucrose sink tissues. In the cytoplasmic sucrose synthase breakdown pathway, a role for the PPi-phosphofructokinase was to produce PPi while a role for the NTP-phosphofructokinase and for the fructokinase was to produce UDP. Plant physiology. June 1989. v. 90 (2). p. 635-642. Includes references. (NAL Call No.: DNAL 450 P692).

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Charred wood stimulated germination of two fire-following herbs of the California chaparral and the role of Hemicellulose.
AJBOA. Keeley, S.C. Pizzorno, M. Baltimore, Md. : Botanical Society of America. American journal of botany. Sept 1986. v. 73 (9). p. 1289-1297. Includes references. (NAL Call No.: DNAL 450 AM36).

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Chemical variation in lodgepole pine with latitude, elevation, and diameter class.
FPJOA. Kim, W.J. Campbell, A.G.; Koch, P. Madison, Wis. : Forest Products Research Society. Lodgepole pine (Pinus contorta var. latifolia and murrayana) is one of the most abundant and underutilized forest resources in the Northwest United States and Canada. This paper describes the chemical variation in lodgepole pine over its geographical range. The sample trees were collected from nine different latitudes (40 degrees to 60 degrees north), three elevations (low, medium, and high), and three diameter classes (76, 152, and 228 mm DBH). The average chemcial composition of the latifolia stems was 0.26 percent ash, 2.87 percent extractives, 25.81 percent lignin, 80.40 percent holocellulose, and 49.64 percent alpha-cellulose. The average pH was 4.57. Ash, lignin, and holocellulose were negatively correlated with latitude, while alpha-cellulose generally increased as latitude increased. The extractive content was positively correlated with latitude. The ash content and pH were negatively correlated with diameter class, while extractive content was positively correlated with diameter class. The latifolia and murrayana trees had similar chemical characteristics and no extreme chemical variabilities that would limit ordinary wood utilization. Forest products journal. Mar 1989. v. 39 (3). p. 7-12. maps. Includes references. (NAL Call No.: DNAL 99.9 F7662J).

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Chlorophyll a fluorescence and photosynthetic and growth responses of Pinus radiata to phosphorus deficiency, drought stress, and high CO2.
PLPHA. Conroy, J.P. Smillie, R.M.; Kuppers, M.; Bevege, D.I.; Barlow, E.W. Rockville, Md. : American Society of Plant Physiologists. Plant physiology. June 1986. v. 81 (2). p. 423-429. Includes 25 references. (NAL Call No.: DNAL 450 P692).

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Chronic herbivory: impacts on architecture and sex expression of pinyon pine.
SCIEA. Whitman, T.G. Mopper, S. Washington, D.C. : American Association for the Advancement of Science. Science. May 31, 1985. v. 228 (4703). p. 1089-1091. ill. Includes 23 references. (NAL Call No.: DNAL 470 SCI2).

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Climate and red spruce growth and decline in the northern Appalachians.
PNASA. Johnson, A.H. Cook, E.R.; Siccama, T.G. Washington, D.C. : The Academy. Proceedings of the National Academy of Sciences of the United States of America. Aug 1988. v. 85 (15). p. 5369-5373. Includes references. (NAL Call No.: DNAL 500 N21P).

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Clonal diversity in populations of Polysphondylium pallidum, a cellular slime mold.
ECOLA. Ketcham, R.B. Eisenberg, R.M. Tempe, Ariz. : The Society. Ecology : a publication of the Ecological Society of America. Oct 1989. v. 70 (5). p. 1425-1433. Includes references. (NAL Call No.: DNAL 410 EC7).

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Cold-hardiness testing of conifer seedlings.
Burr, K.E. Wallner, S.J.; Tinus, R.W. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, United States, Forest Service. Feb 1986. (125). p. 104-108. Includes references. (NAL Call No.: DNAL aSD11.A42).

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Cold tolerance of shade tree species and cultivars in the upper Midwest.
Pellett, H. Moe, S.; Vogel, K. Washington, D.C. : Horticultural Research Institute. Journal of environmental horticulture. June 1985. v. 3 (2). p. 58-62. ill. Includes 3 references. (NAL Call No.: DNAL SB1.J66).

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Combustion losses of sulfur from forest foliage and litter.
FOSCA. Tiedemann, A.R. Bethesda, Md. : Society of American Foresters. Forest science. Mar 1987. v. 33 (1). p. 216-223. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Comparative anatomy and physiology of microcultured, seedling, and greenhouse-grown Asian white birch.
JOSHB. Smith, M.A.L. Palta, J.P.; McCown, B.H. Alexandria, Va. : The Society. Journal of the American Society for Horticultural Science. May 1986. v. 111 (3). p. 437-442. ill. Includes references. (NAL Call No.: DNAL 81 SO12).

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Comparative drought physiology and biogeography of Quercus gambelii and Quercus turbinella.
AMNAA. Neilson, R.P. Wullstein, L.H. Notre Dame, Ind. : University of Notre Dame. American midland naturalist. Oct 1985. v. 114 (2). p. 259-271. Includes references. (NAL Call No.: DNAL 410 M58).

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Comparative physiology of successional forest trees.
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Comparison of adventitious shoot formation from mature embryos of longleaf pine, slash pine, and the hybrid, longleaf pine X slash pine.
Stine, M. Sommer, H.E. Madison : Dept. of Forestry, University of Wisconsin-Madison. Proceedings of the ... North Central Tree Improvement Conference. 1985? . (4th). p. 6-11. Includes references. (NAL Call No.: DNAL SD399.5.N6).

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Comparison of canopy position and other factors on seedling growth in Acacia smallii.
TJSCA. Lohstroh, R.J. Van Auken, O.W. Lubbock, Tex. : Texas Academy of Science. The Texas journal of science. Aug 1987. v. 39 (3). p. 233-239. Includes references. (NAL Call No.: DNAL 470 T31).

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Comparison of four cold hardiness tests on three western conifers.
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Comparison of three techniques to determine Al content in micro-samples of plant material.
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Compartmentalization of decay in trees.
SCAMA. Shigo, A.L. New York, N.Y. : Scientific American, Inc. Scientific American. Apr 1985. v. 252 (4). p. 96-103. ill. (NAL Call No.: DNAL 470 SCI25).

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Competitive effects of various grasses and forbs on ponderosa pine seedlings.
FOSCA. Elliott, K.J. White, A.S. Bethesda, Md. : Society of American Foresters. Forest science. June 1987. v. 33 (2). p. 356-366. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Competitive interactions between Cynodon dactylon and Acacia smallii seedlings at different nutrient levels.
AMNAA. Cohn, E.J. Van Auken, O.W.; Bush, J.K. Notre Dame, Ind. : University of Notre Dame. American midland naturalist. Apr 1989. v. 121 (2). p. 265-272. Includes references. (NAL Call No.: DNAL 410 M58).

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BOGAA. Zobel, D.B. Antos, J.A. Chicago, Ill. : University of Chicago Press. Botanical gazette. Dec 1987. v. 148 (4). p. 490-500. Includes references. (NAL Call No.: DNAL 450 B652).

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HJHSA. King, S.M. Morehart, A.L. Alexandria, Va. : American Society for Horticultural Science. HortScience. Feb 1988. v. 23 (1). p. 219. Includes references. (NAL Call No.: DNAL SB1.H6).

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Correlation of forest growth and yield with soil characteristics.
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Ponder, F. Jr. Schlesinger, R.C. Bethesda, Md. : Society of American Foresters. Northern journal of applied forestry. Dec 1986. v. 3 (4). p. 153-155. Includes references. (NAL Call No.: DNAL SD143.N6).

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HJHSA. Tao, R. Sugiura, A. Alexandria, Va. : American Society for Horticultural Science. HortScience. Oct 1987. v. 22 (5). p. 932-935. ill. Includes references. (NAL Call No.: DNAL SB1.H6).

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Cupric carbonate controls green ash root morphology and root growth.
HJHSA. Arnold, M.A. Struve, D.K. Alexandria, Va. : American Society for Horticultural Science. HortScience. Apr 1989. v. 24 (2). p. 262-264. Includes references. (NAL Call No.: DNAL SB1.H6).

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Cytochemical localization of p-nitrophenyl phosphatase activity in Suillus granulatus.
Crowley, D.E. Reid, C.P.P. Corvallis, Or. : Oregon State University , Forest Research Laboratory, 1985. Proceedings of the 6th North American Conference on Mycorrhizae : June 25-29, 1984, Bend, Oregon / compiled and edited by Randy Molina ; sponsoring institutions, Oregon State University, College of Forestry, and USDA. p. 342. ill. Includes references. (NAL Call No.: DNAL aQK604.N6 1984).

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Damage to conifer seedlings by summer frost and winter drought.
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Defensive responses of trees in relation to their carbon/nutrient balance.
Tuomi, J. Niemela, P.; Chapin, F.S. III; Bryant, J.P.; Siren, S. New York : Springer-Verlag, c1988. Mechanisms of woody plant defences against insects : search for pattern / William J. Mattson, Jean Levieux, C. Bernard-Dagan, editors. Literature review. p. 57-72. Includes references. (NAL Call No.: DNAL SB761.M46).

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Degree growth stage model and rest-breaking mechanisms in temperate woody perennials.
HJHSA. Fuchigami, L.H. Nee, C.C. Alexandria, Va. : American Society for Horticultural Science. HortScience. Paper presented at the "Symposium on Mechanisms of Rest and Dormancy of the XXII International Horticultural Congress/83rd ASHS Annual Meeting," August 12, 1986, Davis, California.~ Literature review. Oct 1987. v. 22 (5). p. 836-845. ill. Includes references. (NAL Call No.: DNAL SB1.H6).

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Dendroecological analysis of a population of black gum (Nyssa sylvatica Marsh.) in southern Ontario, Canada.
McCaw, P.E. Eckenwalder, J.E. Washington, DC : U.S. Department of Energy, Office of Energy Research, 1986. Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis / compiled by G.C. Jacoby, J.W. Hornbeck. p. 70-78. Includes references. (NAL Call No.: DNAL QK477.2.A6I5 1986).

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Description of host species.
XATBA. Hermann, R.K. Washington, D.C. : The Department. Technical bulletin - United States Dept. of Agriculture. In the series analytic: Western Spruce Budworm / Martha H. Brooks... et.al . May 1987. (1694). p. 43-56. ill. (NAL Call No.: DNAL 1 AG84TE).

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Detection of brassinolide and castasterone in Alnus glutinosa (European alder) pollen by mass spectrometry/mass spectrometry.
JNPRDF. Plattner, R.D. Taylor, S.L.; Grove, M.D. Cincinnati, Ohio : American Society of Pharmacognosy. Journal of natural products. May/June 1986. v. 49 (3). p. 540-545. ill. Includes references. (NAL Call No.: DNAL 442.8 L77).

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TPLNA. Skeates, D.A. Irving, D.E.; Haavisto, V.F. Washington, D.C. : The Service. Tree planters' notes - U.S. Department of Agriculture, Forest Service. Summer 1989. v. 40 (3). p. 5-8. Includes references. (NAL Call No.: DNAL 1.962 C5T71).

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JOSHB. Montano, J.M. Proebsting, W.M. Alexandria, Va. : The Society. Journal of the American Society for Horticultural Science. Includes cut trees. Jan 1988. v. 113 (1). p. 133-137. Includes references. (NAL Call No.: DNAL 81 S012).

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XFIPA. Cole, D.M. Ogden, Utah : The Station. Research paper INT - U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Nov 1989. (415). 11 p. Includes references. (NAL Call No.: DNAL A99.9 F764U).

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Kung, F.H. s.l. : Southern Forest Tree Improvement Committee. Proceedings of the ... Southern Forest Tree Improvement Conference. 1987. (41). p. 407-414. Includes references. (NAL Call No.: DNAL A99.9 F769).

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wood and the rate of new tracheid production. Mean concentrations for whole branch segments were not affected by the treatments regardless, of whether IAA concentrations were expressed on a surface area, weight, or cell basis. Plant physiology. Sept 1989. v. 91 (1). p. 338-344. ill. Includes references. (NAL Call No.: DNAL 450 P692).

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Fluoride-induced enhancement and inhibition of photosynthesis in four taxa of Pinus.
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NEPHA. Doley, D. New York, N.Y. : Cambridge University Press. The New phytologist. Aug 1989. v. 112 (4). p. 543-552. Includes references. (NAL Call No.: DNAL 450 N42).

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Flux of ethylene from leaves treated with a polar or non-polar ethylene-releasing compound.
JOSHB. Beaudry, R.M. Kays, S.J. Alexandria, Va. : The Society. Flux of ethylene from adaxial applications of Ethrel and Silaid to amphi- and hemistomatous leaves was examined. Following application of Ethrel to amphistomatous leaves in the dark (i.e., closed stomata) or hemistomatous leaves in the light, steady-state ethylene evolution was almost entirely adaxial. When stomata of amphistomatous leaves were fully open, abaxial ethylene flux for Ethrel was about 45% of the total ethylene evolved. Abaxial ethylene flux could then be dramatically reduced by stomatal closure induced by low light levels. Steady-state abaxial flux of ethylene from Silaid on amphistomatous leaves in the dark or hemistomatous leaves in the light was usually equal to or greater than adaxial ethylene flux. When stomata of amphistomatous leaves were fully open, flux of ethylene from Silaid was invariably equal from both leaf surfaces. Flux of Silaid- or Ethrel-derived ethylene from one leaf surface was reduced by increasing air velocity on the opposite side of the leaf, but only on amphistomatous leaves following light-induced stomatal opening. For Ethrel, the effect of air velocity was greater when the side of the leaf to which Ethrel had been applied was exposed to the increased air flow. No similar effect was found for Silaid. Closure of stomata on amphistomatous leaves and use of hemistomatous leaf material prevented any air velocity effect. Data indicate little to no entry of Ethrel or Ethrel-derived ethylene into the side of a leaf that lacks stomata or whose stomata are tightly closed. Significant movement of Silaid into leaf tissues probably occurs regardless of stomatal status, resulting in considerable release of ethylene within the leaf. Chemical names used: (2-chloroethyl)phosphonic acid (Ethrel); (2-chloroethyl) methylbis(phenylmethoxy)silane (Silaid). Journal of the American Society for Horticultural Science. Sept 1988. v. 113 (5). p. 784-789. Includes references. (NAL Call No.: DNAL 81 SO12).

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FOSCA. Bunderson, E.D. Weber, D.J. Bethesda, Md. : Society of American Foresters. Forest science. Mar 1986. v. 32 (1). p. 149-156. maps. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Frost hardiness in Eucalyptus grandis: a possible molecular mechanism.
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Frost hardiness of coniferous seedlings: principles and applications.
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AJBOA. Greenwood, M.S. Baltimore, Md. : Botanical Society of America. American journal of botany. Oct 1986. v. 73 (10). p. 1443-1451. ill. Includes references. (NAL Call No.: DNAL 450 AM36).

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Grass and forb species for revegetation of mixed soil-lignite overburden in east central Texas.
JSWCA3. Skousen, J.G. Call, C.A. Ankeny, Iowa : Soil Conservation Society of America. Journal of soil and water conservation. Nov/Dec 1988. v. 42 (6). p. 438-442. Includes references. (NAL Call No.: DNAL 56.8 J822).

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Green ash establishment following transplant.
JOSHB. Arnold, M.A. Struve, D.K. Alexandria, Va. : The Society. Bare-root 1-year-old green ash (Fraxinus pennsylvanica Marsh.) seedlings were transplanted into root observation boxes under greenhouse conditions to study timing of budbreak, root regeneration, and subsequent shoot growth during establishment. Green ash seedlings began shoot growth before root growth. Seven to 20 days after transplant, intact second- and third-order lateral roots (referred to here after as intact roots) began to elongate, followed 10 to 19 days later by initiation of long roots from callus at pruned root surfaces. Plants with earlier budbreak were larger and regenerated more roots faster than plants that broke bud later. During establishment, there was a strong correlation between shoot and intact root elongation and a low correlation between shoot and long root elongation. Root pruning after establishment resulted in bud set and/or cessation of shoot elongation within 3 to 6 days in 1985 and within 20 to 28 days in 1986. The days to bud set and cessation of shoot elongation were positively correlated with increased numbers of regenerated roots from pruned surfaces (long roots). Only long root elongation was significantly correlated with shoot growth after root pruning. Root pruning also induced reductions (12 days) in net photosynthesis, transpiration, and stomatal conductance, and increased stomatal resistance to water loss; however, all recovered after root regeneration. Journal of the American Society for Horticultural Science. July 1989. v. 114 (4). p. 591-595. Includes references. (NAL Call No.: DNAL 81 SO12).

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Growth and chemical composition of Populus deltoides X nigra grown in field-grow fabric containers.
Chong, C. Lumis, G.P.; Cline, R.A.; Reissmann, H.J. Washington, D.C. : Horticultural Research Institute. Journal of environmental horticulture. June 1987. v. 5 (2). p. 45-48. ill. Includes references. (NAL Call No.: DNAL SB1.J66).

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Growth and heavy metal accumulation in pine seedlings grown with sewage sludge.
JEVQAA. Berry, C.R. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. July/Sept 1985. v. 14 (3). p. 415-419. Includes references. (NAL Call No.: DNAL QH540.J6).

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Growth and morphological responses to irradiance in three forest understory species of the C4 grass genus Muhlenbergia.
BOGAA. Smith, M. Martin, C.E. Chicago, Ill. : University of Chicago Press. Botanical gazette. June 1987. v. 148 (2). p. 141-148. ill. Includes references. (NAL Call No.: DNAL 450 B652).

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Growth and nutrient content of red spruce seedlings in soil amended with aluminum.
JEVQAA. Ohno, T. Sucoff, E.I.; Erich, M.S.; Bloom, P.R.; Buschena, C.A.; Dixon, R.K. Madison, Wis. : American Society of Agronomy. Aluminum toxicity may be a factor linking acid deposition to forest decline. Acid precipitation may lower soil pH, which would raise the level of phytotoxic forms of Al in soil solution. A greenhouse study was conducted to examine the effects of soil Al on the growth and nutrient composition of red spruce (Picea rubens Sarg.). A Becker series forest soil (Typic Fragiorthod) was amended with AlCl3 to give a range of saturated paste extract Al concentrations from 37 to 537 micromol L-1 at harvest. Bare-rooted seedlings were transplanted into pots and grown for 52 d. Biomass of needles, primary roots, and lateral roots were not significantly decreased by soil Al levels. The biomass of needles were negatively correlated with the concentration of Al in the needles. All seedlings were P-deficient, which may account for the lack of response to soil Al levels. The concentration of Al in seedling needles increased significantly with increasing soil Al levels, but not in the primary or lateral roots. The concentration of Mn in seedling needles, primary roots, and lateral roots decreased with higher concentrations of Al in the soil. The concentrations of N, P, K, Ca, Mg, Fe, Zn, Cu, and B in the needles were not affected by soil Al. However, the Mg, Ca, and B concentrations in both primary and lateral roots were significantly lower with increasing levels of soil Al. Increasing soil Al levels resulted in lower nitrification rates in the soils. The addition of Al significantly reduced colonies of bacteria relative to the control soil. However, fungi/actinomycetes colonies were not significantly reduced by soil Al. Journal of environmental quality. Oct/Dec 1988. v. 17 (4). p. 666-672. Includes references. (NAL Call No.: DNAL QH540.J6).

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Growth and nutrient status of black spruce seedlings as affected by water table depth.
Czapowskyj, M.M. Rourke, R.V.; Grant, W.J. Broomall, Pa. : The Station. USDA Forest Service Research Paper NE-RP - Northeastern Forest Experiment Station. Aug 1986. (591). 9 p. Includes references. (NAL Call No.: DNAL A99.9 F7622UN).

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Growth and survival of eastern cottonwood in Kentucky.
SJAFD. Stringer, J.W. Shain, L.; Wittwer, R.F. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. May 1987. v. 11 (2). p. 73-76. Includes references. (NAL Call No.: DNAL SD1.S63).

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Growth and survival of hybrid poplar and Populus deltoides clones in east central Wisconsin.
Wyckoff, G.W. Einspahr, D.W.; Dinus, R.J. Madison, Wis. : Dept. of Forestry, University of Wisconsin-Madison. Proceedings of the ... North Central Tree Improvement Conference. Conference held August 10-12, 1987, Fargo, North Dakota.~ Includes statistical data. 1987? . p. 187-196. Includes references. (NAL Call No.: DNAL SD399.5.N6).

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FOSCA. Petersen, T.D. Newton, M.; Zedaker, S.M. Bethesda, Md. : Society of American Foresters. Abstract: Stem dimensions for two age groups of Douglas-fir growing in the central Cascade Mountains of western Oregon were related to water-stress and the amount of interference from dense Ceanothus velutinus and forbs 8 years earlier. In 1978, three regimes were established in four 5-year-old and four 10-year-old stands by means of controls (no treatment) and two herbicide treatments to individual trees in each stand: a partial treatment (C. velutinus eliminated) and a complete treatment (both shrubs and forbs eliminated). In the subsequent year, soil water potential during late summer was less than -1.5 MPa at 10-, 40-, and 100-cm depths, where C. velutinus was growing with forbs. In the absence of shrubs and forbs, soil water potential at 100 cm was near field capacity throughout the 1979 growing season. Predawn stem water potential and Douglas-fir during late summer was significantly lower for trees competing with C. velutinus and forbs than for trees without competitors in the complete treatment, or for trees competing with forbs in the partial treatment, in the four 5-year-old stands and in two of the 10-year-old stands. By 1986, Douglas-fir stems were 2 to 6 cm larger in basal diameter and 1 to 2 m taller in the absence of competitors. Interference from C. velutinus and forbs had a greater effect on stem size of 5-year-old than 10-year-old trees. The correlation between growth and water stress suggests that interspecific competition for soil water during summer drought is a factor limiting stemwood production. FOR. SCI. 34(2):333-343. Forest science. June 1988. v. 34 (2). p. 333-343. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Red spruce rhizosphere dynamics: spatial distribution of aluminum and zinc in the near-root soil zone.
FOSCA. Smith, W.H. Pooley, A.S. Bethesda, Md. : Society of American Foresters. Red spruce roots, associated with mature, healthy trees occupying canopy positions, were located in three 8.5 m2 forest floor plots at 250 m elevation in the Hubbard Brook Experimental Forest, White Mountain National Forest, New Hampshire. Roots, 0.25-1.0 cm diam, were severed, and cut ends were placed in soil in plastic bags. In 14 months, new roots developed behind cut ends and were cultured in wooden trays containing screened forest floor material. Forest floor concentrations of aluminum, calcium, chlorine, iron, lead, and zinc were established. Trays containing roots were supplied with a distilled water treatment or with distilled water containing chloride salts of aluminum, lead or zinc sufficient to increase substrate cation concentration by 500 ppm. Eight weeks following treatment, roots (largely ectomycorrhizal, diam 0.4-1.0 mm) with associated rhizosphere soil were harvested by impregnating specimens in agar and freezing in liquid nitrogen. Cross sections of root-rhizosphere soil samples were freeze dried

and examined with a scanning electron microscope and energy dispersive x-ray spectrometer. Gradients of element concentrations were established along transects from root interiors (cortex) through the inner and outer rhizosphere zones (2 mm from root) and in bulk soil (devoid of roots). The pH of rhizosphere soil was approximately 0.5 unit less than bulk soil. Aluminum concentrations exhibited a strongly descending gradient from bulk soil through the rhizosphere to the root. Estimated concentrations ranged from 1000 ppm within 200 microns of the root to 10 x this amount in soil beyond 2000 microns. Calcium distribution, without aluminum amendment, was relatively constant through the rhizosphere, but with aluminum amendment, calcium exhibited a sharply decreasing gradient near the root. In the unamended treatment, the Al:Ca ratio dropped from 7 to 0.2 across the rhizosphere. Chlorine was constant in the rhizosphere but exhibited pronounced accumulation in. Forest science. Dec 1989. v. 35 (4). p. 1114-1124. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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AMNAA. Parker, V.T. Yoder-Williams, M.P. Notre Dame, Ind. : University of Notre Dame. American midland naturalist. Jan 1989. v. 121 (1). p. 105-111. Includes references. (NAL Call No.: DNAL 410 M58).

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Davis, J.M. Keathley, D.E. Madison : Dept. of Forestry, University of Wisconsin-Madison. Proceedings of the ... North Central Tree Improvement Conference. 1985? . (4th). p. 29-34. Includes references. (NAL Call No.: DNAL SD399.5.N6).

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Tinus, R.W. Burr, K.E.; Wallner, S.J.; King, R.M. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. Paper presented at a Meeting of the Combined Western Forest Nursery Council and Intermountain Nursery Association, August 12-15, 1986, Tumwater, Washington. Dec 1986. (137). p. 80-86. Includes references. (NAL Call No.: DNAL aSD11.A42).

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SJAFD. Tuttle, C.L. South, D.B.; Golden, M.S.; Meldahl, R.S. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. Aug 1987. v. 11 (3). p. 139-143. Includes references. (NAL Call No.: DNAL SD1.S63).

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Relationship between volume and biomass of early successional vegetation and the prediction of loblolly pine seedling growth.
FOSCA. Byrne, S.V. Wentworth, T.R. Bethesda, Md. : Society of American Foresters. A simple and nondestructive method of measuring plant volume was developed to test the following two hypotheses: (1) plant volume is an effective substitute for plant biomass in the prediction of competitive potential; and (2) the plant biomass-volume relationship is affected by plant growth form. In 1983, above-ground volume

and biomass were determined for all plants in 40 1-m2 plots in an experimental loblolly pine (Pinus taeda L.) plantation having varying degrees of successional regrowth. After natural log transformations of plant biomass and volume, separate regression equations were developed for grass, forb, shrub, and tree growth forms. A test of homogeneity indicated that the slopes and intercepts for the four regression equations were not all identical. Specific contrasts among the regression equations were also tested for common slopes and intercepts to determine the source of overall significance. Results of the contrasts were explained by differences in plant allocation patterns. The variation in plant biomass accounted for by the volume models ranged from 78% for grasses to 94% for trees. As an application of this approach, volume was measured and biomass was estimated from the regression equations for successional plants within a 2m radius (the "neighborhood") of each of 69 loblolly pine seedlings. Total plant volume and total estimated biomass each accounted for approximately 40% of the variation in pine growth. FOR. SCI. 34(4):939-947. Forest science. Dec 1988. v. 34 (4). p. 939-947. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Sources of variation in osmotic potentials with special reference to North American tree species.
FOSCA. Abrams, M.D. Bethesda, Md. : Society of American Foresters. The purpose of this review is to discuss sources of variation in osmotic potentials (psi pi), with special reference to North American tree species. Lowering of osmotic potentials by solute accumulation (osmotic adjustment) has been reported in a wide variety of tree species during drought, but not in all species. Osmotic potentials at zero turgor for 37 tree species throughout the United States and Canada averaged (+/- s.e.) -2.06 +/- 0.13 MPa and -2.54 +/- 0.06 MPa for leaves or shoots under moist and dry conditions, respectively. The low standard error associated with the mean values suggest that, as a group, North American trees develop fairly similar osmotic potentials for a range of moisture conditions. Substantial solute accumulation often routinely occurs in developing leaves and in over-wintering leaves. Drought preconditioning can increase physiological activity in plants during subsequent drought by lowering psi pi. However, if drought is imposed too rapidly osmotic

adjustment may not occur. Physiological plasticity in trees may cause variations in psi pi in responses to light regime and leaf canopy position. Light and nutrient regimes that promote high net photosynthesis should also promote the ability to osmotically adjust. However, stomatal responses and growth during water and nutrient stress may be unrelated to osmotic potentials because of species differences in rooting and water transport, guard cell turgor not being closely coupled with that of the bulk leaf, and changes in plant growth regulator concentrations. When examining changes in osmotic potentials using pressure-volume curves, it is important to rehydrate plant material to a water potential characteristic for that species at full hydration in the field. Moreover, as with most physiological measurements, sampling variation in light regime, canopy position, nutrient status, temperature, age, phenology, drought history, and diurnal timing of harvesting of the leaves and shoots should be mi. Forest science. Dec 1988. v. 34 (4). p. 1030-1046. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Thinning red alder: effects of method and spacing.
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Three-dimensional forest growth model relating tree size, tree number, and stand age: relation to previous growth models and to self-thinning.
FOSCA. McFadden, G. Oliver, C.D. Bethesda, Md. : Society of American Foresters. A generalized three-dimensional model for tree growth containing tree size, number of trees per area, and stand age on the three axes can be shown to incorporate three previous models in the theoretical absence of differentiation and self-thinning. The previous models, each incorporating two of the three axes, are: the sigmoid growth models of tree size/stand age; the relation of tree size (volume or diameter)/tree number; and the reverse-J-shaped mortality relation of maximum tree number/stand age. Information developed from one two-dimensional model can be transferred to the other models using the three-dimensional response surface to interpret the growth trajectory of stands undergoing differentiation and self-thinning. For. Sci. 34(3):662-676. Forest science. Sept 1988. p. 662-676. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Three-dimensional representation of Douglas-fir volume growth: comparison of growth and yield models with stand data.
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MUCBA. Sapio, F.J. Priest, R.J. East Lansing, Mich. : The Service. Extension bulletin E - Cooperative Extension Service, Michigan State University. In the series analytic: The Second annual report of the Gypsy Moth Technical Committee: Gypsy moth in Michigan, 1987 / edited by Bruce A. Montgomery. May 1988. (2142). p. 2-3. maps. (NAL Call No.: DNAL 275.29 M58B).

1369

A degree-day model to predict Nantucket pine tip moth, Rhyacionia frustrana (Comstock) (Lepidoptera: Tortricidae), flights in southern California.
EVETEX. Malinoski, M.K. Paine, T.D. College Park, Md. : Entomological Society of America. Environmental entomology. Feb 1988. v. 17 (1). p. 75-79. maps. Includes references. (NAL Call No.: DNAL QL461.E532).

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The Delphi approach to the mediation of environmental disputes.
EMNGD. Miller, A. Cuff, W. New York : Springer International. Environmental management. May 1986. v. 10 (3). p. 321-330. Includes references. (NAL Call No.: DNAL HC79.E5E5).

1371

Demonstrating effective management measures for southern pine beetle in Virginia.
XFGSA. Morris, C.L. Asheville, N.C. : The Station. USDA Forest Service general technical report SE - United States, Southeastern Forest Experiment Station. Dec 1985. (34). p. 64-66. Includes references. (NAL Call No.: DNAL aSD433.A53).

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Demonstrating integrated pest management on National Forests in South Carolina and Georgia.
XFGSA. Hoffard, W.H. Oak, S.W. Asheville, N.C. : The Station. USDA Forest Service general technical report SE - United States, Southeastern Forest Experiment Station. Dec 1985. (34). p. 35-44. ill., maps. Includes references. (NAL Call No.: DNAL aSD433.A53).

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Demonstrating the efficacy of thinning for reducing southern pine Beetle impacts in North Carolina.
XFGSA. Doggett, C. Asheville, N.C. : The Station. USDA Forest Service general technical report SE - United States, Southeastern Forest Experiment Station. Dec 1985. (34). p. 31-34. maps. Includes references. (NAL Call No.: DNAL aSD433.A53).

1374

Demonstration of the effectiveness of basal area cutting to reduce tree killing by the mountain pine beetle in ponderosa pine, Crow and Northern Cheyenne Indian Reservations, Montana, 1984: establishment report.
Gibson, K.E. McGregor, M.D.; Amman, G.D. Missoula, Mont. : The Region. Report - USDA Forest Service, Northern Region. Mar 1985. (85-8). 9 p. maps. Includes references. (NAL Call No.: DNAL aSD11.U585).

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A Dendroctonus frontalis infestation growth model: organization, refinement, and utilization.
Stephen, F.M. Lih, M.P. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 186-194. ill. Includes references. (NAL Call No.: DNAL aSD11.U57).

1376

Density-damage relationship and presence-absence sampling of the elm leaf beetle (Coleoptera: Chrysomelidae) in northern California.
EVETEX. Dreistadt, S.H. Dahlsten, D.L. Lanham, Md. : Entomological Society of America. The relationship between density of elm leaf beetle, Xanthogaleruca luteola (Muller), and damage to English elm, Ulmus procera Salisbury, and Siberian elm, Ulmus pumila L., was studied in seven northern California cities in 1986 and 1987. Peak first-generation elm leaf beetle egg or larval densities were good predictors of cumulative foliage damage to English elm and to a lesser extent predicted Siberian elm damage. Egg density on both hosts was highly associated with the proportion of samples infested with eggs. The maximum proportion of presence-absence samples infested with first generation eggs predieted cumulative damage to English but not to Siberian elm. When no effort was made to control beetle populations most English elm trees sustained more than 40% damage to retained foliage, whereas damage to most Siberian elms was less. Environmental entomology. Oct 1989. v. 18 (5). p. 849-853. Includes references. (NAL Call No.: DNAL QL461.E532).

1377

Description of host species.
XATBA. Hermann, R.K. Washington, D.C. : The Department. Technical bulletin - United States Dept. of Agriculture. In the series analytic: Western Spruce Budworm / Martha H. Brooks... et.al . May 1987. (1694). p. 43-56. ill. (NAL Call No.: DNAL 1 AG84TE).

1378

Development and implementation of a gypsy moth integrated pest management program.
JOARD. Reardon, R. McManus, M.; Kolodny-Hirsch, D.; Tichenor, R.; Raupp, M.; Schwalbe, C.; Webb, R.; Meckley, P. Urbana, Ill. : International Society of Arboriculture. Journal of arboriculture. Literature review. Sept 1987. v. 13 (9). p. 209-216. ill., maps. Includes references. (NAL Call No.: DNAL SB436.J6).

1379

Development and implementation of the southern pine beetle decision support system.
Saunders, M.C. Loh, P.K.; Coulson, R.N.; Rykiel, E.J.; Payne, T.L.; Pulley, P.E.; Hu, L.C. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 335-363. ill. Includes references. (NAL Call No.: DNAL aSD11.U57).

1380

Development and mortality of Ips avulsus (Coleoptera: Scolytidae) at constant temperatures.
EVETEX. Wagner, T.L. Hennier, P.B.; Flamm, R.O.; Coulson, R.N. College Park, Md. : Entomological Society of America. Aspects of the development and mortality of Ips avulsus (Eichhoff) were studied at seven constant temperatures from 10 to 35 degrees C. On average, eggs occupied 10.3% of the total time in the host, larvae 34.8%, pupae 11.8%, and teneral adults 43.1%. Plots of development

rates (reciprocal of median times) and percent mortalities versus constant temperatures indicated that the insect is well adapted to high temperatures but sensitive to low temperatures. The timing of oviposition relative to sibling oviposition time in a slab had little effect on the development times of any life stage or the life cycle. Oviposition time influenced life-stage and life-cycle mortality, although the effects were not great. For example, the probability of larval death increased from 16.6 to 28.7% for individuals originating in the first and fourth quarters of the oviposition period. The probability of death due to cannibalism was less than 10% and was not influenced by oviposition time. No difference was observed in the overall proportion of males to total emerging beetles (0.496) and 0.5; however, this proportion increased with time throughout the emergence period. Models were developed to predict life-stage and life-cycle development times as functions of temperature. A mechanistic model described the development rate versus constant temperature relationship, whereas a cumulative Weibull function described the temperature-independent distributions of normalized development times. The life-cycle model was validated using a multiple-cohort simulation procedure and data of I. avulsus emergence from three trees in each of three field plots. The validation indicated model suitability in a larger model of population dynamics, although additional testing is indicated. Environmental entomology. Apr 1988. v. 17 (2). p. 181-191. Includes references. (NAL Call No.: DNAL QL461.E532).

1381

Development and mortality of Ips calligraphus (Coleoptera: Scolytidae) at constant temperatures.
EVETEX. Wagner, T.L. Fargo, W.S.; Flamm, R.O.; Coulson, R.N.; Pulley, P.E. Lanham, Md. : Entomological Society of America. We describe effects of constant temperature, beetle density, and time of oviposition on aspects of development, mortality, sex ratio, and size of Ips calligraphus (Germar). Emphasis is placed on individual life stages. Relationships of median development times to constant temperatures were similar for eggs, larvae, and pupae in the 12.5-37.5 degrees C range. These relationships appeared as backward J-shaped curves. Reciprocal development times versus temperatures for these life stages were described by the six-parameter rate function of Sharpe & DeMichele (1977, J. Theor. Biol. 64: 649-670). Development times and foraging distances of larvae increased with each instar. The third instar required 61% of total larval time and excavated 73% of the total larval gallery. Optimum development temperature of teneral adults was not identified, indicating greater tolerance to high temperatures of this stage compared with the others. The four-parameter Sharpe & DeMichele (1977) model (without high-temperature inhibition) described teneral adult rate as a function of temperature. Timing of oviposition influenced development time of larvae (increased development time with late oviposition) and teneral adults (decreased), but not development times of eggs or pupae. Reversed patterns of longer development times for larvae and shorter times for teneral adults canceled any effects of sequential oviposition on length of life cycle. Distributions of development times were generally skewed toward the longer times, and variation around mean time tended to increase with successive life stage. A single, temperature-independent distribution of normalized development times is presented for each life stage and is described by a three-parameter cumulative Weibull function. stage-specific mortality (resulting from unknown causes) formed partial or full U-shaped patterns when plotted against temperature. Density-dependent mortality resulting from cannibalism is discussed, with a Weibull functi. Environmental entomology. Apr 1987. v. 16 (2). p. 484-496. Includes references. (NAL Call No.: DNAL QL461.E532).

1382

Development, implementation, and validation of a large area hazard- and risk-rating system for southern pine beetle.
Billings, R.F. Bryant, C.M.; Wilson, K.H. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 226-232. Includes references. (NAL Call No.: DNAL aSD11.U57).

1383

The development of a computerized database management system for Midland County.
MUCBA. Gage, S.H. Wirth, T.M. East Lansing, Mich. : The Service. Extension bulletin E - Cooperative Extension Service, Michigan State University. In the series analytic: The Second annual report of the Gypsy Moth Technical Committee: Gypsy moth in Michigan, 1987 / edited by Bruce A. Montgomery. May 1988. (2142). p. 50-51. (NAL Call No.: DNAL 275.29 M58B).

1384

Development of wound tissue in the bark of Fraser fir and its relation to injury by the balsam woolly adelgid.
GENSAB. Arthur, F.H. Hain, F.P. Athens, Ga. : The Society. Journal of Entomological Science. Jan 1985. v. 20 (1). p. 129-135. Includes references. (NAL Call No.: DNAL QL461.G4).

1385

Development, reproduction, and competitive interactions between two sympatric leafhopper species (Homoptera: Cicadellidae) on redbud trees.
EVETEX. Hunter, C.E. Yeargan, K.V. Lanham, Md. : Entomological Society of America. The developmental and reproductive biologies of two sympatric leafhoppers, Erythroneura aclys McAtee and Erythroneura bistrata McAtee were studied, as well as their responses to intra-and interspecific competition. Both leafhoppers specialize on redbud trees, Cercis canadensis L. E. aclys eggs developed faster in the field than E. bistrata eggs in 1985 but not in 1986; developmental periods for nymphs in the field did not differ significantly between species in either year. Under controlled but fluctuating warm temperatures (19-29 degrees C; average = 24 degree C), egg developmental periods did not differ significantly between species, but nymphal E. aclys developed faster than nymphal E. bistrata. Under controlled, cool fluctuating temperatures (11-21 degrees C; average = 16 degrees C), eggs and nymphs of E. aclys developed more quickly than those of E. bistrata. E. aclys and E. bistrata did not have statistically different pre-ovipositional periods, ovipositional periods, fecundities, or average daily ovipositional rates. Pre-ovipositional periods were longer in the first generation for both species. Both species exhibited a similar significant density-dependent response in a competition study. Fewer progeny were produced per female as density in a cage increased. There were no differences between species in the number of progeny produced whether caged as mixed or single species. Interspecific competition did not affect either species to a greater degree than did intraspecific competition. Shorter developmental requirements of E. aclys and its early-season ovipositional pattern may maintain this species as the numerically dominant of the two Erythroneura species at the primary study site on the University of Kentucky campus. Environmental entomology. Feb 1989. v. 18. p. 127-132. Includes references. (NAL Call No.: DNAL QL461.E532).

1386

Developments in commercially produced microbials at Biochem Products.
XGNEA. Lublinkhof, J. Ross, D.H. Broomall, Pa. : The Station. USDA Forest Service general technical report NE - United States, Northeastern Forest Experiment Station. Paper presented at the "Symposium: Microbial Control of Spruce Budworms and Gypsy Moths," April 10-12, 1984, Windsor Locks, CT. 1985. (100). p. 137. (NAL Call No.: DNAL aSD11.U56).

1387

Diagnosing injury to eastern forest trees a manual for identifying damage caused by air pollution, pathogens, insects, and abiotic stresses /National Acid Precipitation Assessment Program, Forest Response Program, National Vegetation Survey Research Cooperative.
University Park, Penn. : Agricultural Information Service, College of Agriculture and the Dept. of Plant Pathology, Pennsylvania State University for USDA-Forest Service , 1987. "Published under a cooperative agreement with the United States Department of Agriculture-Forest Service, Forest Pest Management, Atlanta, Georgia, and The Pennsylvania State University, College of Agriculture, Department of Plant Pathology, University Park, Pennsylvania.". vii, 122 p. : col. ill. ; 28 cm. Bibliography: p. 121. (NAL Call No.: DNAL SB762.D43).

1388

Differential susceptibility of Toumeyella pini (King) (Homoptera: Coccidae) to pyrethroid and organophosphate insecticides: a factor in outbreaks in southern pine seed orchards.
JEENAI. Clarke, S.R. Debarr, G.L.; Berisford, C.W. College Park, Md. : Entomological Society of America. Contact toxicities of nine insecticides (four organophosphorous insecticides and five pyrethroids) were tested on crawlers of a striped pine scale, Toumeyella pini (King). Organophosphorous insecticides were more toxic than pyrethroids. Chlorpyrifos was the most toxic, and fenvalerate was the least toxic. Residual tests showed that the pyrethroid esfenvalerate lost its toxic effects at a slightly faster rate than the organophosphorous insecticide azinphos-methyl. Low toxicity of the pyrethroids to crawlers may be partially responsible for the rapid build-up of T. pini in southern pine seed orchards. Journal of economic entomology. Oct 1988. v. 81 (5). p. 1443-1445. Includes references. (NAL Call No.: DNAL 421 J822).

1389

Direct control of insect defoliation in oak stands is economically feasible in preventing timber value loss.
XFGTA. Hicks, R.R. Jr. Riddle, K.S.; Brock, S.M. St. Paul, Minn. : The Station. USDA Forest Service general technical report NC - North Central Forest Experiment Station. Paper presented at the Seventh Central Hardwood Forest Conference, Mar 5-8, 1989, Carbondale, Illinois. 1989. (132). p. 86-94. maps. Includes references. (NAL Call No.: DNAL aSD11.A352).

1390

Dispersal of second-instar western spruce budworm above and below forest canopies in western Montana.
XFINA. Carlson, C.E. McCarthy, G.J. Ogden, Utah : The Station. Research note INT - U.S. Department of Agriculture, Forest Service, Intermountain Research Station. June 1989. (388). 6 p. ill. Includes references. (NAL Call No.: DNAL A99.9 F764UN).

1391

Distribution and abundance of early instar gypsy moth (Lepidoptera: Lymantriidae) in forests during day and night.
EVETEX. Ticehurst, M. Yendol, W. Lanham, Md. : Entomological Society of America. Studies were conducted to determine the distribution and abundance of early instar gypsy moth, Lymantria dispar (L.), within canopies of codominant Quercus rubra L., Q. alba L., and Q. prinus L. in moderate and dense populations during the day; and to compare the distribution and abundance of early instar gypsy moth within canopies of Q. rubra trees, saplings, and seedlings, and saplings of witch hazel, Hamamelis virginiana L., during day and night in a moderate population. Most larvae were observed in the lower canopy of codominant trees in all sites during the day. Variation associated with tree species was not significant at any site. Larval abundance was highly correlated, r(2) = 0.992, with preseason egg mass density. No differences in larval abundance or distribution were detected during day and night. More than 80% fo all larvae were observed in the lower canopy, understory, and forest floor day and night. The most larvae per 1,000 leaves were detected on seedlings and the least in the upper canopy of codominant trees. The target for the aerial application of insecticides and release of parasitoids occupies a lower vertical position in the forest than was previously thought.
Environmental entomology. June 1989. v. 18 (3). p. 459-464. Includes references. (NAL Call No.: DNAL QL461.E532).

1392

Distribution and dynamics of aphid (Homoptera: Drepanosiphidae) populations on Betula pendula in northern California.
HILGA. Hajek, A.E. Dahlsten, D.L. Berkeley, Calif. : California Agricultural Experiment Station. Hilgardia : a journal of agricultural science. Feb 1988. v. 56 (1). p. 1-33. (NAL Call No.: DNAL 100 C12H).

1393

Distribution and habitats of the formosan subterranean termite (Isoptera: Rhinotermitidae) in South Carolina.
JEENAI. Chambers, D.M. Zungoli, P.A.; Hill, H.S. Jr. Lanham, Md. : Entomological Society of America. Journal of economic entomology. Dec 1988. v. 81 (6). p. 1611-1619. Includes references. (NAL Call No.: DNAL 421 J822).

1394

Distribution and parasitism of winter moth, Operophtera brumata (Lepidoptera: Geometridae), in western Oregon.
EVETEX. Kimberling, D.N. Miller, J.C.; Penrose, R.L. College Park, Md. : Entomological Society of America. Environmental entomology. Oct 1986. v. 15 (5). p. 1042-1046. Includes references. (NAL Call No.: DNAL QL461.E532).

1395

Distribution of arsenic in lodgepole pines treated with MSMA.
Maclauchlan, L.E. Borden, J.H.; D'Auria, J.M. Bethesda, Md. : Society of American Foresters. Western journal of applied forestry. Apr 1988. v. 3 (2). p. 37-40. Includes references. (NAL Call No.: DNAL SD388.W6).

1396

Distribution of arsenic in MSMA-treated lodgepole pines infested by the mountain pine beetle, Dendroctonus ponderosae (Coleoptera: Scolytidae), and its relationship to beetle mortality.
JEENAI. Maclauchlan, L.E. Borden, J.H.; D'Auria, J.M.; Wheeler, L.A. Lanham, Md. : Entomological Society of America. The LC50 of MSMA (monosodium methanearsonate) for first- and second-instar mountain pine beetle (MPB), Dendroctonus ponderosae Hopkins, mining for 4 d in ground phloem tissue impregnated with methane arsonic acid, the pure form of arsenic in MSMA, was 102 ppm. Application of MSMA 3 wk after attack to axe-frills (cuts) near the root collar of five lodgepole pines, Pinus contorta var. latifolia Engelmann, resulted in high accumulations of arsenic in phloem and sapwood near the point of application and in foliage 11 wk later. MPB taken from bolts cut from MSMA-treated trees 1 m above the axe-frill were all dead. There was a strong relationship between amounts of arsenic in MPB and those in phloem tissue up to 2 m. At sampling points above 2 m on treated trees, arsenic residues in phloem and sapwood were, on average, not significantly different from those occurring naturally in tissues of lodgepole pine. Enough arsenic could have passed through the tissues to kill or inhibit the brood MPB within the trees, but MPB mortality was probably due to an interaction of many factors including moisture deficit and fungal invasion of the host tree.
Journal of economic entomology. Feb 1988. v. 81

(1). p. 274-280. ill. Includes references. (NAL Call No.: DNAL 421 J822).

1397

Does foliage damage influence predation on the insect herbivores of birch?.
ECOLA. Bergelson, J.M. Lawton, J.H. Tempe, Ariz : Ecological Society of America. Ecology : a publication of the Ecological Society of America. Apr 1988. v. 69 (2). p. 434-445. ill. Includes references. (NAL Call No.: DNAL 410 EC7).

1398

Does verbenone reduce mountain pine beetle attacks in susceptible stands of ponderosa pine?.
XARRA. Bentz, B. Lister, C.K.; Schmid, J.M.; Mata, S.A.; Rasmussen, L.A.; Haneman, D. Fort Collins, Colo. : The Station. Research note RM - U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. Includes statistical data. Oct 1989. (495). 4 p. Includes references. (NAL Call No.: DNAL A99.9 F7632US).

1399

Don't move gypsy moth.
Washington, D.C. : The Department. Program aid - United States Department of Agriculture. July 1985. (1329,slightly rev.). 11 p. ill., maps. (NAL Call No.: DNAL 1 AG84PRO).

1400

The Douglas-fir tussock moth in the interior pacific northwest.
Mason, R.R. Wickman, B.E. New York : Plenum Press, c1988. Dynamics of forest insect populations : patterns, causes, implications / edited by Alan A. Berryman. Literature review. p. 179-209. ill., maps. Includes references. (NAL Call No.: DNAL SB761.D96).

1401

Douglas-fir tussock moth in the Western United States.
Washington, D.C. : The Department. Program aid - United States Department of Agriculture. Dec 1987. (1401). 8 p. ill. (NAL Call No.: DNAL 1 AG84PRO).

1402

Draft environmental impact statement for the suppression of the Southern pine beetle, Southern region /U.S. Dept. of Agriculture, Forest Service, Southern Region ; responsible official: R. Max Peterson. --.
Peterson, R. Max. Atlanta, Ga. : The Region, 1986. Title on spine: DEIS for the suppression of the SPB - Southern region.~ "July 1986"--cover. ca. 600 p. in various pagings : ill., maps ; 28 cm. Includes bibliographies. (NAL Call No.: DNAL aSB945.S635D7).

1403

Droplet deposit from aerial applications of different pesticide formulations.
XGNEA. Sundaram, A. Sundaram, K.M.S.; Cadogan, B.L. Broomall, Pa. : The Station. USDA Forest Service general technical report NE - United States, Northeastern Forest Experiment Station. Paper presented at the "Conference on Spruce-Fir Management and Spruce Budworm", April 24/26, 1984, Burlington, Vermont. 1985. (99). p. 121-126. Includes references. (NAL Call No.: DNAL aSD11.U56).

1404

The Dutch elm disease.
McDaniel, M.C. Jones, B.F.; Tainter, F.H. Little Rock, Ark. : The Service. Leaflet EL - Arkansas University, Cooperative Extension Service. Apr 1987. (467). 8 p. ill. (NAL Call No.: DNAL 275.29 AR4LE).

1405

Dynamics of forest insect populations patterns. causes, implications /edited by Alan A. Berryman.
Berryman, A. A._1937-. New York : Plenum Press, c1988. xx, 603 p. : ill. ; 26 cm. Includes bibliographies and indexes. (NAL Call No.: DNAL SB761.D96).

1406

Early impact and control of aphid (Chaitophorus populicola Thomas) infestations on young cottonwood plantations in the Mississippi Delta.
XFNSA. Solomon, J.D. New Orleans, La. : The Station. U.S. Forest Service research note SO - United States, Southern Forest Experiment Station. Aug 1986. (326). 4 p. ill. Includes references. (NAL Call No.: DNAL A99.9 F7628U).

1407

Effect of aerial application of racemic disparlure on male trap catch and female mating success of gypsy moth (Lepidoptera: Lymantriidae).
JEENAI. Webb, R.E. Tatman, K.M.; Leonhardt, B.A.; Plimmer, J.R.; Boyd, V.K.; Bystrak, P.G.; Schwalbe, C.P.; Douglass, L.W. Lanham, Md. : Entomological Society of America. Studies were conducted in Cecil County, Md., during the summer of 1980 using racemic disparlure to disrupt mating communication of the gypsy moth, Lymantria dispar (L.). A laminated plastic flake formulation of racemic disparlure was applied aerially at rates of 0, 7.5, 30, or 75 g (AI)/ha to replicated 16-ha forest plots. Significant decreases in male trap catch and in mating success for three different female types (lab females from a laboratory colony , wild females pupae obtained from the field, adults emerged in the laboratory, then replaced in the field , and natural females occurring naturally in the test plot) were observed with increasing disruptant dose. Although degree of mating success was highly correlated for all three female types, differences among female types in slope, intercept, and linear and quadratic relationships were observed. Generally, plots having higher populations (as measured by larval counts) among replicate plots for each dose also had increased mating for all female types. The flake formulation was easily applied and provided season-long mating disruption. Journal of economic entomology. Feb 1988. v. 81 (1). p. 268-273. Includes references. (NAL Call No.: DNAL 421 J822).

1408

Effect of aerial spraying with Dimilin, Dipel, or Gypchek on two natural enemies of the gypsy moth (Lepidoptera: Lymantriidae).
JEENAI. Webb, R.E. Shapiro, M.; Podgwaite, J.D.; Reardon, R.C.; Tatman, K.M.; Venables, L.; Kolodny-Hirsch, D.M. Lanham, Md. : Entomological Society of America. The effects of three aerially applied insecticides on the incidence of two components of the natural enemy complex of the gypsy moth, Lymantria dispar (L.), were evaluated for the 1987 year of application. Application of Gypchek, a registered formulation of the gypsy moth nuclear polyhedrosis virus (NPV), initiated a large early-season (fist-wave) epizootic of NPV; late-season NPV (second-wave) levels were higher in plots treated with Gypchek than in control plots, but not significantly so, whereas levels of the parasitoid Cotesia melanoscela (Ratzeburg) were significantly reduced in Gypchek-treated plots compared with control plots. Application of Dipel (Bacillus thuringiensis Berliner) resulted in a significant increase in numbers of C. melanoscela. Application of either Dipel or Dimilin (diflubenzuron) resulted in a significant decrease in incidence of NPV compared with control plots. Numbers of C. melanoscela in plots treated with Dimilin were not significantly different from those detected in control plots. Journal of economic entomology. Dec 1989. v. 82 (6). p. 1695-1701. Includes references. (NAL Call No.: DNAL 421 J822).

1409

Effect of burlap bands on between-tree movement of late-instar gypsy moth, Lymantria dispar (Lepidoptera: Lymantriidae).
EVETEX. Liebhold, A.M. Elkinton, J.S.; Wallner, W.E. College Park, Md. : Entomological Society of America. Environmental entomology. Apr 1986. v. 15 (2). p. 373-379. Includes references. (NAL Call No.: DNAL QL461.E532).

1410

Effect of constant- and variable-humidity and temperature regimes on the survival and developmental periods of Oligonychus ununguis (Acarina: Tetranychidae) and Neoseiulus fallacis (Acarina: Phytoseiidae).
EVETEX. Kramer, D.A. Hain, F.P. Lanham, Md. : Entomological Society of America. This study focused on the effects of constant- and variable-humidity and temperature regimes on the developmental periods of the spruce spider mite, Oligonychus ununguis (Jacobi), and a predator of this mite, Neoseiulus fallacis (Garman). Variable-humidity regimes, either alone or with variable-temperature regimes, had no significant effect on the developmental period of the immature stages of O. ununguis. Survival was marginally decreased under variable-temperature regimes. Temperature was the overriding influence for development of this mite. Developmental periods of N. fallacis immatures, however, were markedly increased by the use of a constant-humidity regime with a constant-temperature regime. In addition, survival of the immatures was low under low constant-humidity regimes. The effects of a range of constant-humidity regimes over a range of constant-temperature regimes on the survival and developmental period of N. fallacis eggs also were studied. Humidity was found to have a statistically significant but biologically trivial effect on the egg developmental period at the lower temperatures. However, when the vapor pressure deficit was high, there was a significant relationship between egg survival and vapor pressure deficit. The data suggest that the meteorological conditions in the field during the hot, dry summer months may not support a large population of N. fallacis and thereby allow O. ununguis populations to build up during these months. Environmental entomology. Oct 1989. v. 18 (5). p. 741-746. Includes references. (NAL Call No.: DNAL QL461.E532).

1411

Effect of diflubenzuron on the canopy arthropod community in a central appalachian forest.
JEENAI. Martinat, P.J. Coffman, C.C.; Dodge, K.; Cooper, R.J.; Whitmore, R.C. Lanham, Md. : Entomological Society of America. Little is known of the effects of diflubenzuron on the

nontarget forest arthropod community. We hypothesized that the use of this compound in gypsy moth, Lymantria dispar (L.) (Lepidoptera: Lymantriidae), control may cause indiscriminate reduction of nontarget arthropods. This, in turn, might be an important loss of food for forest birds and small mammals. In a 2-yr replicated study we sampled canopy arthropods with pole pruners for up to 3 mo following application of diflubenzuron. Due to a strong trend over time and large between-tree variance in canopy arthropod abundance and taxonomic richness, intensive sampling was required to reveal the treatment effect. Besides reductions in gypsy moth larvae, significant reductions due to diflubenzuron application were found mainly in canopy macrolepidoptera and non-lepidopteran mandibulate herbivores. Sucking herbivorous insects, microlepidoptera, and predaceous arthropods were not affected. Journal of economic entomology. Feb 1988. v. 81 (1). p. 261-267. Includes references. (NAL Call No.: DNAL 421 J822).

1412

Effect of dosage and ratio of sex pheromone components on behavior of Chrysoteuchia topiaria (Zeller) (Lepidoptera: Pyralidae).
EVETEX. Kamm, J.A. McDonough, L.M.; Rowe, K.E. Lanham, Md. : Entomological Society of America. When the dosage of the primary pheromone component (Z)-11-hexedecenal (Z11-16:Al) of the cranberry girdler, Chrysoteuchia topiaria (Zeller), was varied from 0.03 to 10 mg in field tests, maximum catch was obtained at a dosage of less than 1 mg. When (Z)-9-hexadecenal (Z9-16:Al) was present at 0.3, 1, or 3% of Z11-16:Al, trap catch was proportional to the logarithm of the dosage over the same concentration range. The amount of Z9-16:Al that produced maximum trap catches within calculated confidence limits of each dosage ranged from 0.2 to 2.1% when the dosages of Z11-16:Al were 0.3, 1, 3, and 10 mg. Z9-16:Al at 1% always was included within the confidence limits of these dosages. The two higher dosages captured significantly more males than the two lower dosages, but trap catches were not significantly different between dosages of 0.3-1 and 3-10 mg. The reduced trap catch by Z11-16:Al alone for dosages above 1 mg was the result of the absence of an important pheromone component. In flight tunnel studies, Z11-16:Al induced limited plume-oriented flight (19% of tested males) at a dosage of 0.03 mg only, and males did not reach the source. The percentage of males exhibiting upwind flight in the plume increased dramatically when Z9-16:Al was present. At a dosage of 0.3 mg, upwind flight in the plume was 0% for the single component and 90% for the two components. Maximum upwind flight occurred at dosages from 0.03 to 3 mg and, as occurred in field tests, the Z9-16:Al at 1% of Z11-16:Al always was included within the calculated confidence limits for these dosages. The 3-mg dosage of Z11-16:Al reduced the number of males landing on the septa. Environmental entomology. June 1989. v. 18 (3). p. 368-372. Includes references. (NAL Call No.: DNAL QL461.E532).

1413

The effect of Erynia radicans on food consumption, utilization and fecundity by the spruce budworm, Choristoneura fumiferana.
XGNEA. Mohamed, A.K.A. Lewis, L.; Lewis, D. Broomall, Pa. : The Station. USDA Forest Service general technical report NE - United States, Northeastern Forest Experiment Station. Paper presented at the "Symposium: Microbial Control of Spruce Budworms and Gypsy Moths," April 10-12, 1984, Windsor Locks, CT. 1985. (100). p. 77-81. Includes references. (NAL Call No.: DNAL aSD11.U56).

1414

Effect of experience on the responses of the parasitoid Brachymeria intermedia (Hymenoptera: Chalcididae) to its host, Lymantria dispar (Lepidoptera: Lymantriidae), and to kairomone.
AESAAI. Carde, R.T. Lee, H.P. Lanham, Md. : The Society. Annals of the Entomological Society of America. Sept 1989. v. 82 (5). p. 653-657. ill. Includes references. (NAL Call No.: DNAL 420 EN82).

1415

Effect of height on responses of redheaded pine sawfly (Hymenoptera: Diprionidae) males to synthetic pheromone and virgin females.
EVETEX. Wilkinson, R.C. Chappelka, A.H. III; Kraemer, M.E.; Coppel, H.C.; Mastsumura, F. College Park, Md. : Entomological Society of America. Environmental entomology. Oct 1987. v. 16 (5). p. 1152-1156. Includes references. (NAL Call No.: DNAL QL461.E532).

1416

Effect of humidity and cold storage on diapause termination of hickory shuckworm larvae.
SENTD. Gunasena, G.H. Harris, M.K. College Station, Tex. : Southwestern Entomological Society. The Southwestern entomologist. Mar 1987. v. 12 (1). p. 24-31. Includes references. (NAL Call No.: DNAL QL461.S65).

1417

Effect of juvenile hormone analog, fenoxycarb, on pheromone production by Ips paraconfusus (Coleoptera: Scolytidae).
JCECD. Chen, N.M. Borden, J.H.; Pierce, H.D. Jr. New York, N.Y. : Plenum Press. Journal of chemical ecology. Apr 1988. v. 14 (4). p. 1087-1098. Includes references. (NAL Call No.: DNAL QD415.A1J6).

1418

Effect of Nosema fumiferanae (Microsporida) on fecundity, fertility, and progeny performance of Choristoneura fumiferana (Lepidoptera: Tortricidae).
EVETEX. Bauer, L.S. Nordin, G.L. Lanham, Md. : Entomological Society of America. Female eastern spruce budworm, Choristoneura fumiferana (Clemens), inoculated sublethally as fourth or fifth instars with Nosema fumiferanae (Thomson), exhibited significant reductions in size, fecundity, and total egg complement. Mating success and egg fertility were similar for treated and control insects. The presence of disease improved the positive correlation between fecundity or total egg complement and female pupal weight without significantly reducing the slope. Total egg complement was negatively correlated with disease load. A subsample of progeny reared from each fertile mating indicates 100% transovarial transmission efficiency at the spore dosages provided. Diseased progeny experienced twice the larval mortality, and surviving individuals were approximately 25% smaller and took 17% longer to complete development than healthy progeny. Maternal disease load ws a significant, positive factor in percentage progeny mortality and male pupal weight. Environmental entomology. Apr 1989. v. 18 (2). p. 261-265. Includes references. (NAL Call No.: DNAL QL461.E532).

1419

Effect of pandora moth (Lepidoptera: Saturniidae) defoliation on growth of ponderosa pine in Arizona.
JEENAI. Miller, K.K. Wagner, M.R. Lanham, Md. : Entomological Society of America. Defoliation of ponderosa pine, Pinus ponderosa Douglas ex Lawson and Lawson, by the pandora moth, Coloradia pandora Blake, results in a significant reduction in basal area growth compared with undefoliated trees. A high proportion (83%) of heavily defoliated trees produced no growth in the year following defoliation. Heavily defoliated trees produced more growth than moderately defoliated trees one year after the last defoliation. Overall, tree growth is not related linearly to defoliation intensity. Journal of economic entomology. Dec 1989. v. 82 (6). p. 1682-1686. Includes references. (NAL Call No.: DNAL 421 J822).

1420

Effect of pine oil on landing and attack by the southern pine beetle (Coleoptera: Scolytidae).
JESCEP. O'Donnell, B.P. Payne, T.L.; Walsh, K.D. Tifton, Ga. : The Entomological Science Society. Journal of Entomological Science. Oct 1986. v. 21 (4). p. 319-321. (NAL Call No.: DNAL QL461.G4).

1421

Effect of pinewood nematode density on tethered flight of Monochamus carolinesis (Coleoptera: Cerambycidae).
EVETEX. Lanham, Md. : Entomological Society of America. Monochamus carolinensis (Olivier) beetles infested with the pinewood nematode, Bursaphelenchus xylophilus, were tethered and flown upon emergence from host logs. The mean (+/-SD) number of nematodes carried per beetle was, 7,933, (+/-16,997) with a mean flight time of 18.6 (+/-11.4) min. Larger beetles exhited longer flights and carried more nematodes. The density of nematodes in the beetle had a slight negative influence on flight capability. The sex of the beetle had no effect on flight duration or the number of nematodes carried. Environmental entomology. Aug 1989. v. 18 (4). p. 670-673. Includes references. (NAL Call No.: DNAL QL461.E532).

1422

Effect of plant resistance, competition, and enemies on a leaf-galling sawfly (Hymenoptera: Tenthredinidae).
EVETEX. Clancy, K.M. Price, P.W. Lanham, Md. : Entomological Society of America. The relative importance of three sources of larval mortality (host plant resistance, intraspecific competition, and natural enemies) was evaluated for a population of leaf-galling sawflies, Pontania sp., near P. pacifica Marlatt, on arroyo willow, Salix lasiolepis Bentham, at a site in Flagstaff, Ariz., from 1981 to 1984. The ratio of the percentage of sawfly larvae killed by natural enemies to the percentage lost to host plant defenses (i.e., abortion, defined as an aborted formation of a gall resulting from death of the egg or small larva) was 1.53:1. Mortality from abortion was divided into a host plant resistance component (constitutive abortion, e.g., a plant resistance factor preventing establishment of the egg or small larva) and an intraspecific competition-mediated component (because abortion increased as within-leaf gall densities rose). Natural enemies caused twice as much mortality as plant resistance and 6.36 times greater mortality than intraspecific competition. These results support the hypothesis that third-trophic-level effects exert a stronger selective pressure on many insect populations than competition for limiting resources. There was evidence that intraspecific competition for limiting food resources occurred for these Pontania sp. sawflies; increased within-leaf gall densities had a density-denpendent, linear, negative effect on gall size, and consequently, on larval boimass because sawfly size was positively correlated with gall size. However, only about 3% of the variation in gall size was explained by within-leaf gall density. Thus, gall (and larval) size were only weakly affected by intraspecific competition. Environmental entomology. Apr 1989. v. 18 (2). p. 284-290. Includes references. (NAL Call No DNAL QL461.E532).

1423

Effect of prey density on diurnal activity and ovarian development in Calosoma calidum (Coleoptera: Carabidae): implications for biological control of the gypsy moth, Lymantria dispar (Lepidoptera: Lymantriidae) in the Midwest.
GRLEA. Jeffords, M.R. Case L.J. East Lansing, Mich. : Michigan Entomological Society. The Great Lakes entomologist. Summer 1987. v. 20 (2). p. 93-97. Includes references. (NAL Call No.: DNAL QL461.M5).

1424

Effect of selected chemicals on non-suberized impervious tissue (NIT) formation in Fraser fir.
GENSAB. Arthur, F.H. Hain, F.P. Tifton, Ga. : The Society. Journal of Entomological Science. July 1985. v. 20 (3). p. 305-311. Includes references. (NAL Call No.: DNAL QL461.G4).

1425

Effect of simulated insect damage on growth and survival of northern red oak (Quercus rubra L.) seedlings.
EVETEX. Wright, S.L. Hall, R.W.; Peacock, J.W. Lanham, Md. : Entomological Society of America. Effects of simulated insect damage--artifical defoliation and root damage in combination with two levels of watering--were studied to determine the potential effect on northern red oak seedlings (Quercus rubra L.). Treatments and treatment combinations caused significant differences in stem diameter, percentage of stem dieback, and mortality. Defoliation and a regime of decreased watering seemed to have the greatest effect on seedling growth and mortality. Root injury had no consistent direct effect, but interacted significantly with other factors. Insect damage to foliage and roots, together with water stress, may be a factor in poor survival of oak seedlings under field conditions. Environmental entomology. Apr 1989. v. 18 (2). p. 235-239. Includes references. (NAL Call No.: DNAL QL461.E532).

1426

Effect of Taxus foliage and extract on the toxicity of some pyrethroid insecticides to adult black vine weevil (Coleoptera: Curculionidae).
JEENAI. Shanks, C.H. Jr. Chamberlain, J.D. Lanham, Md. : Entomological Society of America. The pyrethroid insecticides fenvalerate, permethrin, and fluvalinate were more toxic to adult black vine weevil; Otiorhynchus sulcatus (F.), on yew, Taxus media Rehder, foliage rather than on leaves of strawberry, Fragaria X ananasssa Duchesne, or cranberry, Vaccinium macrocarpon Ait. Feeding weevils untreated yew foliage or an ethanolic extract of yew needles for 24 h before placing them on fenvalerate-treated strawberry leaves greatly increased knockdown. Host plant species must be considered when pyrethroids are used for control of adult black vine weevil. Journal of economic entomology. Feb 1988. v. 81 (1). p. 98-101. Includes references. (NAL Call No.: DNAL 421 J822).

1427

Effect of thinning damage on bark beetle susceptibility indicators in loblolly pine.
Blanche, C.A. Nebeker, T.E.; Hodges, J.D.; Karr, B.L.; Schmitt, J.J. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Third Biennial Southern Silvicultural Research Conference," November 7/8, 1984, Atlanta, Georgia. Apr 1985. (54). p. 471-479. Includes references. (NAL Call No.: DNAL aSD11.U57).

1428

Effect of two insecticides on abundance of insect families associated with Siberian elm windbreaks.
JKESA. Frye, R.D. Dix, M.E.; Carey, D.R. Lawrence, Kan. : The Society. Journal of the Kansas Entomological Society. July 1988. v. 61 (3). p. 278-284. Includes references. (NAL Call No.: DNAL 420 K13).

1429

Effect of verbenone on response of Dendroctonus brevicomis to exo-brevicomin, frontalin, and myrcene.
JCECD. Tilden, P.E. Bedard, W.D. New York, N.Y. : Plenum Press. Journal of chemical ecology. Jan 1988. v. 14 (1). p. 113-122. Includes references. (NAL Call No.: DNAL QD415.A1J6).

1430

Effect of within-leaf density and leaf size on pupal weight of a leaf-miner, Cameraria (Lepidoptera: Gracillariidae).
SWNAA. Bultman, T.L. Faeth, S.H. Austin : Southwestern Association of Naturalists. The Southwestern naturalist. May 22, 1986. v. 31 (2). p. 201-206. Includes references. (NAL Call No.: DNAL 409.6 S08).

1431

Effective residual life of carbaryl for protecting ponderosa pine from attack by the western pine beetle (Coleoptera: Scolytidae).
JEENAI. Haverty, M.I. Shea, P.J.; Hall, R.W. College Park, Md. : Entomological Society of America. Journal of economic entomology. Feb 1985. v. 78 (1). p. 197-199. Includes references. (NAL Call No.: DNAL 421 J822).

1432

Effectiveness of carbaryl and acephate in reducing damage by Petrova metallica (Busck) (Lepidoptera:Tortricidae) in ponderosa pine windbreaks.
XARRA. Dix, M.E. Fort Collins, Colo. : The Station. USDA Forest Service research note RM - United States, Rocky Mountain Forest and Range Experiment Station. Oct 1985. (458). 3 p. Includes references. (NAL Call No.: DNAL A99.9 F7632US).

1433

Effects of a nuclear polyhedrosis virus isolate from Malacosoma disstria on Lymantria dispar larval growth pattern.
JIVPA. Stairs, G.R. Duluth, Minn. : Academic Press. Journal of invertebrate pathology. Mar 1989. v. 53 (2). p. 247-250. Includes references. (NAL Call No.: DNAL 421 J826).

1434

Effects of abamectin and milbemycin D on gypsy moth (Lepidoptera: Lymantriidae).
JEENAI. Deecher, D.C. Brezner, J.; Tanenbaum, S.W. Lanham, Md. : Entomological Society of America. Effects of abamectin and milbemycin D on gypsy moth, Lymantria dispar L., were determined. Fifty percent of third instars exposed for 2 h to 5.2 ppm milbemycin D on artificial diet were flaccid and paralyzed, whereas larvae exposed to 5.0 ppm abamectin were unaffected. When larvae were exposed to abamectin on artificial diet for 24 or 48 h, 50% of third instars died. Larvae exposed for 24 h to milbemycin D were not affected, but at 48 h 165 ppm caused 50% mortality of third instars. When larvae were exposed to milbemycin D residues for 48 h and observed 5 d later, the LC50 was 92 ppm. LC50's (ppm) when larvae were exposed for 72 h to residues on poplar foliage were 4 for abamectin, 1,454 for milbemycin D, and 125 for carbaryl. Five days after exposure to foliage residues, LC50's (ppm) were 1 for abamectin, 244 for milbemycin D and 106 for carbaryl. On both substrates, abamectin was most toxic to third instars. Larvae exposed for 2 h to milbemycin D residues were flaccid and paralyzed but the effect was reversible. Journal of economic entomology. Oct 1989. v. 82 (5). p. 1395-1398. Includes references. (NAL Call No.: DNAL 421 J822).

1435

Effects of aerial detection schedules on the age of southern pine beetle infestations.
FOSCA. De Steiguer, J.E. Hedden, R.L. Bethesda, Md. : Society of American Foresters. Forest science. Mar 1988. v. 34 (1). p. 229-235. Includes references. (NAL Call No.: DNAL 99.8 F7632).

1436

Effects of Bacillus thuringiensis on parasites of western spruce budworm (Lepidoptera: Tortricidae).
JEENAI. Niwa, C.G. Stelzer, M.J.; Beckwith, R.C. College Park, Md. : Entomological Society of America. Journal of economic entomology. Aug 1987. v. 80 (4). p. 750-753. Includes references. (NAL Call No.: DNAL 421 J822).

1437

Effects of Bacillus thuringiensis treatments on the occurrence of nuclear polyhedrosis virus in gypsy moth (Lepidoptera: Lymantriidae) populations.
JEENAI. Woods, S.A. Elkinton, J.S.; Shapiro, M. Lanham, Md. : Entomological Society of America. Journal of economic entomology. Dec 1988. v. 81 (6). p. 1706-1714. Includes references. (NAL Call No.: DNAL 421 J822).

1438

Effects of birds on spruce budworm populations - a progress report.
Crawford, H.S. Jennings, D.T. Orono, Me. : The Station. Miscellaneous publication - University of Maine, Agricultural Experiment Station. Paper presented at the "Joint Conference of New England Chapter of the Society of American Foresters, Maine Chapter of the Wildlife Society, Atlantic International Chapter of the American Fisheries Society," March 6-8, 1985, Portland, Maine. Apr 1986. (689). p. 315-321. Includes references. (NAL Call No.: DNAL 100 M28S (2)).

1439

Effects of defoliation by the western false hemlock looper on Douglas-fir tree-ring chronologies.
TRBUA. Alfaro, R.I. MacDonald, R.N. Tucson, Ariz. : Tree-Ring Society. Tree-ring bulletin. 1988. v. 48. p. 3-11. Includes references. (NAL Call No.: DNAL 99.8 T713).

1440

Effects of Dimilin on diversity and abundance of forest birds.
Stribling, H.L. Smith, H.R. Bethesda, Md. : Society of American Foresters. Northern journal of applied forestry. Mar 1987. v. 4 (1). p. 37-38. Includes references. (NAL Call No.: DNAL SD143.N6).

1441

Effects of drainage and severe defoliation on the rawfiber content of balsam fir needles and growth of the spruce budworm (Lepidoptera: Tortricidae).
EVETEX. Bauce, E. Hardy, Y. College Park, Md. : Entomological Society of America. Analysis of rawfiber content of balsam fir, Abies balsamea (L.) Miller, needles in conjunction with laboratory-reared larvae of spruce budworm, Choristoneura fumiferana (Clemens), during the 1985 growing season indicated significant variations in the quality of food available for consumption by the insect. Two consecutive years of defoliation as well as poor drainage were directly related to higher rawfiber content of the current year's foliage which, in turn, caused a decrease in pupal weight, larval development rate, and survival. Environmental entomology. Aug 1988. v. 17 (4). p. 671-674. Includes references. (NAL Call No.: DNAL QL461.E532).

1442

Effects of food, temperature, and breeding conditions on the life span of adults of three cohabitating bark beetle (Scolytidae) parasitoids (Hymenoptera).
EVETEX. Mendel, Z. College Park, Md. : Entomological Society of America. The study deals with the adult life span of three hymenopterous parasitoids of bark beetles (Scolytidae)--Dendrosoter caenopachoides Ruschka, D. protuberans Nees (Braconidae), and Metacolus unifasciatus Foerster (Pteromalidae)--investigated under three temperature and two nutrition treatments. Longevity decreased significantly with increasing temperature and absence of carbohydrate in the diet. Regardless of species, life span was about 2 mo with honey plus water at 18 degrees C compared with 20-30 d at 30 degrees C; with water only, the life span was 15-30 d at 18 degrees C and dropped to about 4-8 d at 30 degrees C. Longevity was significantly related to body length of males and females of all tested species when kept on water, but usually not when honey was available. Marked differences between longevities in the same species were attributed to breeding conditions (i.e., differences in host size of parasitoids reared from scolytids of different size). Ecological and silvicultural implications of the findings are discussed. It is suggested that an increase in tree species diversity in the stands might have diversified and increased food sources for adult parasitoids. Environmental entomology. Apr 1988. v. 17 (2). p. 293-298. Includes references. (NAL Call No.: DNAL QL461.E532).

1443

Effects of frontalure in suppressing southern pine beetle spot growth under endemic and epidemic population levels.
Payne, T.L. Kudon, L.H.; Berisford, C.W.; O'Donnell, B.P.; Walsh, D.K. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 281-285. ill. Includes references. (NAL Call No.: DNAL aSD11.U57).

1444

Effects of grand fir monoterpenes on the fir engraver, Scolytus ventralis (Coleoptera: Scolytidae), and its symbiotic fungus.
EVETEX. Raffa, K.F. Berryman, A.A.; Simasko, J.; Teal, W.; Wong, B.L. College Park, Md. : Entomological Society of America. Environmental entomology. Oct 1985. v. 14 (5). p. 552-556. Includes references. (NAL Call No.: DNAL QL461.E532).

1445

Effects of insecticides on forest structure.
Trial, H. Jr. Orono, Me. : The Station. Miscellaneous publication - University of Maine, Agricultural Experiment Station. Paper presented at the "Joint Conference of New England Chapter of the Society of American Foresters, Maine Chapter of the Wildlife Society, Atlantic International Chapter of the American Fisheries Society," March 6-8, 1985, Portland, Maine. Apr 1986. (689). p. 309-314. Includes references. (NAL Call No.: DNAL 100 M28S (2)).

1446

Effects of intertrap distance and wind direction on the interaction of gypsy moth (Lepidoptera: Lymantriidae) pheromone-baited traps.
EVETEX. Elkinton, J.S. Carde, R.T. Lanham, Md. : Entomological Society of America. More male gypsy moths, Lymantria dispar L., were captured in traps at the perimeter compared with traps at the center of a 6- X -6 grid of pheromone traps spaced every 80 m. Additional tests demonstrated suppression of catch at the center of hexagonal arrays of traps with intertrap distances ranging from 2.5 to 40 m. In a hexagonal array of traps spaced every 20 m and monitored every 1-3 h, more males were captured in upwind and downwind traps than in crosswind or central traps. Environmental entomology. Oct 1988. v. 17 (5). p. 764-769. Includes references. (NAL Call No.: DNAL QL461.E532).

1447

Effects of light on location of host egg masses by Ooencyrtus kuvanae (Hymenoptera: Encyrtidae), an egg parasite of gypsy moth (Lepidoptera: Lymantriidae).
EVETEX. Odell, T.M. Chang, P.Y.; Walton, G.S. Lanham, Md. : Entomological Society of America. The effect of light on host finding and parasitism by Ooencyrtus kuvanae (Howard), an egg parasitoid of gypsy moth, Lymantria dispar L., was studied in the laboratory. Parasitism by O. kuvanae females confined in light or dark cylinders was not significantly different. When parasites were given a choice between light or dark chambers, significantly more chose the light chamber regardless of the presence or absence of an egg mass. However, chambers were significantly more attractive when they contained an egg mass, indicating that an egg mass contributes to host location over short distances. Parasitism of egg masses in dark chambers in which no O. kuvanae were found demonstrates that the parasite may leave these sites after oviposition. Implications for success of O. kuvanae in low-density gypsy moth populations are discussed. Environmental entomology. Dec 1989. v. 18 (6). p. 1101-1104. Includes references. (NAL Call No.: DNAL QL461.E532).

1448

Effects of microwave treatment of live oak acorns on germination and on Curculio sp. (Coleoptera: Curculionidae) larvae.
JEENAI. Crocker, R.L. Morgan, D.L.; Longnecker, M.T. College Park, Md. : Entomological Society of America. Journal of economic entomology. Aug 1987. v. 80 (4). p. 916-920. Includes references. (NAL Call No.: DNAL 421 J822).

1449

Effects of moisture before and after laboratory spray application of insecticides to western spruce budworm (Lepidoptera: Tortricidae).
JEENAI. Robertson, J.L. Preisler, H.K. Lanham, Md. : Entomological Society of America. Journal of economic entomology. Dec 1988. v. 81 (6). p. 1678-1680. Includes references. (NAL Call No.: DNAL 421 J822).

1450

Effects of mycangial fungi on gallery construction and distribution of bluestain in southern pine beetle-infested pine bolts.
GENSAB. Bridges, J.R. Perry, T.J. Tifton, Ga. : The Society. Journal of Entomological Science. Apr 1985. v. 20 (2). p. 271-275. ill. Includes references. (NAL Call No.: DNAL QL461.G4).

1451

Effects of outbreaks and management responses on big game and other wildlife.
XGTIA. Light, J.T. Burbridge, W.B. Ogden, Utah : The Station. USDA Forest Service general technical report INT - Intermountain Forest and Range Experiment Station. Apr 1985. (174). p. 37-43. ill. (NAL Call No.: DNAL aSD11.A48).

1452

Effects of previous stand management of mortality following gypsy moth defoliation.
XFGTA. Gottschalk, K.W. St. Paul, Minn. : The Station. USDA Forest Service general technical report NC - North Central Forest Experiment Station. Paper presented at the Seventh Central Hardwood Forest Conference, Mar 5-8, 1989, Carbondale, Illinois. 1989. (132). p. 296. (NAL Call No.: DNAL aSD11.A352).

1453

Effects of previous stand management on mortality following gypsy moth defoliation: preliminary results.
Gottschalk, K.W. New Orleans, La. : The Station. General technical report SO - U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. Paper presented at the Fifth Biennial Southern Silvicultural Research Conference, Nov 1-3, 1988, Memphis, Tennessee. 1989. (74). p. 573-578. Includes references. (NAL Call No.: DNAL aSD11.U57).

1454

Effects of short-term phenological changes in leaf suitability on the survivorship, growth, and development of gypsy moth (Lepidoptera: Lymantriidae) larvae.
EVETEX. Raupp, M.J. Werren, J.H.; Sadof, C.S. College Park, Md. : Entomological Society of America. In this report we examine the effects of short-term phenological changes in host suitability on the performance of gypsy moth, Lymantria dispar (L.), larvae. The time frame examined was a 2-wk period during which most gypsy moth larvae hatch and feed in central Maryland. Oak supported high levels of survivorship for almost 2 wk, and beech remained suitable for young larvae for less than 1 wk; hickory and maple were intermediate. Larvae did not respond uniformly to chronological changes in foliage when fed leaves from different tree species. When fed oak, larvae tended to develop more slowly as the season progressed. This trend was less important for hickory. Also, differences in pupal weight were observed for female larvae fed different hosts--oak produced pupae of greater weight; this trend was less pronounced for male larvae. Phenological differences in host suitability may help explain associations of gypsy moth with particular tree species that are commonly observed in the field.

Environmental entomology. Apr 1988. v. 17 (2). p. 316-319. Includes references. (NAL Call No.: DNAL QL461.E532).

1455

Effects of silvicultural practice on bird predation.
XGNEA. Crawford, H.S. Broomall, Pa. : The Station. USDA Forest Service general technical report NE - United States, Northeastern Forest Experiment Station. Paper presented at the "Conference on Spruce-Fir Management and Spruce Budworm", April 24/26, 1984, Burlington, Vermont. 1985. (99). p. 173-175. Includes references. (NAL Call No.: DNAL aSD11.U56).

1456

Effects of simulated acid rain, ozone and sulfur dioxide on suitability of elms for elm leaf beetle.
JOARD. Hall, R.W. Barger, J.H.; Townsend, A.M. Urbana, Ill. : International Society of Arboriculture. Journal of arboriculture. Mar 1988. v. 14 (3). p. 61-66. ill. Includes references. (NAL Call No.: DNAL SB436.J6).

1457

Effects of slash pine phloem nutrition on the reproductive performance of Ips calligraphus (Coleoptera: Scolytidae).
EVETEX. Popp, M.P. Wilkinson, R.C.; Jokela, E.J.; Harding, R.B.; Phillips, T.W. Lanham, Md. : Entomological Society of America. The density of eggs laid per centimeter of gallery by laboratory-reared Ips calligraphus (Germar) females was determined following introduction into thin phloem bolts cut from 25-yr-old slash pine, Pinus elliotii Engelm. var. elliottii, that had been fertilized at the time of planting with a combination of nitrogen, phosphorus, and potassium, or phosphorus alone. Egg density was negatively correlated with female pronotal width (size) and positively correlated with the phloem phosphorus concentration. These two variables explained 64% of the variation in egg density. It is hypothesized that altering egg density in response to varying phloem nutrition represents a resource partitioning mechanism that reduces larval competition. These results also suggest that excessive phosphorus fertilization of slash pine on the Coastal Plain soils could contribute to a build-up in the beetle population without the added benefits of stand growth. Environmental entomology. Oct 1989. v. 18 (5). p. 795-799. Includes references. (NAL Call No.: DNAL QL461.E532).

1458

Effects of stand conditions on parasitoid dynamics.
XGNEA. Hanson, P.M. Broomall, Pa. : The Station. USDA Forest Service general technical report NE - United States, Northeastern Forest Experiment Station. Paper presented at the "Conference on Spruce-Fir Management and Spruce Budworm", April 24/26, 1984, Burlington, Vermont. 1985. (99). p. 177-183. Includes references. (NAL Call No.: DNAL aSD11.U56).

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Efficacy and economics of selected systemic insecticides for control of Phoracantha semipunctata (Coleoptera: Cerambycidae), a new pest in North America.
JEENAI. Ali, A.D. Garcia, J.M. College Park, Md. : Entomological Society of America. Journal of economic entomology. Aug 1988. v. 81 (4). p. 1124-1127. Includes references. (NAL Call No.: DNAL 421 J822).

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JOARD. Ball, J. Urbana, Ill. : International Society of Arboriculture. Journal of arboriculture. July 1987. v. 13 (7). p. 174-177. Includes references. (NAL Call No.: DNAL SB436.J6).

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Egg contamination as a method for the inoculative release of exotic microsporidia of the gypsy moth.
JIVPA. Jeffords, M.R. Maddox, J.V.; McManus, M.L.; Webb, R.E.; Wieber, A. Duluth, Minn. : Academic Press. Journal of invertebrate pathology. May 1988. v. 51 (3). p. 190-196. Includes references. (NAL Call No.: DNAL 421 J826).

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Electroantennogram responses by mountain pine beetles, Dendroctonus ponderosae Hopkins, exposed to selected semiochemicals.
JCECD. Whitehead, A.T. New York, N.Y. : Plenum Press. Journal of chemical ecology. July 1986. v. 12 (7). p. 1603-1621. Includes references. (NAL Call No.: DNAL QD415.A1J6).

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Elevated parasitism in artificially augmented populations of Lymantria dispar (Lepidoptera: Lymantriidae).
EVETEX. Liebhold, A.M. Elkinton, J.S. Lanham, Md. : Entomological Society of America. Within 1-ha plots, gypsy moth, Lymantria dispar L., densities were artificially elevated from low densities (about 20 egg masses/ha) to high densities (8,000 egg masses/ ha) using field-collected eggs and F1 sterile laboratory-reared eggs. At all sites, including the feral and sterile release areas, densities decreased to undetectable levels (less than 10 egg masses/ha). In the sterile and feral release areas, parasitism by Cotesia melanoscela (Ratzeburg) was the largest source of identified mortality and was significantly greater than in the surrounding area or in untreated plots. Within the feral release area, parasitism by Compsilura concinnata (Meigen) and Parasetigena silvestris (Robineau-Desvoidy) was substantial and was greater than in the surrounding area. This pattern was not observed in the sterile release area. This difference may have been caused by differences in gypsy moth phenologies between the two populations. Spatially density-dependent mortality caused by parasitoids is hypothesized to be important in the regulation of low-density populations. Furthermore, this mortality may have profound effects on attempts to suppress populations using releases of induced-inherited sterile insects. Environmental entomology. Dec 1989. v. 18 (6). p. 986-995. ill. Includes references. (NAL Call No.: DNAL QL461.E532).

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Lieutier, F. Berryman, A.A. New York : Springer-Verlag, c1988. Mechanisms of woody plant defences against insects : search for pattern / William J. Mattson, Jean Levieux, C. Bernard-Dagan, editors. p. 313-319. ill. Includes references. (NAL Call No.: DNAL SB761.M46).

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Endemic and epidemic populations of southern pine beetle: implications of the two-phase model for forest managers.
FOSCA. Mawby, W.D. Hain, F.P.; Doggett, C.A. Bethesda, Md. : Society of American Foresters. Typical of many Dendroctonus species, the southern pine beetle (D. frontalis Zimmerman) exhibits dramatic fluctuations in population levels. Using field observations of beetle damage, this study empirically demonstrates that a two-phase model described for mountain pine beetle (D. ponderosae Hopkins) is appropriate for southern pine beetle at each of five hierarchical levels: the tree, the local infestation, the county, the state, and the region. The model has three points that represent a stable low-level (endemic) phase maintained by host-tree-defensive capabilities, a transient high-level (epidemic) phase determined by the availability of host material, and a threshold between the two phases. The threshold depends on local environmental and biotic factors and is a rarely observed phenomenon. Implications of these results for southern pine beetle management and control are discussed. The necessity for establishing and maintaining control programs during the endemic phase is stressed. Forest science. Dec 1989. v. 35 (4). p. 1075-1087. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Sharpe, P.J.H. Wu, H.I.; Cates, R.G.; Coeschl, J.D. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 206-223. ill. Includes references. (NAL Call No.: DNAL aSD11.U57).

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Enhancement of baculovirus activity on gypsy moth (Lepidoptera: Lymantriidae) by chitinase.
JEENAI. Shapiro, M. Preisler, H.K.; Robertson, J.L. College Park, Md. : Entomological Society of America. Journal of economic entomology. Dec 1987. v. 80 (6). p. 1113-1116. Includes references. (NAL Call No.: DNAL 421 J822).

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Enhancement of baculovirus activity on gysp moth (Lepidoptera: Lymantriidae) by chitinase.
JEENAI. Shapiro, M. Preisler, H.K.; Robertson, J.L. Lanham, Md. : Entomological Society of America. Chitinase significantly enhanced the activity of nuclear polyhedrosis viruses (NPV) ingested by second-instar gypsy moth, Lymantria dispar (L.). Multiple probit regressions calculated from mortality observed at 14 and 21 d indicated that the LC50's of NPV declined 1.3-, 2.0-, 3.2-, and 5.4-fold with the addition of 0.001, 0.010, 0.10, and 1.00% chitinase, respectively. In addition, insects exposed to NPV-chitinase combinations died more rapidly than those that ingested NPV only. Journal of economic entomology. Dec 1987. v. 80 (6). p. 1113-1116. Includes references. (NAL Call No.: DNAL 421 J822).

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Enniatins from Fusarium avenaceum isolated from balsam fir foliage and their toxicity to spruce budworm larvae, Choristoneura fumiferana (Clem.) (Lepidoptera: Tortricidae).
JCECD. Strongman, D.B. Strunz, G.M.; Giguere, P.; Yu, C.M.; Calhoun, L. New York, N.Y. : Plenum Press. Journal of chemical ecology. Mar 1988. v. 14 (3). p. 753-764. Includes references. (NAL Call No.: DNAL QD415.A1J6).

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GTRWD. Houseweart, M.W. Knight, F.B. Washington, D.C. : The Service. General technical report WO - U.S. Department of Agriculture, Forest Service. Paper presented at a "Symposium on Eastern White Pine: Today and Tomorrow," June 12-14, 1985, Durham, New Hampshire. Apr 1986. (51). p. 89-92. Includes references. (NAL Call No.: DNAL aSD11.U52).

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Environmental contamination of egg masses as a major component of transgenerational transmission of gypsy moth nuclear polyhedrosis virus (LdMNPV).
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XGNEA. Ma, M. Broomall, Pa. : The Station. USDA Forest Service general technical report NE - United States, Northeastern Forest Experiment Station. Paper presented at the "Symposium: Microbial Control of Spruce Budworms and Gypsy Moths," April 10-12, 1984, Windsor Locks, CT. 1985. (100). p. 125-131. ill. Includes references. (NAL Call No.: DNAL aSD11.U56).

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Eolutionary reduction of complex life cycles: loss of host-alternation in Pemphigus (Homoptera: Aphididae).
EVOLA. Moran, N.A. Whitham, T.G. Lawrence, Kan. : Society for the Study of Evolution. Evolution. July 1988. v. 42 (4). p. 717-728. ill. Includes references. (NAL Call No.: DNAL 443.8 EV62).

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MYCOAE. Perry, D.F. Fleming, R.A. Bronx, N.Y. : The New York Botanical Garden. Mycologia. Jan/Feb 1989. v. 81 (1). p. 154-158. ill. Includes references. (NAL Call No.: DNAL 450 M99).

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FOSCA. Liebhold, A.M. Berck, P.; Williams, N.A.; Wood, D.L. Washington, D.C. : Society of American Foresters. Forest science. June 1986. v. 32 (2). p. 325-338. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Estimating oak leaf area index and gypsy moth, Lymantria dispar (L.) (Lepidoptera: Lymantriidae), defoliation using canopy photographs.
EVETEX. Liebhold, A.M. Elkinton, J.S.; Miller, D.R.; Wang, Y.S. College Park, Md. : Entomological Society of America. Abstract: Oak leaf area index was (LAI) was estimated using wide-angle photographs of the forest canopy taken from the ground at grid points throughout three sites on Cape Cod, Mass. Confidence intervals for these estimates and optimal sample sizes were calculated. Oak LAI estimates leveled off by early June when no defoliation was present. Within-plot two-dimensional spatial distribution of oak LAI was very similar to the spatial distribution of oak basal area. Consequently, there was a positive correlation between local oak leaf area and local basal area. Comparison of LAI estimates taken before and after gypsy moth, Lymantria dispar. (L.), defoliation allowed the estimation of oak leaf area consumed. Leaf area loss was similarin areas of high and low host foliage densities. The correlation of leaf area lost with local density of early instars was greater than the correlation with the density of late instars. Environmental entomology. June 1988. v. 17 (3). p. 560-566. ill., maps. Includes references. (NAL Call No.: DNAL QL461.E532).

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Evaluating the impact of sequential releases of Cotesia melanoscela (Hymenoptera: Braconidae) on Lymantria dispar (Lepidoptera: Lymantriidae).
EVETEX. Kolodny-Hirsch, D.M. Reardon, R.C.; Thorpe, K.W.; Raupp, M.J. College Park, Md. : Entomological Society of America. Laboratory-reared Cotesia melanoscela (Ratzeburg) were released sequentially over 3 wk at an average level of 12,000 females per ha in three isolated mixed-hardwood woodlots infested with gypsy moth on Maryland's Eastern Shore. Southwood's area under the curve method was used to estimate generational levels of parasitism for the first three instars of the gypsy moth and rates of parasitism were estimated from gypsy moth larvae collected from various canopy strata and host tree species. Significantly higher rates of generational parasitism were achieved in release woodlots (15.4%) than in control woodlots (5.1%). Cotesia melanoscela parasitized a greater proportion of larvae occurring in the upper canopy of trees. Despite significantly higher rates of parasitism in release woodlots, inundative releases of the Korean strain of C. melanoscela failed to reduce gypsy moth populations as determined from egg mass counts. Environmental entomology. Apr 1988. v. 17 (2). p. 403-408. Includes references. (NAL Call No.: DNAL QL461.E532).

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Evaluation of diflubenzuron as a control agent for hemlock looper (Lepidoptera: Geometridae).
JEENAI. Retnakaran, A. Raske, A.G.; West, R.J.; Lim, K.P.; Sundaram, A. Lanham, Md. : Entomological Society of America. Journal of economic entomology. Dec 1988. v. 81 (6). p. 1698-1705. ill., maps. Includes references. (NAL Call No.: DNAL 421 J822).

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Evaluation of hydraulically applied baculovirus preparations to control western spruce budworm (Lepidoptera: Tortricidae) on grand fir.
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Evaluation of (S)-verbenone applications for suppressing southern pine beetle (Coleoptera: Scolytidae) infestations.
JEENAI. Payne, T.L. Billings, R.F. Lanham, Md. : Entomological Society of America. Field tests were conducted to evaluate the efficacy of various applications of the beetle-produced, inhibitory compound (S)-verbenone for suppressing infestations of the southern pine beetle, Dendroctonus frontalis Zimmermann. Twenty-four expanding infestations (spots), ranging in size from 22 to 140 active trees, and representing a variety of stand conditions, were treated with one of five different applications. Treatments included: (A) (S)-verbenone applied at the rate of 4 ml per tree, (B) (S)-verbenone applied at 8 ml per tree, (C) (S)-verbenone at 8 ml per tree in combination with felling all freshly-attacked trees, and the preliminary treatments; (D) (S)-verbenone in combination with the attractant frontalin, and (E) (S)-verbenone plus frontalin, plus felling all infested trees. In all treatments, (S)-verbenone was mixed with a sustained release liquid polymer and applied to a horseshoe-shaped buffer of uninfested trees at the advancing head of the infestation. To draw emerging beetles away from the advancing head, in Treatments D and E, frontalin, a beetle-produced attractant, was applied in the center of the infestation to nonhost trees or to host trees previously infested by beetles. To measure treatment efficacy, rates of spot growth following treatment were compared with pretreatment infestation growth rates. Observed rates of spot growth before and after treatment were compared with spot growth projections generated by a southern pine beetle spot growth prediction model. Results showed that Treatment C was the most effective and practical treatment tested. Spot growth in all five infestations treated with this application was completely halted with few or no additional trees being attacked. Treatment B proved relatively effective in slowing rates of spot growth in small or moderate-sized spots. Treatment E was effective in completely halting spot growth in two large infestations in sawtimber stands, but the treatment required the use of two behavioral. Journal of economic entomology. Dec 1989. v. 82 (6). p. 1702-1708. Includes references. (NAL Call No.: DNAL 421 J822).

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Evaluation of the influence of droplet size and density of Bacillus thuringiensis against gypsy moth larvae (Lepidoptera: Lymantriidae).
JEENAI. Bryant, J.E. Yendol, W.G. Lanham, Md. : Entomological Society of America. A study was conducted to determine the effect of spray droplet size and density on the efficacy of a commercial preparation of Bacillus thuringiensis against the gypsy moth (Lymantria dispar L.). A concentration of 5,795 International Units (IU)/microliter was used. In the laboratory, various size droplets and densities were tested against larvae using 12-cm2 red oak leaflets. Results show that producing relatively high densities of small (50-150 micrometers) droplets of B. thuringiensis will increase the efficacy compared with larger droplets (greater than 150 micrometers) present at low densities at the same dose. Median lethal dose estimates are made for droplets in three size classes (50-150, 150-250, and 250-350 micrometers). LD95's for the generalized size classes of 100, 200, and 300 micrometers were 10.8, 2.2, and 0.9 drops/cm2, respectively. Implications of these results are discussed. Journal of economic entomology. Feb 1988. v. 81 (1). p. 130-134. Includes references. (NAL Call No.: DNAL 421 J822).

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SJAFD. Burkhart, H.E. Haney, H.L. Jr.; Newberry, J.D.; Leuschner, W.A.; Morris, C.L.; Reed, D.D. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. May 1986. v. 10 (2). p. 105-108. Includes references. (NAL Call No.: DNAL SD1.S63).

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EVETEX. Breden, F. Wade, M.J. College Park, Md. : Entomological Society of America. Environmental entomology. Oct 1987. v. 16 (5). p. 1082-1086. Includes references. (NAL Call No.: DNAL QL461.E532).

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EVETEX. Young, C.E. Hall, R.W. College Park, Md. : Entomological Society of America. Environmental entomology. Aug 1986. v. 15 (4). p. 843-849. Includes references. (NAL Call No.: DNAL QL461.E532).

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An introduced clerid, Paratillus carus (Newman) (Coleoptera: Cleridae), preying on Lyctus brunneus (Stephens) (Coleoptera: Lyctidae) in California live oak.
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Introduction and establishment of Olesicampe benefactor hinz (Hymenoptera: Ichneumonidae), a parasite of the larch sawfly, Pristiphora erichsonii (Hartig) (Hymenoptera: Tenthredinidae), in Pennsylvania.
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Introduction and North American establishment of Coccygomimus disparis (Hymenoptera: Ichneumonidae), a polyphagous pupal parasite of Lepidoptera, including gypsy moth.
EVETEX. Schaefer, P.W. Fuester, R.W.; Chianese, R.J.; Rhoads, L.D.; Tichenor, R.B. Jr. Lanham, Md. : Entomological Society of America. Recoveries of Coccygomimus disparis (Viereck) from pupae of gypsy moth, Lymantria dispar (L.), in Pennsylvania, Maryland, New Jersey, Massachusetts, Virginia, Vermont, New York, Nebraska, and Ontario, Canada, indicate that this Palearctic species is now well established in North America. This represents the first successful establishment of a natural enemy of gypsy moth in North America in nearly 50 yr. Levels of pupal parasitism in gypsy moth average 1.9% (maximum 13%). Historical records indicate C. disparis was intentionally imported from India (1972), Japan (1976), and Korea (1984). Laboratory rearing resulted in the eventual release of more than 819,012 individuals liberated in 16 states. Details on the biology of this wasp, its foreign collection, introduction, release, and recovery (first in North America in 1978) are documented. Recovery from Thyridopteryx ephemeraeformis (Haworth) (Psychidae) and Malacosoma americanum (F.) (Lasiocampidae) in New Jersey and Dioryctria auranticella (Grote) (Pyralidae) from Nebraska, as well as host data from outside the United States, indicates that C. disparis is not specific to gypsy moth and should be searched for in other forest or shade tree Lepidoptera. Recent collections of M. americanum in New Jersey showed 20.6% parasitism. Overall effectiveness as a biological control agent against the gypsy moth or other hosts remains uncertain but promising. Environmental entomology. Dec 1989. v. 18 (6). p. 1117-1125. maps. Includes references. (NAL Call No.: DNAL QL461.E532).

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The inventory effect of spruce budworm in New Brunswick.
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Inventory monitoring for estimating impact of insects on seed production in a Douglas-fir seed orchard in western Oregon.
JEENAI. Dombrosky, S.A. Schowalter, T.D. Lanham, Md. : Entomological Society of America. Impact of various factors on seed production was examined in a Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco) seed orchards in western Oregon during 1984. Cones were examined monthly between April and September for mortality or evidence of insect damage. Loss of immature cones began early in the growing season and had a substantial impact on seed production. A newly discovered cone-feeding weevil, Lepesoma lecontei (Casey), caused a large proportion of this mortality. Unexplained cone mortality (possibly frost damage), undeveloped seed, Douglas-fir cone gall midge (Contarinia oregonensis Foote), and Douglas-fir seed chalcid (Megastigmus spermotrophus (Wachtl) were other major causes of seed loss. Crown elevation was important for an accurate estimate of the importance of some seed-loss factors. An inventory monitoring system for Douglas-fir seed production based on early monitoring of immature cones, identifying specific seed loss factors, stratified crown sampling, and an adequate sample size, is suggested. Journal of economic entomology. Feb 1988. v. 81 (1). p. 281-285. Includes references. (NAL Call No.: DNAL 421 J822).

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Inverse density-dependent parasitism of the bagworm, Thyridopteryx ephemeraeformis (Lepidoptera: Psychidae).
EVETEX. Cronin, J.T. Lanham, Md. : Entomological Society of America. This paper reports the results of a controlled manipulative experiment with the bagworm, Thyridopteryx ephemeraeformis (Haworth), on eastern redcedar, Juniperus virginiana L., to determine whether parasitism is density-dependent. Parasitoid foraging behavior indicated that two spatial scales were appropriate: individual trees and small patches of trees. Percentage of parasitism by Itoplectis conquisitor (Say) declined significantly as the density of female bagworms on individual trees increased. Although mathematically possible, this inverse density-dependent response appears too "vague" to promote the stability of the bagworm-I. conquisitor system. Other factors that may be involved in the regulation or control of the bagworm are discussed. Environmental entomology. June 1989. v. 18 (3). p. 403-407. Includes references. (NAL Call No.: DNAL QL461.E532).

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MUCBA. Thompson, L. East Lansing, Mich. : The Service. Extension bulletin E - Cooperative Extension Service, Michigan State University. In the series analytic: The Second annual report of the Gypsy Moth Technical Committee: Gypsy moth in Michigan, 1987 / edited by Bruce A. Montgomery. May 1988. (2142). p. 20-21.

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Isolation and characterization of Entomophaga maimaiga sp. nov., a fungal pathogen of gypsy moth, Lymantria dispar, from Japan.
JIVPA. Soper, R.S. Shimazu, M.; Humber, R.A.; Ramos, M.E.; Hajek, A.E. Duluth, Minn. : Academic Press. Journal of invertebrate pathology. May 1988. v. 51 (3). p. 229-241. ill. Includes references. (NAL Call No.: DNAL 421 J826).

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Vasievich, J.M. Thompson, W.A. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 300-327. ill. Includes references. (NAL Call No.: DNAL aSD11.U57).

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Jack pine budworm surveys.
Dixon, J.C. Broomall, Pa. : The Service. Evaluation report S - U.S. Department of Agriculture Forest Service, Northeastern Area, State & Private Forestry. Dec 1985. (9). 18 p. Includes references. (NAL Call No.: DNAL aSB763.A115E8).

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Japanese beetle (Coleoptera: Scarabaeidae): feeding by adults on minor host and nonhost plants.
JEENAI. Ladd, T.L. Jr. Lanham, Md. : Entomological Society of America. Foliage samples from 48 minor host and nonhost plants (33 families) of the Japanese beetle, Popillia japonica Newman, were evaluated in the laboratory to determine their influence on the feeding response of the insect under controlled conditions. Only foliage from strawberry, Fragraria X ananassa Duchesne, induced greater feeding than that brought about by feeding on sassafras, Sassafras albidum (Nutt.) Nees, a favored host used as a comparison standard. Foliage from three other plants, silver linden, Tilia tomentosa Moench, black tupelo, Nyssa slyvatica Marsh., and pignut hickory, Carya glabra (Mill.) Sweet, induced feeding comparable with that of sassafras. Two plants considered to be nonhosts, red maple, Acer rubrum L., and mock orange, Philadelphus coronarius L., induced measurable feeding by the insect. Journal of economic entomology. Dec 1989. v. 82 (6). p. 1616-1619. Includes references. (NAL Call No.: DNAL 421 J822).

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Japanese beetle (Coleoptera: Scarabaeidae) traps: evaluation of single and multiple arrangements for reducing defoliation in urban landscape.
JEENAI. Gordon, F.C. Potter, D.A. College Park, Md. : Entomological Society of America. Journal of economic entomology. Oct 1986. v. 79 (5). p. 1381-1384. Includes references. (NAL Call No.: DNAL 421 J822).

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Knowledge system environment for integrated pest management in forest landscapes: the southern pine beetle (Coleoptera: Scolytidae).
Coulson, R.N. Saunders, M.C.; Loh, D.K.; Oliveria, F.L.; Drummond, D.; Barry, P.J.; Swain, K.M. Lanham, Md. : The Society. Bulletin of the Entomological Society of America. Summer 1989. v. 35 (2). p. 26-32. Includes references. (NAL Call No.: DNAL 423.9 EN8).

1713

Laboratory assessment of predation by Lonchaea corticis (Diptera: Lonchaeidae) on Pissodes strobi (Coleoptera: Curculionidae).
EVETEX. Hulme, M.A. Lanham, Md. : Entomological Society of America. Larvae of Lonchaea corticis Taylor killed and consumed pupae and to a lesser extent prepupal larvae of Pissodes strobi (Peck) at temperatures ranging from 5 to 14 degrees C during a 3-wk experiment in glass vials that were monitored weekly. Marginal predation of pupae but not prepupal larvae was observed at 0 degrees C. In simulated pupal cells of P. strobi stored outdoors in a Victoria, British Columbia, winter, L. corticis larvae killed and consumed pupae and prepupal larvae of P. strobi in a 3-wk experiment that left most cells devoid of obvious prey remains. Tests in glass vials in March with L. corticis larvae collected during March and during the previous August showed that L. corticis larvae remain predacious at the end of winter. When the insects were left in situ in severed leaders stored outdoors in a Victoria, British Columbia, winter, the proportion of pupal cells with live P. strobi decreased significantly and the proportion of pupal cells emptied without insect emergence increased signficantly; the numbers of L. corticis larvae and total P. strobi pupal cells did not change significantly. These experiments show that P. strobi pupae and prepupal larvae can be vulnerable prey for L. corticis larvae and that

predation may be common in the winter conditions of coastal British Columbia. Environmental entomology. Dec 1989. v. 18 (6). p. 1011-1014. Includes references. (NAL Call No.: DNAL QL461.E532).

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Laboratory comparisons of sulfuryl fluoride toxicity and mean time of mortality among ten termite species (Isoptera: Hodotermitidae, Kalotermitidae, Rhinotermitidae).
JEENAI. Osbrink, W.L.A. Scheffrahn, R.H.; Su, N.Y.; Rust, M.K. College Park, Md. : Entomological Society of America. Journal of economic entomology. Oct 1987. v. 80 (5). p. 1044-1047. Includes references. (NAL Call No.: DNAL 421 J822).

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Laboratory evaluation of new ultraviolet absorbers for protection of Douglas-fir tussock moth (Leipidoptera: Lymantriidae) Baculovirus.
JEENAI. Martignoni, M.E. Iwai, P.J. College Park, Md. : Entomological Society of America. Journal of economic entomology. Aug 1985. v. 78 (4). p. 982-987. ill. Includes references. (NAL Call No.: DNAL 421 J822).

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degrees C (40 degrees F). This value accurately predicted crawler hatch dates in West Lafayette, Ind., and College Park, Md., in 1986, and in Lexington in 1987. Six species of primary parasites and one hyperparasite species were reared from scale-infested twig samples. Parasite flight periods were determined from sticky trap collections within tree crowns. Application of insecticidal sprays during July for control of obscure scale crawlers would unfortunately coincide with peak activity of the scale's primary parasites. Journal of economic entomology. Apr 1989. v. 82 (2). p. 551-555. Includes references. (NAL Call No.: DNAL 421 J822).

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A conducive day concept to explain the effect of low temperature on the development of scleroderris shoot blight.
PHYTA. Marosy, M. Patton, R.F.; Upper, C.D. St. Paul, Minn. : American Phytopathological Society. The in vitro growth of Gremmeniella abietina at -6 C both in the presence or absence of ice crystals was confirmed. Red pine seedlings artificially inoculated with the North American serotype, exposed to natural field conditions and artificially manipulated field conditions, developed symptoms of Scleroderris shoot blight when exposed to 44 or more days in which the temperature remained between -6 and +5 C or snow completely covered the seedlings or tree parts--a conducive day. Thus, an extended period of relatively mild canopy temperature during the winter appears to favor disease development. The conducive period--a period in which 44 or more conducive days occurred--could either occur in the winter after inoculation, or over the two winters after inoculation. The apparent latent period in the disease cycle may result from the need for winter conditions before symptom development can occur. The occurrence of symptoms primarily on lower branches, and the restriction of the disease to latitudes that receive sustained snow cover in the Lake States are consistent with this observation. Comparison of literature descriptions of outbreaks of the disease to weather records revealed a strong association between conducive periods, usually single conducive winters, and the occurrence of symptoms. The natural range of the disease may be restricted by the need for recurrence of conducive periods within 3 yr to avoid breaking the disease cycle. Phytopathology. Nov 1989. v. 79 (11). p. 1293-1301. Includes references. (NAL Call No.: DNAL 464.8 P56).

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plots had the most post-emergence damping off, (15%) and silica sand the least (3%). Rhizoctonia solani (AG-1) was isolated from 52% of damped-off seedlings collected while Pythium spp., Fusarium spp. and Cylindrocladium spp. were recovered from 24%, 23%, and 1% of the seedlings, respectively. Seedling mortality from May 18 to September 23, 1986, ranged from 28% in the dazomet plots to 61% in nontreated plots. At the end of the first growing season, plots treated with dazomet had significantly more seedlings than any other treatment. The incidence of stunted seedlings was greatest in plots treated with dazomet and least when seed was covered with silica sand. Silica sand or thiram treatments produced seedlings with the greatest total dry weights. Forest science. Dec 1989. v. 35 (4). p. 1006-1013. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Acute ozone stress on eastern cottonwood (Populus deltoides Bartr.) and the pest potential of the aphid, Chaitophorus populicola Thomas (Homoptera: Aphididae).
EVETEX. Coleman, J.S. Jones, C.G. College Park, Md. : Entomological Society of America. The effect of acute ozone exposure of eastern cottonwood (Populus deltoides Bartr.) on the survivorship, reproduction, and development of the aphid Chaitophorus populicola Thomas (Homoptera: Aphididae) was investigated. Cottonwoods were exposed to 397 microgram/m3 (0.20 ppm) ozone or charcoal-filtered air and infested with aphids on leaf plastochron index 5, 40 h after fumigation. Aphid performance was not significantly different on plants exposed to ozone compared with charcoal-filtered air-treated control plants. These data do not support the notion that aphid performance will directly increase on air pollution-stressed plants. We also examined settling and feeding preference of aphids for cottonwood leaves of different developmental ages. Aphids significantly preferred leaf plastochron index 5 to all other leaf ages. These data support hypotheses relating aphid leaf preference to stages of leaf development. Reproduction of the cottonwood leaf rust fungus (Melampsora medusae Thum.) and the imported willow leaf beetle (Plagiodera versicolora Laicharting) are reduced on ozone-fumigated plants (reported elsewhere). If aphid populations are affected by competition with these cottonwood pests for leaf resources, then aphid pest potential may actually increase in areas characterized by episodic ozone concentrations because of ozone-induced decreases in populations of M. medusae and P. versicolora. Environmental entomology. Apr 1988. v. 17 (2). p. 207-212. Includes references. (NAL Call No.: DNAL QL461.E532).

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EVETEX. Price, P.W. Lanham, Md. : Entomological Society of America. Five clones of the willow, Salix exigua Nuttall, along the Weber River, Utah, produced shorter shoots with increasing ramet age. The number of ovipositions by the shoot-galling sawfly, Euura exiguae Smith, correlated positively with shoot length, so that sawfly density was high on younger ramets of a clone and low on older ramets. The sawfly attacked the most vigorous parts of the clones. Survival of progeny in galls decreased with ramet age from 60% survival on 1-yr-old ramets to 26% survival on 6-yr-old ramets when plant-induced mortality was considered alone. The effects of parasitoids on the pattern of sawfly attack was not significant. Survival of progeny in young ramets (2 and 3 yr old) was higher in the egg to very early first-instar stage (50%) than in older ramets (37%) (5 and 6 yr old), but differences were slight after that stage. The major determinants of Euura population distribution on willow clones were the female selective oviposition behavior on longer shoots on younger ramets, which probably evolved in response to higher survival of progeny in the younger ramets. When the relative effects of attack and survival were evaluated in response to ramet age, age accounted for 89% of the variance in attack and 95% of the variance in survival. The contrast between this species and others that attack vigorous plants and plant parts and those that attack stressed plants is emphasized, and an explanation is proposed for the difference between epidemic pest insect herbivores and those that remain as endemic species. Environmental entomology. Feb 1989. v. 18. p. 61-68. Includes references. (NAL Call No.: DNAL QL461.E532).

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Distribution and characteristics of windthrow microtopography on the Cumberland Plateau of Kentucky.
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ground surface ranged from 0.4% on ridges to 2.4% in coves; number and mean area disturbed by individual uprootings ranged from 50 to 112 ha-1, and from 0.5 to 2.1 m2 along the ridge-to-cove gradient. The lower abundance of windthrow microtopography on ridges was attributed to a relatively high incidence of stem breakage vs. uprooting. Stem breakage seemed particularly common in scarlet oak (Quercus coccinea Muenchh.) which dominated ridges and south slopes. Observations made during the course of this study also suggested that concentrated subsurface water flow and concomitant decreases in tree stability may contribute to uprooting in coves and on lower slopes. Windthrow, viewed as a pedogenic process, clearly does not operate uniformly over this mountainous landscape. Soil Science Society of America journal. May/June 1988. v. 52 (3). p. 816-821. maps. Includes references. (NAL Call No.: DNAL 56.9 SO3).

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JOSHB. Gingas, V.M. Sydnor, T.D.; Weidensaul, T.C. Alexandria, Va. : The Society. Journal of the American Society for Horticultural Science. Mar 1988. v. 113 (2). p. 258-261. Includes references. (NAL Call No.: DNAL 81 SO12).

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Enhanced ethylene emissions from red and Norway spruce exposed to acidic mists.
PLPHA. Chen, Y.M. Wellburn, A.R. Rockville, Md. : American Society of Plant Physiologists. Acidic cloudwater is believed to cause needle injury and to decrease winter hardiness in conifers. During simulations of these adverse conditions, rates of ethylene emissions from and levels of 1-aminocyclopropane-1-carboxylic acid (ACC) in both red and Norway spruce needles increased as a result of treatment with acidic mists but amounts of 1-malonyl(amino)cyclopropane-1-carboxylic acid remained unchanged. However, release of significant quantities of ethylene by another mechanism independent of ACC was also detected from brown needles. Application of exogenous plant growth regulators such as auxin, kinetin, abscisic acid and gibberellic acid (each 0.1 millimolar) had no obvious effects on the rates of basal or stress ethylene production from Norway spruce needles. The kinetics of ethylene formation by acidic mist-stressed needles suggest that there is no active inhibitive mechanism in spruce to prevent stress ethylene being released once ACC has been formed. Plant physiology. Sept 1989. v. 91 (1). p. 357-361. Includes references. (NAL Call No.: DNAL 450 P692).

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Ethylene production by excised sapwood of clonal eastern cottonwood and the compartmentalization and closure of seasonal wounds.
PHYTAJ. Shain, L. Miller, J.B. St. Paul, Minn. : American Phytopathological Society. Increment cores were removed from ramets of six clones of eastern cottonwood at 3-mo intervals starting either in November, at the beginning of the dormant season, or in May, at the beginning of the growing season. By offsetting the two wounding series by 6 mo, it was possible to separate the effect of wound age from the effect of season of wounding with regard to dynamic host reponses and the fungi that colonize such wounds. Production of ethylene by these cores of outer sapwood was measured 1 (et1) and 2 (et2) days after their collection and incubation in sealed containers under standarized conditions. Methane, a product of methogenic bacteria, was measured 1 day after core collection. Observations on wound closure were made at3-mo intervals. At the time of harvest, each tree had wounds 3, 6, 9, and 12 mo old. Discoloration associated with wounds initiated during the growing season was significantly less than that associated with wounds initiated during the dormant season regardless of wound age. Clones differed in their capacity to compartmentalize wounds. Ethylene production (et1) by increment cores collected in February correlated best with the ranking of mean clonal discoloration. The seasonal course of et1 but not et2 across clones faithfully mirrored that expected for the physiological activity of sapwood; i.e., it increased significantly through February, November, August, and May. The ratios of basal (February) to maximal (May) rates of et1 ranged from 2.7 to 5.6 for better compartmentalizing clones from 1.4 to 1.7 for poorer compartmentalizing clones. It is suggested that ratios of et1 may be used to rapidly screen for superior compartmentalizing genotypes, although additional studies are necessary to confirm or refute this hypothesis. Wounds largely closed during the 3-mo period from May to August. Clones differed significantly in their rate of closure. Those with higher et2 in May tended to close more rapidly. Wound closure and compartmentalization, h. Phytopathology. Oct 1988. v. 78 (10). p. 1261-1265. ill. Includes references. (NAL Call No.: DNAL 464.8 P56).

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Hellergren, J. Widell, S.; Lundborg, T. New York : Alan R. Liss. Plant biology. In the series analytic: Plant Cold Hardiness / edited by P.H. Li. Proceedings of an International Seminar, September 4-7, 1986, Shanghai, China. 1987. v. 5. p. 211-220. Includes references. (NAL Call No.: DNAL QH301.P535).

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OARCB. Smith, E.M. Treaster, S.A. Wooster, Ohio : The Center. Research circular - Ohio Agricultural Research and Development Center. Jan 1987. (291). p. 11-12. Includes references. (NAL Call No.: DNAL 100 OH3R).

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Lichens, tree growth, and foliar symptoms of air pollution: are the stories consistent?.
JEVQAA. Muir, P.S. McCune, B. Madison, Wis. : American Society of Agronomy. Lichen communities, tree growth, and foliar symptoms of Acer saccharum, Fraxinus spp., Liriodendron tulipifera, Quercus alba, and the Quercus rubra group were studied in relation to air pollutants in southern Indiana and Illinois. Both study areas receive regional pollutants, but only one is close to a large coal-fired utility, which results in a high dose of SO2 and its reaction products. Lichen communities differed significantly between the two areas; species richness and total cover were lowest in the near-utility area, and species compositional differences suggested that air quality was responsible. Few differences were noted in foliar symptoms between areas; when symptom levels differed, they were generally highest in the remote area. Ozone-induced stippling was found in both areas on leaves of Fraxinus spp. and Liriodendron. Although ring widths indicated depressed tree growth in the near-utility area during years of high emissions, periodic basal area increments and tree vigor did not generally differ between areas, and were generally not related to foliar symptoms other than stippling. Ozone-induced stippling on Liriodendron was negatively correlated with basal area increments. Journal of environmental quality. July/Sept 1988. v. 17 (3). p. 361-370. Includes references. (NAL Call No.: DNAL QH540.J6).

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Hennon, P.E. Shaw, C.G. III; Hansen, E.M. Boulder, Colo. : Westview Press, 1987. Atlantic white cedar wetlands / edited by Aimlee D. Laderman. Paper presented at the First Atlantic White Cedar Wetlands Symposium, held at the Marine Biological Laboratory, Woods Hole, Massachusetts, October, 1984. p. 331-337 maps. Includes references. (NAL Call No.: DNAL QK938.M3A8).

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Shaw, C.G. III. Eglitis, A.; Laurent, T.H.; Hennon, P.E. Boulder, Colo. : Westview Press, 1987. Atlantic white cedar wetlands / edited by Aimlee D. Laderman. Paper presented at the First Atlantic White Cedar Wetlands Symposium, held at the Marine Biological Laboratory, Woods Hole, Massachusetts, October, 1984. p. 327-330. Includes references. (NAL Call No.: DNAL QK938.M3A8).

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SSSJD4. Li, C.S. Bockheim, J.G.; Leide, J.E.; Wentz, D.A. Madison, Wis. : The Society. Bulk precipitation, soil-water, and groundwater chemistry were monitored at Round Lake, a small, forested catchment receiving acidic precipitation (pH 4.6) in northwestern Wisconsin. The groundwater basin retained H ion and released nonhydrolyzable cations (NHC = Ca, Mg, Na, K) and Si. The percentage of plagioclase feldspar, hornblende, olivine, and augite increased with depth in soils from the catchment; quartz, orthoclase feldspar, and weathered mica decreased with depth. Thermodynamic stability indices estimated from water-quality and mineralogic data, and from the WATEQF chemical speciation model indicate that the soil-water and groundwater are undersaturated with respect to hornblende, chlorite, olivine, augite, plagioclase, and orthoclase feldspars and that these minerals may be undergoing dissolution. Minimally disturbed soil cores were leached with dilute H2SO4 and distilled water (pH 3.0 to 5.7). When the pH of the extracting solution was greater than 4.5, Ca was released in the greatest amounts, followed by Si, Mg, K, Na, and Al. This ranking is similar to that for cations in groundwater. Leaching with a pH 3.0 solution released Si in the greatest amounts from the C horizon, followed by the Bw2, Bw1, and A + B/E horizons. This trend parallels the depth distribution of weatherable minerals in the very fine sand fraction. Results from the laboratory leaching study confirm the chemical modeling studies, indicating that mineral weathering (hydrolysis) can contribute to buffering within the groundwater basin at Round Lake. Soil Science Society of America journal. July/Aug 1988. v. 52 (4). p. 1148-1154. Includes references. (NAL Call No.: DNAL 56.9 SO3).

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ECOLA. Johnson, E.A. Tempe, Ariz : Ecological Society of America. Ecology : a publication of the Ecological Society of America. Feb 1987. v. 68 (1). p. 43-53. ill. Includes references. (NAL Call No.: DNAL 410 EC7).

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Survival of loblolly pine seedlings planted on areas fall-sprayed with soil-active herbicides.
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Tebuthiuron formulation and placement effects on response of woody plants and soil residue.
WEESA6. Meyer, R.E. Bovey, R.W. Champaign, Ill. : Weed Science Society of America. Abstract: Tebuthiuron (N- 5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl -N,N'-dimethylurea in various formulations and placements was applied to honey mesquite (Prosopis glandulosa Torr. ~ PRGJG), huisache Acacia farnesiana (L.) Willd. ~ ACAFA , live oak (Quercus virginiana Mill. ~ QUEVI), Macartney rose (Rosa bracteata J.C. Wendl. ~ ROSBC), and Texas whitebrush Aloysia gratissima (Gillies & Hook.) Troncoso ~ ALYLY . There was little difference in a species response to the various tebuthiuron formulations. Pellets (20%) at 2 g ai/tree base reduced the canopy 85% and killed 50% of the honey mesquite. At 1 g ai/plant, two briquettes at 0.5 g ai each or pellets (5.14 g, 20%) killed 37 and 80% of the huisache, respectively. Pelletswere no more effective at 2 g than at 1 g ai on huisache. Basal treatments of 0.25, 0.5, 0.5, 1, and 2 g ai tebuthiuron/tree killed from 8 to 22, 48 to 62,

62 to 85, and 92% of the live oak, respectively. Pellets at 2 g ai placed at the base reduced the canopy 83% and killed 59% of the Macartney rose. On Texas whitebrush, 0.25, 0.5, 1, and 2 g ai tebuthiuron/tree killed from 68 to 85, 75 to 100, 90, and 100% of the plants, respectively. Tebuthiuron persisted mainly in the upper 30 cm of soil for at least 15 months. Weed science. May 1988. v. 36 (3). p. 373-378. Includes references. (NAL Call No.: DNAL 79.8 W41).

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Bionomics of Lomamyia hamata (Neuroptera: Berothidae).
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Comparative effects of an insect growth regulator, S-31183, against the Formosan subterranean termite and eastern subterranean termite (Isoptera: Rhinotermitidae).
JEENAI. Su, N.Y. Scheffrahn, R.H. Lanham, Md. : Entomological Society of America. In a no-choice experiment, the insect growth regulator 2- 1-methyl-2(4-phenoxyphenoxy) ethoxy pyridine (S-31183) induced presoldier formation more effectively in the eastern subterranean termite, Reticulitermes flavipes (Kollar) than in the Formosan subterranean termite, Coptotermes formosanus Shiraki. When given a choice of treated or untreated wood cubes, C. formosanus avoided feeding on cubes treated with concentrations of 1,500 and 7,500 ppm. A S-31183 concentration of 300 ppm (AI) did not deter feeding or increase presoldier formation in C. formosanus. Feeding of R. flavipes groups exposed to cubes containing 30 or 150 ppm S-31183 was not deterred, but these concentrations caused approximately 80% worker mortality by the end of the 12-wk test. The results indicate that S-31183 might control R. flavipes colonies if 30-150 ppm were applied to a bait. Journal of economic entomology. Aug 1989. v. 82 (4). p. 1125-1129. Includes references. (NAL Call No.: DNAL 421 J822).

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Comparative toxicity of fourteen insecticides to two species of carpenter ants (Hymenoptera: Formicidae).
JEENAI. Gibson, R.L. Scott, J.G. Lanham, Md. : Entomological Society of America. Although carpenter ants are important pests of wooden structures throughout the United States and Canada, little is known about toxicity of insecticides to these insects. We tested 14 insecticides (3 carbamates, 7 organophosphates, and 4 pyrethroids) against two species of carpenter ants, Camponotus novaeboracensis (Fitch) and C. pennsylvanicus (DeGeer), with a residual bioassay. Deltamethrin and diazinon were the most toxic to C. novaeboracensis and C. pennsylvanicus, respectively. Pyrenone and propoxur were the least toxic. A comparison of the sensitivity of carpenter ants with four other insect species, tested under identical conditions, revealed that carpenter ants were among the most sensitive. Journal of economic entomology. Aug 1989. v. 82 (4). p. 1121-1124. Includes references. (NAL Call No.: DNAL 421 J822).

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Comparative wood consumption within and between mounds of Coptotermes acinaciformis (Froggatt) (Isoptera: Rhinotermitidae).
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Comparison of wood preservatives in stake tests (1985 progress report).
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Concentration-dependent presoldier induction and feeding deterrency: potential of two insect growth regulators for remedial control of the Formosan subterranean termite (Isoptera: Rhinotermitidae).
JEENAI. Haverty, M.I. Su, N.Y.; Tamashiro, M.; Yamamoto, R. Lanham, Md. : Entomological Society of America. Laboratory experimental groups of 120 workers and 30 soldiers of Coptotermes formosanus Shiraki were given a choice of feeding on untreated pine blocks or pine blocks treated with one of five concentrations of methoprene (0, 4, 20, 100, and 500 ppm) or S-31183 (2- 1-methyl-2(4-phenoxy-phenoxy)ethoxy pyridine) (0, 20, 100, 500, and 2,500 ppm) for 4, 8, or 12 wk. Soldier production and total mortality were significantly increased by 100 and 500 ppm methoprene at 8 and 12 wk. Biologically significant mortality (>50%) resulted from feeding on blocks treated with methoprene at 500 ppm after 8 wk. The response of C. formosanus to S-31183 was much reduced when compared with the response to methoprene. None of the concentrations of S-31183 caused biologically significant mortality to the C. formosanus groups. In addition, the highest concentration of S-31183 caused feeding deterrency that was apparently learned. Effective baits for remedial control of C. formosanus colonies should be evaluated under conditions that simulate actual use. These baits would require methoprene concentrations from 500 to 1,500 ppm, depending on the pattern of use. Journal of economic entomology. Oct 1989. v. 82 (5). p. 1370-1374. Includes references. (NAL Call No.: DNAL 421 J822).

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Effect of volume and position of stakes on feeding by subterranean termites (Isoptera).
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FOSCA. Hibbs, D.E. Emmingham, W.H.; Bondi, M.C. Bethesda, Md. : Society of American Foresters. A 14-year-old fully stocked red alder (Alnus rubra Bong.) stand on a site index 30 m (50 yr) site in northwest Oregon was precommercially thinned and growth measured for 5 years. Treatments were (1) 4.3 X 4.3 m in spacing (541 trees/ha), chemically thinned, (2) 6.1 X 6.1 m spacing (269 trees/ha), chemically thinned, (3) 6.1 X 6.1 m spacing, chain-saw thinned, and (4) control (1754 trees/ha). Chemical thinning was done by trunk injection of 2,4-D and casued some damage (flashback) to neighboring crop trees. Thinning increased individual-tree radial growth 49% to 100% and decreased tree height growth by as much as 56%. In combination, this resulted in no significant change in tree volume growth with thinning. The lack of tree volume growth increase combined with the decrease in stem density with thinning produced a net decrease in stand volume growth with thinning. A review of the literature showed height growth reductions to be common among other alder studies. Tree basal area growth on the chemically thinned plots did not increase as much as on the chain-saw thinned plots, suggesting a prolonged growth reduction effect from the herbicide treatment. Diameter growth decreased with increasing degree of herbicide-induced crown damage. Thinning increased the size but not the numbers of epicormic branches. The longevity or effects on wood quality of these branches is not known. Forest science. Mar 1989. v. 35 (1). p. 16-29. Includes references. (NAL Call No.: DNAL 99.8

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Effect of tebuthiuron on soil N mineralization and nitrification.
CSOSA2. Goodroad, L.L. New York, N.Y. : Marcel Dekker. Communications in soil science and plant analysis. Apr 1987. v. 18 (4). p. 473-481. Includes references. (NAL Call No.: DNAL S590.C63).

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Entomogenous nematodes for control of subterranean termites, Reticulitermes spp. (Isoptera: Rhinotermitidae).
JEENAI. Mauldin, J.K. Beal, R.H. Lanham, Md. : Entomological Society of America. Laboratory and field studies were done to determine the efficacy of entomogenous nematodes in preventing or eliminating eastern subterranean termites, Reticulitermes flavipes (Kollar), in the laboratory and infestations of Reticulitermes spp. in the field. Nematodes tested in a laboratory study were two strains (Breton and All) of Steinernema feltiae Filipjev (=Neoaplectana carpocapsae Weiser), S. bibionis (Bovien), and Heterorhabditis heliothidis (Khan, Brooks, and Hirschmann). The same nematodes were tested in field studies except that the Mexican strain of S. feltiae was used instead of the Breton strain. In the laboratory study, termites quickly moved from a nest container through a tube containing a mixture of sand, vermiculite, and water to reach a chamber in which nematodes had been released. After 9.5 wk, termite survival rates in the nematode treatments and in the untreated control did not differ significantly. In field studies, nematodes did not eliminate or control termites either in a simulation of soil treatments under concrete slabs or in logs naturally infested with termites. Journal of economic entomology. Dec 1989. v. 82 (6). p. 1638-1642. ill. Includes references. (NAL Call No.: DNAL 421 J822).

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Lignin biodegradation: the microorganisms involved and the physiology and biochemistry of degradation by white-rot fungi.
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Mycorrhiza and soil fertility effects with growth, nodulation and nitrogen fixation of Leucaena grown on a Typic Eutrustox.
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Nickel toxicity in mycorrhizal birch seedlings infected with Lactarius rufus or Scleroderma flavidum. II. Uptake of nickel, calcium, magnesium phosphorus and iron.
NEPHA. Jones, M.D. Hutchinson, T.C. New York, N.Y. : Cambridge University Press. The New phytologist. Apr 1988. v. 108 (4). p. 461-470. Includes references. (NAL Call No.: DNAL 450 N42).

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Nitrogen isotope fractionation in burned and unburned chaparral soils.
SSSJD4. Herman, D.J. Rundel, P.W. Madison, Wis. : The Society. Plant and soil processes involving N-transformations have been monitored by techniques measuring the 15N/14N ratio in a sample relative to the atmosphere (delta 15N). Ususually low delta 15N values have been reported in the tissues of chaparral shrubs. The primary objective of this study was to investigate soil N-cycling processes which may yield the low plant tissue delta 15N levels. Since the chaparral is subject to periodic brush fires, which in turn result in high levels of inorganic N-forms in the soil during the first year following the burn, possible effects of burning on soil delta 15N were also investigated. Incubations were conducted on soils from an area which had been subjected to a brusn fire, and an adjacent unburned area; both soils are fine, thermic, schistose, very steep Ultic Haploxeralfs. Concentrations and delta 15N of soil NH4(1+) and NO3(-1) were periodically measured. A C- and N-rich ash resulted in rapid mineralization of N in the burned soil; a substrate more resistant to biological degradation resulted in an initial loss, then subsequent slow accumulation of inorganic-N in the unburned soil. Nitrate was the dominant mineral species in each soil after a few weeks. As nitrification progressed, delta 15N of NH4(1+) increased and delta 15N of NO3(-1) decreased. Since the mineral pool in each soil became dominated by NO3(-1) delta 15N of the mineral pool became strongly negative. A mathematical model of isotope dynamics fits empirical data well. Soil Science Society of America journal. July/Aug 1989. v. 53 (4). p. 1229-1236. Includes references. (NAL Call No.: DNAL 56.9 SO3).

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Phenolic compound utilization by the soft rot fungus.
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Reexamination of pore water sulfide concentrations and redox potentials near the aerial roots of Rhizophora mangle and Avicennia germinans.
AJBOAA. McKee, K.L. Mendelssohn, I.A.; Hester, M.W. Columbus, Ohio : Botanical Society of America. American journal of botany. Sept 1988. v. 75 (9). p. 1352-1359. ill. Includes references. (NAL Call No.: DNAL 450 AM36).

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Survival and growth of outplanted pine seedlings after mycorrhizae were inhibited by use of triadimefor in the nursery.
SJAFD. Rowan, S.J. Kelley, W.D. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. Feb 1986. v. 10 (1). p. 21-23. Includes references. (NAL Call No.: DNAL SD1.S63).

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Correlation of forest growth and yield with soil characteristics.
XFTRA. Packee, E.C. Portland, Or. : The Station. USDA Forest Service general technical report PNW - United States, Pacific Northwest Forest and Range Experiment Station. Paper presented at the "Workshop on Alaska Forest Soil Productivity," April 28-30, 1987, Anchorage, Alaska. Apr 1988. (GTR-219). p. 37-42. Includes references. (NAL Call No.: DNAL aSD11.A46).

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Effect of soil compaction and oxygen content on vertical and horizontal root distribution.
Gilman, E.F. Leone, I.A.; Flower, F.B. Washington, D.C. : Horticultural Research Institute. Journal of environmental horticulture. Mar 1987. v. 5 (1). p. 33-36. ill. Includes references. (NAL Call No.: DNAL SB1.J66).

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Effects of soil compaction on root growth characteristics of yellow-poplar and sweetgum seedlings.
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JEVQAA. Driscoll, C.T. Fuller, R.D.; Simone, D.M. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. Jan/Mar 1988. v. 17 (1). p. 101-107. ill., maps. Includes references. (NAL Call No.: DNAL QH540.J6).

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ECMOA. McDowell, W.H. Likens, G.E. Tempe, Ariz. : Ecological Society of America. Ecological monographs. Sept 1988. v. 58 (3). p. 177-195. ill., maps. Includes references. (NAL Call No.: DNAL 410 EC72).

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Particle size and container size effects on growth of three ornamental species.
JOSHB. Tilt, K.M. Bilderback, T.E.; Fonteno, W.C. Alexandria, Va. : The Society. Journal of the American Society for Horticultural Science. Nov 1987. v. 112 (6). p. 981-984. Includes references. (NAL Call No.: DNAL 81 SO12).

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Performance of Miconia albicans (Sw.) triana, an aluminum-accumulating species, in acidic and calcareous soils.
CSOSA2. Haridasan, M. New York, N.Y. : Marcel Dekker. Communications in soil science and plant analysis. May/Sept 1988. v. 19 (7/12). p. 1091-1103. Includes references. (NAL Call No.: DNAL S590.C63).

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Persistence, degradation, and movement of triclopyr and its ethylene glycol butyl ether ester in a forest soil.
JAFCAU. Lee, C.H. Oloffs, P.C.; Szeto, S.Y. Washington, D.C. : American Chemical Society. Journal of agricultural and food chemistry. Nov/Dec 1986. v. 34 (6). p. 1075-1079. Includes references. (NAL Call No.: DNAL 381 J8223).

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Picloram movement in soil solution and streamflow from a coastal plain forest.
JEVQAA. Michael, J.L. Neary, D.G.; Wells, M.J.M. Madison, Wis. : American Society of Agronomy. Picloram (4-amino-3,5,6-trichloropicolinic acid) was aerially applied to a longleaf pine (Pinus palustris L.) site in the upper coastal plain

of Alabama to control kudzu Pueraria lobata (Willd.) Ohwi . Pellets (10% a.i.) were spread at the rate of 56 kg ha-1 on loamy sand Typic Kanhapludult soils. Movement of this herbicide was monitored with mineral soil samples, tension-cup lysimeters, flowproportional streamflow samplers, and discrete samplers. Picloram levels in the upper 15 cm of mineral soil peaked at 0.96 to 2.25 mg kg-1 25 d after application, depending on slope position, and declined to 0.13 to 0.29 mg kg-1 1 yr later. In soil solution, picloram was detected at a depth of 0.4 m between 26 and 273 d after application. Only 4 of 15 lysimeters consistently contained detectable residues. Maximum picloram levels in soil solution were 130, 450, and 191 mg m-3 for ridge, midslope, and toe-slope positions, respectively. Downstream monitoring began 4 d after the herbicide application, and an initial concentration of 68 mg m-3 of picloram was detected. The maximum downstream concentration of 77 mg m-3 occurred 18 d after the application, immediately after the second storm event. Downstream levels dropped to less than 10 mg m-3 after 90 d and to less than 2 mg m-3 after 200 d. Following localized retreatment along the stream more than a year after the initial treatment, levels climbed again into the 20 to 30 mg m-3 range. Most of the initial off-site movement came from a perennial stream the had been inadvertently treated, but subsequently storm runoff was the largest contributor to stream contamination. Picloram residues in this stream were similar to those observed downstream, but they were higher (up to 241 mg m-3 and dropped faster to below 2 mg m-3 after D 150. Journal of environmental quality. Jan/Mar 1989. v. 18 (1). p. 89-95. maps. Includes references. (NAL Call No.: DNAL QH540.J6).

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Pine release in unevenly stocked stands on Droughty soils may be uneconomical.
Guldin, R.W. New Orleans, La. : The Station. USDA Forest Service research paper SO - Southern Forest Experiment Station. Aug 1985. (216). 5 p. Includes references. (NAL Call No.: DNAL A99.9 F7628US).

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Potential for buffering of acidic precipitation by mineral weathering in a forested entisol.
SSSJD4. Li, C.S. Bockheim, J.G.; Leide, J.E.; Wentz, D.A. Madison, Wis. : The Society. Bulk precipitation, soil-water, and groundwater chemistry were monitored at Round Lake, a small, forested catchment receiving acidic precipitation (pH 4.6) in northwestern Wisconsin. The groundwater basin retained H ion and released nonhydrolyzable cations (NHC = Ca, Mg, Na, K) and Si. The percentage of plagioclase feldspar, hornblende, olivine, and augite increased with depth in soils from the catchment; quartz, orthoclase feldspar, and weathered mica decreased with depth. Thermodynamic stability indices estimated from water-quality and mineralogic data, and from the WATEQF chemical speciation model indicate that the soil-water and groundwater are undersaturated with respect to hornblende, chlorite, olivine, augite, plagioclase, and orthoclase feldspars and that these minerals may be undergoing dissolution. Minimally disturbed soil cores were leached with dilute H2SO4 and distilled water (pH 3.0 to 5.7). When the pH of the extracting solution was greater than 4.5, Ca was released in the greatest amounts, followed by Si, Mg, K, Na, and Al. This ranking is similar to that for cations in groundwater. Leaching with a pH 3.0 solution released Si in the greatest amounts from the C horizon, followed by the Bw2, Bw1, and A + B/E horizons. This trend parallels the depth distribution of weatherable minerals in the very fine sand fraction. Results from the laboratory leaching study confirm the chemical modeling studies, indicating that mineral weathering (hydrolysis) can contribute to buffering within the groundwater basin at Round Lake. Soil Science Society of America journal. July/Aug 1988. v. 52 (4). p. 1148-1154. Includes references. (NAL Call No.: DNAL 56.9 SO3).

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Predicting tree survival and growth from minesoil analysis.
Davidson, W.H. Bethesda, Md. : The Society. Proceedings of the...Society of American Foresters National Convention. 1986. p. 244-246. (NAL Call No.: DNAL SD143.S64).

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Red spruce rhizosphere dynamics: spatial distribution of aluminum and zinc in the near-root soil zone.
FOSCA. Smith, W.H. Pooley, A.S. Bethesda, Md. : Society of American Foresters. Red spruce roots, associated with mature, healthy trees occupying canopy positions, were located in three 8.5 m2 forest floor plots at 250 m elevation in the Hubbard Brook Experimental Forest, White Mountain National Forest, New Hampshire. Roots, 0.25-1.0 cm diam, were severed, and cut ends were placed in soil in plastic bags. In 14 months, new roots developed behind cut ends and were cultured in wooden trays containing screened forest floor material. Forest floor concentrations of aluminum, calcium, chlorine, iron, lead, and zinc were established. Trays containing roots were supplied with a distilled water treatment or with distilled water containing chloride salts of aluminum, lead or zinc sufficient to increase substrate cation concentration by 500 ppm. Eight weeks following treatment, roots (largely ectomycorrhizal, diam 0.4-1.0 mm) with associated rhizosphere soil were harvested by impregnating specimens in agar and freezing in liquid nitrogen. Cross sections of root-rhizosphere soil samples were freeze dried and examined with a scanning electron microscope and energy dispersive x-ray spectrometer. Gradients of element

concentrations were established along transects from root interiors (cortex) through the inner and outer rhizosphere zones (2 mm from root) and in bulk soil (devoid of roots). The pH of rhizosphere soil was approximately 0.5 unit less than bulk soil. Aluminum concentrations exhibited a strongly descending gradient from bulk soil through the rhizosphere to the root. Estimated concentrations ranged from 1000 ppm within 200 microns of the root to 10 x this amount in soil beyond 2000 microns. Calcium distribution, without aluminum amendment, was relatively constant through the rhizosphere, but with aluminum amendment, calcium exhibited a sharply decreasing gradient near the root. In the unamended treatment, the Al:Ca ratio dropped from 7 to 0.2 across the rhizosphere. Chlorine was constant in the rhizosphere but exhibited pronounced accumulation in. Forest science. Dec 1989. v. 35 (4). p. 1114-1124. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Hicks, R.R. Jr. Frank, P.S. Jr. Asheville : The Council. Proceedings - Annual Hardwood Symposium of the Harwood Research Council. Paper presented at the "Symposium on The Changing Hardwood Scene," May 22-24, 1985, High Point, North Carolina. 1985. (13th). p. 50-60. Includes references. (NAL Call No.: DNAL SD397.H3H37).

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Root growth of black walnut trees related to soil temperature, soil water potential, and leaf water potential.
FOSCA. Khuns, M.R. Garrett, H.E.; Teskey, R.O.; Hinckley, T.M. Bethesda, Md. : Society of American Foresters. Forest science. Sept 1985. v. 31 (3). p. 617-629. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Root system considerations in the quality of loblolly pine seedlings.
SJAFD. Carlson, W.C. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. May 1986. v. 10 (2). p. 87-92. ill. Includes references. (NAL Call No.: DNAL SD1.S63).

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Roots, air and tree health.
Ball, J. Van Nuys, Calif. : Gold Trade Publications. Arbor age. Nov 1988. v. 8 (11). p. 12-14. ill. (NAL Call No.: DNAL SB435.5.A645).

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Soil compaction: effects on seedling growth.
Omi, S.K. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, United States, Forest Service. Literature review. Feb 1986. (125). p. 12-23. Includes references. (NAL Call No.: DNAL aSD11.A42).

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Soil factors and efficacy of hexazinone formulations for loblolly pine (Pinus taeda) release.
WEESA6. Minogue, P.J. Zutter, B.R.; Gjerstad, D.H. Champaign, Ill. : Weed Science Society of America. Abstract: Broadcast applications of hexazinone
3-cyclo-hexy -6-(dimethylamino)-1-methyl-1,3,-5-triazine-2,4(1H,3H)-dione pellets and foliar sprays were tested at four rates for hardwood control and safety to loblolly pine (Pinus taeda L.) at each of eight study locations differing in soil characteristics. Reduction in the number of hardwoods in the stand (hardwood density reduction) was greater with the pellet on soils with more than 60% sand, while the liquid formulation was most efficacious for finely textured soils. Hardwood density reduction with the pellet was negatively correlated with percent silt, clay, soil organic matter, and cation exchange capacity, and positively correlated with percent sand. With foliar sprays, hardwood density reduction was positively correlated with hexazinone rate and negatively correlated with soil pH. Pine mortality was positively correlated to percent sand with the pellet and negatively correlated to soil pH with broadcast sprays. Regression models incorporating pine height, herbicide rate, soil texture, cation exchange capacity, soil organic matter, and acidity could explain up to 78% of the variation in hardwood density change and 77% of the variation in pine mortality. Selective control of hardwoods in young loblolly pine stands is a function of hexazinone rate, formulation, and various soil factors. Weed science. May 1988. v. 36 (3). p. 399-405. Includes references. (NAL Call No.: DNAL 79.8 W41).

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Soil-microsite differentiation, growth and genetic variation of lodgepole pine in the foothills of Alberta, Canada.
CSOSA2. Florence, L.Z. Dancik, B.P. New York, N.Y. : Marcel Dekker. Communications in soil science and plant analysis. May/Sept 1988. v. 19 (7/12). p. 1105-1116. Includes references. (NAL Call No.: DNAL S590.C63).

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Soil properties dominate yellow-poplar seedling growth.
SJAFD. Hay, R.L. Hammer, R.D.; Conn, J.P. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. May 1987. v. 11 (2). p. 119-123. Includes references. (NAL Call No.: DNAL SD1.S63).

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Soil-site 1 relationships for white pine in the Northeast.
GTRWD. Mader, D.L. Washington, D.C. : The Service. General technical report WO - U.S. Department of Agriculture, Forest Service. Paper presented at a "Symposium on Eastern White Pine: Today and Tomorrow," June 12-14, 1985, Durham, New Hampshire. Apr 1986. (51). p. 28-31. Includes references. (NAL Call No.: DNAL aSD11.U52).

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Soils and conifer forest productivity on serpentinized peridotite of the Trinity ophiolite, California.
SOSCAK. Alexander, E.B. Adamson, C.; Zinke, P.J.; Graham, R.C. Baltimore, Md. : Williams & Wilkins. Soil science. Dec 1989. v. 148 (6). p. 412-423. maps. Includes references. (NAL Call No.: DNAL 56.8 SO3).

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Soils and productivity of lodgepole pine.
Cochran, P.H. Pullman, Wash. : Cooperative Extension, Washington State University, 1985. Lodgepole pine--the species and its management : symposium proceedings, May 8-10, 1984 Spokane, Washington, USA; repeated May 14-16, 1984 Vancouver, British Columbia, Canada / comp./ed. by D.M. Baumga. p. 89-93. Includes references. (NAL Call No.: DNAL SD397.P585L6).

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Some responses of riparian soils to grazing management in northeastern Oregon.
JRMGA. Bohn, C.C. Buckhouse, J.C. Denver, Colo. : Society for Range Management. Journal of range management. July 1985. v. 38 (4). p. 378-381. maps. Includes references. (NAL Call No.: DNAL 60.18 J82).

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Variation in growth of red alder families in relation to shallow water table levels.
FOSCA. Hook, D.D. Murray, M.D.; DeBell, D.S.; Wilson, B.C. Bethesda, Md. : Society of American Foresters. Forest science. Mar 1987. v. 33 (1). p. 224-229. Includes references. (NAL Call No. : DNAL 99.8 F7632).

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Adaptation of littleleaf disease hazard rating for use in forest management in South Carolina National Forests.
Oak, S.W. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 246-251. maps. Includes references. (NAL Call No.: DNAL aSD11.U57).

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Distribution and characteristics of windthrow microtopography on the Cumberland Plateau of Kentucky.
SSSJD4. Cremeans, D.W. Kalisz, P.J. Madison, Wis. : The Society. The abundance and characteristics of microtopography resulting from the uprooting of trees were examined on five landtypes on the northern Cumberland Plateau. Plots, 10 m by 25 m, were established at 180 locations on randomly-oriented systematic grids located in 12 first-order watersheds. The area and depth of soil disturbed were measured for each of the 524 uprootings encountered. In addition, all windthrow microtopography in a single representative hollow, 11.3 ha in area, was mapped and measured. Soil disturbance by uprooting was least on ridges, intermediate on side slopes, and greatest in coves and on lower north slopes. Percentage disturbance of the ground surface ranged from 0.4% on ridges to 2.4% in coves; number and mean area disturbed by individual uprootings ranged from 50 to 112 ha-1, and from 0.5 to 2.1 m2 along the ridge-to-cove gradient. The lower abundance of windthrow microtopography on ridges was attributed to a relatively high incidence of stem breakage vs. uprooting. Stem breakage seemed particularly common in scarlet oak (Quercus coccinea Muenchh.) which dominated ridges and south slopes. Observations made during the course of this study also suggested that concentrated subsurface water flow and concomitant decreases in tree stability may contribute to uprooting in coves and on lower slopes. Windthrow, viewed as a pedogenic process, clearly does not operate uniformly over this mountainous landscape. Soil Science Society of America journal. May/June 1988. v. 52 (3). p. 816-821. maps. Includes references. (NAL Call No.: DNAL 56.9 SO3).

3297

Silvics of loblolly-bay, Gordonia lasianthus.
Gresham, C.A. Lipscomb, D.J. Urbana-Champaign : Dept. of Forestry, University of Illinois, 1985. Fifth Central Hardwood Forest Conference : proceedings of a meeting held at the University of Illinois at Urbana-Champaign, Illinois, April 15-17, 1985 / edited by Jeffrey O. Dawson and Kimberly A. Majerus. p. 165-169. Includes references. (NAL Call No.: DNAL SD397.H3C46 1985).

3298

Soil spot herbicides for single-stem hardwood control.
SJAFD. Miller, J.H. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. Aug 1988. v. 12 (3). p. 199-203. Includes references. (NAL Call No.: DNAL SD1.S63).

3299

Potential use of soil maps to estimate southern pine beetle risk.
Lorio, P.L. Jr. Sommers, R.A. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 239-245. maps. Includes references. (NAL Call No.: DNAL aSD11.U57).

3300

Aluminum effects on northern red oak seedling growth in six forest soil horizons.
SSSJD4. Joslin, J.D. Wolfe, M.H. Madison, Wis. : The Society. The response of northern red oak (Quercus rubra L.) seedlings to varying levels of soil Al was examined in a 16-wk greenhouse study. Forest soil samples representing three soil series were used as growth media: Captina (Fragiudult, Missouri), Lexington (Paleudalf, Mississippi) and Becket (Fragiorthod, New York). Soil from two horizons from each series was separately amended in four treatments to create a wide range of soil Al availability: (i) control, (ii) limed Ca(OH)2 , (iii) acidified (HCl), (iv) acidified with supplemental calcium added (+HCl and CaSO4). Treatments significantly (p less than 0.05) altered soil pH (range 3.65 to 5.48), base saturation, and 0.01 M SrCl2-extractable Al (range 0.6-37.2 mg kg-1). Compared to controls, both acidification treatments resulted in significant reductions in fine root and foliar biomass production or in fine root branching, in all horizons except the highly organic Bhs of the Fragiorthod. In the remaining five horizons, fine root branching and biomass production were highly and negatively correlated (R2 = 0.70 and 0.50, respectively) with 0.01 M SrCl2-extractable Al. Although fine root tissue concentrations of Al correlated highly with 0.01 M SrCl2- extractable Al levels, root tissue Al predicted root branching and biomass only moderately well (R2 = 0.30 and 0.21, respectively). Fine root branching was more sensitive to treatment effects than either root biomass production or root elongation. Reductions in foliar biomas appeared to be secondary responses to direct effects on root systems. Present soil Al levels and acidic deposition rates appear to pose no threat to northern red oak in the southern portion of its range, whereas the possibility of Al toxicity in northeastern Spodosols deserves further study. Soil Science Society of America journal. Jan/Feb 1989. v. 53 (1). p. 274-281. Includes references. (NAL Call No.: DNAL 56.9 S03).

3301

Analysis of forest fertilizer experiments: obtaining better precision and extracting more information.
FOSCA. Woollons, R.C. Whyte, A.G.D. Bethesda, Md. : Society of American Foresters. Later-age forest fertilizer experiments can be quite difficult to analyze appropriately and in ways that extract all the information inherent in the collected data. Observed responses are likely to be partially confounded with variations in pretreatment stand development, most of which can be removed through analyses of covariance using quanta of initial growing stock as a covariate. Pretreatment growth rate may represent an even more discerning covariate. Rather than use covariance some authors have chosen, instead, to use arithmetical procedures to adjust treatment responses. Reanalysis of a Canadian experiment of this latter kind suggests that such methodology may be less than ideal, and should not be preferred to covariance analysis. A general and systematic procedure for examining forest nutrition experiments is proposed for those involving t treatments, and also those where the t treatments represent n factors at p levels in factorial combination. An example of adopting the recommendation methodology for the first type is given using a completely randomized experiment in naturally regenerated radiata pine in New Zealand with five replications of four treatments. Adoption of the suggested procedures in conjuction with two covariates provides a useful insight into the data, and appreciably increases precision. The system is sequential in structure, necessarily inducing some risk of erroneous hypothesis testing. Such a danger is usually minimal, however, and the suggested system, it is claimed, represents a useful method for isolating treatment and growth effects in forest fertilizer trials. For. Sci. 34(3):769-780. Forest science. Sept 1988. p. 769-780. Includes references. (NAL Call No.: DNAL 99.8 F7632).

3302

Aspen mortality following sludge application in Michigan.
Hart, J.H. Hart, J.B.; Nguyen, P.V. Seattle : University of Washington Press, 1986. The Forest alternative for treatment and utilization of municipal and industrial wastes / edited by Dale W. Cole, Charles L. Henry, and Wade L. Nutter. p. 266-271. ill. Includes references. (NAL Call No.: DNAL TD897.F65).

3303

Black bears prefer urea-fertilized trees.
Nelson, E.E. Bethesda, Md. : Society of American Foresters. Western journal of applied forestry. Jan 1989. v. 4 (1). p. 13-15. ill. Includes references. (NAL Call No.: DNAL SD388.W6).

3304

Changes in pattern of stem growth in pole-sized loblolly pine after sewage sludge application.
McKee, W.H. Jr. New Orleans, La. : The Station. General technical report SO - U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. Paper presented at the Fifth Biennial Southern Silvicultural Research Conference, Nov 1-3, 1988, Memphis, Tennessee. 1989. (74). p. 461-463. Includes references. (NAL Call No.: DNAL aSD11.U57).

3305

Comparing the effects of equal versus increasing application rates of nitrogen on the quality of shortleaf pine seedlings.
Brissette, J.C. Tiarks, A.E.; Carlson, W.C. New Orleans, La. : The Station. General technical report SO - U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. Paper presented at the Fifth Biennial Southern Silvicultural Research Conference, Nov 1-3, 1988, Memphis, Tennessee. 1989. (74). p. 95-100. Includes references. (NAL Call No.: DNAL aSD11.U57).

3306

Controlling the bronze birch borer.
Schuder, D.L. West Lafayette : The Service. Publication E - Purdue University, Cooperative Extension Service. In subseries: Ornamental Insects. Oct 1986. (50,rev.). 2 p. ill. (NAL Call No.: DNAL SB844.I6P8).

3307

Crown release and fertilization of natural black walnut.
Ponder, F. Jr. Schlesinger, R.C. Bethesda, Md. : Society of American Foresters. Northern journal of applied forestry. Dec 1986. v. 3 (4). p. 153-155. Includes references. (NAL Call No.: DNAL SD143.N6).

3308

Cupric carbonate controls green ash root morphology and root growth.
HJHSA. Arnold, M.A. Struve, D.K. Alexandria, Va. : American Society for Horticultural Science. HortScience. Apr 1989. v. 24 (2). p. 262-264. Includes references. (NAL Call No.: DNAL SB1.H6).

3309

Effect of family and nitrogen fertilizer on growth and foliar nutrients of Douglas-fir saplings.
FOSCA. DeBell, D.S. Silen, R.R.; Radwan, M.A.; Mandel, N.L. Bethesda, Md. : Society of American Foresters. Forest science. Sept 1986. v. 32 (3). p. 643-652. Includes references. (NAL Call No.: DNAL 99.8 F7632).

3310

Effect of inoculum density and fertilization on greenhouse screening of loblolly pine seedlings for resistance to fusiform rust.
PHYTAJ. Carson, S.D. Young, C.H. St. Paul, Minn. : American Phytopathological Society. Phytopathology. Aug 1987. v. 77 (8). p. 1186-1191. Includes references. (NAL Call No.: DNAL 464.8 P56).

3311

Effect of operational fertilizaton on foliar nutrient content and growth of young Douglas-fir and Pacific silver fir.
XPNWA. Cochran, P.H. Lopushinsky, W.; McColley, P.D. Portland, Or. : The Station. PNW research note - U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. July 1986. (445). 10 p. Includes references. (NAL Call No.: DNAL A99.9 F7625U).

3312

Effect of slow release fertilizers on formation of mycorrhizae and growth of container grown pine seedlings.
Crowley, D.E. Maronek, D.M.; Hendrix, J.W. Washington, D.C. : Horticultural Research Institute. Journal of environmental horticulture. Sept 1986. v. 4 (3). p. 97-101. Includes 11 references. (NAL Call No.: DNAL SB1.J66).

3313

Effect of sludge on wood properties: a conceptual review with results from a sixty-year-old Douglas-fir stand.
Briggs, D.G. Mecific, F.; Smith, W.R. Seattle : University of Washington Press, 1986. The Forest alternative for treatment and utilization of municipal and industrial wastes / edited by Dale W. Cole, Charles L. Henry, and Wade L. Nutter. p. 246-257. Includes references. (NAL Call No.: DNAL TD897.F65).

3314

Effects and interactions of slash burning and mycorrhizal infection on douglas-fir seedling growth and morphology.
Black, C.H. Corvallis, Or. : Oregon State University , Forest Research Laboratory, 1985. Proceedings of the 6th North American Conference on Mycorrhizae : June 25-29, 1984, Bend, Oregon / compiled and edited by Randy Molina ; sponsoring institutions, Oregon State University, College of Forestry, and USDA. p. 276. (NAL Call No.: DNAL aQK604.N6 1984).

3315

Effects of different urea fertilizers on soil and trees in a young thinned stand of western hemlock.
SSSJD4. Radwan, M.A. DeBell, D.S. Madison, Wis. : The Society. Effects of three different urea fertilizers on selected chemical characteristics of soils and foliage, and on growth per tree of a 24-yr-old thinned stand of

werstern hemlock Tsuga heterophylla (Raf.) Sarg. were compared at a site in coastal Oregon. Treatments were the following: untreated control (C), urea (U), urea treated with N-Serve nitrapyrin, 2-chloro-6-(trichloromethyl) pyridine (U + NS), and sulfur-coated urea (SCU). Fertilizers were uniformly applied by hand to 0.03-ha plots in March at 224 kg N ha-1. Soil, to a depth of 20 cm, and current-year foliage were sampled periodically for 2 yr. Height and diameter of 10 dominant or codominant trees per plot were measured annually for 6 yr. Treatment effects on soil pH va ried by fertilizer and sampling date; throughout, pH was lower with U + NS than with U, and the smallest change in ph was associated with SCU. Effects of fertilizer on inorganic N in the soil and on foliar nutrients varied by fertilizer and sampling date. Initially, N-Serve inhibited nitrification and produced the highest NH4-N concentrations. In general, all fertilizers increased inorganic N in the soil and total N in the foliage. Fertilizers significantly reduced foliar concentrations of some other macronutrients, especially in the first year after fertilization; some depressions were significantly less with SCU than with the other two fertilizers. Height growth per tree was not significantly affected by any of the fertilizers. Basal-areaand volume growth per tree were significantly greater with the SCU treatment than with the control, U, or U + NS treatments. Beneficial effects of SCU seemed to be mostly due to the slow release of N from the fertilizer, although some positive effect of S cannot be ruled out. Soil Science Society of America journal. May/June 1989. v. 53 (3). p. 941-946. Includes references. (NAL Call No.: DNAL 56.9 S03).

3316

Effects of fertilization on growth and foliar nutrients of red alder seedlings.
XFPNA. Radwan, M.A. Portland, Or. : The Station. USDA Forest Service research paper PNW-RP - United States, Pacific Northwest Research Station. July 1987. (375). 14 p. Includes references. (NAL Call No.: DNAL A99.9 F7625UNI).

3317

Effects of propagation container dimensions, and media on the growth of 4 nursery crops.
Threadgill, C.C. Whitcomb, C.E.; McNew, R. Washington, D.C. : Horticultural Research Institute. Journal of environmental horticulture. Sept 1985. v. 3 (3). p. 126-131. Includes 12 references. (NAL Call No.: DNAL SB1.J66).

3318

Enhanced herbaceous weed control in conifers with combinations of nitrogen fertilizer formulations and hexazinone.
WSWPA. White, D.E. Newton, M.; Cole, E.C. Reno : The Society. Proceedings - Western Society of Weed Science. Paper presented at the annual meeting of the Western Society of Weed Science, March 18-20, 1986, San Diego, California. 1986. v. 39. p. 102-106. (NAL Call No.: DNAL 79.9 W52).

3319

Estimating the response of ponderosa pine forests to fertilization.
XGTIA. Powers, R.F. Webster, S.R.; Cochran, P.H. Ogden, Utah : The Station. General technical report INT - U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Paper presented at "Future Forests of the Mountain West : A Stand Culture Symposium," Sept 29-Oct 3, 1986, Missoula, MT. Apr 1988. (243). p. 219-225. maps. Includes references. (NAL Call No.: DNAL aSD11.A48).

3320

Explorations of mechanisms regulating ectomycorrhizal colonizationg sic of boron-fertilized pine quarterly report, period covered 8/20/86-3/31/87 /principal investigator, Harold E. Garrett.
Garrett, Harold E. Columbia, Mo. : University of Missouri? , 1987. "Submitted to Department of Energy."~ "DOE/CE/15270--T1."~ "DE87 006451."~ "Instrument no. DE-FG01-86CE1570.". 17 p. : ill. ; 28 cm. (NAL Call No.: DNAL QK918.G3).

3321

Factors regulating overwinter survival of newly propagated stem tip cuttings of Acer palmatum Thunb. 'Bloodgood' and Cornus florida L. var. rubra.
HJHSA. Goodman, M.A. Stimart, D.P. Alexandria, Va. : American Society for Horticultural Science. HortScience. Dec 1987. v. 22 (6). p. 1296-1298. Includes references. (NAL Call No.: DNAL SB1.H6).

3322

Fertilization and competition control accelerate early southern pine growth on flatwoods.
SJAFD. Swindel, B.F. Neary, D.G.; Comerford, N.B.; Rockwood, D.L.; Blakeslee, G.M. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. May 1988. v. 12 (2). p. 116-121. ill. Includes references. (NAL Call No.: DNAL SD1.S63).

3323

Fertilizer trials on containerized red pine.
Eggleston, K.L. Sharp, R.C. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, United States, Forest Service. Feb 1986. (125). p. 38-42. maps. Includes references. (NAL Call No.: DNAL aSD11.A42).

3324

Field performance of five interior spruce stock types with and without fertilization at time of planting.
Sutherland, C. Newsome, T. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. Paper presented at a meeting of the Western Forest Nursery Associations, Aug 8-11, 1988, Vernon, British Columbia. Dec 1988. (167). p. 195-198. Includes references. (NAL Call No.: DNAL aSD11.A42).

3325

Growth and heavy metal accumulation in pine seedlings grown with sewage sludge.
JEVQAA. Berry, C.R. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. July/Sept 1985. v. 14 (3). p. 415-419. Includes references. (NAL Call No.: DNAL QH540.J6).

3326

Growth of nitrogen-fertilized and thinned quaking Aspen (Populus tremuloides Michx.).
Perala, D.A. Laidly, P.R. St. Paul, Minn. : The Station. Research paper NC - U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 1989. (286). 8 p. Includes references. (NAL Call No.: DNAL aSD11.A34).

3327

Growth rates after fertilizing lodgepole pine.
Cochran, P.H. Bethesda, Md. : Society of American Foresters. Western journal of applied forestry. Jan 1989. v. 4 (1). p. 18-20. Includes references. (NAL Call No.: DNAL SD388.W6).

3328

Growth response of a boreal black spruce stand to fertilizer treatments.
Foster, N.W. Morrison, I.K.; Swan, H.S.D. Bethesda, Md. : Society of American Foresters. Northern journal of applied forestry. Dec 1986. v. 3 (4). p. 142-144. Includes references. (NAL Call No.: DNAL SD143.N6).

3329

Growth, xylem pressure potential, and nutrient absorption of loblolly pine on a reclaimed surface mine as affected by an induced Pisolithus tinctorius infection.
FOSCA. Walker, R.F. West, D.C.; McLaughlin, S.B.; Amundsen, C.C. Bethesda, Md. : Society of American Foresters. The effects of Pisolithus tinctorius ectomycorrhizae on survival, growth, xylem pressure potential, and nutrient uptake of loblolly pine on a southern Appalachian coal surface mine were examined. One-year-old bareroot seedlings artificially inoculated with P. tinctorius and control seedlings with Thelephora terrestris ectomycorrhizae were outplanted on a surface-mined site in Tennessee. The site had previously been contoured and hydroseeded with a mixture of herbaceous ground cover species. A soil fertility variable was imposed in the study by broadcast fertilization at outplanting of one-half of the plots of each mycorrhizal treatment at the rate of 336 kg/ha NPK. After 7 years, survival and growth of trees previously inoculated with P. tinctorius were significantly improved relative to control trees. Fertilization elicited a significant reduction in survival and a negligible growth response in trees of both mycorrhizal treatments due primarily to its stimulation of competing herbaceous species. During the third growing season, xylem pressure potential of seedlings with P. tinctorius ectomycorrhizae was significantly less negative than that of control seedlings during a prolonged period of moisture stress. Analyses of foliar samples collected during the third growing season revealed that seedlings infected by P. tinctorius had more NO3 and less Zn in their needles than control seedlings. The results of this study provide evidence that the benefits afforded loblolly pine on surface mines by P. tinctorius ectomycorrhizae include enhanced absorption of water as well as increased uptake of nutrients, and these benefits are not compromised by the presence of competing herbaceous species. Forest science. June 1989. v. 35 (2). p. 569-581. Includes references. (NAL Call No.: DNAL 99.8 F7632).

3330

Heating system, germination temperature and post germination fertilizer regime effects on white spruce nursery growth.
Hawkins, C.D.B. Draper, D.A.; Eng, R.Y.N. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. Paper presented at a meeting of the Western Forest Nursery Associations, Aug 8-11, 1988, Vernon, British Columbia. Dec 1988. (167). p. 50-53. (NAL Call No.: DNAL aSD11.A42).

3331

Height and diameter growth response in loblolly pine stands following fertilization.
FOSCA. Bolstad, P.V. Allen, H.L. Bethesda, Md. : Society of American Foresters. Forest science. Sept 1987. v. 33 (3). p. 644-653. Includes references. (NAL Call No.: DNAL 99.8 F7632).

3332

Influence of fall fertilization and moisture stress on growth and field performance of container-grown Douglas-fir seedlings.
XGTIA. Jopson, T.M. Paul, J.L. Ogden, Utah : The Station. USDA Forest Service general technical report INT - Intermountain Forest and Range Experiment Station. June 1985. (185). p. 14-19. ill. Includes references. (NAL Call No.: DNAL aSD11.A48).

3333

Leaf area, stemwood growth, and nutrition relationships in loblolly pine.
FOSCA. Vose, J.M. Allen, H.L. Bethesda, Md. : Society of American Foresters. The relationships among loblolly pine (Pinus taeda L.) stand leaf area index (LAI), stemwood volume growth (m3/ha/yr), and growth efficiency (m3 stemwood/ha/yr/LAI) were examined in three nitrogen (N) by phosphorus (P) fertilization field trials. Prior to fertilization, stocking levels and nitrogen limitations varied for the three stands. LAI increased significantly (up to 60%) following N fertilization on the two N deficient stands. Phosphorus additions did not affect LAI. Stenwood growth was positively and linearly related to LAI across treatments and stands. Variations in LAI across stands reflected the differences in stocking and N availability. On average, a unit of LAI produced 7.3 m3 stemwood/ha/yr. Growth efficiency was not affected by fertilization on two of the three stands. A decrease in growth efficiency at a projected LAI above 3.5 resulted from an asymptotic relationship between stemwood growth and LAI on a stand that was fully stocked and highly responsive to N fertilization. The use of LAI as an index of stocking is proposed because LAI intergrates tree size, stand density, and site resource supply. In addition, it is proposed that the deviation of a stand's current LAI from the maximum supportable LAI based on fixed site factors (e.g., water, temperature) may provide a good measure of a stand's potential responsiveness to fertilization. For. Sci. 34(3):547-563. Forest science. Sept 1988. p. 547-563. Includes references. (NAL Call No.: DNAL 99.8 F7632).

3334

Long-term effects of fertilization on stem form, growth relations, and yield estimates of slash pine.
FOSCA. Jokela, E.J. Harding, R.B.; Nowak, C.A. Bethesda, Md. : Society of American Foresters. The long-term effects of time-of-planting phosphorus (P) fertilization on stem form were evaluated in a 25-year-old slash pine plantation in north Florida. Cylindrical form factor (CFF), relative taper curves, the constant-stress principle of stem formation, and individual tree volume and biomass estimation equations were compared among treatments. Significant differences in CFF and taper existed between control and fertilized trees. Treatment-induced changes in crown size and accelerated tree and stand development may be responsible for these differences. Although statistically significant, alteration of stem form by fertilization was of minor importance relative to the accurate estimation of stand volume and weight. The cost and effort necessary to develop treatment-specific equations for quantifying fertilizer responses for slash pine on P-deficient sites appears unwarranted. Forest science. Sept 1989. v. 35 (3). p. 832-842. Includes references. (NAL Call No.: DNAL 99.8 F7632).

3335

Mycorrhiza and soil fertility effects with growth, nodulation and nitrogen fixation of Leucaena grown on a Typic Eutrustox.
CSOSA2. Purcino, A.A.C. Lurlarp, C.; Lynd, J.Q. New York, N.Y. : Marcel Dekker. Communications in soil science and plant analysis. May 1986. v. 17 (5). p. 473-489. ill. Includes 16 references. (NAL Call No.: DNAL S590.C63).

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Nitrogen sources and fertilizer rates affect growth of hybrid poplar.
Hansen, E.A. Tolsted, D.N. Urbana-Champaign : Dept. of Forestry, University of Illinois, 1985. Fifth Central Hardwood Forest Conference : proceedings of a meeting held at the University of Illinois at Urbana-Champaign, Illinois, April 15-17, 1985 / edited by Jeffrey O. Dawson and Kimberly A. Majerus. p. 71-77. Includes references. (NAL Call No.: DNAL SD397.H3C46 1985).

3337

Nursery and field evaluation of compost-grown coniferous seedlings.
Coleman, M. Dunlap, J.; Dutton, D.; Bledsoe, C. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. Paper presented at a Meeting of the Combined Western Forest Nursery Council and Intermountain Nursery Association, August 12-15, 1986, Tumwater,

Washington. Dec 1986. (137). p. 24-28. Includes references. (NAL Call No.: DNAL aSD11.A42).

3338

Patterns of leaf area distribution within crowns of nitrogen- and phosphorus-fertilized loblolly pine trees.
FOSCA. Vose, J.M. Bethesda, Md. : Society of American Foresters. Field trials of nitrogen (N) and phosphorus (P) fertilization in loblolly pine plantations (Pinus taeda L.) were used to determine the effects of fertilization on within-crown leaf area distribution in a fully stocked stand, and two less than fully stocked stands. A second objective was to examine the utility of the Weibull distribution for modeling leaf area distribution in loblolly pine crowns. Results showed that leaf area increases were most evident in the mid-and lower-crown positions (2-4 m and 4-6 m crown depths), regardless of stocking level. Response patterns suggested that the Westvaco Stocking Chart, which is based on empirical relationships between stand basal area, stand density, and canopy closure, did not adequately reflect light interception in these stands because stands were ranked differently when stocking was expressed by stand leaf area index. The fully stocked stand was 50% below the theoretical optimum leaf area index value of 5. Thus, it is hypothesized that leaf area increases occurred in the mid- and lower-crown because shading in the mid- and lower-crown positions was insufficient to inhibit foliage production and survival. Fertilization-induced changes in leaf physiology may have also played an important role in leaf production and branch retention in the mid- and lower-crown. The Weibull distribution provided a good fit of within-crown leaf area distribution. For. Sci. 34(3): 564-573. Forest science. Sept 1988. p. 564-573. Includes references. (NAL Call No.: DNAL 99.8 F7632).

3339

Physiological characteristics of loblolly pine seedlings in relation to field performance.
Kramer, P.J. Rose, R.W. Jr. Auburn, Ala.? : Orders, Dept. of Research Information, Auburn University, 1986? . Proceedings of the International Symposium on Nursery Management Practices for the Southern Pines, Montgomery, Alabama, August 4-9, 1985 / edited by David B. South. p. 416-440. Includes references. (NAL Call No.: DNAL SD397.P55I58 1985).

3340

Plant uptake of trace elements from coal gasification ashes.
JEVQAA. Francis, C.W. Davis, E.C.; Goyert, J.C. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. Oct/Dec 1985. v. 14 (4). p. 561-569. Includes references. (NAL Call No.: DNAL QH540.J6).

3341

Predicting fertilizer response of loblolly pine using foliar and needle-fall nutrients sampled in different seasons.
FOSCA. McNeil, R.C. Lea, R.; Ballard, R.; Allen, H.L. Bethesda, Md. : Society of American Foresters. Nitrogen (N) phosphorus (P) concentrations in loblolly pine (Pinus taeda) foliage and needle-fall were determined five times during 1979 on ten fertilizer trails installed between 1971 and 1973. Bole volume responses to fertilizers were regressed on initial stand basal area, and the residual errors were used as dependent variables in regressions with the nutrient variables. The only sampling period during which the N response residuals had a significant relation to foliar nutrients was early fall. The needle-fall N/P ratio was significantly related to the N response residuals in late winter, late spring, and early fall. Phosphorus response residuals were significantly related to foliar nutrients during all sampling periods and to needle-fall N/P in all sampling periods except late winter. The maximum R2, 0.73, was for the regression of the P response residuals versus a foliar N/P ratio in late spring. The N + P response residuals were not significantly related to foliar or needle-fall nutrients. For. Sci. 34(3):698-707. Forest science. Sept 1988. p. 698-707. Includes references. (NAL Call No.: DNAL 99.8 F7632).

3342

Proceedings Intermountain Nurseryman's Association meeting : August 13-15, 1985, Fort Collins, Colorado /technical coordinators: Thomas D. Landis, James W. Fischer. --.
Intermountain Nurseryman's Association.~Meeting_(1985 :_Fort Collins, Colo.). Landis, Thomas D.; Fischer, James W. Fort Collins, Colo. : Rocky Mountain Forest and Range Experiment Station, Forest Service, U.S. Dept. of Agriculture, 1986. "February 1986.". 111 p. : ill., 1 map ; 28 cm. --. Includes bibliographies. (NAL Call No.: DNAL aSD11.A42 no.125).

3343

Recent research indicates plant community responses to intensive treatment including chemical amendments.
SJAFD. Swindel, B.F. Smith, J.E.; Neary, D.G.; Comerford, N.B. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. Aug 1989. v. 13 (3). p. 152-156. Includes references. (NAL Call No.: DNAL SD1.S63).

3344

Relationship of feeding damage by red squirrels to cultural treatments in young stands of lodgepole pine.
XGTIA. Brockley, R.P. Sullivan, T.P. Ogden, Utah : The Station. General technical report INT - U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Paper presented at "Future Forests of the Mountain West : A Stand Culture Symposium," Sept 29-Oct 3, 1986, Missoula, MT. Apr 1988. (243). p. 322-329. Includes references. (NAL Call No.: DNAL aSD11.A48).

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Acute ozone stress on eastern cottonwood (Populus deltoides Bartr.) and the pest potential of the aphid, Chaitophorus populicola Thomas (Homoptera: Aphididae).
EVETEX. Coleman, J.S. Jones, C.G. College Park, Md. : Entomological Society of America. The effect of acute ozone exposure of eastern cottonwood (Populus deltoides Bartr.) on the survivorship, reproduction, and development of the aphid Chaitophorus populicola Thomas (Homoptera: Aphididae) was investigated. Cottonwoods were exposed to 397 microgram/m3 (0.20 ppm) ozone or charcoal-filtered air and infested with aphids on leaf plastochron index 5, 40 h after fumigation. Aphid performance was not significantly different on plants exposed to ozone compared with charcoal-filtered air-treated control plants. These data do not support the notion that aphid performance will directly increase on air pollution-stressed plants. We also examined settling and feeding preference of aphids for cottonwood leaves of different developmental ages. Aphids significantly preferred leaf plastochron index 5 to all other leaf ages. These data support hypotheses relating aphid leaf preference to stages of leaf development. Reproduction of the cottonwood leaf rust fungus (Melampsora medusae Thum.) and the imported willow leaf beetle (Plagiodera versicolora Laicharting) are reduced on ozone-fumigated plants (reported elsewhere). If aphid populations are affected by competition with these cottonwood pests for leaf resources, then aphid pest potential may actually increase in areas characterized by episodic ozone concentrations because of ozone-induced decreases in populations of M. medusae and P. versicolora. Environmental entomology. Apr 1988. v. 17 (2). p. 207-212. Includes references. (NAL Call No.: DNAL QL461.E532).

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Allelopathic effects of shrubs of the sand pine scrub on pines and grasses of the sandhills.
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Allelopathic potential of coniferous species to old-field weeds in eastern Quebec.
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Aluminum effects on northern red oak seedling growth in six forest soil horizons.
SSSJD4. Joslin, J.D. Wolfe, M.H. Madison, Wis. : The Society. The response of northern red oak (Quercus rubra L.) seedlings to varying levels of soil Al was examined in a 16-wk greenhouse study. Forest soil samples representing three soil series were used as growth media: Captina (Fragiudult, Missouri), Lexington (Paleudalf, Mississippi) and Becket (Fragiorthod, New York). Soil from two horizons from each series was separately amended in four treatments to create a wide range of soil Al availability: (i) control, (ii) limed $Ca(OH)_2$, (iii) acidified (HCl), (iv) acidified with supplemental calcium added (+HCl and $CaSO_4$). Treatments significantly (p less than 0.05) altered soil pH (range 3.65 to 5.48), base saturation, and 0.01 M $SrCl_2$-extractable Al (range 0.6-37.2 mg kg-1). Compared to controls, both acidification treatments resulted in significant reductions in fine root and foliar biomass production or in fine root branching, in all horizons except the highly organic Bhs of the Fragiorthod. In the remaining five horizons, fine root branching and biomass production were highly and negatively correlated (R^2 = 0.70 and 0.50, respectively) with 0.01 M $SrCl_2$-extractable Al. Although fine root tissue concentrations of Al correlated highly with 0.01 M $SrCl_2$- extractable Al levels, root tissue Al predicted root branching and biomass only moderately well (R^2 = 0.30 and 0.21, respectively). Fine root branching was more sensitive to treatment effects than either root biomass production or root elongation. Reductions in foliar biomas appeared to be secondary responses to direct effects on root systems. Present soil Al levels and acidic deposition rates appear to pose no threat to northern red oak in the southern portion of its range, whereas the possibility of Al toxicity in northeastern Spodosols deserves further study. Soil Science Society of America journal. Jan/Feb 1989. v. 53 (1). p. 274-281. Includes references. (NAL Call No.: DNAL 56.9 S03).

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within 2% of the estimates obtained with observed heights at ages greater than 3 years. Differences in survival, height, and diameter were combined to examine trends in volume production associated with families. Predicted volume for each family was simulated using a bivariate distribution of height and diameter accounting for differences in height-growth patterns among families. Family rankings for volume are also closely correlated, resulting in two or three of the same families being selected using observed and predicted data. Selection differential obtained from simulated and observed volume fluctuates in rank producing a satisfactory trend based on predicted volume after age 5. Gain based on simulated volume tends to be slightly greater than gain based on observed volume. Estimates of percent gain obtained by reinitializing the simulations with quadratic mean dbh and residual trees per acre after thinning differed more from the observed trends th. Forest science. Mar 1989. v. 35 (1). p. 211-228. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Clonal development of coyote willow, Salix exigua (Salicaceae), and attack by the shoot-galling sawfly, Euura exiguae (Hymenoptera: Tenthredinidae).
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Computer prediction of insecticide efficacy for western spruce budworm and Douglas-fir Tussock moth susceptible, tolerant, resistant /Jacqueline L. Robertson, Molly W. Stock. --.
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XGTIA. McGregor, M.D. Ogden, Utah : The Station. USDA Forest Service general technical report INT - Intermountain Forest and Range Experiment Station. Apr 1985. (174). p. 30-31. (NAL Call No.: DNAL aSD11.A48).

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A Dendroctonus frontalis infestation growth model: organization, refinement, and utilization.
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Dendroecological analysis of a population of black gum (Nyssa sylvatica Marsh.) in southern Ontario, Canada.
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Densitometric and ring width analysis of 3-year-old Pinus taeda L. and Liquidambar styraciflua L. grown under three levels of CO2 and two water regimes.
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Density-damage relationship and presence-absence sampling of the elm leaf beetle (Coleoptera: Chrysomelidae) in northern California.
EVETEX. Dreistadt, S.H. Dahlsten, D.L. Lanham, Md. : Entomological Society of America. The relationship between density of elm leaf beetle, Xanthogaleruca luteola (Muller), and damage to English elm, Ulmus procera Salisbury, and Siberian elm, Ulmus pumila L., was studied in seven northern California cities in 1986 and 1987. Peak first-generation elm leaf beetle egg or larval densities were good predictors of cumulative foliage damage to English elm and to a lesser extent predicted Siberian elm damage. Egg density on both hosts was highly associated with the proportion of samples infested with eggs. The maximum proportion of presence-absence samples infested with first generation eggs predieted cumulative damage to English but not to Siberian elm. When no effort was made to control beetle populations most English elm trees sustained more than 40% damage to retained foliage, whereas damage to most Siberian elms was less. Environmental entomology. Oct 1989. v. 18 (5). p. 849-853. Includes references. (NAL Call No.: DNAL QL461.E532).

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Deposition of hexazinone from a logarithmic sprayer.
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Design efficiencies with planned and unplanned unbalance for estimating heritability in forestry.
FOSCA. McCutchan, B.G. Namkoong, G.; Giesbrecht, F.G. Bethesda, Md. : Society of American Foresters. Design efficiencies are evaluated for the estimation of heritability in unbalanced designs using Modified Maximum Likelihood estimation. Assuming knowledge of the variance components, the variance of the estimate of heritability is calculated. The effects of block size, plot size, family size, variance of family size, and total number of observations on design efficiency are examined across the range of heritability and under 100%, 90%, 80%, and 60% survival. The implications of each of these design factors are discussed. There is no uniformly best design for estimating heritability; the most efficient design is a function of the heritability. Forest science. Sept 1989. v. 35 (3). p. 801-815. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Deterioration of black spruce seed during in-situ storage and processing.
TPLNA. Skeates, D.A. Irving, D.E.; Haavisto, V.F. Washington, D.C. : The Service. Tree planters' notes - U.S. Department of Agriculture, Forest Service. Summer 1989. v. 40 (3). p. 5-8. Includes references. (NAL Call No.: DNAL 1.962 C5T71).

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Determination of persistence, movement, and degradation of hexazinone in selected Canadian boreal forest soils.
JAFCAU. Roy, D.N. Konar, S.K.; Charles, D.A.; Feng, J.C.; Prasad, R.; Campbell, R.A. Washington, D.C. : American Chemical Society. Journal of agricultural and food chemistry. Mar/Apr 1989. 37 (2). p. 443-447. Includes references. (NAL Call No.: DNAL 381 J8223).

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Determining the amount of triclopyr required to control ash and birch with basal bark application.
PNWSB. Kuhns, L.J. Lyman, G.T. College Park, Md. : The Society. Proceedings of the annual meeting - Northeastern Weed Science Society. Meeting held on January 4-6, 1989, Baltimore, Maryland. 1989. v. 43. p. 62-63. (NAL Call No.: DNAL 79.9 N814).

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Determining the effects of fusiform rust on forest productivity.
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Developing weed control systems for conifer seedlings.
WSWPA. Agamalian, H.S. Reno : The Society. Proceedings - Western Society of Weed Science. 1985. v. 38. p. 164-166. (NAL Call No.: DNAL 79.9 W52).

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Development and implementation of a gypsy moth integrated pest management program.
JOARD. Reardon, R. McManus, M.; Kolodny-Hirsch, D.; Tichenor, R.; Raupp, M.; Schwalbe, C.; Webb, R.; Meckley, P. Urbana, Ill. : International Society of Arboriculture. Journal of arboriculture. Literature review. Sept 1987. v. 13 (9). p. 209-216. ill., maps. Includes references. (NAL Call No.: DNAL SB436.J6).

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Development and implementation of the southern pine beetle decision support system.
Saunders, M.C. Loh, P.K.; Coulson, R.N.; Rykiel, E.J.; Payne, T.L.; Pulley, P.E.; Hu, L.C. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 335-363. ill. Includes references. (NAL Call No.: DNAL aSD11.U57).

3697

Development and mortality of Ips avulsus (Coleoptera: Scolytidae) at constant temperatures.
EVETEX. Wagner, T.L. Hennier, P.B.; Flamm, R.O.; Coulson, R.N. College Park, Md. : Entomological Society of America. Aspects of the development and mortality of Ips avulsus (Eichhoff) were studied at seven constant temperatures from 10 to 35 degrees C. On average, eggs occupied 10.3% of the total time in the host, larvae 34.8%, pupae 11.8%, and teneral adults 43.1%. Plots of development rates (reciprocal of median times) and percent mortalities versus constant temperatures indicated that the insect is well adapted to high temperatures but sensitive to low temperatures. The timing of oviposition relative to sibling oviposition time in a slab had little effect on the development times of any life stage or the life cycle. Oviposition time influenced life-stage and life-cycle mortality, although the effects were not great. For example, the probability of larval death increased from 16.6 to 28.7% for individuals originating in the first and fourth quarters of the oviposition period. The probability of death due to cannibalism was less than 10% and was not influenced by oviposition time. No difference was observed in the overall proportion of males to total emerging beetles (0.496) and 0.5; however, this proportion increased with time throughout the emergence period. Models were developed to predict life-stage and life-cycle development times as functions of temperature. A mechanistic model described the development rate versus constant temperature relationship, whereas a cumulative Weibull function described the temperature-independent distributions of normalized development times. The life-cycle model was validated using a multiple-cohort simulation procedure and data of I. avulsus emergence from three trees in each of three field plots. The validation indicated model suitability in a larger model of population dynamics, although additional testing is indicated. Environmental entomology. Apr 1988. v. 17 (2). p. 181-191. Includes references. (NAL Call No.: DNAL QL461.E532).

3698

Development and mortality of Ips calligraphus (Coleoptera: Scolytidae) at constant temperatures.
EVETEX. Wagner, T.L. Fargo, W.S.; Flamm, R.O.; Coulson, R.N.; Pulley, P.E. Lanham, Md. : Entomological Society of America. We describe effects of constant temperature, beetle density, and time of oviposition on aspects of development, mortality, sex ratio, and size of Ips calligraphus (Germar). Emphasis is placed on individual life stages. Relationships of median development times to constant temperatures were similar for eggs, larvae, and pupae in the 12.5-37.5 degrees C range. These relationships appeared as backward J-shaped curves. Reciprocal development times versus temperatures for these life stages were described by the six-parameter rate function of

Sharpe & DeMichele (1977, J. Theor. Biol. 64: 649-670). Development times and foraging distances of larvae increased with each instar. The third instar required 61% of total larval time and excavated 73% of the total larval gallery. Optimum development temperature of teneral adults was not identified, indicating greater tolerance to high temperatures of this stage compared with the others. The four-parameter Sharpe & DeMichele (1977) model (without high-temperature inhibition) described teneral adult rate as a function of temperature. Timing of oviposition influenced development time of larvae (increased development time with late oviposition) and teneral adults (decreased), but not development times of eggs or pupae. Reversed patterns of longer development times for larvae and shorter times for teneral adults canceled any effects of sequential oviposition on length of life cycle. Distributions of development times were generally skewed toward the longer times, and variation around mean time tended to increase with successive life stage. A single, temperature-independent distribution of normalized development times is presented for each life stage and is described by a three-parameter cumulative Weibull function. stage-specific mortality (resulting from unknowr causes) formed partial or full U-shaped patterns when plotted against temperature. Density-dependent mortality resulting from cannibalism is discussed, with a Weibull functi. Environmental entomology. Apr 1987. v. 16 (2). p. 484-496. Includes references. (NAL Call No.: DNAL QL461.E532).

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Development, implementation, and validation of a large area hazard- and risk-rating system for southern pine beetle.
Billings, R.F. Bryant, C.M.; Wilson, K.H. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 226-232. Includes references. (NAL Call No.: DNAL aSD11.U57).

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The development of a computerized database management system for Midland County.
MUCBA. Gage, S.H. Wirth, T.M. East Lansing, Mich. : The Service. Extension bulletin E - Cooperative Extension Service, Michigan State University. In the series analytic: The Second annual report of the Gypsy Moth Technical Committee: Gypsy moth in Michigan, 1987 / edited by Bruce A. Montgomery. May 1988. (2142). p. 50-51. (NAL Call No.: DNAL 275.29 M58B).

3701

Development of a herbicide data base for the Southeastern United States forestry sector.
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Development of Ectomycorrhizae on container-grown European larch.
TPLNA. Rietveld, W.J. Sharp, R.A.; Kienzler, M.F.; Dixon, R.K. Washington, D.C. : The Service. Tree planters' notes - U.S. Department of Agriculture, Forest Service. Spring 1989. v. 40 (2). p. 12-17. Includes references. (NAL Call No.: DNAL 1.962 C5T71).

3703

The development of old-growth douglas-fir forests northeast of Mount St. Helens, Washington, following an A.D. 1480 eruption.
Yamaguchi, D.K. Washington, DC : U.S. Department of Energy, Office of Energy Research, 1986. Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis / compiled by G.C. Jacoby, J.W. Hornbeck. p. 181-185. maps. Includes references. (NAL Call No.: DNAL QK477.2.A6I5 1986).

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Development of the abscission zone in needles of Douglas-fir.
JOSHB. Montano, J.M. Proebsting, W.M. Alexandria, Va. : The Society. Journal of the American Society for Horticultural Science. Includes cut trees. Jan 1988. v. 113 (1). p. 133-137. Includes references. (NAL Call No.: DNAL 81 S012).

3705

Development of wound tissue in the bark of Fraser fir and its relation to injury by the balsam woolly adelgid.
GENSAB. Arthur, F.H. Hain, F.P. Athens, Ga. : The Society. Journal of Entomological Science. Jan 1985. v. 20 (1). p. 129-135. Includes references. (NAL Call No.: DNAL QL461.G4).

3706

Development, reproduction, and competitive interactions between two sympatric leafhopper species (Homoptera: Cicadellidae) on redbud trees.
EVETEX. Hunter, C.E. Yeargan, K.V. Lanham, Md. : Entomological Society of America. The developmental and reproductive biologies of two sympatric leafhoppers, Erythroneura aclys McAtee and Erythroneura bistrata McAtee were studied, as well as their responses to intra-and interspecific competition. Both leafhoppers specialize on redbud trees, Cercis canadensis L. E. aclys eggs developed faster in the field than E. bistrata eggs in 1985 but not in 1986; developmental periods for nymphs in the field did not differ significantly between species in either year. Under controlled but fluctuating warm temperatures (19-29 degrees C; average = 24 degree C), egg developmental periods did not differ significantly between species, but nymphal E. aclys developed faster than nymphal E. bistrata. Under controlled, cool fluctuating temperatures (11-21 degrees C; average = 16 degrees C), eggs and nymphs of E. aclys developed more quickly than those of E. bistrata. E. aclys and E. bistrata did not have statistically different pre-ovipositional periods, ovipositional periods, fecundities, or average daily ovipositional rates. Pre-ovipositional periods were longer in the first generation for both species. Both species exhibited a similar significant density-dependent response in a competition study. Fewer progeny were produced per female as density in a cage increased. There were no differences between species in the number of progeny produced whether caged as mixed or single species. Interspecific competition did not affect either species to a greater degree than did intraspecific competition. Shorter developmental requirements of E. aclys and its early-season ovipositional pattern may maintain this species as the numerically dominant of the two Erythroneura species at the primary study site on the University of Kentucky campus. Environmental entomology. Feb 1989. v. 18. p. 127-132. Includes references. (NAL Call No.: DNAL QL461.E532).

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Developmental differences among five lodgepole pine provenances planted on a subalpine site in Montana.
XFIPA. Cole, D.M. Ogden, Utah : The Station. Research paper INT - U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Nov 1989. (415). 11 p. Includes references. (NAL Call No.: DNAL A99.9 F764U).

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Developments in commercially produced microbials at Biochem Products.
XGNEA. Lublinkhof, J. Ross, D.H. Broomall, Pa. : The Station. USDA Forest Service general technical report NE - United States, Northeastern Forest Experiment Station. Paper presented at the "Symposium: Microbial Control of Spruce Budworms and Gypsy Moths," April 10-12, 1984, Windsor Locks, CT. 1985. (100). p. 137. (NAL Call No.: DNAL aSD11.U56).

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Dicamba products and their uses in forest management.
SWSPB. Crowley, R.H. Newbold, R.A. Champaign : The Society. Proceedings - Southern Weed Science Society. Paper presented at the 38th Annual Meeting of the Southern Weed Science Society, "Challenges in Food Production" Jan. 14/16, 1985, Houston, Texas. 1985. v. 38. p. 140-145. Includes 1 references. (NAL Call No.: DNAL 79.9 S08).

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Dieback and declines of urban trees.
JOARD. Houston, D.R. Urbana, Ill. : International Society of Arboriculture. Journal of arboriculture. Mar 1985. v. 11 (3). p. 65-72. ill. Includes references. (NAL Call No.: DNAL SB436.J6).

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Differences in growth rate and in acceleration of growth rate among loblolly pine rangewide seed sources confirmed.
Kung, F.H. s.l. : Southern Forest Tree Improvement Committee. Proceedings of the ... Southern Forest Tree Improvement Conference. 1987. (41). p. 407-414. Includes references. (NAL Call No.: DNAL A99.9 F769).

3712

Differential susceptibility of Toumeyella pini (King) (Homoptera: Coccidae) to pyrethroid and organophosphate insecticides: a factor in outbreaks in southern pine seed orchards.
JEENAI. Clarke, S.R. Debarr, G.L.; Berisford, C.W. College Park, Md. : Entomological Society of America. Contact toxicities of nine insecticides (four organophosphorous insecticides and five pyrethroids) were tested on crawlers of a striped pine scale, Toumeyella pini (King). Organophosphorous insecticides were more toxic than pyrethroids. Chlorpyrifos was the most toxic, and fenvalerate was the least toxic. Residual tests showed that the pyrethroid esfenvalerate lost its toxic effects at a slightly faster rate than the organophosphorous insecticide azinphos-methyl. Low toxicity of the pyrethroids to crawlers may

be partially responsible for the rapid build-up of T. pini in southern pine seed orchards. Journal of economic entomology. Oct 1988. v. 81 (5). p. 1443-1445. Includes references. (NAL Call No.: DNAL 421 J822).

3713

Differential thermal analysis of Black Oak acorns.
Boese, S.R. George, M.F. Columbia, Mo. : The Interdisciplinary Plant Biochemistry and Physiology Program. Current topics in plant biochemistry and physiology : Proceedings of the ... Plant Biochemistry and Physiology Symposium held at the University of Missouri, Columbia. 1985. v. 4. p. 231. Includes 4 references. (NAL Call No.: DNAL QK861.P55).

3714

Diphenylether herbicides in southern pine nurseries.
South, D.B. Auburn, Ala.? : Orders, Dept. of Research Information, Auburn University, 1986? . Proceedings of the International Symposium on Nursery Management Practices for the Southern Pines, Montgomery, Alabama, August 4-9, 1985 / edited by David B. South. p. 441-453. Includes references. (NAL Call No.: DNAL SD397.P55I58 1985).

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Diplodia tip blight or dieback of pines.
MUCBA. Adams, G. Bessette, P. East Lansing, Mich. : The Service. Extension bulletin E - Cooperative Extension Service, Michigan State University. In subseries: Woody Ornamental Tips. May 1988. (2112). 7 p. ill. (NAL Call No.: DNAL 275.29 M58B).

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Direct control of insect defoliation in oak stands is economically feasible in preventing timber value loss.
XFGTA. Hicks, R.R. Jr. Riddle, K.S.; Brock, S.M. St. Paul, Minn. : The Station. USDA Forest Service general technical report NC - North Central Forest Experiment Station. Paper presented at the Seventh Central Hardwood Forest Conference, Mar 5-8, 1989, Carbondale, Illinois. 1989. (132). p. 86-94. maps. Includes references. (NAL Call No.: DNAL aSD11.A352).

3717

Disease of forest trees.
Alexander, S.A. Blacksburg, Va. : Extension Division, Virginia Polytechnic Institute and State University. Publication - Virginia Cooperative Extension Service. In the series analytic: 1988-89 pest management guide for forest, Christmas tree, aquatic, right-of-way and non-crop areas / coordinator: J.M. Luna. Jan 1988. (456-011,rev.). p. 5-7. (NAL Call No.: DNAL S544.3.V8V52).

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Diseases of Christmas trees.
Alexander, S.A. Blacksburg, Va. : Extension Division, Virginia Polytechnic Institute and State University. Publication - Virginia Cooperative Extension Service. In the series analytic: 1988-89 pest management guide for forest, Christmas tree, aquatic, right-of-way and non-crop areas / coordinator: J.M. Luna. Jan 1988. (456-011,rev.). p. 13. (NAL Call No.: DNAL S544.3.V8V52).

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Diseases of conifer seedlings caused by seed-borne Fusarium species.
XGTIA. James, R.L. Ogden, Utah : The Station. USDA Forest Service general technical report INT - Intermountain Forest and Range Experiment Station. Paper presented at the "Conifer Tree Seed in the Inland Mountain West Symposium," August 5-6, 1985, Missoula, Montana.~ Literature review. Apr 1986. (203). p. 267-271. Includes references. (NAL Call No.: DNAL aSD11.A48).

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Diseases of eastern white pine.
GTRWD. Hodges, C.S. Washington, D.C. : The Service. General technical report WO - U.S. Department of Agriculture, Forest Service. Paper presented at a "Symposium on Eastern White Pine: Today and Tomorrow," June 12-14, 1985, Durham, New Hampshire. Apr 1986. (51). p. 93-98. Includes references. (NAL Call No.: DNAL aSD11.U52).

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Diseases of landscape trees.
Stipes, R.J. Blacksburg, Va. : Extension Division, Virginia Polytechnic Institute and State University. Publication - Virginia Cooperative Extension Service. In the series analytic: 1988-89 pest management guide for home ornamental plants / coordinated by J.M. Luna. Jan 1988. (456-004,rev.). p. 53-57. (NAL Call No.: DNAL S544.3.V8V52).

3722

Diseases of trees and shrubs /by Wayne A. Sinclair, Howard H. Lyon, and Warren T. Johnson.
Sinclair, Wayne A., 1936-. Lyon, Howard H.; Johnson, Warren T. Ithaca, N.Y. : Comstock Pub. Associates, 1987. Includes index. 574 p. : col.

ill. ; 31 cm. Bibliography: p. 512-546. (NAL Call No.: DNAL SB762.S56).

3723

Dispersal of second-instar western spruce budworm above and below forest canopies in western Montana.
XFINA. Carlson, C.E. McCarthy, G.J. Ogden, Utah : The Station. Research note INT - U.S. Department of Agriculture, Forest Service, Intermountain Research Station. June 1989. (388). 6 p. ill. Includes references. (NAL Call No.: DNAL A99.9 F764UN).

3724

Distribution and abundance of early instar gypsy moth (Lepidoptera: Lymantriidae) in forests during day and night.
EVETEX. Ticehurst, M. Yendol, W. Lanham, Md. : Entomological Society of America. Studies were conducted to determine the distribution and abundance of early instar gypsy moth, Lymantria dispar (L.), within canopies of codominant Quercus rubra L., Q. alba L., and Q. prinus L. in moderate and dense populations during the day; and to compare the distribution and abundance of early instar gypsy moth within canopies of Q. rubra trees, saplings, and seedlings, and saplings of witch hazel, Hamamelis virginiana L., during day and night in a moderate population. Most larvae were observed in the lower canopy of codominant trees in all sites during the day. Variation associated with tree species was not significant at any site. Larval abundance was highly correlated, r(2) = 0.992, with preseason egg mass density. No differences in larval abundance or distribution were detected during day and night. More than 80% fo all larvae were observed in the lower canopy, understory, and forest floor day and night. The most larvae per 1,000 leaves were detected on seedlings and the least in the upper canopy of codominant trees. The target for the aerial application of insecticides and release of parasitoids occupies a lower vertical position in the forest than was previously thought. Environmental entomology. June 1989. v. 18 (3). p. 459-464. Includes references. (NAL Call No.: DNAL QL461.E532).

3725

Distribution and characteristics of windthrow microtopography on the Cumberland Plateau of Kentucky.
SSSJD4. Cremeans, D.W. Kalisz, P.J. Madison, Wis. : The Society. The abundance and characteristics of microtopography resulting from the uprooting of trees were examined on five landtypes on the northern Cumberland Plateau. Plots, 10 m by 25 m, were established at 180 locations on randomly-oriented systematic grids located in 12 first-order watersheds. The area and depth of soil disturbed were measured for each of the 524 uprootings encountered. In addition, all windthrow microtopography in a single representative hollow, 11.3 ha in area, was mapped and measured. Soil disturbance by uprooting was least on ridges, intermediate on side slopes, and greatest in coves and on lower north slopes. Percentage disturbance of the ground surface ranged from 0.4% on ridges to 2.4% in coves; number and mean area disturbed by individual uprootings ranged from 50 to 112 ha-1, and from 0.5 to 2.1 m2 along the ridge-to-cove gradient. The lower abundance of windthrow microtopography on ridges was attributed to a relatively high incidence of stem breakage vs. uprooting. Stem breakage seemed particularly common in scarlet oak (Quercus coccinea Muenchh.) which dominated ridges and south slopes. Observations made during the course of this study also suggested that concentrated subsurface water flow and concomitant decreases in tree stability may contribute to uprooting in coves and on lower slopes. Windthrow, viewed as a pedogenic process, clearly does not operate uniformly over this mountainous landscape. Soil Science Society of America journal. May/June 1988. v. 52 (3). p. 816-821. maps. Includes references. (NAL Call No.: DNAL 56.9 S03).

3726

Distribution and dynamics of aphid (Homoptera: Drepanosiphidae) populations on Betula pendula in northern California.
HILGA. Hajek, A.E. Dahlsten, D.L. Berkeley, Calif. : California Agricultural Experiment Station. Hilgardia : a journal of agricultural science. Feb 1988. v. 56 (1). p. 1-33. (NAL Call No.: DNAL 100 C12H).

3727

Distribution and habitats of the formosan subterranean termite (Isoptera: Rhinotermitidae) in South Carolina.
JEENAI. Chambers, D.M. Zungoli, P.A.; Hill, H.S. Jr. Lanham, Md. : Entomological Society of America. Journal of economic entomology. Dec 1988. v. 81 (6). p. 1611-1619. Includes references. (NAL Call No.: DNAL 421 J822).

3728

Distribution and persistence of carbaryl in some terrestrial and aquatic components of a forest environment.
JPFCD2. Sundaram, K.M.S. Szeto, S.Y. New York, N.Y. : Marcel Dekker. Journal of environmental science and health. Part B. Pesticides, food contaminants, and agricultural wastes. 1987. v. B22 (5). p. 579-599. maps. Includes references. (NAL Call No.: DNAL TD172.J61).

3729

Distribution and persistence of trichlorfon in a forest environment.
JPFCD2. Sundaram, K.M.S. Varty, I.W. New York, N.Y. : Marcel Dekker. Journal of environmental science and health : Part B : Pesticides, food contaminants, and agricultural wastes. 1989. v. 24 (6). p. 647-659. Includes references. (NAL Call No.: DNAL TD172.J61).

3730

Distribution of arsenic in lodgepole pines treated with MSMA.
Maclauchlan, L.E. Borden, J.H.; D'Auria, J.M. Bethesda, Md. : Society of American Foresters. Western journal of applied forestry. Apr 1988. v. 3 (2). p. 37-40. Includes references. (NAL Call No.: DNAL SD388.W6).

3731

Distribution of arsenic in MSMA-treated lodgepole pines infested by the mountain pine beetle, Dendroctonus ponderosae (Coleoptera: Scolytidae), and its relationship to beetle mortality.
JEENAI. Maclauchlan, L.E. Borden, J.H.; D'Auria, J.M.; Wheeler, L.A. Lanham, Md. : Entomological Society of America. The LC50 of MSMA (monosodium methanearsonate) for first- and second-instar mountain pine beetle (MPB), Dendroctonus ponderosae Hopkins, mining for 4 d in ground phloem tissue impregnated with methane arsonic acid, the pure form of arsenic in MSMA, was 102 ppm. Application of MSMA 3 wk after attack to axe-frills (cuts) near the root collar of five lodgepole pines, Pinus contorta var. latifolia Engelmann, resulted in high accumulations of arsenic in phloem and sapwood near the point of application and in foliage 11 wk later. MPB taken from bolts cut from MSMA-treated trees 1 m above the axe-frill were all dead. There was a strong relationship between amounts of arsenic in MPB and those in phloem tissue up to 2 m. At sampling points above 2 m on treated trees, arsenic residues in phloem and sapwood were, on average, not significantly different from those occurring naturally in tissues of lodgepole pine. Enough arsenic could have passed through the tissues to kill or inhibit the brood MPB within the trees, but MPB mortality was probably due to an interaction of many factors including moisture deficit and fungal invasion of the host tree. Journal of economic entomology. Feb 1988. v. 81 (1). p. 274-280. ill. Includes references. (NAL Call No.: DNAL 421 J822).

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Distribution of blank hexazinone granules from aerial and ground applicators.
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FOSCA. Abrams, M.D. Scott, M.L. Bethesda, Md. : Society of American Foresters. In northern lower Michigan, logging accelerated sugar maple (Acer saccharum) dominance in a northern white cedar (Thuja occidentalis) community, and clear-cutting and burning quickly converted certain sites dominated by mature jack pine (Pinus banksiana) to early-successional hardwoods, including Prunus, Populus, and Quercus. In both forest types the succeeding hardwoods should continue to increase in the future at the expense of the pioneer conifer species. In the cedar example, sugar maple was also increasing in an undistrubed, old-growth stand, but at a much reduced rate than in the logged stand. Traditionally, disturbance was thought to set back succession to some earlier stage. However, our study sites and at least several other North American forest communities exhibited accelerated succession following a wide range of disturbances, including logging, fire, ice storms, wind-throw, disease, insect attach, and herbicide spraying. Forest science. Mar 1989. v. 35 (1). p. 42-49. ill. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Effect of a clay mineral (montmorillonite) on the nodulation of Alnus and on the nitrogenase activity of Frankia in pure culture.
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Effect of aerial application of racemic disparlure on male trap catch and female mating success of gypsy moth (Lepidoptera: Lymantriidae).
JEENAI. Webb, R.E. Tatman, K.M.; Leonhardt, B.A.; Plimmer, J.R.; Boyd, V.K.; Bystrak, P.G.; Schwalbe, C.P.; Douglass, L.W. Lanham, Md. : Entomological Society of America. Studies were conducted in Cecil County, Md., during the summer of 1980 using racemic disparlure to disrupt mating communication of the gypsy moth, Lymantria dispar (L.). A laminated plastic flake formulation of racemic disparlure was applied aerially at rates of 0, 7.5, 30, or 75 g (AI)/ha to replicated 16-ha forest plots. Significant decreases in male trap catch and in mating success for three different female types (lab females from a laboratory colony , wild females pupae obtained from the field, adults emerged in the laboratory, then replaced in the field , and natural females occurring naturally in the test plot) were observed with increasing disruptant dose. Although degree of mating success was highly correlated for all three female types, differences among female types in slope, intercept, and linear and quadratic relationships were observed. Generally, plots having higher populations (as measured by larval counts) among replicate plots for each dose also had increased mating for all female types. The flake formulation was easily applied and provided season-long mating disruption. Journal of economic entomology. Feb 1988. v. 81 (1). p. 268-273. Includes references. (NAL Call No.: DNAL 421 J822).

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Effect of aerial spraying with Dimilin, Dipel, or Gypchek on two natural enemies of the gypsy moth (Lepidoptera: Lymantriidae).
JEENAI. Webb, R.E. Shapiro, M.; Podgwaite, J.D.; Reardon, R.C.; Tatman, K.M.; Venables, L.; Kolodny-Hirsch, D.M. Lanham, Md. : Entomological Society of America. The effects of three aerially applied insecticides on the incidence of two components of the natural enemy complex of the gypsy moth, Lymantria dispar (L.), were evaluated for the 1987 year of application. Application of Gypchek, a registered formulation of the gypsy moth nuclear polyhedrosis virus (NPV), initiated a large early-season (fist-wave) epizootic of NPV; late-season NPV (second-wave) levels were higher in plots treated with Gypchek than in control plots, but not significantly so, whereas levels of the parasitoid Cotesia melanoscela (Ratzeburg) were significantly reduced in Gypchek-treated plots compared with control plots. Application of Dipel (Bacillus thuringiensis Berliner) resulted in a significant increase in numbers of C. melanoscela. Application of either Dipel or Dimilin (diflubenzuron) resulted in a significant decrease in incidence of NPV compared with control plots. Numbers of C. melanoscela in plots treated with Dimilin were not significantly different from those detected in control plots. Journal of economic entomology. Dec 1989. v. 82 (6). p. 1695-1701. Includes references. (NAL Call No.: DNAL 421 J822).

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The effect of blue oak removal on herbaceous production on a foothill site in the northern Sierra Nevada.
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Effect of burlap bands on between-tree movement of late-instar gypsy moth, Lymantria dispar (Lepidoptera: Lymantriidae).
EVETEX. Liebhold, A.M. Elkinton, J.S.; Wallner, W.E. College Park, Md. : Entomological Society of America. Environmental entomology. Apr 1986. v. 15 (2). p. 373-379. Includes references. (NAL Call No.: DNAL QL461.E532).

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Effect of constant- and variable-humidity and temperature regimes on the survival and developmental periods of Oligonychus ununguis (Acarina: Tetranychidae) and Neoseiulus fallacis (Acarina: Phytoseiidae).
EVETEX. Kramer, D.A. Hain, F.P. Lanham, Md. : Entomological Society of America. This study focused on the effects of constant- and variable-humidity and temperature regimes on the developmental periods of the spruce spider mite, Oligonychus ununguis (Jacobi), and a predator of this mite, Neoseiulus fallacis (Garman). Variable-humidity regimes, either alone or with variable-temperature regimes, had no significant effect on the developmental period of the immature stages of O. ununguis. Survival was marginally decreased under variable-temperature regimes. Temperature was the overriding influence for development of this mite. Developmental periods of N. fallacis immatures, however, were markedly increased by the use of a constant-humidity regime with a constant-temperature regime. In addition, survival of the immatures was low under low constant-humidity regimes. The effects of a range of constant-humidity regimes over a range of constant-temperature regimes on the survival and developmental period of N. fallacis eggs also were studied. Humidity was found to have a statistically significant but biologically trivial effect on the egg developmental period at the lower temperatures. However, when the vapor pressure deficit was high, there was a significant relationship between egg survival and vapor pressure deficit. The data suggest that the meteorological conditions in the field during the hot, dry summer months may not support a large population of N. fallacis and thereby allow O. ununguis populations to build up during these months. Environmental entomology. Oct 1989. v. 18 (5). p. 741-746. Includes references. (NAL Call No.: DNAL QL461.E532).

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Effect of ditching, fertilization, and herbicide application on groundwater levels and groundwater quality in a flatwood Spodosol.
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Effect of dosage and ratio of sex pheromone components on behavior of Chrysoteuchia topiaria (Zeller) (Lepidoptera: Pyralidae).
EVETEX. Kamm, J.A. McDonough, L.M.; Rowe, K.E. Lanham, Md. : Entomological Society of America. When the dosage of the primary pheromone component (Z)-11-hexedecenal (Z11-16:Al) of the cranberry girdler, Chrysoteuchia topiaria (Zeller), was varied from 0.03 to 10 mg in field tests, maximum catch was obtained at a dosage of less than 1 mg. When (Z)-9-hexadecenal (Z9-16:Al) was present at 0.3, 1, or 3% of Z11-16:Al, trap catch was proportional to the logarithm of the dosage over the same concentration range. The amount of Z9-16:Al that produced maximum trap catches within calculated confidence limits of each dosage ranged from 0.2 to 2.1% when the dosages of Z11-16:Al were 0.3, 1, 3, and 10 mg. Z9-16:Al at 1% always was included within the confidence limits of these dosages. The two higher dosages captured significantly more males than the two lower dosages, but trap catcnes were not significantly different between dosages of 0.3-1 and 3-10 mg. The reduced trap catch by Z11-16:Al alone for dosages above 1 mg was the result of the absence of an important pheromone component. In flight tunnel studies, Z11-16:Al induced limited plume-oriented flight (19% of tested males) at a dosage of 0.03 mg only, and males did not reach the source. The percentage of males exhibiting upwind flight in the plume increased dramatically when Z9-16:Al was present. At a dosage of 0.3 mg, upwind flight in the plume was 0% for the single component and 90% for the two components. Maximum upwind flight occurred at dosages from 0.03 to 3 mg and, as occurred in field tests, the Z9-16:Al at 1% of Z11-16:Al always was included within the calculated confidence limits for these dosages. The 3-mg dosage of Z11-16:Al reduced the number of males landing on the septa. Environmental entomology. June 1989. v. 18 (3). p. 368-372. Includes references. (NAL Call No.: DNAL QL461.E532).

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The effect of Erynia radicans on food consumption, utilization and fecundity by the spruce budworm, Choristoneura fumiferana.
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Effect of excess aluminum and manganese on Norway spruce seedlings as related to magnesium nutrition.
JPNUDS. Hecht-Buchholz, C. Jorns, C.A.; Keil, P. New York, N.Y. : Marcel Dekker. Journal of plant nutrition. Paper presented at the "Tenth International Plant Nutrition Colloquium," August 4-9, 1986, Beltsville, Maryland. 1987. v. 10 (9116). p. 1103-1110. ill. Includes references. (NAL Call No.: DNAL QK867.J67).

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Effect of experience on the responses of the parasitoid Brachymeria intermedia (Hymenoptera: Chalcididae) to its host, Lymantria dispar (Lepidoptera: Lymantriidae), and to kairomone.
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Effect of height on responses of redheaded pine sawfly (Hymenoptera: Diprionidae) males to synthetic pheromone and virgin females.
EVETEX. Wilkinson, R.C. Chappelka, A.H. III; Kraemer, M.E.; Coppel, H.C.; Mastsumura, F. College Park, Md. : Entomological Society of America. Environmental entomology. Oct 1987. v. 16 (5). p. 1152-1156. Includes references. (NAL Call No.: DNAL QL461.E532).

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Effect of mycorrhizal fungi on growth and development of roots in seedlings of Pinus resinosa.
Yang, C.S. Wilcox, H.E. Corvallis, Or. : Oregon State University , Forest Research Laboratory, 1985. Proceedings of the 6th North American Conference on Mycorrhizae : June 25-29, 1984, Bend, Oregon / compiled and edited by Randy Molina ; sponsoring institutions, Oregon State University, College of Forestry, and USDA. p. 348. Includes references. (NAL Call No.: DNAL aQK604.N6 1984).

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Effect of Nosema fumiferanae (Microsporida) on fecundity, fertility, and progeny performance of Choristoneura fumiferana (Lepidoptera: Tortricidae).
EVETEX. Bauer, L.S. Nordin, G.L. Lanham, Md. : Entomological Society of America. Female eastern spruce budworm, Choristoneura fumiferana (Clemens), inoculated sublethally as fourth or fifth instars with Nosema fumiferanae (Thomson), exhibited significant reductions in size, fecundity, and total egg complement. Mating success and egg fertility were similar for treated and control insects. The presence of disease improved the positive correlation between fecundity or total egg complement and female pupal weight without significantly

reducing the slope. Total egg complement was negatively correlated with disease load. A subsample of progeny reared from each fertile mating indicates 100% transovarial transmission efficiency at the spore dosages provided. Diseased progeny experienced twice the larval mortality, and surviving individuals were approximately 25% smaller and took 17% longer to complete development than healthy progeny. Maternal disease load ws a significant, positive factor in percentage progeny mortality and male pupal weight. Environmental entomology. Apr 1989. v. 18 (2). p. 261-265. Includes references. (NAL Call No.: DNAL QL461.E532).

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O'Reilly, C. Owens, J.N.; Arnott, J.T.; Dunsworth, B.G. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. Paper presented at a meeting of the Western Forest Nursery Associations, Aug 8-11, 1988, Vernon, British Columbia. Dec 1988. (167). p. 188-194. Includes references. (NAL Call No.: DNAL aSD11.A42).

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Effect of operational fertilizaton on foliar nutrient content and growth of young Douglas-fir and Pacific silver fir.
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Effect of paclobutrazol on conifer seedling morphology and field performance.
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Effect of pandora moth (Lepidoptera: Saturniidae) defoliation on growth of ponderosa pine in Arizona.
JEENAI. Miller, K.K. Wagner, M.R. Lanham, Md. Entomological Society of America. Defoliation of ponderosa pine, Pinus ponderosa Douglas ex Lawson and Lawson, by the pandora moth, Coloradia pandora Blake, results in a significant reduction in basal area growth compared with undefoliated trees. A high proportion (83%) of heavily defoliated trees produced no growth in the year following defoliation. Heavily defoliated trees produced more growth than moderately defoliated trees one year after the last defoliation. Overall, tree growth is not related linearly to defoliation intensity. Journal of economic entomology. Dec 1989. v. 82 (6). p. 1682-1686. Includes references. (NAL Call No.: DNAL 421 J822).

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Effect of paraquat plus prescribed burning on eastern redcedar (Juniperus virginiana).
WETEE9. Engle, D.M. Stritzke, J.F.; Claypool, P.L. Champaign, Ill. : The Society. Weed technology : a journal of the Weed Science Society of America. Apr 1988. v. 2 (2). p. 172-174. Includes references. (NAL Call No.: DNAL SB610.W39).

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Effect of phloem water relations on the growth of Phytophthora cinnamomi in Eucalyptus marginata.
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Effect of pine oil on landing and attack by the southern pine beetle (Coleoptera: Scolytidae).
JESCEP. O'Donnell, B.P. Payne, T.L.; Walsh, K.D. Tifton, Ga. : The Entomological Science Society. Journal of Entomological Science. Oct 1986. v. 21 (4). p. 319-321. (NAL Call No.: DNAL QL461.G4).

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Effect of pinewood nematode density on tethered flight of Monochamus carolinesis (Coleoptera: Cerambycidae).
EVETEX. Lanham, Md. : Entomological Society of America. Monocnamus carolinensis (Olivier) beetles infested with the pinewood nematode, Bursaphelenchus xylophilus, were tethered and flown upon emergence from host logs. The mean (+/-SD) number of nematodes carried per beetle was, 7,933, (+/-16,997) with a mean flight time of 18.6 (+/-11.4) min. Larger beetles exhited longer flights and carried more nematodes. The density of nematodes in the beetle had a slight negative influence on flight capability. The sex of the beetle had no effect on flight duration or the number of nematodes carried. Environmental entomology. Aug 1989. v. 18 (4). p. 670-673. Includes references. (NAL Call No.: DNAL QL461.E532).

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Effect of plant resistance, competition, and enemies on a leaf-galling sawfly (Hymenoptera: Tenthredinidae).
EVETEX. Clancy, K.M. Price, P.W. Lanham, Md. : Entomological Society of America. The relative importance of three sources of larval mortality (host plant resistance, intraspecific competition, and natural enemies) was evaluated for a population of leaf-galling sawflies, Pontania sp., near P. pacifica Marlatt, on arroyo willow, Salix lasiolepis Bentham, at a site in Flagstaff, Ariz., from 1981 to 1984. The ratio of the percentage of sawfly larvae killed by natural enemies to the percentage lost to host plant defenses (i.e., abortion, defined as an aborted formation of a gall resulting from death of the egg or small larva) was 1.53:1. Mortality from abortion was divided into a host plant resistance component (constitutive abortion, e.g., a plant resistance factor preventing establishment of the egg or small larva) and an intraspecific competition-mediated component (because abortion increased as within-leaf gall densities rose). Natural enemies caused twice as much mortality as plant resistance and 6.36 times greater mortality than intraspecific competition. These results support the hypothesis that third-trophic-level effects exert a stronger selective pressure on many insect populations than competition for limiting resources. There was evidence that intraspecific competition for limiting food resources occurred for these Pontania sp. sawflies; increased within-leaf gall densities had a density-denpendent, linear, negative effect on gall size, and consequently, on larval boimass because sawfly size was positively correlated with gall size. However, only about 3% of the variation in gall size was explained by within-leaf gall density. Thus, gall (and larval) size were only weakly affected by intraspecific competition. Environmental entomology. Apr 1989. v. 18 (2). p. 284-290. Includes references. (NAL Call No.: DNAL QL461.E532).

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Effect of prey density on diurnal activity and ovarian development in Calosoma calidum (Coleoptera: Carabidae): implications for biological control of the gypsy moth, Lymantria dispar (Lepidoptera: Lymantriidae) in the Midwest.
GRLEA. Jeffords, M.R. Case L.J. East Lansing, Mich. : Michigan Entomological Society. The Great Lakes entomologist. Summer 1987. v. 20 (2). p. 93-97. Includes references. (NAL Call No.: DNAL QL461.M5).

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Effect of selected chemicals on non-suberized impervious tissue (NIT) formation in Fraser fir.
GENSAB. Arthur, F.H. Hain, F.P. Tifton, Ga. : The Society. Journal of Entomological Science. July 1985. v. 20 (3). p. 305-311. Includes references. (NAL Call No.: DNAL QL461.G4).

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Effect of short-term storage of triadimefon-treated loblolly pine seed on incidence of fusiform rust.
SJAFD. Kelley, W.D. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. Feb 1988. v. 12 (1). p. 18-20. Includes references. (NAL Call No.: DNAL SD1.S63).

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Effect of simulated insect damage on growth and survival of northern red oak (Quercus rubra L.) seedlings.
EVETEX. Wright, S.L. Hall, R.W.; Peacock, J.W. Lanham, Md. : Entomological Society of America. Effects of simulated insect damage--artifical defoliation and root damage in combination with two levels of watering--were studied to determine the potential effect on northern red oak seedlings (Quercus rubra L.). Treatments and treatment combinations caused significant differences in stem diameter, percentage of stem dieback, and mortality. Defoliation and a regime of decreased watering seemed to have the greatest effect on seedling growth and mortality. Root injury had no consistent direct effect, but interacted significantly with other factors. Insect damage to foliage and roots,

together with water stress, may be a factor in poor survival of oak seedlings under field conditions. Environmental entomology. Apr 1989. v. 18 (2). p. 235-239. Includes references. (NAL Call No.: DNAL QL461.E532).

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Effect of site preparation and vegetation control on slash pine plantation growth.
SWSPBE. Shiver, B.D. Rheney, J.W.; Pienaar, L.V.; Fortson, J.C. Raleigh, N.C. : The Society . Proceedings - Southern Weed Science Society. 1986. (39th). p. 210-216. Includes references. (NAL Call No.: DNAL 79.9 S08 (P)).

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Effect of slow release fertilizers on formation of mycorrhizae and growth of container grown pine seedlings.
Crowley, D.E. Maronek, D.M.; Hendrix, J.W. Washington, D.C. : Horticultural Research Institute. Journal of environmental horticulture. Sept 1986. v. 4 (3). p. 97-101. Includes 11 references. (NAL Call No.: DNAL SB1.J66).

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CSOSA2. Goodroad, L.L. New York, N.Y. : Marcel Dekker. Communications in soil science and plant analysis. Apr 1987. v. 18 (4). p. 473-481. Includes references. (NAL Call No.: DNAL S590.C63).

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PNDAAZ. Redlin, S.C. Stack, R.W. Grand Forks, N.D. : The Academy. Proceedings of the North Dakota Academy of Science. Apr 1986. v. 40. p. 63. Includes references. (NAL Call No.: DNAL 500 N813).

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Effect of thinning damage on bark beetle susceptibility indicators in loblolly pine.
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Effect of timing of cold storage on cold hardiness and root growth potential of Douglas-fir.
Burr, K.E. Tinus, R.W. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. Paper presented at a meeting of the Western Forest Nursery Associations, Aug 8-11, 1988, Vernon, British Columbia. Dec 1988. (167). p. 133-138. Includes references. (NAL Call No.: DNAL aSD11.A42).

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Effect of triadimefon on development of mycorrhizae from natural inoculum in loblolly pine nursery beds.
SJAFD. Kelley, W.D. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. Feb 1987. v. 11 (1). p. 49-52. Includes references. (NAL Call No.: DNAL SD1.S63).

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Effect of trunk injection of flurprimidol and paclobutrazol on sprout growth in silver maple.
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Effect of two insecticides on abundance of insect families associated with Siberian elm windbreaks.
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Effect of verbenone on response of Dendroctonus brevicomis to exo-brevicomin, frontalin, and myrcene.
JCECD. Tilden, P.E. Bedard, W.D. New York, N.Y. : Plenum Press. Journal of chemical ecology. Jan 1988. v. 14 (1). p. 113-122. Includes references. (NAL Call No.: DNAL QD415.A1J6).

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Effective residual life of carbaryl for protecting ponderosa pine from attack by the western pine beetle (Coleoptera: Scolytidae).
JEENAI. Haverty, M.I. Shea, P.J.; Hall, R.W. College Park, Md. : Entomological Society of America. Journal of economic entomology. Feb 1985. v. 78 (1). p. 197-199. Includes references. (NAL Call No.: DNAL 421 J822).

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Effectiveness and vegetation response to triclopyr tree injection on selected plots in eastern New York.
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Effects of a nuclear polyhedrosis virus isolate from Malacosoma disstria on Lymantria dispar larval growth pattern.
JIVPA. Stairs, G.R. Duluth, Minn. : Academic Press. Journal of invertebrate pathology. Mar 1989. v. 53 (2). p. 247-250. Includes references. (NAL Call No.: DNAL 421 J826).

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Effects of abamectin and milbemycin D on gypsy moth (Lepidoptera: Lymantriidae).
JEENAI. Deecher, D.C. Brezner, J.; Tanenbaum, S.W. Lanham, Md. : Entomological Society of America. Effects of abamectin and milbemycin D on gypsy moth, Lymantria dispar L., were determined. Fifty percent of third instars exposed for 2 h to 5.2 ppm milbemycin D on artificial diet were flaccid and paralyzed, whereas larvae exposed to 5.0 ppm abamectin were unaffected. When larvae were exposed to abamectin on artificial diet for 24 or 48 h, 50% of third instars died. Larvae exposed for 24 h to milbemycin D were not affected, but at 48 h 165 ppm caused 50% mortality of third instars. When larvae were exposed to milbemycin D residues for 48 h and observed 5 d later, the LC50 was 92 ppm. LC50's (ppm) when larvae were exposed for 72 h to residues on poplar foliage were 4 for abamectin, 1,454 for milbemycin D, and 125 for carbaryl. Five days after exposure to foliage residues, LC50's (ppm) were 1 for abamectin, 244 for milbemycin D and 106 for carbaryl. On both substrates, abamectin was most toxic to third instars. Larvae exposed for 2 h to milbemycin D residues were flaccid and paralyzed but the effect was reversible. Journal of economic entomology. Oct 1989. v. 82 (5). p. 1395-1398. Includes references. (NAL Call No.: DNAL 421 J822).

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The effects of acid deposition on forest ecosystems Minnesota's response : literature review /by Brian D. McCann.
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Effects of aerial detection schedules on the age of southern pine beetle infestations.
FOSCA. De Steiguer, J.E. Hedden, R.L. Bethesda, Md. : Society of American Foresters. Forest science. Mar 1988. v. 34 (1). p. 229-235. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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XPNWA. Broshot, N. Larsen, L.; Tinnin, R. Portland, Or. : The Station. PNW-RN research note - U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Nov 1986. (453). 6 p. Includes references. (NAL Call No.: DNAL A99.9 F7625U).

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PLPHA. Norby, R.J. O'Neill, E.G.; Luxmoore, R.J. Rockville, Md. : American Society of Plant Physiologists. Plant physiology. Sept 1986. v. 82 (1). p. 83-89. Includes 30 references. (NAL Call No.: DNAL 450 P692).

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JOARD. Roberts, B.R. Dochinger, L.S.; Townsend, A.M. Urbana, Ill. : International Society of Arboriculture. Journal of arboriculture. Sept 1986. v. 12 (9). p. 209-212. Includes references. (NAL Call No.: DNAL SB436.J6).

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Effects of Bacillus thuringiensis on parasites of western spruce budworm (Lepidoptera: Tortricidae).
JEENAI. Niwa, C.G. Stelzer, M.J.; Beckwith, R.C. College Park, Md. : Entomological Society of America. Journal of economic entomology. Aug 1987. v. 80 (4). p. 750-753. Includes references. (NAL Call No.: DNAL 421 J822).

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Effects of Bacillus thuringiensis treatments on the occurrence of nuclear polyhedrosis virus in gypsy moth (Lepidoptera: Lymantriidae) populations.
JEENAI. Woods, S.A. Elkinton, J.S.; Shapiro, M. Lanham, Md. : Entomological Society of America. Journal of economic entomology. Dec 1988. v. 81 (6). p. 1706-1714. Includes references. (NAL Call No.: DNAL 421 J822).

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Effects of bark fragmentation on plant succession on conifer logs in the Picea-Tsuga forests of Olympic National Park, Washington.
AMNAA. Harmon, M.E. Notre Dame, Ind. : University of Notre Dame. American midland naturalist. Jan 1989. v. 121 (1). p. 112-124. Includes references. (NAL Call No.: DNAL 410 M58).

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Crawford, H.S. Jennings, D.T. Orono, Me. : The Station. Miscellaneous publication - University of Maine, Agricultural Experiment Station. Paper presented at the "Joint Conference of New England Chapter of the Society of American Foresters, Maine Chapter of the Wildlife Society, Atlantic International Chapter of the American Fisheries Society," March 6-8, 1985,, Portland, Maine. Apr 1986. (689). p. 315-321. Includes references. (NAL Call No.: DNAL 100 M28S (2)).

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Effects of chemical weed control and seedling planting depth on survival and growth of aspen.
TPLNA. Reighard, G.L. Howe, G.; Hanover, J.W. Washington, D.C. : The Service. Tree planters' notes - United States, Forest Service. Winter 1985. v. 36 (1). p. 3-7. Includes 15 references. (NAL Call No.: DNAL 1.962 C5T71).

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Effects of chronic doses of ozone on loblolly pine: photosynthetic characteristics in the third growing season.
FOSCA. Sasek, T.W. Richardson, C.J. Bethesda, Md. : Society of American Foresters. Gas exchange characteristics of loblolly pine seedlings were measured in the third growing season of ozone fumigations to determine the effects of long-term ozone exposure on photosynthetic capacity. Light and CO2 response curves indicated significant decreases of 21% and 27%, respectively, in light-saturated and CO2-saturated photosynthetic capacities at 2 X ambient ozone (92 ppb 12-hr seasonal mean) compared to charcoal-filtered (CF) air, approximately 0.5 X ambient ozone (29 ppb 12-hr seasonal mean). Differences in the response curves suggest changes in light-harvesting and biochemical efficiencies as well as changes in the activity of RuBP Carboxylase and the regeneration rate of RuBP. Chlorophyll and carotenoid conditions per unit leaf area were decreased at the high ozone treatment in older flushes. Stomatal resistance limited photosynthesis by about 29% in both CF and 2 X ambient ozone treated plants, suggesting that chronic ozone exposure did not affect stomatal control in loblolly pine. Forest science. Sept 1989. v. 35 (3). p. 745-755. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Effects of competing vegetation on loblolly pine plantations.
LOAGA. Clason, T.R. Baton Rouge, La. : The Station. Louisiana agriculture - Louisiana Agricultural Experiment Station. Fall 1987. v. 31 (1). p. 7-9. ill. (NAL Call No.: DNAL 100 L939).

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Effects of conjugated auxins on in vitro root regeneration and shoot growth in larch bud cultures.
Keathley, D.E. Madison : Dept. of Forestry, University of Wisconsin-Madison. Proceedings of the ... North Central Tree Improvement Conference. 1985? . (4th). p. 102-106. Includes references. (NAL Call No.: DNAL SD399.5.N6).

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TRBUA. Alfaro, R.I. MacDonald, R.N. Tucson, Ariz. : Tree-Ring Society. Tree-ring bulletin. 1988. v. 48. p. 3-11. Includes references. (NAL Call No.: DNAL 99.8 T713).

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Effects of different urea fertilizers on soil and trees in a young thinned stand of western hemlock.
SSSJD4. Radwan, M.A. DeBell, D.S. Madison, Wis. : The Society. Effects of three different urea fertilizers on selected chemical characteristics of soils and foliage, and on growth per tree of a 24-yr-old thinned stand of werstern hemlock Tsuga heterophylla (Raf.) Sarg. were compared at a site in coastal Oregon. Treatments were the following: untreated control (C), urea (U), urea treated with N-Serve nitrapyrin, 2-chloro-6-(trichloromethyl) pyridine (U + NS), and sulfur-coated urea (SCU). Fertilizers were uniformly applied by hand to 0.03-ha plots in March at 224 kg N ha-1. Soil, to a depth of 20 cm, and current-year foliage were sampled periodically for 2 yr. Height and diameter of 10 dominant or codominant trees per plot were measured annually for 6 yr. Treatment effects on soil pH va ried by fertilizer and sampling date; throughout, pH was lower with U + NS than with U, and the smallest change in ph was associated with SCU. Effects of fertilizer on inorganic N in the soil and on foliar nutrients varied by fertilizer and sampling date. Initially, N-Serve inhibited nitrification and produced the highest NH4-N concentrations. In general, all fertilizers increased inorganic N in the soil and total N in the foliage. Fertilizers significantly reduced foliar concentrations of some other macronutrients, especially in the first year after fertilization; some depressions were significantly less with SCU than with the other two fertilizers. Height growth per tree was not significantly affected by any of the fertilizers. Basal-areaand volume growth per tree were significantly greater with the SCU treatment than with the control, U, or U + NS, treatments. Beneficial effects of SCU seemed to be mostly due to the slow release of N from the fertilizer, although some positive effect of S cannot be ruled out. Soil Science Society of America journal. May/June 1989. v. 53 (3). p. 941-946. Includes references. (NAL Call No.: DNAL 56.9 S03).

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EVETEX. Bauce, E. Hardy, Y. College Park, Md. : Entomological Society of America. Analysis of rawfiber content of balsam fir, Abies balsamea (L.) Miller, needles in conjunction with laboratory-reared larvae of spruce budworm, Choristoneura fumiferana (Clemens), during the 1985 growing season indicated significant variations in the quality of food available for consumption by the insect. Two consecutive years of defoliation as well as poor drainage were directly related to higher rawfiber content of the current year's foliage which, in turn, caused a decrease in pupal weight, larval development rate, and survival. Environmental entomology. Aug 1988. v. 17 (4). p. 671-674. Includes references. (NAL Call No.: DNAL QL461.E532).

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Effects of dwarf mistletoe on spruce in the White Mountains, Arizona.
GRBNA. Mathiasen, R.L. Hawksworth, F.G.; Edminster, C.B. Provo : Brigham Young University. The Great Basin naturalist. Oct 31, 1986. v. 46 (4). p. 685-689. Includes references. (NAL Call No.: DNAL 410 G79).

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Effects of ectomycorrhiza on host growth and carbon balance in a semi-hydroponic cultivation system.
NEPHA. Nylund, J.E. Wallander, H. New York, N.Y. : Cambridge University Press. The New phytologist. July 1989. v. 112 (3). p. 389-398. Includes references. (NAL Call No.: DNAL 450 N42).

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Binder, W.D. Fielder, P. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. Paper presented at a meeting of the Western Forest Nursery Associations, Aug 8-11, 1988, Vernon, British Columbia. Dec 1988. (167). p. 122-126. ill. Includes references. (NAL Call No.: DNAL aSD11.A42).

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Barnett, J.P. Johnson, J.D.; Stumpff, N.J. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, United States, Forest Service. Feb 1986. (125). p. 48-53. Includes references. (NAL Call No.: DNAL aSD11.A42).

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Effects of extended prechilling on laboratory germination and fungal infection in seeds of white spruce and eastern white pine.
TPLNA. Mittal, R.K. Wang, B.S.P.; Harmsworth, D. Washington, D.C. : The Service. Tree planters' notes - U.S. Department of Agriculture, Forest Service. Fall 1987. v. 38 (4). p. 6-9. Includes references. (NAL Call No.: DNAL 1.962 C5T71).

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XFPNA. Radwan, M.A. Portland, Or. : The Station. USDA Forest Service research paper PNW-RP - United States, Pacific Northwest Research Station. July 1987. (375). 14 p. Includes references. (NAL Call No.: DNAL A99.9 F7625UNI).

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PIACA. Wade, K.A. Menges, E.S. Indianapolis, Ind. : The Academy. Proceedings of the Indiana Academy of Science. Meeting held November 13-15, 1986, University of Indianapolis, Indianapolis, Indiana. 1987. v. 96. p. 273-286. maps. Includes references. (NAL Call No.: DNAL 500 IN2).

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Effects of flooding and nutrient enrichment on biomass allocation in Acer rubrum seedlings.
AJBOA. Day, F.P. Jr. Baltimore, Md. : Botanical Society of America. American journal of botany. Oct 1987. v. 74 (10). p. 1541-1554. Includes references. (NAL Call No.: DNAL 450 AM36).

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AMNAA. Jones, R.H. Sharitz, R.R.; McLeod, K.W. Notre Dame, Ind. : University of Notre Dame. American midland naturalist. Jan 1989. v. 121 (1). p. 165-175. Includes references. (NAL Call No.: DNAL 410 M58).

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Effects of food, temperature, and breeding conditions on the life span of adults of three cohabitating bark beetle (Scolytidae) parasitoids (Hymenoptera).
EVETEX. Mendel, Z. College Park, Md. : Entomological Society of America. The study deals with the adult life span of three hymenopterous parasitoids of bark beetles (Scolytidae)--Dendrosoter caenopachoides Ruschka, D. protuberans Nees (Braconidae), and Metacolus unifasciatus Foerster (Pteromalidae)--investigated under three temperature and two nutrition treatments. Longevity decreased significantly with increasing temperature and absence of carbohydrate in the diet. Regardless of species, life span was about 2 mo with honey plus water at 18 degrees C compared with 20-30 d at 30 degrees C; with water only, the life span was 15-30 d at 18 degrees C and dropped to about 4-8 d at 30 degrees C. Longevity was significantly related to body length of males and females of all tested species when kept on water, but usually not when honey was available. Marked differences between longevities in the same species were attributed to breeding conditions (i.e., differences in host size of parasitoids reared from scolytids of different size). Ecological and silvicultural implications of the findings are discussed. It is suggested that an increase in tree species diversity in the stands might have diversified and increased food sources for adult parasitoids. Environmental entomology. Apr 1988. v. 17 (2). p. 293-298. Includes references. (NAL Call No.: DNAL QL461.E532).

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Effects of forest fragmentation on depredation of artificial nests.
JWMAA9. Yahner, R.H. Scott, D.P. Bethesda, Md. : Wildlife Society. Journal of wildlife management. Jan 1988. v. 52 (1). p. 158-161. Includes references. (NAL Call No.: DNAL 410 J827).

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Effects of forest fuel smoke on dwarf mistletoe seed germination.
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Effects of forest soil acidification on ectomycorrhizal and vesicular-arbuscular mycorrhizal development.
NEPHA. Danielson, R.M. Visser, S. New York, N.Y. : Cambridge University Press. The New phytologist. May 1989. v. 112 (1). p. 41-47. Includes references. (NAL Call No.: DNAL 450 N42).

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Effects of fusiform rust on growth of planted slash pines.
Burns, P.Y. Hu, S.C. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Third Biennial Southern Silvicultural Research Conference," November 7/8, 1984, Atlanta, Georgia. Apr 1985. (54). p. 231-234. Includes references. (NAL Call No.: DNAL aSD11.U57).

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Effects of fusiform rust on survival and structure of Mississippi and Louisiana loblolly pine plantations.
Shoulders, E. Nance, W.L. New Orleans, La. : The Station. USDA Forest Service research paper SO - Southern Forest Experiment Station. 1987. (232). 11 p. Includes references. (NAL Call No.: DNAL A99.9 F7628US).

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Effects of grand fir monoterpenes on the fir engraver, Scolytus ventralis (Coleoptera: Scolytidae), and its symbiotic fungus.
EVETEX. Raffa, K.F. Berryman, A.A.; Simasko, J.; Teal, W.; Wong, B.L. College Park, Md. : Entomological Society of America. Environmental entomology. Oct 1985. v. 14 (5). p. 552-556. Includes references. (NAL Call No.: DNAL QL461.E532).

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Effects of intertrap distance and wind direction on the interaction of gypsy moth (Lepidoptera: Lymantriidae) pheromone-baited traps.
EVETEX. Elkinton, J.S. Carde, R.T. Lanham, Md. : Entomological Society of America. More male gypsy moths, Lymantria dispar L., were captured in traps at the perimeter compared with traps at the center of a 6- X -6 grid of pheromone traps spaced every 80 m. Additional tests demonstrated suppression of catch at the center of hexagonal arrays of traps with intertrap distances ranging from 2.5 to 40 m. In a hexagonal array of traps spaced every 20 m and monitored every 1-3 h, more males were captured in upwind and downwind traps than in crosswind or central traps. Environmental entomology. Oct 1988. v. 17 (5). p. 764-769. Includes references. (NAL Call No.: DNAL QL461.E532).

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FOSCA. Bloomberg, W.J. Hall, A.A. Bethesda, Md. : Society of American Foresters. Forest science. Mar 1986. v. 32 (1). p. 202-219. ill. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Effects of light on location of host egg masses by Ooencyrtus kuvanae (Hymenoptera: Encyrtidae), an egg parasite of gypsy moth (Lepidoptera: Lymantriidae).
EVETEX. Odell, T.M. Chang, P.Y.; Walton, G.S. Lanham, Md. : Entomological Society of America. The effect of light on host finding and parasitism by Ooencyrtus kuvanae (Howard), an egg parasitoid of gypsy moth, Lymantria dispar L., was studied in the laboratory. Parasitism by O. kuvanae females confined in light or dark cylinders was not significantly different. When parasites were given a choice between light or dark chambers, significantly more chose the light chamber regardless of the presence or absence of an egg mass. However, chambers were significantly more attractive when they contained an egg mass, indicating that an egg mass contributes to host location over short distances. Parasitism of egg masses in dark chambers in which no O. kuvanae were found demonstrates that the parasite may leave these sites after oviposition. Implications for success of O. kuvanae in low-density gypsy moth populations are discussed. Environmental entomology. Dec 1989. v. 18 (6). p. 1101-1104. Includes references. (NAL Call No.: DNAL QL461.E532).

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Effects of moisture before and after laboratory spray application of insecticides to western spruce budworm (Lepidoptera: Tortricidae).
JEENAI. Robertson, J.L. Preisler, H.K. Lanham, Md. : Entomological Society of America. Journal of economic entomology. Dec 1988. v. 81 (6). p. 1678-1680. Includes references. (NAL Call No.: DNAL 421 J822).

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XFIPA. Bilderback, D.E. Carlson, C.E. Ogden, Utah : The Station. USDA Forest Service research paper INT - Intermountain Research Station. Aug 1987. (380). 3 p. Includes references. (NAL Call No.: DNAL A99.9 F764U).

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WLSBA. Wood, G.W. Bethesda, Md. : The Society. Wildlife Society bulletin. Summer 1988. v. 16 (2). p. 180-186. Includes references. (NAL Call No.: DNAL SK357.A1W5).

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Appleton, B.L. Whitcomb, C.E.; Akers, S.W. Washington, D.C. : Horticultural Research Institute. Journal of environmental horticulture. Sept 1986. v. 4 (3). p. 69-72. ill. Includes 4 references. (NAL Call No.: DNAL SB1.J66).

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Effects of short-term phenological changes in leaf suitability on the survivorship, growth, and development of gypsy moth (Lepidoptera: Lymantriidae) larvae.
EVETEX. Raupp, M.J. Werren, J.H.; Sadof, C.S. College Park, Md. : Entomological Society of America. In this report we examine the effects of short-term phenological changes in host suitability on the performance of gypsy moth, Lymantria dispar (L.), larvae. The time frame examined was a 2-wk period during which most gypsy moth larvae hatch and feed in central Maryland. Oak supported high levels of survivorship for almost 2 wk, and beech remained suitable for young larvae for less than 1 wk; hickory and maple were intermediate. Larvae did not respond uniformly to chronological changes in foliage when fed leaves from different tree species. When fed oak, larvae tended to develop more slowly as the season progressed. This trend was less important for hickory. Also, differences in pupal weight were observed for female larvae fed different hosts--oak produced pupae of greater weight; this trend was less pronounced for male larvae. Phenological differences in host suitability may help explain associations of gypsy moth with particular tree species that are commonly observed in the field. Environmental entomology. Apr 1988. v. 17 (2). p. 316-319. Includes references. (NAL Call No.: DNAL QL461.E532).

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XGNEA. Crawford, H.S. Broomall, Pa. : The Station. USDA Forest Service general technical report NE - United States, Northeastern Forest Experiment Station. Paper presented at the "Conference on Spruce-Fir Management and Spruce Budworm", April 24/26, 1984, Burlington, Vermont. 1985. (99). p. 173-175. Includes references. (NAL Call No.: DNAL aSD11.U56).

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Effects of slash pine phloem nutrition on the reproductive performance of Ips calligraphus (Coleoptera: Scolytidae).
EVETEX. Popp, M.P. Wilkinson, R.C.; Jokela, E.J.; Harding, R.B.; Phillips, T.W. Lanham, Md. : Entomological Society of America. The density of eggs laid per centimeter of gallery by

laboratory-reared Ips calligraphus (Germar) females was determined following introduction into thin phloem bolts cut from 25-yr-old slash pine, Pinus elliotii Engelm. var. elliottii, that had been fertilized at the time of planting with a combination of nitrogen, phosphorus, and potassium, or phosphorus alone. Egg density was negatively correlated with female pronotal width (size) and positively correlated with the phloem phosphorus concentration. These two variables explained 64% of the variation in egg density. It is hypothesized that altering egg density in response to varying phloem nutrition represents a resource partitioning mechanism that reduces larval competition. These results also suggest that excessive phosphorus fertilization of slash pine on the Coastal Plain soils could contribute to a build-up in the beetle population without the added benefits of stand growth. Environmental entomology. Oct 1989. v. 18 (5). p. 795-799. Includes references. (NAL Call No.: DNAL QL461.E532).

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Helms, J.A. Alexander, E.B. Bethesda, Md. : Society of American Foresters. Western journal of applied forestry. Oct 1986. v. 1 (4). p. 104-108. Includes references. (NAL Call No.: DNAL SD388.W6).

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Hildebrand, D.M. Denver : The Service. Technical report R2 - United States Forest Service, Forest Pest Management. Dec 1986. (37). 10 p. ill. Includes references. (NAL Call No.: DNAL aSD11.A422).

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XGNEA. Hanson, P.M. Broomall, Pa. : The Station. USDA Forest Service general technical report NE - United States, Northeastern Forest Experiment Station. Paper presented at the "Conference on Spruce-Fir Management and Spruce Budworm", April 24/26, 1984, Burlington, Vermont. 1985. (99). p. 177-183. Includes references. (NAL Call No.: DNAL aSD11.U56).

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WLSBA. DeFazio, J.T. Jr. Stone, A.E.; Warren, R.J. Bethesda, Md. : The Society. Wildlife Society bulletin. Spring 1988. v. 16 (1). p. 12-18. (NAL Call No.: DNAL SK357.A1W5).

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Haack, R.A. Foltz, J.L.; Wilkinson, R.C. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 102-113. ill. Includes references. (NAL Call No.: DNAL aSD11.U57).

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PHYTAJ. Bridges, J.R. St. Paul, Minn. : American Phytopathological Society. Phytopathology. Jan 1987. v. 77 (1). p. 83-85. Includes references. (NAL Call No.: DNAL 464.8 P56).

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PLDIDE. Runion, G.B. Bruck, R.I. St. Paul, Minn. : American Phytopathological Society. Plant disease. Apr 1988. v. 72 (4). p. 297-300. Includes references. (NAL Call No.: DNAL 1.9 P69P).

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XFGSA. Price, T.S. Asheville, N.C. : The Station. USDA Forest Service general technical report SE - United States, Southeastern Forest Experiment Station. Dec 1985. (34). p. 12-15. maps. Includes references. (NAL Call No.: DNAL aSD433.A53).

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JEENAI. Su, N.Y. Tamashiro, M.; Haverty, M.I. College Park, Md. : Entomological Society of America. Journal of economic entomology. Dec 1985. v. 78 (6). p. 1259-1263. Includes references. (NAL Call No.: DNAL 421 J822).

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PLDRA. Kelley, W.D. Williams, J.C. St. Paul, Minn. : American Phytopathological Society. Plant disease. Feb 1985. v. 69 (2). p. 147-148. ill. Includes 6 references. (NAL Call No.: DNAL 1.9 P69P).

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PHYTAJ. Marx, D.H. Cordell, C.E.; France, R.C. St. Paul, Minn. : American Phytopathological Society. Phytopathology. Aug 1986. v. 76 (8). p. 824-831. Includes references. (NAL Call No.: DNAL 464.8 P56).

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Elevated parasitism in artificially augmented populations of Lymantria dispar (Lepidoptera: Lymantriidae).
EVETEX. Liebhold, A.M. Elkinton, J.S. Lanham, Md. : Entomological Society of America. Within 1-ha plots, gypsy moth, Lymantria dispar L., densities were artificially elevated from low densities (about 20 egg masses/ha) to high densities (8,000 egg masses/ ha) using field-collected eggs and F1 sterile laboratory-reared eggs. At all sites, including the feral and sterile release areas, densities decreased to undetectable levels (less than 10 egg masses/ha). In the sterile and feral release areas, parasitism by Cotesia melanoscela (Ratzeburg) was the largest source of identified mortality and was significantly greater than in the surrounding area or in untreated plots. Within the feral release area, parasitism by Compsilura concinnata (Meigen) and Parasetigena silvestris (Robineau-Desvoidy) was substantial and was greater than in the surrounding area. This pattern was not observed in the sterile release area. This difference may have been caused by differences in gypsy moth phenologies between the two populations. Spatially density-dependent mortality caused by parasitoids is hypothesized to be important in the regulation of low-density populations. Furthermore, this mortality may have profound effects on attempts to suppress populations using releases of induced-inherited sterile insects. Environmental entomology. Dec 1989. v. 18 (6). p. 986-995. ill. Includes references. (NAL Call No.: DNAL QL461.E532).

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Elicitation of defensive reactions in conifers.
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Endemic and epidemic populations of southern pine beetle: implications of the two-phase model for forest managers.
FOSCA. Mawby, W.D. Hain, F.P.; Doggett, C.A. Bethesda, Md. : Society of American Foresters. Typical of many Dendroctonus species, the southern pine beetle (D. frontalis Zimmerman) exhibits dramatic fluctuations in population levels. Using field observations of beetle damage, this study empirically demonstrates that a two-phase model described for mountain pine beetle (D. ponderosae Hopkins) is appropriate for southern pine beetle at each of five hierarchical levels: the tree, the local infestation, the county, the state, and the region. The model has three points that represent a stable low-level (endemic) phase maintained by host-tree-defensive capabilities, a transient high-level (epidemic) phase determined by the availability of host material, and a threshold between the two phases. The threshold depends on local environmental and biotic factors and is a rarely observed phenomenon. Implications of these results for southern pine beetle management and control are discussed. The necessity for establishing and maintaining control programs during the endemic phase is stressed. Forest science. Dec 1989. v. 35 (4). p. 1075-1087. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Energetics of pine defense systems to bark beetle attack.
Sharpe, P.J.H. Wu, H.I.; Cates, R.G.; Coeschl, J.D. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 206-223. ill. Includes references. (NAL Call No.: DNAL aSD11.U57).

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Enhanced ethylene emissions from red and Norway spruce exposed to acidic mists.
PLPHA. Chen, Y.M. Wellburn, A.R. Rockville, Md. : American Society of Plant Physiologists. Acidic cloudwater is believed to cause needle injury and to decrease winter hardiness in conifers. During simulations of these adverse conditions, rates of ethylene emissions from and levels of 1-aminocyclopropane-1-carboxylic acid (ACC) in both red and Norway spruce needles increased as a result of treatment with acidic mists but amounts of 1-malonyl(amino)cyclopropane-1-carboxylic acid remained unchanged. However, release of significant quantities of ethylene by another mechanism independent of ACC was also detected

from brown needles. Application of exogenous plant growth regulators such as auxin, kinetin, abscisic acid and gibberellic acid (each 0.1 millimolar) had no obvious effects on the rates of basal or stress ethylene production from Norway spruce needles. The kinetics of ethylene formation by acidic mist-stressed needles suggest that there is no active inhibitive mechanism in spruce to prevent stress ethylene being released once ACC has been formed. Plant physiology. Sept 1989. v. 91 (1). p. 357-361. Includes references. (NAL Call No.: DNAL 450 P692).

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Enhanced herbaceous weed control in conifers with combinations of nitrogen fertilizer formulations and hexazinone.
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Enhancement of baculovirus activity on gypsy moth (Lepidoptera: Lymantriidae) by chitinase.
JEENAI. Shapiro, M. Preisler, H.K.; Robertson, J.L. College Park, Md. : Entomological Society of America. Journal of economic entomology. Dec 1987. v. 80 (6). p. 1113-1116. Includes references. (NAL Call No.: DNAL 421 J822).

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Enhancement of baculovirus activity on gysp moth (Lepidoptera: Lymantriidae) by chitinase.
JEENAI. Shapiro, M. Preisler, H.K.; Robertson, J.L. Lanham, Md. : Entomological Society of America. Chitinase significantly enhanced the activity of nuclear polyhedrosis viruses (NPV) ingested by second-instar gypsy moth, Lymantria dispar (L.). Multiple probit regressions calculated from mortality observed at 14 and 21 d indicated that the LC50's of NPV declined 1.3-, 2.0-, 3.2-, and 5.4-fold with the addition of 0.001, 0.010, 0.10, and 1.00% chitinase, respectively. In addition, insects exposed to NPV-chitinase combinations died more rapidly than those that ingested NPV only. Journal of economic entomology. Dec 1987. v. 80 (6). p. 1113-1116. Includes references. (NAL Call No.: DNAL 421 J822).

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Enhancement of Sphaeropsis sapinea stem invasion of pines by water deficits.
PLDRA. Bachi, P.R. Peterson, J.L. St. Paul, Minn. : American Phytopathological Society. Plant disease. Sept 1985. v. 69 (9). p. 798-799. Includes 9 references. (NAL Call No.: DNAL 1.9 P69P).

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Enniatins from Fusarium avenaceum isolated from balsam fir foliage and their toxicity to spruce budworm larvae, Choristoneura fumiferana (Clem.) (Lepidoptera: Tortricidae).
JCECD. Strongman, D.B. Strunz, G.M.; Giguere, P.; Yu, C.M.; Calhoun, L. New York, N.Y. : Plenum Press. Journal of chemical ecology. Mar 1988. v. 14 (3). p. 753-764. Includes references. (NAL Call No.: DNAL QD415.A1J6).

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XGNEA. Ma, M. Broomall, Pa. : The Station. USDA Forest Service general technical report NE - United States, Northeastern Forest Experiment Station. Paper presented at the "Symposium: Microbial Control of Spruce Budworms and Gypsy Moths," April 10-12, 1984, Windsor Locks, CT. 1985. (100). p. 125-131. ill. Includes references. (NAL Call No.: DNAL aSD11.U56).

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Epidemiology of Fusarium on containerized Douglas-fir seedlingsISeed and seedling infection, symptom production, and disease progression /by R.L. James ... et al. .
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SWSPBE. Gonzalez, F.E. Evans, R.M. Raleigh, N.C. : The Society . Proceedings - Southern Weed Science Society. 1986. (39th). p. 240-246. Includes references. (NAL Call No.: DNAL 79.9 SO8 (P)).

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Establishment of long-term callus cultures from mature white pine (Pinus strobus, Pinaceae).
AJBOA. Kaul, K. Baltimore, Md. : Botanical Society of America. American journal of botany. Feb 1986. v. 73 (2). p. 242-245. ill. Includes references. (NAL Call No.: DNAL 450 AM36).

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Estimates of genetic parameters for deer browsing of Douglas-fir.
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FOSCA. Liebhold, A.M. Berck, P.; Williams, N.A.; Wood, D.L. Washington, D.C. : Society of American Foresters. Forest science. June 1986. v. 32 (2). p. 325-338. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Estimating effects of competing plants on conifer growth and yield, and determining release needs.
Fiske, J.N. S.l. : s.n. . Proceedings ... annual Forest Vegetation Management Conference. Meeting held November 1-2, 1984, Redding, California. Aug 1985. (6th). p. 129-143. Includes references. (NAL Call No.: DNAL QH541.5.F6F67).

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Estimating fusiform rust losses in five southeast states.
SJAFD. Anderson, R.L. McClure, J.P.; Cost, N.; Uhler, R.J. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. Nov 1986. v. 10 (4). p. 237-240. Includes references. (NAL Call No.: DNAL SD1.S63).

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Estimating oak leaf area index and gypsy moth, Lymantria dispar (L.) (Lepidoptera: Lymantriidae), defoliation using canopy photographs.
EVETEX. Liebhold, A.M. Elkinton, J.S.; Miller, D.R.; Wang, Y.S. College Park, Md. : Entomological Society of America. Abstract: Oak leaf area index was (LAI) was estimated using wide-angle photographs of the forest canopy taken from the ground at grid points throughout three sites on Cape Cod, Mass. Confidence intervals for these estimates and optimal sample sizes were calculated. Oak LAI estimates leveled off by early June when no defoliation was present. Within-plot two-dimensional spatial distribution of oak LAI was very similar to the spatial distribution of oak basal area. Consequently, there was a positive correlation between local oak leaf area and local basal area. Comparison of LAI estimates taken before and after gypsy moth, Lymantria dispar. (L.), defoliation allowed the estimation of oak leaf area consumed. Leaf area loss was similarin areas of high and low host foliage densities. The correlation of leaf area lost with local density of early instars was greater than the correlation with the density of late instars. Environmental entomology. June 1988. v. 17 (3). p. 560-566. ill., maps. Includes references. (NAL Call No.: DNAL QL461.E532).

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Estimating southern pine beetle caused timber losses over extensive areas.
Ward, J.D. Dull, C.W.; Ryan, G.W.; Remion, M.C. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 34-40. ill., maps. Includes references. (NAL Call No.: DNAL aSD11.U57).

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Estimating the benefits of gypsy moth control on timberland.
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Estimating the response of ponderosa pine forests to fertilization.
XGTIA. Powers, R.F. Webster, S.R.; Cochran, P.H. Ogden, Utah : The Station. General technical report INT - U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Paper presented at "Future Forests of the Mountain West : A Stand Culture Symposium," Sept 29-Oct 3, 1986, Missoula, MT. Apr 1988. (243). p. 219-225. maps. Includes references. (NAL Call No.: DNAL aSD11.A48).

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Estimating timber losses from a town ant colony with aerial photographs.
SJAFD. Moser, J.C. Bethesda, Md. : Society of American Foresters. Southern journal of applied forestry. Feb 1986. v. 10 (1). p. 45-47. ill. Includes references. (NAL Call No.: DNAL SD1.S63).

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Ethylene production by excised sapwood of clonal eastern cottonwood and the compartmentalization and closure of seasonal wounds.
PHYTAJ. Shain, L. Miller, J.B. St. Paul, Minn. : American Phytopathological Society. Increment cores were removed from ramets of six clones of eastern cottonwood at 3-mo intervals starting either in November, at the beginning of the dormant season, or in May, at the beginning of the growing season. By offsetting the two wounding series by 6 mo, it was possible to separate the effect of wound age from the effect of season of wounding with regard to dynamic host reponses and the fungi that colonize such wounds. Production of ethylene by these cores of outer sapwood was measured 1 (et1) and 2 (et2) days after their collection and incubation in sealed containers under standarized conditions. Methane, a product of methogenic bacteria, was measured 1 day after core collection. Observations on wound closure were made at3-mo intervals. At the time of harvest, each tree had wounds 3, 6, 9, and 12 mo old. Discoloration associated with wounds initiated during the growing season was significantly less than that associated with wounds initiated during the dormant season regardless of wound age. Clones differed in their capacity to compartmentalize wounds. Ethylene production (et1) by increment cores collected in February correlated best with the ranking of mean clonal discoloration. The seasonal course of et1 but not et2 across clones faithfully mirrored that expected for the physiological activity of sapwood; i.e., it increased significantly through February, November, August, and May. The ratios of basal (February) to maximal (May) rates of et1 ranged from 2.7 to 5.6 for better compartmentalizing clones from 1.4 to 1.7 for poorer compartmentalizing clones. It is suggested that ratios of et1 may be used to rapidly screen for superior compartmentalizing genotypes, although additional studies are necessary to confirm or refute this hypothesis. Wounds largely closed during the 3-mo period from May to August. Clones differed significantly in their rate of closure. Those with higher et2 in May tended to close more rapidly. Wound closure and compartmentalization, h. Phytopathology. Oct 1988. v. 78 (10). p. 1261-1265. ill. Includes references. (NAL Call No.: DNAL 464.8 P56).

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Eucalyptus stump and basal treatment.
Cudney, D.W. McHenry, W.B.; Elmore, C.L. S.l. : Western Society of Weed Science. Research progress report - Western Society of Weed Science. 1987. p. 83-84. (NAL Call No.: DNAL 79.9 W52R).

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European hornet damage to ash and birch trees.
JOARD. Santamour, F.S. Jr. Greene, A. Urbana, Ill. : International Society of Arboriculture. Journal of arboriculture. Nov 1986. v. 12 (11). p. 273-279. ill. Includes 16 references. (NAL Call No.: DNAL SB436.J6).

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Evaluating the impact of sequential releases of Cotesia melanoscela (Hymenoptera: Braconidae) on Lymantria dispar (Lepidoptera: Lymantriidae).
EVETEX. Kolodny-Hirsch, D.M. Reardon, R.C.; Thorpe, K.W.: Raupp, M.J. College Park, Md. : Entomological Society of America. Laboratory-reared Cotesia melanoscela (Ratzeburg) were released sequentially over 3 wk at an average level of 12,000 females per ha in three isolated mixed-hardwood woodlots infested with gypsy moth on Maryland's Eastern Shore. Southwood's area under the curve method was used to estimate generational levels of parasitism for the first three instars of the gypsy moth and rates of parasitism were estimated from gypsy moth larvae collected from various canopy strata and host tree species. Significantly higher rates of generational parasitism were achieved in release woodlots (15.4%) than in control woodlots (5.1%). Cotesia melanoscela parasitized a greater proportion of larvae occurring in the upper canopy of trees. Despite significantly higher rates of parasitism in release woodlots, inundative releases of the Korean strain of C. melanoscela failed to reduce gypsy moth populations as determined from egg mass counts. Environmental entomology. Apr 1988. v. 17 (2). p. 403-408. Includes references. (NAL Call No.: DNAL QL461.E532).

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Evaluation and application of the TAMBEETLE and Arkansas southern pine beetle spot growth models in the Gulf Coastal Plain.
Nettleton, W.A. Connor, M.D.; Ryan, G.W. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 202-205. Includes references. (NAL Call No.: DNAL aSD11.U57).

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Evaluation of a hemlock sawfly outbreak in the northern tip of Idaho-1985.
Tunnock, S. Missoula, Mont. : The Region. Report - USDA Forest Service, Forest Pest Management, Northern Region. Nov 1985. (85-26). 4 p. maps. Includes references. (NAL Call No.: DNAL aSD11.U585).

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Evaluation of a repellent for prevention of attacks by three species of southern pine bark beetles (Coleoptera: Scolytidae).
JESCEP. Berisford, C.S. Brady, U.E.; Fatzinger, C.W.; Ebel, B.H. Tifton, Ga. : The Entomological Science Society. Journal of Entomological Science. Oct 1986. v. 21 (4). p. 316-318. Includes references. (NAL Call No.: DNAL QL461.G4).

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ETOCDK. Mineau, P. Peakall, D.B. Elmsford : Pergamon Press. Environmental toxicology and chemistry. 1987. v. 6 (10). p. 781-791. Includes references. (NAL Call No.: DNAL QH545.A1E58).

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Evaluation of diflubenzuron as a control agent for hemlock looper (Lepidoptera: Geometridae).
JEENAI. Retnakaran, A. Raske, A.G.; West, R.J.; Lim, K.P.; Sundaram, A. Lanham, Md. : Entomological Society of America. Journal of economic entomology. Dec 1988. v. 81 (6). p. 1698-1705. ill., maps. Includes references. (NAL Call No.: DNAL 421 J822).

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Introduction and North American establishment of Coccygomimus disparis (Hymenoptera: Ichneumonidae), a polyphagous pupal parasite of Lepidoptera, including gypsy moth.
EVETEX. Schaefer, P.W. Fuester, R.W.; Chianese, R.J.; Rhoads, L.D.; Tichenor, R.B. Jr. Lanham, Md. : Entomological Society of America. Recoveries of Coccygomimus disparis (Viereck) from pupae of gypsy moth, Lymantria dispar (L.), in Pennsylvania, Maryland, New Jersey, Massachusetts, Virginia, Vermont, New York, Nebraska, and Ontario, Canada, indicate that this Palearctic species is now well established in North America. This represents the first successful establishment of a natural enemy of gypsy moth in North America in nearly 50 yr. Levels of pupal parasitism in gypsy moth average 1.9% (maximum 13%). Historical records indicate C. disparis was intentionally imported from India (1972), Japan (1976), and Korea (1984). Laboratory rearing resulted in the eventual release of more than 819,012 individuals liberated in 16 states. Details on the biology of this wasp, its foreign collection, introduction, release, and recovery (first in North America in 1978) are documented. Recovery from Thyridopteryx ephemeraeformis (Haworth) (Psychidae) and Malacosoma americanum (F.) (Lasiocampidae) in New Jersey and Dioryctria auranticella (Grote) (Pyralidae) from Nebraska, as well as host data from outside the United States, indicates that C. disparis is not specific to gypsy moth and should be searched for in other forest or shade tree Lepidoptera. Recent collections of M. americanum in New Jersey showed 20.6% parasitism. Overall effectiveness as a biological control agent against the gypsy moth or other hosts remains uncertain but promising. Environmental entomology. Dec 1989. v. 18 (6).

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Inventory monitoring for estimating impact of insects on seed production in a Douglas-fir seed orchard in western Oregon.
JEENAI. Dombrosky, S.A. Schowalter, T.D. Lanham, Md. : Entomological Society of America. Impact of various factors on seed production was examined in a Douglas-fir (Pseudotsuga menziesii (Mirb.) Franco) seed orchards in western Oregon during 1984. Cones were examined monthly between April and September for mortality or evidence of insect damage. Loss of immature cones began early in the growing season and had a substantial impact on seed production. A newly discovered cone-feeding weevil, Lepesoma lecontei (Casey), caused a large proportion of this mortality. Unexplained cone mortality (possibly frost damage), undeveloped seed, Douglas-fir cone gall midge (Contarinia oregonensis Foote), and Douglas-fir seed chalcid (Megastigmus spermotrophus (Wachtl) were other major causes of seed loss. Crown elevation was important for an accurate estimate of the importance of some seed-loss factors. An inventory monitoring system for Douglas-fir seed production based on early monitoring of immature cones, identifying specific seed loss factors, stratified crown sampling, and an adequate sample size, is suggested. Journal of economic entomology. Feb 1988. v. 81 (1). p. 281-285. Includes

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Laboratory assessment of predation by Lonchaea corticis (Diptera: Lonchaeidae) on Pissodes strobi (Coleoptera: Curculionidae).
EVETEX. Hulme, M.A. Lanham, Md. : Entomological Society of America. Larvae of Lonchaea corticis Taylor killed and consumed pupae and to a lesser extent prepupal larvae of Pissodes strobi (Peck) at temperatures ranging from 5 to 14 degrees C during a 3-wk experiment in glass vials that were monitored weekly. Marginal predation of pupae but not prepupal larvae was observed at 0 degrees C. In simulated pupal cells of P. strobi stored outdoors in a Victoria, British Columbia, winter, L. corticis larvae killed and consumed pupae and prepupal larvae of P. strobi in a 3-wk experiment that left most cells devoid of obvious prey remains. Tests in glass vials in March with L. corticis larvae collected during March and during the previous August showed that L. corticis larvae remain predacious at the end of winter. When the insects were left in situ in severed leaders stored outdoors in a Victoria, British Columbia, winter, the proportion of pupal cells with live P. strobi decreased significantly and the proportion of pupal cells emptied without insect emergence increased signficantly; the numbers of L. corticis larvae and total P. strobi pupal cells did not change significantly. These experiments show that P. strobi pupae and prepupal larvae can be vulnerable prey for L. corticis larvae and that predation may be common in the winter conditions of coastal British Columbia. Environmental entomology. Dec 1989. v. 18 (6). p. 1011-1014. Includes references. (NAL Call No.: DNAL QL461.E532).

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Laboratory rearing of Tetrastichus gallerucae (Hymenoptera: Eulophidae), an egg parasitoid of the elm leaf beetle (Coleoptera: Chrysomelidae).
JEENAI. Hamerski, M.R. Hall, R.W. College Park, Md. : Entomological Society of America. Rearing of Tetrastichus gallerucae (Fonscolombe), a parasitoid of the elm leaf beetle, Xanthogaleruca luteola (Muller), was conducted at 15:9 (L:D) photoperiod, 25?C, and 80-90% relative humidity. Under these conditions, adult males lived for an average of 23 d and females for 59 d when fed a 1:1 water-honey mixture. Adult T. gallerucae began to emerge from elm leaf beetle egg masses 28 d after exposure to T. gallerucae when held at 20?C, 12 d at 25?C, 11 d at 27?C, and 10 d at 30?C. Peak emergence occurred after 13 d at 25?C. Male T. gallerucae emerged first, remained close to the egg mass, and mated with their sisters. T. gallerucae exhibited a female-biased sex ratio. T. gallerucae would parasitize elm leaf beetle eggs that were between 1 and 104 h old at 25?C. Parasitization of egg masses exposed to single females for 48 h averaged 44.9%. Percent parasitization of eggs within parasitized masses ranged from 3.5 to 100 (-/x = 53.1%). Host feeding by female T. gallerucae destroyed approximately 65% of the eggs presented. The number of eggs in an egg mass and the number of parasitized eggs in a mass had no effect on the percentage of males produced. Journal of economic entomology. Oct 1988. v. 81 (5). p. 1503-1505. Includes references. (NAL Call No.: DNAL 421 J822).

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Leaf area, stemwood growth, and nutrition relationships in loblolly pine.
FOSCA. Vose, J.M. Allen, H.L. Bethesda, Md. : Society of American Foresters. The relationships among loblolly pine (Pinus taeda L.) stand leaf area index (LAI), stemwood volume growth (m3/ha/yr), and growth efficiency (m3 stemwood/ha/yr/LAI) were examined in three nitrogen (N) by phosphorus (P) fertilization field trials. Prior to fertilization, stocking levels and nitrogen limitations varied for the three stands. LAI increased significantly (up to 60%) following N fertilization on the two N deficient stands. Phosphorus additions did not affect LAI. Stenwood growth was positively and linearly related to LAI across treatments and stands. Variations in LAI across stands reflected the differences in stocking and N availability. On average, a unit of LAI produced 7.3 m3 stemwood/ha/yr. Growth efficiency was not affected by fertilization on two of the three stands. A decrease in growth efficiency at a projected LAI above 3.5 resulted from an asymptotic relationship between stemwood growth and LAI on a stand that was fully stocked and highly responsive to N fertilization. The use of LAI as an index of stocking is proposed because LAI intergrates tree size, stand density, and site resource supply. In addition, it is proposed that the deviation of a stand's current LAI from the maximum supportable LAI based on fixed site factors (e.g., water, temperature) may provide a good measure of a stand's potential responsiveness to fertilization. For. Sci. 34(3):547-563. Forest science. Sept 1988. p. 547-563. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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JEENAI. Schowalter, T.D. College Park, Md. : Entomological Society of America. Journal of economic entomology. June 1986. v. 79 (3). p. 843-846. ill. Includes references. (NAL Call No.: DNAL 421 J822).

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GRLEA. Katovich, S.A. Kulman, H.M. East Lansing, Mich. : Michigan Entomological Society. The Great Lakes entomologist. Autumn 1987. v. 20 (3). p. 119-120. Includes references. (NAL Call No.: DNAL QL461.M5).

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Phenology and degree-day relationships of the obscure scale (Homoptera: Diaspididae) and associated parasites on pin oak in Kentucky.
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Pheromone mating disruption of Rhyacionia zozana (Lepidoptera: Tortricidae): influence on the associated parasite complex.
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Recovery in a tornado-damaged hardwood forest in northern Kentucky.
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Recovery of goat-damaged vegetation in an insular tropical montane forest.
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Recovery of pine beauty moth (Panolis flammea) nuclear polyhedrosis virus from pine foliage.
JIVPA. Carruthers, W.R. Cory, J.S.; Entwistle, P.F. Duluth, Minn. : Academic Press. Journal of invertebrate pathology. July 1988. v. 52 (1). p. 27-32. Includes references. (NAL Call No.: DNAL 421 J826).

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Red spruce rhizosphere dynamics: spatial distribution of aluminum and zinc in the near-root soil zone.
FOSCA. Smith, W.H. Pooley, A.S. Bethesda, Md. : Society of American Foresters. Red spruce roots, associated with mature, healthy trees occupying canopy positions, were located in three 8.5 m2 forest floor plots at 250 m elevation in the Hubbard Brook Experimental Forest, White Mountain National Forest, New Hampshire. Roots, 0.25-1.0 cm diam, were severed, and cut ends were placed in soil in plastic bags. In 14 months, new roots developed behind cut ends and were cultured in wooden trays containing screened forest floor material. Forest floor concentrations of aluminum, calcium, chlorine, iron, lead, and zinc were established. Trays containing roots were supplied with a distilled water treatment or with distilled water containing chloride salts of aluminum, lead or zinc sufficient to increase substrate cation concentration by 500 ppm. Eight weeks following treatment, roots (largely ectomycorrhizal, diam 0.4-1.0 mm) with associated rhizosphere soil were harvested by impregnating specimens in agar and freezing in liquid nitrogen. Cross sections of root-rhizosphere soil samples were freeze dried and examined with a scanning electron microscope and energy dispersive x-ray spectrometer. Gradients of element concentrations were established along transects from root interiors (cortex) through the inner and outer rhizosphere zones (2 mm from root) and in bulk soil (devoid of roots). The pH of rhizosphere soil was approximately 0.5 unit less than bulk soil. Aluminum concentrations exhibited a strongly descending gradient from bulk soil through the rhizosphere to the root. Estimated concentrations ranged from 1000 ppm within 200 microns of the root to 10 x this amount in soil beyond 2000 microns. Calcium distribution, without aluminum amendment, was relatively constant through the rhizosphere, but with aluminum amendment, calcium exhibited a sharply decreasing gradient near the root. In the unamended treatment, the Al:Ca ratio dropped from 7 to 0.2 across the rhizosphere. Chlorine was constant in the rhizosphere but exhibited pronounced accumulation in. Forest science. Dec 1989. v. 35 (4). p. 1114-1124. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Reduction of Phellinus weirii inoculum in Douglas-fir stumps by the fumigants chloropicrin, Vorlex, or methylisothiocyanate.
FOSCA. Thies, W.G. Nelson, E.E. Bethesda, Md. : Society of American Foresters. Forest science. June 1987. v. 33 (2). p. 316-329. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Reduction of ponderosa pine dwarf mistletoe with the plant growth regulator ethephon.
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AMNAA. Parker, V.T. Yoder-Williams, M.P. Notre Dame, Ind. : University of Notre Dame. American midland naturalist. Jan 1989. v. 121 (1). p. 105-111. Includes references. (NAL Call No.:

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Relation between cold hardiness, root growth capacity, and bud dormancy in three western conifers.
Tinus, R.W. Burr, K.E.; Wallner, S.J.; King, R.M. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service. Paper presented at a Meeting of the Combined Western Forest Nursery Council and Intermountain Nursery Association, August 12-15, 1986, Tumwater, Washington. Dec 1986. (137). p. 80-86. Includes references. (NAL Call No.: DNAL aSD11.A42).

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Relationship between color intensity of leaf supernatants from resistant and susceptible birch trees and rate of oviposition by the birch leafminer (Hymenoptera: Tenthredinidae).
JEENAI. Fiori, B.J. Graig, D.W. Lanham, Md. : Entomological Society of America. In no-choice laboratory tests, young leaves from trees of Betula davurica Pall. Fl. Ross., Betula maximowicziana Reg., Betula schmidtii Reg., and Betula costata Trautv. exhibited 95-100% reductions in oviposition by the birch leafminer Fenusa pusilla (Lepeletier) compared with leaves from Betula populifolia Marsh. Visible absorbance ratios (500 nm: 400 nm) of aqueous supernatants from leaves which exhibited high reductions in oviposition were 2.5- to 4-fold greater than ratios from leaves of B. populifolia. Results suggest these trees offer high resistance against birch leafminer damage and that absorbance characteristics of supernatants from young leaves can be used to detect high levels of resistance. Journal of economic entomology. Dec 1987. v. 80 (6). p. 1331-1333. Includes references. (NAL Call No.: DNAL 421 J822).

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Relationship between initial seedling height and survival and growth of loblolly pine seedlings planted during a droughty year.
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EVETEX. Martinat, P.J. Allen, D.C. College Park, Md. : Entomological Society of America. Environmental entomology. Feb 1987. v. 16 (1). p. 246-249. Includes references. (NAL Call No.: DNAL QL461.E532).

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Relationship between susceptibility of gypsy moth larvae (Lepidoptera: Lymantriidae) to a Baculovirus and host plant foliage constituents.
EVETEX. Keating, S.T. Yendol, W.G.; Schultz, J.C. Lanham, Md. : Entomological Society of America. The susceptibility of gypsy moth, Lymantria dispar L., larvae to the gypsy moth nuclear polyhedrosis virus was significantly altered when larvae were fed different host plants in conjunction with the virus. Larvae consuming the virus on the foliage of oak species suffered lower mortality rates than did larvae consuming the virus-contaminated foliage of aspen species. Decreased viral pathogenicity

was correlated with increased acidity and hydrolyzable tannin content of the leaf material. Environmental entomology. Dec 1988. v. 17 (6). p. 952-958. Includes references. (NAL Call No.: DNAL QL461.E532).

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The relationship between tree diameter growth and climate in the Lake States.
XFGTA. Holdaway, M.R. St. Paul, Minn. : The Station. USDA Forest Service general technical report NC - North Central Forest Experiment Station. Paper presented at the "Conference on Forest Growth Modelling and Prediction," Aug 23-27, 1987, Minneapolis, Minnesota. 1988. (120). p. 490-497. Includes references. (NAL Call No.: DNAL aSD11.A352).

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Relationship between volume and biomass of early successional vegetation and the prediction of loblolly pine seedling growth.
FOSCA. Byrne, S.V. Wentworth, T.R. Bethesda, Md. : Society of American Foresters. A simple and nondestructive method of measuring plant volume was developed to test the following two hypotheses: (1) plant volume is an effective substitute for plant biomass in the prediction of competitive potential; and (2) the plant biomass-volume relationship is affected by plant growth form. In 1983, above-ground volume and biomass were determined for all plants in 40 1-m2 plots in an experimental loblolly pine (Pinus taeda L.) plantation having varying degrees of successional regrowth. After natural log transformations of plant biomass and volume, separate regression equations were developed for grass, forb, shrub, and tree growth forms. A test of homogeneity indicated that the slopes and intercepts for the four regression equations were not all identical. Specific contrasts among the regression equations were also tested for common slopes and intercepts to determine the source of overall significance. Results of the contrasts were explained by differences in plant allocation patterns. The variation in plant biomass accounted for by the volume models ranged from 78% for grasses to 94% for trees. As an application of this approach, volume was measured and biomass was estimated from the regression equations for successional plants within a 2m radius (the "neighborhood") of each of 69 loblolly pine seedlings. Total plant volume and total estimated biomass each accounted for approximately 40% of the variation in pine growth. FOR. SCI. 34(4):939-947. Forest science. Dec 1988. v. 34 (4). p. 939-947. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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The relationship between western spruce budworm defoliation levels and growth of individual Douglas-fir and grand fir trees.
FOSCA. Nichols, T.J. Bethesda, Md. : Society of American Foresters. Abstract: Regression models were fit relating foliage levels to height and basal area growth of 192 trees from 26 stands representing a wide range of site and stand conditions. The study confirmed that deteriorated tree conditions in prior years (often resulting from defoliation) affect current-year growth at specific foliage levels. Absolute height and basal area growth at specific foliage levels were found to be linearly related to absolute height and basal area growth before defoliation, indicating that proportional growth losses resulting from specified levels of defoliation do not vary between fast-growing and slow-growing trees. Various site, stand, and tree variables showed no effect on the relationship between foliage levels and proportional growth loss. Models that included predicted nondefoliated growth, foliage level, and preceding-year condition variables explained up to 61 and 91% of the variation in height and basal area growth (In-In transformation), respectively. FOR. SCI. 34(2):496-504. Forest science. June 1988. v. 34 (2). p. 496-504. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Relationship of aspect to soil nutrients, species importance and biomass in a forested watershed in West Virginia.
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Relationship of feeding damage by red squirrels to cultural treatments in young stands of lodgepole pine.
XGTIA. Brockley, R.P. Sullivan, T.P. Ogden, Utah : The Station. General technical report INT - U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Paper presented at "Future Forests of the Mountain West : A Stand Culture Symposium," Sept 29-Oct 3, 1986, Missoula, MT. Apr 1988. (243). p. 322-329. Includes references. (NAL Call No.: DNAL aSD11.A48).

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Relationship of growth reduction in Douglas-fir to infection by Armillaria root disease in southeastern British Columbia.
PHYTA. Bloomberg, W.J. Morrison, D.J. St. Paul, Minn. : American Phytopathological Society. Stem volume growth during consecutive 5-yr periods was measured in four Douglas-fir (Pseudotsuga menziesii) stands infected by Armillaria ostoyae in the interior cedar-hemlock and montane spruce biogeoclimatic zones of southeastern British Columbia. Growth, expressed as percent of stem volume at the start of each period, decreased significantly as resinosis increased due to mycelial colonization of the tree base. It was highest in resinosis severity class 0 (healthy), lowest in classes 3 (greater than 50-100% of basal circumference showing resinosis) and 4 (recently killed, 100% resinosis), and intermediate in classes 1 (no basal resinosis but root s infected within 1 m of root collar) and 2 (less than or equal to 50% basal resinosis). Differences among classes were greatest for the past 5-yr period and least, though still significant, for the past 15-yr period. Trends during the past 30 yr showed greater declines in severity classes 3 and 4 relative to class 0 than in classes 1 and 2. The period in which decline was initiated also occurred earlier (up to 25 yr ago) in classes 3 and 4 than in other classes. The percentage of basal circumference that was affected by lesion was strongly related to percent roots infected but only weakly to percent volume growth. The relation of percent basal circumference affected by lesion to percent volume growth was greatly strengthened by including the period in which decline was initiated in the regression equation. Phytopathology. Apr 1989. v. 79 (4). p. 482-487. maps. Includes references. (NAL Call No.: DNAL 464.8 P56).

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Relationship of symbiotic fungi to southern pine beetle population trends.
Bridges, J.R. New Orleans, La. : The Station. Forest Service general technical report SO - United States, Southern Forest Experiment Station. Paper presented at the "Symposium on Integrated Pest Management," Apr 15-18, 1985, Asheville, North Carolina. Aug 1985. (56). p. 127-135. Includes references. (NAL Call No.: DNAL aSD11.U57).

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Relationships of dwarf mistletoes and intermediate stand cultural practices in the Northern Rockies.
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Relative effect of seed and cone insects on ponderosa pine in northern Arizona.
JEENAI. Blake, E.A. Wagner, M.R.; Koerber, T.W. Lanham, Md. : Entomological Society of America. A total of 2,548 second-year cones were collected from 10 ponderosa pine, Pinus ponderosa Dougl. ex Laws., trees at each of five representative stands in northern Arizona in fall 1984. Five insect species were responsible for cone mortality and seed destruction. Dioryctria auranticella Grote (Lepidoptera: Pyralidae) caused the most mortality, killing all of the cones on some individual trees. On a plot average basis, this species was responsible for 38.7-81.0% of the cone mortality. Less (but still substantial) cone mortality was caused by Conophthorus ponderosae Hopkins (Coleoptera: Scolytidae) and Conotrachelus neomexicana Fall (Coleoptera: Curculionidae). Cydia piperana (Kearfott) (Lepidoptera: Olethreutidae) destroyed 1.3-7.6 seeds per cone in the cones that survived. Radiographic examination of apparently normal seeds from surviving cones showed that 46.0-70.0% were destroyed by Megastigmus albifrons Walker (Hymenoptera: Torymidae). In combination, these five insect species dramatically reduced the production of ponderosa pine seeds at the locations studied. Journal of economic entomology. Dec 1989. v. 82 (6). p. 1691-1694. Includes references. (NAL Call No.: DNAL 421 J822).

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Tilden, P.E. Berkeley, Calif. : The Station. USDA Forest Service research note PSW - Pacific Southwest Forest and Range Experiment Station.

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AJBOA. Zimmerman, M. Pyke, G.H. Baltimore, Md. : Botanical Society of America. American journal of botany. Oct 1986. v. 73 (10). p. 1405-1415. Includes references. (NAL Call No.: DNAL 450 AM36).

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JLPSA. Miller, W.E. Los Angeles, Calif. : The Society. Journal of the Lepidopterists' Society. 1989. v. 43 (3). p. 167-177. Includes references. (NAL Call No.: DNAL 421 L554).

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A requirement for sucrose in xylem sap flow from dormant maple trees.
PLPHA. Johnson, R.W. Tyree, M.T.; Dixon, M.A. Rockville, Md. : American Society of Plant Physiologists. Plant physiology. June 1987. v. 84 (2). p. 495-500. ill. Includes references. (NAL Call No.: DNAL 450 P692).

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MUCBA. Montgomery, B.A. East Lansing, Mich. : The Service. Extension bulletin E - Cooperative Extension Service, Michigan State University. In the series analytic: The Second annual report of the Gypsy Moth Technical Committee: Gypsy moth in Michigan, 1987 / edited by Bruce A. Montgomery. May 1988. (2142). p. 31. (NAL Call No.: DNAL 275.29 M58B).

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Research on tree growth regulators has exciting implications for horticulture.
ANURA. Watson, M.R. Chicago, Ill. : American Nurseryman Publishing Co. American nurseryman. July 15, 1987. v. 166 (2). p. 70-79. ill. (NAL Call No.: DNAL 80 AM371).

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Residual toxicity of a high-potency formulation of Bacillus thuringiensis to spruce budworm (Lepidoptera: Tortricidae).
JEENAI. Van Frankenhuyzen, K. Nystrom, C. Lanham, Md. : Entomological Society of America. Foliar persistence of an aqueous high-potency formulation of Bacillus thuringiensis (Thuricide 48LV) applied to a white spruce (Picea glauca Moench.) plantation at 2.4 liter/ha was assessed. Residual toxicity of treated foliage to spruce budworm, Choristoneura fumiferana (Clemens), larvae was less than 2 d despite high spray deposition on the target foliage. Experiments with potted balsam fir indicated that wash-off by rain was the primary cause for loss of residual toxicity, whereas inactivation by sunlight played a limited role. As little as 6 mm of rain caused a substantial loss of residual toxicity. We conclude that deposits of Thuricide 48LV (low viscosity) on white spruce and balsam fir (Abies balsamea L.) foliage are highly susceptible to wash-off by rain. A high concentration of active ingredient does not improve foliar persistence and a suitable sticker is required. Journal of economic entomology. June 1989. v. 82 (3). p. 868-872. Includes references. (NAL Call No.: DNAL 421 J822).

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Residues from organic arsenical herbicides in chemically thinned forests.
JEVQAA. Newton, M. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. Oct/Dec 1986. v. 15 (4). p. 388-394. Includes references. (NAL Call No.: DNAL QH540.J6).

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Lunderstadt, J. New York : Springer-Verlag, c1988. Mechanisms of woody plant defences against insects : search for pattern / William J. Mattson, Jean Levieux, C. Bernard-Dagan, editors. p. 131-137. ill. Includes references. (NAL Call No.: DNAL SB761.M46).

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Resistance of ponderosa pine to the gouty pitch midge (Cecidomyia piniinopis).
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PHYTAJ. Worrall, J.J. Harrington, T.C. St. Paul, Minn. : American Phytopathological Society. Phytopathology. June 1988. v. 78 (6). p. 676-682. Includes references. (NAL Call No.: DNAL 464.8 P56).

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XGTIA. McCaughey, W.W. Ferguson, D.E. Ogden, Utah : The Station. General technical report INT - U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Paper presented at "Future Forests of the Mountain West : A Stand Culture Symposium," Sept 29-Oct 3, 1986, Missoula, MT.~ Literature review. Apr 1988. (243). p. 255-266. Includes references. (NAL Call No.: DNAL aSD11.A48).

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JOARD. Williams, J.D. Ponder, H.G.; Gilliam, C.H. Urbana, Ill. : International Society of Arboriculture. Journal of arboriculture. Apr 1987. v. 13 (4). p. 98-101. Includes references. (NAL Call No.: DNAL SB436.J6).

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AMNAA. Collins, B.S. Pickett, S.T.A. Notre Dame, Ind. : University of Notre Dame. American midland naturalist. Apr 1988. v. 119 (2). p. 282-290. Includes references. (NAL Call No.: DNAL 410 M58).

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Response of Plagithymysus bilineatus Sharp (Coleoptera: Cerambycidae) to healthy and stressed ohia trees.
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leaves or shoots under moist and dry conditions, respectively. The low standard error associated with the mean values suggest that, as a group, North American trees develop fairly similar osmotic potentials for a range of moisture conditions. Substantial solute accumulation often routinely occurs in developing leaves and in over-wintering leaves. Drought preconditioning can increase physiological activity in plants during subsequent drought by lowering psi pi. However, if drought is imposed too rapidly osmotic adjustment may not occur. Physiological plasticity in trees may cause variations in psi pi in responses to light regime and leaf canopy position. Light and nutrient regimes that promote high net photosynthesis should also promote the ability to osmotically adjust. However, stomatal responses and growth during water and nutrient stress may be unrelated to osmotic potentials because of species differences in rooting and water transport, guard cell turgor not being closely coupled with that of the bulk leaf, and changes in plant growth regulator concentrations. When examining changes in osmotic potentials using pressure-volume curves, it is important to rehydrate plant material to a water potential characteristic for that species at full hydration in the field. Moreover, as with most physiological measurements, sampling variation in light regime, canopy position, nutrient status, temperature, age, phenology, drought history, and diurnal timing of harvesting of the leaves and shoots should be mi. Forest science. Dec 1988. v. 34 (4). p. 1030-1046. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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elongation. Root pruning after establishment resulted in bud set and/or cessation of shoot elongation within 3 to 6 days in 1985 and within 20 to 28 days in 1986. The days to bud set and cessation of shoot elongation were positively correlated with increased numbers of regenerated roots from pruned surfaces (long roots). Only long root elongation was significantly correlated with shoot growth after root pruning. Root pruning also induced reductions (12 days) in net photosynthesis, transpiration, and stomatal conductance, and increased stomatal resistance to water loss; however, all recovered after root regeneration. Journal of the American Society for Horticultural Science. July 1989. v. 114 (4). p. 591-595. Includes references. (NAL Call No.: DNAL 81 SO12).

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Three-dimensional representation of Douglas-fir volume growth: comparison of growth and yield models with stand data.
FOSCA. O'Hara, K.L. Oliver, C.D. Bethesda, Md. : Society of American Foresters. Growth and yield estimates for unthinned stands from the Douglas-fir Stand Simulator (DFSIM; Curtis et al. 1981) and the Tree and Stand Simulator (TASS; Mitchell and Cameron 1985) were used to construct graphical three-dimensional representations of Douglas-fir (Pseudotsuga menziesii Mirb. Franco) stand growth on site index 44 meter (50 year). The three-dimensional models used three variables: trees per hectare, breast height age, and either mean tree volume

or stand volume. The TASS and DFSIM models were in agreement over most of their common range of age and number of trees. At wider spacings and older ages, however, the volumes predicted by the DFSIM model exceeded those predicted by the TASS model by as much as 25%. Comparisons of these three-dimensional models to unthinned and thinned stand data from a similar site quality found the models to be reasonalby accurate representations of untinned stand growth. The thinned stands, however, had greater mean tree and stand volumes than those indicated by the TASS model for untinned stands at similar spacings. Complete comparisons were not possible with the DFSIM model because of its limited range of number of trees. These results suggest the TASS model, and to a lesser extent, the DFSIM model may be underestimating the growth of widely spaced stands, or thinning may actually increase the growth of thinned trees over that of trees which had always grown at the post-thinning spacing. For. Sci. 34(3):724-743. Forest science. Sept 1988. p. 724-743. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Comparative effects of an insect growth regulator, S-31183, against the Formosan subterranean termite and eastern subterranean termite (Isoptera: Rhinotermitidae).
JEENAI. Su, N.Y. Scheffrahn, R.H. Lanham, Md. : Entomological Society of America. In a no-choice experiment, the insect growth regulator 2- 1-methyl-2(4-phenoxyphenoxy) ethoxy pyridine (S-31183) induced presoldier formation more effectively in the eastern subterranean termite, Reticulitermes flavipes (Kollar) than in the Formosan subterranean termite, Coptotermes formosanus Shiraki. When given a choice of treated or untreated wood cubes, C. formosanus avoided feeding on cubes treated with concentrations of 1,500 and 7,500 ppm. A S-31183 concentration of 300 ppm (AI) did not deter feeding or increase presoldier formation in C. formosanus. Feeding of R. flavipes groups exposed to cubes containing 30 or 150 ppm S-31183 was not deterred, but these concentrations caused approximately 80% worker mortality by the end of the 12-wk test. The results indicate that S-31183 might control R. flavipes colonies if 30-150 ppm were applied to a bait. Journal of economic entomology. Aug 1989. v. 82 (4). p. 1125-1129. Includes references. (NAL Call No.: DNAL 421 J822).

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Concentration-dependent presoldier induction and feeding deterrency: potential of two insect growth regulators for remedial control of the Formosan subterranean termite (Isoptera: Rhinotermitidae).
JEENAI. Haverty, M.I. Su, N.Y.; Tamashiro, M.; Yamamoto, R. Lanham, Md. : Entomological Society of America. Laboratory experimental groups of 120 workers and 30 soldiers of Coptotermes formosanus Shiraki were given a choice of feeding on untreated pine blocks or pine blocks treated with one of five concentrations of methoprene (0, 4, 20, 100, and 500 ppm) or S-31183 (2- 1-methyl-2(4-phenoxy-phenoxy)ethoxy pyridine) (0, 20, 100, 500, and 2,500 ppm) for 4, 8, or 12 wk. Soldier production and total mortality were significantly increased by 100 and 500 ppm methoprene at 8 and 12 wk. Biologically significant mortality (>50%) resulted from feeding on blocks treated with methoprene at 500 ppm after 8 wk. The response of C. formosanus to S-31183 was much reduced when compared with the response to methoprene. None of the concentrations of S-31183 caused biologically significant mortality to the C. formosanus groups. In addition, the highest concentration of S-31183 caused feeding deterrency that was apparently learned. Effective baits for remedial control of C. formosanus colonies should be evaluated under conditions that simulate actual use. These baits would require methoprene concentrations from 500 to 1,500 ppm, depending on the pattern of use. Journal of economic entomology. Oct 1989. v. 82 (5). p. 1370-1374. Includes references. (NAL Call No.: DNAL 421 J822).

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Entomogenous nematodes for control of subterranean termites, Reticulitermes spp. (Isoptera: Rhinotermitidae).
JEENAI. Mauldin, J.K. Beal, R.H. Lanham, Md. : Entomological Society of America. Laboratory and field studies were done to determine the efficacy of entomogenous nematodes in preventing or eliminating eastern subterranean termites, Reticulitermes flavipes (Kollar), in the laboratory and infestations of Reticulitermes spp. in the field. Nematodes tested in a laboratory study were two strains (Breton and All) of Steinernema feltiae Filipjev (=Neoaplectana carpocapsae Weiser), S. bibionis (Bovien), and Heterorhabditis heliothidis (Khan, Brooks, and Hirschmann). The same nematodes were tested in field studies except that the Mexican strain of S. feltiae was used instead of the Breton strain. In the laboratory study, termites quickly moved from a nest container through a tube containing a mixture of sand, vermiculite, and water to reach a chamber in which nematodes had been released. After 9.5 wk, termite survival rates in the nematode treatments and in the untreated control did not differ significantly. In field studies, nematodes did not eliminate or control termites either in a simulation of soil treatments under concrete slabs or in logs naturally infested with termites. Journal of economic entomology. Dec 1989. v. 82 (6). p. 1638-1642. ill. Includes references. (NAL Call No.: DNAL 421 J822).

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Preference of the Formosan subterranean termite (Isoptera: Rhinotermitidae) for wood damaged by conspecifics.
JEENAI. Delaplane, K.S. La Fage, J.P. Lanham, Md. : Entomological Society of America. In a laboratory choice-feeding test, groups of termites from five colonies of Coptotermes formosanus Shiraki were presented with wood blocks that had been previously damaged by nestmates; by conspecifics from another colony; by another termite species, Reticulitermes virginicus (Banks); and that had no damage. C. formosanus preferred wood previously damaged by conspecifics, regardless of colony origin, over wood damaged by R. virginicus or undamaged wood. Additionally, they preferred wood damaged by R. virginicus over undamaged wood. Covariate analyses and trail-following assays suggested that the results were almost entirely explained by thigmotaxic cues on the surface of damaged wood blocks rather than on pheromonal cues deposited on the wood. Journal of economic entomology. Oct 1989. v. 82 (5). p. 1363-1366. Includes references. (NAL Call No.: DNAL 421 J822).

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Retention time and toxicity of a dye marker, Sudan red 7B, on Formosan and eastern subterranean termites (Isoptera: Rhinotermitidae).
JESCEP. Su, N.Y. Scheffrahn, R.H.; Ban, P. Tifton, Ga. : The Entomological Science Society. Journal of entomological science. July 1988. v. 23 (3). p. 235-239. Includes references. (NAL Call No.: DNAL QL461.G4).

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Toxicity and feeding deterrency of a dihaloalkyl arylsulfone biocide, A-9248, against the Formosan subterranean termite (Isoptera: Rhinotermitidae).
JEENAI. Su, N.Y. Scheffrahn, R.H. College Park, Md. : Entomological Society of America.
Abstract: The topical LD50 of A-9248 (diiodomethyl para-tolyl sulfone) against the Formosan subterranean termite, Coptotermes formosanus Shiraki, wasestimated at 141.7 ug/g with 95% fiducial limits of 110.4-168.3 ug/g. A-9248 showed protracted activity against this termite. Time required to kill 90% of C. formosanus (ELT90) ws 8.4-18.9 d when administered topically, 21-26 d after 24-h forced feeding, and 19-22 d when C. formosanus were confined continuously on treated feeding substrate. Results of a choice test revealed that A-9248 is a feeding deterrent at concentrations greater than or equal to 8,000 ppm. Initially, C. formosanus fed on wood treated with 1,000-6,000 ppm A-9248 but learned to avoid the treatment of A-9248. Only those groups exposed to wood treated with less than 1,000 ppm continued feeding on the treated substrate; ingestion of these concentrations resulted in 85-100% mortality at the end of the 4 wk experiment. Journal of economic entomology. June 1988. v. 81 (3). p. 850-854. Includes references. (NAL Call No.: DNAL 421 J822).

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Allowable compressive design stresses for pressure-treated round timber foundation piling.
PAWPA. Graham, J.S. Stevensville, Md. : The Association. Proceedings ... annual meeting - American Wood-Preservers' Association. 1985. v. 81. p. 50-59. Includes references. (NAL Call No.: DNAL 300.9 AM3).

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Ambrodiscus, a new genus of inoperculate Discomycetes from ambrosia beetle galleries.
MYCOAE. Carpenter, S.E. Bronx, N.Y. : The New York Botanical Garden. Mycologia. May/June 1988. v. 80 (3). p. 320-323. ill. Includes references. (NAL Call No.: DNAL 450 M99).

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Ammonium bifluoride treatment of air-seasoning Douglas-fir poles.
FPJOA. Morrell, J.J. Graham, R.D.; Corden, M.E.; Sexton, C.M.; Kropp, B.R. Madison, Wis. : Forest Products Research Society. In the Pacific Northwest, freshly peeled Douglas-fir poles are often air-seasoned for 6 to 24 months before preservative treatment. During this period, the wood is susceptible to colonization by decay fungi. Although these fungi have little effect on wood properties over the first 2 years, their presence places added importance on adequate sterilization during treatment. The ability of ammonium bifluoride (ABF) to limit fungal colonization was evaluated by flooding pole sections with saturated solutions of ABF before air-seasoning them for 1, 2, or 3 years at sites in Oroville, Calif.; Eugene, Oreg.; Scappoose, Oreg.; and Arlington, Wash. Each year, selected poles were destructively sampled to determine levels of fungal colonization. The results indicate that ABF substantially reduced those levels, especially at the drier, southernmost site. ABF treatment can reduce, but not eliminate, the risk of fungal colonization during air-seasoning. Forest products journal. Jan 1989. v. 39 (1). p. 51-54. Includes references. (NAL Call No.: DNAL 99.9 F7662J).

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Anatomical studies of CCA penetration associated with conventional (tooth) and with micro (needle) incising.
WOOFAJ. Keith, C.T. Chauret, G. Madison, Wis. : The Society. Wood and fiber science : journal of the Society of Wood Science and Technology. Apr 1988. v. 20 (2). p. 197-208. ill. Includes references. (NAL Call No.: DNAL TA419.W6).

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Antitermitic and antifungal properties of selected bark extractives.
WOOFAJ. Harun, J. Labosky, P. Jr. Madison : Society of Wood Science and Technology. Wood and fiber science. July 1985. v. 17 (3). p. 327-335. Includes references. (NAL Call No.: DNAL TA419.W6).

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Attempts to improve penetration of waterborne preservatives in spruce and jack pine lumber.
FPJOA. Keith, C.T. Madison, Wis. : Forest Products Research Society. Forest products journal. Nov/Dec 1985. v. 35 (11/12). p. 59-64. ill. Includes 15 references. (NAL Call No.: DNAL 99.9 F7662J).

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Azaconazole, a new wood preservative.
PAWPA. Valcke, A.R. Goodwine, W.R. Stevensville, Md. : The Association. Proceedings ... annual meeting - American Wood-Preservers' Association. 1985. v. 81. p. 196-202. Includes references. (NAL Call No.: DNAL 300.9 AM3).

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Bait stake detection of the Formosan termite in south Florida.
FETMA. Thompson, C.R. Gainesville, Fla. : Florida Entomological Society. Florida entomologist. Dec 1985. v. 68 (4). p. 641-645. ill. Includes references. (NAL Call No.: DNAL 420 F662).

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Bioassaying wood preservatives with Aspergillus niger.
WOOFAJ. Morrell, J.J. Madison : Society of Wood Science and Technology. Wood and fiber science. Oct 1987. v. 19 (4). p. 388-391. Includes references. (NAL Call No.: DNAL TA419.W6).

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Biodegradation of Pentachlorophenol by the white rot fungus Phanerochaete chrysosporium.
APMBA. Mileski, G.J. Bumpus, J.A.; Jurek, M.A.; Aust, S.D. Washington, D.C. : American Society for Microbiology. Extensive biodegradation of pentachlorophenol (PCP) by the white rot fungus Phanerochaete chrysosporium was demonstrated by the disappearance and mineralization of 14C PCP in nutrient nitrogen-limited culture. Mass balance analyses demonstrated the formation of water-soluble metabolites of 14C PCP during degradation. Involvement of the lignin-degrading system of this fungus was

suggested by the fact that the time of onset, time course, and eventual decline in the rate of PCP mineralization were similar to those observed for 14C lignin degradation. Also, a purified ligninase was shown to be able to catalyze the initial oxidation of PCP. Although biodegradation of PCP was decreased in nutrient nitrogen-sufficient (i.e., nonligninolytic) cultures of P. chrysosporium, substantial biodegradation of PCP did occur, suggesting that in addition to the lignin-degrading system, another degradation system may also be responsible for some of the PCP degradation observed. Toxicity studies showed that PCP concentrations above 4 mg/liter (15 microM) prevented growth when fungal cultures were initiated by inoculation with spores. The lethal effects of PCP could, however, be circumvented by allowing the fungus to establish a mycelial mat before adding PCP. With this procedure, the fungus was able to grow and mineralize 14C PCP at concentrations as high as 500 mg/liter (1.9 mM). Applied and environmental microbiology. Dec 1988. v. 54 (12). p. 2885-2889. Includes references. (NAL Call No.: DNAL 448.3 AP5).

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Biological control of decay fungi in wood.
Mercer, P.C. Boca Raton, Fla. : CRC Press, 1988. Biocontrol of plant diseases / editors, K.G. Mukerji, K.L. Garg. Literature review. v. 1 p. 177-198. ill. Includes references. (NAL Call No.: DNAL SB732.6.B56).

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Bionomics of Lomamyia hamata (Neuroptera: Berothidae).
AESAAI. Brushwein, J.R. College Park, Md. : The Society. Annals of the Entomological Society of America. Sept 1987. v. 80 (5). p. 671-679. ill. Includes references. (NAL Call No.: DNAL 420 EN82).

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Borate rods as an on-site remedial treatment for control of decay in wood decks.
JMNAA. Dietz, M.G. Schmidt, E.L. St. Paul, Minn. : The Academy. Journal of the Minnesota Academy of Science. Winter 1988. v. 53 (2). p. 22-26. ill. Includes references. (NAL Call No.: DNAL 500 M663).

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Boron treatment of hardwood lumber: a preliminary cost analysis.
FPJOA. Mulach, R.W. Cubbage, F.W.; Granskog, J.E. Madison, Wis. : Forest Products Research Society. Boron was examined as an alternative to lindane for treatment of hardwood lumber. Costs were calculated for systems representative of current practice and for systems most likely for boron usage. The application methods for current lindane-based chemicals and those required for boron differ, as do the end results. Boron treatment provides more thorough wood penetration, which results in better long-term protection of manufactured products. A comparison of costs showed boron was more expensive per unit treated than current systems with lindane, but annual costs could be reduced by selective application of boron with new bulk dip equipment. Forest products journal. July/Aug 1989. v. 39 (7/8). p. 49-52. ill. Includes references. (NAL Call No.: DNAL 99.9 F7662J).

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Bound chlorinated residue in chloropicrin-treated Douglas-fir.
WOOFAJ. Goodell, B.S. Krahmer, R.L.; Graham, R.D. Madison : Society of Wood Science and Technology. Wood and fiber science. Jan 1986. v. 18 (1). p. 127-133. ill. Includes references. (NAL Call No.: DNAL TA419.W6).

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Burning cacodylic acid-treated oak trees: how safe?.
FPJOA. Woolson, E.A. Madison, Wis. : Forest Products Research Society. Forest products journal. May 1986. v. 36 (5). p. 49-52. Includes references. (NAL Call No.: DNAL 99.9 F7662J).

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A case for ecosystem-level experimentation in termite research.
SOCID. French, J.R.J. Chico, Calif. : California State University, Dept. of Biological Sciences. Sociobiology. Paper presented at the "Symposium on Recent Developments in Termite Biology," December 2, 1987, Boston, Massachusetts. 1988. 14 (1). p. 269-280. Includes references. (NAL Call No.: DNAL QH549.S6).

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CCA-PEG pole preservative research.
PAWPA. Trumble, W.P. Messina, E.E. Stevensville, Md. : The Association. Proceedings ... annual meeting - American Wood-Preservers' Association. 1985. v. 81. p. 203-212. (NAL Call No.: DNAL 300.9 AM3).

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Changes in structural and chemical components of wood delignified by fungi.
WOSTBE. Blanchette, R.A. Otjen, L.; Effland, M.J.; Eslyn, W.E. Secaucus, N.J. : Springer-Verlag New York Inc. Wood science and technology. 1985. v. 19 (1). p. 35-46. ill. Includes references. (NAL Call No.: DNAL SD433.A1W6).

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Characteristics of decay and insect attack in California homes.
CAGRA. Brier, A.N. Dost, W.A.; Wilcox, W.W. Berkeley, Calif. : The Station. California agriculture - California Agricultural Experiment Station. Sept/Oct 1988. v. 42 (5). p. 21-22. Includes references. (NAL Call No.: DNAL 100 C12CAG).

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Characteristics of wound-associated wood of yellow-poplar (Liriodendron tulipifera L.).
WOOFAJ. Lowerts, G. Wheeler, E.A.; Kellison, R.C. Madison : Society of Wood Science and Technology. Wood and fiber science. Oct 1986. v. 18 (4). p. 537-552. ill. Includes references. (NAL Call No.: DNAL TA419.W6).

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A chemical and microscopic study of decayed earlywood and latewood of loblolly pine killed by the southern pine beetle.
WOOFAJ. Shamoun, S.F. Levi, M.P. Madison : Society of Wood Science and Technology. Wood and fiber science. Jan 1985. v. 17 (1). p. 22-28. ill. Includes references. (NAL Call No.: DNAL TA419.W6).

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Chloromethane, a novel methyl donor for biosynthesis of esters and anisoles in Phellinus pomaceus.
APMBA. Harper, D.B. Hamilton, J.T.G.; Kennedy, J.T.; McNally, K.J. Washington, D.C. : American Society for Microbiology. Chloromethane (CH_3Cl), a gaseous natural product released as a secondary metabolite by many wood-rotting fungi of the family Hymenochaetaceae, has been shown to act as a methyl donor for biosynthesis of methyl esters of benzoic and furoic acid in the primary metabolism of Phellinus pomaceus. The broad-specificity methylating system could esterify a wide range of aromatic and aliphatic acids. In addition to CH_3Cl, both bromo- and iodomethanes acted as methyl donors. Methylation did not appear to proceed via methanol or a coenzyme A intermediate. The initial growth-related accumulation of methyl benzoate during culture of P. pomaceus was paralleled by an increase in activity of the methylating system in the mycelium. Changes in percent incorporation of C_2H_3 from exogenous C_2H_3Cl during growth indicated that although utilization of CH_3Cl was initially closely coupled to biosynthesis of the compound, the system became less channeled later in growth. This phase coincide with release of gaseous CH_3Cl by the fungus. A biochemically distinct CH_3Cl-utilizing system capable of methylating phenols and thiophenol was also identified in the fungus, but in contrast with the carboxylic acid-methylating systems, it attainded maximum activity in the idiophase. Preliminary investigations of a non-CH_3Cl-releasing fungus, Fomitopsis pinicola, have shown the presence of a CH_3Cl-utilizing system capable of methylating benzoic acid suggesting that CH_3Cl biosynthesis may occur in non-hy menochaetaceous fungi. Halogenated compounds hitherto found in nature are mainly stable end products of metabolism. The participation of CH_3Cl in primary fungal metabolism demonstrates that some halometabolites may have a previously unrecognized role as intermediates in the biosynthesis of nonhalogenated natural products. Applied and environmental microbiology. Aug 1989. v. 55 (8). p. 1981-1989. Includes references. (NAL Call No.: DNAL 448.3 AP5).

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Comparative wood consumption within and between mounds of Coptotermes acinaciformis (Froggatt) (Isoptera: Rhinotermitidae).
SOCID. Creffield, J.W. Howick, C.D.; Pahl, P.J. Chico, Calif. : California State University, Dept. of Biological Sciences. Sociobiology. 1985. v. 11 (1). p. 77-86. Includes references. (NAL Call No.: DNAL QH549.S6).

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Comparing the efficacies of water-emulsifiable formulations of pentachlorophenol with that of technical-grade penta by soil-block bioassays.
PAWPA. Amburgey, T.L. Fatima Castro Cardias, M. de; Parikh, S.V. Stevensville, Md. : The Association. Proceedings ... annual meeting - American Wood-Preservers' Association. 1985. v. 81. p. 10-18. Includes references. (NAL Call No.: DNAL 300.9 AM3).

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FPJOA. Zahora, A.R. Corden, M.E. Madison, Wis. : Forest Products Research Society. Forest products journal. July/Aug 1985. v. 35 (7/8). p. 64-69. ill. Includes 14 references. (NAL Call No.: DNAL 99.9 F7662J).

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Influence of veratryl alcohol and hydrogen peroxide on ligninase activity and ligninase production by Phanerochaete chrysosporium.
APMBA. Tonon, F. Odier, E. Washington, D.C. : American Society for Microbiology. Abstract: Veratryl alcohol, added as a supplement to cultures of Phanerochaete chrysosporium, enhanced ligninase activity through protection of the ligninase against inactivation by hydrogen peroxide produced by this fungus in cultures. In the presence of veratryl alcohol, the loss of liginiase activity observed in non-protein-synthesizing cultures (cycloheximide-treated) equaled the extracellular protein turnover. When cultures were not supplemented with veratryl alcohol, inactivation of ligninase by hydrogen peroxide added to protein turnover, resulting in a more rapid loss of ligninase activity. Although all ligninase isoenzymes are sensitive to inactivation by hydrogen peroxide, only the isoenzyme of the highest specific act ivity (80.6 nkat . mg of protein-1; Mr, 41,800; pI, 3.96) was found to be protected by veratryl alcohol. The concentration of veratryl alcohol necessary for full protection of ligninase activity varied according to the concentration of hydrogen peroxide present in the medium, which depended on the nature of the carbon source (glucose or glycerol). It is proposed that the nature of the carbon source influences the overall ligninase activity not only directly, by affecting the rate and type of synthesized ligninase activity, but also by affecting the rate of hydrogen peroxide production, bringing about different rates of inactivation. Applied and Environmental microbiology. Feb 1988. v. 54 (2). p. 466-472. Includes references. (NAL Call No.: DNAL 448.3 AP5).

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APMBA. Jokela, J. Pellinen, J.; Salkinoja-Salonen, M. Washington, D.C. : American Society for Microbiology. Applied and Environmental microbiology. Nov 1987. v. 53 (11). p. 2642-2649. Includes references. (NAL Call No.: DNAL 448.3 AP5).

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Insect answers: Moisture ants.
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Insects and other pests in firewood.
Rice, M.E. Baird, C.R.; McCaffrey, J.P. Moscow, Idaho : The Service. Current information series - Cooperative Extension Service, University of Idaho. Sept 1988. (834). 3 p. ill. (NAL Call No.: DNAL 275.29 ID13IDC).

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Integrated protection against lyctid beetle infestations. V. Selecting efficient schedules for pressure treatment of tropical hardwood lumber with polyborates.
FPJOA. Barnes, H.M. Williams, L.H. Madison, Wis. : Forest Products Research Society. This research investigated pressure and nonpressure methods for treating imported hardwoods with polyborates. A series of studies was designed

to determine the most efficient schedules for use with imported hardwoods. Effective treatment was obtained with both a Lowry treatment cycle and a simple vacuum process. Treatability varied depending on the species treated. Banak was much easier to treat than was obeche. Better penetration and retention were obtained with a disodium octaborate (TimBor) compared to an ammonium pentaborate/sodium sulfate solution (AmBor-S). Selective absorption from polyborate working solutions did not occur when solutions were reused for treating repetitive charges. The use of a final vacuum in the Lowry process removed approximately 5 pcf of water (about 20% moisture content) from treated stock. Forest products journal. Sept 1988. v. 38 (9). p. 13-19. Includes references. (NAL Call No.: DNAL 99.9 F7662J).

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XFNSA. Williams, L.H. Mauldin, J.K. New Orleans, La. : The Station. U.S. Forest Service research note SO - United States, Southern Forest Experiment Station. Aug 1985. (313). 8 p. ill. Includes references. (NAL Call No.: DNAL A99.9 F7628U).

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Integrated protection against lyctid beetle infestations. VI. Thermal treatment of tropical hardwood lumber with polyborates.
FPJOA. Barnes, H.M. Williams, L.H. Madison, Wis. : Forest Products Research Society. Results are presented for air-dried banak that had been treated with a polyborate using a thermal treatment process. Results indicate that surface protection can be achieved using short immersion times. A diffusion storage period resulted in deeper, more uniform penetration. Forest products journal. Sept 1988. v. 38 (9). p. 20-21. Includes references. (NAL Call No.: DNAL 99.9 F7662J).

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WOSTBE. Cease, K.R. Blanchette, R.A.; Highley, T.L. Secaucus, N.J. : Springer-Verlag. Wood science and technology. 1989. v. 23 (2). p. 151-161. ill. Includes references. (NAL Call No.: DNAL SD433.A1W6).

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Introduction of Coptotermes formosanus Shiraki to the continental United States.
Beal, R.H. Honolulu, Hawaii : The Service. Research extension series - College of Tropical Agriculture and Human Resources, University of Hawaii, Cooperative Extension Service. In the series analytic: Biology and control of the Formosan subterranean termite / edited by M. Tamashiro and N.Y. Su. Proceedings of an International Symposium, June 1985, Honolulu, Hawaii.~ Literature review. Oct 1987. (083). p. 48-53. Includes references. (NAL Call No.: DNAL S481.R4).

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Laboratory decay resistance of preservative-treated red alder.
WOOFAJ. Mitchoff, M.E. Morrell, J.J. Madison, Wis. : The Society. Wood and fiber science : journal of the Society of Wood Science and Technology. July 1988. v. 20 (3). p. 370-377. Includes references. (NAL Call No.: DNAL TA419.W6).

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Laccase-mediated detoxification of phenolic compounds.
APMBA. Bollag, J.M. Shuttleworth, K.L.; Anderson, D.H. Washington, D.C. : American Society for Microbiology. The ability of a polyphenoloxidase, the laccase of the fungus Rhizoctonia praticola, to detoxify phenolic pollutants was examined. The growth of the fungus could be inhibited by phenolic compounds, and the effective concentration was dependent on the substituents of the phenol. A toxic amount of a phenolic compound was added to a fungal growth medium in the presence or absence of a naturally occurring phenol, and half of the replicates also received laccase.

The medium was then inoculated with R. praticola, and the levels of phenols in the medium were monitored by high-performance liquid chromatography analysis. The addition of the laccase reversed thT inhibitory effect of 2,6-xylenol, 4-chloro-2-methylphenol, and p-cresol. Other compounds, e.g., o-cresol and 2,4-dichlorophenol, were detoxified only when laccase was used in conjunction with a natural phenol such as syringic acid. The toxicity of p-chlorophenol and 2,4,5-trichlorophenol could not be overcome by any additions. The ability of the laccase to alter the toxicity of the phenols appeared to be related to the capacity of the enzyme to decrease the levels of the parent compound by transformation or cross-coupling with another phenol. Applied and environmental microbiology. Dec 1988. v. 54 (12). p. 3086-3091. Includes references. (NAL Call Nc.: DNAL 448.3 AP5).

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An overview of the Formosan subterranean termite (Isoptera: Rhinotermitidae) in the world.
Su, N.Y. Tamashiro, M. Honolulu, Hawaii : The Service. Research extension series - College of Tropical Agriculture and Human Resources, University of Hawaii, Cooperative Extension Service. In the series analytic: Biology and control of the Formosan subterranean termite / edited by M. Tamashiro and N.Y. Su. Proceedings of an International Symposium, June 1985, Honolulu, Hawaii.~ Literature review. Oct 1987. (083). p. 3-15. maps. Includes references. (NAL Call No.: DNAL S481.R4).

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Pest management of wood-destroying organisms.
Moore, H.B. New York : Van Nostrand Reinhold Co., c1986. Advances in urban pest management / edited by Gary W. Bennett and John M. Owens. Literature review. p. 313-333. Includes references. (NAL Call No.: DNAL SB950.8.A3).

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NOSCA. Thies, W.G. Li, C.Y. Pullman, Wash. : Washington State University Press. Northwest science : official publication of the Northwest Scientific Association. Feb 1988. v. 62 (1). p. 16-20. ill. Includes references. (NAL Call No.: DNAL 470 N81).

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Properties of compression dewatered and baled aspen wood chip fuels.
FPJOA. Steklenski, P.G. Schmidt, E.L.; Haygreen, J.G. Madison, Wis. : Forest Products Research Society. This project investigated basic relationships of the compression dewatering and baling of wood chips. The following fundamental aspects of experimental, compression dewatered chip bales were investigated: bale durability, moisture content (MC) and distribution, biodeterioration and internal heating. These factors were studied over time with bales of three different densities. Bale physical durability was dependent on restraining forces. As restraining forces decreased (i.e., lower density bales or as bales dried below the fiber saturation point), bale integrity declined. Bales in a controlled environment (65 degrees F and 50% RH) dried in a manner similar to solid wood, that is, rapidly within the first 30 days and then at a slower rate thereafter, reaching a final MC of 15 percent (dry basis) at 98 days. However, MC distribution within bales was highly variable and only partially dependent on time, bale density, and external insulation. It is likely that internal heating, due to respiration and microorganism activity, also influenced MC distribution. Bale density and insulation (simulated stacking) were found to influence the growth of wood-innabiting organisms that in turn produced varying levels of heat within bales. However, several temperature peaks (up to 35 degrees F above ambient conditions) were found in all bales at approximately the same time which indicated that factors other than density and insulation also influenced temperature increases within bales. Bales with higher density and slower drying rates supported extensive growth of the white-rot fungus Phanaerochaete chrysosporium. Wood in such colonized areas was approximately 20 percent lower in specific gravity than uncolonized wood but retained the same caloric value per unit of weight. Forest products journal. Feb 1989. v. 39 (2). p. 8-13. Includes references. (NAL Call No.: DNAL 99.9 F7662J).

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Atmospheric deposition and forest pest interactions.
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Kellison, R.C. Weir, R.J. Washington, D.C. : Conservation Foundation, c1987. The Greenhouse effect, climate change, and U.S. forests / edited by William E. Shands and John S. Hoffman. p. 285-293. Includes references. (NAL Call No.: DNAL SD390.7.G73G74).

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ESTHAG. Klein, R.M. Washington, D.C. : American Chemical Society. Environmental science & technology. Feb 1988. v. 22 (2). p. 148-149. Includes references. (NAL Call No.: DNAL TD420.A1E5).

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Characteristics of wound-associated wood of yellow-poplar (Liriodendron tulipifera L.).
WOOFAJ. Lowerts, G. Wheeler, E.A.; Kellison, R.C. Madison : Society of Wood Science and Technology. Wood and fiber science. Oct 1986. v. 18 (4). p. 537-552. ill. Includes references. (NAL Call No.: DNAL TA419.W6).

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XFINA. Rehfeldt, G.E. Ogden, Utah : The Station. USDA Forest Service research note INT - United States Intermountain Forest and Range Experiment Station. July 1986. (369). 5 p. maps. Includes references. (NAL Call No.: DNAL A99.9 F764UN).

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The development of old-growth douglas-fir forests northeast of Mount St. Helens, Washington, following an A.D. 1480 eruption.
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XFIPA. Cole, D.N. Ogden, Utah : The Station. Research paper INT - U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Includes statistical data. Mar 1988. (389). 41 p. ill. Includes references. (NAL Call No.: DNAL A99.9 F764U).

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Economic impact of decay on black walnut.
Hart, J.H. Baughan, R.; Jennings, N.E. Bethesda, Md. : Society of American Foresters. Northern journal of applied forestry. Sept 1986. v. 3 (3). p. 116-118. ill. Includes references. (NAL Call No.: DNAL SD143.N6).

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Effect of salinity on leaf ionic content and photosynthesis of Taxodium distichum L.
AMNAA. Pezeshki, S.R. DeLaune, R.D.; Patrick, W.H. Jr. Notre Dame, Ind. : University of Notre Dame. American midland naturalist. Jan 1988. v. 119 (1). p. 185-192. Includes references. (NAL Call No.: DNAL 410 M58).

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Effect of simulated acid rain on growth and yield of Valencia orange, Floradade tomato and slash pine in Florida.
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PLPHA. Mehlhorn, H. Seufert, G.; Schmidt, A.; Kunert, K.J. Rockville, Md. : American Society of Plant Physiologists. Plant physiology. Sept 1986. v. 82 (1). p. 336-338. Includes 18 references. (NAL Call No.: DNAL 450 P692).

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Effects of air pollutants on the composition of stable carbon isotopes, delta 13C, of leaves and wood, and on leaf injury.
PLPHA. Martin, B. Bytnerowicz, A.; Thorstenson, Y.R. Rockville, Md. : American Society of Plant Physiologists. Plant physiology. Sept 1988. v. 88 (1). p. 218-223. Includes references. (NAL Call No.: DNAL 450 P692).

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Effects of ozone or sulfur dioxide on pitch pine seedlings.
JEVQAA. Scherzer, A.J. McClenahen, J.R. Madison, Wis. : American Society of Agronomy. Pitch pine seedlings (Pinus rigida Mill.) were fumigated with O3 or SO2 to determine their effects on growth and symptom expression. Seedlings fumigated twice with 0.20 microliter O3L-1 for 4 hr at age 14 and 22 wk had significantly greater shoot weight than those fumigated with 0.30 microliter O3L-01; 0, 0.08, 0.10, and 0.15 microliter L-1 were intermediate and not significantly different. Root starch content tended to decrease with increasing O3 with control seedlings being significantly higher than the 0.15, 0.20, and 0.30 microliter O3L-1 treatments. Root starch of seedlings treated with 0.20, 0.50, 0.60, 0.70, and 0.90 microliter SO2L-1 was significantly lower than the controls. Seedlings from six families fumigated for 5 wk starting at age 6 wk differed in direction and degree of growth response when exposed to 0.08 and 0.30 microliter O3L-1. Significant differences exited among families for needle weight, shoot weight, and total weight. No differences were found among O3 treatments within a family, but patterns suggest some pitch pine individuals may be sensitive to low O3 while others are stimulated. Visible injury consisted of light chlorotic mottle on oldest needles. Discriminant function analysis indicated that growth responses were indistinguishable among families receiving no treatment; however, treated seedlings could be classified based on various height measurements and/or shoot weight. Differences in visible injury were apparent among families of seedlings treated with 0.40 microliter O3L-1, indicating some pitch pine families are more sensitive to O3 than others. Journal of environmental quality. Jan/Mar 1989. v. 18 (1). p. 57-61. Includes references. (NAL Call No.: DNAL QH540.J6).

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Effects of persistent volcanic ash on Douglas-fir in Northern Idaho.
XFIPA. Bilderback, D.E. Carlson, C.E. Ogden, Utah : The Station. USDA Forest Service research paper INT - Intermountain Research Station. Aug 1987. (380). 3 p. Includes references. (NAL Call No.: DNAL A99.9 F764U).

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Effects of simulated acid rain on cadmium mobilization in soils and subsequent uptake and accumulation in poplar and sunflower.
JOSHB. Gingas, V.M. Sydnor, T.D.; Weidensaul, T.C. Alexandria, Va. : The Society. Journal of the American Society for Horticultural Science. Mar 1988. v. 113 (2). p. 258-261. Includes references. (NAL Call No.: DNAL 81 SO12).

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Efficacy and timing of metsulfuron methyl in forestry in Maine.
PNWSB. Maass, D. Prouty, R. Beltsville, Md. : The Society. Proceedings of the ... annual meeting - Northeastern Weed Science Society. 1986. v. 40. p. 230-232. (NAL Call No.: DNAL 79.9 N814).

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A fifty year comparison of white oak (Quercus alba) growth in the Lehigh Valley and nearby Poconos: possible air pollution effects.
PPASA. Halma, J.R. Rieker, D.; Majumdar, S.K. Allentown, Pa. : The Academy. Proceedings of the Pennsylvania Academy of Science. 1986. v. 60 (1). p. 39-42. maps. Includes references. (NAL Call No.: DNAL 500 P383).

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A five year record of change for a declining scarlet oak stand in the Missouri Ozarks.
XFGTA. Johnson, L.J. Law, J.R. St. Paul, Minn. : The Station. USDA Forest Service general technical report NC - North Central Forest Experiment Station. Paper presented at the Seventh Central Hardwood Forest Conference, Mar 5-8, 1989, Carbondale, Illinois. 1989. (132). p. 103-107. Includes 70 references. (NAL Call No.: DNAL aSD11.A352).

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Forest tree nursery herbicide studies in the northern Great Plains: herbicide phytotoxicity tables.
Abrahamson, L.P. Fort Collins, Colo. : The Station. General technical report RM - Rocky Mountain Forest and Range Experiment Station, United States, Forest Service. Feb 1986. (125). p. 58-67. Includes references. (NAL Call No.: DNAL aSD11.A42).

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Forests are dying but is acid rain really to blame?.
AUDUAD. Luoma, J.R. New York, N.Y. : National Audubon Society. Audubon. Mar 1987. v. 89 (2). p. 36-38, 40, 41, 44-46, 48-51. ill., maps. (NAL Call No.: DNAL S900.A8).

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Ghost moths & dead spruce.
AMFOA. Egerter, D.E. Washington, D.C. : American Forestry Association. American forests. July/Aug 1989. v. 95 (7/8). p. 54-57. ill. (NAL Call No.: DNAL 99.8 F762).

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Growth and nutrient content of red spruce seedlings in soil amended with aluminum.
JEVQAA. Ohno, T. Sucoff, E.I.; Erich, M.S.; Bloom, P.R.; Buschena, C.A.; Dixon, R.K. Madison, Wis. : American Society of Agronomy. Aluminum toxicity may be a factor linking acid deposition to forest decline. Acid precipitation may lower soil pH, which would raise the level of phytotoxic forms of Al in soil solution. A greenhouse study was conducted to examine the effects of soil Al on the growth and nutrient composition of red spruce (Picea rubens Sarg.). A Becker series forest soil (Typic Fragiorthod) was amended with AlCl3 to give a range of saturated paste extract Al concentrations from 37 to 537 micromol L-1 at harvest. Bare-rooted seedlings were transplanted into pots and grown for 52 d. Biomass of needles, primary roots, and lateral roots were not significantly decreased by soil Al levels. The biomass of needles were negatively correlated with the concentration of Al in the needles. All seedlings were P-deficient, which may account for the lack of response to soil Al levels. The concentration of Al in seedling needles increased significantly with increasing soil Al levels, but not in the primary or lateral roots. The concentration of Mn in seedling needles, primary roots, and lateral roots decreased with higher concentrations of Al in the soil. The concentrations of N, P, K, Ca, Mg, Fe, Zn, Cu, and B in the needles were not affected by soil Al. However, the Mg, Ca, and B concentrations in both primary and lateral roots were significantly lower with increasing levels of soil Al. Increasing soil Al levels resulted in lower nitrification rates in the soils. The addition of Al significantly reduced colonies of bacteria relative to the control soil. However, fungi/actinomycetes colonies were not significantly reduced by soil Al. Journal of environmental quality. Oct/Dec 1988. v. 17 (4). p. 666-672. Includes references. (NAL Call No.: DNAL QH540.J6).

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Growth response of green and white ash seedlings to ozone, sulfur dioxide, and simulated acid rain.
FOSCA. Chappelka, A.H. Chevone, B.I.; Burk, T.E. Bethesda, Md. : Society of American Foresters. Nine-week-old green (Fraxinus pennsylvanica Marsh.) and white (F. americana L.) ash were exposed to O3 and/or SO2 (control, 0.10 ppm O3, 0.08 ppm SO2, or 0.10 ppm O3 + 0.08 ppm SO2) for 4 h d-1, 5 d wk-1 in combination with simulated rain (pH 3.0, 4.3 or 5.6, 1 h d-1, 2 d wk-1 at 0.75 cm h-1) for 6 weeks, under controlled laboratory conditions, with rain applied either just before or after fumigation. Across all rain treatments, white ash biomass was suppressed by the application of O3 and cumulative shoot elongation of green ash exposed to O3 and/or SO2 was less than controls. The combination of O3 + SO2 did not affect the growth of either species more than the pollutants applied alone. Leaf area ratio (LAR) and root to shoot ratio (RSR) exhibited quadratic responses to rain pH in green ash, across all pollutant treatments. Significant pollutant X pH interactions occurred in leaf weight ratio (LWR) in green ash and LAR and RSR in white ash. Significant linear increases in LAR and decreases in RSR, with decreasing pH, were observed for O3 and SO3-treated white ash. These findings are discussed relative to implications of the effects of gaseous pollutants in combination with acid rain on green and white ash growth. FOR. SCI. 34(4):1016-1029. Forest science. Dec 1988. v. 34 (4). p. 1016-1029. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Growth responses and delayed winter hardening in Sitka spruce following summer exposure to ozone.
NEPHA. Lucas, P.W. Cottam, D.A.; Sheppard, L.J.; Francis, B.J. New York, N.Y. : Cambridge University Press. The New phytologist. Apr 1988. v. 108 (4). p. 495-504. Includes references. (NAL Call No.: DNAL 450 N42).

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Herbicide injury to trees.
Meade, J.A. New Brunswick, N.J. : The Service. FS - Cooperative Extension Service, Cook College. 1986. (121,rev.). 2 p. (NAL Call No.: DNAL S544.3.N5F7).

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Historical overview of Atlantic white cedar in the Carolinas.
Frost, C.C. Boulder, Colo. : Westview Press, 1987. Atlantic white cedar wetlands / edited by Aimlee D. Laderman. Paper presented at the First Atlantic White Cedar Wetlands Symposium, held at the Marine Biological Laboratory, Woods Hole, Massachusetts, October, 1984. p. 257-264. maps. Includes references. (NAL Call No.: DNAL QK938.M3A8).

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Increase in Pinus strobus needle transectional areas in response to acid misting.
AECTCV. Maurice, C.G. Crang, R.E. New York, N.Y. : Springer-Verlag. Archives of environmental contamination and toxicology. Jan 1986. v. 15 (1). p. 77-82. ill. Includes references. (NAL Call No.: DNAL TD172.A7).

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Johnson, D.W. Lindberg, S.E.; Pitelka, L.F.; Bondietti, E.A. Atlanta, Ga. : TAPPI Press. Annual meeting - Technical Association of the Pulp and Paper Industry. Meeting held on March 2-5, Atlanta, Georgia. 1986. p. 3-13. ill. Includes references. (NAL Call No.: DNAL TS1080.T325).

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Interactions between ozone and plant cuticles. II. Water permeability.
NEPHA. Kerstiens, G. Lendzian, K.J. New York, N.Y. : Cambridge University Press. The New phytologist. May 1989. v. 112 (1). p. 21-27. Includes references. (NAL Call No.: DNAL 450 N42).

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Prance, G.T. Boulder, Colo. : Westview Press, c1986. Tropical rain forests and the world atmosphere / edited by Ghillean T. Prance. p. 1-8. Includes references. (NAL Call No.: DNAL SD390.5.P7).

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Investigations on the effect of ozone on leaves of pinto bean (Phaseolus vulgaris L.) and beech yearlings (Fagus sylvatica L.).
Masuch, G. Kettrup, A. Deerfield Beach, Fla. : VCH Publishers, c1985. Air pollution and plants / edited by Clement Troyanowsky. Presented at the 2nd "European Conference on Chemistry and the Environment," May 21-24, 1984, Lindau, West Germany. p. 142-145. Includes 3 references. (NAL Call No.: DNAL QK751.E97 1984).

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Lichens, tree growth, and foliar symptoms of air pollution: are the stories consistent?.
JEVQAA. Muir, P.S. McCune, B. Madison, Wis. : American Society of Agronomy. Lichen communities, tree growth, and foliar symptoms of Acer saccharum, Fraxinus spp., Liriodendron tulipifera, Quercus alba, and the Quercus rubra group were studied in relation to air pollutants in southern Indiana and Illinois. Both study areas receive regional pollutants, but only one is close to a large coal-fired utility, which results in a high dose of SO2 and its reaction products. Lichen communities differed significantly between the two areas; species richness and total cover were lowest in the near-utility area, and species compositional differences suggested that air quality was responsible. Few differences were noted in foliar symptoms between areas; when symptom levels differed, they were generally highest in the remote area. Ozone-induced stippling was found in both areas on leaves of Fraxinus spp. and Liriodendron. Although ring widths indicated depressed tree growth in the near-utility area during years of high emissions, periodic basal area increments and tree vigor did not generally differ between areas, and were generally not related to foliar symptoms other than stippling. Ozone-induced stippling on Liriodendron was negatively

correlated with basal area increments. Journal of environmental quality. July/Sept 1988. v. 17 (3). p. 361-370. Includes references. (NAL Call No.: DNAL QH540.J6).

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JEVQAA. Bouchard, D.C. Lavy, T.L.; Lawson, E.R. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. Apr/June 1985. v. 14 (2). p. 229-233. Includes 21 references. (NAL Call No.: DNAL QH540.J6).

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The nature and timing of the deterioration of red spruce in the northern Appalachian Mountains.
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One year results for a hexazinone conifer release trial.
PNWSB. Reynolds, P.E. MacKay, T.S.; McCormack, M.L. Jr. Beltsville, Md. : The Society. Proceedings of the ... annual meeting - Northeastern Weed Science Society. 1986. v. 40. p. 218-222. Includes references. (NAL Call No.: DNAL 79.9 N814).

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Hennon, P.E. Shaw, C.G. III; Hansen, E.M. Boulder, Colo. : Westview Press, 1987. Atlantic white cedar wetlands / edited by Aimlee D. Laderman. Paper presented at the First Atlantic White Cedar Wetlands Symposium, held at the Marine Biological Laboratory, Woods Hole, Massachusetts, October, 1984. p. 331-337. maps. Includes references. (NAL Call No.: DNAL QK938.M3A8).

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An overview of decline and mortality of Chamaecyparis nootkatensis in southeast Alaska.
Shaw, C.G. III. Eglitis, A.; Laurent, T.H.; Hennon, P.E. Boulder, Colo. : Westview Press, 1987. Atlantic white cedar wetlands / edited by Aimlee D. Laderman. Paper presented at the First Atlantic White Cedar Wetlands Symposium, held at the Marine Biological Laboratory, Woods Hole, Massachusetts, October, 1984. p. 327-330. Includes references. (NAL Call No.: DNAL QK938.M3A8).

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Photosynthesis and growth response of red spruce and loblolly pine to soil-applied lead and simulated acid rain.
FOSCA. Seiler, J.R. Paganelli, D.J. Bethesda, Md. : Society of American Foresters. Forest science. Sept 1987. v. 33 (3). p. 668-675. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Pine responses to glyphosate plus sulfometuron methyl treatments.
SWSPBE. Voth, R.D. Raleigh, N.C. : The Society . Proceedings - Southern Weed Science Society. Meeting held on January 12-14, 1987, Orlando, Florida. 1987. (40). p. 167-174. Includes references. (NAL Call No.: DNAL 79.9 S08 (P)).

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Recovery in a tornado-damaged hardwood forest in northern Kentucky.
TKASAT. Held, M.E. Bryant, W.S. Louisville, Ky. : The Academy. Transactions of the Kentucky Academy of Science. Mar 1989. v. 50 (1/2). p. 16-21. Includes references. (NAL Call No.: DNAL 500 K41).

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Reduction of initial plagiotropic growth of softwood 'Fraser' fir cuttings.
JOSHB. Wise, F.C. Blazich, F.A.; Hinesley, L.E. Alexandria, Va. : The Society. Journal of the American Society for Horticultural Science. Jan 1986. v. 111 (1). p. 21-26. ill. Includes 21 references. (NAL Call No.: DNAL 81 SO12).

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HOUSING, HOME FURNISHINGS, AND SURROUNDINGS

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Biodegradation of Pentachlorophenol by the white rot fungus Phanerochaete chrysosporium.
APMBA. Mileski, G.J. Bumpus, J.A.; Jurek, M.A.; Aust, S.D. Washington, D.C. : American Society for Microbiology. Extensive biodegradation of pentachlorophenol (PCP) by the white rot fungus Phanerochaete chrysosporium was demonstrated by the disappearance and mineralization of 14C PCP in nutrient nitrogen-limited culture. Mass balance analyses demonstrated the formation of water-soluble metabolites of 14C PCP during degradation. Involvement of the lignin-degrading system of this fungus was suggested by the fact that the time of onset, time course, and eventual decline in the rate of PCP mineralization were similar to those observed for 14C lignin degradation. Also, a purified ligninase was shown to be able to catalyze the initial oxidation of PCP. Although biodegradation of PCP was decreased in nutrient nitrogen-sufficient (i.e., nonligninolytic) cultures of P. chrysosporium, substantial biodegradation of PCP did occur, suggesting that in addition to the lignin-degrading system, another degradation system may also be responsible for some of the PCP degradation observed. Toxicity studies showed that PCP concentrations above 4 mg/liter (15 microM) prevented growth when fungal cultures were initiated by inoculation with spores. The lethal effects of PCP could, however, be circumvented by allowing the fungus to establish a mycelial mat before adding PCP. With this procedure, the fungus was able to grow and mineralize 14C PCP at concentrations as high as 500 mg/liter (1.9 mM). Applied and environmental microbiology. Dec 1988. v. 54 (12). p. 2885-2889. Includes references. (NAL Call No.: DNAL 448.3 AP5).

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Effects of chronic doses of ozone on loblolly pine: photosynthetic characteristics in the third growing season.
FOSCA. Sasek, T.W. Richardson, C.J. Bethesda, Md. : Society of American Foresters. Gas exchange characteristics of loblolly pine seedlings were measured in the third growing season of ozone fumigations to determine the effects of long-term ozone exposure on photosynthetic capacity. Light and CO2 response

curves indicated significant decreases of 21% and 27%, respectively, in light-saturated and CO2-saturated photosynthetic capacities at 2 X ambient ozone (92 ppb 12-hr seasonal mean) compared to charcoal-filtered (CF) air, approximately 0.5 X ambient ozone (29 ppb 12-hr seasonal mean). Differences in the response curves suggest changes in light-harvesting and biochemical efficiencies as well as changes in the activity of RuBP Carboxylase and the regeneration rate of RuBP. Chlorophyll and carotenoid conditions per unit leaf area were decreased at the high ozone treatment in older flushes. Stomatal resistance limited photosynthesis by about 29% in both CF and 2 X ambient ozone treated plants, suggesting that chronic ozone exposure did not affect stomatal control in loblolly pine. Forest science. Sept 1989. v. 35 (3). p. 745-755. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Effects of insecticide use in a pine seed orchard on pesticide levels in fish.
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Effects of ozone or sulfur dioxide on pitch pine seedlings.
JEVQAA. Scherzer, A.J. McClenahen, J.R. Madison, Wis. : American Society of Agronomy. Pitch pine seedlings (Pinus rigida Mill.) were fumigated with O3 or SO2 to determine their effects on growth and symptom expression. Seedlings fumigated twice with 0.20 microliter O3L-1 for 4 hr at age 14 and 22 wk had significantly greater shoot weight than those fumigated with 0.30 microliter O3L-01; 0, 0.08, 0.10, and 0.15 microliter L-1 were intermediate and not significantly different. Root starch content tended to decrease with increasing O3 with control seedlings being significantly higher than the 0.15, 0.20, and 0.30 microliter O3L-1 treatments. Root starch of seedlings treated with 0.20, 0.50, 0.60, 0.70, and 0.90 microliter SO2L-1 was significantly lower than the controls. Seedlings from six families fumigated for 5 wk starting at age 6 wk differed in direction and degree of growth response when exposed to 0.08 and 0.30 microliter O3L-1. Significant differences exited among families for needle weight, shoot weight, and total weight. No differences were found among O3 treatments within a family, but patterns suggest some pitch pine individuals may be sensitive to low O3 while others are stimulated. Visible injury consisted of light chlorotic mottle on oldest needles. Discriminant function analysis indicated that growth responses were indistinguishable among families receiving no treatment; however, treated seedlings could be classified based on various height measurements and/or shoot weight. Differences in visible injury were apparent among families of seedlings treated with 0.40 microliter O3L-1, indicating some pitch pine families are more sensitive to O3 than others. Journal of environmental quality. Jan/Mar 1989. v. 18 (1). p. 57-61. Includes references. (NAL Call No.: DNAL QH540.J6).

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A fifty year comparison of white oak (Quercus alba) growth in the Lehigh Valley and nearby Poconos: possible air pollution effects.
PPASA. Halma, J.R. Rieker, D.; Majumdar, S.K. Allentown, Pa. : The Academy. Proceedings of the Pennsylvania Academy of Science. 1986. v. 60 (1). p. 39-42. maps. Includes references. (NAL Call No.: DNAL 500 P383).

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Fluoride-induced enhancement and inhibition of shoot growth in four taxa of Pinus.
NEPHA. Doley, D. New York, N.Y. : Cambridge University Press. The New phytologist. Aug 1989. v. 112 (4). p. 543-552. Includes references. (NAL Call No.: DNAL 450 N42).

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Forests are dying but is acid rain really to blame?.
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Growth and nutrient content of red spruce seedlings in soil amended with aluminum.
JEVQAA. Ohno, T. Sucoff, E.I.; Erich, M.S.; Bloom, P.R.; Buschena, C.A.; Dixon, R.K. Madison, Wis. : American Society of Agronomy. Aluminum toxicity may be a factor linking acid deposition to forest decline. Acid precipitation may lower soil pH, which would raise the level of phytotoxic forms of Al in soil solution. A greenhouse study was conducted to examine the effects of soil Al on the growth and nutrient composition of red spruce (Picea rubens Sarg.). A Becker series forest soil (Typic Fragiorthod) was amended with AlCl3 to give a range of saturated paste extract Al concentrations from 37 to 537 micromol L-1 at harvest. Bare-rooted seedlings were transplanted into pots and grown for 52 d. Biomass of needles, primary roots, and lateral roots were not significantly decreased by soil Al levels. The biomass of needles were negatively correlated with the concentration of Al in the needles. All seedlings were P-deficient, which may account for the lack of response to soil Al levels. The concentration of Al in seedling needles increased significantly with increasing soil Al levels, but not in the primary or lateral roots. The concentration of Mn in seedling needles, primary roots, and lateral roots decreased with higher concentrations of Al in the soil. The concentrations of N, P, K, Ca, Mg, Fe, Zn, Cu, and B in the needles were not affected by soil Al. However, the Mg, Ca, and B concentrations in both primary and lateral roots were significantly lower with increasing levels of soil Al. Increasing soil Al levels resulted in lower nitrification rates in the soils. The addition of Al significantly reduced colonies of bacteria relative to the control soil. However, fungi/actinomycetes colonies were not significantly reduced by soil Al. Journal of environmental quality. Oct/Dec 1988. v. 17 (4). p. 666-672. Includes references. (NAL Call No.: DNAL QH540.J6).

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JFUSA. Zedaker, S.M. Hyink, D.M.; Smith, D.W. Bethesda, Md. : Society of American Foresters. Journal of forestry. Jan 1987. v. 85 (1). p. 34-36. ill. Includes references. (NAL Call No.: DNAL 99.8 F768).

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Growth response of green and white ash seedlings to ozone, sulfur dioxide, and simulated acid rain.
FOSCA. Chappelka, A.H. Chevone, B.I.; Burk, T.E. Bethesda, Md. : Society of American Foresters. Nine-week-old green (Fraxinus pennsylvanica Marsh.) and white (F. americana L.) ash were exposed to O3 and/or SO2 (control, 0.10 ppm O3, 0.08 ppm SO2, or 0.10 ppm O3 + 0.08 ppm SO2) for 4 h d-1, 5 d wk-1 in combination with simulated rain (pH 3.0, 4.3 or 5.6, 1 h d-1, 2 d wk-1 at 0.75 cm h-1) for 6 weeks, under controlled laboratory conditions, with rain applied either just before or after fumigation. Across all rain treatments, white ash biomass was suppressed by the application of O3 and cumulative shoot elongation of green ash exposed to O3 and/or SO2 was less than controls. The combination of O3 + SO2 did not affect the growth of either species more than the pollutants applied alone. Leaf area ratio (LAR) and root to shoot ratio (RSR) exhibited quadratic responses to rain pH in green ash, across all pollutant treatments. Significant pollutant X pH interactions occurred in leaf weight ratio (LWR) in green ash and LAR and RSR in white ash. Significant linear increases in LAR and decreases in RSR, with decreasing pH, were observed for O3 and SO3-treated white ash. These findings are discussed relative to implications of the effects of gaseous pollutants in combination with acid rain on green and white ash growth. FOR. SCI. 34(4):1016-1029. Forest science. Dec 1988. v. 34 (4). p. 1016-1029. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Herbicides in southern forestry--improving water quality.
SWSPBE. Neary, D.G. Bush, P.E.; Michael, J.L. Raleigh, N.C. : The Society . Proceedings - Southern Weed Science Society. 1986. (39th). p. 335-341. Includes references. (NAL Call No.: DNAL 79.9 S08 (P)).

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History of the chemical environment from elemental analysis of tree rings.
McClenahen, J.R. Vimmerstedt, J.P.; Lathrop, R.C. Washington, DC : U.S. Department of Energy, Office of Energy Research, 1986. Proceedings of the International Symposium on Ecological Aspects of Tree-Ring Analysis / compiled by G.C. Jacoby, J.W. Hornbeck. p. 690-694. (NAL Call No.: DNAL QK477.2.A6I5 1986).

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Increase in Pinus strobus needle transectional areas in response to acid misting.
AECTCV. Maurice, C.G. Crang, R.E. New York, N.Y. : Springer-Verlag. Archives of environmental contamination and toxicology. Jan 1986. v. 15 (1). p. 77-82. ill. Includes references. (NAL Call No.: DNAL TD172.A7).

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Influence of automobile exhaust and lead on the oxygen echange of two lichens measured by a new oxygen electrode method.
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Interim assessment the causes and effects of acidic deposition /Charles N. Herrick, managing editor.
Herrick, Charles N. Washington, DC : National Acid Precipitation Assessment Program, Office of the Director of Research, 1987? . Cover title: NAPAP interim assessment.~ At head of cover title: The National Acid Precipitation Assessment Program. 4 v. : ill., maps ; 28 cm. Includes bibliographies. (NAL Call No.: DNAL TD196.A25I64).

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Masuch, G. Kettrup, A. Deerfield Beach, Fla. : VCH Publishers, c1985. Air pollution and plants / edited by Clement Troyanowsky. Presented at the 2nd "European Conference on Chemistry and the Environment," May 21-24, 1984, Lindau, West Germany. p. 142-145. Includes 3 references. (NAL Call No.: DNAL QK751.E97 1984).

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Laboratory measurements of ozone removal by plants, and application to rural ozone records.
Steinberger, E.H. Wurtele, M.G. Boston : The Society, 1985. 17th Conference on Agricultural and Forest Meteorology and seventh Conference on Biometeorology and Aerobiology, May 21-24, 1985, Scottsdale, Ariz. : preprint volume / sponsored by the American Meteorological Society. p. 400-403. Includes references. (NAL Call No.: DNAL S600.2.C6 1985).

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Laccase-mediated detoxification of phenolic compounds.
APMBA. Bollag, J.M. Shuttleworth, K.L.; Anderson, D.H. Washington, D.C. : American Society for Microbiology. The ability of a polyphenoloxidase, the laccase of the fungus Rhizoctonia praticola, to detoxify phenolic pollutants was examined. The growth of the fungus could be inhibited by phenolic compounds, and the effective concentration was dependent on the substituents of the phenol. A toxic amount of a phenolic compound was added to a fungal growth medium in the presence or absence of a naturally occurring phenol, and half of the replicates also received laccase. The medium was then inoculated with R. praticola, and the levels of phenols in the medium were monitored by high-performance liquid chromatography analysis. The addition of the laccase reversed thT inhibitory effect of 2,6-xylenol, 4-chloro-2-methylphenol, and p-cresol. Other compounds, e.g., o-cresol and 2,4-dichlorophenol, were detoxified only when laccase was used in conjunction with a natural phenol such as syringic acid. The toxicity of p-chlorophenol and 2,4,5-trichlorophenol could

not be overcome by any additions. The ability of the laccase to alter the toxicity of the phenols appeared to be related to the capacity of the enzyme to decrease the levels of the parent compound by transformation or cross-coupling with another phenol. Applied and environmental microbiology. Dec 1988. v. 54 (12). p. 3086-3091. Includes references. (NAL Call No.: DNAL 448.3 AP5).

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Last stand of the red spruce /Robert A. Mello ; introduction by Patrick J. Leahy.
Mello, Robert A., 1946-. Washington, D.C. : Island Press ; New York City? : Natural Resources Defense Council, c1987. Includes index. xviii, 199 p. : ill. ; 23 cm. Bibliography: p. 179 -189. (NAL Call No.: DNAL SB608.R33M45).

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FOSCA. Dierberg, F.E. Straub, P.A.; Hendry, C.D. Bethesda, Md. : Society of American Foresters. Forest science. Dec 1986. v. 32 (4). p. 900-913. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Lichens, tree growth, and foliar symptoms of air pollution: are the stories consistent?.
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Lindane and fenitrothion reduce soil and litter mesofauna on Piedmont and Appalachian sites.
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JEVQAA. Bouchard, D.C. Lavy, T.L.; Lawson, E.R. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. Apr/June 1985. v. 14 (2). p. 229-233. Includes 21 references. (NAL Call No.: DNAL QH540.J6).

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Shugart, H.H. McLaughlin, S.B. Jr. Stanford, Calif. : Stanford University Press, 1985. Sulfur dioxide and vegetation : physiology, ecology, and policy issues / edited by William E. Winner, Harold A. Mooney, and Robert A. Goldstein. p. 478-491. maps. (NAL Call No.: DNAL QK753.S85S85).

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Nutrient uptake and growth responses of Virginia pine to elevated atmospheric carbon dioxide.
JEVQAA. Luxmoore, R.J. O'Neill, E.G.; Ells, J.M.; Rogers, H.H. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. July/Sept 1986. v. 15 (3). p. 244-251. Includes references. (NAL Call No.: DNAL QH540.J6).

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Integrated Pest Management Working Group (U.S.). Brown, Dave.; Hitt, Samuel M.; Moir, William H. United States : The Group ; Washington, D.C. : U.S. G.P.O., Supt. of Doc. , 1986. "January 1986."~ "The Integrated Pest Management Working Group was established by an out-of-court settlement between the Committee for Integrated Pest Management and the USDA Forest Service. The USDA Forest Service has agreed to issue a response to the recommendations in this report within 60 days of issuance of the report"--T.p. verso. 1 v. (various pagings) ; 29 cm. Includes bibliographies. (NAL Call No.: DNAL S970.4.U5I6).

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Pesticides in forestry and agriculture: effects on aquatic habitats.
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FOSCA. Seiler, J.R. Paganelli, D.J. Bethesda, Md. : Society of American Foresters. Forest science. Sept 1987. v. 33 (3). p. 668-675. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Photosynthetic response of yellow-poplar seedlings to the antioxidant chemical ethylenediurea.
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Picloram movement in an Appalachian hardwood forest watershed.
JEVQAA. Neary, D.G. Bush, P.B.; Douglass, J.E.; Todd, R.L. Madison, Wis. : American Society of Agronomy. Journal of environmental quality. Oct/Dec 1985. v. 14 (4). p. 585-592. maps. Includes references. (NAL Call No.: DNAL QH540.J6).

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Picloram movement in soil solution and streamflow from a coastal plain forest.
JEVQAA. Michael, J.L. Neary, D.G.; Wells, M.J.M. Madison, Wis. : American Society of Agronomy. Picloram (4-amino-3,5,6-trichloropicolinic acid) was aerially applied to a longleaf pine (Pinus palustris L.) site in the upper coastal plain of Alabama to control kudzu Pueraria lobata (Willd.) Ohwi . Pellets (10% a.i.) were spread at the rate of 56 kg ha-1 on loamy sand Typic Kanhapludult soils. Movement of this herbicide was monitored with mineral soil samples, tension-cup lysimeters, flowproportional streamflow samplers, and discrete samplers. Picloram levels in the upper 15 cm of mineral soil peaked at 0.96 to 2.25 mg kg-1 25 d after application, depending on slope position, and declined to 0.13 to 0.29 mg kg-1 1 yr later. In soil solution, picloram was detected at a depth of 0.4 m between 26 and 273 d after application. Only 4 of 15 lysimeters consistently contained detectable residues. Maximum picloram levels in soil solution were 130, 450, and 191 mg m-3 for ridge, midslope, and toe-slope positions, respectively. Downstream monitoring began 4 d after the herbicide application, and an initial concentration of 68 mg m-3 of picloram was detected. The maximum downstream concentration of 77 mg m-3 occurred 18 d after the application, immediately after the second storm event. Downstream levels dropped to less than 10 mg m-3 after 90 d and to less than 2 mg m-3 after 200 d. Following localized retreatment along the stream more than a year after the initial treatment, levels climbed again into the 20 to 30 mg m-3 range. Most of the initial off-site movement came from a perennial stream the had been inadvertently treated, but subsequently storm runoff was the largest contributor to stream contamination. Picloram residues in this stream were similar to those observed downstream, but they were higher (up to 241 mg m-3 and dropped faster to below 2 mg m-3 after D 150. Journal of environmental quality. Jan/Mar 1989. v. 18 (1). p. 89-95. maps. Includes references. (NAL Call No.: DNAL QH540.J6).

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Lauenroth, W.K. Milchunas, D.G. Stanford, Calif. : Stanford University Press, 1985. Sulfur dioxide and vegetation : physiology, ecology, and policy issues / edited by William E. Winner, Harold A. Mooney, and Robert A. Goldstein. p. 454-477. (NAL Call No.: DNAL QK753.S85S85).

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Sugar maple decline, acid rain, pest interactions in the Northeast.
Lachance, D. Bethesda, Md. : The Society. Proceedings of the ... Society of American Foresters National Convention. Meeting held Oct 16-19, 1988, Rochester, New York. 1989. p. 102-105. Includes references. (NAL Call No.: DNAL SD143.S64).

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Vegetation management in the Coastal Plain/Piedmontfinal environmental impact statement : record of decision, USDA Forest Service.
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Watershed losses of triclopyr after aerial application to release spruce-fir.
PNWSB. Smith, C.T. McCormack, M.L. Jr. College Park, Md. : The Society. Proceedings of the annual meeting - Northeastern Weed Science Society. Meeting held January 6, 7 & 8, 1988 in Hartford, Connecticut. 1988. v. 42. p. 104-108. Includes references. (NAL Call No.: DNAL 79.9 N814).

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Application of an evapotranspiration model to estimating understory removal effects in a douglas-fir forest.
Kelliher, F.M. Black, T.A. Boston : The Society, 1985. 17th Conference on Agricultural and Forest Meteorology and seventh Conference on Biometeorology and Aerobiology, May 21-24, 1985, Scottsdale, Ariz. : preprint volume / sponsored by the American Meteorological Society. p. 259-262. Includes references. (NAL Call No.: DNAL S600.2.C6 1985).

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Application of growth models for simulating genetic gain of loblolly pine.
FOSCA. Knowe, S.A. Foster, G.S. Bethesda, Md. Society of American Foresters. A technique for predicting genetic gain in progeny tests using height-age models and stand-stimulations is presented for loblolly pine (Pinus taeda L.). Periodic remeasurements for a block-plot open-pollinated progeny test are used to examine trends in height growth, selection differential, and percent gain in height and volume. Using the Chapman-Richards model and approximate F tests, significant differences among families were detected in asymptote and rate parameters but not for the shape parameter. Separate base-age invariant height-age equations were developed for each family to account for polymorphism associated with the rate parameter. Selection differential calculated from either observed or predicted heights exhibited similar-trends although estimates from the height-age equations are consistently higher than obtained with observed height after age 5. Family rankings using the height-age models are consistent with those obtained using observed heights. Also, percent gain calculated from predicted heights is within 2% of the estimates obtained with observed heights at ages greater than 3 years. Differences in survival, height, and diameter were combined to examine trends in volume production associated with families. Predicted volume for each family was simulated using a bivariate distribution of height and diameter accounting for differences in height-growth patterns among families. Family rankings for volume are also closely correlated, resulting in two or three of the same families being selected using observed and predicted data. Selection differential obtained from simulated and observed volume fluctuates in rank producing a satisfactory trend based on predicted volume after age 5. Gain based on simulated volume tends to be slightly greater than gain based on observed volume. Estimates of percent gain obtained by reinitializing the simulations with quadratic mean dbh and residual trees per acre after thinning differed more from the observed trends th. Forest science. Mar 1989. v. 35 (1). p. 211-228. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Community dynamics and topographic controls on forest pattern in Shenandoah National Park, Virginia.
BTBCAL. Harrison, E.A. McIntyre, B.M.; Dueser, R.D. Bronx, N.Y. : The Club. The Bulletin of the Torrey Botanical Club. Jan/Mar 1989. v. 116 (1). p. 1-14. maps. Includes references. (NAL Call No.: DNAL 451 T63B).

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Mattson, W.J. Lawrence, R.K.; Haack, R.A.; Herms, D.A.; Charles, P.J. New York : Springer-Verlag, c1988. Mechanisms of woody plant defences against insects : search for pattern / William J. Mattson, Jean Levieux, C. Bernard-Dagan, editors. Literature review. p. 3-38. ill. Includes references. (NAL Call No.: DNAL SB761.M46).

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Degree growth stage model and rest-breaking mechanisms in temperate woody perennials.
HJHSA. Fuchigami, L.H. Nee, C.C. Alexandria, Va. : American Society for Horticultural Science. HortScience. Paper presented at the "Symposium on Mechanisms of Rest and Dormancy of the XXII International Horticultural Congress/83rd ASHS Annual Meeting," August 12, 1986, Davis, California.~ Literature review. Oct 1987. v. 22 (5). p. 836-845. ill. Includes references. (NAL Call No.: DNAL SB1.H6).

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Development and mortality of Ips avulsus (Coleoptera: Scolytidae) at constant temperatures.
EVETEX. Wagner, T.L. Hennier, P.B.; Flamm, R.O.; Coulson, R.N. College Park, Md. : Entomological Society of America. Aspects of the development and mortality of Ips avulsus (Eichhoff) were studied at seven constant temperatures from 10 to 35 degrees C. On average, eggs occupied 10.3% of the total time in the host, larvae 34.8%, pupae 11.8%, and teneral adults 43.1%. Plots of development rates (reciprocal of median times) and percent mortalities versus constant temperatures indicated that the insect is well adapted to high temperatures but sensitive to low temperatures. The timing of oviposition relative to sibling oviposition time in a slab had little effect on the development times of any life stage or the life cycle. Oviposition time influenced life-stage and life-cycle mortality, although the effects were not great. For example, the probability of larval death increased from 16.6 to 28.7% for individuals originating in the first and fourth quarters of the oviposition period. The probability of death due to cannibalism was less than 10% and was not influenced by oviposition time. No difference was observed in the overall proportion of males to total emerging beetles (0.496) and 0.5; however, this proportion increased with time throughout the emergence period. Models were developed to predict life-stage and life-cycle development times as functions of temperature. A mechanistic model described the development rate versus constant temperature relationship, whereas a cumulative Weibull function described the temperature-independent distributions of normalized development times. The life-cycle model was validated using a multiple-cohort simulation procedure and data of I. avulsus emergence from three trees in each of three field plots. The validation indicated model suitability in a larger model of population dynamics, although additional testing is indicated. Environmental entomology. Apr 1988. v. 17 (2). p. 181-191. Includes references. (NAL Call No.: DNAL QL461.E532).

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Development and verification on models of freezing tolerance for Douglas-fir populations in the inland Northwest.
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Economic analysis of vegetation management.
SWSPB. Kuch, P.J. Champaign : The Society. Proceedings - Southern Weed Science Society. Paper presented at the 38th Annual Meeting of the Southern Weed Science Society, "Challenges in Food Production" Jan. 14/16, 1985, Houston, Texas. 1985. v. 38. p. 347-353. Includes 3 references. (NAL Call No.: DNAL 79.9 S08).

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Teeter, L.D. Huang, Y.S. New Orleans, La. : The Station. General technical report SO - U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. Paper presented at the Fifth Biennial Southern Silvicultural Research Conference, Nov 1-3, 1988, Memphis, Tennessee. 1989. (74). p. 373-378. Includes references. (NAL Call No.: DNAL aSD11.U57).

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An economic assessment of risk and returns from prescribed burning on tallgrass prairie.
JRMGA. Bernardo, D.J. Engle, D.M.; McCollum, E.T. Denver, Colo. : Society for Range Management. Journal of range management. Mar 1988. v. 41 (2). p. 178-183. Includes references. (NAL Call No.: DNAL 60.18 J82).

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Economics of dutch elm disease control: a model and case study.
JFUSA. Baughman, M.J. Bethesda, Md. : Society of American Foresters. Journal of forestry. Sept 1985. v. 83 (9). p. 554-557. Includes references. (NAL Call No.: DNAL 99.8 F768).

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Effects and adjustments of competition bias in progeny trials with single-tree plots.
FOSCA. Magnussen, S. Bethesda, Md. : Society of American Foresters. A competition model based on the height difference between a subject tree and its neighbors was used to adjust annual growth data (age 1-5) in a close-spaced single tree plot trial of 25 open-pollinated Pinus banksiana progenies. Competition effects in tree height, basal area, and volume growth were estimated within each of eight classes of dominance suppression. This procedure allowed a differential adjustment of family performances to their large plot expectations. It is limited to the absence of competition effects on height growth. Response to competition was the same in all families. Variance components and heritability estimates of basal area and stem volume were inordinately inflated by competition. Forest science. June 1989. v. 35

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Effects of moisture before and after laboratory spray application of insecticides to western spruce budworm (Lepidoptera: Tortricidae).
JEENAI. Robertson, J.L. Preisler, H.K. Lanham, Md. : Entomological Society of America. Journal of economic entomology. Dec 1988. v. 81 (6). p. 1678-1680. Includes references. (NAL Call No.: DNAL 421 J822).

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Enhancement of baculovirus activity on gysp moth (Lepidoptera: Lymantriidae) by chitinase.
JEENAI. Shapiro, M. Preisler, H.K.; Robertson, J.L. Lanham, Md. : Entomological Society of America. Chitinase significantly enhanced the activity of nuclear polyhedrosis viruses (NPV) ingested by second-instar gypsy moth, Lymantria dispar (L.). Multiple probit regressions calculated from mortality observed at 14 and 21 d indicated that the LC50's of NPV declined 1.3-, 2.0-, 3.2-, and 5.4-fold with the addition of 0.001, 0.010, 0.10, and 1.00% chitinase, respectively. In addition, insects exposed to NPV-chitinase combinations died more rapidly than those that ingested NPV only. Journal of economic entomology. Dec 1987. v. 80 (6). p. 1113-1116. Includes references. (NAL Call No.: DNAL 421 J822).

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Estimating oak leaf area index and gypsy moth, Lymantria dispar (L.) (Lepidoptera: Lymantriidae), defoliation using canopy photographs.
EVETEX. Liebhold, A.M. Elkinton, J.S.; Miller, D.R.; Wang, Y.S. College Park, Md. : Entomological Society of America. Abstract: Oak leaf area index was (LAI) was estimated using wide-angle photographs of the forest canopy taken from the ground at grid points throughout three sites on Cape Cod, Mass. Confidence intervals for these estimates and optimal sample sizes were calculated. Oak LAI estimates leveled off by early June when no defoliation was present. Within-plot two-dimensional spatial distribution of oak LAI was very similar to the spatial distribution of oak basal area. Consequently, there was a positive correlation between local oak leaf area and local basal area. Comparison of LAI estimates taken before and after gypsy moth, Lymantria dispar. (L.), defoliation allowed the estimation of oak leaf area consumed. Leaf area loss was similarin areas of high and low host foliage densities. The correlation of leaf area lost with local density of early instars was greater than the correlation with the density of late instars. Environmental entomology. June 1988. v. 17 (3). p. 560-566. ill., maps. Includes references. (NAL Call No.: DNAL QL461.E532).

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Forest-bark beetle interactions: stand dynamics and prognoses.
Crookston, N.L. Stark, R.W. New York : Wiley, c1985. Integrated pest management in pine-bark beetle ecosystems / edited by William E. Waters, Ronald W. Stark, David L. Wood. p. 81-103. ill. (NAL Call No.: DNAL SB608.P65I58).

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Mathematical analysis and modeling of epidemics of rubber tree root diseases: probability of infection of an individual tree.
FOSCA. Chadoeuf, J. Joannes, H.; Nandris, D.; Pierrat, J.C. Bethesda, Md. : Society of American Foresters. The spread of root diseases in rubber tree (Hevea brasiliensis) due to Rigidoporus lignosus and Phellinus noxius was investigated epidemiologically using data collected every 6 months during a 6-year survey in a plantation. The aim of the present study is to see what factors could predict whether a given tree would be infested at the following inspection. Using a qualitative regression method we expressed the probability of pathogenic attack on a tree in terms of three factors: the state of health of the surrounding trees, the method used to clear the forest prior to planting, and evolution with time. The effects of each factor were ranked, and the roles of the various classes of neighbors were established and quantified. Variability between successive inspections was small, and the method of forest clearing was important only while primary inocula in the soil were still infectious. The state of health of the immediate neighbors was most significant; more distant neighbors in the same row had some effect; interrow spread was extremely rare. This investigation dealt only with trees as individuals, and further study of the interrelationships of groups of trees is needed. For. SCI. 34(4):831-845. Forest science. Dec 1988. v. 34 (4). p. 831-845. Includes references. (NAL Call No.: DNAL 99.8 F7632).

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Modeling control strategies for laminated root rot in managed Douglas-fir stands: model development.
PHYTAJ. Bloomberg, W.J. St. Paul, Minn. : American Phytopathological Society. Phytopathology. Apr 1988. v. 78 (4). p. 403-409. ill., maps. Includes references. (NAL Call No.: DNAL 464.8 P56).

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Modeling the effect of thinning on tree water use.
Spittlehouse, D.L. Boston : The Society, 1985. 17th Conference on Agricultural and Forest Meteorology and seventh Conference on Biometeorology and Aerobiology, May 21-24,

1985, Scottsdale, Ariz. : preprint volume / sponsored by the American Meteorological Society. p. 256-258. Includes references. (NAL Call No.: DNAL S600.2.C6 1985).

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